調製油	(1)	(2)	(3)	(4)	(5)	(6)
喫食時 AA 濃度(ppm)	10	10	10	10	10	10
油中 Fe 濃度(ppm)	0	0.1	0.5	10	100	200
香りの強さ	−	△	○	◎	◎	◎
香りの好ましさ	−	○	○	◎	○	△
風味の強さ	−	△	○	◎	◎	◎
風味の好ましさ	−	○	○	○	○	△
味の強さ	−	△	○	◎	◎	◎
味の好ましさ	−	○	○	◎	○	△

[0069] 表5に示した結果から、(1)(コントロール)と(2)、(3)、(4)、(5)、(6)の比較において、AATGが食塩水中に同濃度でも、(3)、(4)、(5)、(6)の濃度の鉄分を含有することにより香り、風味、味の強さが増強されたことが判明した。また(2)、(3)、(4)、(5)の鉄濃度では香り、風味、味が(1)に比べ好まれた。(6)は鉄由来と思われる香り及び味の影響により、香り及び味が(3)、(4)、(5)に比べ劣っていた。

[0070] ラーメンスープ(妃湯(フェイタン)とんこつ醤油:味の素(株)製の9倍希釈液)に5%AATG/LLCと硫酸第1鉄・7水塩を下記配合比で添加し、味風味を評価した。

(1)5%AATG/LLCのみ 1g/1000gラーメンスープ

(2)(1)＋硫酸第1鉄・7水塩 0.001mM/1000gラーメンスープ(Fe:0.06ppm)

(3)(1)＋硫酸第1鉄・7水塩 0.01mM/1000gラーメンスープ(Fe: 0.56ppm)

(4)(1)＋硫酸第1鉄・7水塩 0.

1mM/1000gラーメンスープ(Fe: 5.6ppm)

(5)(1)＋硫酸第1鉄・7水塩 1.0

mM/1000gラーメンスープ (Fe: 56ppm)

(6)(1)＋硫酸第1鉄・7水塩 5.0 mM/1000gラーメンスープ (Fe: 280ppm)

[0071] [表6]

調製油	(1)	(2)	(3)	(4)	(5)	(6)
喫食時AA濃度(ppm)	20	20	20	20	20	20
Fe濃度(ppm)	0	0.06	0.56	5.6	56	280
香りの強さ	−	△	○	◎	◎	◎
香りの好ましさ	−	○	○	◎	○	△
風味の強さ	−	△	○	◎	◎	◎
風味の好ましさ	−	○	○	○	○	△
味の強さ	−	△	○	◎	◎	◎
味の好ましさ	−	○	◎	○	○	△

[0072] 表6に示した結果から、(1)(コントロール)と(2)、(3)、(4)、(5)の比較において、AATGがラーメンスープ中に同濃度でも、(3)、(4)、(5)、(6)の濃度の鉄分を含有することにより香り、風味、味の強さが増強された。また(2)、(3)、(4)、(5)の鉄濃度では香り、風味、味が(1)に比べ好まれた。(6)は鉄由来と思われる香り及び味の影響により、香り及び味が(3)、(4)、(5)に比べ劣っていた。

[0073] <ボラージ油のコク味向上剤としての効果>

ボラージ油とLLCで表のような植物油脂組成物を調製し、「シューストリング」(味の素冷凍食品(株))150gを各油脂3kgを用いて180℃で3分間揚げ、フライドポテトを調理した。

[0074] [表7]

ボラージ油含量(%)	0	0.1	0.5	1	5	10	20	30	50	100
γレノレン酸含量(%)	0	0.02	0.1	0.2	1	2	4	6	10	20
香りの強さ	−	△	○	◎	◎	◎	◎	◎	◎	◎
香りの好ましさ	−	△	○	◎	◎	◎	○	○	○	×
風味の強さ	−	△	○	○	◎	◎	◎	◎	◎	○
風味の好ましさ	−	△	○	○	◎	◎	◎	○	○	×
味の強さ	−	△	○	○	◎	◎	◎	◎	◎	◎
味の好ましさ	−	△	○	○	◎	◎	◎	○	○	×
後味の強さ	−	△	○	○	◎	◎	◎	◎	◎	◎
後味の好ましさ	−	△	○	○	◎	◎	◎	○	○	×

[0075] 長鎖高度不飽和脂肪酸としてγリノレン酸を含有するボラージ油でシューストリングを揚げることによりシューストリングにコク味が付与された。一方で、油中に過剰なγリノレン酸を含有させると風味、味を損なう結果となった。

[0076] 次に、以下のように調製油を使用して炊き込みピラフを調理した。

(1)LLC

(2)3%ボラージ油/LLC(0.6%γリノレン酸)

(3)30%ボラージ/LLC(6%γリノレン酸)

(4)ボラージ油(20%γリノレン酸)

無洗米200gに水300gを加え、「ライスクック炒飯用」(味の素(株))10g及び各調製油を添加し、炊飯器にてピラフを調理した。その結果、以下の表8に示されるように、適当な量のγリノレン酸を含有するボラージ油をピラフに添加することによりピラフにコク味が付与された。

[0077] [表8]

調製油	(1)	(2)	(3)	(4)
添加量(g)	5	5	5	5
γリノレン酸の添加時濃度(ppm)	0	58	580	1942
香りの強さ	−	○	◎	◎
香りの好ましさ	−	○	◎	◎
風味の強さ	−	○	◎	◎
風味の好ましさ	−	○	◎	○
味の強さ	−	○	◎	◎
味の好ましさ	−	○	◎	○
後味の強さ	−	○	◎	◎
後味の好ましさ	−	○	◎	○

[0078] <脂肪酸組成の効果>

以下のように油脂を調製した。

(1)0.0625%AATG/CO(AA含量250ppm)

(2)0.125%AATG/CO

(AA含量500ppm)

(3)0.0625%AATG/LLC

（AA含量250ppm）

(4)0．0625%AATG/HOS

（AA含量250ppm）

[0079] 「とんかつ」は75gの豚ロース肉に塩0．6g、胡椒少々をまぶし、小麦粉、20%卵溶液の順で付着させ、生パン粉を付け、各調整油で180℃、30分揚げた。その結果、以下の表9に示されるように、同じAA濃度でも添加する油脂の脂肪酸組成によりコク味向上効果が異なった。具体的には、αリノレン酸（C18:3（n-3））の含量が5%以下である油脂（HOS、LLC）がより好ましいことが判明した。

[0080] [表9]

とんかつ

	(1)	(2)	(3)	(4)
	CO	CO	LLC	HOS
AATG含量	250ppm	500ppm	250ppm	250ppm
香りの強さ	△	◎	◎	◎
香りの好ましさ	△	○	○	○
風味の強さ	△	◎	◎	◎
風味の好ましさ	△	○	○	○
味の強さ	△	◎	◎	◎
味の好ましさ	△	◎	◎	◎
後味の強さ	△	◎	◎	◎
後味の好ましさ	△	○	○	◎

産業上の利用可能性

[0081] 本発明コク味向上剤又はそれを含む植物油脂組成物を使用し調理することによって、 食品に「コク」や「濃厚感」を賦与することが出来る。

請求の範囲

[1] 主成分としての長鎖高度不飽和脂肪酸及び／又はそのエステル体、及びコク味増強成分を含むコク味向上剤。

[2] コク味増強成分がαトコフェロール及び／又は鉄分である、請求項1記載のコク味向上剤。

[3] αトコフェロールを50ー15000ppm含有する、請求項2記載のコク味向上剤。

[4] 含まれるトコフェロール全量中、αトコフェロールが50％以上である、請求項2記載のコク味向上剤。

[5] 鉄分をFe換算で0．5ー100ppm含有する、請求項2記載のコク味向上剤。

[6] 長鎖高度不飽和脂肪酸がn−6系である請求項1ないし5のいずれか一項に記載のコク味向上剤。

[7] 長鎖高度不飽和脂肪酸がアラキドン酸である、請求項6記載のコク味向上剤。

[8] アラキドン酸が微生物由来である、請求項7記載のコク味向上剤。

[9] 長鎖高度不飽和脂肪酸及び／又はそのエステル体から成るコク味向上剤にコク味増強成分を添加することによりコク味向上剤の効果を増強する方法。

[10] コク味増強成分がαトコフェロール及び／又は鉄分である、請求項9記載の方法。

[11] ボラージ油、月見草油、ローズヒップ油、又はブラックカラント油から選ばれた植物油由来の長鎖高度不飽和脂肪酸及び／又はそのエステル体から成るコク味向上剤。

[12] ボラージ油由来の長鎖高度不飽和脂肪酸及び／又はそのエステル体から成るコク味向上剤である、請求項11記載のコク味向上剤。

[13] 請求項11ないし12のいずれか一項記載のコク味向上剤を含む植物油脂組成物。

[14] αリノレン酸の含量が5％以下であることを特徴とする、請求項13記載の植物油脂組成物。

[15] オレイン酸含量が20ー86％及び／又はリノール酸含量が3ー25％である、請求項13又は14記載の植物油脂組成物。

[16] 長鎖高度不飽和脂肪酸及び／又はそのエステル体を含む植物油脂組成物であって、αリノレン酸の含量が5％以下であることを特徴とする植物油脂組成物。

[17] 長鎖高度不飽和脂肪酸及び／又はそのエステル体を長鎖高度不飽和脂肪酸の含

量が10ー100，000ppmである、請求項16記載の植物油脂組成物。

[18] オレイン酸含量が20ー86％及び／又はリノール酸含量が3ー25％である、請求項16又は17記載の植物油脂組成物。

[19] 長鎖高度不飽和脂肪酸がn−6系である請求項16ないし18のいずれか一項に記載の植物油脂組成物。

[20] 長鎖高度不飽和脂肪酸がアラキドン酸である、請求項19記載の植物油脂組成物。

[21] アラキドン酸が微生物由来である、請求項20記載の植物油脂組成物。

[22] 請求項1ー8、11及び12のいずれか一項に記載のコク味向上剤、又は請求項13ないし21のいずれか一項に記載の植物油脂組成物を含むコク味が向上した食品。

[23] 請求項1ー8、11及び12のいずれか一項に記載のコク味向上剤、又は請求項13ないし21のいずれか一項に記載の植物油脂組成物を食品に含有させることから成る、食品のコク味を向上させる方法。

[24] 長鎖高度不飽和脂肪酸及び／又はそのエステル体、及びコク味増強成分を個別に食品に添加することから成る、食品のコク味を向上させる方法。

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/016557

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] A23L1/226, A23L1/22, A23D9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] A23L1/22-1/23, A23D9/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
JSTPlus(JOIS)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Hiroshi KATO, "Borage-yu no Seijo to Oyo", FRAGRANCE JOURNAL, 1996, Vol.24, No.5, pages 77 to 81	13-19
X/A	JP 5-304972 A (UNION INDUSTRIAL Y AGRO-GANADERA S.A.), 19 November, 1993 (19.11.93), & EP 484266 A1 & CA 2054409 A & ZA 9108443 A	13-22/1-12, 23,24
X/A	JP 2003-306690 A (Kabushiki Kaisha Noburu), 31 October, 2003 (31.10.03), (Family: none)	13-19,22/ 1-12,23,24

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 February, 2005 (09.02.05)	01 March, 2005 (01.03.05)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/016557

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X/A	JP 11-89513 A (SCIETE DES PRODUITS NESTLE S.A.), 06 April, 1999 (06.04.99), & EP 893064 A1 & AU 9877323 A & KR 99013725 A & US 6297279 B1 & DE 69718455 E	13-22/1-12, 23,24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/016557

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

A matter common between claims 16 and 13 is a vegetable fat composition containing a long-chain highly unsaturated fatty acid. However, it is a known vegetable fat composition as apparent from the fact that it is disclosed in, e.g., JP 2001-226693 A. This matter cannot hence be considered to be a technical feature which contributes to the prior art. Consequently, the two claims do not have a common special technical feature. Therefore, these inventions are not considered to be so linked as to form a single general inventive concept.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

国際調査報告	国際出願番号　ＰＣＴ／ＪＰ２００４／０１６５５７

A.　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl[7] A23L 1/226, A23L 1/22, A23D 9/00

B.　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl[7] A23L 1/22～1/23, A23D 9/00

最小限資料以外の資料で調査を行った分野に含まれるもの

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

JSTPlus(JOIS)

C.　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
X	加藤 博史、ボラージ油の性状と応用、FRAGRANCE JOURNAL, 1996, 第24巻、第5号、p 77-81	13-19
X/A	JP 5-304972 A（ウニオン・インドゥストリアル・イ・アグローガナデラ・エス・ア）1993.11.19 & EP 484266 A1 & CA 2054409 A & ZA 9108443 A	13-22/1-12, 23, 24
X/A	JP 2003-306690 A（株式会社ノーブル）2003.10.31 （ファミリーなし）	13-19, 22/1-12, 23, 24

☒ Ｃ欄の続きにも文献が列挙されている。　　☐ パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー
「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの
「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの
「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「Ｏ」口頭による開示、使用、展示等に言及する文献
「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「＆」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
09.02.2005	01.3.2005

国際調査機関の名称及びあて先	特許庁審査官（権限のある職員）		
日本国特許庁（ＩＳＡ／ＪＰ） 郵便番号１００－８９１５ 東京都千代田区霞が関三丁目４番３号	鈴木　恵理子	4N	8114
	電話番号　０３－３５８１－１１０１　内線　3448		

様式ＰＣＴ／ＩＳＡ／２１０（第２ページ）（２００４年１月）

国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２００４／０１６５５７

C（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
X/A	JP 11-89513 A（ソシエテ　デ　プロデユイ　ネツスル　ソシエテ　アノニム）1999.04.06 & EP 893064 A1 & AU 9877323 A & KR 99013725 A & US 6297279 B1 & DE 69718455 E	13-22/1-12, 23, 24

様式ＰＣＴ／ＩＳＡ／２１０（第２ページの続き）（２００４年１月）

国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２００４／０１６５５７

第Ⅱ欄　請求の範囲の一部の調査ができないときの意見（第１ページの２の続き）

法第８条第３項（ＰＣＴ１７条(2)(a)）の規定により、この国際調査報告は次の理由により請求の範囲の一部について作成しなかった。

1．☐ 請求の範囲 _____ は、この国際調査機関が調査をすることを要しない対象に係るものである。
つまり、

2．☐ 請求の範囲 _____ は、有意義な国際調査をすることができる程度まで所定の要件を満たしていない国際出願の部分に係るものである。つまり、

3．☐ 請求の範囲 _____ は、従属請求の範囲であってＰＣＴ規則6.4(a)の第２文及び第３文の規定に従って記載されていない。

第Ⅲ欄　発明の単一性が欠如しているときの意見（第１ページの３の続き）

次に述べるようにこの国際出願に二以上の発明があるとこの国際調査機関は認めた。

請求の範囲16と13の共通事項は、長鎖高度不飽和脂肪酸を含む植物油脂組成物であるが、例えば、特開2001-226693号公報に記載のように公知の植物油脂組成物であるから、この点を先行技術に対して貢献する技術的特徴とは認められないので、両請求の範囲は特別な技術的特徴を共有するものとはいえず、これらの発明群は単一の一般的発明概念を形成するように関連しているものとは認められない。

1．☐ 出願人が必要な追加調査手数料をすべて期間内に納付したので、この国際調査報告は、すべての調査可能な請求の範囲について作成した。

2．☒ 追加調査手数料を要求するまでもなく、すべての調査可能な請求の範囲について調査することができたので、追加調査手数料の納付を求めなかった。

3．☐ 出願人が必要な追加調査手数料を一部のみしか期間内に納付しなかったので、この国際調査報告は、手数料の納付のあった次の請求の範囲のみについて作成した。

4．☐ 出願人が必要な追加調査手数料を期間内に納付しなかったので、この国際調査報告は、請求の範囲の最初に記載されている発明に係る次の請求の範囲について作成した。

追加調査手数料の異議の申立てに関する注意

☐ 追加調査手数料の納付と共に出願人から異議申立てがあった。

☐ 追加調査手数料の納付と共に出願人から異議申立てがなかった。

様式ＰＣＴ／ＩＳＡ／２１０（第１ページの続葉（２））（２００４年１月）

Electronic Acknowledgement Receipt

EFS ID:	32033546
Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	M. Angela Parsons/Shannon Stadnick
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0015008
Receipt Date:	13-MAR-2018
Filing Date:	
Time Stamp:	11:08:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	83847 d5049d17fbae57863546a97df289e78c542ce319	no	1

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
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If you need help call the Patent Electronic Business Center at (866)
217-9197 (toll free).
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Timestamp: [year=2018; month=3; day=13; hr=17; min=4; sec=21; ms=938; ]
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Validated By CRFValidator v 1.0.5

Application No: 15913090 Version No: 1.0

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Actual SeqID Count: 27

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SEQUENCE LISTING

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<120> METHODS AND COMPOSITIONS FOR AFFECTING
THE FLAVOR AND AROMA PROFILE OF CONSUMABLES

<130> 38767-0015001

<140> US 15/913,090
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<150> PCT/US2014/011347
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Leu Phe Ser Phe Leu Arg Asp Ser Thr Val Pro Leu Glu Gln Asn Pro
    50                  55                  60
Lys Leu Lys Pro His Ala Val Ser Val Phe Val Met Thr Cys Asp Ser
65                  70                  75                  80
Ala Val Gln Leu Arg Lys Ala Gly Lys Val Thr Val Arg Glu Ser Asn
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Val Pro Glu Met Trp Ser Pro Ala Met Lys Asn Ala Trp Gly Glu Ala
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    50   55   60
Ile Asp Asn Leu Glu Gly Leu Ile Pro Thr Leu Gln Asp Leu Gly Arg
65   70   75   80
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                85   90   95
Asp Cys Leu Leu Lys Ser Ile Gln Glu Tyr Leu Gly Gln Gly Phe Thr
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Phe Ser Lys Tyr Pro Lys Thr Lys Glu Leu Phe Ala Gly Ala Ser Glu
        35   40   45
Glu Gln Pro Lys Lys Leu Ala Asn Ala Ile Ile Ala Tyr Ala Thr Tyr
    50   55   60
Ile Asp Arg Leu Glu Glu Leu Asp Asn Ala Ile Ser Thr Ile Ala Arg
65   70   75   80
Ser His Val Arg Arg Asn Val Lys Pro Glu His Tyr Pro Leu Val Lys
                85   90   95
Glu Cys Leu Leu Gln Ala Ile Glu Glu Val Leu Asn Pro Gly Glu Glu
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    50   55   60
Lys Leu Phe Gly Leu Val Arg Asp Ser Ala Gly Gln Leu Lys Ala Asn
65   70   75   80
Gly Thr Val Val Ala Asp Ala Ala Leu Gly Ser Ile His Ala Gln Lys
                85   90   95
Ala Ile Thr Asp Pro Gln Phe Val Val Val Lys Glu Ala Leu Leu Lys
            100   105   110
Thr Ile Lys Glu Ala Val Gly Asp Lys Trp Ser Asp Glu Leu Ser Ser
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    50   55   60
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Gly His Phe Glu Val Thr Arg Phe Ala Leu Leu Glu Thr Ile Lys Glu
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Ala Leu Pro Ala Asp Met Trp Gly Pro Glu Met Arg Asn Ala Trp Gly
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        35                  40                  45
Glu Ser Pro Ser Arg Lys Ser Ser Thr Ile Gly Gln Ser Thr Arg Asn
    50                  55                  60
Gly Ser Cys Gln Ala Asp Thr Gln Lys Gly Gln Leu Pro Pro Val Gly
65                  70                  75                  80
Glu Lys Pro Lys Pro Val Lys Glu Asn Pro Met Lys Lys Leu Lys Glu
                85                  90                  95
Met Ser Gln Arg Pro Leu Pro Thr Gln His Gly Asp Gly Thr Tyr Pro
            100                 105                 110
Thr Glu Lys Lys Leu Thr Gly Ile Gly Glu Asp Leu Lys His Ile Arg
        115                 120                 125
Gly Tyr Asp Val Lys Thr Leu Leu Ala Met Val Lys Ser Lys Leu Lys
    130                 135                 140
Gly Glu Lys Leu Lys Asp Asp Lys Thr Met Leu Met Glu Arg Val Met
145                 150                 155                 160
Gln Leu Val Ala Arg Leu Pro Thr Glu Ser Lys Lys Arg Ala Glu Leu
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Ser Val Leu Leu Ile Met Phe Asn Arg Phe His Asn His Val Ala Glu
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        355                 360                 365
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Ser Lys Phe Val Glu Ala Gln Phe Gln Asn Ile Phe Gly Lys Pro Ala
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Gln Asn Thr Pro Ala Asp Pro Gly Gln Arg Thr Phe Gly Gly Phe Lys
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Pro Gly Leu Val Ala Glu Glu Asp Lys Gln Pro Met Val Pro Gly Val
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Gly Ile Ala Pro Thr Tyr Thr Ile Ser Arg Val Val Leu Ser Asp Ala
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Ser Tyr Gly Gly Ala Glu Tyr Ile Leu Glu Thr Gln Glu Lys Tyr Lys
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Tyr Leu Ser Pro Ala Gly Met His Tyr Ile Pro Glu Ile His Met Val
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1105 1110 1115 1120
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35 40 45
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Thr Val Leu Ala Val Gly Ala Cys Asn Gly Pro Arg Ile Pro Phe Arg
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Pro Ser Thr Asn Leu Lys Asp Thr Phe Ala Ala Phe Thr Lys Ala Gly
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/913,090	03/06/2018	1791	2020	38767-0015008	23	1

CONFIRMATION NO. 9878

FILING RECEIPT

26191
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022



Date Mailed: 04/12/2018

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Applicant(s)

Impossible Foods Inc., Redwood City, CA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 15/398,479 01/04/2017 PAT 9943096
which is a CON of 14/797,006 07/10/2015 PAT 9700067
which is a CON of PCT/US2014/011347 01/13/2014
which is a CON of 13/941,211 07/12/2013
and claims benefit of 61/908,634 11/25/2013
and claims benefit of 61/751,816 01/11/2013

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/913,090**
Projected Publication Date: 07/19/2018
Non-Publication Request: No
Early Publication Request: No
Title

METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES

Preliminary Class

426

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative,

this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/913,090

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	23 minus 20 =	* 3			OR	x 100 =	300
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2020

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/913,090	03/06/2018	Rachel Fraser	38767-0015008

CONFIRMATION NO. 9878

IMPROPER CPOA LETTER

26191
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022

OC000000098618064

Date Mailed: 04/12/2018

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 03/06/2018. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney you provided did not comply with the power of attorney rules that became effective on June 25, 2004. See 37 CFR 1.32 and 69 Fed. Reg. 29865.

/tle/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Attorney Docket No.: 38767-0015008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Rachel Fraser	Art Unit	:	1791
Application No.	:	15/913,090	Examiner	:	Unknown
Filed	:	March 6, 2018	Conf. No.	:	9878
Title	:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. The U.S. patent and patent application publication will be provided upon request.

This statement is being filed before receipt of a first Office Action on the merits. Therefore, no fees are believed due. If this is incorrect, please apply any charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Please contact the undersigned if there are any questions regarding this statement.

Respectfully submitted,

Date: /May 14, 2018/

/M. Angela Parsons/
M. Angela Parsons, Ph.D.
Reg. No. 44,282

Customer Number 26191
Fish & Richardson P.C.
Telephone: (612) 335-5070
Facsimile: (877) 769-7945

61683695.doc

Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0015008	Application No. 15/913,090
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
		Filing Date March 6, 2018	Group Art Unit 1791

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	1.	2017/0105438	04/20/2017	Ajami et al.			
	2.	9,943,096	4/17/2018	Fraser et al.			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No
	--	--	--	--				

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document
	--	--

Examiner Signature	Date Considered
EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

Electronic Acknowledgement Receipt

EFS ID:	32610463
Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	M. Angela Parsons/Shannon Stadnick
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0015008
Receipt Date:	14-MAY-2018
Filing Date:	06-MAR-2018
Time Stamp:	11:22:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	69660 3abdac066f34e069319ebe09e3ba91a255ec9dd7	no	1

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	1449.pdf	121414 67ee9f7205ed4cc2f381b67046200d6151911c61	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
			Total Files Size (in bytes):	191074	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No.: 38767-0015008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Rachel Fraser	Art Unit	:	1791
Application No.	:	15/913,090	Examiner	:	Unknown
Filed	:	March 6, 2018	Conf. No.	:	9878
Title	:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. Foreign patent documents are enclosed.

This statement is being filed within three months of the filing date of the application. Therefore, no fees are believed due. If this is incorrect, please apply any charges or credits to deposit account 06-1050, referencing the above attorney docket number.

Please contact the undersigned if there are any questions regarding this statement.

Respectfully submitted,

Date: /May 17, 2018/

/Kimberly M. Maize/
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61684841.doc

Sheet 1 of 1

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0015008	15/913,090
		Applicant: Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date: March 6, 2018	Group Art Unit: 1791

U.S. Patent Documents							
Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	--	--	--	--			

Foreign Patent Documents or Published Foreign Patent Applications								
Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation	
							Yes	No
	1.	JP H08173024	07/09/1996	JAPAN			English Abstract	
	2.	JP 2001/061415	03/13/2001	JAPAN			English Abstract	
	3.	JP 2005/021163	01/27/2005	JAPAN			English Abstract	
	4.	JP 2005/530483	10/13/2005	JAPAN			English Abstract	
	5.	JP 2010/512788	04/30/2010	JAPAN			English Abstract	
	6.	JP 2014/113112	06/26/2014	JAPAN			English Abstract	

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
	--	--

Examiner Signature	Date Considered

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Espacenet

Bibliographic data: JPH08173024 (A) — 1996-07-09

METHOD FOR CONTROLLING MEAT COLOR OF RAW MEAT

Inventor(s): KURODA YOUKO ± (KURODA YOUKO)

Applicant(s): KAKIYASU HONTEN KK ± (KAKIYASU HONTEN:KK)

Classification: **- international:** ***A23B4/00;*** (IPC1-7): A23B4/00
- cooperative:

Application number: JP19940327635 19941228

Priority number(s): JP19940327635 19941228

Abstract of JPH08173024 (A)

PURPOSE: To change color of browned raw meat to bright meat color by changing metmyoglobin in raw meat to a reduction type myoglobin by eliminating and removing oxygen from raw meat and putting the treated raw meat into the air. CONSTITUTION: Browned raw meat is put in a container having low oxygen partial pressure and kept in reduced pressure state and promotion of dissociation between myoglobin and oxygen and reduction of heme iron are carried out to increase an amount of the reduction type myoglobin. When the raw meat is put in the air, oxygen is bound to the reduction myoglobin to produce oxymyoglobin and the resultant oxymyoglobin exhibits bright meat color.

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

特開平8－173024

(43)公開日　平成８年(1996)７月９日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ａ２３Ｂ　4/00				
			Ａ２３Ｂ　4/ 00	Ｅ

審査請求　有　　請求項の数５　ＯＬ　（全 11 頁）

(21)出願番号　特願平6－327635

(22)出願日　平成６年(1994)12月28日

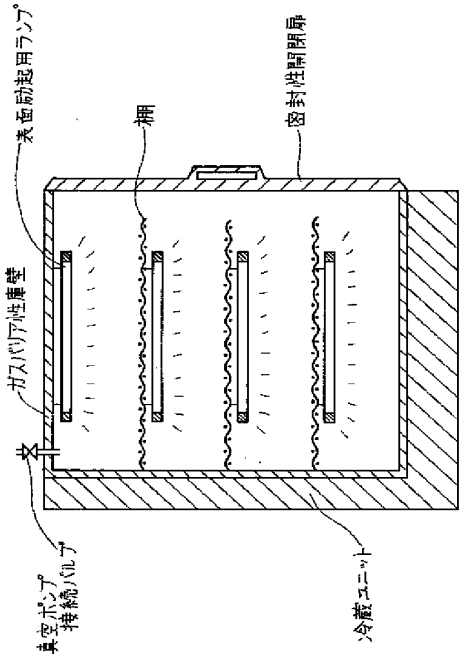
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(72)発明者　黒田　要子
三重県桑名市江戸町36　株式会社柿安本店内

(74)代理人　弁理士　岡田　英彦　（外４名）

(54)【発明の名称】　生肉の肉色制御方法

(57)【要約】
【目的】ミオグロビンと酸素との結合やヘム鉄の酸化を制御して、生肉の褐変化を有効に防止して、生肉の肉色を制御する。
【構成】生肉から酸素を脱離除去することにより、生肉中のメトミオグロビンを還元型ミオグロビンとする工程と、前記工程で得た生肉を酸素と接触させる工程とを含むことにより、鮮やかな肉色を得る。



【特許請求の範囲】
【請求項１】　生肉の肉色の制御方法であって、
生肉から酸素を脱離除去することにより、生肉中のメトミオグロビンを還元型ミオグロビンとする工程と、
前記工程で得た生肉を酸素と接触させる工程、とを含んだ生肉の肉色制御方法。
【請求項２】　請求項１において、生肉を減圧下に保持することにより、生肉から酸素を脱離除去することを特徴とする生肉の肉色制御方法。
【請求項３】　請求項１において、
酸素の透過を制限した容器内で、酸素捕捉材により生肉から酸素を脱離除去することを特徴とする生肉の肉色制御方法。
【請求項４】　請求項２又は３において、生肉に光照射することにより、生肉から酸素の脱離除去を促進することを特徴とする生肉の肉色制御方法。
【請求項５】　請求項２において、
ガスバリヤー性のある外皮の内面にフィルム状体を有し密封可能に設けた袋状体に生肉を封入し、この袋状体内部を減圧状態として、フィルム状体を生肉表面に密着させることにより、生肉から酸素を脱離除去し、かつフィルム状体の生肉表面側に生肉から脱離した酸素を捕捉することを特徴とする生肉の肉色制御方法。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】この発明は、生肉の肉色を制御する方法に関する。
【０００２】
【従来の技術】牛肉等の赤身の新鮮な肉は、筋肉中の還元型ミオグロビンによる紫がかった暗赤色を呈している。この新鮮肉を空気にさらすと、還元型ミオグロビンと酸素が結合してオキシミオグロビンとなり、きれいな赤色へと変化し、さらに、長時間空気にさらすと、ヘム鉄が酸化されてメトミオグロビンに変化し、肉色は次第に褐色となる。いわゆる肉質の低下の目安となる”メト化”の現象である。
【０００３】このメト化による褐色化により、腐敗していないくても生肉としての商品価値は著しく低下する。また、メト化の進行は腐敗の進行を促すことにもなるため、生鮮肉の流通に際しては、このメト化を効果的に防止することが望まれていた。
【０００４】しかし、かかるメト化を有効に防止するには、生肉と酸素との長時間接触を防止することが必要であるところ、流通過程や販売状態において酸素との長時間接触を避けるのは、非常に困難であり、販売状態において商品価値の高い長時間鮮赤色維持は不可能であった。
【０００５】そこで、本発明は、ミオグロビンと酸素との結合やヘム鉄の酸化を制御して、褐変化した生肉を有効に制御して、生肉の肉色を還元する方法を提供することを目的とする。
【０００６】
【課題を解決するための手段】本発明者は、上記した課題を解決するために、褐変化した生肉中のメトミオグロビンを再び還元して還元型ミオグロビンに戻して生肉本来の肉色とし、このミオグロビンを含む生肉を酸素存在下において酸素と結合させてオキシミオグロビンとすることにより、商品価値の高い鮮赤色を呈する生肉を得られること見いだし、本発明を完成した。すなわち、請求項１に記載の発明は、生肉の肉色の制御方法であって、生肉から酸素を脱離除去することにより、生肉中のメトミオグロビンを還元型ミオグロビンとする工程と、前記工程で得た生肉を酸素と接触させる工程、とを含んだ生肉の肉色制御方法である。請求項２に記載の発明は、請求項１において、生肉を減圧下に保持することにより、生肉から酸素を脱離除去することを特徴とする生肉の肉色制御方法である請求項３に記載の発明は、請求項１において、酸素の透過を制限した容器内で、酸素捕捉材により生肉から酸素を脱離除去することを特徴とする生肉の肉色制御方法である。請求項４に記載の発明は、請求項２又は３において、生肉に光照射することにより、生肉から酸素の脱離除去を促進することを特徴とする生肉の肉色制御方法である。請求項５に記載の発明は、請求項２において、ガスバリヤー性のある外皮の内面にフィルム状体を有し密封可能に設けた袋状体に生肉を封入し、この袋状体内部を減圧状態として、フィルム状体を生肉表面に密着させることにより、生肉から酸素を脱離除去し、かつフィルム状体の生肉表面側に生肉から脱離した酸素を捕捉することを特徴とする生肉の肉色制御方法である。
【０００７】以下、本発明を詳細に説明する。本発明は、生肉中の還元型ミオグロビンが、酸素と可逆的に結合、解離し、また、ミオグロビンのヘム鉄が空気中で酸化されて３価の鉄となってメトミオグロビンとなることに着目し、生肉を酸素分圧の低い減圧状態において、ミオグロビンと酸素との解離を促進するとともに、ヘム鉄の還元を図り、還元型ミオグロビンの量を増大させることにより、生肉の肉色を制御しようとするものである。すなわち、生肉の色は、生肉中に存在する還元型ミオグロビンの酸化の程度により変わり得る。したがって、”メト化”により褐変化した生肉でも、還元型ミオグロビンの比率を増大させて、再び、その還元型ミオグロビンを空気等と接触させれば、オキシミオグロビンによる鮮やかな肉色を得ることができる。
【０００８】前記生肉とは、ミオグロビンを含む生の肉をいい、本発明は、特にミオグロビン含量の多い牛肉等の畜肉やマグロ等の赤身の魚肉に有効である。また、酸素と接触させるとは、還元処理した生肉を酸素あるいは酸素を含む空気等のガスに接触させることをいう。
【０００９】ここに、生肉から酸素を脱離除去するに

は、生肉を減圧下の保持したり、酸素捕捉材により酸素を捕捉させたりする手段を用いることができ、また、これらを組み合わせて用いることができる。さらに、光照射により酸素の脱離除去を促進することができる。

【００１０】前記減圧下とは、雰囲気圧より低い圧力状態にあることをいい、密封容器等内を真空吸引することにより達成される。したがって、減圧下に生肉を保持する場合としては、減圧下でも変形しない剛性のある密封容器内に生肉をおいて真空吸引する場合と、変形可能でかつ密封可能な袋状体内に生肉を封入して真空吸引する場合とがある。かかる密封容器としては、一般に気密状態を維持できる容器が該当し、袋状体としては、ガスバリヤー性のあるプラスチックフィルムやシートからなるものが該当する。かかるガスバリヤー性のフィルムあるいはシートとしては、ポリビニルアルコール系樹脂、ビニリデン系樹脂、アルミニウム等、通気性が 1cc・15μg/m²・24hrs ・1atm 以下（すなわち、１５μｇ／ｍ²のシートで、１気圧下、２４時間あたり、１ｃｃ以下の通気性を意味する。）のものを使用するのが、密封性確保と減圧状態の維持のために好ましい。また、かかるフィルムあるいはシートは、２層以上で使用することもできる。

【００１１】かかる減圧下に生肉をおくと、生肉及び生肉周辺からは空気、酸素が除去され、生肉から酸素が脱離できる状態となる。特に、袋状体の内表面を生肉表面に密着させて真空吸引する場合には、生肉内部からも効果的に酸素が脱離される。また、効果的に減圧状態で生肉から脱離した酸素を除去するには、真空吸引を継続したり、酸素捕捉材を生肉とともに減圧下においたり、酸素の励起を促進する光照射を行うことができる。

【００１２】酸素捕捉材を用いることによっても、生肉から酸素を脱離除去することができる。前記酸素捕捉材とは、酸素を化学的、物理的に捕捉することにより除去するものである。この結果、ガスの通気を制限した容器内で生肉あるいはその周囲の酸素分圧が低下し、減圧下で保持して除去するのと同様に生肉から酸素が脱離される。例えば、酸素捕捉材としては、鉄粉等を利用することができ、容器の容積１００ｍｌに対して１ｇ以上が望ましい。なお、雰囲気圧での鉄粉による酸素除去には、容器内の温度は０～１０℃が望ましい。０℃より低くては、鉄粉により十分に酸素捕捉が行われにくく、１０℃を越えると、生肉の保存上問題があるからである。なお、かかる酸素捕捉材による生肉からの酸素の除去は、減圧状態かどうかにかかわらず可能である。減圧下であれば、効果的に酸素が脱離される。前記ガスの通気を制限した容器とは、一般的に、気密状態を形成できる容器をいい、前記した密封容器やガスバリヤー性のあるフィルム等の密閉可能な袋状体を用いることができる。

【００１３】前記光照射とは、生肉に紫外部及び／又は可視部の波長を有する光線を照射することをいい、望ましくは２００～５００ｎｍ範囲の波長を有する光線を照射する。この光照射により、生肉中でミオグロビンと結合した酸素を励起して、ミオグロビンから酸素を解離せしめ反応性を有した一重項酸素として真空吸引や酸素捕捉材により除去することができる。

【００１４】また、ガスバリヤー性のある外皮の内面にフィルム状体を配して密封可能な袋状体内に生肉を封入して、この袋状体内を吸引して減圧状態として、生肉から酸素を除去することもできる。この場合、フィルム状体は、生肉表面に密着して、効果的に生肉内部から酸素を脱離させるとともに、脱離した酸素が生肉表面に密着したフィルム状体表面に酸素が捕捉される。すなわち、フィルム状体は、酸素捕捉材として機能し、かかるフィルム状体としては、ポリエチレン、ポリプロピレン、ポリスチレン、ポリアミド樹脂等、吸引により生肉表面に密着でき、かつ、シール性を有するものを使用することができ、最も好ましいのはポリエチレンである。この場合においても、酸素の脱離を促進するためには、光照射が効果的である。

【００１５】なお、かかる生肉からの酸素の脱離は、生肉における自己消化や腐敗細菌の増殖を考慮して低温で行うのが好ましく、特に好ましくは、－３℃～４℃である。

【００１６】

【作用】請求項１に記載の発明によれば、生肉から酸素が脱離され除去されて、生肉中のメトミオグロビンが還元型ミオグロビンに変化することにより、生肉の酸化前の状態となる。したがって、この状態の生肉を酸素に触れさせれば、新鮮な赤色を呈する。また、このようなミオグロビンのメト化の抑制は、引き続き進行する腐敗の進行を抑制する。さらに、請求項２ないし５においては、以下の作用を奏する。請求項２に記載の発明によれば、生肉を減圧下に保持することにより、簡易に生肉から酸素が脱離される。請求項３に記載の発明によれば、酸素捕捉材の存在下、容器内の酸素分圧が低下して生肉から酸素が脱離除去される。請求項４に記載の発明によれば、光照射により生肉中の酸素が励起されて、生肉からの酸素の脱離が速やかに行われ、減圧下あるいは酸素捕捉材の存在下、酸素が除去される。請求項５に記載の発明によれば、生肉を封入した袋状体内を吸引して、生肉を減圧下に保持して酸素を脱離すると同時に、フィルム状体を生肉表面に密着させることにより、フィルム状体の生肉側表面に酸素を捕捉する。さらに、減圧下、フィルム状体が生肉表面に密着されるため、生肉内部からも効果的に酸素の脱離が促進される。

【００１７】

【発明の効果】請求項１に記載の発明によれば、腐敗していないにもかかわらず褐変化した生肉を、再び新鮮な肉色に制御・復元することができて、生肉としての商品価値を維持することができる。請求項２に記載の発明に

よれば、生肉を減圧下に保持することにより、簡易に生肉の肉色を制御することができる。請求項３に記載の発明によれば、酸素捕捉材により、生肉から脱離する酸素を除去でき、生肉の肉色を制御し、復元することができる。請求項４に記載の発明によれば、光照射により、生肉からの酸素の脱離が促進され、短時間の処理により生肉の肉色を制御し、復元することができる。請求項５に記載の発明によれば、フィルム状体を生肉表面に密着させて、生肉を減圧下に置くことにより、生肉表面のみならず、内部からも効果的に酸素の脱離を促進でき、また、酸素の捕捉除去がフィルム状体内表面、すなわち生肉表面で速やかに行われるため、効率的に生肉の肉色を制御可能である。

【００１８】

【実施例】以下に本発明を具現化した実施例について説明する。なお、本発明は、以下の実施例に限るものではない。

〔実施例１～８〕これらの実施例１～８においては、以下に示す条件で生肉の肉色を制御して、新鮮な肉色を復元することを試みた。

【００１９】１．褐変化した生肉の調製

新鮮な牛スライス肉（厚さ１．５ｍｍ）５０ｇを４℃の空気中下に放置して、褐変化した生肉を調製した。

【００２０】２．減圧状態の形成

減圧状態は、表１に示す袋状体を容器として用い、上記１．により褐変化した生肉を入れ、袋状体の開口部から真空ポンプで吸引することにより袋状体内を吸引することにより行った（真空度は10^{-4}ｔｏｒｒ以上）。その後、袋状体を密封し、４℃で保存した。なお、この袋状体は可撓性であるため、真空吸引により、内部の生肉表面に密着する状態となる。

【００２１】３．減圧処理の終了と肉色の復元

前記２．により生肉を減圧状態下においた後、一定時間間隔で袋状体を開封して減圧状態を解除し、袋状体から取り出してトレー上で空気に接触させ、あるいは別の密閉袋に入れ、酸素ガスを封入することにより肉色の復元を行った。

【００２２】４．減圧処理後のメトミオグロビン量の測定と酸化処理後の肉色の観察

上記処理において各時間ごとに開封された生肉について、酸化処理により復元した肉色を目視にて観察するとともに、酸化処理後の生肉中の全ミオグロビン量におけるメトミオグロビンの割合（％）を以下の方法により測定した。

【００２３】ｉ吸光度の測定

酸化処理直後の肉を２ｍＭリン酸緩衝液（ｐＨ７．０）を使用してホモゲナイズした後、清澄化して吸光度測定用溶液とし、５３５ｎｍ、５７２ｎｍ、７３０ｎｍの吸光度を測定し、Ｋｒｚｙｗｉｃｋｉの方法（Ｍｅａｔ Ｓｃｉ．３：１－１０、１９７９）に基づき、以下に示す計算式によりメトミオグロビンの割合を算出した。なお、吸光度の測定は、日本分光工業（株）製のＵＶＩＤＥＣ３４０を用いた。

【００２４】ii計算式

メトミオグロビンの割合（％）＝１．３９５－｛（A_{572} －A_{730} ）／（A_{525} －A_{730} ）｝×１００

但し、１．３９５；定数

A_{572}　；波長５７２ｎｍにおける吸光度

A_{730}　；波長７３０ｎｍにおける吸光度

A_{525}　；波長５２５ｎｍにおける吸光度

【００２５】

【表１】

実施例の種類	袋状体の構成	減圧状態	酸化処理
1	外層;HDP 中層;PVA 内層;N	4 ℃,10^{-4} torrまで脱気後、密封して8 、24 、48hrs 保存	空気
2			酸素ガス
3	外層;LDP 中層;PVA 内層;N		空気
4			酸素ガス
5	外層;HDP 中層;PVC 内層;N		空気
6			酸素ガス
7	外層;HDP 中層;PVC 内層;N		空気
8	外層;HDP 中層;PVC 内層;N		酸素ガス

HDP:高密度ポリエチレン(40μm 厚)
LDP:低密度ポリエチレン(40μm 厚)
PVA:ポリビニルアルコール(12μm 厚)
PVC:ポリ塩化ビニリデン(15μm 厚)
N:ナイロン(15μm 厚)

【００２６】このようにして、肉色の復元を行った結果を表２に示す。なお、併せて、各実施例につき、減圧処理を施す前の褐変化した生肉につき、メトミオグロビン量の試験を行った結果をその肉色とともに表２に示す。

【００２７】

【表２】

実施例	試験結果 メトミオグロビン量（%);復元した肉色			
	未処理	8hr	24hr	48hr
1	89 ; 褐色	71 ; 褐色	60 ; 褐赤色	17 ; 鮮赤色
2	93 ; 褐色	76 ; 褐色	56 ; 暗赤色	13 ; 鮮赤色
3	93 ; 褐色	68 ; 褐色	43 ; 鮮赤色	13 ; 鮮赤色
4	76 ; 褐色	71 ; 褐色	63 ; 褐赤色	16 ; 鮮赤色
5	88 ; 褐色	69 ; 褐色	59 ; 褐赤色	19 ; 鮮赤色
6	79 ; 褐色	70 ; 褐色	64 ; 褐赤色	21 ; 鮮赤色
7	81 ; 褐色	68 ; 褐色	60 ; 褐赤色	20 ; 鮮赤色
8	81 ; 褐色	78 ; 褐色	56 ; 褐赤色	13 ; 鮮赤色

【００２８】表２の結果から明らかなように、褐変化した生肉を少なくとも48時間の減圧処理(4℃、10^{-4}torr)におき、その後酸素あるいは空気に接触させることにより、速やかに鮮やかな赤色に復元できることが確認できた。すなわち、未処理肉においては、すべての実施例において全ミオグロビン量の80～90%近くがメトミオグロ

ビンであり褐色を呈しているが、減圧処理時間が長くなるにつれてメトミオグロビン量が低下していることから、減圧処理によりメトミオグロビンから還元型ミオグロビンへの変化が進行していることが確認できた。このことは、酸化処理による肉色の復元が減圧処理時間が長くなるほど良好であることからも確認できた。

【００２９】すなわち、メトミオグロビン量の低下は、反対にミオグロビン量の増加を意味するものであり、ミオグロビン量が多いほど酸化処理により鮮赤色に近い色を呈するものである。なお、これらの実施例において、48時間減圧処理直後の生肉の色は、いずれも赤紫色であり、還元型ミオグロビンの呈する肉色が観察された。

【００３０】これらの実施例において、密閉された状態での減圧処理により、メトミオグロビンが還元され、また酸素が放出されて還元型ミオグロビンに変化しえたのは、ミオグロビンと結合した酸素が袋状体の内層の内表面に捕捉され除去されて、酸素濃度が低減され、更に、ミオグロビン結合の三価の鉄が二価に還元されているためと考えられる。すなわち、袋状体の内層の内表面が酸素捕捉材として作用していたためである。

【００３１】このように、これらの実施例では、酸素を除去する酸素捕捉材として、減圧状態を維持する袋状体の内層の内表面を利用したが、これに限定するものでなく、化学的・物理的に酸素を、捕捉除去、吸着除去、分解除去等できるものであればよく、これらを減圧状態下、生肉とともにおくことにより、同様の効果を奏する。なお、これらの実施例では、特に、酸素を捕捉できる内表面を有する袋状体内で減圧状態を形成することにより、ミオグロビンを生成せしめる構成としたが、減圧状態を維持して、生肉から脱離した酸素を系内から除去することができ、メトミオグロビンの還元及び酸素との脱離を促進することも可能である。

【００３２】〔実施例９～３２〕これらの実施例では、袋状体内部で減圧状態にある生肉に光を照射して、メトミオグロビンからの酸素の脱離を促進して、短時間で肉色の復元を試みた例について説明する。

【００３３】１．褐変化した生肉の調製

実施例１～８と同様にして行った。

【００３４】２．減圧状態の形成

減圧は、表３及び表４に示す袋状体を容器として用い、上記１．により褐変化した生肉を入れ、袋状体の開口部から真空ポンプで吸引することにより袋状体内を吸引することにより行った（真空度は10^{-4}ｔｏｒｒ以上）。その後、袋状体内部の減圧状態を維持して密封し、４℃下で表３及び表４に示す条件で光照射を行い、２０分、４０分、６０分間保存した。なお、３１２ｎｍ及び３６０ｎｍの光照射では、減圧状態維持時間内のうち２分あるいは３分間光照射し、５４０ｎｍの光照射では、２０分、４０分、６０分の減圧状態維持時間の間、継続して光照射したものである。

【００３５】３．肉色の復元

前記２．により生肉を減圧状態下においた後、所定時間で容器を開封して減圧状態を解除し、容器から取り出してトレー上で空気に接触させ、あるいは別の密閉袋に入れ、酸素ガスを封入することにより肉色の復元を行った。所定時間ごとに開封された生肉について、復元後の肉色を目視にて観察するとともに、実施例１～８と同様に処理後のメトミオグロビンの割合（％）を測定した。

【００３６】

【表３】

実施例の種類	袋状体の構成	減圧状態	光照射条件	肉色復元法
9	外層;HDP 中層;PVA 内層;N	4 ℃,10^{-4} torrまで脱気後、密封し、右の条件で光照射して20,40,60min 保存	312nm 90W 2min	空気
10			〃	酸素ガス
11			360nm 16W 5min	空気
12			〃	酸素ガス
13			540nm 90W 継続	空気
14			〃	酸素ガス
15	外層;LDP 中層;PVA 内層;N		312nm 90W 2min	空気
16			〃	酸素ガス
17			360nm 16W 5min	空気
18			〃	酸素ガス
19			540nm 90W 継続	空気
20			〃	酸素ガス

HDP:高密度ポリエチレン（ 40μm 厚）
LDP:低密度ポリエチレン（ 40μm 厚）

PVA:ポリビニルアルコール(12μm 厚)
N:ナイロン(15μm 厚)

【００３７】　　【表４】

実施例の種類	袋状体の構成	減圧状態	光照射条件	肉色復元法
21	外層;HDP	4 ℃,10^{-4} torrまで脱気後、密封し、右の条件で光照射して20,40,60min 保存	312nm 90W 2min	空気
22	中層;PVC		〃	酸素ガス
23	内層;N		360nm 16W 5min	空気
24			〃	酸素ガス
25			540nm 90W 継続	空気
26			〃	酸素ガス
27	外層;LDP		312nm 90W 2min	空気
28	中層;PVC		〃	酸素ガス
29	内層;N		360nm 16W 5min	空気
30			〃	酸素ガス
31			540nm 90W 継続	空気
32			〃	酸素ガス

HDP:高密度ポリエチレン(40μm 厚)
LDP:低密度ポリエチレン(40μm 厚)
PVC:ポリ塩化ビニリデン(15μm 厚)
N:ナイロン(15μm 厚)

【００３８】このようにして、肉色の復元を行った結果を表５及び表６に示す。なお、各実施例につき、減圧処理を施す前の褐変化した生肉につき、メトミオグロビン量の試験を行った結果をその肉色とともに併せて表５及び表６に示す。

【表５】

実施例	試験結果 メトミオグロビン量（%);復元した肉色			
	未処理	20分	40分	60分
9	84 ; 褐色	69 ; 褐色	54 ; 褐赤色	23 ; 鮮赤色
10	89 ; 褐色	77 ; 褐色	69 ; 褐色	18 ; 鮮赤色
11	90 ; 褐色	78 ; 褐色	44 ; 暗赤色	17 ; 鮮赤色
12	88 ; 褐色	77 ; 褐色	51 ; 褐赤色	21 ; 鮮赤色
13	91 ; 褐色	69 ; 褐色	49 ; 褐赤色	19 ; 鮮赤色
14	89 ; 褐色	71 ; 褐色	48 ; 褐赤色	18 ; 鮮赤色
15	91 ; 褐色	78 ; 褐色	61 ; 褐赤色	18 ; 鮮赤色
16	93 ; 褐色	76 ; 褐色	54 ; 褐赤色	22 ; 鮮赤色
17	89 ; 褐色	68 ; 褐色	53 ; 褐赤色	18 ; 鮮赤色
18	91 ; 褐色	71 ; 褐色	48 ; 褐赤色	19 ; 鮮赤色
19	96 ; 褐色	80 ; 褐色	49 ; 褐赤色	23 ; 鮮赤色
20	87 ; 褐色	64 ; 褐色	49 ; 褐赤色	17 ; 鮮赤色

【００３９】　　【表６】

実施例	試験結果 メトミオグロビン量（%）;復元した肉色			
	未処理	20分	40分	60分
21	94 ; 褐色	68 ; 褐色	49 ; 褐赤色	17 ; 鮮赤色
22	89 ; 褐色	77 ; 褐色	50 ; 褐赤色	14 ; 鮮赤色
23	92 ; 褐色	69 ; 褐色	43 ; 暗赤色	18 ; 鮮赤色
24	92 ; 褐色	71 ; 褐色	42 ; 暗赤色	17 ; 鮮赤色
25	91 ; 褐色	80 ; 褐色	68 ; 褐色	22 ; 鮮赤色
26	88 ; 褐色	71 ; 褐色	53 ; 褐赤色	18 ; 鮮赤色
27	90 ; 褐色	67 ; 褐色	41 ; 暗赤色	15 ; 鮮赤色
28	89 ; 褐色	64 ; 褐色	52 ; 褐赤色	10 ; 鮮赤色
29	94 ; 褐色	71 ; 褐色	41 ; 暗赤色	24 ; 鮮赤色
30	97 ; 褐色	68 ; 褐色	50 ; 褐赤色	21 ; 鮮赤色
31	87 ; 褐色	73 ; 褐色	54 ; 褐赤色	18 ; 鮮赤色
32	93 ; 褐色	74 ; 褐色	39 ; 暗赤色	17 ; 鮮赤色

【００４０】表５及び表６の結果から明らかなように、いずれの実施例においても、少なくとも６０分間の減圧・光照射後の生肉は、空気あるいは酸素に接触させることにより、速やかに鮮赤色を復元できることが確認できた。すなわち、実施例１～８と同様に褐変化した生肉には、メトミオグロビンが大量に存在するが（表５及び表６の〔未処理〕の欄参照）、本発明の減圧処理中に生肉中のメトミオグロビンが還元型ミオグロビンに変化されている。この結果、長時間処理したほど還元型ミオグロビン量が多くなり、その後の酸化処理（肉色復元）により鮮赤色を呈するようになっている（表５及び表６の「６０分」の欄参照）。

【００４１】このような結果は、実施例１～８の結果と同様であるが、実施例９～３２においては、光照射により、極めて短時間の減圧処理により、メトミオグロビン量を低減させうることが特徴である。

【００４２】なお、いずれの袋状体の構成、光照射条件、酸化処理の違いによっても、メトミオグロビン量の低下及び肉色の復元にほとんど変化はなかった。

【００４３】また、これらのいずれの実施例においても、６０分間の処理によって、当初褐変化していた生肉は、還元型ミオグロビンの色である赤紫色に変化していた。したがって、具体的には、先にも述べたように、減圧・光照射処理において、肉色が赤紫色を呈して、十分にメトミオグロビン量が低減され、還元型ミオグロビンが生成した段階で、処理を停止して、酸化処理を行うことにより、鮮赤色の肉色を得ることができる。

【００４４】〔実施例３３～４４〕次に、内部の減圧状態に対してその剛性により本来の形状を維持できる容器を用いて、その内部に褐変化した生肉をおいて、光照射により酸素の脱離を促進して短時間の減圧処理で肉色の復元を試みた例について説明する。

【００４５】１．褐変化した生肉の調製

実施例１～８と同様にして行った。

【００４６】２．減圧状態の形成

減圧は、ガスバリアー性のある真空用容器である図１に示す還元用冷蔵庫に、上記１．により褐変化した生肉を入れて、容器内部を、真空ポンプで吸引することにより行った（真空度は10^{-4}ｔｏｒｒ以上）。その後、実施例３３～３８については、４℃下で真空吸引を継続しつつ、表７に示す条件で光照射を行って、２０～６０分間保存した。また、実施例３９～４４については、真空用容器内に生肉の他酸素吸収剤（鉄粉）もいれて減圧状態とした後、真空用容器を密封し、４℃で、表７に示す条件で光照射して、２０～６０分間保存した。なお、これらのの実施例において、３１２ｎｍ及び３６０ｎｍの光照射では、吸引継続時間内あるいは減圧状態維持時間内のうち２分あるいは３分間光照射し、５４０ｎｍの光照射では、２０分、４０分、６０分の吸引継続時間内あるいは減圧状態維持時間の間、継続して光照射したものである。

３．肉色の復元

前記２．により生肉を減圧状態下においた後、所定時間後に容器を開封して減圧状態を解除し、容器から取り出してトレー上で空気に接触させ、あるいは別の密閉袋に入れ、酸素ガスを封入することにより肉色の復元を行った。所定時間ごとに開封された生肉について、復元後の肉色を目視にて観察するとともに、実施例１～８と同様に復元時のメトミオグロビンの割合（％）を測定した。

【００４７】

【表７】

実施例の種類	容器の構成	減圧状態	光照射条件	肉色復元法
33 34 35 36 37 38	ガスバリアー性のある真空用容器	4 ℃,10 $^{-4}$ torrで脱気しつつ、20、40、60 min 保存	312nm 90W 2min 〃 360nm 16W 5min 〃 540nm 90W 継続 〃	空気 酸素ガス 空気 酸素ガス 空気 酸素ガス
39 40 41 42 43 44	ガスバリアー性のある真空用容器	4 ℃,10 $^{-4}$ torrで脱気後、容器を密封し、酸素吸収剤の存在下、20 40,60min保存	312nm 90W 2min 360nm 16W 5min 〃 540nm 90W 継続 〃	空気 酸素ガス 空気 酸素ガス 空気 酸素ガス

【００４８】このようにして、肉色の復元を行った結果を表８に示す。なお、各実施例につき、減圧処理を施す前の褐変化した生肉につき、メトミオグロビン量の試験を行った結果をその肉色とともに併せて表８に示す。

【表８】

実施例	試験結果 メトミオグロビン量（%）;復元した肉色			
	未処理	20分	40分	60分
33	86 ; 褐色	42 ; 暗赤色	21 ; 鮮赤色	11 ; 鮮赤色
34	93 ; 褐色	48 ; 褐赤色	31 ; 暗赤色	14 ; 鮮赤色
35	81 ; 褐色	39 ; 暗赤色	16 ; 鮮赤色	10 ; 鮮赤色
36	89 ; 褐色	44 ; 暗赤色	35 ; 暗赤色	13 ; 鮮赤色
37	91 ; 褐色	54 ; 褐赤色	47 ; 褐赤色	20 ; 鮮赤色
38	96 ; 褐色	61 ; 褐赤色	50 ; 褐赤色	18 ; 鮮赤色
39	89 ; 褐色	70 ; 褐色	29 ; 暗赤色	30 ; 鮮赤色
40	91 ; 褐色	69 ; 褐色	35 ; 暗赤色	13 ; 鮮赤色
41	96 ; 褐色	48 ; 褐赤色	40 ; 暗赤色	19 ; 鮮赤色
42	90 ; 褐色	51 ; 褐赤色	38 ; 暗赤色	20 ; 鮮赤色
43	90 ; 褐色	60 ; 褐赤色	43 ; 暗赤色	19 ; 鮮赤色
44	91 ; 褐色	49 ; 褐赤色	35 ; 暗赤色	15 ; 鮮赤色

【００４９】表８の結果から明らかなように、いずれの実施例においても、少なくとも６０分間の減圧・光照射後の生肉は、空気あるいは酸素に接触させることにより、速やかに鮮赤色を復元できることが確認できた。特に、実施例３３～３６については、メトミオグロビン量の低下が速やかであり、４０分の処理で鮮赤色を呈する場合も観察された（実施例３３及び３５）。

【００５０】表８に示すように、最終的に生肉の肉色を鮮赤色に復元できたという結果は、実施例１～８や実施例９～３２の結果と同様であるが、実施例３３～４４においては、光照射と脱気若しくは酸素吸収剤により、より短時間の減圧処理により、メトミオグロビン量を低減させうることが特徴である。

【００５１】なお、これらのいずれの実施例において

も、６０分間の処理によって、当初褐変化していた生肉は、還元型ミオグロビンの色である赤紫色に変化しており、減圧処理中、目視にて肉色が赤紫色を呈すれば、処理を停止して、酸化処理を行うことにより、鮮赤色の肉色を得ることができる。

【００５２】〔実施例４５〕次に、ガスバリヤー性のある容器内において、生肉を保持し、酸素捕捉材として鉄粉を用いて、生肉から酸素を除去した例について説明する。

【００５３】１．褐変化した生肉の調製

実施例１～８と同様にして行った。

２．通気の制限状態の形成

通気の制限状態は、実施例３２～４４と同様のガスバリアー性のある真空用容器である還元用冷蔵庫（図１参照）に、上記１．により褐変化した生肉を入れた後、そのまま還元用冷蔵庫を密封し、４℃で所定時間、表９に示す条件で光照射した。なお、密封した還元用冷蔵庫においては、ガスの通気は禁止され、酸素の透過も禁止された状態となっている。酸素捕捉材としては、鉄粉を用い、容積100ml に対し、１ｇ使用し、真空用容器内に配置した。

３．肉色の復元

前記２．で還元用冷蔵庫を密封した後、所定時間後に冷蔵庫を開封して、生肉を取り出してトレー上で空気に接触させることにより、肉色の復元を行った。所定時間ごとに開封された生肉について、復元後の肉色を目視にて観察するとともに、実施例１～８と同様に復元時のメトミオグロビンの割合（ ％）を測定した。

【００５４】

【表９】

実施例の種類	容器の構成	肉色復元法
４５	ガスバリアー性のある真空用容器	空気

【００５５】このようにして、肉色の復元を行った結果を表１０に示す。なお、各実施例につき、減圧処理を施す前の褐変化した生肉につき、メトミオグロビン量の試験を行った結果をその肉色とともに併せて表１０に示す。

【表１０】

実施例	試験結果 メトミオグロビン量（％）;復元した肉色			
	未処理	分	分	分
45	87 ；　褐色	85 ； 褐色	70 ； 褐色	60 ； 鮮赤色

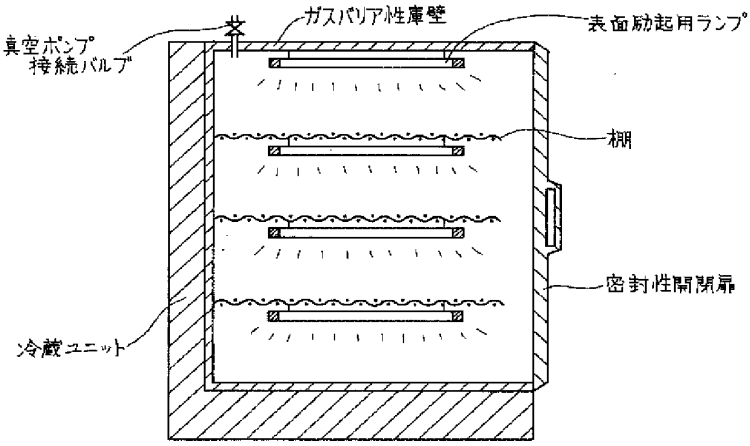
【００５６】表１０の結果から明らかなように、単に酸素捕捉材と生肉とを密封した還元用冷蔵庫に載置するだけで、鮮赤色の生肉を得ることができた。

【００５７】

【図面の簡単な説明】

【図１】真空用容器としての還元用冷蔵庫の構造を示す図である。

【図１】



Espacenet

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EXTENSION OF ACTIVE WHEAT GLUTEN IN NONAQUEOUS MEDIUM

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Classification: - international: ***A21D2/26; A21D2/36; A23G3/34; A23G4/00; A23G4/06; A23G4/08; A23G4/14; A23J3/18; A23K1/16; A23K1/18; A23L1/09; C08L89/00;*** (IPC1-7): A21D2/36; A23G3/30; A23J3/18; A23L1/09

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Abstract of JP2001061415 (A)

PROBLEM TO BE SOLVED: To provide a digestible and decomposable gluten basic composition preservable for a long period of time without deterioration, useful as a gum base for a chewing gum, etc. and usable for a processed food and a feed by extending wheat gluten in a nonaqueous medium. SOLUTION: This method for extending active wheat gluten in a nonaqueous medium comprises formulating 20-60 wt.% (on the basis of dry weight) of a gluten such as active gluten with a nonaqueous medium (preferably <0.8 water activity) such as a condensed hydrocarbon syrup, etc., selected from glycerol, glucose, fructose, sucrose, invert sugar, sorbitol and lactose, kneading the mixture at 50-90 deg.C, continuing the kneading operation until a torque reaches at least 75% the maximum torque and forming the obtained gluten into a fixed shape to extend the wheat gluten. A food or a feed containing the obtained wheat gluten is preferably prepared.

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(54)【発明の名称】　非水性媒体中での活性小麦グルテンの展開方法

(57)【要約】　（修正有）
【課題】　劣化することなく長期間貯蔵でき、かつチューインガム等のガムベースとして、または加工食品や飼料のために使用できる、消化及び分解可能なグルテン基礎組成物を提供する。
【解決手段】　非水性媒体、すなわち０．８未満のＡｗを有する媒体または最終組成物が０．７未満のＡｗを有する媒体中で、小麦グルテンを混合し、５０～９０℃で混練を続け、得られたグルテンを所望の形に成形する。

【特許請求の範囲】
【請求項１】　非水性媒体中で展開することを特徴とする、小麦グルテンの展開方法。
【請求項２】　非水性媒体が、水を20％未満、好ましくは15％未満、より好ましくは10％未満の割合で含む、請求項１の方法。
【請求項３】　非水性媒体が0.8 未満の水分活性を有する、請求項１の方法。
【請求項４】　最終生成物が0.7 未満の水分活性を有する、請求項３の方法。
【請求項５】　非水性媒体が濃厚炭水化物シロップである、請求項１または２の方法。
【請求項６】　炭水化物が、グリセロール、グルコース、フルクトース、スクロース、転化糖、ソルビトール及びラクトースからなる群から選択される、請求項４の方法。
【請求項７】　グルテンが活性グルテン（バイタルグルテン）である、請求項１の小麦グルテンの展開方法。
【請求項８】　以下の段階、すなわち
－　グルテン20～60重量％（乾量基準）を、非水性媒体と混合し、
－　この混合物を50～90℃の温度で混練し、
－　この混練作業を、最大トルクの少なくとも75％の値に達するまで続け、
－　得られたグルテンを所望の形状に成形する、段階を含む、小麦グルテンの展開方法。
【請求項９】　非水性媒体の水分活性が0.8 未満である、請求項８の方法。
【請求項１０】　最大トルクに達した後も混練を続けそして最大値の75％に至る前に混練を停止する、請求項８の方法。
【請求項１１】　混練の後の段階において、成形加工の前、その間またはその後に、他の成分をグルテンに付加する、請求項８の方法。
【請求項１２】　非水性媒体中で展開された小麦グルテンを含む食品または飼料。
【発明の詳細な説明】
【０００１】
【技術分野】本発明は、非水性媒体中での活性小麦グルテンの展開法に関する。このように展開されたグルテンは、周囲貯蔵条件下に長期間簡単に貯蔵することができる。このグルテンは、咀嚼性の可食品(chewable consumable product) の製造に使用される。またこれらは、加工食品及び飼料にも使用される。
【０００２】
【本発明の背景】従来のチューインガムは市場において広い成功を収めている。このようなチューインガムは、典型的には、ガムベースとコーティング材から構成される。これらの成分の双方とも更に、甘味料、着色料、風味料、防腐剤及び加工助剤として働く化合物を含む。このような成分は、製品の噛みごたえ(bite)及び味を変化させる働きもする。
【０００３】従来のガムベースは、天然または合成樹脂、例えばチクル、天然ゴム、グッタペルカ、レチカプシ(lechi capsi) 、ソルバ(sorva) 、グッタカイ(gutta kay)、クラウンガム、ブタジエン- スチレンコポリマー、ポリイソブチレン、イソブチレン- イソプレンコポリマー、ポリビニルアセテート及びポリビニルアルコールから選択することができる。水不溶性で及び咀嚼性のこのガムベースは、更に、エラストマー、樹脂、脂肪、油、ワックス、軟化剤及びフィラーを含む。軟化剤または可塑剤としては、ラノリン、プロピレングリコール、グリセリンまたはトリアセチンなどの分子を10重量％までの量で使用できる。他の添加剤にはフィラー及び粘着防止剤などが包含される。
【０００４】ガムベースの基本成分として使用される上記の材料は生分解性でもないし、咀嚼時に分解するものでもない。この点が、チューイングガムと、完全に消化できるチューウイキャンディーとが異なるところである。従来のチューイングガムは捨てられると見苦しいゴミとなることが往々にしてある。
【０００５】小麦グルテンは、上記のガムベース成分に対する消化可能で生分解性の代替品として試みられてきた。それらは捨てられた際に生分解性であるということの他に、グルテンはタンパク質であるため飲み込んでも人体に無害である。それどころか、グルテンに基づくもしくはこれを含むガムは栄養にもなり得る。
【０００６】米国特許第3,814,815 号は、グルテンをその10％超、好ましくはその10～60％変質させるガムベースの製造方法を記載している。この変質は、加熱または凍結することによって過剰の水中で行われると記載されている。
【０００７】国際特許出願公開第95/12322号は、グルテンをチューインガムのガムベースとして使用することを開示している。その咀嚼性を改善するために、グルテンをタンパク質縮合剤、好ましくはタンニンで架橋させる。このグルテンに基づくチューインガムは高い含湿量を有するものと認められる。このような高い含湿量は、このガムを微生物によって腐敗し易くする。この腐敗を避けるために、防腐剤が添加される。
【０００８】国際特許出願公開第94/17673号は、テクスチャリング剤(texturing agent) を添加することにより、グルテンをガムベースとして使用した際のその咀嚼性を改善する方法を開示している。
【０００９】米国特許第3,692,535 号は、直ぐに焼くことができるパイ皮の製造法に関する。このパイ皮は、冷凍しなくとも貯蔵安定性であると記載されている。またこのパイ皮は、ばらしたり切断することをしなくとも、巻いたりまたはその他の取り扱いをすることができる。明細書に記載のように（第２欄３～21行）、その全ての

小麦粉が水中で展開される。これは、微生物の成長を防ぐために防腐剤の添加を必要とする。

【００１０】米国特許第5,366,740 号は、噴霧乾燥したグルテンとフラッシュ乾燥したグルテンとの組み合わせ物をチューイングガムベースとして使用することに関する。

【００１１】米国特許第5,665,152 号は、固形で、非可食性かつ生分解性の穀物タンパク質ベースの物品を成形する方法に関する。

【００１２】米国特許第5,945,142 号は、軋み感(squeakiness) を減らすために標準的なチューインガムベースに少量のグルテンを添加することに関する。

【００１３】グルテンは幅広い応用範囲で受け入れられているという事実にも拘わらず、これまでグルテンは、食品及び飼料の応用分野ではそれ相応の市場を得ていない。

【００１４】チューインガムの分野では、グルテンの使用は、一連の官能的(organoleptic)な要因によって阻まれており、グルテンは生分解性かつ可食性であるという利点を持つにも拘わらず、市場で幅広く受け入れられているグルテンに基づくチューインガムは存在しない。官能的な要因の他の理由の一つには、グルテンは水性媒体中で展開する必要があると広く信じられているということがある。水性媒体中での展開は、最終製品中に多すぎる水の存在を招き、そうすると微生物の成長によりその製品が腐りやすくなる。本発明はこの問題を解決するものである。

【００１５】

【本発明の要約】本発明の課題の一つは、劣化することなく長期間貯蔵でき、かつチューインガムまたはチューウイキャンディのガムベースとして、または加工食品もしくは飼料のために使用できる、消化及び分解可能なグルテン基礎組成物を提供することである。その貯蔵条件は、グルテンにとって通常の貯蔵条件である。

【００１６】本発明は、展開された活性小麦グルテンを開示するものであり、ここでこの“展開”は、非水性媒体、すなわち0.8 未満のAwを有する媒体または最終組成物が0.7 未満のAwを有するようになるようなAwを有する媒体中で行われた。グルテンを展開するのに好ましい媒体は、水を30重量％未満、好ましくは20重量％未満、より好ましくは10重量％未満の割合で含む濃厚炭水化物溶液である。

【００１７】本発明は、小麦グルテンを非水性媒体中で展開する方法をも開示する。この方法は、以下の段階、すなわち

－　グルテン20～60％（乾量基準(d.s)，w/w）を、非水性媒体と混合し、

－　この混合物を50～90℃の温度で混練し、

－　最大トルクの少なくとも75％の値に到達するまでこの混練を続け、

－　得られたグルテンを所望の形に成形する、ことを含む。

【００１８】本発明は、更に、このように展開された小麦グルテンをチューイングガムのガムベースとしてまたはチューウイキャンディの基礎材料として使用することを開示する。

【００１９】非水性媒体中で展開された小麦グルテンは、食品の分野、並びにパン及び加工食品に使用した。更にこの小麦グルテンは、飼料分野、例えばペットフードまたは魚餌に使用した。

【００２０】

【本発明の詳細な説明】本発明の課題の一つは、劣化することなく長期間貯蔵でき及び例えばチューインガムまたはチューイキャンディのガムベースとして使用できる、消化及び分解し得るグルテン基礎組成物を提供することである。本発明は、非水性媒体、すなわち最終組成物が0.7 未満のAw（水分活性）有するように0.8 未満のAwを有する媒体中で展開処理が行われた、展開された活性小麦グルテンを開示する。

【００２１】一般的な意味で、小麦グルテンは、活性小麦グルテンを高濃度で、選択された非水性媒体と混合することによって展開される。この混合物の混練は、トルクが最大になるまで続けられる（図１参照）。このトルクの最大値において特に、生成物が優れた咀嚼性を有するようになる。この時この生成物はガムベースとして使用できるものとなる。上記の最大値の前にまたは最大値を超えた後に混合を停止すると、その生成物は、むしろ、チューイキャンディ、加工食品または飼料（ペットフードを含む）の用途に適したものとなる。一般的な意味で、我々は、最大トルク値の少なくとも75％、好ましくは少なくとも85％に到達するまで混練を続けるべきであることを見いだした。なお、これらの数値に至るのは、最大値に到達する前でも、またはその後でもよい。

【００２２】この小麦グルテンは非水性媒体中で展開されたために、微生物による分解に対して安定しており、通常の貯蔵条件下に劣化することなく数ヶ月貯蔵することができる。このことは、活性小麦グルテンの使用の柔軟性に大きく寄与する。

【００２３】代表的な製造方法の一つでは、混練作業は50～90℃の温度で行われる。この混練作業において重要なことは、グルテンを広げ(unfold)そしてそれらの相互作用、すなわちH- ブリッジ、疎水結合、イオン結合、硫黄ブリッジ及び架橋を復元する(restore) ために十分なエネルギーを加えなければならないことである。これは、混練機のタイプ（型、連続的またはバッチ式操業、押出機など）及び混練機を使用する条件に関して或る程度融通がきくことを意味する。またこれが、本発明において“展開”という言葉により意味される事柄である。グルテンを広げ及び相互作用を復元する際、タンパク質の一次構造が解裂することは実質的にない。このような

解裂を伴うプロセスは“変質”と呼ばれ、本件においては少なくとも大いには望ましくない。

【００２４】トルクの進展（最大までの時間）及びトルクの高さは、混練条件、すなわち温度、混練の速度、他の成分または添加剤の混入などによって影響を受け得る。これらのパラメータの一部については、以下の例で例示する。

【００２５】混練時間は、一般的に５分～１時間、好ましくは10～25分間である。重要なことはミキサーのエネルギー伝達特性であることに留意すべきである。押出機が使用された場合は、上記処理時間は秒のオーダーである。本発明は水の不存在に関するものであるが、一般的に約20％までの水は存在してもよい。これの限界は、水分活性(Aw)が微細物が成長できないような値でなければならないという事実によって決定される。この水分活性は、微生物の種類にも或る程度依存する。

【００２６】加えて、水の存在下では混練がより簡単になるということも留意すべきである。好ましい媒体は、30％未満、好ましくは20％未満、より好ましくは10％(w/w)未満の割合で水を含む濃厚炭水化物溶液である。混練作業中に存在する水の量は、混練条件に影響を与える。水の存在下では混練はより簡単となる。実際、本発明にとって重要なことは最終製品の水分活性である。

【００２７】本発明で使用されるグルテンは、いかなる穀物源からも得ることができる。有利には、これらは小麦グルテンであり、最も好ましくは活性小麦グルテンである。異なる源からのグルテンを組み合わせることも、また部分的に活性のグルテンを使用することも可能である。

【００２８】展開後、グルテンは所望の形状に成形される。型を用いて成形してもよいしまたダイを通して成形してもよい。得るべき製品の種類に応じて、追加の成分を添加する。

【００２９】チューインガムを製造するために使用する際は、展開されたグルテンをそのままベースとして使用することができる。またグルテンを、他の生分解性成分、例えば架橋性タンパク質と組み合わせることもできる。更に、本発明のグルテンを通常の合成または天然ガムベースと組み合わせることも可能である。

【００３０】本発明は、上記のように展開された小麦グルテンを、チューインガムまたはチューウイキャンディのガムベースとして使用することを開示する。この小麦グルテンは、パン及び加工食品を含む食品の分野に使用された。更にこの小麦グルテンは、ペットフードなどの飼料の用途にも使用された。このような用途では、グルテンを、加熱調理、焼成（ベーキング）または他の手段により加工することが必要な場合もある。

【００３１】

【実施例】１．50ｇの活性小麦グルテン（乾量94％(Gluvital (R) 21000)）をグリセロール50ｇ及び水10ｇと混合し、そしてドゥー コーダ（ブラベンダー製，デュイスブルク在，50ｇボウル）中58℃及び25rpm で混練した。１分間後にトルクが高まり、そして13分後には8.5Nm の最大に達し、その後トルクは低下し始めた（図１参照）。この展開曲線の頂点まで混練した時に回収した生成物は優れた咀嚼特性を有し、例えばチューインガム調合物のガムベースとして使用することができる。

２．50ｇの活性小麦グルテン(乾量94％(Gluvital (R) 21000)）をグリセロール50ｇ及びレシチン６ｇ（ステルン製，ハンブルグ在）と混合し、そしてドゥー コーダ中58℃及び25rpm で混練した。４分後にトルクが高まりそして18分後に4.5Nm の最大に達し、その後トルクは低下し始めた。この展開曲線の頂点まで混練した時に回収した生成物は優れた咀嚼特性を示し、例えばチューインガム調合物のガムベースとして使用することができる。この生成物は微生物による分解に対し安定しており、数ヶ月貯蔵された。

３．50ｇの活性小麦グルテン（乾量94％(Gluvital (R) 21000)）をグリセロール50ｇ及び水15ｇと混合し、そしてドゥー コーダ中58℃及び25rpm で混練した。２分後にトルクが高まりそして15分後に6.5Nm の最大に達し、その後トルクは低下し始めた。この生成物の粘稠度は例１のものよりも高く、そして異なる“噛みごたえ”が得られた。水分活性は、生成物の微生物による分解を避けるのになお十分に低かった。

４．50ｇの活性小麦グルテン(乾量94％(Gluvital 21000)）をグリセロール50ｇ及び水５ｇと混合し、そして58℃及び25、50、100 及び160rpmの速度でドゥー コーダ中で混練した。高トルクに達するまでの時間が、ミキサー速度が速くなるにつれ短くなることが観察された。

５．50ｇの活性小麦グルテン(乾量94％(Gluvital 21000)）を、81.25 ｇ(乾量80％）のグルコースシロップ(CISweet(TM) D 01608,セレスター）、18.75 ｇの水、１ｇのレシチン、３ｇのココナッツ脂肪、10ｇのタピオカデンプンと、40、60及び80℃及び150rpmでドゥー コーダの50ｇボウル中で混合した。温度を高めても、最大トルクのレベルには殆ど影響はないが、この最大に到達する時間には劇的な影響があった。

６．50ｇの活性小麦グルテン（乾量94％(Gluvital 21000)）を、81.25 ｇ(乾量80％）のグルコースシロップ(CISweet D 01608, セレスター）、18.75 ｇの水、１ｇのレシチン及び３ｇのココナッツ脂肪とドゥー コーダの50ｇボウル中で58℃で混合し、そして150rpmで混練した。得られた生成物は、そのままで可食(consumable)の咀嚼性品であった。

７．50ｇの活性小麦グルテン（乾量94％(Gluvital 21000)）を、81.25 ｇ(乾量80％）のグルコースシロップ(CISweet D 01608, セレスター）、18.75 ｇの水、１ｇのレシチン、３ｇのココナッツ脂肪、10ｇの米粉及び0.1ｇのミント風味料とドゥー コーダの50ｇボウル中で58℃

及び150rpmで混合した。最大トルクはフィラー（米粉）を用いない場合と同じであるが、混合物の乾量がより高いため、この最大値へはより短い時間で到達する。この生成物は、そのままで可食の咀嚼性品であった。

８．例６と同じように製品を作り、そしてその最大トルクまで混練した後、それを成形し、その後フライしてスナックを作った。

【００３２】この製品の一部は焼成して（通例の電子レンジまたはコンビ－ オーブンによる焼成）、バケット様のクラム構造を有する優良なパン製品を得た。

９．40ｇの活性小麦グルテン（ 乾量94％(Gluvital 21000)）を、40ｇの乾燥した（乾量96％）コーン胚芽（ 油分40％）及び25ｇの水と混合し、そしてドゥ-コーダの50ｇボウル中で58℃及び25rpm で混練した。更に加工、加熱調理、フライ、焼成、缶中で滅菌などを簡単にできる、ペットにとって栄養素的に優れた製品が得られる。これはまた、その組成（高タンパク質、高脂肪、低炭水化物）及びその性質（水中に落とした際にくずれない、一つにまとまった塊）の双方から優れた魚餌でもある。

10．50ｇの活性小麦グルテン（乾量94％(Gluvital 21000)）を、50ｇのコーングルテン（乾量88％）及び25ｇの水と、ドゥ－ コーダの50ｇボウル中で58℃及び25rpm で混合した。成形できそしてペットフード、家畜飼料及び魚餌に使用される通常の加工法で更に加工できる、栄養素的に非常に興味深い優良な製品が得られた。

【００３３】

【表１】

例	初期展開[分]	最大トルク(Nm)	最大トルクに至るまでの時間(分)	9Nmに至るまでの時間(分)
1	1	8.5	13	
2	4	4.5	18	
3	2	6.5	15	
4(25rpm)	5			21
4(50rpm)	3			13.5
4(100rpm)	2			12
4(160rpm)	1			5.5
5(40℃)	4	3.5	58	
5(60℃)	3	3.5	11	
5(80℃)	2	3	6	
6	9	3.5	19	
7.8	4	4	12	
9	1	4	10	
10	1	5	3	

11．１kgの活性グルテン（ 乾量94％(Gluvital 21000)）を、1.625kg （乾量80％）のグルコースシロップ(C* Sweet D 01608,セレスター）、0.375kg の水、0.2kg の米粉、20ｇのレシチン及び60ｇのココナッツ脂肪と、Z-ブレードミキサー中で58℃で混合した。500ppmの過酸化カルシウム及び500ppmのタンニンを架橋剤として加えた。このミキサーのエネルギー伝達性は、上記のドゥー コーダのそれよりも低く、最適の展開度（最大トルク）まで25分かかった。最大トルクに至る２分前に、10mlのミント風味料を加えた。トルクが最大になった時に混練を停止し、そしてその生成物を成形した。すなわち、先ず、異なる厚さ（それぞれ３、５及び８mm）のシート上に積層しそして所望の形状に切った。この生成物は、簡単にサンディング(sanding) 及びコーティング加工することができた。サンディングでは、この生成物を水蒸気で湿らせそして精糖、デキストロースまたはこの目的に使用される他の粉末中に入れた。コーティングプロセスは、風味料（桃、レモンなど）を加えたシュクロース（ 糖度66° ）またはデキストロース溶液（固形分48％）を用いて行った。上記の生成物を篩器または沪網上に置き、そしてコーティング溶液をその上に注いだ。また上記生成物は、チューインガムとして可食であった。

12．１kgの活性グルテン（ 乾量94％(Gluvital 21000)）を、1.625kg(乾量80％)のグルコースシロップ(C* Sweet D 01608,セレスター）、0.2kg の水、0.09kgのグリセロール、0.2kg の米粉、20ｇのレシチン及び60ｇのココナッツ脂肪と、Z-ブレードミキサー中で58℃で混合した。架橋剤としての500ppmの過酸化カルシウム及び500ppmのタンニンを、35mlの50％クエン酸ナトリウム溶液及び１mlの黄色着色料と一緒に加えた。このミキサーのエネルギー伝達性は上記のドゥー コーダのそれよりも低く、最適の展開度（最大トルク）まで25分かかった。この最大トルクに至る２分前に、15mlのオレンジ風味料を加えた。トルクが最大になった時に混練を停止し、そしてその生成物を成形した。すなわち、先ず、異なる厚さ（それぞれ３、５及び８mm）のシートに積層して、そして所望の形状に切った。この生成物は、例11に記載のように簡単にサンディング及びコーティング加工すること

ができた。この生成物は、チューインガムとして可食であった。

13．１kgの活性グルテン（乾量94％(Gluvital 21000)）を、1.625kg(乾量80％)のグルコースシロップ(C* Sweet D 01608,セレスター）、0.2kg の水、0.09kgのグリセロール、0.2kg の米粉、20ｇのレシチン及び60ｇのココナッツ脂肪と、Z-ブレードミキサー中で58℃で混合した。架橋剤としての500ppmの過酸化カルシウム及び500ppmのタンニンを、35mlの50％クエン酸ナトリウム溶液及び１mlの黄色着色料と一緒に加えた。このミキサーのエネルギー伝達性は上記のドゥー コーダより低く、最適の展開度（最大トルク）まで25分かかった。この最大トルクに至る２分前に、15mlのオレンジ風味料を加えた。トルクが最大に達した５分後に、混練を停止し、そしてその生成物を成形した。すなわち、先ず、異なる厚さ（それぞれ３、５及び８mm）のシート上に積層しそして様々な形状に切った。この生成物は例11に記載のように簡単にサンディング及びコーティング加工することができた。チューイキャンディのテクスチャを有する非常に優良な甘味品が得られた。この試験をより高い温度(85℃）で繰り返した。得られた製品はより硬いテクスチャを有した。

14．３kgの活性グルテン（乾量94％(Gluvital 21000)）を、4.875kg(乾量80％)のグルコースシロップ(C* Sweet D 01608,セレスター）、1.125kg の水、0.6kg の米粉、60ｇのレシチン及び180 ｇのココナッツ脂肪と、大型のZ-ブレードミキサー中で58℃で混合した。着色料として、１％の割合で酸化鉄(III）を加えた。このミキサーのエネルギー伝達性は上記のドゥー コーダと同じであり、すなわち展開時間は15分で済んだ。この最大に到達する２分前に、12個の固形ミートブイヨンを加えた。

【００３４】混練後、得られた材料を異なる塊に分割した。冷めるとこの材料は硬くなり、ローストビーフのような外観を呈し、簡単にスライスすることができた。他の塊は積層しそしてペットフード用途（猫）向きの小さなサイコロの形(0.5×0.5 ×0.5cm³）に切り分けた。また我々は上記で得た塊をビーフステーキ様の塊にも成形した。この試験を、異なる着色レベル（ それぞれ酸化鉄0.25％及び0.1 ％）及び異なる風味料（例えば0.1 ％量のチキンエキス）を用いて繰り返した。得られた製品は犬に大変喜ばれた。

【００３５】加熱調理すると、そのテクスチャは煮沸した肉に近い。

15．３kgの活性グルテン（ 乾量94％(Gluvital 21000)）を、4.875kg(乾量80％)のグルコースシロップ(C* Sweet D 01608,セレスター）、1.125kg の水、0.6kg の米粉、60ｇのレシチン及び180 ｇのココナッツ脂肪と、大型のZ-ブレードミキサー中で58℃で混合した。全ての成分を十分に混合したら、得られた塊状の材料を、グルテンを適切に展開させるスクリュー構成を有するパイロットプラント押出機(Clextral 製）に移した。この材料の硬さ及びテクスチャは混練温度に依存して変化した。85℃の出口温度では、この材料は非常に軟質の白黄色のドウとなり、冷めると硬くなった。押出機の出口の構成（ダイの形状及び直径、切断ナイフ、など）に応じて、様々な形状の成形品を作製することができた。この材料を型を用いて様々な形状に成形することもできた。成形品の構造はスクリュー構造の変化に応じて変化した。混練の強さを高めると、繊維様構造の形成を誘発した。温度が100 ℃を超えると、成形品はぼろぼろに崩れる状態になったが冷めると硬くなり、スナック様の製品になった。この場合も、最終の形状は、押出機のダイを変えることによって変更することができた。

【図面の簡単な説明】

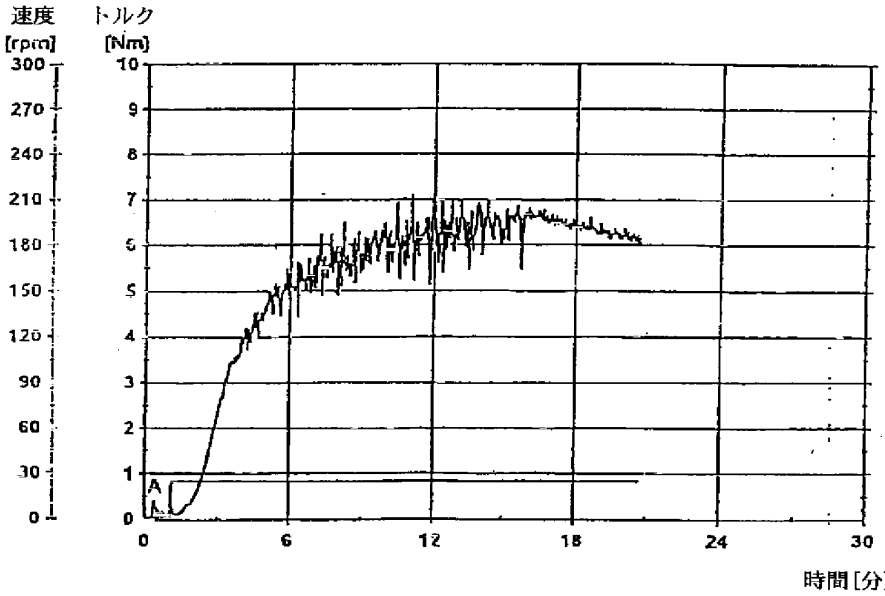
【図１】図１は、ドゥー コーダ(Do-Corder)DC 2200-3（ブラベンダーOHG,デュイスブルク在）で記録したブラベンダー・プラストグラムを示す。これは、58℃及び25 rpm でグルテン- グリセロール- 水(50:50:15)の混合物を混練した際の、時間の関数としてのトルク(Nm)の進展を表すものである。

【図１】

ブラベンダー　プラストグラム
プラスチ-コーダ及びミキサー測定ヘッド
セミ-オートマチック万能評価法

試験条件

オ--ダー:	CoE RM&C	速度:	1 rpm
作業者:	ジー. マウロー(g. moureau)	ミキサー温度:	37℃
日付:	15/09/98 01:39	初期温度:	24℃
駆動装置:	PL2200-3	測定範囲:	2Nm
ミキサー:	W 50	ダンピング:	3
シュ--ト供給:	手動+5kg	試験時間:	31 分
サンプル:	グルテン 50-グリセロール 50	サンプル重量:	50.50g
添加物:	水 15	コードナンバー:	



	時間[h:m:s] 0-X	時間[h:m:s] X-X	トルク[Nm] Xでの値	温度[℃] Xでの値	エネルギー[kJ] 0-X	エネルギー[kJ] X-X
A	00:00:00	00:00:00	0.0	24	0.0	0.0

グルテン　　50%
グリセロール　50%

(8)開2001-61415(P2001-61415A)

【外国語明細書】

1. Title of Invention

The development of vital wheat gluten in non-aqueous media

2. Claims

1. A method for developing wheat gluten characterized in that the wheat gluten are developed in a non-aqueous medium.

2. A method according to claim 1 wherein the non-aqueous medium contains less than 20% of water, preferably less than 15%, more preferably less than 10 %.

3. A method according to claim 1 wherein the non-aqueous medium has a water activity which is below 0.8

4. A method according to claim 3 wherein the final product has a water activity of less than 0.7.

5. A method according to claim 1 or 2 wherein the non-aqueous medium is a concentrated carbohydrate syrup.

6. A method according to claim 4 wherein the carbohydrate is selected from the group consisting of glycerol, glucose, fructose, sucrose, invert sugar, sorbitol, and lactose.

7. A method of developing wheat gluten according claim 1 wherein the gluten are vital gluten.

8. A method for developing wheat gluten comprising the steps of
   - mixing gluten 20 – 60 % (d.s. w/w) with a non-aqueous medium,
   - kneading the mixture at a temperature of between 50 and 90 °C,
   - continuing the kneading until the value of at least 75% of the maximal torque is reached,
   - shaping the gluten into a desired form.

9. A method according to claim 8 wherein the water activity of the non-aqueous medium is below 0.8.

10. A method according to claim 8 wherein the kneading is continued after reaching the maximal torque and halted before 75% of the maximal value is reached.

11. A method according to claim 8 wherein during the later stage of the kneading, before, during or after shaping other ingredients are added to the gluten.

12. A food or feed product comprising a wheat gluten which has been developed in a non-aqueous medium.

3. Detailed Description of Invention

Technical field

The present invention relates to the development of vital wheat gluten in non-aqueous media. The gluten which have been developed in such a way can easily be stored for a prolonged period of time under ambient storing conditions. The gluten are used in the preparation of chewable consumable products, they are also used in processed foods and feeds.

Background of the invention

Conventional chewing gums have achieved a broad success in the marketplace. Such chewing gums are typically made of a gum base and a coating. Both of these parts further contain compounds, which act as sweeteners, colourants, flavours, preservatives and processing aids. Such ingredients also serve to modify the bite and taste of the product.

Conventional gum bases may be chosen from natural or synthetic resins such as chicle, natural rubber, guttapercha, lechi capsi, sorva, guitakay, crown gum, butadiene-styrene copolymers, polyisobutylene, isobutylene-isoprene copolymers, polyvinyl acetate, and polyvinyl alcohol. The gum base, which is water insoluble and chewable further comprises elastomers, resins, fats, oils, waxes, softeners and fillers. As a softener or plasticiser the following molecules can be used lanolin, propylene glycol, glycerine or triacetin in amounts of up to 10 weight%. Other additives include fillers and anti-sticking agents.

The products used as basic ingredient for the gum base are not biodegradable and do not degrade upon chewing either. This distinguishes the chewing gum from the chewy candies, which are completely digestible. Disposal of conventional chewing gum can cause unsightly litter.

Wheat gluten has been tried as a digestible and biodegradable alternative to the mentioned gum base ingredients. In addition to their being biodegradable when discarded the gluten, because they are proteins, are not harmful to the human body

should they be swallowed. To the contrary, gums based on or including gluten would be nutritious.

US patent 3,814,815 describes a method of manufacturing a gum base in which gluten are denatured by more than 10% and preferably between 10 and 60%. Denaturation is described to be performed in an excess of water either by heating or freezing.

International patent application WO 95/12322 discloses the use of gluten as a gum base for chewing gum. In order to improve the chewability characteristics the gluten are cross-linked with a protein condensing agent, preferably tannin. It is recognized that the gluten-based chewing gums have a high moisture content, which renders the gums susceptible to microbial spoilage. In order to avoid this spoilage preservatives are added.

WO 94/17673 describes an improvement in the chew of gluten when used as a gum base wherein the improvement consists in the addition of a texturizing agent.

US patent 3,692,535 relates to the preparation of ready-to-bake pie crust. The pie crust is said to be shelf stable without refrigeration and can be rolled or otherwise handled without crumbling or breaking. As indicated in the description (col.2, lines 3 –21) the complete flour is developed in water. This necessitates the addition of preservatives to inhibit microbial growth.

US patent 5,366,740 relates to the use of a combination of spray dried and flash dried gluten as a chewing gum base.

US patent 5,665,152 relates to the forming of solid, non-edible biodegradable, grain protein-based articles.

US patent 5,945,142 relates to the addition of small amounts of gluten to the norma chewing gum base in order to reduce the squeakiness.

Despite the fact that gluten have found acceptance in a wide range of applications gluten have to date not gained a reasonable markets share in food or feed applications. In the chewing gum field the use of gluten has been hampered by a number of organoleptic factors and no gluten based chewing gum has gained wide acceptance in the market, regardless of the advantages of degradability and edibility of the gluten.

In addition to the organoleptic factors one of the reasons therefore is the wide-spread belief that it is necessary to develop the gluten in an aqueous medium. Development in an aqueous medium results in the presence of too much water in the final product,

which makes the product perishable due to the growth of microorganisms. The present invention solves this problem.

Summary of the invention

It is an object of the present invention to provide a digestible, degradable gluten basic composition which, can be stored for a prolonged period of time without degradation and which can be used as a gum base for chewing gums, chewable candies, and processed food or feed. The storage conditions are the normal storage conditions for gluten.

The present invention discloses a developed vital wheat gluten wherein the development was performed in a non-aqueous medium i.e. a medium having a Aw of less then 0.8, or with a Aw so that the final composition has a Aw less than 0.7

A preferred medium for developing the gluten is a concentrated carbohydrate solution, containing less than 30 % of water, preferably less than 20 %, more preferably less than 10 % (w/w).

The present invention also discloses a method for developing wheat gluten in a non-aqueous medium. The method comprises the steps of

- mixing gluten 20 – 60 % (d.s. w/w) with a non-aqueous medium,
- kneading the mixture at a temperature of between 50 and 90 °C,
- continuing the kneading until the value of at least 75% of the maximal torque is reached,
- shaping the gluten into a desired form.

The present invention further discloses the use of the so-developed wheat gluten as a gum base for chewing gums, or as basis for chewing candies.

Wheat gluten developed in non-aqueous media has been applied in food applications but also in bakery and processed food. The wheat gluten was further applied in feed applications such as in pet food or fish feed.

It is an object of the present invention to provide a digestible, degradable gluten basic composition, which can be stored for a prolonged period of time without degradation and which can for example be used as a gum base for chewing gums or chewable candies. The present invention discloses a developed vital wheat gluten wherein the development was performed in a non-aqueous medium i.e. a medium having a Aw (water activity) of less than 0.8, so that the final composition has a Aw of less than 0.7.

In general terms, the wheat gluten are developed by mixing a high concentration of vital wheat gluten with the non-aqueous medium of choice. Kneading of this mixture is continued until the torque is maximal (see Figure 1). It is especially at the maximum value of this torque that the product has excellent chewing properties. The product can now be used as a gum base. When mixing is stopped before the maximum value, or beyond the maximum value, the product will be more suitable for applications in chewy candy, in processed food, or in feed applications (including pet food). In general we have found that the kneading is to continue until at least 75% of the maximum torque value is reached (note that this can be before or after the maximum value), preferably until at least 85% is reached.

Since the wheat gluten were developed in a non-aqueous medium the product is stable towards microbial degradation and can be stored for several months without deterioration, under normal storage conditions This greatly adds to the flexibility of the use of vital wheat gluten.

In a typical preparation the kneading is performed at a temperature between 50 and 90°C. The essence of the kneading is that sufficient energy has to be added to allow the gluten to unfold, and restore their interactions i.e. H bridges, hydrophobic and

ionic bonds, sulpher bridges and crosslinks. This means that there is some flexibility as to the type of kneader (type, continuous or batch, extruder etc.) and the conditions under which the kneader is employed. This is what is understood by developing according to the present invention. Unfolding and restoration of interactions is not accompanied by a substantial breakdown of the primary structure of the proteins. Such a process is called denaturation and that is not desirable at least not to an extensive degree in the present case.

The evolution of the torque (time to maximum) and the height of the torque can be influenced by altering the conditions of the kneading, i.e. temperature, speed of kneading, inclusion of other ingredients or additives, etc. Some of these parameters are illustrated in the examples.

Kneading times are typically between 5 min and 1 hour preferably between 10 and 25 minutes. It should be kept in mind that what counts is the energy transfer properties of the mixer. Where an extruder is used the treatment time is in the order of seconds.

Although the present invention relates to the absence of water typically up to about 20 % of water may be present. The limits for this are determined by the fact that the water activity (Aw) has to be such that microbial growth is not possible. This water activity limit depends to a certain extent on the type of microorganism.

In addition it should be noted that in the presence of water kneading becomes easier.

A preferred medium is a concentrated carbohydrate solution, containing less than 30 % of water, preferably less than 20 %, more preferably less than 10 % (w/w).

The amount of water, which is present during kneading influences the kneading conditions. Kneading becomes easier in the presence of water. In fact what is essential for the present invention is the water activity of the final product.

The gluten used in the present invention can be from any cereal source, advantageously they are wheat gluten and most preferred are the vital wheat gluten. It is possible to combine gluten from different sources and it is also possible to use partially vital gluten.

After development of the gluten they are shaped in a desired form. They can be moulded or forced through a die. Additional components and ingredients are added depending on the type of product which is to be obtained.
When used for preparing chewing gum it is possible to use the gluten as presently developed as base. The gluten can also be combined with other biodegradable components such as crosslinking proteins. It is further possible to combine the gluten of the present invention with normal synthetic or natural gum bases.

The present invention discloses the use of the so-developed wheat gluten as a gum base for chewing gums or chewing candies. The wheat gluten has been applied in food applications including in bakery and processed food. The wheat gluten was further applied in feed applications such as in pet food. In such cases it may be necessary to process the gluten by cooking, baking or other means.

Examples

1. 50 g vital wheat gluten (94% dry substance (Gluvital® 21000)) were mixed with 50 g glycerol and 10 g of water, and kneaded in a Do-Corder (Brabender,Duisburg, 50 g bowl) at 58°C at 25 rpm. After 1 minute the torque increased, and reached a maximum of 8.5 Nm after 13 min, after which it started declining (see figure 1). The product recovered when kneading up to the top of the development curve has excellent chewing properties and can be used as gum base for e.g. chewing gum formulas.

2. 50 g vital wheat gluten (94% dry substance (Gluvital® 21000)) were mixed with 50 g glycerol and 6 g lecithin (Stern, Hamburg), and kneaded in a Do-Corder at 58°C at 25 rpm. After 4 minute the torque increased, and reached a maximum of 4.5 Nm after 18 min, after which it started declining. The product recovered when kneading up to the top of the development curve has excellent chewing properties and can be used as gum base for e.g. chewing gum formulas. The product was stable towards microbiological degradation, and was stored for several months.

3. 50 g vital wheat gluten (94% dry substance (Gluvital® 21000)) were mixed with 50 g glycerol, and 15 g water, and kneaded in a Do-Corder at 58°C at 25 rpm. After 2 minutes the torque increased, and reached a maximum of 6.5 Nm after 15 min, after which it started declining. The consistency of the product is higher than in example 1, and a different 'bite' was obtained. The water activity was still low enough to avoid microbiological degradation of the product.

4. 50 g vital wheat gluten (94% dry substance (Gluvital 21000)) were mixed with 50 g glycerol, and 5 g water, and kneaded in a Do-Corder at 58°C and a speed of resp. 25, 50, 100 and 160 rpm. It was found that the time to reach the high torque declines with increasing mixer speed.

5. 50 g vital wheat gluten (94% dry substance (Gluvital 21000)) were mixed with 81.25 g (80% dry substance) glucose syrup (CISweet™ D 01608, Cerestar), 18.75 g water, 1 g of lecithin, 3 g of cocosfat, 10 g of tapioca starch in the 50 g bowl of the Do-Corder at resp. 40. 60 and 80°C, at 150 rpm. Increasing the temperature hardly influences the level of the maximum torque, but drastically influences the time at which this maximum is reached.

6. 50 g vital wheat gluten (94% dry substance (Gluvital 21000)) were mixed with 81.25 g (80% dry substance) glucose syrup (CISweet D 01608, Cerestar), 18.75 g water, 1 g of lecithin, and 3 g of cocosfat in the 50 g bowl of the Do-Corder at 58°C and kneaded at 150 rpm. The product was a directly consumable chewable product.

7. 50 g vital wheat gluten (94% dry substance (Gluvital 21000)) were mixed with 81.25 g (80% dry substance) glucose syrup (CISweet D 01608, Cerestar), 18.75 g water, 1 g of lecithin, 3 g of cocosfat, 10 g of rice flour and 0.1 g of mint flavour in the 50 g bowl of the Do-Corder at 58°C and 150 rpm. The maximum torque is the same as without the filler (rice flour), but the maximum is reached after a shorter time, due to the higher dry substance of the mixture. The product was a directly consumable chewable product.

8. A product was produced as in example 6, and after kneading to its maximal torque it was shaped after which it was fried yielding snacks.

   A part of the same product was baked (conventional, microwave or combi-oven) yielding nice bakery products with bagueite-like crumb structure.

9. 40 g vital wheat gluten (94% dry substance (Gluvital 21000)) were mixed with 40 g of dried (96% dry substance) corn germs (40% oil) and 25 g of water, and kneaded in the 50g bowl of the Do-Corder at 58° C and 25 rpm. A nutritionally excellent product is generated for pets that easily can be further processed cooked, fryed, baked, sterrilised in cans, etc. It is also an excellent fish feed, both through its composition (high protein, high fat, low carbohydrates) and its properties (consistant mass that is not desintegrating when dropped in water).

10. 50 g of vital wheat gluten 94% dry substance (Gluvital 21000) were mixed with 50 g of corn gluten (88% dry substance) and 25 g of water in the 50 g bowl of the Do-Corder at 58°C and 25 rpm. A nice, nutritionally very interesting product was obtained that can be shaped and further processed through the normal processes applied in pet food, animal feed and fish feed.

example	onset development (min)	maximum torque (Nm)	time to maximum (min)	time to 9 Nm (min)
1	1	8.5	13	
2	4	4.5	18	
3	2	6.5	15	
4 (25 rpm)	5			21
4 (50 rpm)	3			13.5
4 (100 rpm)	2			12
4 (160 rpm)	1			5.5
5 (40°C)	4	3.5	58	
5 (60°C)	3	3.5	11	
5 (80°C)	2	3	6	
6	9	3.5	19	
7.8	4	4	12	
9	1	4	10	
10	1	5	3	

11. 1 kg of vital gluten (94% dry substance (Gluvital 21000)) were mixed with 1.625 kg (80% dry substance) glucose syrup (C*Sweet D 01608, Cerestar), 0.375 kg of water, 0.2 kg of rice flour, 20 g of lecithin and 60 g of cocosfat in a Z-blade mixer at 58°C. 500 ppm calcium peroxide and 500 ppm of tannin were added as crosslinking agents. The energy transfer of this mixer was lower than that of the Do-Corder, which resulted in times to optimal development (maximal torque) of 25 min. 2 min. before reaching the maximum 10 ml of mint flavour were added. At the maximum torque the kneading was stopped and the product shaped: first laminated to sheets of different thickness (resp. 3, 5 and 8 mm), and cut into desired forms. The products could be easily sanded and coated : for sanding the products were damped with steam, and dropped in fine sugar, dextrose, or any other powder used for this purpose. The coating process was executed with sucrose (66° Brix) or dextrose solutions (48% solids) to which flavour (peach, lemon etc.) was added. The products were put on sieves or screens, and the coating solution poured on it. The products could be consumed as chewing gums.

12. 1 kg of vital gluten (94% dry substance (Gluvital 21000)) were mixed with 1.625 kg (80% dry substance) glucose syrup (C*Sweet D 01608, Cerestar), 0.2 kg of water, 0.09 kg of glycerol, 0.2 kg of rice flour, 20 g of lecithin and 60 g of cocosfat in a Z-blade mixer at 58°C. 500 ppm calcium peroxide and 500 ppm of tannin were added as crosslinking agents, together with 35 ml of a 50% sodium citrate solution and 1 ml of yellow colour. The energy transfer of this mixer was lower than that of the Do-Corder, which resulted in times to optimal development (maximal torque) of 25 min. 2 min before reaching the maximum 15 ml of orange flavour were added. At the maximum torque the kneading was stopped and the product shaped: first laminated to sheets of different thickness (resp. 3. 5 and 8 mm), and cut into desired forms. The products could be easily sanded and coated as described in example 11.The products could be consumed as chewing gums.

13. 1 kg of vital gluten (94% dry substance (Gluvital 21000)) were mixed with 1.625 kg (80% dry substance) glucose syrup (C*Sweet D 01608, Cerestar), 0.2 kg of water, 0.09 kg of glycerol, 0.2 kg of rice flour, 20 g of lecithin and 60 g of cocosfat in a Z-blade mixer at 58°C. 500 ppm calcium peroxide and 500 ppm of tannin were added as crosslinking agents, together with 35 ml of a 50% sodium citrate solution and 1 ml of yellow colour. The energy transfer of this mixer was lower than that of the Do-Corder, which resulted in times to optimal development (maximal torque) of 25 min. 2 min before reaching the maximum 15 ml of orange flavour were added. 5 min after the maximum torque was reached, the kneading was stopped and the product shaped: first laminated to sheets of different thickness (resp. 3. 5 and 8 mm), and cut into different forms. The products could be easily sanded and coated as described in Example 11. Very nice sweets with a chewy candy texture were obtained. The tests were repeated at higher temperatures (85°C). The resulting products had a harder texture.

14. 3 kg of vital gluten (94% dry substance (Gluvital 21000)) were mixed with 4.875 kg (80% dry substance) glucose syrup (C*Sweet D 01608, Cerestar), 1.125 kg of water, 0.6 kg of rice flour, 60 g of lecithin and 180 g of cocosfat in a large Z-blade mixer at 58°C. 1% of iron(III)oxide were added as colouring agent. The energy transfer of this mixer was identical to that of the Do-Corder, i.e. development time was only 15 min. 2 min before reaching the maximum 12 meat bouillon cubes were added

After the kneading the mass was divided in different lumps. After cooling down the mass hardened, looked as a roast beef, and could be easily sliced. Other lumps were laminated and cut into small cubes (0.5*0.5*0.5 cm^3) for pet food applications (cats). We also shaped lumps into beef steak like mass. The tests were repeated with different colouring levels (resp. 0.25 and 0.1% iron oxide), and different favours (e.g. 0.1% chicken extract). The products were very much appreciated by dogs.

After cooking the texture is close to that of boiled meat.

15. 3 kg of vital gluten (94% dry substance (Gluvital 21000)) were mixed with 4.875 kg (80% dry substance) glucose syrup (C*Sweet D 01608, Cerestar), 1.125 kg of water, 0.6 kg of rice flour, 60 g of lecithin and 180 g of cocosfat in a large Z-blade mixer at 58°C. When all ingredients were well mixed, the mass was transferred to a pilot plant extruder (Clextral) with a screw configuration that correctly developped the gluten. The hardness and texture of the products varied with the kneading temperature: at 85°C exit temperature the product was a very soft, white-yellow dough that hardened on cooling down. Depending on the configuration of the exit of the extruder (die shape and diameter, cutting knife etc.) different shaped products could be produced. Also moulding of the mass into different forms was possible. The structure of the product varied with varying screw configuration: intensifying the kneading induced the formation of fibre-like structures. At temperatures above 100°C the products became crumble, but hardened on cooling down, yielding snack-like products. Here too, the final shape could be adapted by changing the extruder die.

4. Brief Description of Drawings

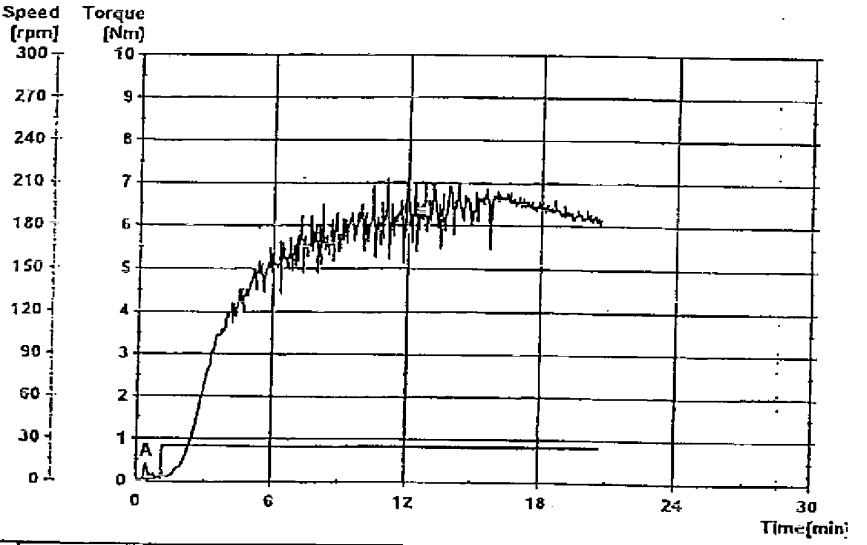
Figure 1 shows a Brabender Plastogram recorded on a Do-Corder DC 2200-3 (Brabender OHG, Duisburg), expressing the evolution of the torque (Nm) as a function of time when kneading a mixture of gluten-glycerol-water (50:50:15) at 58° Celsius and 25 rpm.

FIGURE 1

BRABENDER Plastogram

PLASTI-CORDER and Mixer Measuring Head
Semi-Automatic Universal Evaluation

Test Conditions				
Order	: CoE RM&C	Speed	:	1 rpm
Operator	: g.moureau	Mixer Temp.	:	37 °C
Date	: 15/09/98 01:39	Start Temp.	:	24 °C
Drive Unit	: PL2200-3	Meas. Range	:	2 Nm
Mixer	: W 50	Damping	:	3
Loading Chute	: Manual + 5 kg	Test Time	:	31 min
Sample	: glu50-glycerol50	Sample Weight	:	50.50 g
Additive	: water 15	Code Number	:	



	Time [h:m:s] 0-X	Time [h:m:s] X-X	Torque [Nm] at X	Temp. [°C] at X	Energy [kJ] 0-X	Energy [kJ] X-X
A	00:00:00	00:00:00	0.0	24	0.0	0.0

gluten 50 %
glycerol 50 %
H_2O 15 %

5. Abstract

The present invention relates to the development of vital wheat gluten in non-aqueous media. The gluten which have been developed in such a way can easily be stored for a prolonged period. The gluten are used in the preparation of chewable consumable products, or in processed food and feed.

Espacenet

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ANALOGUE OF VEGETABLE PROTEIN MEAT

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Classification: - international:***A23J3/14; A23J3/16; A23J3/18; A23J3/22;*** (IPC1-7): A23J3/14; A23J3/22
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Abstract of JP2005021163 (A)

PROBLEM TO BE SOLVED: To provide an analogue of vegetable-base meat such as burger patty and sausage usable for various vegetable dish foods and to provide a method for producing the analogue. ;SOLUTION: The method for producing the analogue of vegetable-base meat comprises preparing cream through continuously mixing methyl cellulose with a mixture of water/ice and preparing a flavor-giving emulsion base through mixing denatured gluten, vegetable protein components each having high water solubility and forming gel by slow heating treatment and emulsion-base preparing oil and denatured edible starch with flavor components. It is possible also to cook the flavor-giving emulsion base after filling in a casing. The cooked flavor-giving emulsion base is an analogue of vegetable-base meat and resembles closely to a processed meat product having improved handling characteristics. The addition of the flavor-giving emulsion base and the analogue of vegetable-base meat to a vegetable dish food improves palate feeling, sensation in the mouth and juicy character of the product to be obtained. ;COPYRIGHT: (C)2005,JPO&NCIPI

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(54)【発明の名称】植物たんぱく質食肉類似物

(57)【要約】
【課題】　バーガーパティー及びソーセージ等の、種々の菜食用食品において使用できる植物ベースの食肉類似物及びその製造方法を提供する。
【解決手段】　メチルセルロースを水/氷混合物中に連続的に混合してクリームを調製し、次に変性グルテン、高い水溶解性を有し且つ緩やかな加熱処理によってゲルを形成し得る植物たんぱく質成分、エマルジョンベース調製用油、および変性食用澱粉と風味料成分中に混合して、風味付けエマルジョンベースを調製することを含む方法により上記課題は解決される。風味付けエマルジョンベースは、ケーシングに詰めた後調理することもできる。調理された風味付けエマルジョンベースは、植物ベースの食肉類似物であり、改良された取扱い特性を有する加工食肉製品に酷似する。菜食用食品中への上記風味付けエマルジョンベースおよび上記植物ベースの食肉類似物の添加は、得られる製品の食感、口当たりおよびジューシー性を改善する。
【選択図】　なし

【特許請求の範囲】
【請求項1】
下記の各工程を含むことを特徴とする植物ベースの食肉類似物の製造方法：
メチルセルロースを水/氷混合物に添加し、引き続きメチルセルロースと水/氷混合物を混合してクリームを調製する工程；
変性グルテン中に混合する工程；
水中で高溶解性を有し且つ緩やかな加熱処理によってゲルを形成し得る植物たんぱく質成分中に混合してたんぱく質混合物を調製する工程；
油中に混合してエマルジョンベースを調製する工程；
変性食用澱粉と風味料成分中に混合して風味付けエマルジョンベースを調製する工程；および、
該風味付けエマルジョンベースを調理して植物ベースの食肉類似物を調製する工程。
【請求項2】
前記風味付けエマルジョンベースを前記調理工程前に水不透過性ケーシングに詰める工程をさらに含む、請求項１記載の方法。
【請求項3】
前記変性グルテンが活性小麦粉グルテンを含む、請求項１記載の方法。
【請求項4】
前記植物たんぱく質成分が大豆由来である、請求項１記載の方法。
【請求項5】
前記変性食用澱粉がコーンスターチを含む、請求項１記載の方法。
【請求項6】
前記油が大豆油、キャノーラ油、とうもろこし油またはピーナツ油の少なくとも１種を含む、請求項１記載の方法。
【請求項7】
前記風味料成分が甘味料、香辛料、塩、ビーフ風味料、ガーリック粉末または着色用染料の少なくとも１種を含む、請求項１記載の方法。
【請求項8】
前記氷/水混合物が等容量の氷と水を含有する、請求項１記載の方法。
【請求項9】
前記風味付けエマルジョンベースが約10～20質量％の前記植物たんぱく質成分を含有する、請求項１記載の方法。
【請求項10】
前記風味付けエマルジョンベースが3～10質量％の前記変性グルテン、10～15質量％の前記油、5～10質量％の前記変性食用澱粉、1～3質量％の前記メチルセルロースおよび5～8質量％の前記風味料成分をさらに含有する、請求項１記載の方法。
【請求項11】
前記風味料成分が甘味料、塩、香辛料、ビーフ風味料、チキン風味料またはポーク風味料を含む、請求項１記載の方法。
【請求項12】
前記調理工程が約87.8℃(190° F)～約90.6℃(195° F)の温度に加熱することを含む、請求項１記載の方法。
【請求項13】
前記植物ベースの食肉類似物を約4.4℃(40° F)に冷却する工程；および前記植物ベースの食肉類似物を前記植物ベースの食肉類似物片に砕く工程をさらに含む、請求項１２記載の方法。
【請求項14】
前記食肉類似物片が約3～12 ㎜の直径を有する、請求項１３記載の方法。
【請求項15】

請求項１記載の方法に従って製造した前記植物ベースの食肉類似物。
【請求項16】
請求項１３記載の方法に従って製造した前記植物ベースの食肉類似物片。
【請求項17】
下記の各工程を含むことを特徴とする植物バーガーパティーの製造方法：
植物ベースの食肉類似物片を少なくとも１種の食用つなぎ成分、風味付けエマルジョンベース、メチルセルロース、カラゲナンゲル混合物および風味料成分と混合する工程；および、得られた混合物をパティーに成形する工程。
【請求項18】
前記パティーを調理する工程をさらに含む、請求項１７記載の方法。
【請求項19】
前記調理したパティーを冷凍する工程をさらに含む、請求項１８記載の方法。
【請求項20】
前記少なくとも１種の食用つなぎ成分がクラッカー屑、トースト化小麦屑、変性澱粉、ミルクたんぱく質、小麦粉、マスタードまたは水和大豆たんぱく質生成物を含む、請求項１７記載の方法。
【請求項21】
前記食用つなぎ成分が、大豆たんぱく質濃縮物を含む水和大豆たんぱく質生成物である、請求項２０記載の方法。
【請求項22】
前記調理工程が、油中で30秒間約176℃(350°F)の温度で加熱することを含む、請求項１８記載の方法。
【請求項23】
50～75質量％の前記食用つなぎ成分、5～20質量％の前記食肉類似物片、15～25質量％の風味つけエマルジョンベース、7～12質量％の前記カラゲナン、0.1～1質量％の前記メチルセルロースおよび0.01～0.25質量％の風味料成分を含む、請求項１７記載のバーガーパティー。
【請求項24】
前記風味料成分が甘味料、塩、香辛料、ビーフ風味料、チキン風味料またはポーク風味料を含む、請求項１７記載の方法。
【発明の詳細な説明】
【技術分野】
【0001】
本発明は、植物たんぱく質製品、さらに詳細には、植物ベースの食肉類似物の製造方法に関する。
【背景技術】
【0002】
挽き肉パティーは、焼いたり、直火焼きしたりあるいは炒めたりすることによって調理した場合、その水分の多くを喪失し、実質的な重量損失を被る。この重量損失は、調理した食肉製品の明白な収縮をもたらす。天然汁分の調理損減に基づく全体的な水分損失は、調理加工の必然的な結果であり、調理の度合に大きく左右される。
食品消費の最近の傾向は、人々が、健康に対する特定の食材の潜在的な作用についての最近の研究の結果として、より健康思考型となり食品摂取に注意していることを示している。動物製品は、コレステロールの唯一の食餌源であり、高レベルの飽和油脂類を含有し得る。このために、大多数の保健専門家が、一般の人々に赤肉類の摂取を有意に減らすことを推奨する結果になっている。魚類および鶏肉が一般的な代替品となってきているが、植物たんぱく質も人気が高まってきている。一般に、植物たんぱく質は、豆類または他の自然製品の単独または動物食材と混合した形で食されているが、脱脂した脂肪種子、とりわけ大豆の粉末、濃縮物および分離物のようなリッチ化素材も食成分として使用するのために開発されてきている。
【0003】

植物たんぱく質をベースとする食肉類似物製品即ちゲル化食品、例えば、チーズおよびヨーグルトは、多くの健康利益を消費者に提供している。これら製品の消費者の支持は、食感、風味、口当たりおよび外観のような感覚刺激的な品質に直接関連している。食肉代替品として使用し得る植物たんぱく質製品を製造する試みはなされている。例えば、米国特許第4,057,656号は、美味で、淡白で、明色性で、食感的に肉様であり、水和させたときに咀嚼性のある塊片である迅速調理用食品の製造方法を開示している。この方法は、30％以上のたんぱく質、5～10％の水分および水分を水蒸気に転化するのに十分な温度での約30～70のNSIを含有する植物たんぱく質物質をプレス加工することを含む。結果として、該植物たんぱく質物質は、部分的にまたは実質的に淡白なものとなっている。

米国特許第4,943,441号および第5,068,117号は、大豆を丸ごと処理して、風味隠滅性物質(off flavors)と臭気を含まず肉様食感と外観を有する加工たんぱく質物質の独立した不規則形状の塊または片を製造する方法を開示している。この方法は、丸ごとの大豆を酸性化し水性媒質中で破砕して大豆粒子の水性スラリーまたはドウを調製し、これを、独立した塊または片の形状への大豆たんぱく質の加工を行う条件で高温加圧水蒸気中に通すことを含む。加工片は、乾燥させ、広範囲の種々の食品において使用するために再水和させている。風味料、着色剤、油脂、調味料および他のたんぱく質物質のような添加剤を上記の加工大豆たんぱく質片に混入させ得る。

【0004】

上述の肉様植物たんぱく質製品は、ピクルス用塩水において使用し得る製品のような、比較的低調理温度における良好なゲル形成特性および良好な水と油脂の結合特性を有しなければならないゲル系食品用のたんぱく質源としては、適切ではあり得ない。典型的には、植物たんぱく質さらには活性小麦グルテンと大豆たんぱく質分離物とのような植物たんぱく質組合せ物は、調理前に粘稠な混合物を形成し、この混合物はポンプ吸引装置および成形装置内での取扱いが困難である。また、これらのたんぱく質源からの調理製品は、加工食肉製品またはゲル化食品の天然組織とは、咀嚼性即ち“噛み”において典型的に著しく異なっている。

米国特許第5,663,058号は、高濃度のピクリング溶液としてまたスープのような粘稠液体食品において使用するのに適する旨味、色合および水分散性を有する大豆たんぱく質物質の製造方法を開示している。この方法は、大豆たんぱく質を加水分解し、油脂成分を該大豆たんぱく質と一緒にエマルジョン化し、混合物を乾燥させる各工程を含む。

【発明の開示】

【発明が解決しようとする課題】

【0005】

広範囲の種々の菜食用食品において使用することのできる、より良好な品質の植物たんぱく質食肉類似物が求められている。

【課題を解決するための手段】

【0006】

本発明は、下記の各工程を含むことを特徴とする植物ベースの食肉類似物の製造方法に関する：

メチルセルロースを水/氷混合物に添加し、引き続きメチルセルロースと水/氷混合物を混合してクリームを調製する工程；

変性グルテン中に混合する工程；

水中で高溶解性を有し且つ緩やかな加熱処理によってゲルを形成し得る植物たんぱく質成分中に混合してたんぱく質混合物を調製する工程；

油中に混合してエマルジョンベースを調製する工程；

変性食用澱粉と風味料成分中に混合して風味付けエマルジョンベースを調製する工程；および、

該風味付けエマルジョンベースを調理して植物ベースの食肉類似物を調製する工程。

別法としては、上前記風味付けエマルジョンベースを上記調理工程前に水不透過性ケーシングに詰める。

また、本発明は、下記の各工程を含むことを特徴とする植物バーガーパティーの製造方法にも関する：

植物ベースの食肉類似物片を少なくとも１種の食用つなぎ成分、風味付けエマルジョンベース、メチルセルロース、カラゲナンゲル混合物および風味料成分と混合する工程；および、得られた混合物をパティーに成形する工程。

【0007】

植物バーガーパティーは、消費者の健康思考型要求に合致する。しかしながら、典型的な植物バーガーパティーは、“１工程”法において製造されており、従って、これらのパティーを調理する場合、水としての水分が調理により損減するので、有意の重量損失が生ずる。本発明は、第１工程において風味付けエマルジョンベースと植物ベースの食肉類似物を調製する“２工程”法に関する。第１工程からのこれら２成分を第２工程において他の成分と混合して、調理時に、その元の重量の大部分を維持するパティーを製造する。従って、本発明の２工程法によって製造したパティーは、１工程法によって製造したパティーよりもジューシーである。

本発明の１つの実施態様においては、上記植物ベースの食肉類似物を製造する方法は、以下の各工程を含む：メチルセルロースを水/氷混合物に添加し、引き続きメチルセルロースと水/氷混合物を混合してクリームを調製する工程；変性グルテン中に混合する工程；

水中で高溶解性を有し且つ緩やかな加熱処理によってゲルを形成し得る植物たんぱく質成分中に混合してたんぱく質混合物を調製する工程；油中に混合してエマルジョンベースを調製する工程；変性食用澱粉と風味料成分中に混合して風味付けエマルジョンベースを調製する工程；および、該風味付けエマルジョンベースを調理して植物ベースの食肉類似物を調製する工程。また、上前記風味付けエマルジョンベースを上記調理工程前に水不透過性ケーシングに詰める。

適切な変性グルテンとしては、活性小麦グルテンがある。上記植物たんぱく質成分は、大豆またはとうもろこしもしくは乾燥豆類のような他の植物たんぱく質に由来する。上記変性食用澱粉は、増粘剤成分として機能し、とうもろこし、ジャガイモまたは米のような任意の植物に由来する。大豆油、キャノーラ油、とうもろこし油またはピーナツ油のような任意の植物油が適している。上記風味料成分は、甘味料、香辛料、塩、ビーフ風味料、ガーリック粉末または着色用染料の少なくとも１種を含む。上記風味付けエマルジョンベースは、上記植物たんぱく質成分、油、変性食用澱粉、メチルセルロースおよび風味料成分を含有する。

【0008】

１つの特定の実施態様においては、上記調理工程は、約87.8℃(190°F)～約90.6℃(195°F)の温度に加熱することを含む。

もう１つの実施態様においては、本発明の方法は、上記植物ベースの食肉類似物を約4.4℃(40°F)に冷却する工程；および上記調理した植物ベースの食肉類似物を植物ベースの食肉類似物片または粒子に破砕する工程を含む。上記植物ベースの食肉類似物片は、任意の所望の大きさを有し得る。好ましくは、上記片は、約3～12ミリメートルの直径を有する。

本発明は、本明細書において説明する方法に従って製造した植物ベースの食肉類似物または植物ベースの食肉類似物片をさらに提供する。

もう１つの実施態様においては、本発明の方法は、上記植物ベースの食肉類似物片を少なくとも１種の食用つなぎ成分、風味付けエマルジョンベース、メチルセルロース、カラゲナンゲルおよび風味料成分と混合し；混合物をパティーに成形することによる植物バーガーパティーの製造工程を含む。食用つなぎ成分の例としては、大豆濃縮物がある。

本発明は、本明細書において説明する方法に従って製造した植物バーガーパティーおよび菜食用ソーセージも包含する。

【発明を実施するための最良の形態】

【0009】

以下に開示する実施態様は、網羅を意図するものではなく、また、本発明を以下の詳細な説明において開示する正確な態様に限定するものでもない。むしろ、以下の実施態様は、当業者がその教示を利用し得るように選定し説明するものである。

本発明は、肉様食感並びに改良された口当たりおよびジューシー性を有する植物ベースの食肉類似物の製造方法に関する。該植物ベースの食肉類似物は、高度に水溶性であり、高度に分散性であり且つ低加熱処理においてゲルを形成し得る植物たんぱく質成分から製造する。食肉低温殺菌に関連する温度における完全ゲル形成の特徴は、スライスするのに優れて適する極めて堅固で粘着性の食肉全体構造を生ずることである。とりわけ、上記植物たんぱく質成分は、60～105℃の温度、好ましくは70～90℃の温度においてゲルを形成する。上記植物たんぱく質成分は、無水分基準で60％～82％のたんぱく質含有量および50～100のNSI（窒素溶解性指数）を有する。さらに、上記植物たんぱく質成分は、水中での10質量％分散液で測定したとき、5～50センチポイズ、好ましくは5～25センチポイズの粘度を有することに特徴を有する。好ましくは、上記植物たんぱく質成分は、大豆またはキャノーラ、ピーナツもしくは乾燥豆類のような他の植物たんぱく質に由来する。そのような植物たんぱく質成分は、任意の公知の方法を使用して製造し得る。例えば、米国特許出願第10/050,532号（その全体を参考として引用する）は、高PDI（たんぱく質分散性指数）を有する精製たんぱく質を中性pH付近の水中に分散させ；分散液を抽出し；不溶性画分を除去し；必要に応じて、上清画分のpHを5.0に低下させ；中和し；必要に応じて、低分子量可溶性物を限外沪過により除去し；植物たんぱく質成分を、必要に応じてジェット・クッカー内で処理し；冷却し；そして、スプレー乾燥させる各工程を含む方法を開示している。乾燥植物たんぱく質成分は、その後、上記植物ベースの食肉類似物の製造方法において使用し得る。

【0010】

本発明の方法は、先ず、1～3質量％のメチルセルロースを45～65質量％の水/氷混合物に添加し、該メチルセルロースと水/氷混合物とを、得られる混合物がシェービングクリームのコンシステンシーを有するまで混合することを含む。上記水/氷混合物は、およそ等量の水と氷を含有する。他の割合の水と氷も、処理中の温度を得られる混合物が固化するようになる点よりも低く保持する限りにおいて適し得る。混合は、任意の商業的に入手可能なブレンダーまたはボウルカッターを使用することによって実施する。混合プロセスは、低チョッピング（切刻み）速度で開始して溢れ出を防止する。メチルセルロースを十分に分散させた後、チョッピング速度を上昇させる。チョッピングは、クリーム状混合物が得られるまで高速で続ける。

その後、3～10質量％の変性グルテン、例えば、活性小麦グルテン（Midwest Grain Products社、カンザス州アチソン）を上記メチルセルロースクリームに添加する。チョッピングを、グルテンが上記クリーム中に良好に混合するまで、上述したのと同じ方法で数分間続ける。

次に、上述したような高水溶性をさらにまた緩やかな加熱処理によるゲル形成能力を有する10～20質量％の植物たんぱく質成分を上記メチルセルロースクリーム中に混合してたんぱく質混合物を調製する。本発明において使用し得る適切な植物たんぱく質成分は、ミズーリ州セントルイス 63188のSolae社から入手し得るAlpha^{R} 5800大豆たんぱく質濃縮物である。好ましくは、上記植物たんぱく質成分は、Alpha^{R} 5812大豆たんぱく質濃縮物のような高分散性も有し得る。チョッピングは、上記植物たんぱく質成分が分散し良好に混合するまで数分間続け得る。

【0011】

次の工程は、10～15質量％の油を上記メチルセルロースクリーム中に添加してエマルジョンベースを調製することである。適切な油は、大豆油、キャノーラ油、とうもろこし油またはピーナツ油を含む。チョッピングは、上述した方法で続行する。

その後の工程は、5～10質量％の変性澱粉およびその後のデキストロースもしくはサクロースのような甘味料、塩、香辛料または食品着色剤を含む5～8質量％の風味料成分中への混合である。風味料成分は１度で添加し得るが、チョッピングは上述のようにして継続

する。また、追加の水/氷混合物を添加して、風味付けしたエマルジョンベースの硬直を低減させ得る。その後、風味付けエマルジョンベースをケーシング中に詰め込む。ケーシングは、天然または人工、食用または非食用ケーシングのいずれかである。その後、詰め込んだエマルジョンベースを、コア温度が87.8℃(190°F)～約90.℃(195°F)に達するまで調理し得る。得られる生成物は、容易にスライスし得る植物ベースの食肉類似物である。

本発明の方法は、上記調理した植物ベースの食肉類似物をスライスまたは破砕して植物ベースの食肉類似物片とする前に、上記植物ベースの食肉類似物を約4.4℃(40°F)に冷却することを含み得る。任意の所望の大きさを、所望するタイプの食品に応じて製造し得る。菜食用バーガーパティーを製造するためには、上記植物ベースの食肉類似物片は約3～約12 mmの直径を有する。

風味付けエマルジョンベース、植物ベースの食肉類似物および植物ベースの食肉類似物片を製造する方法の特定の例は、実施例１に示している。

【0012】

さらに、本発明は、上記風味付けエマルジョンベースと上記植物ベースの食肉類似物の双方を使用する、植物バーガーパティーの製造方法も提供する。一般に、この方法は、15～25質量%の上記風味付けエマルジョンベース、5～20質量%の上記植物ベースの食肉類似物片、50～75質量%の少なくとも１種の食用つなぎ成分、0.1～1質量%のメチルセルロース、7～12質量%のカラゲナンゲル混合物および0.01～0.25質量%の風味料成分を一緒に混合することを含む。その後、植物バーガー混合物を任意の所望の大きさを有するパティーに成形する。

既知の食用つなぎ成分は、クラッカー屑、焼上げ小麦屑、変性澱粉、ミルクたんぱく質、小麦粉またはたんぱく質濃縮物を含む。実施例２に示す特定の配合においては、RESPONSE® 4402大豆たんぱく質濃縮物およびRESPONSE® 4320大豆たんぱく質濃縮物なる登録名を有するミズーリ州セントルイス 63188のSolae社のたんぱく質濃縮物の押出加工製品(供給元；Central Soya社、インディアナ州ホートウェーン)を食用つなぎ成分として使用している。RESPONSE 4402およびRESPONSE 4320は、構造的に粒状であり、70%のたんぱく質含有量を有する。これらのたんぱく質製品を配合中に添加することにより、バーガーの食感を改善し、ガスグリル上での燃上り(flaring)を減少させる。

上記カラゲナンゲル混合物は、バーガーパティーの肉様食感とジューシー性の保存を助長するゲル混合物である。カラゲナンゲル混合物は、種々の配合物を使用して製造し得る。カラゲナンゲル混合物を製造する方法の特定の例は、実施例３に示している。バーガーパティーは、176.7℃(350°F)の調理油中で約30秒間で炒め揚げることができる。調理温度および調理時間は、パティーの厚さに応じて変化する。調理油は、とうもろこし油およびピーナツ油のような任意の適切な植物油である。

【0013】

さらに、本発明は、菜食用ソーセージの製造方法も提供する。この本発明方法は、上記風味付けエマルジョンベース食肉の製造方法について説明したのと相対的に同じ工程に従う。しかしながら、比較的多量の水/氷混合物を、メチルセルロースを水/氷混合物中に混合する初期工程において使用する(総水/氷混合物の98%)。水/氷混合物の残りは、乾燥成分と一緒に添加する。

グルテンを上記メチルセルロースクリーム中に混合した後、植物たんぱく質成分、変性澱粉、油および風味料成分を、上記エマルジョンベース食肉類似物の製造において説明した各工程に従って添加する。その後、風味付けエマルジョンベースをソーセージケーシング中に詰める。

菜食用ソーセージを製造する特定の方法の例は、実施例４に示している。実施例４によれば、この本発明方法において使用した変性澱粉は、ミネソタ州ミネアポリスのCargill社の製品であるPOLARTEX 06734である。POLARTEX 06734は、増粘剤として使用する安定な変性コーンスターチである。さらに、上記風味料成分は、ビーフ風味料535557 (Givaudan Roure社、オハイオ州シンシナティ)を含む。

【0014】
本発明を以下の実施例において概略するが、これらの実施例は、単なる例示であり、本発明の範囲を如何なる意味でも限定するものではない。ここで提示する配合は多くの形で修正し得ることを理解すべきである。例えば、油または風味料成分の量は、変更可能である。ある種の風味料成分は省いてもよく、あるいは追加の風味料を添加してもよい。例えば、チキンまたはポーク風味料でビーフ風味料を置換え得る。
【0015】
〔実施例１〕
エマルジョンベース食肉類似物を製造するための方法および配合
水/氷混合物を、先ず、等量の氷と水を一緒に添加して50/50の水/氷混合物を調製することによって調製する。本実施例において必要とする水/氷混合物の総量および各成分の量を、表Iに示す配合に基づき算出する。水/氷混合物総量の約90％をボウルカッター(Meissnerカッター)に加え、次いで1.5質量％のメチルセルロースを加える。好ましくは、ミシガン州ミッドランドのDow Chemical社のMETHOCELのような高ゲル化特性を有するメチルセルロースを使用する。チョッピング操作は、メチルセルロースが十分に分散するまで、低ナイフ速度で開始する。その後、ナイフ速度を全速即ち約3600 rpmに上昇させる。3～5分後、メチルセルロースは、容量を増大し、シェービングクリームと同様なコンシステンシーを有する。表Iに示すような計算量の活性小麦グルテンを上記メチルセルロースクリームに添加する。チョッピングは、低ナイフ速度で開始し、活性小麦グルテンが完全に分散した後に、全速に上昇させる。チョッピングをおよそ2～4分間継続する。その後、植物たんぱく質成分の計算量(16質量％)を上記たんぱく質混合物中にチョッピング操作によって混合する。好ましくは、上記植物たんぱく質成分は、高水溶解性を有し、緩やかな加熱処理によってゲルを形成し得るものである。約2～3分後、12.5質量％の大豆油またはキャノーラ油を添加する。とうもろこし油およびピーナツ油のような他の油類も使用可能である。チョッピングを、油が完全に分散するまで低速で、均質混合物が形成されるまで全速で続ける。その後、2.50質量％の変性澱粉(B990)、0.50質量％のデキストロース、5.0質量％の香辛料および0.25質量％の着色用物質を含む全ての他の乾燥成分を、水/氷混合物の残り(10％)と一緒に順次添加する。チョッピングを、約3～4分間、即ち、風味付けエマルジョンベースの均質混合物が得られるまで真空下に続ける。該風味付けエマルジョンベースは、水密容器中に入れるかあるいは水分不透過性ケーシング(プラスチックまたはセルロース製であり得る)中に詰めることができる。該風味付けエマルジョンベースは、コア温度が約87.8℃(190° F)～約90.6℃(195° F)に達するまで、油浴連続オーブン中で調理することができる。調理した製品は、その後、ケーシングを除去する前に、約4.4℃(40° F)に冷却し得る。調理した植物ベースの食肉類似物は、スライスするかあるいは切り刻んで好ましくは直径約3～12 mmの小粒子として、植物ベースの食肉類似物片を得ることができる。上記風味付けエマルジョンベースまたは植物ベースの食肉類似物片は、種々の菜食用食品中に混入させて菜食用食品の食感、口当たりおよびジューシー性を改善することができる。
【0016】
表I：風味付けエマルジョンベース/植物ベースの食肉類似物を製造するための配合

成分	質量％
水/氷混合物	55.75
植物たんぱく質成分	16.0
活性小麦グルテン[1]	6.0
大豆/キャノーラサラダ油	12.5
変性澱粉B990[2]	2.5
デキストロース	0.5
メチルセルロース[3]	1.5
香辛料	5.0
着色剤	0.25
合計	100.0

1：Midwest Grain Products社、2：Grain Processing社、3：ミシガン州ミッドランドのDow Chemical社

【0017】

〔実施例２〕

植物バーガーパティーを製造するための方法および配合

RESPONSE 4402およびRESPONSE 4320(Solae社の登録大豆たんぱく質製品；供給元、Central Soya社)のような乾燥押出加工大豆たんぱく質濃縮物を、大豆たんぱく質製品１部当り水２部の割合の水で水和させる。その後、30質量％の水和RESPONSE 4402と30質量％の水和RESPONSE 4320を、20質量％の実施例１において調製したような風味付けエマルジョンベース混合物と一緒に混合する。各成分を一緒に混合した後、計算量のメチルセルロース(0.25質量％)を香辛料と一緒に上記混合物に添加する(表II参照)。次に、実施例１において述べた方法によって製造した植物ベースの食肉類似物片をカラゲナンゲル混合物(実施例３参照)と一緒にゆっくり添加して植物バーガー混合物を調製する。この植物バーガー混合物を、その後、バーガーパティーに成形する。その後、この植物バーガーパティーは、十分に調理し、即ち、176.7℃(350°F)の調理油中で約30秒間炒め揚げ、直ちに冷却し、凍結させ、包装することができる。

【0018】

表II：バーガーパティー用の配合

成分	質量％
水和Response 4402	30.0
水和Response 4320	30.0
植物ベースの食肉類似物片	10.0
風味付けエマルジョンベース	20.0
カラゲナンゲル	9.7
メチルセルロース[3]	0.25
香辛料	0.05
合計	100.0

【0019】
〔実施例３〕
カラゲナンゲル混合物を製造するための方法および配合
この方法は、1.0質量％のDanisco Carrageenan 860 (Danisco社；デンマーク、コペンハーゲン)を0.35質量％のDanisco Locust Beanガムおよび4.0質量％の香辛料と一緒に混合し、次いで94.65質量％の水を加えることを含む。混合物を約85℃(185° F)に連続撹拌しながら加熱する。その後、沸騰水量を加え戻して元の100質量％とする。この混合物は、実施例２で述べたエマルジョンベース混合物に添加する前に、約24時間冷却または冷凍してゲルを形成させ得る。
【0020】
〔実施例４〕
菜食用ソーセージを製造するための方法および配合
計算量の水/氷(50/50)混合物を調製する(表III参照)。水/氷混合物総量の約98質量％をボウルカッターに加え、次いで1.5質量％の高ゲル化性メチルセルロースを加える。チョッピング運動をメチルセルロースが十分に分散するまで低ナイフ速度で開始し、その後、ナイフ速度を全速即ち約3600 rpmに上昇させる。3～5分後、メチルセルロースは、容量を増大し、シェービングクリームと同様なコンシステンシーを有する。約6.0質量％の活性小麦グルテンの計算量を上記メチルセルロースクリームに添加する。チョッピングは、低ナイフ速度で開示し、活性小麦グルテンが完全に分散した後に全速に上昇させる。チョッピングをおよそ2～4分間継続する。その後、約16.0質量％の植物たんぱく質成分を上記たんぱく質混合物中に上述した方法でチョッピングによって混合する。好ましくは、上記植物たんぱく質成分は、水中で高溶解性を有し且つ緩やかな加熱処理によってゲルを形成し得る大豆たんぱく質である。約2～3分後、12.5質量％の大豆油またはキャノーラ油を添加する。チョッピングを、油が完全に分散するまでは低速で、その後、均質混合物が形成されるまで全速で続ける。その後、2.5質量％の変性澱粉(C*Polartex 06734)、0.50質量％のデキストローズ、5.0質量％の香辛料および0.25質量％の着色用物質を含む全ての他の乾燥成分を順次添加する。水/氷混合物の残り(2％)をその後添加して混合物を軟化させる。チョッピングを、上述した方法で、真空(1～9バール)下に約3～4分間、即ち、均質混合物が得られるまで続ける。この風味付けエマルジョンベースを水不透過性または半透過性ケーシング(後で除去し得る)中にあるいは任意の適切な食用ソーセージケーシング中に詰める。詰込んだエマルジョンベースは、コア温度が87.8℃(190° F)～約90℃(195° F)に達するまで調理することができる。得られた製品は、肉様食感と良好な口当たりを有する植物ベースのソーセージである。

【0021】
表III：菜食用ソーセージ用の配合

成分	質量％
水/氷混合物	57.55
植物たんぱく質成分	16.0
変性グルテン[1]	6.0
大豆/キャノーラサラダ油	12.5
C*Polartex 06734[2]	2.5
デキストロース	0.5
メチルセルロース	1.5
ビーフ風味料535557[3]	2.75
塩	0.5
ガーリック粉末	0.2
合計	100.0

1：Midwest Grain Products社、2：Cerester社、3：Givaudan Roure社

【0022】

本発明を例示としての１つの設計について説明してきたが、本発明は、本開示の精神および範囲内においてさらに修正可能である。従って、本出願は、本発明の一般的原理を使用する如何なる本発明の変形、使用、または適用をも包含するものとする。さらに、本出願は、本発明が関連する技術における公知または慣用の実施に属するような本開示からの新展開も包含するものとする。

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The food product, especially for animals, has a coating containing pigments or coloring agents and a source of protein to give it a roast appearance once cooked by a hot air and/or steam system or in a microwave oven. The pigments/coloring agents and protein source each form between 5 and 20 per cent by weight of the coating substance, which is made from a mixture of meat and/or fish with cereals and also contains thickener(s), binding agent(s), flour and water. The minimal temperature at which the roasted appearance is achieved is the temperature at which the proteins in the coating substance coagulate. The coating is co-extruded with a food product made from an emulsion of poultry and animal sub-products, cooked and cut into chunks.

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(54)【発明の名称】焼き上げ外観を有する製品の製造

(57)【要約】
本発明は、調理された製品に焼き上げ外観を与えるように設計されたコーティングを含んでおり、前記コーティングが少なくとも色素または着色剤と蛋白質源とを含んでいる、食品組成物特に動物用食品組成物に関する。

【特許請求の範囲】
【請求項1】
調理後に焼き上げ外観を得るためのコーティングを含んでおり、前記コーティングが少なくとも下記成分
（１）色素または着色剤の源
（２）蛋白質の源
を含んでいる、食品組成物。
【請求項2】
色素または着色剤がコーティングの５～２０重量％である、請求項１の組成物。
【請求項3】
蛋白質がコーティングの５～２０重量％である、請求項１または２の組成物。
【請求項4】
さらに、一つまたはそれ以上の増粘剤（単数または複数）、一つまたはそれ以上の結合剤（単数または複数）、および一つまたはそれ以上の添加剤（単数または複数）、粉および水、を含んでいる、請求項１～３のいずれか一項の組成物。
【請求項5】
コーティングの含水量がコートされる製品の含水量に類似している、請求項１～４のいずれか一項の組成物。
【請求項6】
コーティングの粘度がコートされる製品の粘度に類似している、請求項１～５のいずれか一項の組成物。
【請求項7】
コートされる製品が肉および／または魚と穀類と水の混合物である、請求項１～６のいずれか一項の組成物。
【請求項8】
調理後に焼き上げ外観を有する食品組成物を製造する方法であって、食品製品をコーティングでコートすることからなり、前記コーティング組成物が色素または着色剤の少なくとも一つの源と、蛋白質の源とを含んでいる、前記方法。
【請求項9】
コーティングを含んでいる、調理後に焼き上げ外観を有する食品組成物を製造する方法であって、組成物の表面に焼き上げ外観を得るのに要求される最低調理温度がコーティングの蛋白質が凝固する温度である、前記方法。
【請求項10】
調理システムがホットエアシステム、スチームシステム、ホットエア・スチームシステム、またはマイクロ波システムである、請求項８の方法。

【発明の詳細な説明】
【技術分野】
【0001】
本発明は焼き上げ外観(roasted appearance、ローストされた外観)を有する製品を迅速調理後に得るための特殊コーティングを含んでいる食品組成物に関する。本発明はまた、この製品を製造する方法に関する。
【背景技術】
【0002】
調理時間を減少させることを可能にするがその大きな欠点が食品の表面に殆ど又は全く色を付けないことである電子レンジ(microwave oven)やスチームオーブンのような新規調理法の出現で、ここ数年の間に、きつね色の、黄金色の又は燻製の組成物を得るための方法および製品が膨大に開発されている。
【0003】
肉や魚などをきつね色にするための第一の方法は米国特許第５，２５１，５２３号または第６，０９０，４２１号に記載されているもののような着色した液状溶液を気化させる

又は吹き付けることからなる。しかしながら、これら溶液は比較的一様な燻製外観(smoked appearance)と、多分、燻製食品の特徴的な味とを与えるのに寄与するだけである。

【0004】

食品をきつね色にするための別の方法は米国特許第５，２９２，５４１号および第５，３９７，５８２号に記載された糖や澱粉の熱分解(pyrolysis)である。これは、食品に適用されて加熱後に燻製の外観と味を与える溶液を伴っている。

【0005】

通常の調理を模するのに使用される別の方法は米国特許第５，７５６，１４０号に記載されているものである。それは、表面に黄金色の照りをつけた実際には単に従来の卵黄の刷毛塗りの代替からなる食品を得ることを可能にさせる。

【0006】

マイクロ波調理またはスチーム調理のための、米国特許第５，１９６，２１９号、第５，２２３，２８９号、および第４，７３５，８１２号に記載されている、褐変剤(browning agent)も存在している。これら褐変剤は調理中にメイラード反応(Mallard reaction)を行う少なくともアミノ酸の源と還元糖の源とからなる。これら発明はどれも、マイクロ波調理またはスチーム調理の最も顕著な欠点の一つ、すなわち、たとえば肉やパンやペーストリーのような食品の表面における褐色着色(brown colouring)の欠如、を矯正することを試みている。これら褐変剤の欠点はそれらが組成物の表面を一様に着色することによって通常のオーブンでの調理を不完全に摸しているにすぎないということである。

【発明の開示】

【発明が解決しようとする課題】

【0007】

本発明によれば、単に一様かつ均質な燻製の、黄金色の又は着色した外観を生じるのではなく、むしろ、通常のオーブンでの調理後に得られるような焼き上げ外観を、すなわち、組成物の表面における不規則なそしてランダムな褐色化を、より迅速な調理方法たとえばスチームオーブンやマイクロ波オーブンを使用しながら、生じるので、これら欠点を克服することを可能にする。

【課題を解決するための手段】

【0008】

（発明の概要）

本発明は調理後に焼き上げ外観を有する製品を得るための特殊なコーティングを含んでいる食品組成物、特に動物用食品組成物に関する。コーティングの組成は少なくとも一つの色素と、蛋白源とを含んでいる。食品組成物はこの特殊コーティングによって覆われ、加熱されなければならない。調理温度はコーティングの中に含有された蛋白質の凝固(coagulation)を可能にするのに十分でなければならない。この反応は焼き上げ外観を有する組成物を得ることを可能にする；これら組成物の表面はばらついて褐色化され、焼き面の割合はコーティングの中に含有された蛋白質の及び／又は着色剤の量の単純な変更によって又は単純に調理の時間および温度を変更することによって調節することが可能である。

【0009】

本発明はまた、植物性または動物性蛋白質に基づいたエマルジョンを調製し、同時押出プロセスによってこの特殊コーティングで覆い、調理後にはこのエマルジョンに焼き上げ外観を与えることができる方法を提供する。

【0010】

最後に、本発明は特に動物用食品に関しており、その混合物の全体が殺菌されているソース(sauce)またはベース(base)と混合されたローストピース（roasted pieces)の形態であってもよい。用語「ベース」は微粉砕肉(microground meats)と技術上の添加物との混合物を意味することを意図しており、それらには、なかでも、ナチュラルピースが添加されていてもよい。

【0011】

本発明のプロセスは、少なくとも一つの着色剤または色素と蛋白質源との混合物によっ

て食品組成物をコーティングしているという意味で、現在あるものとは完全に異なっており、ホットエアシステム(hot air system)やスチームシステムやホットエア・スチームシステム(hot air and steam system)やマイクロ波システムのような調理システムを使用して調理した後、組成物に焼き上げ外観を与える。こうして得られた焼き上げ外観は均質ではなく、この不規則性が通常のオーブンで調理された製品の感じを与える。

【0012】

本明細書においては、用語「肉」は「肉および／または肉副産物」を意味することを意図しており、そして用語「魚」は「魚および／または魚副産物」を意味することを意図している。

【0013】

（発明の詳細）

本発明に従うコーティングの組成は、少なくとも一つの着色剤、たとえば、カラメル化された糖、血液(blood)（冷凍された又は粉末化された）または無機酸化物、と、蛋白質源、たとえば、血漿(plasma)またはグルテン、とを含んでいる。それはまた、たとえば次のようなものから採用された成分を含有していてもよい：増粘剤、たとえば、澱粉、グアー、キサンタン、カルボキシメチルセルロース、アルギン酸ナトリウム、またはこれらの族に属するその他化合物；添加剤、たとえば、塩、糖およびアスコルビン酸；着香剤(flavouring agent)（たとえば、ロースト風味を組成物に与えるもの）；粉；水。

【0014】

本発明の好ましい態様によれば、着色剤は特に、カラメル化された糖（コーティングの１０～２０重量%、好ましくは、１４～１６%）、冷凍された又は粉末化された血液（５～１０%、好ましくは７～８%）、無機酸化物（５～１０%、好ましくは６～８%）、またはこれら化合物の混合物、であってもよい。

【0015】

また、増粘剤または増粘剤混合物を、たとえば、それが澱粉の場合には２～８%の割合で、それがグアー、キサンタンまたはアルギン酸ナトリウムである場合には０～２%の割合で、カルボキシメチルセルロースの場合には０～１%の割合で、添加することも可能である。

【0016】

それから、結合剤または結合剤混合物は本発明の組成物またはコーティングの中に、たとえば、選ばれた源がグルテンである場合には０～５%の量で、結合剤の源が血漿である場合には０～１０%の量で、含有されることができる。

【0017】

添加剤、特に、０～５%の塩および／または糖、そして／または０～１%のアスコルビン酸、が添加されてもよい。コーティングは一般的には粉（２５～３５%）と水（３０～５０%）を含有している。

【0018】

好ましくは、コーティングの蛋白質源は、血漿、グルテンまたは血液、またはこれら化合物の混合物、から選ばれる。しかしながら、当業者に知られているその他のいずれかの蛋白質源が使用されてもよい。蛋白質のパーセント（コーティングの総重量に対する重量による）は好ましくは５～２０%である。

【0019】

コーティングの調製は乾燥成分を混練用トラフ(kneading trough)の中に移すことから始まり、それから、この成分は他の成分と混合される。この混合物全体をポンプを備えたホッパーに導き、ポンプによって乳化装置へ運ぶ。この段階では、コーティングはペースト状である。それは貯蔵でき、そして次いで、食品組成物をコートするのに必要な装置へ運ばれる。ペースト状コーティングは次いで、ポンプを備えた第二ホッパーの中に貯蔵される。このポンプはコーティングを、２つのバイプロダクト(by-products)（コーティングと、コートされるべき食品組成物）を結合させるための特殊装置の中へ移動させるために使用される。

【0020】
コートされるべき食品組成物はエマルジョンであってもよい。この場合、エマルジョンとコーティングは２つの異なるホッパーの中に貯蔵されてもよく、ホッパーはそれぞれポンプを備えており、その流量は変量器(variator)の周期数(frequencies)を調節することによって変更できる。これらポンプはコーティングとエマルジョンを特殊装置の中へ移すのに使用されるであろう。
【0021】
この特殊装置は２つの異なる入口を備えており、そして異なる直径の２つの異なる管の同心組合せから成る。コーティングは管を出るときにエマルジョンを被覆するために大きい直径の管の中に注入され、エマルジョンそれ自体は中心の管の中へ注入される。このプロセスは乾式食品工業に使用されてもよい同時押出のプロセスと比べることができる。相違は乾式食品工業ではフィリング(filling)として使用される製品はガイド(guide)されないという事実にある。押出される製品の中に浸された管によって流れ(vein)を注入すれば、それはコーティングとは混ざらない。
【0022】
本発明においては、装置の出口において２つのバイプロダクトの間で混合を生じさせないように層流を可能な限り完全に保証するために、２つのバイプロダクトは或る距離の間ガイドされる。２つのバイプロダクトの粘性はかかるシステムの効率に影響する。
【0023】
こうして製造された製品は押出機に移される。次いで、それは、たとえば、ホットエア、スチーム、ホットエア・スチームまたはマイクロ波システムを使用して、調理できる。温度および調理時間は使用成分により変動する。
【0024】
本発明を動物用食品に適用してもよく、また本発明はソースまたはベースと混合された、焼き上げ外観を有するピース形態を有してもよい。
【0025】
これらピースは５５～８５％の肉および肉副産物および／または魚および魚副産物と、１０～２５％の穀類と、６～１５％の水との混合物から製造されることができ、前記ピースは好ましくは、５８～６８％の肉および肉副産物および／または魚および魚副産物と、１０～２５％の穀類と、０～５％（好ましくは２～５％）の植物性蛋白質と、５～１４％の水とから製造される。
【0026】
肉エマルジョンは欧州特許第６６８，０２４号に記載された通常の方法に従って製造される。肉および肉副産物および／または魚および魚副産物はサイズが１２ｍｍのオーダーのものであるピースを製造するように圧潰および粉砕される。次いで、ミキサーの中に入れられ、レシピの乾燥成分が添加される。この混合物全体は均質ペーストが得られるまで混合され、それから、混合物を乳化装置に移すためのポンプを底部に備えたホッパーの中に移される。この段階で、任意に、着色剤がエマルジョンに添加されてもよい。乳化は１５℃の最大温度においてダブルスクリーン乳化機（たとえば、カール・シュネル(Karl Schnell)タイプ）の中で行われる。次いで、肉エマルジョンはホッパーの中に貯蔵される。ホッパーには、２つの副製品（コーティングとエマルジョン）の特殊結合のための特殊装置にエマルジョンを移すためのポンプが備えられている。
【0027】
こうして調製された製品は、たとえば、押出機に移される。エマルジョンおよびそのコーティングはブロックの形態であり、それらの厚さおよび幅は使用される装置の幾何学的構造に従って変動可能である。
【0028】
エマルジョン－コーティング集成体は次いで、連続調理システム（たとえば、ホットエア、スチーム、ホットエア・スチームまたはマイクロ波システム）の中で、使用成分に従って変動する温度および調理時間で、調理されることができる。従って、ブロックは凝固

によって固化し(set up)、調理装置を出るとカットできる。また、コーティングの蛋白質は凝固し、このコーティングの中に含有された色素または着色剤を捕捉し、こうして、製品の表面に焼き上げ外観を与える。ブロックは調理システムを出ると連続的にカットされることができる。ピースを１０～４０℃の温度に冷却することによって硬化できる；ピースが相互に粘着するのを避けるために、冷却は好ましくは吹きつけ又は浸漬によって行われる。次いで、これらピースを小立方体にカットし、それから、ソースまたはベースと混合して容器の中へ移る。組成物を通常の仕方で、１２０～１３５℃の温度で、２０～１００分間殺菌することができる。

【0029】

以下の実施例は本発明を非限定的に例証する。

【実施例】

【0030】

エマルジョンは６３％の肉および肉副産物（特に、家禽肉副産物（主にカーカス、carcasses）からの及び／又は豚肉もしくは牛肉副産物（主に肝臓および肺臓）からの）、１５％の穀類、１．５％の植物性または動物性の組織質蛋白質(texturing proteins)と、１５％の水から調製される。このエマルジョンはビタミン類、塩類、着香剤および着色剤をも含有している。この混合物は乳化され、そしてポンプを備えたホッパーの中に貯蔵され、ポンプは後で、このエマルジョンを特殊装置へ移すのに使用される。

【0031】

コーティングは１５％のカラメル化された糖と、６％の澱粉と、１％のグアーと、０．５％のカルボキシメチルセルロースと、３０％の粉との混合物からなり、そこに均質溶液が得られるまで４０％の水と７％の血漿が添加されており、その溶液は次いで乳化され、それから、ポンプを備えたホッパーのなかに貯蔵され、ポンプは後で、この乳化物を特殊装置に移すのに使用される。

【0032】

それから、コーティングとエマルジョンは２つの同心管からなる特殊装置の中に注入される（エマルジョンは中心の管の中に注入され、そしてコーティングは大きい直径の管の中に注入される）。エマルジョンとコーティングの間の混合の恐れを回避するために、これら生成物は６０ｃｍの距離にわたってガイドされる。それから、組成物は押出機に移され、次いで、スチームオーブンの中で、１１０℃の温度で、２分３０秒間調理される。そこを出ると、生成物はカットされ（ピースの形状およびサイズは組成物がイヌ用か又はネコ用かによって変動する）、ソースまたはベースと混合され、そして通常通りに殺菌される。

【実施例】

【0033】

エマルジョンは６３％の肉および肉副産物（特に、家禽肉副産物（主にカーカス）からの及び／又は豚肉もしくは牛肉副産物（主に肝臓および肺臓）からの）、１５％の穀類、１．５％の植物性または動物性の組織質蛋白質と、１５％の水から調製される。このエマルジョンはビタミン類、塩類、着香剤および着色剤をも含有している。この混合物は乳化され、そしてポンプを備えたホッパーの中に貯蔵され、ポンプは後で、このエマルジョンを特殊装置へ移すのに使用される。

【0034】

コーティングは９％の粉末血液と、１％のグアーと、１％のアルギン酸ナトリウムと、０．５％のカルボキシメチルセルロースと、３％の塩と、１％の糖と、０．２％のアスコルビン酸と、２６％の粉との混合物からなり、そこには、４９％の水と２％のグルテンと５％の血漿が添加されている。

【0035】

先に記載したのと同じ製造プロセスが使用される。

【実施例】

【0036】

エマルジョンは６３％の肉および肉副産物（特に、家禽肉副産物（主にカーカス）からの及び／又は豚肉もしくは牛肉副産物（主に肝臓および肺臓）からの）、１５％の穀類、１．５％の植物性または動物性の組織質蛋白質と、１５％の水から調製される。このエマルジョンはビタミン類、塩類、着香剤および着色剤をも含有している。この混合物は乳化され、そしてポンプを備えたホッパーの中に貯蔵され、ポンプは後で、このエマルジョンを特殊装置へ移すのに使用される。

【0037】

コーティングは５％の酸化鉄と、５％の澱粉と、１％のグアーと、１％のキサンタンと、１％のカルボキシメチルセルロースと、２．５％の糖と、３０％の粉との混合物からなり、そこには、４４％の水と５％の血漿と５％のグルテンが添加されている。

【0038】

先に記載したのと同じ製造プロセスが使用される。

【手続補正書】

【提出日】平成15年10月21日(2003.10.21)

【手続補正1】

【補正対象書類名】特許請求の範囲

【補正対象項目名】全文

【補正方法】変更

【補正の内容】

【特許請求の範囲】

【請求項1】

調理後に焼き上げ外観を得るためのコーティングを含んでおり、コーティングの含水量がコートされる製品の含水量に類似しており、前記コーティングが少なくとも下記成分

（１）色素または着色剤の源

（２）蛋白質の源

を含んでいる、食品組成物。

【請求項2】

色素または着色剤がコーティングの５～２０重量％である、請求項１の組成物。

【請求項3】

蛋白質がコーティングの５～２０重量％である、請求項１または２の組成物。

【請求項4】

さらに、一つまたはそれ以上の増粘剤（単数または複数）、一つまたはそれ以上の結合剤（単数または複数）、および一つまたはそれ以上の添加剤（単数または複数）、粉および水、を含んでいる、請求項１～３のいずれか一項の組成物。

【請求項5】

コーティングの粘度がコートされる製品の粘度に類似している、請求項１～４のいずれか一項の組成物。

【請求項6】

コートされる製品が肉および／または魚と穀類と水の混合物である、請求項１～５のいずれか一項の組成物。

【請求項7】

調理後に焼き上げ外観を有する動物用食品組成物を製造する方法であって、

異なる直径の２つの管の同心組合せを含む装置を提供し、

中心の管の中に、肉および肉副産物および／または魚および魚副産物のエマルジョンを注入し、そして

エマルジョンをコーティングでコートするために大きい直径の管の中にコーティングの組成物を注入し、前記コーティングが色素または着色剤の少なくとも一つの源と、蛋白質の源とを含んでいる、

ことを含む、前記方法。

【請求項8】

コートされたエマルジョンを調理システムの中で、コーティングの蛋白質が凝固する温度である組成物の表面に焼き上げ外観を得るのに要求される最低調理温度で、調理することを含む、請求項７の方法。
【請求項9】
調理システムがホットエアシステム、スチームシステム、ホットエア・スチームシステム、またはマイクロ波システムである、請求項８の方法。
【手続補正書】
【提出日】平成16年9月28日(2004.9.28)
【手続補正1】
【補正対象書類名】特許請求の範囲
【補正対象項目名】全文
【補正方法】変更
【補正の内容】
【特許請求の範囲】
【請求項1】
調理後に焼き上げ外観を得るためのコーティングを有し、前記コーティングが色素または着色剤の少なくとも一つの源と、蛋白質の源とを含んでいる、食品組成物。
【請求項2】
コーティングの含水量がコートされる製品の含水量に類似している、請求項１の食品組成物。
【請求項3】
前記色素または着色剤がコーティングの約５重量％～約２０重量％である、請求項１の食品組成物。
【請求項4】
前記色素または着色剤が、カラメル化された糖、粉末化された血液、冷凍された血液、無機酸化物、およびそれらの組合せ、の少なくとも一つである、請求項１の食品組成物。
【請求項5】
前記蛋白質がコーティングの約５重量％～約２０重量％である、請求項１の食品組成物。
【請求項6】
前記蛋白質が、血漿、グルテン、血液源、およびそれらの組合せ、の少なくとも一つから選ばれる、請求項１の食品組成物。
【請求項7】
前記コーティングがさらに、増粘剤、結合剤、添加剤、粉、水、およびそれらの組合せ、の少なくとも一つを含んでいる、請求項１の食品組成物。
【請求項8】
前記コーティングの粘度がコートされる製品の粘度に似ている、請求項１の食品組成物。
【請求項9】
コートされる製品が、肉、肉副産物、魚、魚副産物、家禽肉、家禽肉副産物、豚肉、豚肉副産物、穀類、および水、およびそれらの組合せ、の混合物からなる、請求項１の食品組成物。
【請求項10】
前記食品組成物がペットフードである、請求項１の食品組成物。
【請求項11】
前記食品組成物がエマルジョンである、請求項１の食品組成物。
【請求項12】
前記エマルジョンが、肉、穀類、植物性組織質蛋白質、動物性組織質蛋白質、水、ビタミン類、塩、着香剤、着色剤、およびそれらの組合せ、の混合物を含む、請求項１１の食品組成物。

【請求項13】
前記コーティングが、カラメル化された糖、澱粉、グアー、カルボキシメチルセルロース、粉、水、血漿、粉末化された血液、アルギン酸ナトリウム、糖、アスコルビン酸、グルテン、酸化鉄、およびそれらの組合せ、の混合物を含む、請求項１の食品組成物。
【請求項14】
調理後に前記コーティングが前記食品組成物に不均質な不規則なランダムな焼き上げ外観をつくりだす、請求項１の食品組成物。
【請求項15】
前記調理が、ホットエアシステム、スチームシステム、ホットエアとスチームの組合せシステム、マイクロ波システム、の少なくとも一つによって行われる、請求項１の食品組成物。
【請求項16】
調理後に焼き上げ外観を有する動物用食品組成物を製造する方法であって、
前記食品組成物をコーティングし；
前記食品組成物を調理し；
前記食品組成物を冷却し；そして
前記食品組成物を包装する
諸工程を含む、前記方法。
【請求項17】
前記食品組成物がエマルジョンと非均質なコーティングを含む、請求項１６の方法。
【請求項18】
前記コーティングが色素または着色剤と蛋白質源とを含んでいる、請求項１７の方法。
【請求項19】
前記色素が前記コーティングの約５重量％～約２０重量％である、請求項１８の方法。
【請求項20】
前記蛋白質が前記コーティングの約５重量％～約２０重量％である、請求項１８の方法。
【請求項21】
前記エマルジョンが、肉、肉副産物、魚、魚副産物、家禽肉、家禽肉副産物、豚肉、豚肉副産物、植物性組織質蛋白質、動物性組織質蛋白質、ビタミン類、塩、着香剤、着色剤、穀類、水、およびそれらの組合せ、の混合物を含む、請求項１７の方法。
【請求項22】
前記調理工程がさらに、前記食品組成物を、ホットエアシステム、スチームシステム、ホットエアとスチームの組合せシステム、マイクロ波システム、の少なくとも一つで調理する工程を含む、請求項１６の方法。
【請求項23】
前記調理工程がさらに、前記食品組成物を押出機で調理する工程を含む、請求項１７の方法。
【請求項24】
前記食品組成物を押出機で調理する前記工程において、前記押出機は第一直径を有する第一入口と第二直径を有する第二入口を包含しており、前記第一直径が前記第二直径より大きく、そして前記第二入口が前記第一入口と同心に置かれている、請求項２３の方法。
【請求項25】
前記コーティングが前記第一入口の中に流れ、そして前記エマルジョンが前記第二入口の中に流れる、請求項２４の方法。
【請求項26】
前記調理工程がさらに、前記食品組成物を前記コーティングの蛋白質が凝固するまで調理する工程を含む、請求項１８の方法。
【請求項27】
さらに、調理時間、温度、および蛋白質と着色剤の比を、不均質な焼き面の外観を生じ

るように変動させる工程を含む、請求項１８の方法。
【請求項28】
　前記コーティングが、カラメル化された糖、澱粉、グアー、カルボキシメチルセルロース、粉、水、血漿、粉末化された血液、アルギン酸ナトリウム、塩、糖、アスコルビン酸、グルテン、酸化鉄、およびそれらの組合せ、の混合物を含む、請求項１７の方法。

INTERNATIONAL SEARCH REPORT

PCT/EP 03/00286

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23L1/31 A23L1/314 A23P1/08 A23P1/12 A23L1/272
A23K1/00 A23K1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23L A23P A23K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00 65937 A (NESTLE SA ;PRASAD NIKHIL (US); KIM HYUNG WOOK (US); LOIZEAU GERARD) 9 November 2000 (2000-11-09) claims 1,2,4,9,10,12,14-19; example 1 page 3, paragraph 2 -page 5, paragraphs 1,5 page 6, paragraph 3 -page 7, paragraph 3 page 8, paragraph 3 -page 9, paragraphs 1,3 page 9, paragraph 6 -page 10, paragraph 3 page 11, paragraph 2 -page 12, paragraph 2 page 14, paragraph 4 -page 15, paragraph 1 --- -/--	1-6,8-10

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 May 2003	02/06/2003

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Tallgren, A

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INTERNATIONAL SEARCH REPORT

PCT/EP 03/00286

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 586 512 A (HAGEN BETTY F ET AL) 22 June 1971 (1971-06-22) claims 1-3,5-11; examples 3-5,7-9 column 2, line 46-62 column 3, line 17-35 column 4, line 13-31 column 5, line 43-53,63-69 column 6, line 5-68 column 7, line 33-44	1,3-6, 8-10
X	EP 0 650 671 A (GRIFFITH LAB WORLDWIDE INC) 3 May 1995 (1995-05-03) claims 1,3,5,7,10,14; examples 1,2 page 2, line 20-30,54 -page 4, line 2,24-43,47,48	1-10
A	EP 0 668 024 A (NESTLE SA) 23 August 1995 (1995-08-23) cited in the application claims 1-3,9; examples 1-3 column 2, line 37 -column 3, line 10	1-10
A	EP 0 203 725 A (DEVRO INC) 3 December 1986 (1986-12-03) cited in the application claims 1,4,7,11,12,15-18 page 1, line 1-33 page 2, line 34 -page 3, line 2 page 6, line 25 -page 7, line 3	1-10

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

PCT/EP 03/00286

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			CA	2371440 A1	09-11-2000
			WO	0065937 A1	09-11-2000
			EP	1176881 A1	06-02-2002
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EP 0650671	A	03-05-1995	CA	2117991 A1	29-04-1995
			CN	1105200 A	19-07-1995
			DE	69432009 D1	20-02-2003
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			EP	0650671 A2	03-05-1995
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			AU	1006395 A	03-08-1995
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			DE	69426973 T2	19-07-2001
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			ES	2156129 T3	16-06-2001
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			ZA	9500365 A	21-09-1995
EP 0203725	A	03-12-1986	AT	54801 T	15-08-1990
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			AU	5677486 A	06-11-1986
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			NZ	215906 A	29-09-1988
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RAPPORT DE RECHERCHE INTERNATIONALE

PCT/EP 03/00286

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
CIB 7　A23L1/31　A23L1/314　A23P1/08　A23P1/12　A23L1/272
A23K1/00　A23K1/16

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)
CIB 7　A23L　A23P　A23K

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si réalisable, termes de recherche utilisés)
EPO-Internal, WPI Data, PAJ, FSTA

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie °	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
X	WO 00 65937 A (NESTLE SA ;PRASAD NIKHIL (US); KIM HYUNG WOOK (US); LOIZEAU GERARD) 9 novembre 2000 (2000-11-09) revendications 1,2,4,9,10,12,14-19; exemple 1 page 3, alinéa 2 -page 5, alinéas 1,5 page 6, alinéa 3 -page 7, alinéa 3 page 8, alinéa 3 -page 9, alinéas 1,3 page 9, alinéa 6 -page 10, alinéa 3 page 11, alinéa 2 -page 12, alinéa 2 page 14, alinéa 4 -page 15, alinéa 1 -/--	1-6,8-10

[X] Voir la suite du cadre C pour la fin de la liste des documents　　[X] Les documents de familles de brevets sont indiqués en annexe

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Date à laquelle la recherche internationale a été effectivement achevée	Date d'expédition du présent rapport de recherche internationale
22 mai 2003	02/06/2003

Nom et adresse postale de l'administration chargée de la recherche internationale	Fonctionnaire autorisé
Office Européen des Brevets, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Tallgren, A

Formulaire PCT/ISA/210 (deuxième feuille) (juillet 1992)

RAPPORT DE RECHERCHE INTERNATIONALE

PCT/EP 03/00286

C.(suite) DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie	Identification des documents cités, avec,le cas échéant, l'indicationdes passages pertinents	no. des revendications visées
X	US 3 586 512 A (HAGEN BETTY F ET AL) 22 juin 1971 (1971-06-22) revendications 1-3,5-11; exemples 3-5,7-9 colonne 2, ligne 46-62 colonne 3, ligne 17-35 colonne 4, ligne 13-31 colonne 5, ligne 43-53,63-69 colonne 6, ligne 5-68 colonne 7, ligne 33-44	1,3-6, 8-10
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Formulaire PCT/ISA/210 (suite de la deuxième feuille) (juillet 1992)

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(81)指定国　　AP(GH,GM,KE,LS,MW,MZ,SD,SL,SZ,TZ,UG,ZM,ZW),EA(AM,AZ,BY,KG,KZ,MD,RU,TJ,TM),EP(AT,BE,BG,CH,CY,CZ,DE,DK,EE,ES,FI,FR,GB,GR,HU,IE,IT,LU,MC,NL,PT,SE,SI,SK,TR),OA(BF,BJ,CF,CG,CI,CM,GA,GN,GQ,GW,ML,MR,NE,SN,TD,TG),AE,AG,AL,AM,AT,AU,AZ,BA,BB,BG,BR,BY,BZ,CA,CH,CN,CO,CR,CU,CZ,DE,DK,DM,DZ,EC,EE,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KP,KR,KZ,LC,LK,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,MZ,NO,NZ,OM,PH,PL,PT,RO,RU,SD,SE,SG,SK,SL,TJ,TM,TN,TR,TT,TZ,UA,UG,US,UZ,VN,YU,ZA,ZM,ZW

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フランス国、アルベール、リュ　フェリクス　フォール、２２

Ｆターム(参考)　4B035 LC16　LG15　LG42　LP01
4B042 AC02　AC09　AD39　AG01　AG12　AH01　AH06　AK09　AK10　AK11
AK12　AP02　AP10

Espacenet

Bibliographic data: JP2010512788 (A) — 2010-04-30

MEAT EMULSION PRODUCTS AND METHODS OF MAKING SAME

Inventor(s):

Applicant(s):

Classification: **- international:** ***A23L1/31***
- cooperative: A23K10/20; A23K50/48; A23L13/426; A23L13/67

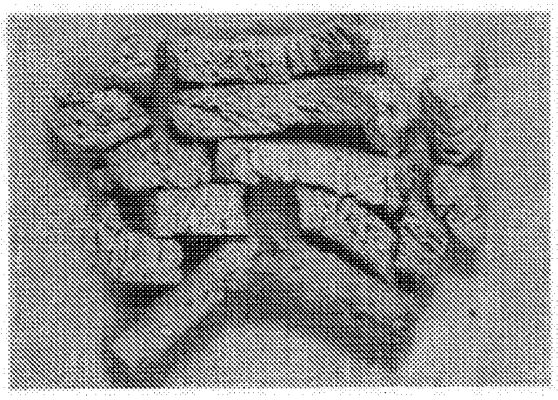
Application number: JP20090542818 20071212 Global Dossier

Priority number (s): US20060612989 20061219 ; WO2007US25616 20071212

Also published as: AU2007342596 (A1) AU2007342596 (B2) BRPI0721294 (A2) BRPI0721294 (B1) CA2673115 (A1) more

Abstract not available for JP2010512788 (A)
Abstract of corresponding document: US2007148323 (A1)

Meat emulsion products and methods for producing meat emulsion products are presented. Meat emulsion products are produced that have realistic fiber definition. In an embodiment, the meat emulsion products comprise a protein, a fat and a plurality of colors and/or textures. The meat emulsion products further comprise a plurality of linear strands of fiber-like material affording the meat emulsion product a realistic meat-like appearance.



(19)日本国特許庁(JP)　(12)公表特許公報(A)　(11)特許出願公表番号
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(43)公表日　平成22年4月30日(2010.4.30)

(51)Int.Cl.		F I			テーマコード（参考）
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		A23L	1/31	D	

審査請求 未請求　予備審査請求 未請求　（全 19 頁）

(21)出願番号	特願2009-542818 (P2009-542818)
(86)(22)出願日	平成19年12月12日 (2007.12.12)
(85)翻訳文提出日	平成21年7月23日 (2009.7.23)
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(87)国際公開日	平成20年7月17日 (2008.7.17)
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(33)優先権主張国	米国 (US)

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弁理士　池田　成人

最終頁に続く

(54)【発明の名称】肉エマルション製品及びその製造方法

(57)【要約】
肉エマルション製品と、本物らしく繊維が明示されている肉エマルション製品の製造方法とを提供する。該肉エマルション製品は、タンパク質、脂肪、並びに複数の色及び／又は質感を含む。該肉エマルション製品は、さらに、該肉エマルション製品に本物らしい肉様外観をもたらす、繊維様材料の複数の線状ストランドを含む。

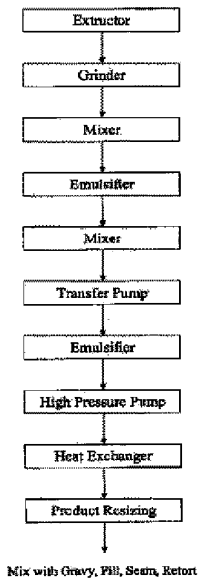


FIG. 3

【特許請求の範囲】
【請求項1】
複数の繊維構造及び複数の異なる色によって明示される本体を含む肉エマルション製品。
【請求項2】
前記複数の色が、前記肉エマルションの外面に、渦巻き、霜降り、陰影、及びそれらの組合せからなる群から選択される外観をもたらす、請求項１に記載の肉エマルション製品。
【請求項3】
前記色が、カラメル、ＦＤ＆Ｃ認可色素、二酸化チタン、酸化鉄、アナットー、ターメリック、天然色素、人工着色料、及びそれらの組合せからなる群から選択される着色料に由来する、請求項１に記載の肉エマルション製品。
【請求項4】
前記本体が、タンパク質を少なくとも約２９重量％、及び脂肪を約８重量％未満含む、請求項１に記載の肉エマルション製品。
【請求項5】
前記タンパク質が、鳥肉、牛肉、豚肉、魚肉及びそれらの組合せからなる群から選択される、請求項１に記載の肉エマルション製品。
【請求項6】
少なくとも１種のタンパク性材料を含む、請求項１に記載の肉エマルション製品。
【請求項7】
前記タンパク性材料が、前記製品の約２５重量％～約５５重量％を構成する、請求項６に記載の肉エマルション製品。
【請求項8】
タンパク質、脂肪、及び複数の異なる質感を含む肉エマルション製品であって、前記質感のうちの少なくとも１種が、それにより一体的に形成された複数の繊維構造を含み、前記肉エマルション製品に本物らしい肉様外観をもたらす、肉エマルション製品。
【請求項9】
小麦グルテン、小麦粉、卵白、硫黄化合物、シスチン、ガム、大豆タンパク質及びそれらの組合せからなる群から選択される質感付与原料を含む、請求項８に記載の肉エマルション製品。
【請求項10】
前記タンパク質が、前記肉エマルション製品の約２９重量％～約３１重量％を構成する、請求項８に記載の肉エマルション製品。
【請求項11】
前記脂肪が、前記肉エマルション製品の約４重量％～約８重量％を構成する、請求項８に記載の肉エマルション製品。
【請求項12】
前記肉エマルション製品が、水分を約５２重量％～約５６重量％含む、請求項８に記載の肉エマルション製品。
【請求項13】
肉エマルション製品に本物らしい肉様外観をもたらす、繊維材料の複数の線状ストランド及び繊維材料の複数の軸方向ストランドによって明示される本体を含む肉エマルション製品。
【請求項14】
肉エマルション製品の製造方法であって、
タンパク質、脂肪及び第１の色を含む第１の肉エマルションを形成するステップと、
タンパク質、脂肪及び第２の色を含む第２の肉エマルションを形成するステップと、
前記第１の肉エマルションを前記第２の肉エマルションと混合するステップと、

前記混合された肉エマルションを加熱するステップと、
前記混合された肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記肉エマルションの温度を低下させるために、前記肉エマルションに熱交換器を通過させるステップと
を含む方法。
【請求項15】
肉エマルション製品の製造方法であって、
タンパク質、脂肪及び第１の色を含む肉エマルションを形成するステップと、
前記肉を微粉砕して加熱するステップと、
第２の色を前記肉エマルションに添加するステップと、
前記肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記肉エマルションの温度を低下させるために、前記肉エマルションに熱交換器を通過させるステップと
を含む方法。
【請求項16】
肉エマルション製品の製造方法であって、
タンパク質及び脂肪を含む肉エマルションを形成するステップと、
前記肉エマルションを微粉砕して加熱するステップと、
前記肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記肉エマルションを長軸方向の螺旋流にさらすステップと、
前記肉エマルションの温度を低下させるステップと
を含む方法。
【請求項17】
肉エマルション製品の製造方法であって、
タンパク質、脂肪及び第１の質感付与原料を含む第１の肉エマルションを形成するステップと、
タンパク質、脂肪及び第２の質感付与原料を含む第２の肉エマルションを形成するステップと、
前記第１の肉エマルションを前記第２の肉エマルションと混合するステップと、
前記混合された肉エマルションを加熱するステップと、
前記混合された肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記混合された肉エマルションの温度を低下させるために、前記混合された肉エマルションに熱交換器を通過させるステップと
を含む方法。
【請求項18】
前記質感付与原料が、小麦グルテン、小麦粉、卵白、硫黄化合物、シスチン、ガム、大豆タンパク質及びそれらの組合せからなる群から選択される請求項１７に記載の方法。
【請求項19】
肉エマルション製品の製造方法であって、
タンパク質及び脂肪を含む肉エマルションを形成するステップと、
前記肉エマルションを微粉砕して加熱するステップと、
前記肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記肉エマルションから排気するステップと、
前記肉エマルションを排出するステップと
を含む方法。
【請求項20】
肉エマルション製品の製造方法であって、
タンパク質、脂肪及び第１の色を含む第１の肉エマルションを形成するステップと、
前記肉エマルションを微粉砕して、約１２０℃～約１６５℃の温度まで加熱するステップと、

前記肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記肉エマルションに焼結チャンバを通過させるステップと、
前記肉エマルションを排出するステップと
を含む方法。
【請求項21】
前記焼結チャンバが多孔性金属を含む、請求項２０に記載の方法。
【請求項22】
肉エマルション製品の製造方法であって、
タンパク質、脂肪、及び第１の色を含む肉エマルションを形成するステップと、
前記肉エマルションを第１の部分及び第２の部分に分割するステップと、
第２の色を前記第１の部分に添加するステップと、
前記第１の部分及び前記第２の部分を独立に微粉砕して、約１００℃～約１６５℃の温度まで加熱するステップと、
複合肉エマルションを形成するために、前記第１の部分及び前記第２の部分を組み合わせるステップと、
前記複合肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記肉エマルションの温度を低下させて前記肉エマルション製品を形成するために、前記加圧された肉エマルションに熱交換器を通過させるステップと
を含む方法。
【請求項23】
肉エマルション製品の製造方法であって、
タンパク質、脂肪、及び第１の色を含む肉エマルションを形成するステップと、
前記第１の色を有する肉エマルションを微粉砕して、約１００℃～約１６５℃の温度まで加熱するステップと、
タンパク質、脂肪、及び第２の色を含む肉エマルションを形成するステップと、
前記第２の色を有する肉エマルションを微粉砕して、約２０℃～約５０℃の温度まで加熱するステップと、
複合肉エマルションを形成するために、前記加熱された肉エマルションを組み合わせるステップと、
前記複合肉エマルションを少なくとも８０ｐｓｉの圧力にさらすステップと、
前記肉エマルションの温度を低下させて前記肉エマルション製品を形成するために、前記加圧された肉エマルションに熱交換器を通過させるステップと
を含む方法。
【請求項24】
請求項１４、１５、１６、１７、１９、２０、２２、又は２３に記載のプロセスの製品。
【発明の詳細な説明】
【発明の詳細な説明】
【0001】
〔関連出願の相互参照〕
本出願は、１９９９年１１月１６日に出願された米国特許出願第０９／４４１２４６号明細書、現在の米国特許第６３７９７３８号明細書の優先権を主張する、２０００年１１月８日に出願されたＰＣＴ／ＥＰ００／１１２３８の米国国内段階である、２００２年９月２５日に出願された米国特許第１０／１４９５４５号明細書の一部継続出願である、２００６年１２月１９日に出願された米国特許出願第１１／６１２９８９号明細書の優先権を主張するものであり、以上の各開示内容全体がこの参照により本明細書に組み込まれる。
【0002】
〔背景技術〕
〔発明の分野〕
本発明は、一般に食品に関し、特に肉様外観及び質感を有する肉エマルション製品並び

にそのような製品の製造方法に関する。
【0003】
〔関連技術の説明〕
肉エマルションの製造方法は、食品産業で知られている。肉エマルションは、ボローニャ、フランクフルト、及び他のソーセージ製品などの製品の製造で幅広く使用されている。さらに、肉エマルションは、ペットフードの製造に使用されている。
【0004】
一般に、肉エマルション製品は、肉原料から溶解したタンパク質で被覆された微細な脂肪粒子を含有するエマルションを製造するように、牛及び豚の骨格筋赤身肉、並びに肉副産物などの生肉材料の混合物を、氷、塩、香辛料、及び漬け塩と混合し、切り刻んで乳化することによって調製される。ソーセージ製品については、生成肉エマルションは、次いで、加工用型として機能する好適なケーシングに詰め込まれる。次いで、ケーシングは、加工される肉エマルションの容量に応じて、長時間、一般には約１～８時間以上、温度を上昇させながら、例えば、５５℃～７７℃で加熱される。
【0005】
肉エマルションの加熱は、その中に含有されているタンパク質の凝固又は固化を引き起こす。したがって、このことは、脂肪粒子をタンパク質マトリックス中に捕捉し、それにより堅い肉エマルション製品を形成する。生成肉エマルション製品は、肉の離散粒子を含有せず、固化するとケーシングの形状を保持する、均一で均質な塊である。
【0006】
消費者向けの特定の食品の価格を低下させるために、近年では、外観、質感、及び物理的構造が天然肉の塊又は小片と似ている肉エマルション製品に対する需要がある。そのような製品は、シチュー、ポットパイ、キャッセロール、缶詰食品、及びペットフード製品などの食品中の、より高価な厚切り天然肉の部分的又は完全な代替品として使用される。厚切り肉製品は、美的な品質及び消費者へのアピールの両面から、人間の食品及びペットフードにおいて非常に望ましい。これらの厚切り製品は、形状、外観、及び質感について厚切り天然肉を模擬しようとした、より経済的な製品を提供する。缶詰製造及びレトルト処理の業務手順に付されたときに、これらの製品が形状、外観、及び質感を保持することが非常に望ましい。
【0007】
そのような厚切り天然肉の模造品を提供するために向けられた努力には、押出・膨張技法を使用して植物タンパク源からそのような製品を製造することが含まれている。そのような製品は、食品産業におけるいくつかの基準を満たしてきたが、それらは肉の増量材としての使用に主に限定されてきた。押出・膨張手順で植物タンパク源を使用して製造された製品は、天然肉の外観及び質感を欠いており、したがって、肉の完全な代替品としては一般に好適ではない。
【0008】
同様に、従来の手順によって製造された肉タンパク質に基づいた肉押出製品は、完全に満足のいくものではない。これらの製品は、均一で均質な塊の形状であり、厚切り天然肉の構造、質感、及び外観を欠いている。したがって、これらの製品は、厚切り肉模造品の使用が所望されている用途での使用に好適ではない。
【0009】
そのような肉エマルション製品を改善する１つの試みが、米国特許第４７８１９３９号明細書で開示されている。この特許は、厚切り天然肉の質感、外観、及び粘稠度を模擬した厚切り又は小片の形状である、層状の非膨張製品を製造する条件下で、肉エマルションを加工することを開示している。肉エマルション製品は、厚切り天然肉の外観、質感、及び粘稠度と類似している、並置されていて手動で分離できる複数の肉様の層を有する別々の厚切り又は小片の形状である。厚切り肉エマルションは、人間の食品及び動物の食品の両方において、より高価な厚切り天然肉の部分的又は完全な代替品としての使用に好適である。それらは、高水分缶詰食品の製造で要求されるものなどの、缶詰製造及び殺菌の業

務手順に付されたときに、その完全性及び形状を保持する。

【0010】

米国特許第４７８１９３９号明細書で説明された方法によって製造された製品は、人間の食品及び動物の食品の両方において、より高価な厚切り天然肉の代替品として使用され得る厚切り肉エマルションを提供するが、そのような製品は、依然として、肉様製品を完全に模擬するに至らず、本物の厚切り肉同様の強い噛み応え／口当たりを有していない可能性がある。このことについては、そのような製品は、繊維の複数の線状束又はストランドを含む非内臓肉を完全に模擬するには至っていない。

【0011】

〔発明の概要〕

本発明は、肉様外観及び質感を有する肉エマルション製品、並びにそのような肉エマルション製品の製造方法に関する。一実施形態では、本発明は、複数の繊維状又は繊維様の構造及び複数の異なる色によって明示される本体を含む肉エマルション製品を提供する。本体は、タンパク質を少なくとも約２９重量％、脂肪を約８重量％未満、好ましくは脂肪を約６重量％未満含む。別の実施形態では、複数の色が、肉エマルションの外面に、様々な色の渦巻き、霜降り、陰影、又はそれらの組合せなどの外観又は模様をもたらす。色は、カラメル、ＦＤ＆Ｃ認可色素、二酸化チタン、酸化鉄、アナットー、ターメリック、天然色素、人工着色料、又はそれらの組合せなどの着色料に由来する。

【0012】

肉エマルションは、少なくとも１種のタンパク性材料を含む。一実施形態では、タンパク性材料は、製品の約２５重量％～約５５重量％を構成する。タンパク質は、鳥肉、牛肉、豚肉、魚肉及びそれらの組合せなどの任意の好適な源から得ることができる。

【0013】

別の実施形態では、本発明は、タンパク質、脂肪、及び複数の異なる質感を含む肉エマルション製品を提供する。例えば、質感のうちの少なくとも１種は、それにより一体的に形成された複数の繊維構造を含み、肉エマルション製品に本物らしい肉様外観をもたらす。一般に、肉エマルション製品は、小麦グルテン、小麦粉、卵白、硫黄化合物、システイン、ガム、大豆タンパク質、及びそれらの組合せなどの質感付与原料を含む。

【0014】

様々な実施形態では、タンパク質は、肉エマルション製品の約２９重量％～約３１重量％を構成し、脂肪は、肉エマルション製品の約４重量％～約６重量％を構成し、肉エマルション製品は、水分を約５２重量％～約５６重量％含む。

【0015】

代替の実施形態では、本発明は、肉エマルション製品に本物らしい肉様外観をもたらす、繊維性材料の複数の線状ストランド及び繊維性材料の複数の軸方向ストランドによって明示される本体を含む。

【0016】

本発明は、肉エマルション製品の製造方法を提供する。一実施形態では、該方法は、タンパク質、脂肪及び第１の色を含む第１の肉エマルションを形成することと、タンパク質、脂肪及び第２の色を含む第２の肉エマルションを形成することを含む。第１の肉エマルションは、第２の肉エマルションと混合される。肉エマルションは、約１００℃～約１６５℃の温度まで加熱される。混合された肉エマルションは、少なくとも８０ｐｓｉの圧力を受ける。加圧された肉エマルションは、肉エマルションの温度を低下させて肉エマルション製品を形成するために、熱交換器を通過させられる。

【0017】

別の実施形態では、該方法は、タンパク質、脂肪、及び第１の色を含む第１の肉エマルションを形成することを含む。肉エマルションは、微粉砕されて、約１００℃～約１６５℃の温度まで加熱される。第２の色は、肉エマルションに添加され、肉エマルションと混合される。肉エマルションは、少なくとも８０ｐｓｉの圧力を受ける。加圧された肉エマルションは、肉エマルションの温度を低下させて肉エマルション製品を形成するために、

熱交換器を通過させられる。
【0018】
別の実施形態では、該方法は、タンパク質及び脂肪を含む肉エマルションを形成することと、肉エマルションを微粉砕して約１００℃～約１６５℃の温度まで加熱することを含む。肉エマルションは、少なくとも８０ｐｓｉの圧力を受ける。次いで、肉エマルションは、長軸方向の螺旋流を受ける。最終的に、肉エマルションは、肉エマルション製品を形成するために排出される。
【0019】
さらなる実施形態では、該方法は、タンパク質、脂肪、及び第１の質感付与原料を含む第１の肉エマルションを形成することと、タンパク質、脂肪、及び第２の質感付与原料を含む第２の肉エマルションを形成することを含む。第１の肉エマルションは、第２の肉エマルションと混合される。混合された肉エマルションは、加熱されて、少なくとも８０ｐｓｉの圧力を受ける。加圧された肉エマルションは、肉エマルションの温度を低下させて肉エマルション製品を形成するために、熱交換器を通過させられる。
【0020】
別の実施形態では、該方法は、タンパク質及び脂肪を含む肉エマルションを形成することと、肉エマルションを微粉砕して約１００℃～約１６５℃の温度まで加熱することを含む。肉エマルションは、少なくとも８０ｐｓｉの圧力を受け、次いで、肉エマルションから水分を放出するために排気される。肉エマルションは、肉エマルション製品を形成するために排出される。
【0021】
さらなる実施形態では、該方法は、タンパク質、脂肪、及び第１の色を含む第１の肉エマルションを形成することと、肉エマルションを微粉砕して約１００℃～約１６５℃の温度まで加熱することを含む。肉エマルションは、少なくとも８０ｐｓｉの圧力を受け、焼結チャンバを通過させられる。加圧された肉エマルションは、肉エマルション製品を形成するために排出される。
【0022】
本発明は、改善された肉エマルション製品と、非内臓肉を模擬して非常に本物らしい肉様の姿を有する肉エマルション製品を製造するための改善された方法とを提供する。該製品は、非常に本物らしい肉様の姿を有しており、高水分缶詰食品の製造で要求されるような、缶詰及び殺菌の業務手順に付されたときに、その完全性及び形状を保持する。該方法は、様々な種類の本物の肉、例えば、鳥肉、豚肉、又は牛肉を模擬する肉エマルション製品を製造する。
【0023】
本発明の他のさらなる目的、特徴、及び利点は、当業者には容易に明らかとなろう。
【図面の簡単な説明】
【0024】
【図1】先行技術の肉エマルション製品の写真である。
【図2】本発明の一実施形態の肉エマルション製品の一実施形態の写真である。
【図3】本発明の一実施形態の肉エマルション製品の製造プロセスの概略図である。
【図4】本発明の第２の実施形態の肉エマルション製品の製造プロセスの概略図である。
【図5】本発明の第３の実施形態の肉エマルション製品の製造プロセスの概略図である。
【図6】本発明の第４の実施形態の肉エマルション製品の製造プロセスの概略図である。
【図7】本発明の第５の実施形態の肉エマルション製品の製造プロセスの概略図である。
【図8】本発明の第６の実施形態の肉エマルション製品の製造プロセスの概略図である。
【図9】本発明の第７の実施形態の肉エマルション製品の製造プロセスの概略図である。
【0025】
〔発明の詳細な説明〕
本発明は、改善された肉エマルション製品、及び肉エマルション製品の製造方法を提供する。本発明は、以前の肉エマルション製品とは対照的に、本物らしく繊維が明示されて

いる肉エマルション製品を提供する。このように繊維を明示することは、非内臓肉と類似の、非常に本物らしい肉様の姿又は外観をもたらす。生成製品は、他の肉エマルション製品と比較して、より強い噛み応え／口当たりも有しており、ペースト状でも、柔らかくも、脆くもない。該肉エマルション製品は、人間及び動物の食品に有用である。好ましい実施形態では、該肉エマルション製品は、缶詰のペットフードのために考えられている。該肉エマルション製品は、鳥肉、牛肉、豚肉、魚肉、及びそれらの組合せを含めた任意の種類の肉製品を模擬し得る。

【0026】

「繊維様」、「肉様」及び「キブル（ｋｉｂｂｌｅ）様」という用語は、肉エマルション製品について説明するのに使用される場合、当業者に理解されるように、肉エマルション製品が、実際の繊維、肉及びキブルと同じ又はほぼ同じ物理的外観及び特性を部分的に所有することをそれぞれ意味している。非内臓肉と類似の非常に本物らしい肉様外観をもたらす本物らしい繊維の明示をしている肉エマルション製品が製造される。

【0027】

特許請求された製品は、部分的に肉エマルションであるが、それらは、本物の肉と同じ又はほぼ同じ特性を有している。生成製品は、他の肉エマルション製品と比較して、より強い噛み応え／口当たりも有しており、ペースト状でも、柔らかくも、脆くもない。さらに、生成製品の小片が、繊維を示しながらも、全体としてキブル様の外観を有するように、水分削減も達成され得る。

【0028】

以下で詳細に説明するように、肉エマルション製品は、一般に、肉、タンパク質、水、及び様々な成分を乳化することによって製造される。次いで、エマルションは、高速エマルションミルを通過させられ、そこでエマルションは、エマルションを熱的にゲル化するために急速に加熱される。次いで、加熱されたエマルションは、保持管又は他の装置の中へ排出され、そこで固化して筋のある肉様の構造になる。

【0029】

以下で詳細に説明するように、肉エマルション製品に非常に本物らしい肉様の姿をもたらす、繊維の明示が改善された（可視的な小径繊維）肉エマルション製品が製造される。このことについては、生成肉エマルション製品は、肉エマルションに非常に本物らしい非内臓肉の外観をもたらす繊維の束又はストランドを有する。鳥肉エマルション製品については、該製品は、それ自身の煮出し汁／液で覆われた、骨から手で引っ張られた柔らかくてじっくり調理された鶏肉又は七面鳥の肉の外観を有する。さらに、本発明は、不規則な製品形状及び寸法を有し、より強い噛み応え／口当たりを有し、ペースト状でも、柔らかくも、脆くもない肉エマルション製品を提供する。

【0030】

図を参照すると、図１は、先行技術の肉エマルション製品を例示している。写真で示されているように、該製品は繊維を全く含まず、むしろ均質様な構造を有する。対照的に、図２は、本発明の肉エマルション製品を例示している。写真で見られるように、該製品は、束となって線状に配置されている繊維の複数のストランドを有する。このことは、図１の肉エマルションよりも本物らしい肉様の製品をもたらす。

【0031】

図３は、本発明の一実施形態の肉エマルション製品の一般的な製造プロセスの概略図を例示している。本発明の一実施形態に従って肉エマルション製品を調製する際、必要な品質、原材料価格及び嗜好性を有する、哺乳類、魚類、若しくは鳥類の肉及び／又は肉副産物を含めた天然肉材料の混合物が、配合され、練磨され、乳化される。例えば、肉材料は、以下で詳述されるような混合及び剪断の力を介して肉材料の大きさを（任意の添加された成分と共に）縮小させる高速ブレンダーを使用して乳化され得る。

【0032】

使用される肉及び／又は肉副産物は広範囲の構成要素から選択されてもよく、配合で使用される肉材料の種類及び量は、製品の使用目的、製品の望ましい香り、嗜好性、価格、

原材料の入手可能性などの考慮すべき事項の数に応じて決まる。様々な哺乳類、鳥類、及び魚類の肉（即ち、骨格組織と非骨格筋）、並びに／或いは肉副産物（即ち、屠殺された哺乳類、鳥類、又は魚類に由来する、肉以外の精製加工されていない清浄部）の両方が、肉材料として使用されてもよい。したがって、本明細書で使用される場合、肉材料という用語は、冷凍材料を含めた、非脱水状態の肉及び／又は肉副産物について言及するものと理解される。

【0033】

該製品が人間の食用を目的としている場合、牛及び羊の全枝肉、赤身豚くず肉、牛の脛肉、子牛肉、牛及び豚の類肉、並びに唇、トライプ、心臓、舌などの肉副産物を含めた、従来の肉エマルション製品の製造で使用される肉及び肉副産物のいずれも本発明で使用され得る。該製品がペットフード製品としての使用を目的としている場合、肉混合物は、上記の肉材料の他に、機械的に骨を取り除いた牛肉、鶏肉、又は魚肉、牛及び豚の肝臓、肺、腎臓などの、動物の食物での使用が承認された肉副産物いずれをも含有してもよい。一般に、肉材料は、脂肪を最大で約２５重量％、好ましくは約１５重量％未満含有するように配合される。

【0034】

従来の肉エマルション製品で使用される添加物は、乳化の前又は後に肉材料と混合されて、本発明の肉エマルションに含まれてもよい。これらの添加物は、塩、香辛料、調味料、砂糖などを、該製品に望ましい味覚特性をもたらすのに十分な量で含む。さらに、少量のビタミン、ミネラル、香料などの他の乾燥成分も、肉エマルションに添加され得る。

【0035】

１種又は複数の乾燥タンパク性材料は、肉エマルションに添加され得る。一実施形態では、乾燥タンパク性材料は、肉材料が第１のステップで乳化された後に、肉材料に添加され得る。添加された乾燥タンパク性材料を含む乳化された肉材料は、続いて、さらに混合されて、高速ブレンディング及び剪断の力を伴う別の乳化ステップを受けることができる。乾燥タンパク性材料が第１の乳化の前に肉材料に添加される得ることも、理解されたい。

【0036】

乾燥タンパク性材料は、エマルションの安定性及び結合を改善し、香りを付与し、配合費用を低減させるために、例えば、小麦グルテン、大豆粉、大豆タンパク質濃縮物、大豆タンパク質分離物、卵アルブミン、及び脱脂粉乳を含んでもよい。肉エマルションが乾燥タンパク性材料を含むことは、ペットフードとしての使用を目的とした製品の製造において特に有利である。乾燥タンパク性材料は、それがなければ、肉エマルション製品の調製に使用するには、ぎりぎり許容できる程度と思われる、タンパク質対脂肪比及びミオシン対総タンパク質比を有する肉材料を、加工者が使用することを可能にする。乾燥タンパク性材料が肉エマルションに含まれる場合、使用される量は、該製品の使用目的、エマルション中で使用される肉材料の品質、原材料価格の配慮などの要因に応じて、エマルションの約５重量％から約３５重量％まで変動することができる。好ましい実施形態では、乾燥タンパク性材料の量は、約２５重量％～約３５重量％である。一般に、肉材料の脂肪含量及び／又は水分含量が増加されると、エマルション中の乾燥タンパク性材料の量は、それに応じて増加される。

【0037】

肉エマルションの配合は幅広く変動し得るが、乾燥タンパク性材料を含むエマルションは、タンパク質の凝固時に、エマルションの不安定性の兆候なく、堅い肉エマルション製品を形成するのに十分なタンパク質対脂肪比を有するべきであり、エマルションのタンパク質含量は、エマルションが、水の沸点を超えた温度まで加熱されるとき、そのような温度まで加熱された後、短期間、即ち約５分以内、好ましくは３分以内に凝固して堅いエマルション製品を形成することを可能にするようなものでなければならない。したがって、肉材料と乾燥タンパク性材料（使用された場合）を含めた添加物は、肉材料が肉エマルションの約５０重量％～約７０重量％、好ましくは約６０重量％～約７０重量％の間の量で

存在するような割合で、共に混合される。好ましい実施形態では、肉エマルション用の出発原材料は、タンパク質を約２９重量％～約３１重量％、脂肪を約４重量％～約６重量％含む。生成肉エマルション製品は、出発原材料と実質的に類似の分布を有するべきである。しかし、該製品に肉汁又は煮出し汁が添加される場合、この分布は、肉汁／煮出し汁の水分、タンパク質及び／又は脂肪含量に起因して変化し得る。

【0038】

さらに、肉エマルションは、水分を約４５重量％～約８０重量％の間含有するように配合されるべきであり、水分含量が、肉エマルション、即ち肉材料及び添加物の約４９重量％～約５６重量％の間で制御されることが好ましい。エマルション中の水分の正確な濃度は、当然のことながら、エマルション中のタンパク質及び脂肪の量に応じて決まる。

【0039】

使用するために選択された肉混合物は、肉材料を粉砕して実質的に均一な大きさの小片にするために、粉砕機を通過させる。一般に、肉に１ｃｍ以下の粉砕板を備えた粉砕機を通過させることが好ましい。肉を粉砕して１ｃｍ以上の粒径にすることによって満足のいく結果を得ることができるが、そのようなより大きい肉小片を使用することは、一般に好ましくない。使用される肉材料が冷凍状態である場合、粉砕機に入る小片の大きさを縮小するために、それらはまず予め切断されるか、又は小片に切断されなければならない。小片の大きさは肉粉砕機の取入れ口の大きさによって決まるが、通常、冷凍肉材料は、約１０ｃｍ角の小片に切断される。

【0040】

粉砕後、肉小片の混合物は、混合タンクに運ばれてその中で均一になるまで混合され、好ましくは、肉混合物のポンピングを容易にするために、温水ジャケット、水蒸気圧入などによって約－１℃～約７℃の間の温度まで加熱される。

【0041】

次いで、粉砕された肉小片の均一な混合物は、肉材料を乳化して肉エマルションを形成する条件下で微粉砕され、肉混合物のタンパク質及び水は、脂肪球を被包するマトリックスをそこで形成する（例えば、乳化ステップ）。肉材料は、エマルションを形成するために、脂肪を砕いてタンパク質スラリー中に小球として分散させることが可能な、ミキサー、ブレンダー、粉砕機、サイレントカッターチョッパー、エマルションミルなどを使用することなどによって、肉の乳化において一般に使用される任意の従来の手順及び設備で乳化され得る。

【0042】

一般に、肉エマルションの温度は、乳化プロセスの間に上昇する。肉エマルションのこの加熱は、該プロセスのこの段階で、タンパク質の変性が望ましくない速度で起こり始める温度までその温度が上昇しない限り、好ましくないものではない。乳化の間の肉混合物の温度は、該プロセスのこの段階でのタンパク質の変性を最小限にするために、約４９℃未満に維持されるべきである。本発明の好ましい実施形態によると、肉材料は、肉材料を乳化するためにエマルションミルを通過させられて、エマルションは、約１０℃～約４９℃の間、好ましくは約２１℃～約３８℃の間の温度まで加熱されている。

【0043】

乾燥タンパク性材料（使用される場合）を含めた、肉エマルションに混合される添加物は、乳化の前に肉混合物に添加されてもよい。代替として、添加物、特に乾燥タンパク性材料を、肉の乳化の後に肉混合物に混合することがしばしば好ましい。乾燥タンパク性材料を添加するとエマルションの粘度が増大するので、肉混合物が乾燥タンパク性材料の添加の前に乳化されると、より良好な乳化が達成され、結果として粘性の肉エマルションが形成される。

【0044】

肉エマルションは、エマルションの細度を増大させるために再び微粉砕され（例えば、第２の乳化ステップ）、水の沸点を超えた温度まで急速に加熱され、該温度では、非常に短い時間、例えば２０秒以下でエマルションが固化して堅いエマルション製品が形成され

るほど急速に、エマルション中のタンパク質の凝固が進行する。

【0045】

粘性のある肉エマルションを水の沸点を超えた温度、一般に約１２０℃～約１６５℃の間、より好ましくは約１３２℃～約１５４℃の間まで急速に加熱すると、加熱後約５分以内、一般には数秒～約３分以内に、エマルション中のタンパク質が凝固してエマルションが固化し、堅いエマルション製品を形成するであろう。プロセス中のこの段階では、エマルションは、約４０～約５００ｐｓｉ、好ましくは６０～３５０ｐｓｉの圧力下にある。この高温は、増大した圧力と共に、製品に繊維の明示をもたらすことになろう。驚いたことに、製品の温度及び圧力が高いほど、繊維発達は良好になる（細くなった長い繊維の線状配列）ことが見出された。

【0046】

エマルションは、エマルションが機械的加熱及び／又は水蒸気圧入などによって微粉砕されながらそのような高温まで加熱される設備で加工されることが好ましい。好ましい実施形態によると、約３０度～約４０℃の間の温度の粘性の肉エマルションは、エマルションミルを通してポンピングされ、そこで肉エマルションは、エマルションの細度を増大させ、ほぼ同時に急速な機械的加熱及び／又は水蒸気圧入によってエマルションを約１２０℃～約１６５℃の間、好ましくは１３２℃～約１５４℃の間まで加熱するために、剪断加工に付される。したがって、エマルションは、約６０秒未満の時間でそのような高温まで加熱されることが好ましい。このように、そのような高温までエマルションが加熱された場合、エマルションのさらに大幅な剪断加工及び切断加工は避けられるべきである。所望の範囲内にエマルションの温度を制御することは、エマルションミルへの供給量、エマルションミルの回転速度などの要因を調整することによって実施されることができ、当業者によって速やかに決定されることができる。

【0047】

水の沸点を超えた、好ましくは約１２０℃～約１６５℃、好ましくは約１３２℃～約１５４℃の範囲の温度のホット肉エマルションは、容積形ポンプ、例えば、ギア又はローブポンプを用いて、密閉加工ゾーンを画定する保持管又は他の装置へ移送される（例えば、熱交換ステップ）。該製品は、約８０ｐｓｉ～約６００ｐｓｉの高圧、好ましくは約１００ｐｓｉ～約５００ｐｓｉ、最も好ましくは１４０ｐｓｉ～約３５０ｐｓｉで加工ゾーンへポンピングされる。そのような高圧では、該プロセスは、基本的には乳化機の最大の圧力設計限界値（最大で２３５ｐｓｉ）で操作される。このため、ギアポンプ（５００～２５００ｐｓｉ超の圧力限界値）が乳化機の直後に直結されることが好ましい。このことにより、乳化機を使用して高圧を用いずに高温を生じさせることが可能になる。圧力は、ギアポンプの後で生じるであろう。したがって、このことは、乳化機ハウジングの圧力を６０～１００ｐｓｉに低下させる。

【0048】

一般に、熱交換ステップにおける熱交換器の使用を例示するために、全体を通して保持管が使用される。平板熱交換器などの他の熱交換装置は、熱交換ステップを実施するために使用され得る。

【0049】

図３に例示されている実施形態では、密閉加工ゾーンが、細長い管の形状をしている。エマルションは、肉エマルション中のタンパク質が十分に凝固してエマルションが固化して堅いエマルション製品を形成するまで、エマルションの蒸気圧を超えた圧力で密閉加工ゾーンに保持されており、堅いエマルション製品は、密閉加工ゾーンから排出されるときにその形状及び構造を保持する。そのような高温では、タンパク質の凝固は非常に速い速度で進行する。

【0050】

ホットエマルションが十分に固化して堅い製品を形成するのに必要な時間は、エマルションが加熱される温度と、エマルション中のタンパク質の量及び種類によって決まるものであるが、一般に、細長い管又は他の装置での数秒～約３分の間、通常は約１～約１．５

分の間の滞留時間が、タンパク質が十分に凝固して、その形状、完全性、及び物理的特性を保持する堅いエマルション製品を形成するのに十分である。細長い管又は他の装置での滞留時間は、エマルションの該装置への供給量を調整すること及び／又は該装置の長さ若しくは他のパラメーター、例えば細長い管の長さ若しくは平板熱交換器内の平板間隔を調整することによって制御され得る。

【0051】

一実施形態では、該製品を製造するために細長い管が使用される。細長い管の構造は、該製品の繊維構造を作る一助となる。細長い管は、該製品が管の中を進むにつれて管の外周が縮小するように、その長さに沿って縮小する断面直径を有するべきである。実際、約２．５ｍと約８．０ｍの間、好ましくは３．０ｍ～６．０ｍの長さ、及び約１２ｍｍと約７５ｍｍの間の内径を有する管が、堅いエマルション製品を形成するのに満足に機能すると考えられている。管が、その長さ又はその一部に沿って縮小する断面直径を有するので、該製品は、管に入ると、管を通って流れるにつれて圧迫される。供給量及び該製品にかかる異なる圧力は、繊維構造を作る一助となる。一例として、開口部で約６２ｍｍの直径を有する材料が使用され、該開口部で製品が管に入って、円錐の径違い継手を通って２５ｍｍの直径に狭まる。直径が縮小される限り、円形、正方形、長方形などの様々な断面形状の管が使用されてもよい。

【0052】

管は、冷却されることが好ましい。このことにより、該製品は、管を通されるときに冷却され得る。一般に、管は、外部ジャケット又は他の手段によって冷却され得る。長方形又は類似の形状の管は、外部から冷却され得る構造をもたらして、管の中央に含有された該製品が十分に冷却され得るようにする好ましい設計を提供し得る。

【0053】

密閉加工ゾーンから排出された固化した肉エマルションの小片は、温度が約６５℃～１００℃で、水分含量が約４７％～６５％である長い細片の製品形状であり、小片の大きさは様々である。加工ゾーンから排出されるとき、小片は、蒸発冷却によって６０℃～９３℃の範囲の温度まで急速に冷却される。所望される場合、回転切断式ナイフ、水噴射式ナイフ、ナイフグリッドなどの好適な切断手段は、該製品を所望の大きさ、例えば約１５０ｍｍ～約３５０ｍｍの小片に切断するために、細長い管又は他の装置の排出端に取り付けられてもよい。所望される場合、該製品は、より急速に冷却され得るように、中心を切り落とされてもよい。このようにして形成された厚切り肉エマルションは、優れた完全性及び強度を有しており、高水分含量の缶詰食品の製造で必要とされるような、缶詰及びレトルト処理の業務手順に付されたときに、それらの形状及び繊維特性を保持するであろう。

【0054】

該製品の繊維状の姿を強化するために、類似の速度で回転する２本の僅かに歯のある長い円柱（ロール）からなる一組の圧縮ロールが使用され得る。密閉加工ゾーンから排出される製品は、繊維を広げる／部分的に分離する／裂く、回転している円柱の間の狭い調節可能な開口部の中へ落とされる。この不完全な細断が、線状繊維を強調するように機能することが見出された。

【0055】

排出された肉エマルションの小片は、多数の排出後ステップを受けることができる。例えば、密閉加工ゾーンから排出された肉エマルションの小片は、そこから水分の大部分を除去するために乾燥機へ搬送され、乾燥された製品は収集され、貯蔵されてもよい。水分の削減は、生成製品の小片が、繊維を示しながらも一般にキブル様の外観を有するように、小片を乾熱にさらすことによっても達成され得る。乾熱は、本体をロースト、ベーキング、グリル又はフライにすることによって提供され得る。本体は、さっとフライにされることが好ましい。持続時間は、油が１５０℃～２００℃の範囲の温度である場合、一般に１分未満、好ましくは１５～３５秒の範囲であろう。

【0056】

代替として、肉エマルションの小片は、細長い管又は他の装置から、ソース、肉汁など

の他の成分と共に缶に厚切りが充填されて缶がレトルト処理される缶詰工程へ直接搬送されてもよい。どちらの状況でも、所望される場合、該製品はサイズ変更され得る。

【0057】

一例として、缶詰ペットフード製品の製造では、好適な肉汁は、水、デンプン、及び香辛料の混合物を加熱することによって調製され得る。厚切り肉エマルション及び肉汁は、所望の割合で缶に充填され、缶は真空密封され、次いで、業務用殺菌を達成するのに十分な時間・温度条件下でレトルト処理される。従来のレトルト処理手順が使用され得る。一般に、商業的無菌製品の製造において、約４０～約９０分の約１１８℃～約１２１℃のレトルト処理温度が十分である。

【0058】

一態様では、本発明は、複数の異なる色及び／又は質感を含む肉エマルション製品を提供する。例えば、肉エマルションは、複数の繊維構造及び複数の色によって明示される本体を含む。本体は、タンパク質を少なくとも約２９重量％、脂肪を約８重量％未満、好ましくは脂肪を約６重量％未満含む。複数の色は、肉エマルションの外面に、異なる色の渦巻き、霜降り、陰影、又はそれらの組合せなどの外観をもたらす。色は、例えば、カラメル、ＦＤ＆Ｃ（食物、薬物＆化粧品）認可色素、二酸化チタン、酸化鉄、アナットー、ターメリック、天然色素、人工着色料、又はそれらの組合せなどの任意の好適な着色料に由来する。

【0059】

一実施形態では、本発明は、タンパク質、脂肪、及び複数の異なる質感を含む肉エマルション製品を提供する。例えば、１種又は複数の質感は、それにより一体的に形成された複数の繊維構造を含み、肉エマルション製品に本物らしい肉様外観をもたらす。複数の異なる質感をもたらすために、肉エマルション製品は、１種又は複数の好適な質感付与原料を含む。質感付与原料は、例えば、小麦グルテン、小麦粉、卵白、硫黄化合物、シスチン、ガム（例えば、キサンタン、アルギン）、大豆タンパク質（例えば、大豆タンパク質の濃縮物及び分画）、及びそれらの組合せなどであり得る。

【0060】

別の実施形態では、本発明は、肉エマルション製品に本物らしい肉様外観をもたらす、繊維状材料の複数の線状ストランド及び繊維状材料の複数の軸方向ストランドによって明示される本体を含む肉エマルション製品を提供する。

【0061】

別の態様では、図４～９で部分的に例示されているように、本発明は、複数の異なる色及び／又は質感を有する肉エマルション製品の様々な製造方法を提供する。図４で例示されている実施形態では、本発明は、複数の色を含む肉エマルションを作るために、以前に論じられた方法（図３に例示されている）を変更することを提供する。例えば、該方法は、タンパク質、脂肪及び第１の色を含む第１の肉エマルションを形成することと、タンパク質、脂肪及び第２の色を含む第２の肉エマルションを形成することを含む。各製品ストリームについて乳化ステップが完了した後、第１の肉エマルションは、第２の肉エマルションと混合される。該混合物は、第１の肉エマルション及び第２の肉エマルションが単一のエマルションを形成するが、少なくとも２種以上の色が該混合物の表面から明らかであるように、ある速度で、ある時間十分に混合され得る（例えば、静的ミキサーを使用して）。

【0062】

混合された肉エマルションは、加工ゾーンにおいて加熱され（例えば、約１００℃～約１６５℃の温度まで）、次いで、８０ｐｓｉ～約６００ｐｓｉ、好ましくは約１００ｐｓｉ～約５００ｐｓｉ、最も好ましくは１４０ｐｓｉ～約３５０ｐｓｉの圧力を受ける。後の熱交換ステップでは、高圧ポンプから出て来たときの混合された肉エマルションの温度は、熱交換装置又はチャンバ内で、短時間で実質的に低下させられる（例えば、約２０℃～約４０℃の低下）。

【0063】

高加圧の前又はその最中の肉エマルションの温度は、約１００℃～約１６５℃、好ましくは約１２０℃～約１４０℃に及ぶことができる。熱交換ステップの直前の初期温度は、最終製品で望ましい構造繊維の形状及び程度に応じて制御され得る。混合された肉エマルションの温度は、数秒～１０分（好ましくは、約１～約３分）の時間で、所望されている構造繊維形成の程度に応じて、高圧ポンプから出て来たときの約１２０℃～約１６５℃から約８０℃～約１２５℃まで低下され得る。加圧された肉エマルションは、肉エマルション製品を形成するために排出されて、上で論じられたような様々な排出後ステップを受けることができる。

【0064】

図５で例示されている代替の実施形態では、本発明は、タンパク質、脂肪及び第１の色を含む肉エマルション製品を形成することを含む方法を提供する。肉エマルションは、微粉砕されて、約１００℃～約１６５℃の温度まで加熱される。１種又は複数の色は、肉エマルションに添加され、肉エマルションと混合される。添加された（１種又は複数の）色を含有する肉エマルションは、少なくとも２種以上の色が肉エマルションの表面から明らかであるように、ある速度で、ある時間十分にブレンドされ得る（例えば、静的ミキサーを使用して）。肉エマルションは、加熱されて、少なくとも８０ｐｓｉの圧力を受ける。加圧された肉エマルションは、肉エマルションの温度を低下させて肉エマルション製品を形成するために、熱交換器を通過させられる。加圧された肉エマルションは、肉エマルション製品を形成するために排出されて、様々な排出後ステップを受けることができる。

【0065】

図６で例示されているさらに別の実施形態では、本発明は、タンパク質及び脂肪を含む肉エマルションを形成することと、肉エマルションを微粉砕して約１００℃～約１６５℃の温度まで加熱することを含む方法を提供する。肉エマルションは、加熱されて、少なくとも８０ｐｓｉの圧力を受ける。次いで、肉エマルションは、長軸方向の螺旋流を受ける（例えば、熱交換プロセスの前、最中又は後）。螺旋流は、銃身の螺旋溝と類似することができる。肉エマルションの流れの形状は、管を直線的に下降しながら、肉エマルションが、３－Ｄ軸方向繊維がライナー繊維と共に形成され、調理された魚の質感と類似の外観を創出するような期間、螺旋運動も行うというものである。肉エマルションは、最終的に、肉エマルション製品を形成するために排出されて、様々な排出後ステップを受けることができる。

【0066】

図７で例示されている代替の実施形態では、本発明は、タンパク質、脂肪及び第１の質感付与原料を含む第１の肉エマルションを形成することと、タンパク質、脂肪及び第２の質感付与原料を含む第２の肉エマルションを形成することを含む方法を提供する。第１の肉エマルションは、第２の肉エマルションと混合される。混合された肉エマルションは、加熱されて、少なくとも８０ｐｓｉの圧力を受ける。加圧された肉エマルションは、肉エマルションの温度を低下させて複数の質感を有する肉エマルション製品を形成するために、熱交換器を通過させられる。加圧された肉エマルションは、肉エマルション製品を形成するために排出されて、様々な排出後ステップを受けることができる。

【0067】

図８で例示されているさらに別の実施形態では、本発明は、タンパク質及び脂肪を含む肉エマルションを形成することと、肉エマルションを微粉砕して約１００℃から約１６５℃の温度まで加熱することを含む方法を提供する。肉エマルションは、少なくとも８０ｐｓｉの圧力を受け、熱交換装置に入れられて、そこで肉エマルションは、肉エマルションから蒸気／水分を放出するために排気／フラッシュ蒸発（ｆｌａｓｈ）される。肉エマルションは、肉エマルション上に意図された外観をもたらすために、任意の好適な時間排気され得る。肉エマルションは、肉エマルション製品を形成するために排出されて、様々な排出後ステップを受けることができる。

【0068】

排気／フラッシュ蒸発ステップでは、高圧ポンプから出て来たときの混合された肉エマ

ルションの温度は、熱交換装置又はチャンバで、水分／蒸気が肉エマルションから放出されるようにすることによって、短時間で実質的に低下させられる（例えば、約２０℃～約４０℃の低下）。温度変化の程度及び温度変化の結果生じる肉エマルションからの水分／蒸気の放出量は、完成品における繊維の明示量及び明示度をもたらすであろう。例えば、初期温度がより高い（例えば、約１４０℃～約１６５℃）と、生成繊維は、形状及び外観がより不揃いである。初期温度がより低い（例えば、約１００℃～約１２０℃）と、生成繊維は、より高密度であると思われる（例えば、ストリングチーズの様に）。

【0069】

図９で例示されている代替の実施形態では、本発明は、タンパク質、脂肪及び第１の色を含む第１の肉エマルションを形成することを含む。次いで、肉エマルションは、微粉砕されて、該肉エマルションを約１００℃～約１６５℃の温度まで加熱した。肉エマルションは、少なくとも８０ｐｓｉの圧力を受け、焼結チャンバを通過させられる。例えば、焼結チャンバは、実際のチャンバの一部である、金属などの焼結材料（例えば、多孔性又はスポンジ様の材料）を含み得る。焼結チャンバは、肉エマルションが冷却に付されてそれによって独特な質感を有する肉エマルション製品を作るときに、フラッシュ蒸発をせずに蒸気を制御放出するための熱交換器として使用され得る。加圧された肉エマルションは、肉エマルション製品を形成するために排出されて、様々な排出後ステップを受けることができる。

【0070】

別の実施形態では、本発明は、タンパク質、脂肪、及び第１の色を含む肉エマルションを形成することと、肉エマルションを第１の部分及び第２の部分に分割することと、第２の色を第１の部分に添加することと、第１の部分及び第２の部分を独立に微粉砕して、約１００℃から約１６５℃の温度まで加熱することと、複合肉エマルションを形成するために第１の部分及び第２の部分を組み合わせることと、複合肉エマルションを少なくとも８０ｐｓｉの圧力にさらすことと、肉エマルションの温度を低下させて肉エマルション製品を形成するために、加圧された肉エマルションに熱交換器を通過させることとを含む、肉エマルション製品の製造方法を提供する。該製品は、肉様外観を有し、一般に、本物の厚切り肉の霜降り肉のように見える。

【0071】

別の実施形態では、本発明は、タンパク質、脂肪、及び第１の色を含む肉エマルションを形成することと、第１の色を有する肉エマルションを微粉砕して約１００℃～約１６５℃の温度まで加熱することと、タンパク質、脂肪、及び第２の色を含む肉エマルションを形成することと、第２の色を有する肉エマルションを微粉砕して約２０℃～約５０℃の温度まで加熱することと、複合肉エマルションを形成するために加熱された肉エマルションを組み合わせることと、複合肉エマルションを少なくとも８０ｐｓｉの圧力にさらすことと肉エマルションの温度を低下させて肉エマルション製品を形成するために、加圧された肉エマルションに熱交換器を通過させることとを含む、肉エマルション製品の製造方法を提供する。この方法は、第１の色を有する肉エマルション中のエネルギーが、第２の色を有する肉エマルションを「調理」するために使用されることを可能にする。この方法を使用して製造された肉エマルション製品は、類似の方法を用いて製造された製品とは異なる。本発明は、この方法を使用して製造する肉エマルション製品も提供する。

【0072】

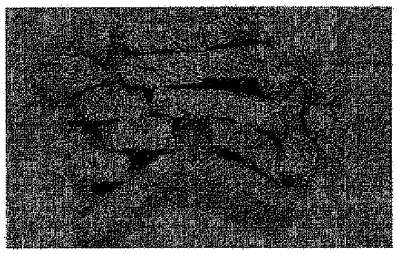
別の態様では、本発明は、本明細書に記載されている個別の方法のそれぞれによって製造される製品を提供する。

【0073】

本明細書に記載されている現在好ましい実施形態に対する様々な変更及び改変は、当業者には明らかであると見込まれることを理解されたい。そのような変更及び改変は、本発明の主題の趣旨及び範囲から逸脱することなく、また意図した利点を損なうことなくなし得る。したがって、そのような変更及び改変は、添付の特許請求の範囲によって包含されることを意図している。

【図1】

FIG. 1

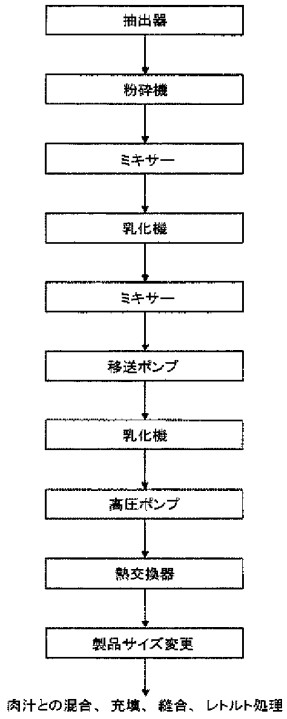


【図2】

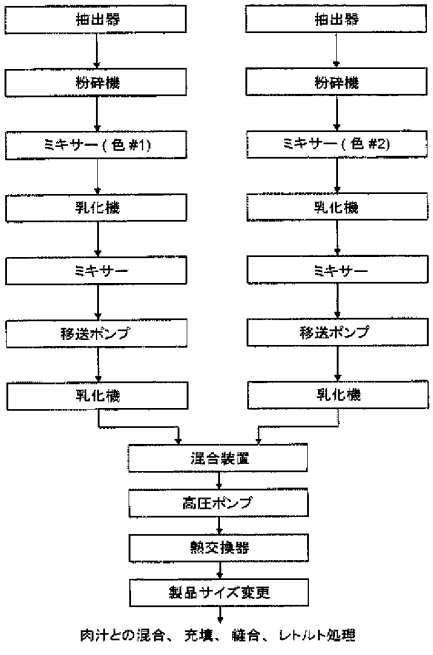
FIG. 2



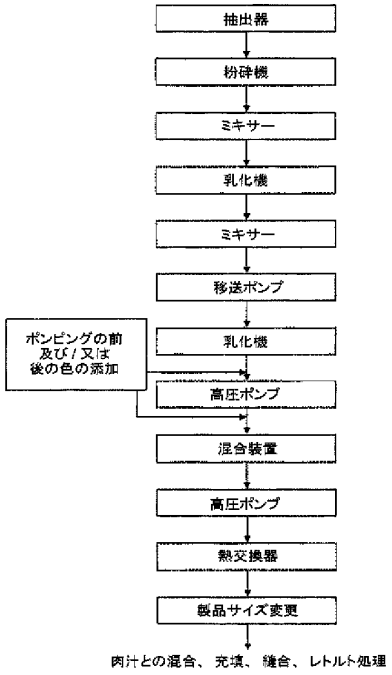
【図3】



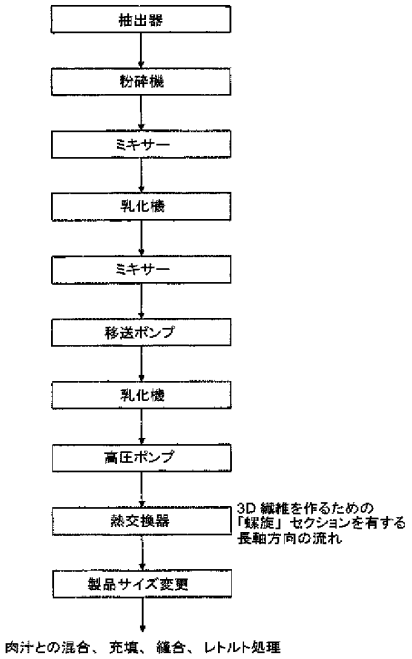
【図4】



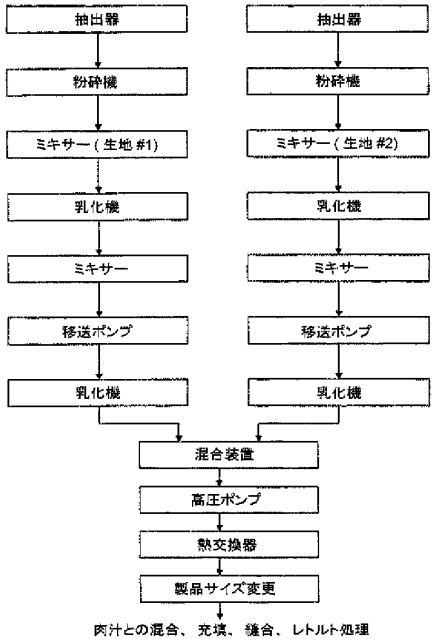
【図5】



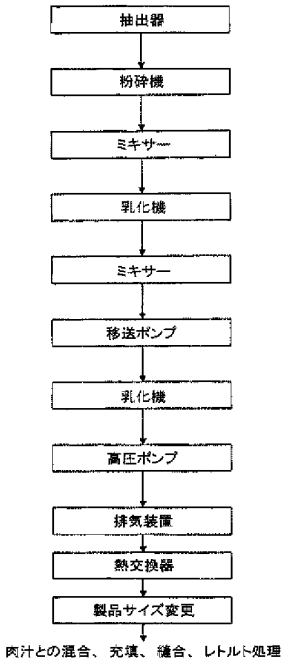
【図6】


抽出器
粉砕機
ミキサー
乳化機
ミキサー
移送ポンプ
乳化機
高圧ポンプ
熱交換器
3D 繊維を作るための
「螺旋」セクションを有する
長軸方向の流れ
製品サイズ変更
肉汁との混合、充填、縫合、レトルト処理

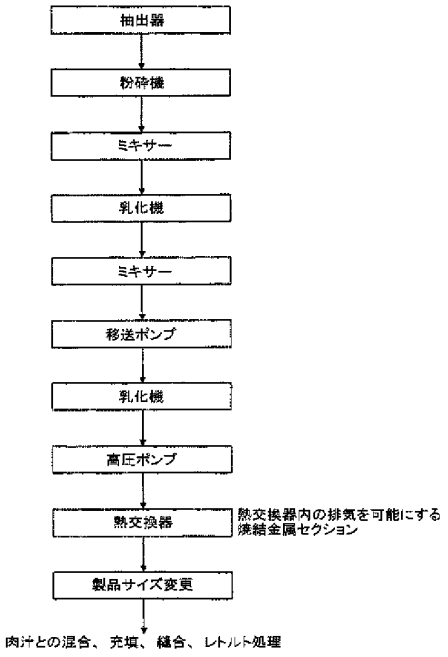
【図7】


抽出器
抽出器
粉砕機
粉砕機
ミキサー（生地 #1)
ミキサー（生地 #2)
乳化機
乳化機
ミキサー
ミキサー
移送ポンプ
移送ポンプ
乳化機
乳化機
混合装置
高圧ポンプ
熱交換器
製品サイズ変更
肉汁との混合、充填、縫合、レトルト処理

【図8】


抽出器
粉砕機
ミキサー
乳化機
ミキサー
移送ポンプ
乳化機
高圧ポンプ
排気装置
熱交換器
製品サイズ変更
肉汁との混合、充填、縫合、レトルト処理

【図9】


抽出器
粉砕機
ミキサー
乳化機
ミキサー
移送ポンプ
乳化機
高圧ポンプ
熱交換器
熱交換器内の排気を可能にする
焼結金属セクション
製品サイズ変更
肉汁との混合、充填、縫合、レトルト処理

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 07/25616

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A22C 7/00 (2008.01)
USPC - 426/802, 426/513
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
426/802, 426/513

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWest: PGPB,USPT,USOC,EPAB,JPAB; Google Scholar; Google Patents; Text: Meat; emulsion; protein; fiber; fibrous; fat; color; heating; cooling; comminuting; moisture content; metal; porous; chamber; sintered; longitudinal; spiral; divide (-ing); texture (-izing); wheat gluten; marbling; shading; swirling; pressure

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,379,738 B1 (DINGMAN et al.) 30 April 2002 (20.04.2002). col 2, ln 30; col 8, ln 11; claim 1; col 2, ln 40-42; col 2, ln 45-46; col 2, ln 54-58; col 2, ln 49-52; col 5, ln 11-15; col 5, ln 44-51; col 5, ln 56-63; col 8, ln 19; col 6, ln 65-66; abstract	1-24
Y	US 5,603,976 A (SHARE et al.) 18 February 1997 (18.02.1997). col 8, ln 44; col 7, ln 24-30; col 7, ln 25-35;	1-12, 14-15, 20-24
Y	US 3,852,487 A (VAN WERVEN et al.) 03 December 1974 (03.12.1974). col 10, ln 24-25	13
Y	US 6,283,846 B1 (TOWNSEND) 04 September 2001 (04.09.2001). col 4, ln 18-23; col 2, ln 15; claim 1	16, 22
Y	US 2002/0160097 A1 (ALTEMUELLER et al.) 31 October 2002 (31.10.2002). para [0172]; para [0062]; para [0027]	14, 17-18
Y	US 3,115,700 A (MARBACH) 31 December 1963 (31.12.1963). col 4, ln 14	19
Y	US 4,539,210 A (O'CONNELL et al.) 03 September 1985 (03.09.1985). col 14, ln 45	2
Y	US 4,428,535 A (VENETUCCI) 31 January 1984 (31.01.1984). col 6, ln 10-22;	20-21

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 March 2008 (13.03.2008)	08 APR 2008
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300. PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2007)

(81)指定国　　AP(BW,GH,GM,KE,LS,MW,MZ,NA,SD,SL,SZ,TZ,UG,ZM,ZW),EA(AM,AZ,BY,KG,KZ,MD,RU,TJ,TM),EP(AT,BE,BG,CH,CY,CZ,DE,DK,EE,ES,FI,FR,GB,GR,HU,IE,IS,IT,LT,LU,LV,MC,MT,NL,PL,PT,RO,SE,SI,SK,TR),OA(BF,BJ,CF,CG,CI,CM,GA,GN,GQ,GW,ML,MR,NE,SN,TD,TG),AE,AG,AL,AM,AT,AU,AZ,BA,BB,BG,BH,BR,BW,BY,BZ,CA,CH,CN,CO,CR,CU,CZ,DE,DK,DM,DO,DZ,EC,EE,EG,ES,FI,GB,GD,GE,GH,GM,GT,HN,HR,HU,ID,IL,IN,IS,JP,KE,KG,KM,KN,KP,KR,KZ,LA,LC,LK,LR,LS,LT,LU,LY,MA,MD,ME,MG,MK,MN,MW,MX,MY,MZ,NA,NG,NI,NO,NZ,OM,PG,PH,PL,PT,RO,RS,RU,SC,SD,SE,SG,SK,SL,SM,SV,SY,TJ,TM,TN,TR,TT,TZ,UA,UG,US,UZ,VC,VN,ZA,ZM,ZW

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(72)発明者　レイナー，　ジーン，　エル．
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Ｆターム(参考)　4B042　AC09　AC10　AD39　AE10　AG02　AG03　AG06　AG12　AH01　AK01
AK02　AK07　AK10　AK11　AK12　AK14　AK20　AP01　AP02　AP06
AP14

Espacenet

Bibliographic data: JP2014113112 (A) — 2014-06-26

SALT COMPOSITION LIQUID FOR DISCOLORATION PREVENTION TREATMENT FOR UNHEATED MEAT, AND DISCOLORATION PREVENTION TREATMENT METHOD WITH USE OF SALT COMPOSITION LIQUID

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Applicant(s): YAFUJI MAKOTO; KANMONKAI KK; SAMASA SUISAN CO LTD ± (YAFUJI MAKOTO, ; KANMONKAI KK, ; SAMASA SUISAN CO LTD, ; /\藤 眞, ; 株式会社関門海)

Classification: - international: ***A23L13/00***
- cooperative:

Application number: JP20120270850 20121211 Global Dossier

Priority number (s): JP20120270850 20121211

Also published as: JP6211760 (B2)

Abstract of JP2014113112 (A)

PROBLEM TO BE SOLVED: To provide a salt composition liquid capable of preventing discoloration of unheated meat due to the reaction of metmyoglobin by a short-time treatment without spoiling the flavor, and a discoloration prevention treatment method.SOLUTION: In clean water, 3 to 7 vol% sodium bicarbonate, 2 to 6 vol% trisodium citrate, 0.05 to 0.12 vol% water-soluble ionized mineral liquid of Ringer's solution which contains metal ions as minerals, 0.5 to 1.2 vol% of salt content, and 0.5 to 1.2 vol% sugar content are dissolved to constitute a salt composition liquid for discoloration prevention treatment. The water-soluble ionized mineral liquid preferably includes two or more types of metal ions selected from calcium, zinc, sodium, magnesium, manganese, iron, and potassium, as minerals.

(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2014-113112
(P2014-113112A)
(43)公開日　平成26年6月26日(2014.6.26)

(51)Int.Cl.			F I			テーマコード（参考）
A23L	1/31	(2006.01)	A23L	1/31	D	4B042
			A23L	1/31	A	

審査請求 未請求　請求項の数 6　ＯＬ　（全 18 頁）

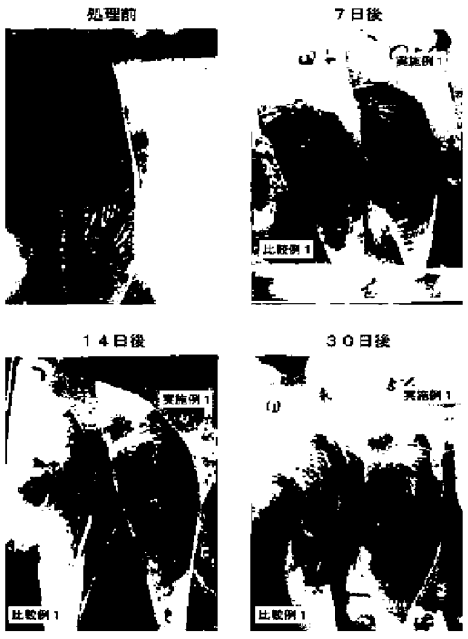
(21)出願番号　特願2012-270850 (P2012-270850)
(22)出願日　平成24年12月11日 (2012.12.11)

(71)出願人　591135200
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(74)代理人　100107375
弁理士　武田　明広
(74)代理人　100064300
弁理士　武田　賢市

最終頁に続く

(54)【発明の名称】非加熱食肉類の変色防止処理用塩類組成液、及び、当該塩類組成液を用いた変色防止処理方法

(57)【要約】
【課題】短時間の処理で、風味を阻害することなく、非加熱肉類のメト化による変色を防止することができる塩類組成液、及び、変色防止処理方法を提供する。
【解決手段】炭酸水素ナトリウム３～７容量％、クエン酸三ナトリウム２～６容量％、ミネラル分として金属イオンを含有するリンゲル液からなる水溶性イオン化ミネラル液０．０５～０．１２容量％、塩分０．５～１．２容量％、及び、糖分０．５～１．２容量％を清浄水に溶解して変色防止処理用塩類組成液を構成した。水溶性イオン化ミネラル液は、カルシウム、亜鉛、ナトリウム、マグネシウム、マンガン、鉄、カリウムのうちから選ばれた２種以上の金属イオンをミネラル分として含有することが好ましい。
【選択図】図１



【特許請求の範囲】
【請求項１】
非加熱食肉類のメト化による変色を防止するための処理に使用する塩類組成液であって、炭酸水素ナトリウム３～７容量％、クエン酸三ナトリウム２～６容量％、ミネラル分として金属イオンを含有するリンゲル液から成る水溶性イオン化ミネラル液０．０５～０．１２容量％、塩分０．５～１．２容量％、及び、糖分０．５～１．２容量％を清浄水に溶解してなることを特徴とする変色防止処理用塩類組成液。
【請求項２】
水溶性イオン化ミネラル液が、カルシウム、亜鉛、ナトリウム、マグネシウム、マンガン、鉄、カリウムのうちから選ばれた２種以上の金属イオンをミネラル分として含有することを特徴とする、請求項１に記載の変色防止処理用塩類組成液。
【請求項３】
塩分として、自然塩又はミネラル結合型の塩を、単独で、若しくは、これらの混合物として含有することを特徴とする、請求項１又は２に記載の変色防止処理用塩類組成液。
【請求項４】
糖分として、蔗糖、トレハロース、ブドウ糖、果糖、麦芽糖、又は、これらの糖をウロン酸化して糖鎖の形にし、その末端基に２価以上のイオン化ミネラルを結合させたミネラル結合型の糖鎖を、単独で、若しくは、２種以上の混合物として含有することを特徴とする、請求項１～３のいずれかに記載の変色防止処理用塩類組成液。
【請求項５】
請求項１～４のいずれかに記載の変色防止処理用塩類組成液を用いて非加熱食肉類のメト化による変色を防止するための方法であって、処理対象となる非加熱食肉類を冷温下で前記塩類組成液中に浸漬する工程を含むことを特徴とする変色防止処理方法。
【請求項６】
処理対象となる非加熱食肉類を浸漬する塩類組成液中に電極を浸漬し、これらの電極に低周波振動電圧を印加することを特徴とする、請求項５に記載の変色防止処理方法。
【発明の詳細な説明】
【技術分野】
【０００１】
この発明は、非加熱食肉類（魚介類、畜肉、鳥肉、鯨肉、その他の獣肉等）のメト化による変色を防止するための処理に使用する塩類組成液、及び、当該塩類組成液を用いて非加熱食肉類のメト化による変色を防止するための処理方法に関する。
【背景技術】
【０００２】
非加熱食肉類の赤身部分は、新鮮な状態においては鮮やかな赤色を呈し、それが一般的に鮮度の目安とされているが、冷蔵保管或いは商品陳列中に、鮮赤色から褐色・暗褐色へと変色し、比較的短期間で鮮度の評価が低下する。
【０００３】
例えば、マグロやカツオの冊（さく）、切り身、刺身では、血合い部分の鮮赤色が鮮度の評価を決定し、これはタイやヒラメのような白身魚の場合でも同様である。また、牛肉や豚肉などの畜肉や鳥肉においても、赤身部分の鮮赤色が、鮮度の評価指標とされている。
【０００４】
一般に、魚や家畜等の動物の筋肉組織中のミオグロビンは、生体反応の停止後の無酸素状態によって還元型ミオグロビンとなり、組織の外観は暗赤紫色となるが、解体により組織が切り出されると、空気に触れて酸素と結合し、酸化型ミオグロビンの割合が増加して鮮赤色となる。その後、更に酸化が進んで、組織内のヘム鉄が３価の第２鉄になると、メトミオグロビンの割合が増加して褐色となる。このようにして「メト化」が進行した食肉類は、鮮赤色から、目視で明瞭に識別可能な褐色・暗褐色へと変色する。
【０００５】

メト化による食肉類の変色（褐変退色）を防止する技術は、例えば、特開２００４－０１６０１３号公報や、特開２０１１－２０６０４２号公報により知られている。これらは、プロアントシアニジン、フェルラ酸、或いは、ビタミンＣなどの食品安全性の高い抗酸化成分により、細胞内のミオグロビンへの酸素の結合を防ごうとするものであるが、いずれにおいても、メト化防止の効果を十分に発揮させるためには、浸漬処理に１時間を超える長時間を要し、また、組成に植物抽出成分を必要とするため、生食用の食肉類に使用する場合には、風味を損ねてしまうという問題が指摘されている。

【先行技術文献】

【特許文献】

【０００６】

【特許文献１】特開２００４－０１６０１３号公報

【特許文献２】特開２０１１－２０６０４２号公報

【発明の概要】

【発明が解決しようとする課題】

【０００７】

本発明が解決しようとする課題は、短時間の処理で、風味を阻害することなく、非加熱食肉類のメト化による変色を防止することができる塩類組成液、及び、当該塩類組成液を用いた変色防止処理方法を提供することにある。

【課題を解決するための手段】

【０００８】

本発明に係る変色防止処理用塩類組成液は、炭酸水素ナトリウム３～７容量％、クエン酸三ナトリウム２～６容量％、ミネラル分として金属イオンを含有するリンゲル液からなる水溶性イオン化ミネラル液０．０５～０．１２容量％、塩分０．５～１．２容量％、及び、糖分０．５～１．２容量％を清浄水に溶解してなることを特徴としている。

【０００９】

この塩類組成液は、主要な三成分としての炭酸水素ナトリウム（重曹）、クエン酸三ナトリウム、及び、水溶性イオン化ミネラル液と、微量添加物としての塩分及び糖分とを、清浄水中に溶解してなる水溶液である。これらのうち、炭酸水素ナトリウム（重曹：$NaHCO_3$）は、清浄水中に溶解することにより水中の水素イオンを奪って炭酸を作り、従って、水溶液中には、この炭酸から生じる二酸化炭素（CO_2）の一部が、ナトリウムイオン、及び、ある程度の水酸化物イオンと共に溶存している。炭酸水素ナトリウムの好適な濃度は、水溶液中、３～７容量％、特に好ましくは４～６容量％である。３容量％未満では、メト化防止の効果が不充分となり、７容量％を超えると、ナトリウム濃度が過剰となって、処理対象となる食肉類の細胞液に対する塩類組成液の等張性が好適範囲から逸脱してしまうため、好ましくない。

【００１０】

クエン酸三ナトリウムは、示性式Na_3（C_3H_5O（COO）$_3$）の塩であり、水溶液中２～６容量％、好ましくは３～５容量％の濃度範囲内で、鉄分存在下において有効量のクエン酸鉄（第二鉄）を生成する。このクエン酸鉄は、水溶液中で沈殿を起こさず、Ｆｅ吸収体として極めて有効に働くことにより、非加熱食肉類中のヘモグロビン及びその筋肉組織中のミオグロビンの色素固定に有効である。また、クエン酸には、水溶液に酸又は塩基が加えられた場合に生じる水素イオン濃度の変化を小さくする緩衝作用や、金属イオンの活量及び配位子の濃度変化に対する緩衝作用があり、更には、食品の変質を防止するための安定剤としても有効である。

【００１１】

水溶性イオン化ミネラル液は、ミネラル分として微量の金属イオンを含有するリンゲル液からなり、好適には、カルシウム、亜鉛、ナトリウム、マグネシウム、マンガン、鉄、カリウムのうちから選ばれた２種以上の金属イオンをミネラル分として含有するリンゲル組成を有するものが用いられる。水溶液中、０．０５～０．１２容量％、好ましくは０．８～１．１容量％の微量濃度範囲の水溶性イオン化ミネラル液は、含有する金属イオンが

、溶存CO_2存在下でそれぞれ拮抗性を有し、食肉類の細胞内外液及び血合組織に対する塩類組成液の吸収能を促進する触媒として作用する。

【００１２】

塩分は、食肉類の細胞液に対する等張性を好適範囲に維持する目的で、細胞液に対する塩類組成液の浸透圧を調整するために、０．５～１．２容量％の範囲内で添加される。塩分としては、天日塩などの自然塩や、ミネラル結合型の塩を、単独で、若しくは、それらの混合物として使用することが好ましい。

【００１３】

糖分も、食肉類の細胞液に対する塩類組成液の浸透圧を調整するために０．５～１．２容量％の範囲内で添加される。糖分としては、蔗糖、トレハロース、ブドウ糖、果糖、麦芽糖、又は、これらの糖をウロン酸化して糖鎖の形にし、その末端基に２価以上のイオン化ミネラルを結合させたミネラル結合型の糖鎖を、単独で、若しくは、２種以上の混合物として使用することすることが好ましい。

【００１４】

塩類組成液の残部を構成する清浄水としては、例えば、次亜塩素、微生物、及び、各種有機物などを濾過除去した浄化水道水を用いることができる。

【００１５】

本発明に係る変色防止処理方法は、処理対象となる非加熱食肉類を、０～１０℃の冷温下、好ましくは０～５℃の冷温（いわゆるチルド冷蔵温度）下で、前記塩類組成液中に浸漬する工程を含むことを特徴としている。

【００１６】

尚、本発明の変色防止処理方法においては、処理対象となる非加熱食肉類は、非包装露出状態で、即ち、食肉類の組織が前記塩類組成液に接する状態で、当該塩類組成液中に浸漬されることが好ましい。浸漬時間は、３０～６０分程度で充分な効果が期待することができる。尚、非加熱食肉類の浸漬中において、当該塩類組成液に電極を浸漬し、これらの電極に、供給電圧振幅７０～１３０Ｖで４５～７０Ｈｚ程度の低周波振動電圧（交流又は直流脈動電圧）を印加した場合には、塩類組成液中における酸化還元反応が活性化されて、食肉類の細胞液への吸収効果とメト化防止効果を促進することができ、浸漬処理時間を、例えば、１～５分に短縮することが可能である。

【００１７】

本発明に係る変色防止処理用塩類組成液及び変色防止処理において、処理対象となる非加熱食肉類には、魚介類、畜肉、鳥肉、鯨肉、その他の獣肉等が含まれ、これらは、解体直後の状態、冷凍状態、解凍状態、或いは、冷蔵状態のいずれであってもよい。また、本発明による変色防止処理方法は、特に、色素蛋白質ミオグロビンを組織全体或いは血合い部分などの一部組織に多く含み、新鮮な状態において鮮やかな赤色を呈する魚介類、畜肉、鯨肉等に対して、好適に適用することができる。

【発明の効果】

【００１８】

本発明に係る変色防止処理用塩類組成液は、組成成分に植物抽出物を含んでおらず、しかも食品に対する安全性が確保されており、また、非加熱食肉類のメト化による変色を好適に防止することができ、魚介類、畜肉、鳥肉、鯨肉、その他の獣肉等に対する変色防止処理に利用することができる。また、本発明に係る変色防止処理方法によれば、従来技術と比べ、メト化による変色防止のための処理時間を大幅に短縮することができる。

【図面の簡単な説明】

【００１９】

【図１】本発明に係る変色防止処理用塩類組成液を用いて変色防止処理を行ったハマチの刺身（実施例１）、及び、変色防止処理を行っていないもの（比較例１）を撮影した写真（図面代用写真）である。

【図２】本発明に係る変色防止処理用塩類組成液を用いて変色防止処理を行ったメバチマグロの冊身（実施例２）、及び、変色防止処理を行っていないもの（比較例２）を撮影し

た写真（図面代用写真）である。
【図３】Ｑ帯吸収波長における吸光度の比（Ｅ５４０／Ｅ５０３）とミオグロビンのメト化率（ｍｅｔＭＢ％）との関係を示すグラフである。
【図４】変色防止処理を行ったメバチマグロの冊身（実施例２）におけるメト化率の測定結果を示すグラフである。
【図５】本発明に係る変色防止処理用塩類組成液を用いて変色防止処理を行った本マグロの冊身（既にメト化が進んだ状態で変色防止処理を行ったもの）（実施例３）、及び、変色防止処理を行っていないもの（比較例３）を撮影した写真（図面代用写真）である。
【図６】本発明に係る変色防止処理用塩類組成液を用いて変色防止処理を行った本マグロ冊身（実施例４）における処理前後の状態を撮影した写真（図面代用写真）である。
【図７】本発明に係る変色防止処理用塩類組成液を用いて変色防止処理を行った豚バラの精肉（実施例５）、及び、変色防止処理を行っていないもの（比較例５）を撮影した写真（図面代用写真）である。
【図８】本発明に係る変色防止処理用塩類組成液を用いて変色防止処理を行ったマアジの切り身（実施例６）、及び、変色防止処理を行っていないもの（比較例６）を撮影した写真（図面代用写真）である。
【発明を実施するための形態】
【００２０】
本発明に係る変色防止処理用塩類組成液は、炭酸水素ナトリウム３～７容量％、クエン酸三ナトリウム２～６容量％、ミネラル分として金属イオンを含有するリンゲル液からなる水溶性イオン化ミネラル液０．０５～０．１２容量％、塩分０．５～１．２容量％、糖分０．５～１．２容量％、及び、残部清浄水からなる水溶液として調製されるが、各組成成分の含有率は、処理対象の種類に応じて適宜調整することができる。
【００２１】
即ち、各組成成分の含有率は、塩類組成液が処理対象となる非加熱食肉類の細胞液に対してほぼ等張の濃度となるように調製されることが望ましい。ここで「細胞液に対してほぼ等張」とは、細胞液に対して０．８～１．５の浸透圧比を有することをいう。好ましい浸透圧比は、細胞液に対して０．９～１．１であり、処理対象となる非加熱食肉類の種類に応じて適宜選択することができる。尚、動物の細胞液は、細胞外液及び細胞内液に分類され、両者の組成は、主要な陽イオン成分が異なるという特徴を有し、細胞外液が高ナトリウム（Ｎａ）、低カリウム（Ｋ）であるのに対して、細胞内液は低ナトリウム（Ｎａ）、高カリウム（Ｋ）となっている。これに対して、本発明に係る塩類組成液は、陽イオン成分としてカリウムイオンよりもナトリウムイオンを多く含む細胞外液（高Ｎａ、低Ｋ）系の組成であることが好ましい。
【００２２】
炭酸水素ナトリウム（重曹：$NaHCO_3$）は、清浄水中に溶解することにより水中の水素イオンを奪って炭酸を作り、従って水溶液中には、この炭酸から生じる二酸化炭素（CO_2）の一部が、ナトリウムイオン、及び、ある程度の水酸化物イオンと共に溶存している。炭酸水素ナトリウムの好適な濃度は、水溶液中、３～７容量％、特に好ましくは４～６容量％である。３容量％未満では、メト化防止の効果が不充分となり、７容量％を超えると、ナトリウム濃度が過剰となって、処理対象となる食肉類の細胞液に対する塩類組成液の等張性が好適範囲から逸脱してしまうため、好ましくない。
【００２３】
クエン酸三ナトリウムは示性式$Na_3(C_3H_5O(COO)_3)$の塩であり、水溶液中、２～６容量％、好ましくは３～５容量％の濃度範囲内で、鉄分存在下において有効量のクエン酸鉄（第二鉄）を生成する。このクエン酸鉄は、水溶液中で沈殿を起こさず、Ｆｅ吸収体として極めて有効に働くことにより、非加熱食肉類中のヘモグロビン、及び、その筋肉組織中のミオグロビンの色素を固定するのに有効である。また、クエン酸には、水溶液に酸又は塩基が加えられた場合に生じる水素イオン濃度の変化を小さくする緩衝作用や、金属イオンの活量及び配位子の濃度変化に対する緩衝作用があり、更には、食品の変

質を防止するための安定剤としても有効である。

【００２４】

水溶性イオン化ミネラル液は、ミネラル分として微量の金属イオンを含有するリンゲル液からなり、好適にはカルシウム、亜鉛、ナトリウム、マグネシウム、マンガン、鉄、カリウムのうちから選ばれた２種以上の金属イオンをミネラル分として含有するリンゲル組成を有するものが用いられる。水溶液中、０．０５～０．１２容量％、好ましくは０．８～１．１容量％の微量濃度範囲の水溶性イオン化ミネラル液は、含有する金属イオンが溶存CO_2存在下でそれぞれ拮抗性を有して食肉類の細胞内外液及び血合組織に対する塩類組成液の吸収能を促進する触媒として作用する。水溶性イオン化ミネラル液としては、例えば、カルマックスＦθ（商品名、株式会社エフ・エル・アイ）など、ミネラルサプリメント飲料を用いることも可能である。カルマックスＦθは、１００ｍＬあたり、ミネラル分としてカルシウム２２００ｍｇ、亜鉛５６０ｍｇ、ナトリウム５１０ｍｇ、マグネシウム４５０ｍｇ、マンガン１３０ｍｇ、鉄１２７ｍｇ、カリウム１．１ｍｇ、蛋白質１．３ｇ、脂質０．１ｇ、炭水化物１０．６ｇ、灰分１０．０ｇ、水分８９．７ｇを含有する熱量４５ｋｃａｌのリンゲル組成健康飲料として市販されている。

【００２５】

塩分は、食肉類細胞液に対する等張性を好適範囲に維持する目的で、細胞液に対する塩類組成液の浸透圧を調整するために０．５～１．２容量％の範囲内で添加される。塩分としては、ミネラル分の含有量が比較的多い天日塩などの自然塩を使用することが好ましい。また、イオン交換塩を原料とする並塩や食塩などの専売塩を使用することもできるが、これらは、組成の９９．５％以上が塩化ナトリウムであるので、例えば、多種のミネラル分を、水にとけるイオンの形で補ったミネラル結合型の塩として使用することが好ましい。これらの自然塩やミネラル結合型の塩は、単独で、若しくは、混合物として使用することができる。

【００２６】

糖分も、食肉類の細胞液に対する塩類組成液の浸透圧を調整するために、０．５～１．２容量％の範囲内で添加される。この糖分としては、蔗糖、トレハロース、ブドウ糖、果糖、麦芽糖、又は、これらの糖をウロン酸化して糖鎖の形にし、その末端基に２価以上のイオン化ミネラルを結合させたミネラル結合型の糖鎖など、種々の糖類を、単独で、若しくは、２種以上の混合物として使用することすることができる。

【００２７】

塩類組成液の残部を構成する清浄水としては、例えば、次亜塩素、微生物、及び、各種有機物などを濾過除去した浄化水道水を用いることが好ましい。尚、清浄水として、浄化水道水に、直径５０μｍ以下の微細気泡（マイクロバブル）を発生させ、更に、数十ＫＨｚの超音波を照射して、それらの微細気泡に物理的刺激を与えることによって発生させたナノバブルを、長時間に亘って保持可能としたナノバブル水（超微細気泡水）を使用することもできる。

【００２８】

ここで、本発明に係る変色防止処理用塩類組成液を使用して行った、各種非加熱食肉類の変色防止処理の試験結果を、本発明の実施例１～６として説明する。尚、各実施例においては、いずれも同一組成の塩類組成液Ａを用いた。より詳細には、炭酸水素ナトリウム５．０％、クエン酸三ナトリウム４．０容量％、水溶性イオン化ミネラル液としてカルマックスＦθ（商品名、株式会社エフ・エル・アイ）０．１容量％、塩分として天日塩１．０容量％、糖分としてトレハロース１．０容量％、及び、残部清浄水からなる水溶液を使用した。

【実施例１】

【００２９】

・天然ハマチの変色防止処理試験

市販の天然ハマチの冊を厚さ８ｍｍ程度の刺身に切り分け、その内の１片を実施例１とし、他の１片を比較例１とした。比較例１については、切り分け直後に氷温下に保持し、

実施例１については、接地面から電気的に絶縁された容器内で、液温０℃に保持した塩類組成液Ａ中に２分間浸漬した。尚、実施例１を浸漬した塩類組成液Ａには、化学的に不活性なグラファイト製の棒状電極を浸漬し、実施例１の浸漬を行っている間、これらの電極に、周波数６０Ｈｚで振動する振幅１００Ｖの脈流電圧を印加した。この浸漬処理の後、実施例１及び比較例１を－２５℃で冷凍保管し、保管開始から７日後、１４日後、３１日後に取り出して、それぞれ写真撮影を行った。それらの写真を図１に示す。

【００３０】

比較例１においては、保管開始から１４日後に、血合い部分に明らかな褐変退色が認められ、３１日後には、肉質にも収縮が認められた。これに対し実施例１は、３１日経過後においても褐変退色は認められず、肉質の弾力性も維持された。

【実施例２】

【００３１】

・冷凍メバチマグロの変色防止処理試験

市販の冷凍メバチマグロの１冊を２つに切り分け、その内の１片を実施例２とし、他の１片を比較例２とした。まず、冷凍状態の実施例２及び比較例２を、ウォーターバブリング解凍機により、一定温度（－０．５℃）に保持した塩水（１．５％）中で、４５分かけて解凍した。比較例２については、氷温下に保持し、実施例２については、接地面から電気的に絶縁された容器内で、液温０℃に保持した塩類組成液Ａ中に２分間浸漬した。尚、実施例２を浸漬した塩類組成液Ａには、化学的に不活性なグラファイト製の棒状電極を浸漬し、実施例２の浸漬を行っている間、これらの電極に、周波数６０Ｈｚで振動する振幅１００Ｖの脈流電圧を印加した。この浸漬処理の後、実施例２及び比較例２を氷温下で保管し、保管開始から１日後、２日後、９日後に取り出して、それぞれ写真撮影を行った。それらの写真を図２に示す。

【００３２】

比較例２においては、保管開始から２日後に、赤身部分において、目視確認可能なほどの褐変退色が現れ、９日後には褐変退色が明瞭に認められた。これに対し実施例２は、９日経過後においても褐変退色は殆ど認められず、肉質の弾力性も維持された。

【００３３】

更に、以下の手順により、実施例２及び比較例２のメト化率（ｍｅｔＭＢ％）を測定した。保管開始当日と１日経過後の実施例２及び比較例２からそれぞれ試料を採取し、約０℃に冷却した乳鉢で個々に磨砕してから、約３ｇずつを３０ｍＬビーカーにそれぞれ秤量した。各ビーカーに冷却蒸留水１０ｍＬを加えてガラス棒で１０分間攪拌し、それぞれ５０ｍＬ遠心分離管を用いて８０００ｒｐｍで５分間の遠心分離により抽出液を採取した。各抽出液には、１Ｎの水酸化ナトリウム（ＮａＯＨ）を滴下してｐＨを６．８～７．０の範囲内に調製し、抽出液の濁りを除去した。各抽出液を再度８０００ｒｐｍで５分間の遠心分離にかけてｐＨ調製で凝集した濁りを取り除き、それぞれの上澄液５ｍＬにリン酸バッファー５ｍＬを加え、静かに混和して測定液とし、低温下に静置した。

【００３４】

メト化率（ｍｅｔＭＢ％）は、各測定液についてＱ帯吸収波長５０３ｎｍ及び５４０ｎｍの吸光度を測定し、図３に示す公知の吸光度の比（Ｅ５４０／Ｅ５０３）とミオグロビンのメト化率（ｍｅｔＭＢ％）との関係から、全ミオグロビン量に対するメトミオグロビン量の割合（％）を求めてメト化率とした。その測定結果を図４に示す。

【００３５】

マグロ肉は、メト化率が５０％を超えると褐変が現れ、肉質も生食に不適となることが知られている。測定されたメト化率は、保管開始当日において比較例２が３３．５％、実施例２が３３．０％であったところ、保管開始から１日後には、比較例２は５１．０％に増加した。これに対し実施例２は、１日後においても４３．０％に抑制されており、図２の写真では明確に確認できなかった、保管開始から１日後のメト化防止効果が確認できた。この場合のメト化の進行率を表１に示す。

【００３６】

【表１】

	開始当日	１日後	メト化進行率
比較例２	33.5%	51.0%	17.5%
実施例２	33.0%	43.0%	10.0%

【実施例３】

【００３７】

・メト化済み本マグロの変色防止処理試験

市販の冷凍本マグロ冊身（既にある程度のメト化が進行したもの）を４つに切り分け、その内の２片を実施例３とし、他の２片を比較例３とした。実施例３については、冷凍状態のまま低温（０℃）の塩類組成液Ａとともにビニール袋内に封入し、ビニール袋内で塩類組成液Ａ中に浸漬した状態とし、この封入された実施例３と、冷凍状態の比較例３（裸のまま）とを、ウォーターバブリング解凍機により、一定温度（－０．５℃）に保持した塩水（１．５％）中で４５分かけて解凍した。解凍された実施例３を、浸漬開始（ビニール袋内への封入）から約４６分後にビニール袋から取り出して、解凍された比較例３とともにステンレスバットに並べてラップをかぶせ、冷蔵庫（４℃）内で保管し、保管開始から６時間後、１日後、２日後、３日後に取り出して、それぞれ写真撮影を行った。それらの写真を図５に示す。

【００３８】

比較例３においては、保管開始から１日後に、赤身部分において、目視確認可能なほどの褐変退色の進行が現れ、２日後には褐変退色が顕著に認められた。これに対し実施例３は、２日後においても褐変退色の進行は殆ど認められず、３日後に僅かに進行が認められる程度であった。

【実施例４】

【００３９】

・本マグロの変色防止処理試験

市販の養殖本マグロ冊身を２つに切り分け、その内の１片を実施例４ａ、他の１片を実施例４ｂとした。切り分け直後の両サンプルを、接地面から電気的に絶縁された容器内で、液温０℃に保持した塩類組成液Ａ中に２分間浸漬した。尚、塩類組成液Ａには、化学的に不活性なグラファイト製の棒状電極を浸漬し、浸漬を行っている間、これらの電極に、周波数６０Ｈｚで振動する振幅１００Ｖの脈流電圧を印加した。この浸漬処理の前後において、両サンプルについて写真撮影を行った。それらの写真を図６に示す。

【００４０】

両サンプルとも褐変退色は認められず、肉質の弾力性も維持されていることが確認された。そして、両サンプルの重量を測定して処理前後の歩留まり率（％）を求めたところ、表２に示す通り、平均１０２％の歩留まり率であった。

【００４１】

【表２】

	処理前	処理後	歩留まり
実施例４ａ	62.7g	63.9g	102%
実施例４ｂ	56.2g	54.7g	103%
平　均	—	—	102%

【実施例５】

【００４２】

・豚バラ精肉品の変色防止処理試験

市販の豚バラの精肉（スライス）１パックから１００ｇの分量を２つ抽出し、その一方を実施例５、他方を比較例５とした。比較例５については、０℃に保持し、実施例５については、接地面から電気的に絶縁された容器内で、液温０℃に保持した塩類組成液Ａ中に２分間浸漬した。尚、実施例５を浸漬した塩類組成液Ａには、化学的に不活性なグラファイト製の棒状電極を浸漬し、実施例５の浸漬を行っている間、これらの電極に、周波数６０Ｈｚで振動する振幅１００Ｖの脈流電圧を印加した。この浸漬処理の後、実施例５及び比較例５を、ラップをかけて冷蔵庫（４℃）内で保管し、保管開始から５日後に取り出して、それぞれ写真撮影を行った。それらの写真を図７に示す。

【００４３】

比較例５においては、保管開始から５日後に、明らかな褐変退色が認められた。これに対し実施例５は、５日後においても褐変退色は認められず、鮮赤色が維持された。

【実施例６】

【００４４】

・マアジの変色防止処理試験

市販のマアジを三枚に下ろして半身２枚をとり、一方を実施例６とし、他方を比較例６とした。比較例６については、ラップを被せて冷蔵庫（４℃）内に保管し、実施例６については、接地面から電気的に絶縁された容器内で、液温０℃に保持した塩類組成液Ａ中に２分間浸漬した。尚、実施例６を浸漬した塩類組成液Ａには、化学的に不活性なグラファイト製の棒状電極を浸漬し、実施例６の浸漬を行っている間、これらの電極に、周波数６０Ｈｚで振動する振幅１００Ｖの脈流電圧を印加した。この浸漬処理の後、実施例６を、比較例６と同様にラップをかけて冷蔵庫（４℃）内に保管し、保管開始から０．５時間後、１時間後、３時間後、６時間後に取り出して、それぞれ写真撮影を行った。それらの写真を図８に示す。

【００４５】

比較例６においては、保管開始から０．５時間経過後に、血合い部分の褐変退色が開始していることが認められ、時間経過とともに褐変退色の進行が確認された。これに対し実施例６は、６時間経過後においても、血合い部分の褐変退色は認められず、鮮赤色が維持された。

【００４６】

以上に示した実施例１～６からも明らかなように、本発明に係る変色防止処理用塩類組成液は、短時間の処理で、風味を阻害することなく、非加熱食肉類のメト化による変色を好適に防止することができ、特に、色素蛋白質ミオグロビンを組織全体或いは血合い部分などの一部組織に多く含み、新鮮な状態において鮮赤色を呈する魚介類、畜肉、鯨肉等に対する変色防止処理において好適に用いることができる。

【図３】

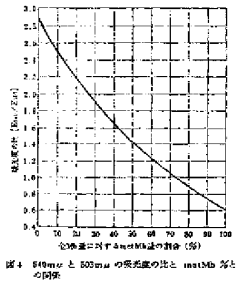
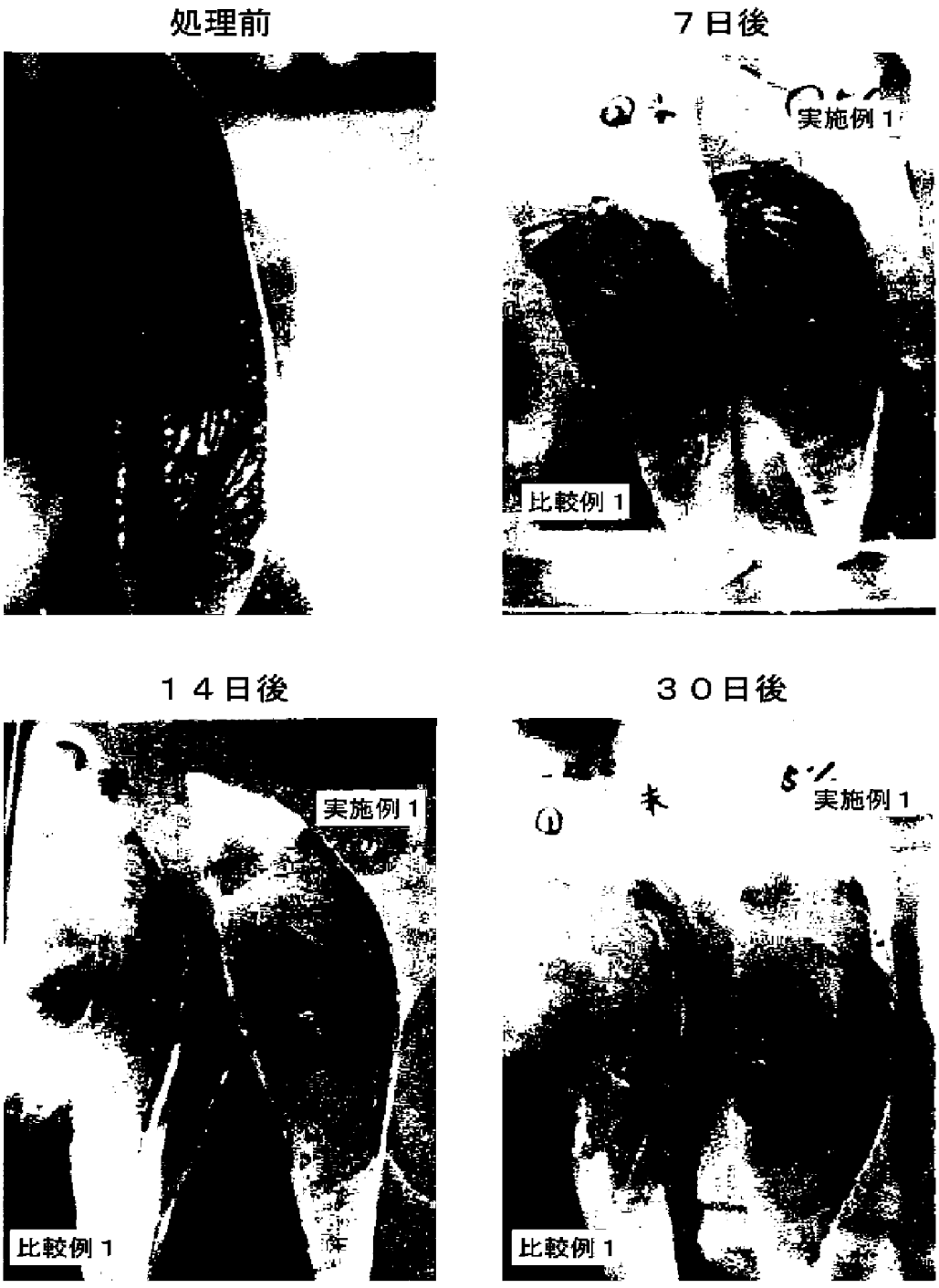
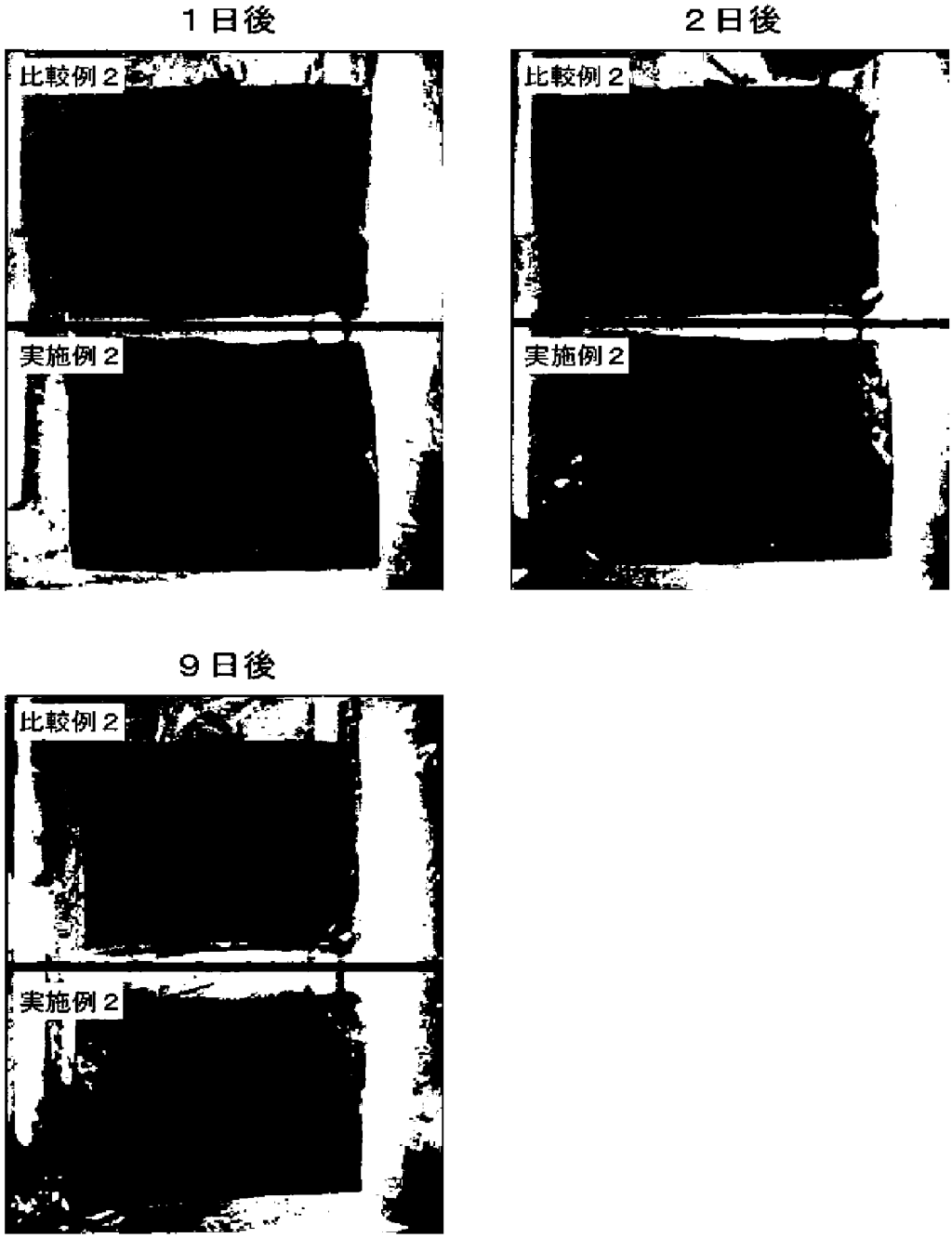


図４　540nm と 503nm の吸光度の比と metMb %との関係

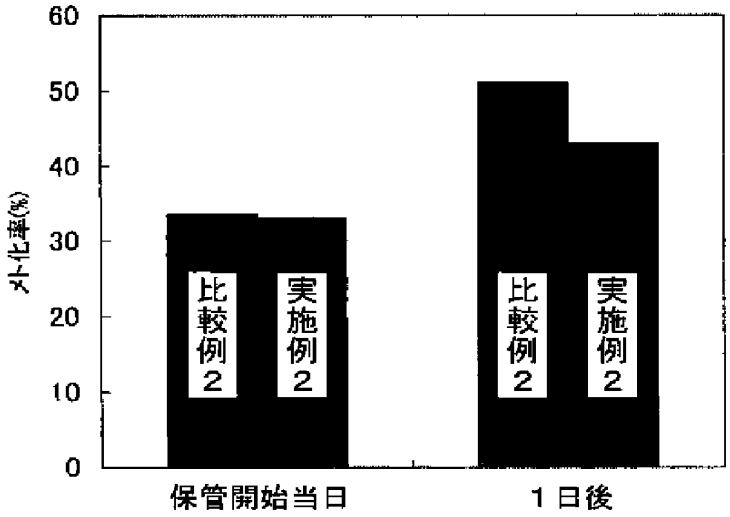
【図１】



【図２】

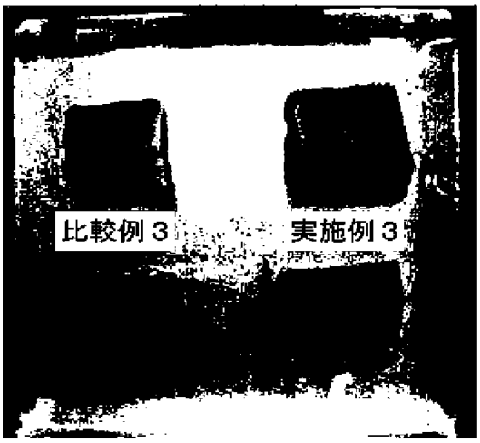


【図４】



【図５】

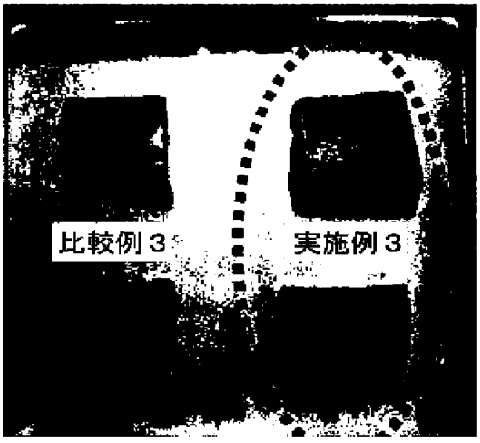
６時間後



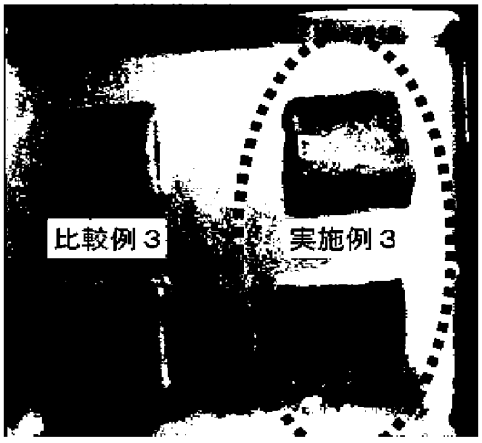
１日後



２日後

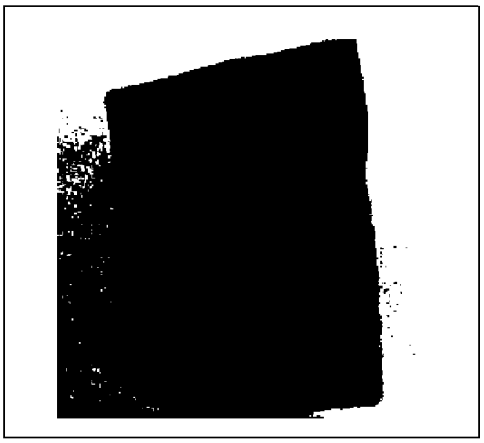


３日後

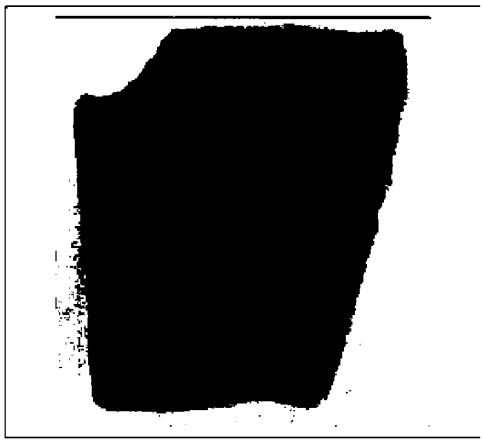


【図６】

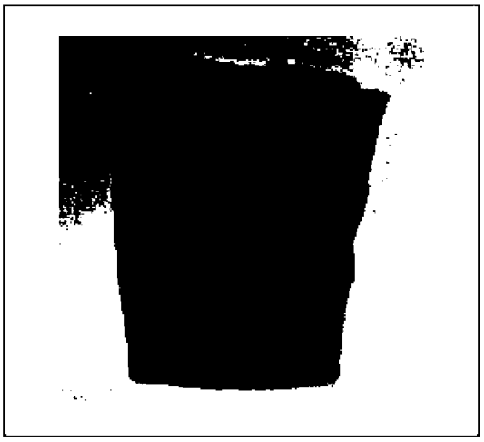
実施例４ａ　処理前



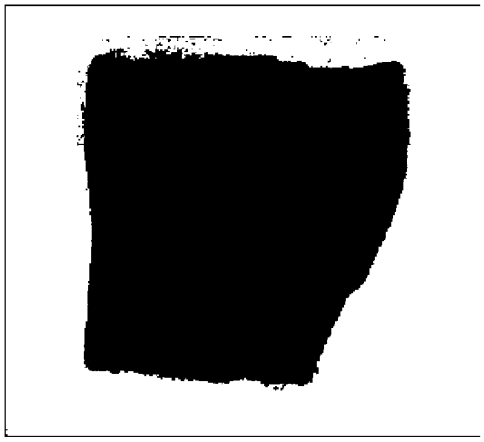
実施例４ａ　処理後



実施例４ｂ　処理前



実施例４ｂ　処理後



【図７】

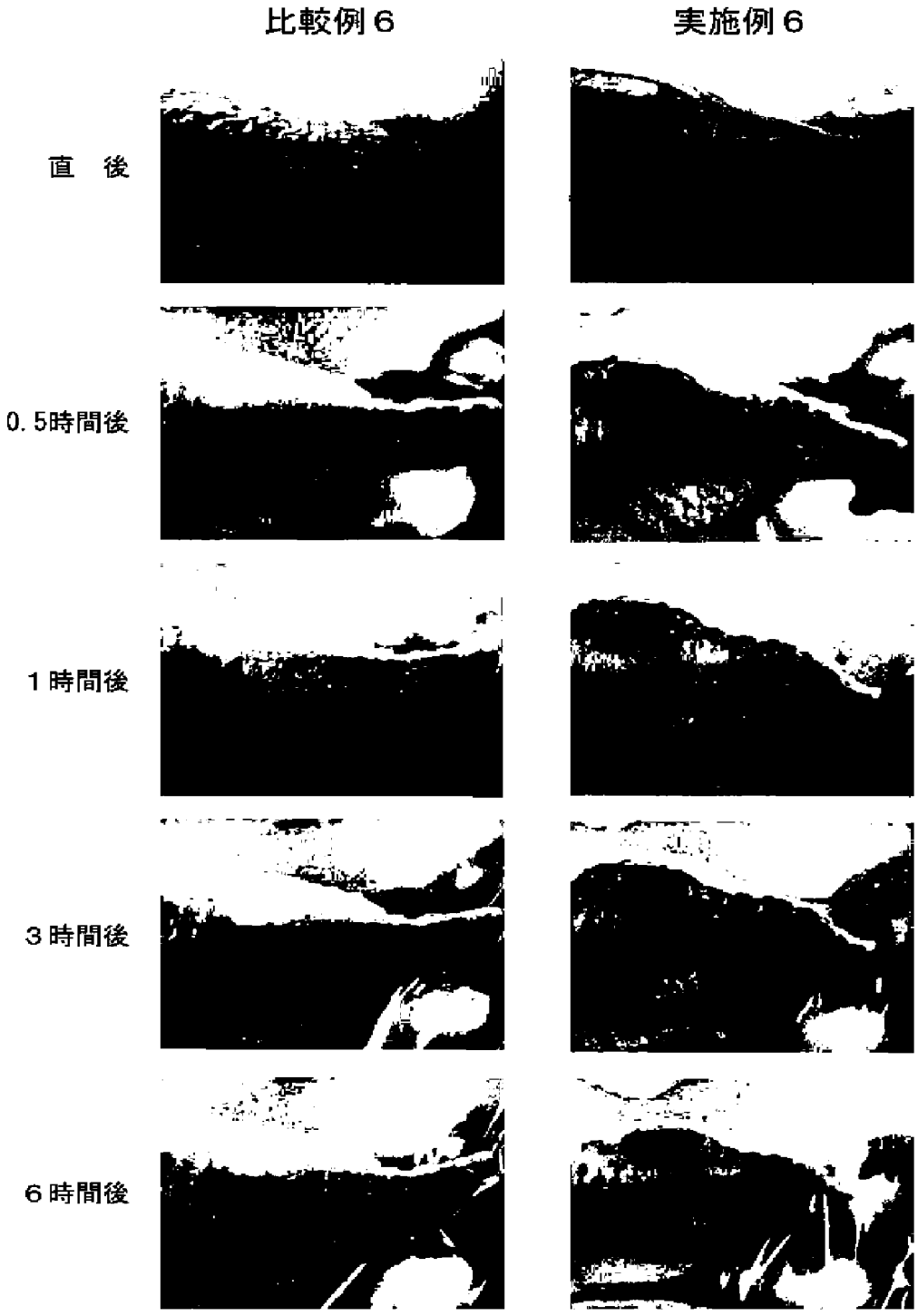
比較例５



実施例５



【図８】



フロントページの続き

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Ｆターム(参考) 4B042 AC06 AG03 AG30 AH01 AK01 AP07 AP12

Electronic Acknowledgement Receipt

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Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	Kimberly M. Maize/Shannon Stadnick
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	70182 88c001db1dadfb4e96fc4e146dac978cac3383b6	no	1

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2	Information Disclosure Statement (IDS) Form (SB08)	1449.pdf	122429 b668712a803ffccc20b444c2d27c9d870e2db4fe	no	1
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3	Foreign Reference	JPH08173024A.pdf	542567 935cd3ef65348bf8774923 8f11592d95f4b2544f	no	12
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No.: 38767-0015008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Rachel Fraser	Art Unit	:	1791
Application No.	:	15/913,090	Examiner	:	Unknown
Filed	:	March 6, 2018	Conf. No.	:	9878
Title	:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. Foreign patent documents and non-patent literature are enclosed; cited U.S. patents will be provided on request. A copy of a communication from a foreign patent office in a counterpart application is also enclosed.

This statement is being filed within three months of the filing date of the application. Apply any necessary charges or credits to deposit account 06-1050, referencing the above attorney docket number.

Please contact the undersigned if there are any questions regarding this statement.

Respectfully submitted,

Date: June 6, 2018

/Kimberly M. Maize/
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61694075.doc

Substitute Disclosure Form U.S. Department of Commerce Patent and Trademark Office **Information Disclosure Statement by Applicant** (Use several sheets if necessary) (37 CFR §1.98(b))	Attorney Docket No. 38767-0015008	Application No. 15/913,090
	Applicant Impossible Foods Inc.	
	Filing Date March 6, 2018	Group Art Unit 1791

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	1.	4,132,809	01/02/1979	Desrosier			
	2.	4,411,915	10/25/1983	Eriksson			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation	
							Yes	No
	3.	RU 2144293	01/20/2000	RU			English Abstract	
	4.	SU 301014	01/15/1974	USSR			English Abstract	

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document
	5.	Alemán et al., "Oxidative stability of a heme iron-fortified bakery product: Effectiveness of ascorbyl palmitate and co-spray-drying of heme iron with calcium caseinate," Food Chemistry, 2016, 196:567-576
	6.	Brown et al., "The structure and function of mammalian and plant globins," International Review of Scientific Synthesis, September 2013, 2014, 21 pages
	7.	Carlsen et al., "Heme-iron in lipid oxidation," Coordination Chemistry Review, 2005, 249:485-498
	8.	Christlbauer et al., "Characterization of the Key Aroma Compounds in Beef and Pork Vegetable Gravies á la Chef by Application of the Aroma Extract Dilution Analysis," J. Agric. Food Chem., 2009, 57:9114-9122
	9.	European Search Report for International Application No. EP 17210528, dated May 14, 2018, 10 pages
	10.	Grunwald et al., "Mechanisms of Heme Protein-Mediated Lipid Oxidation Using Hemoglobin and Myoglobin Variants in Raw and Heated Washed Muscle," J. Agric. Food Chem., 2006, 54:8271-8280
	11.	Maqsood et al., "Haemoglobinmediated lipid oxidation in the fish muscle: A review," Trends in Food Science & Technology, 2012, 28:33-43
	12.	Pazos et al., "Effect of pH on Hemoglobin-Catalyzed Lipid Oxidation in Cod Muscle Membranes in Vitro and in Situ," J. Agric. Food Chem., 2005, 53:3605-3612
	13.	Rebellato et al., "Iron in fortified biscuits: A simple method for its quantification, bioaccessibility study and physicochemical quality," Food Research International, 2015, 77:385-391
	14.	Richards et al., "Effects of Fish Heme Protein Structure and Lipid Substrate Composition on Hemoglobin-Mediated Lipid Oxidation," J. Agric. Food Chem., 2007, 55:3643-3654
	15.	Richards et al., "Pro-oxidative Characteristics of Trout Hemoglobin and Myoglobin: A Role for Released Heme in Oxidation of Lipids," J. Agric. Food Chem., 2005, 53:10231-10238

Examiner Signature	Date Considered

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Sheet 2 of 2

Substitute Disclosure Form U.S. Department of Commerce Patent and Trademark Office **Information Disclosure Statement by Applicant** (Use several sheets if necessary) (37 CFR §1.98(b))	Attorney Docket No. 38767-0015008	Application No. 15/913,090
	Applicant Impossible Foods Inc.	
	Filing Date March 6, 2018	Group Art Unit 1791

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
	16.	Specht et al., "Identification of Volatile Flavor Compounds with High Aroma Values from Shallow-Fried Beef," J. Agric. Food Chem., 1994, 42:2246-2253
	17.	Vasilescu et al., "Chapter 6: Meat Freshness: Peroxynitrite's Oxidative Role, Its Natural Scavengers, and New Measuring Tools," American Chemical Society, December 2014, 30 pages

Examiner Signature	Date Considered
EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

Espacenet

Bibliographic data: RU2144293 (C1) — 2000-01-20

METHOD OF PRODUCING ALBUMEN MASS "KLANVI"

Inventor(s): KLASSEN N V; OLEJNIK V V ± (KLASSEN N.V, ; OLEJNIK V.V)

Applicant(s): OKHOZJAJSTVENNYJ UNI; DAL NEVOSTOCHNYJ G TEKHN RYB ± (OKHOZJAJSTVENNYJ UNIVERSITET)

Classification: - international:*A23C19/02; A23C23/00; A23L17/00;*
(IPC1-7): A23C19/02; A23C23/00; A23L1/325
- cooperative:

Application number: RU19990106553 19990405

Priority number (s): RU19990106553 19990405

Abstract of RU2144293 (C1)

FIELD: food industry, particularly, preparation of dairy, meat and fish products. SUBSTANCE: method involves mixing of liquid component, minced fish, fat component and common salt, emulsifying and structuring of the mass. Before emulsifying filler is additionally introduced in the mixture and the latter is formed. Structure formation is carried out by freezing the mixture. All components are used in the following ratio, mas.%: liquid component, 8.5-89.0; minced fish, 10.0-55.0; fat component, 0.5-35.0; common salt, 0.5-1.5; filler, 0-35.0. EFFECT: higher organoleptical properties. 7 cl, 19 ex

(19) **RU** (11) **2 144 293** (13) **C1**

(51) МПК[7] **A 23 C 23/00, 19/02, A 23 L 1/325**

РОССИЙСКОЕ АГЕНТСТВО
ПО ПАТЕНТАМ И ТОВАРНЫМ ЗНАКАМ

(12) ОПИСАНИЕ ИЗОБРЕТЕНИЯ К ПАТЕНТУ РОССИЙСКОЙ ФЕДЕРАЦИИ

(21), (22) Заявка: **99106553/13, 05.04.1999**

(24) Дата начала действия патента: **05.04.1999**

(46) Дата публикации: **20.01.2000**

(56) Ссылки: **RU 2113138 C1, 20.06.98. SU 1604318 A1, 07.11.90. FR 2023743 A, 21.08.70.**

(98) Адрес для переписки:
690600, Владивосток, ГСП, ул.Луговая 52-Б, Дальрыбвтуз, Центр по охране прав интеллектуальной собственности

(71) Заявитель:
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(72) Изобретатель: **Классен Н.В., Олейник В.В.**

(73) Патентообладатель:
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(54) СПОСОБ ПОЛУЧЕНИЯ БЕЛКОВОЙ МАССЫ "КЛАНВИ"

(57) Реферат:

Изобретение может быть использовано в пищевой промышленности, в частности при производстве молочных, мясных и рыбных изделий. Способ включает смешение жидкого компонента, рыбного фарша, жирового компонента и поваренной соли, эмульгирование и структурообразование смеси. Перед эмульгированием в смесь дополнительно вносят наполнитель. После эмульгирования смесь формуют, процесс структурообразования осуществляют замораживанием смеси, при этом ингредиенты берут в следующих соотношениях, мас.%: жидкий компонент-8,5-89,0; рыбный фарш-10,0-55,0; жировой компонент- 0,5-35,0; поваренная соль-0,5-1,5, наполнитель- 0-35,0. Варьирование соотношениями исходных ингредиентов в заявленных интервалах, выбор соответствующих жидкого компонента, жирового компонента и наполнителя позволяют получить белковую массу с широким спектром органолептических свойств, присущих различным натуральным продуктам. 6 з.п. ф-лы.

RU 2144293 C1

RU 2144293 C1

(19) **RU** (11) **2 144 293** (13) **C1**

(51) Int. Cl.[7] **A 23 C 23/00, 19/02, A 23 L 1/325**

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FOR PATENTS AND TRADEMARKS

(12) ABSTRACT OF INVENTION

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(54) METHOD OF PRODUCING ALBUMEN MASS "KLANVI"

(57) Abstract:

FIELD: food industry, particularly, preparation of dairy, meat and fish products. SUBSTANCE: method involves mixing of liquid component, minced fish, fat component and common salt, emulsifying and structuring of the mass. Before emulsifying filler is additionally introduced in the mixture and the latter is formed. Structure formation is carried out by freezing the mixture. All components are used in the following ratio, mas.%: liquid component, 8.5-89.0; minced fish, 10.0-55.0; fat component, 0.5-35.0; common salt, 0.5-1.5; filler, 0-35.0. EFFECT: higher organoleptical properties. 7 cl, 19 ex

RU 2144293 C1

RU 2144293 C1

Изобретение относится к пищевой промышленности и может быть использовано при производстве молочных, мясных и рыбных изделий.

Известен способ получения белковой массы с волокнистой структурой и нейтральным вкусом и запахом, осуществляемый следующим образом: в пастеризованное и охлажденное до температуры 34°С обезжиренное молоко вносят 20-30 г (из расчета на 100 кг молока) хлористого кальция, 2-5% закваски из термофильного стрептококка неслизистой расы, выдерживают 30 мин при перемешивании и добавляют 2 г молокосвертывающего фермента. Через 30-35 мин полученный сгусток режут на кубики 2-6 см с одновременным подогревом до 36-42 °С, сыворотку удаляют, сгусток солят, чеддеризуют при нагрузке 1,0-1,5 кг на 1 кг массы при 36-42°С. Через 30-40 мин пласт дробят, нагревают до 65-72 °С при перемешивании до получения тестообразной массы, которую формуют в блоки и охлаждают (Авторское свидетельство СССР, N 1604318, кл. A 23 C 19/06, 1990).

Недостатками данного способа являются трудоемкость процесса, высокая стоимость продукта из-за использования молочного сырья, бактериальной закваски и молокосвертывающего фермента.

Наиболее близким к заявляемому техническому решению по совокупности общих существенных признаков является способ получения рыбного продукта типа творог, включающий смешение рыбного фарша, растительного масла (жировой компонент), поваренной соли и воды (жидкий компонент), эмульгирование и структурообразование исходных компонентов, взятых в соотношениях, мас.%: рыбный фарш- 15-25, растительное масло- 10-25, поваренная соль- 1,0-1,5, вода - остальное. Процесс структурообразования осуществляют нагреванием смеси при постоянном перемешивании до образования агломератов творога. Полученный продукт имеет органолептические свойства, аналогичные натуральному твороту (Патент РФ, N 2113138, кл. A 23 L 1/325, 1998).

Недостатком данного способа является невозможность получения продукта с широким спектром органолептических свойств.

Задачей настоящего изобретения является получение белковой массы с широким спектром органолептических свойств.

Поставленная задача решается тем, что в известном способе, включающем смешение жидкого компонента, рыбного фарша, жирового компонента и поваренной соли, эмульгирование и структурообразование смеси, перед эмульгированием в смесь дополнительно вносят наполнитель, после эмульгирования смесь формуют, процесс структурообразования осуществляют замораживанием смеси, при этом ингредиенты берут в следующих соотношениях, мас.%:

Жидкий компонент - 8,5-89,0
Рыбный фарш - 10,0-55,0
Жировой компонент - 0,5-35,0
Поваренная соль - 0,5-1,5
Наполнитель - 0-35,0

Варьирование соотношениями исходных ингредиентов в заявленных интервалах позволяет получить белковую массу с широким спектром органолептических свойств, присущих натуральным продуктам, например сыру, или мясу теплокровных животных, или мясу птицы, или мясу рыбы, или мясу беспозвоночных, или грибам. Для усиления вкуса и запаха вносят соответствующий жидкий компонент, жировой компонент и наполнитель.

Для получения продукта, имитирующего сыр, в качестве жидкого компонента используют молочное сырье (нормализованное, обезжиренное или восстановленное молоко или молочную сыворотку).

Для получения продукта с нейтральным вкусом и запахом и слоисто-волокнистой структурой в качестве жидкого компонента используют воду или соевую дисперсию (0,1-8,0%-ную дисперсию соевого изолята в воде или соевое молоко, полученное из соевых бобов).

Для получения продукта, имитирующего мясо теплокровных животных (говядины, баранины, свинины и др.), или мясо птицы (курицы, индейки и др.), или мясо рыбы (лососевых, осетровых и др.), или мясо беспозвоночных (крабов, креветок, омара, лангуста, гребешка, устрицы, кальмара и др.), в качестве жидкого компонента используют бульон после термической обработки (варки, бланширования и др.) мяса или пищевых отходов (костей, голов, кожи и др.) теплокровных животных, или птицы, или рыбы, или беспозвоночных; для получения продукта, имитирующего грибы, в качестве жидкого компонента используют бульон после термической обработки (варки, бланширования и др.) грибов.

Для получения продукта, имитирующего сыр, или мясо теплокровных животных, или мясо птицы, или мясо рыбы, или мясо беспозвоночных, в качестве наполнителя используют соответственно сыр (мягкий, твердый и др.), или мясо теплокровных животных, или мясо птицы, или мясо рыбы, или мясо беспозвоночных; для получения продукта, имитирующего грибы, в качестве наполнителя используют грибы.

Для получения продукта, имитирующего сыр, или мясо теплокровных животных, или мясо птицы, или мясо рыбы, или мясо беспозвоночных, или грибы, в качестве наполнителя используют соответствующие вкусоароматические добавки (например, сырную, или говяжью, или куриную, или лососевую, или крабовую, или грибную и т.д.).

Для получения продукта, имитирующего по внешнему виду сыр, или мясо теплокровных животных, или мясо птицы, или мясо рыбы, или мясо беспозвоночных, или грибы, после замораживания на поверхность продукта наносят пищевой краситель соответствующего цвета.

В качестве жирового компонента используют соевое, подсолнечное, кукурузное или оливковое или другое растительное масло или животные жиры.

Заявляемые количественные интервалы исходных ингредиентов являются существенными признаками и отклонение от них не позволяет решить поставленной перед изобретением задачи.

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Так, снижение содержания жидкого компонента ниже 8,5 мас.% не позволяет сформировать требуемую структуру белковой массы, а повышение его содержания свыше 89,0 мас.% не позволяет получить продукт предложенным способом.

Уменьшение содержания рыбного фарша и жирового компонента ниже 10,0 мас. % и 0,5 мас.% соответственно не позволяет получить белковую массу предложенным способом, а увеличение содержания ингредиентов более 55,0 мас.% и 35,0 мас.% соответственно не позволяет придать ей требуемую структуру.

Поваренная соль вносится в количестве от 0,5 до 1,5 мас.%, достаточном для формирования структуры и вкуса продукта.

Увеличение содержания наполнителя свыше 35,0 мас.% не позволяет сформировать нужную структуру продукта.

Способ осуществляют следующим образом.

Пример 1. В смеситель с мешалкой вносят 34,0 кг нормализованного молока (34,0 мас.%), 40,0 кг рыбного фарша сурими (40,0 мас.%), 25,0 кг соевого масла (25,0 мас.%) и 1,0 кг поваренной соли (1,0 мас.%). Смесь гомогенизируют при скорости вращения мешалки 1500 об/мин в течение 6 мин. После окончания эмульгирования смесь формуют в виде брикетов и замораживают до температуры минус 18°С. Полученный продукт имеет выраженный молочный вкус и запах, пористую структуру, характерную для сыра, белый цвет.

Пример 2. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют молочную сыворотку, в качестве рыбного фарша - фарш из минтая, в качестве жирового компонента - кукурузное масло, а ингредиенты берут в следующем соотношении: молочная сыворотка - 8,5 мас.%, рыбный фарш - 55,0 мас.%, кукурузное масло- 35,0 мас.%, поваренная соль - 1,5 мас.%. Полученный продукт имеет кисломолочный вкус и запах, пористую структуру, характерную для сыра, белый цвет.

Пример 3. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют воду, замораживание ведут до температуры минус 8°С, а ингредиенты берут в следующем соотношении: вода - 54,5 мас.%, рыбный фарш - 20,0 мас.%, соевое масло - 25,0 мас.%, поваренная соль - 0,5 мас.%. Полученный продукт имеет нейтральный вкус и запах, слоисто-волокнистую структуру, белый цвет.

Пример 4. Осуществляют аналогично примеру 3, при этом в качестве жидкого компонента используют соевое молоко, полученное из соевых бобов. Полученный продукт имеет нейтральный вкус и запах, слоисто-волокнистую структуру, светло-кремовый цвет.

Пример 5. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют бульон после варки мяса говядины, в качестве жирового компонента используют животный жир, замораживание ведут до температуры минус 12°С, а ингредиенты берут в следующем соотношении: бульон - 49,3 мас.%, рыбный фарш - 35,0 мас.%, животный жир - 15,0 мас.%, поваренная соль - 0,7 мас. %. Полученный продукт имеет вкус и запах говядины, характерную для мяса говядины структуру и цвет.

Пример 6. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют бульон после варки курицы, в качестве жирового компонента используют подсолнечное масло, а ингредиенты берут в следующем соотношении: бульон - 59,2 мас.%, рыбный фарш - 20,0 мас.%, подсолнечное масло - 20,0 мас.%, поваренная соль - 0,8 мас.%. Полученный продукт имеет вкус и запах курицы, характерную для мяса курицы структуру, белый цвет.

Пример 7. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют бульон после бланширования горбуши, в качестве жирового компонента используют оливковое масло, а ингредиенты берут в следующем соотношении: бульон - 64,5 мас.%, рыбный фарш - 25,0 мас.%, оливковое масло - 10,0 мас.%, поваренная соль - 0,5 мас.%. Полученный продукт имеет характерный для лососевых вкус, запах и консистенцию, розоватый цвет.

Пример 8. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют бульон после варки гребешка, в качестве жирового компонента используют кукурузное масло, смесь формуют в виде мускула гребешка, а ингредиенты берут в следующем соотношении: бульон - 54,4 мас.%, рыбный фарш - 30,0 мас.%, кукурузное масло - 15,0 мас.%, поваренная соль - 0,6 мас. %. Полученный продукт имеет вкус и запах гребешка, характерную для мускула гребешка структуру, белый цвет.

Пример 9. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют бульон после бланширования краба, в качестве жирового компонента используют оливковое масло, смесь формуют в виде ножек краба, а ингредиенты берут в следующем соотношении: бульон - 54,0 мас.%, рыбный фарш - 25,0 мас. %, оливковое масло - 20,3 мас.%, поваренная соль - 0,7 мас.%. Полученный продукт имеет вкус и запах краба, характерную для мяса краба структуру, белый с розоватым оттенком цвет.

Пример 10. Осуществляют аналогично примеру 1, при этом в качестве жидкого компонента используют бульон после бланширования устриц, смесь формуют в виде устриц, а ингредиенты берут в следующем соотношении: бульон - 89,0 мас. %, рыбный фарш - 10,0 мас.%, соевое масло - 0,5 мас.%, поваренная соль - 0,5 мас. %. Полученный продукт имеет характерные для мяса устрицы вкус, запах, консистенцию и цвет.

Пример 11. Осуществляют аналогично примеру 5, при этом в качестве жидкого компонента используют бульон после варки костей говядины. Полученный продукт имеет вкус и запах говядины, характерные для мяса говядины структуру и цвет.

Пример 12. Осуществляют аналогично примеру 11, но перед эмульгированием вносят наполнитель, в качестве которого используют мясо говядины, а ингредиенты берут в следующем соотношении: бульон - 54,3 мас.%, рыбный фарш - 25,0 мас. %, животный жир - 15,0 мас.%, поваренная соль -

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0,7 мас.%, мясо говядины - 5,0 мас.%. Полученный продукт имеет вкус и запах говядины, характерные для мяса говядины структуру и цвет.

Пример 13. Осуществляют аналогично примеру 3, но перед эмульгированием вносят наполнитель, в качестве которого используют мясо баранины, а ингредиенты берут в следующем соотношении: вода - 49,0 мас.%, рыбный фарш - 30,0 мас.%, соевое масло - 10,0 мас.%, поваренная соль - 0,9 мас.%, мясо баранины - 10,1 мас. %. Полученный продукт имеет вкус и запах баранины, характерные для мяса баранины структуру и цвет.

Пример 14. Осуществляют аналогично примеру 13, при этом в качестве наполнителя используют сыр "Российский", смесь формуют в виде невысоких цилиндров, а ингредиенты берут в следующем соотношении: вода - 26,5 мас.%, рыбный фарш - 35,0 мас.%, соевое масло - 30,0 мас.%, поваренная соль - 1,0 мас. %, сыр - 7,5 мас.%. Полученный продукт имеет вкус, запах и пористую структуру, характерную для сыра, желтоватый цвет.

Пример 15. Осуществляют аналогично примеру 13, при этом в качестве наполнителя используют мясо креветки, смесь формуют в виде шейки креветки, а ингредиенты берут в следующем соотношении: вода - 45,0 мас.%, рыбный фарш - 14,5 мас. %, соевое масло - 25,0 мас.%, поваренная соль - 0,5 мас.%, мясо креветки - 15,0 мас.%. Полученный продукт имеет вкус и запах креветки, характерную для мяса креветки консистенцию, белый с розоватым оттенком цвет.

Пример 16. Осуществляют аналогично примеру 13, при этом в качестве наполнителя используют грибы, смесь формуют в виде грибов, а ингредиенты берут в следующем соотношении: вода - 47,0 мас.%, рыбный фарш - 12,4 мас.%, соевое масло - 5,0 мас.%, поваренная соль - 0,6 мас.%, грибы - 35,0 мас.%. Полученный продукт имеет вкус и запах грибов, характерную для грибов консистенцию, светло-коричневый цвет.

Пример 17. Осуществляют аналогично примеру 13, при этом в качестве наполнителя используют сырную вкусоароматическую добавку, а ингредиенты берут в следующем соотношении: вода - 16,5 мас.%, рыбный фарш - 50,0 мас.%, соевое масло - 30,0 мас.%, поваренная соль - 1,0 мас.%, сырная вкусоароматическая добавка - 2,5 мас.%. Полученный продукт имеет вкус, запах и пористую структуру, характерную для сыра, желтоватый цвет.

Пример 18. Осуществляют аналогично примеру 13, при этом в качестве наполнителя используют куриную вкусоароматическую добавку, а ингредиенты берут в следующем соотношении: вода - 54,8 мас.%, рыбный фарш - 20,0 мас.%, соевое масло - 20,0 мас.%, поваренная соль - 0,8 мас.%, куриная вкусоароматическая добавка - 4,4 мас.%. Полученный продукт имеет вкус и запах курицы, характерную для мяса курицы консистенцию, белый цвет.

Пример 19. Осуществляют аналогично примеру 9, при этом смесь формуют в виде палочек, после замораживания на поверхность продукта наносят пищевой краситель красного цвета. Полученный продукт имеет внешний вид, вкус, запах и консистенцию, характерные для краба.

Таким образом, оптимальные дозировки внесения компонентов составляют, мас. %: жидкий компонент - 8,5-89,0, рыбный фарш - 10,0-55,0, жировой компонент - 0,5-35,0, поваренная соль - 0,5-1,5, наполнитель - 0-35,0.

Приведенные примеры (1-19) подтверждают, что применение предложенного способа позволяет получить белковую массу с широким спектром органолептических свойств.

Различные виды белковой массы, полученные по предложенной технологии, могут быть реализованы как самостоятельные изделия в качестве аналогов натуральных продуктов, например аналогов сыра, мяса говядины, курицы, креветки, грибов и т.д. Кроме того, белковую массу можно использовать при производстве молочных, мясных и рыбных изделий в качестве наполнителя.

Предложенная технология не предполагает использования химических реагентов (например, хлористого кальция). Кроме того, применение рыбного фарша при производстве белковой массы способствует повышению ее биологической и пищевой ценности, а использование растительных масел улучшает вкусовые качества, повышает усвояемость, способствует обогащению полиненасыщенными жирными кислотами. Поэтому полученная белковая масса может быть рекомендована для детского, диетического и лечебно-профилактического питания.

Предложенный способ позволяет получать продукцию на основе широкого спектра молочного, мясного и рыбного сырья, а также пищевых отходов (например, костей, голов, кожи и др.).

Предложенный способ прост, универсален, не требует сложного оборудования, обеспечивает непрерывность производства, при этом возможна полная механизация процесса.

Предложенная технология позволяет расширить ассортимент молочных, мясных и рыбных продуктов.

Формула изобретения:

1. Способ получения белковой массы, включающий смешение жидкого компонента, рыбного фарша, жирового компонента и поваренной соли, эмульгирование и структурообразование смеси, отличающийся тем, что перед эмульгированием в смесь дополнительно вносят наполнитель, после эмульгирования смесь формуют, процесс структурообразования осуществляют замораживанием смеси, при этом ингредиенты берут в следующих соотношениях, мас.%:

Жидкий компонент - 8,5 - 89,0
Рыбный фарш - 10,0 - 55,0
Жировой компонент - 0,5 - 35,0
Поваренная соль - 0,5 - 1,5
Наполнитель - 0 - 35,0

2. Способ по п.1, отличающийся тем, что в качестве жидкого компонента используют молочное сырье.

3. Способ по п.1, отличающийся тем, что в качестве жидкого компонента используют воду или соевую дисперсию.

4. Способ по п.1, отличающийся тем, что в качестве жидкого компонента используют

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бульон после термической обработки теплокровных животных, или птицы, или рыбы, или беспозвоночных, или грибов.

5. Способ по любому из пп.1 - 4, отличающийся тем, что в качестве наполнителя используют сыр, или мясо теплокровных животных, или мясо птицы, или мясо рыбы, или мясо беспозвоночных, или грибы.

6. Способ по любому из пп.1 - 5, отличающийся тем, что в качестве наполнителя используют вкусоароматические добавки.

7. Способ по любому из пп.1 - 6, отличающийся тем, что после замораживания на поверхность продукта наносят пищевой краситель.

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СПОСОБ ПРИГОТОВЛЕНИЯ ПРОДУКТОВ, ИМИТИРУЮЩИХ МЯСОПРОДУКТЫ

1

Изобретение относится к производству искусственных пищевых продуктов, в частности к производству мяса и мясопродуктов.

Известен способ приготовления продуктов, имитирующих мясопродукты, имеющие волокнистую структуру, путем приготовления раствора студнеобразующих веществ, например альгината натрия в водном растворе казеина, обработки в солевом растворе для коагуляции, например, в подкисленном растворе солей кальция, отделения коагулята, промывки слабым раствором кислоты, введения ароматизирующих и вкусовых веществ, например липидов, аминокислот, гидролизаторов, глютамината натрия, нуклеотидов, гомогенизации смеси при нагревании, формования в виде отдельных волокон, обработки связующим веществом, содержащим белки в смеси с различными добавками и термической обработки.

Однако этот способ включает образование каждого волокна в отдельности через фильеру и последующей обработки и склеивания их связующим при повышенной температуре, что значительно усложняет процесс и делает его дорогостоящим.

Предлагаемый способ исключает образование каждого волокна в отдельности через платиновые фильеры и последующую обработку их связующим и позволяет получить волокнистую массу сразу в большом объеме. Это достигается тем, что формование массы осуществляют в подогретом состоянии путем ее растяжения, а после формования продукт охлаждают. Формуемую массу рекомендуется подогревать до 60—80°С, растяжение массы вести с градиентом сдвига в пределах 0,2—2 кг/см², а охлаждение осуществлять до температуры в пределах 0— —20°С.

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Способ состоит в следующем.

Приготавливается коагулят пищевых белков или их смесей с заряженными полисахаридами, например, их совместным осаждением из водных растворов при действии кислот или солей. Полученный коагулят, отделяется, например, декантацией, центрифугированием или фильтрованием, промывается слабым раствором кислоты, добавляются ароматизирующие, вкусовые и пищевые вещества и красители. Смесь гомогенизируют при нагреве, после чего полученную пластичную массу подвергают растяжению при градиенте сдвига в пределах 0,2—2 кг/см² при 60—80°С. В результате получается волокнистая масса, которая может быть использована как определенные готовые мясопродукты, имеющие волокнистую структуру, например отварное мясо, заливное, а также подвергаться дальнейшей обработке, например, растворами солей кальция или алюминия, пропитке расплавленными животными

жирами, кукурузным или хлопковым маслом. Искусственные продукты питания волокнистой структуры, имитирующие различные мясопродукты, полученные по предлагаемому способу, могут быть подвергнуты копчению обычным способом — дымом и при помощи коптильных препаратов высушиваться и продолжительно храниться в высушенном и замороженном состоянии.

Производство продуктов питания, имитирующих мясо и мясопродукты, позволяет рационально использовать различные белки, а также отходы мясной и других отраслей пищевой промышленности, например, измельченные малоценные сорта мяса, рыбы, мясную и рыбную муку, для приготовления диетических и лечебных продуктов питания со строго определенным содержанием пищевых компонентов, регулируемыми органолептическими и технологическими характеристиками и низкой себестоимостью.

Способ поясняется примерами его осуществления.

Пример 1. 10 г альгината Na, 100 г казеина, 25 г NaCl и 10 г пищевого альбумина растворяют при 40—60°С при перемешивании в течение 30 мин в 720 г 0,05 раствора NaOH. Полученный раствор (pH — 7,6) подают при 20°С тонкой струей в перемешиваемую коагуляционную ванну, содержащую 10%-ный раствор $Ca(CH_3COO)_2$ при pH коагуляционной ванны — 6,0. Полученный коагулят отделяют фильтрацией через тканевый фильтр и промывают подсоленной водой до раствора коагуляционной ванны. После этого его подвергают экструзии при 50—60°С через экструзионную щелевую головку (длина 40 мм, ширина 15 мм). Экструзия сопровождается синерезисом.

Полученный продукт содержит 45% сухих веществ, имеет волокнистое строение, достаточно плотный со слегка коричневатым оттенком, суховат, в холодном состоянии напоминает сильно вываренное мясо, полученное от убоя старого животного.

Пример 2. Продукт волокнистого строения, по консистенции имитирующий говяжье мясо, полученный по схеме примера 1, выдерживают 2 час в дубящей ванне, содержащей 1%-ный раствор алюмокалиевых квасцов, после чего промывают 4%-ным раствором NaCl, пропитывают кукурузным маслом и нагревают. Продукт по консистенции напоминает говяжье мясо, жареное при низкой температуре — 120°С долгое время, суховат, при разжевывании крошится, на разрезе сохраняет структуру.

Пример 3. 10 г альгината Na, 100 г казеина, 25 г NaCl растворяют в 855 г 0,05 N раствора NaOH при 40—60°С и при перемешивании в течение 30 мин. Дальнейшую обработку проводят по схеме примера 1, с последующим выдерживанием в дубящей ванне, содержащей 1%-ный раствор алюмокалиевых квасцов в течение 2 час, после чего тщательно промывают дистиллированной водой. Полученный продукт напоминает мясо трески, суховат, волокнист.

Пример 4. В растворе, полученном по схеме примера 1, эмульгируют 50 г сливочного маргарина при перемешивании, при 50°С в течение 30 мин. Дальнейшую обработку проводят по примеру 1. Полученный продукт имеет волокнистое строение. По сравнению с примером 1 обладает более нежной консистенцией.

Пример 5. Волокнистый продукт, имитирующий говяжье мясо, получают по схеме, аналогичной примеру 4, но используют коагуляционную ванну, содержащую 10%-ный раствор $Ca(CH_3COO)_2$ и 5%-ный раствор NaCl. Полученный продукт имеет волокнистое строение, выраженное несколько ярче, чем в примере 4, обладает меньшей сочностью и нежностью.

Пример 6. Продукт, полученный по примеру 5, обрабатывают с поверхности коптильным препаратом, предлагаемым Институтом народного хозяйства им. Плеханова. Полученный продукт имеет ярко выраженную волокнистую структуру, по внешнему виду и консистенции напоминает варено-копченый шейный зарез.

Пример 7. Продукт волокнистого строения, имитирующий мясоподобный продукт, полученный по схеме примера 1, пропитывают с поверхности расплавленным маргарином 2 час при 50°С. После прогрева продукт сохраняет структуру, обладает несколько большей нежностью, чем продукт примера 1, но малой сочностью.

Пример 8. В коагулят, полученный по схеме примера 1, после промывки его дистиллированной водой добавляют 50 г сливочного маргарина, перемешивают. После этого подвергают экструзии через головку, имеющую 50 отверстий диаметром 5 мм. Полученный экструдит имеет вид волокнистых жгутов (диаметр волокон до 8 мм). Полученный продукт отличается большей пластичностью и нежностью, чем продукт, полученный по схеме 1, имеет привкус и запах маргарина.

Пример 9. 100 г казеина, 10 г альгината Na, 10 г пищевого желатина, 10 г пищевого сывороточного альбумина растворяют в 740 г 0,05 N раствора NaOH при 40—60°С при перемешивании в течение 30 мин. Полученную массу обрабатывают по схеме, аналогичной примеру 1. Готовый продукт имеет хорошо выраженное волокнистое строение, большую водоудерживающую способность и по консистенции и цвету напоминает вареное говяжье мясо. В холодном состоянии продукт значительно жестче, чем в слегка подогретом (до 30—35°С).

Пример 10. 100 г казеина, 5 г гуммиарабика, 10 г пищевого сывороточного альбумина растворяют в 885 г 0,05 N раствора NaOH при перемешивании и нагревании при 40—60°С в течение 30 мин.

Case No.: IPR2023-00208
U.S. Patent No. 11,224,241

Полученную массу обрабатывают по схеме примера 1. Готовый продукт имеет неявную волокнистую структуру, слегка жесткое, мало сочное.

Пример 11. 100 г казеина, 15 г альгината Na, 10 г гуммиарабика растворяют в 875 г 0,05 N раствора NaOH в течение 30 мин при 40—60°С. Затем в полученном растворе эмульгируют 50 г сливочного маргарина 30 мин при 50°С. Полученную массу обрабатывают по схеме примера 3. Продукт имеет ярко выраженное волокнистое строение, несколько суховат, обладает недостаточной сочностью.

Пример 12. 80 г казеина, 20 г микробного белка, 10 г сывороточного альбумина крови, 10 г альгината натрия, 25 г NaCl растворяют в 845 г 0,05 N раствора NaOH в течение 30 мин при перемешивании, и при 0—60°С. Полученную массу обрабатывают по схеме примера 1. Готовый волокнистый продукт, имитирующий вареное говяжье мясо, по органолептическим свойствам не отличается от продукта, полученного по схеме примера 1.

Пример 13. 80 г казеина, 20 г соевого белка, 10 г альгината Na, 25 г NaCl растворяют в 860 г 0,05 N раствора NaOH в течение 30 мин при перемешивании и при 40—60°С. Полученную массу обрабатывают по схеме примера 3. Готовый продукт волокнист, суховат, обладает малой сочностью и нежностью, напоминает по структурно-механическим свойствам мясо трески.

Пример 14. 100 г казеина, 10 г яичного альбумина, 10 г альгината Na, 25 г NaCl растворяют в 855 г 0,05 N раствора NaOH в течение 30 мин при перемешивании и при 40—60°С. Полученную массу обрабатывают по схеме примера 1. Готовый продукт обладает волокнистой структурой, большей нежностью и сочностью, чем продукт, полученный по примеру 1, и по внешнему виду и структурно-механическим свойствам напоминает куриное мясо.

Пример 15. Аналогично примеру 1 при употреблении исходного раствора, содержащего 10 г альгината Na, 100 г казеина, 10 г сывороточного альбумина крови, 10 г желатина в 870 г 0,05 N NaOH, получают коагулят в ванне, содержащей 10%-ный раствор $Ca(CH_3COO)_2$, который отфильтровывают, промывают дистиллированной водой, добавляют 25 г NaCl, 15 г глютамината Na и 15 г гидролизата дрожжей. Затем массу перемешивают и экструдируют. Полученный волокнистый продукт выдерживают 2 час в нагретом до 80—90°С говяжьем жире. Продукт содержит 42—45% белка и 2% жира. При органолептической оценке отмечается темно-красная окраска, подобная окраске соленой говядины, плотная, несколько суховатая волокнистая структура.

Пример 16. Аналогично примеру 15 при эмульгировании в исходном растворе 10% кукурузного масла получают продукт, содержащий 36—38% белка и 14—16% жира, отличающийся от продукта, описанного в примере 15, несколько более светлой окраской и нежной волокнистой консистенцией.

Предмет изобретения

1. Способ приготовления продуктов, имитирующих мясопродукты и имеющих волокнистую структуру, путем приготовления студнеобразующих веществ, например, альгината натрия в водном растворе казеина, обработки в солевом растворе для коагуляции, например, в подкисленном растворе солей кальция, отделения коагулята, промывки слабым раствором кислоты, введения ароматизирующих и вкусовых веществ, например липидов, аминокислот, глютамината натрия, нуклеотидов, гомогенизации смеси при нагревании, формования, обработки связующим веществом, содержащим белки в смеси с различными добавками, и термической обработки, отличающийся тем, что, с целью исключения образования каждого волокна в отдельности и упрощения процесса, массу формуют в подогретом состоянии путем ее растяжения, а после формования продукт охлаждают.

2. Способ по п. 1, отличающийся тем, что формуемую массу подогревают до 60—80°С.

3. Способ по пп. 1 или 2, отличающийся тем, что растяжение массы ведут с градиентом сдвига в пределах 0,2—2 кг/см^2.

4. Способ по пп. 1, 2 или 3, отличающийся тем, что продукт охлаждают до 0—20°С.

Составитель **В. Трубицына**

Редактор **Н. Воликова** Техред **Л. Богданова** Корректор **О. Тюрина**

Заказ 1213/1 Изд. № 1237 Тираж 456 Подписное

ЦНИИПИ Государственного комитета Совета Министров СССР
по делам изобретений и открытий
Москва, Ж-35, Раушская наб., д. 4/5

Типография, пр. Сапунова, 2

Espacenet

Bibliographic data: GB1310005 (A) — 1973-03-14

METHOD OF PRODUCING PROTEIN-CONTAINING FOOD-STUFFS OF FIBROUS STRUCTURE

Inventor(s): TOLSTOGUZOV V B; MZHELSKY A I; CHEKHOVSKAYA V T; MIKHEEVA N V

Applicant(s): I ELEMENTOORGANICHESKIKH SOEDI ± (ORDENA LENINA INSTITUT ELEMENTOORGANICHESKIKH SOEDINENY)

Classification: - **international:** ***A23J3/28; A23L27/26; A23L29/231; A23L29/256;*** (IPC1-7): A23J3/00
- **cooperative:** A23J3/28; A23J3/285; A23L29/231; A23L29/256

Application number: GB19710026885 19710419

Priority number (s): SU19701427324 19700424

Also published as: BE765673 (A) CA924175 (A) DE2119159 (A1) FR2090572 (A5) NL148788 (B) more

Abstract of GB1310005 (A)

1310005 Imitation meat ORDENA LENINA INSTITUT ELEMENTO ORGANICHESKIKH SOEDINENY 19 April 1971 [24 April 1970] 26885/71 Heading A2B A protein containing foodstuff having a fibrous structure and resembling a meat product is obtained by forming a gelatinous preparation containing a gelling agent and an edible proteinaceous material, coagulating by heating with a solution of a polyvalent metal salt, separating the coagulate from excess liquid phase, heating, and homegenising the coagulate to form a paste, and subjecting the paste to a suddenly applied load whereby a fibrous structure, having the fibres aligned in the direction of application of the load, is formed therein.

Electronic Acknowledgement Receipt

EFS ID:	32822540
Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	Kimberly M. Maize/Shannon Stadnick
Filer Authorized By:	Kimberly M. Maize
Attorney Docket Number:	38767-0015008
Receipt Date:	06-JUN-2018
Filing Date:	06-MAR-2018
Time Stamp:	15:43:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	70510 c70613bccced909759277bbc37ab37ad4866aa07	no	1

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	1449.pdf	135514 e84413625fcd083338ff01a745b55351cf85340f	no	2
Warnings:					
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3	Foreign Reference	RU2144293C1.pdf	421913 311fc7521cfab11a83977b7c29bd307df2b7bbcc	no	7
Warnings:					
Information:					
4	Foreign Reference	SU301014A1.pdf	383573 3b4d15197a7c0d0bbf0fe6ea1ed7330383149a48	no	4
Warnings:					
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5	Non Patent Literature	Aleman_2016.pdf	5055893 1c5a3564f39273b996162bea97ca68e0f344d9e9	no	10
Warnings:					
Information:					
6	Non Patent Literature	Brown_2013.pdf	8352372 c40b43f2553a3339c42166a8d6e003f8f07d9825	no	21
Warnings:					
Information:					
7	Non Patent Literature	Carlsen_2005.pdf	6801505 e36e5767a59cb64b7fb6a81500a57a1b2e3c25d2	no	14
Warnings:					
Information:					
8	Non Patent Literature	Christlbaurer_2009.pdf	3102356 2adfe7ff12413b1f462c0094fdfcf47e03f9c5e2	no	9
Warnings:					

Information:					
9	Non Patent Literature	ESR_17210528_2018_05_14.pdf	448489 a9b77d837b42df4b1c17c730576664956d9dadcc	no	10
Warnings:					
Information:					
10	Non Patent Literature	Grunwald_2006.pdf	3536242 698671c07e773d268ad158c78e26c0f70cc81748	no	10
Warnings:					
Information:					
11	Non Patent Literature	Maqsood_2012.pdf	4969422 0ba365435f4c49675f5cd46d734a6e0b4900b25b	no	11
Warnings:					
Information:					
12	Non Patent Literature	Pazos_2005.pdf	2688327 02cc4c1f97c205c56cd24d3057a83254711c73c7	no	8
Warnings:					
Information:					
13	Non Patent Literature	Rebellato_2015.pdf	3854841 5d02fdefc3b2300b09bd4491506785e3bd137dc4	no	7
Warnings:					
Information:					
14	Non Patent Literature	Richards_2005.pdf	2946910 2e6ed6aab1ef7236854f1851fa728c9f1b510a03	no	8
Warnings:					
Information:					
15	Non Patent Literature	Richards_2007.pdf	4248450 dcd6c4cd40668271fdbc3523861633bfafc8ea8a	no	12
Warnings:					
Information:					

16	Non Patent Literature	Specht_1994.pdf	972755 0c4ff9236bfed65ee8e6a34ce013c2591340b482	no	8
Warnings:					
Information:					
17	Non Patent Literature	Vasilescu_2014.pdf	11471654 018b5ea39687115df26a2ce6d3db699c627e89e3	no	30
Warnings:					
Information:					
		Total Files Size (in bytes):	59460726		

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National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

Application Number	15/913,090
Filing Date	March 6, 2018
First Named Inventor	Rachel Fraser
Title	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
Art Unit	1791
Examiner Name	
Attorney Docket Number	38767-0015008

SIGNATURE of Applicant or Patent Practitioner

Signature	/M. Angela Parsons/	Date (Optional)	/June 11, 2018/
Name	M. Angela Parsons, Ph.D.	Registration Number	44,282
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

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Application Number	Filing Date
15/913,090	March 6, 2018

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Impossible Foods Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

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SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	
Name	Dana Wagner		
Title	Chief Legal Officer		

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Name	Registration Number
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Elizabeth Kaytor	53,103
Cameron Lutijens	58,674
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Andrea Dorigo	47,532
Angela Follett	60,365
Kimberly Maize	76,370
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Application Number	Filing Date
15/913,090	March 6, 2018

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OR

☒ I hereby appoint Practitioner(s) named in the attached list as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter, which may be an application filed after the date of this power of attorney, or identified above.

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

☐ The address associated with the above-mentioned Customer Number

OR

☒ The address associated with Customer Number: **26191**

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Impossible Foods Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	5/4/18
Name	Dana Wagner		
Title	Chief Legal Officer		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

61678968.doc

POWER OF ATTORNEY BY APPLICANT

No more than ten (10) patent practitioners total may be appointed as set forth below by name and registration number. This page need not be submitted if appointing the Patent Practitioner(s) associated with a Customer Number:

Name	Registration Number
Teresa Lavoie	42,782
M. Angela Parsons	44,282
Elizabeth Kaytor	53,103
Cameron Lutijens	58,674
Monica McCormick Graham	42,600
Andrea Dorigo	47,532
Angela Follett	60,365
Kimberly Maize	76,370
Elizabeth Capan	65,522
Michael Fleming	67,933

Electronic Acknowledgement Receipt

EFS ID:	32854874
Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	M. Angela Parsons/Judith Witzel
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0015008
Receipt Date:	11-JUN-2018
Filing Date:	06-MAR-2018
Time Stamp:	10:06:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	TransPOA.pdf	900141 d567ba6ee3920c5ea1f12c42d7e20ebfb79eed72	no	5

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing	
Information:	
Total Files Size (in bytes):	900141

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/913,090	03/06/2018	Rachel Fraser	38767-0015008

CONFIRMATION NO. 9878

26191
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022

POA ACCEPTANCE LETTER

OC000000100248302

Date Mailed: 06/14/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/11/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/mbeyene/

Attorney Docket No.: 38767-0015008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Rachel Fraser	Art Unit	:	1791
Application No.	:	15/913,090	Examiner	:	Unknown
Filed	:	March 6, 2018	Conf. No.	:	9878
Title	:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the reference listed on the enclosed PTO-1449 Form. Non-patent literature is enclosed.

This statement is being filed before the receipt of a first Office Action on the merits. Please apply any necessary charges or credits to Deposit Account 06-1050, referencing the above attorney docket number.

Please contact the undersigned if there are any questions regarding this statement.

Respectfully submitted,

Date: July 6, 2018

/Kimberly M. Maize/
Kimberly M. Maize
Reg. No. 76,370

Customer Number 26191
Fish & Richardson P.C.
Telephone: (612) 638-5707
Facsimile: (877) 769-7945

61713511.doc

Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0015008	15/913,090
		Applicant: Impossible Foods Inc.	
		Filing Date: March 6, 2018	Group Art Unit: 1791

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	--	--	--	--			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No
	--	--	--	--				

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document
	1.	[No Author Listed] Impossible Foods Inc. "GRAS Notification for Soybean Leghemoglobin Protein Derived from Pichia Pastoris." GRAS notice 000737, Retrieved from internet <URL:https://www.fda.gov/downloads/Food/IngredientsPackagingLabeling/GRAS/NoticeInventory/default.htm, 1063 pages

Examiner Signature	Date Considered

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Electronic Acknowledgement Receipt

EFS ID:	33110328
Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	Kimberly M. Maize/Shannon Stadnick
Filer Authorized By:	Kimberly M. Maize
Attorney Docket Number:	38767-0015008
Receipt Date:	06-JUL-2018
Filing Date:	06-MAR-2018
Time Stamp:	15:54:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	70222 37e8565d9b72407d82810e4c55831d01c484fc88	no	1

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	1449.pdf	123328 6cd32c622c21708a3386058661 5f98b3382c3ecb	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Non Patent Literature	GRAS_Notification_Soybean_Leghemoglobin.pdf	16322875 0be2cfd827f92640e30e9c0c934f712b5526b01e	no	1063
Warnings:					
Information:					
		Total Files Size (in bytes):	16516425		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/913,090	03/06/2018	Rachel Fraser	38767-0015008

CONFIRMATION NO. 9878

26191
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022

PUBLICATION NOTICE



Title:METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES

Publication No.US-2018-0199606-A1
Publication Date:07/19/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0015008	Application No. 15/913,090
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
		Filing Date March 6, 2018	Group Art Unit 1791

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	1.	2018/0192680	07/12/2018	Fraser et al.			
	2.	2018/0199605	7/19/2018	Fraser et al.			
	3.	2010/0178384	07/15/2010	Duan			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document

Examiner Signature	Date Considered
EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

Attorney Docket No.: 38767-0015008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Rachel Fraser	Art Unit	:	1791
Application No.	:	15/913,090	Examiner	:	Unknown
Filed	:	March 6, 2018	Conf. No.	:	9878
Title	:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the documents listed on the disclosure form submitted with this statement. Copies of the documents are being submitted with this statement to the extent required under 37 C.F.R. § 1.98(a)(2).

This statement is being filed before the receipt of a first action on the merits.

Please apply any necessary charges or credits applicable under 37 C.F.R. § 1.17(p) to deposit account 06-1050, referencing the above attorney docket number.

Please contact the undersigned if there are any questions regarding this statement.

Respectfully submitted,

Date: August 9, 2018

/Kimberly M. Maize/
Kimberly M. Maize
Reg. No. 76,370

Customer Number 26191
Fish & Richardson P.C.
Telephone: +1 (612) 638-5707
Facsimile: (877) 769-7945

61722063.doc

Electronic Acknowledgement Receipt

EFS ID:	33426868
Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	Kimberly M. Maize/Kirsten Neuman
Filer Authorized By:	Kimberly M. Maize
Attorney Docket Number:	38767-0015008
Receipt Date:	09-AUG-2018
Filing Date:	06-MAR-2018
Time Stamp:	16:55:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	PTO_1449.pdf	120867 2fc2415bee9154007345c980fac5a75a25521198	no	1

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	70865 9accd66426ef1e1b0bba4404bb5fb9b40b3a1462	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
			Total Files Size (in bytes):	191732	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Attorney Docket No.: 38767-0015008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Rachel Fraser	Art Unit	:	1791
Application No.	:	15/913,090	Examiner	:	Unknown
Filed	:	March 6, 2018	Conf. No.	:	9878
Title	:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES			

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INFORMATION DISCLOSURE STATEMENT

Please consider the documents listed on the disclosure form submitted with this statement. Copies of the documents are being submitted with this statement to the extent required under 37 C.F.R. § 1.98(a)(2).

This statement is being filed before the receipt of a first action on the merits.

Please apply any necessary charges or credits applicable under 37 C.F.R. § 1.17(p) to deposit account 06-1050, referencing the above attorney docket number.

Please contact the undersigned if there are any questions regarding this statement.

Respectfully submitted,

Date: September 24, 2018

/Kimberly M. Maize/
Kimberly M. Maize
Reg. No. 76,370

Customer Number 26191
Fish & Richardson P.C.
Telephone: +1 (612) 638-5707
Facsimile: (877) 769-7945

61751265.doc

Sheet 1 of 1

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0015008	15/913,090
		Applicant: Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date: March 6, 2018	Group Art Unit: 1791

U.S. Patent Documents							
Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate

Foreign Patent Documents or Published Foreign Patent Applications								
Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
	1.	English Translation of Baohua, "Animal products processing,", China agricultural science and technology press, 2008, pages 224-222
	2.	English Translation of Fengyi et al., "Soybean protein production and application,", China light industry press, 2004, pages 275-277

Examiner Signature	Date Considered
EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

Electronic Acknowledgement Receipt

EFS ID:	33807985
Application Number:	15913090
International Application Number:	
Confirmation Number:	9878
Title of Invention:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES
First Named Inventor/Applicant Name:	Rachel Fraser
Customer Number:	26191
Filer:	Kimberly M. Maize/Kirsten Neuman
Filer Authorized By:	Kimberly M. Maize
Attorney Docket Number:	38767-0015008
Receipt Date:	24-SEP-2018
Filing Date:	06-MAR-2018
Time Stamp:	15:34:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	70873 b54ab31b484bfff9df7003f37227c69a987afe51	no	1

Warnings:

Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	PTO_1449.pdf	122598 65f25b1ccab150a1ec7490cc5fb8bbf88dc5b9df	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Non Patent Literature	Fengyi_275-277.pdf	175619 345dabac36dffa00b2647f940312d476b2790b9d	no	3
Warnings:					
Information:					
4	Non Patent Literature	Baohua_224-222.pdf	301727 a3c7a9838b13bfe9a9d335c20f72cc127fa25087	no	5
Warnings:					
Information:					
			Total Files Size (in bytes):	670817	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
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New International Application Filed with the USPTO as a Receiving Office
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Attorney Docket No.: 38767-0015008

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Rachel Fraser	Art Unit	:	1791
Application No.	:	15/913,090	Examiner	:	Unknown
Filed	:	March 6, 2018	Conf. No.	:	9878
Title	:	METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the documents listed on the disclosure form submitted with this statement. Copies of the documents are being submitted with this statement to the extent required under 37 C.F.R. § 1.98(a)(2). A copy of a communication from a foreign patent office in a counterpart application is also being submitted.

This statement is being filed before the receipt of a first action on the merits.

Please apply any necessary charges or credits applicable under 37 C.F.R. § 1.17(p) to deposit account 06-1050, referencing the above attorney docket number.

Please contact the undersigned if there are any questions regarding this statement.

Respectfully submitted,

Date: January 18, 2019

/Kimberly M. Maize, Reg. No. 76,370/
Kimberly M. Maize
Reg. No. 76,370

Customer Number 26191
Fish & Richardson P.C.
Telephone: +1 (612) 638-5707
Facsimile: (877) 769-7945

61827318.doc

Sheet 1 of 5

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0015008	15/913,090
		Applicant: Impossible Foods Inc.	
		Filing Date: March 6, 2018	Group Art Unit: 1791

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	1.	2,934,435	4/26/1960	May			
	2.	2,934,436	4/26/1960	May			
	3.	2,955,041	10/4/1960	Broderick			
	4.	3,157,516	11/17/1964	Huber			
	5.	3,271,167	9/6/1966	Perret			
	6.	3,316,099	4/25/1967	Hoersch			
	7.	3,365,306	1/23/1968	Perret			
	8.	3,394,015	7/23/1968	Giacino et al.			
	9.	3,394,016	7/23/1968	Bidmead			
	10.	3,480,447	11/25/1969	Hack			
	11.	3,493,395	2/3/1970	Soeters			
	12.	3,519,437	7/7/1970	Giacino et al.			
	13.	3,524,747	8/18/1970	O'Hara			
	14.	3,532,514	10/6/1970	May			
	15.	3,532,515	10/6/1970	Broderick			
	16.	3,578,465	5/11/1971	van der Zijden			
	17.	3,615,600	10/26/1971	Zevenaar			
	18.	3,620,772	11/16/1971	Nagayoshi			
	19.	3,642,497	2/15/1972	Gunther			
	20.	3,645,753	2/29/1972	Gasser			
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EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0015008	Application No. 15/913,090
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
		Filing Date March 6, 2018	Group Art Unit 1791

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EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Examiner Signature	Date Considered

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Examiner Signature	Date Considered

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Sheet 5 of 5

Substitute Disclosure Form U.S. Department of Commerce Patent and Trademark Office **Information Disclosure Statement by Applicant** (Use several sheets if necessary) (37 CFR §1.98(b))	Attorney Docket No. 38767-0015008	Application No. 15/913,090
	Applicant Impossible Foods Inc.	
	Filing Date March 6, 2018	Group Art Unit 1791

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EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

PATENT SPECIFICATION

1,032,334

NO DRAWINGS

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Application made in Switzerland (No. 579) on Jan. 15, 1965.
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COMPLETE SPECIFICATION

Flavouring Agent

We, NESTLÉ'S PRODUCTS LIMITED, a Company incorporated in the Bahama Islands, of Peek Building, George Street, Nassau, Bahama Islands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention is concerned with the production of flavouring preparations having a taste similar to that of meat and which may be used for enhancing the flavour of foods.

The Maillard reaction, which has been known for some time, takes place when substances containing amino acids or proteins are heated in the presence of mono- or polysaccharides. The reaction is characterized by a development of aroma and a browning of the reactants. The resulting aroma makes the reaction of some use in the preparation of flavouring agents similar in taste to caramel or bread crust.

It is generally thought that the development of the characteristic "roasted" flavour during the preparation of meat extract is due, at least in part, to this reaction. However, the reaction is extremely complex, and its mechanism has not yet been fully understood. Hence it is not possible to specify the result, even when the reaction is carried out with selected known starting materials.

Recent researches have revealed that the presence of sulphur is essential in the formation of the characteristic flavour of roast meat. Furthermore, it is known that meat contains significant quantities of glutathion, and it is likely that this substance contributes to the development of the characteristic taste of roast meat. On the other hand, the juice of raw muscle has been found to contain appreciable quantities of free amino acids and pentose and hexose phosphate esters. It is thus probable that the aroma of meat derives at least partly from the reaction of glutathion with the amino acids and sugars.

Processes involving the Maillard reaction have been described for the preparation of flavouring agents having an aroma which resembles that of roast meat. The preparation of a product similar in taste to roast meat has been described, starting from, for example, cystine or cysteine, a monosaccharide such as xylose and one or more amino acids. According to the known processes, the reaction of the components is effected in the presence of water, under certain specific conditions which may be summarized as follows:

The quantity of water used is 5 to 1500 times the quantity of monosaccharide and the reaction takes place under reflux. The ratio of cystine or cysteine to monosaccharide is 0.4:1 to 2:1.

However, the products obtained by this process are relatively weak and somewhat unstable. Furthermore, such processes involve the evaporation under vacuum of a highly dilute solution or freeze-drying of the mixture, which involves a substantial loss of volatile aromas; additionally, the large quantities of water present also require considerable installations. Consequently, such processes tend to be rather costly.

It is an object of the present invention to provide a simple and economical process for preparing a flavouring agent which has a strong aroma and is also highly stable.

The invention accordingly provides a process for preparing a flavouring agent having a taste similar to that of meat extract, which comprises reacting together, at an elevated temperature and in aqueous solution or suspension, containing less than 30% by weight of water, a natural substance containing a free -SH group, a monosaccharide and at least one amino acid, the weight ratio of the -SH group containing substance to monosaccharide being from 0.05:1 to 0.4:1.

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As is stated above, the reaction mixture contains less than 30% by weight of water. The weight ratio of amino acid to sulphur-containing compound should advantageously be from 50:1 to 500:1.

Of the natural substances containing a free -SH group, particularly preferred are glutathion and cysteine, used either singly or together. If desired, the gluthathion and/or cysteine may be used in the form of a hydrolysate of a natural proteinaceous substance, particularly an enzymatic hydrolysate of yeast, blood or liver.

As sources of amino acids, particularly suitable are acid, alkaline or enzymatic hydrolysates of animal or vegetable proteins, for example acid hydrolysates of meat, blood or wheat gluten. Alternatively, artificial mixtures of pure amino acids may also be used.

Such hydrolysates should preferably be decolorized and deodorized before use, for example by heating at an elevated temperature with active charcoal. The dilute hydrolysate obtained after this treatment may then be concentrated to a paste containing, for example, 80-90% total solids.

Hydrolysates obtained by the action of hydrochloric acid contain a certain quantity of sodium chloride which, however, does not affect the reaction. The hydrolysate used as a source of amino acids, in the form of a viscous paste, is heated to about 70°C to make it easier to handle.

The process according to the invention may, for example, be carried out as follows:

An intimate mixture of a pentose, for example xylose or ribose, and/or a hexose, and a natural substance containing an -SH group, such as cysteine, glutathion, or an enzymatic hydrolysate of yeast, blood or liver is added to the amino acid or acids provided, for example, by a protein hydrolysate, containing 30 to 70% of amino acids, which has been decolorized and deodorized as described above. The hydrolysate which provides the sulphur containing compound may be concentrated to a paste of at least about 80% solids, and should contain 0.1 to 2.0% of glutathion and/or cysteine. Alternatively, if the hydrolysate is to be stored, it may be dried after concentration and, when used, be mixed with a suitable quantity of water, so that the desired concentration of solid matter is obtained. If desired, the ribose and the sulphur-containing compound may be provided by a yeast hydrolysate.

The reaction itself is preferably effected with agitation, at a temperature of 80 to 110°C, preferably at about 90°C. Under the influence of the heat, the mass first of all foams and then turns brown. Depending on the reactants and also the desired taste of the final product, the reaction time may vary from 10 minutes to 6 hours. Upon completion of the reaction, the mixture is neutralized with sodium hydroxide.

The finished paste may be filled directly into storage containers, where it solidifies. Preferably, the product should be stored in well-filled closed containers, at temperatures below 10-15°C. In this manner the product will remain unaltered, even after an extended period of storage.

According to one preferred embodiment of the invention, the flavour of the product may be further enhanced by incorporating a lactate in the reaction mixture, for example calcium or potassium lactate. Preferably, this addition is made before the end of the reaction, for example by adding the corresponding base and lactic acid to the hydrolysate containing amino acids, before this hydrolysate is concentrated. The lactate concentration in the final product may be up to about 25%, but is preferably in the range 10-15% by weight.

It is also possible to improve further the quality of the product by adding inosinic or 5¹-guanylic acid or a salt of these acids.

The flavouring agents produced by the process according to the invention may be dissolved in water and, in this form, used as seasonings for foodstuffs.

The following examples illustrate the carrying out of the process according to the invention which, however, is not limited to the conditions set out therein. The perencentages are percentages by weight.

EXAMPLE 1

90 kg of wheat gluten are hydrolysed with hydrochloric acid by heating under reflux or under pressure. The hydrolysate is then neutralized with sodium hydroxide or carbonate, to pH 5—6.5. The insoluble matter is removed by filtration and the filtered solution evaporated until precipitation of salt commences. After standing for several weeks, the solution is again filtered and 7 kg of 90% lactic acid and 3 kg of active charcoal (Carboraffin C or Norite) are added. The mixture is then heated to 75°C and stirred for 2 hours. 4 kg of potassium hydroxide, dissolved in water, are then added, the solution is filtered to remove the charcoal and the pH of the filtrate adjusted to a value between 5 and 6.5.

The yellow solution is evaporated to a paste containing 85 to 88% solids. The 115 kg of paste thus obtained are mixed with 1500 g xylose and 300 g of cysteine and heated in a stainless steel kettle for 30 to 60 minutes at 95°C. A highly aromatic paste, resembling meat extract, is thus obtained.

When the heating is stopped, 5.0 litres of 30% sodium hydroxide and 120 g of sodium guanylate or inosinate, or a mixture of both, may be added, giving a product which may be used as a substitute for meat extract. On being dissolved in water, the paste provides

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a very good seasoning for foodstuffs, having a marked meaty taste.

EXAMPLE 2

Fresh or extracted meat, for example scraps from the production of meat extract, is hydrolysed with hydrochloric acid, and one proceeds as described in Example 1. Meat scraps from slaughterhouses may equally well be used. Fish meal, on the other hand, is only suitable when trimethylamine has been completely removed.

The animal protein hydrolysates are then reacted as described in Example 1, thus obtaining a flavouring agent. For strengthening the taste of the product, the quantity of cysteine-xylose mixture may be increased, up to about 5% of the hydrolysate. The cysteine/xylose ratio should, however, be maintained at about 0.2:1.

EXAMPLE 3

2.5 kg commercial dry yeast (Torula utilis) are suspended in 20 litres of hot water. The temperature is maintained at 95°C for 10 minutes, and one then cools to 80°C.

10 g of papain 1:350 are added and the pH is adjusted to 7.0 After 6 hours' reaction, the mixture is heated at 95°C for 10 minutes and the pH is adjusted to 6.0. The suspension is then filtered and the residue washed with hot water. The combined filtrates are evaporated under vacuum, giving 1.8 kg of a yellow paste containing 83% solids and about 0.7% of glutathion and/or cysteine.

5.2 kg of fresh meat (muscle, tripe, liver, kidney) are finely ground and hydrolysed at 135°C for 4 hours with 1.25 kg of concentrated hydrochloric acid. The hydrolysate is then neutralized with 700 g of sodium carbonate and filtered. 160 g of lactic acid and 60g of active charcoal are added and the mixture is heated for 90 minutes at 70°C. 300 g of 30% potassium hydroxide are then added and the product is filtered. A yellow filtrate is obtained which is evaporated under vacuum to give 2 kg of a yellowish paste containing 86% solids and about 60% of amino acids.

1.8 kg of yeast hydrolysate and 2.0 kg of meat hydrolysate, prepared as described above, are mixed well with 450 g of cane sugar and 90 g of xylose. The resulting paste is heated with stirring for about one hour at 90°C. The product is then cooled to 70°C and 120 mls of 30% sodium hydroxide are added. Finally, 45 g of sodium inosinate are initimately mixed into the paste.

4.3 kg of an aromatic product are obtained which is very similar to meat extract.

WHAT WE CLAIM IS:—

1. A process for preparing a flavouring agent having a taste similar to that of meat extract, which comprises reacting together, at an elevated temperature and in aqueous solution or suspension containing less than 30% by weight of water, a natural substance containing a free -SH group, a monosaccharide and at least one amino acid, the weight ratio of the -SH group containing substance to monosaccharide being from 0.05:1 to 0.4:1.

2. A process according to claim 1 in which the substance containing a free -SH group is cysteine.

3. A process according to claim 1 or claim 2 in which the substance containing a free -SH group is glutathion or cysteine contained in an hydrolysate of a natural proteinaceous substance.

4. A process according to claim 3 in which the hydrolysate is an enzymatic hydrolysate of yeast, liver or blood.

5. A process according to any one of the preceding claims in which the weight ratio of amino acid to sulphur-containing substance is from 50:1 to 500:1.

6. A process according to any one of the preceding claims in which the amino acid is supplied by a concentrated, decolorized and deodorized hydrolysate of animal or vegetal proteins.

7. A process according to claim 6 wherein said hydrolysate is an acid hydrolysate of blood, meat or wheat gluten.

8. A process according to any one of the preceding claims in which the monosaccharide is at least one pentose or hexose.

9. A process according to claim 8 in which the pentose is ribose or xylose.

10. A process according to any one of the preceding claims in which the reaction is effected in the presence of a lactate.

11. A process according to claim 10 in which lactic acid and a base of calcium or potassium are added to the amino acid or substance supplying the amino acid and the total quantity of lactate corresponds to not more than about 25% by weight of the reaction mixture.

12. A process according to any one of the preceding claims in which inosinic acid, 5¹-guanylic acid or a salt or mixture of said acids is added to the flavouring agent.

13. A process as claimed in claim 1 substantially as herein described with reference to any of the Examples.

14. A flavouring agent whenever prepared by a process as claimed in any one of the preceding claims.

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COMPLETE SPECIFICATION

Flavoring Compositions

We, INTERNATIONAL FLAVORS & FRAGRANCIES INC., a Corporation organized under the laws of the State of New York, United States of America, of 521, West 57th Street, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to novel meaty flavoring compositions and to the processes for preparing them, and more specifically, it relates to methods for preparing poultry flavor and the products obtained thereby.

Food products enhanced with poultry-like flavors are well-known and have long been used. There is considerable demand for poultry-flavored products in which the actual poultry meat such as chicken, turkey, duck and the like is not needed or is actually undesirable. For example, in the preparation of some sauces and purees, the poultry flavor is desired, but it is necessary to cook the food with the desired poultry and then to remove the meat by straining or some similar operation to obtain the final product ready for use.

Additionally, where weight, space, and/or storage capability are a problem, e.g., when a convenience food is prepared, the presence of the actual poultry meat may be undesirable because it will deteriorate in storage and spoil the food. Moreover, there are occasions when sterilizing or otherwise preserving the natural product is extremely deleterious to the flavor of the natural material, and the desired natural flavor is lost.

This invention provides methods for the production of poultry flavors which are indistinguishable from the natural flavor.

This invention also provides essentially natural poultry flavors which are suitable for incorporating into a wide range of foodstuffs.

Further and more specific objects, features and advantages will clearly appear from the detailed description given below, taken in connection with the accompanying examples which illustrate certain preferred embodiments of this invention.

In one aspect of this invention an edible flavor composition is produced by heating a reaction mixture of a (1) sulfur-containing polypeptide, or a mixture of amino acids, at least one of which is sulfur-containing and (2) thiamine to produce a reaction product. This heating is carried out for a period of time sufficient to develop a flavor of poultry or fowl in the mixture. The edible reaction products produced by this process are novel poultry flavoring materials, or bases, and can also produce other sweet meaty flavor notes. Edible compositions having enhanced flavor and which comprise a food and the aforesaid reaction product are further contemplated by this invention.

The term "polypeptide" as used herein means a lower polypeptide, such as dipeptide or tripeptide, and includes a mixture of amino acids which compose said polypeptide. Glutathione is illustrative of such a polypeptide. A mixture of glycine, cysteine and glutamic acid is exemplary of a mixture of amino acids one of which is sulfur-containing. It will be understood herein that such a mixture of amino acids need not contain each acid in the proportion in which the acid is obtained by the breakdown of a peptide.

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Thus, while equal parts of glycine, cysteine, and glutamic acid are produced from glutathione, a mixture of one part of glycine, three parts of cysteine, and one part of glutamic acid can also be utilized. In the amino acid mixtures used in this invention, cysteine can for example, be replaced by cystine.

These sulfur-containing polypeptides can be added in admixture with inert materials, such as for example inorganic or organic salts, or they can be added in the form of commercially available materials. Where available, they can also be added in the form of the pure compounds themselves.

In another aspect of this invention the flavor composition can contain certain lower alkyl carbonylic materials. Accordingly, preferred poultry flavor compositions are obtained by a combination of the reaction product described above with a ketonic material and an alkyl aldehyde. The aldehyde and the ketonic material can be admixed with the thiamine and sulfur-containing amino compound prior to the heating to produce the reaction mixture or the aldehydic and ketonic materials can be added to the reaction product. It is generally preferred to add these lower alkyl carbonylic materials after heating the thiamine and sulfur-containing polypeptide or sulfur-containing amino acid mixture, since the carbonylic materials are volatile, and losses thereof may occur during the heating.

The ketonic materials used in this invention are butter-flavored and preferably lower alkanones and hydroxy-substituted alkanones containing from about 4 to 8 non-quaternary carbon atoms such as diacetyl, acetylmethylcarbinol, and acetylpropionyl. The alkyl aldehydes are preferably the lower aldehyde containing from about five to about eight carbon atoms. Especially preferred are pentanal, hexanal, and heptanal.

It will be understood that the sulfur-containing polypeptide, or amino acid mixture thiamine, and carbonylic materials can be admixed with inert carriers; they can be added in the form in which they are commercially available; or they can be added in pure form. Where thiamine is used, it will be understood that it can be added in such forms as thiamine hydrochloride. Similarly, when individual amino acids are utilized they can be in the form of a substance which will yield them under the reaction conditions. For example, they can be in the form of the hydrochloride.

It has been found in preparing the reaction product of this invention that the ingredients are desirably heated in a vehicle, such as water at reflux temperatures, a triglyceride fat, and the like. Some of the best results are obtained when the ingredients are heated in a triglyceride fat, and accordingly, it is preferred to carry out the process in the presence of a triglyceride fat.

Where triglyceride fats are used in this invention it will be understood that the term includes esters (generally triesters) of glycerol with fatty acids, the fatty acids predominantly ranging in carbon chain length from about ten carbon atoms to about 22 carbon atoms. The term triglyceride fat will be understood to mean both fats and oils. It is preferred that the triglyceride fats be refined, bleached, and deodorized. The triglyceride fats can be in their natural form or they can be hydrogenated.

In practicing this aspect of the invention quantities of added amino acids, such as β-alanine, or of nucleotides can be used. The preferred nucleotides used in the practice of this invention are mixtures of disodium inosinate and disodium guanylate. Generally the fat is present in much greater quantity than the other components of the mixture, the quantity of fat usually being on the order of from about ten to over 100 times the weight of the total of the sulfur-containing polypeptide and thiamine present. All parts, percentages, proportions, and ratios herein are by weight, unless otherwise indicated.

Further, the polypeptide and thiamine are preferably used in approximately equal amounts, although it will be understood that either one can exceed the quantity of the other by a factor of five or more. Where L-cysteine is used in conjunction with glycine and glutamic acid, the amounts of glycine and of glutamic acid can range from about 0.1 to about ten times the amount of cysteine used. It will be understood, however, that where both glutamic acid and glycine are used, equal amounts of each are not required. The carbonylic material is present in generally lesser amounts than the amount of the polypeptide. It is preferred that each carbonylic material be present in amounts ranging from about 0.05 to about 0.5 times the amount of the amino compound being used.

The time and temperature used in the practice of the process must be so interrelated that the desired poultry flavor is produced. It has been found in practicing this invention that the desired poultry flavor is marked in many cases, and particularly with the preferred ingredients, by the change in appearance of the mixture to a yellow color. It will be understood that the term "yellow color" means a yellowing of the reaction material beyond its original hue. The formation of a definite brown color in the mixture is to be avoided, for such a color generally indicates that heavy burnt notes which are uncharacteristic of the true poultry flavor have been imparted to the reaction mixture.

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The reaction is sufficiently easy to control that the proper extent of heating can readily be determined simply by heating the reaction mixture for a sufficient period to produce the desired poultry flavor. In many instances the color formation is a conventional indicator. Where the flavor composition of this invention is added to a food which is to be subsequently heated or cooked, as taught herein, the reaction time can be reduced, and in some of these cases heating the polypeptide and thiamine can even be eliminated.

In practicing this process, it is preferable to utilize temperatures of at least 200°F. in order to accomplish the reaction in a reasonable length of time. Generally, temperatures much above 420°F. make the reaction difficult to control and may well produce uncharacteristic burnt notes, even with very short reaction times. Accordingly, it is preferred to carry out the reaction at temperatures of from about 200°F. to about 420°F.

The process can be carried out on a batch basis in small quantities of, say, 50—100 grams or it can be carried out batch-wise on much larger quantities of, say 50 kg. It has been found desirable in large scale production to conduct the heating continuously in high heat transfer-rate heat exchangers. With such exchangers the reaction mixture can quickly be brought to the reaction temperature and then quickly cooled in a second exchanger to a lower temperature at which no further color change will take place. A preferred embodiment of this invention utilizes a scraped-wall heat exchanger. Generally, higher temperatures can be used in high heat transfer-rate heat exchangers than can be used in batch production. The use of temperatures at the upper end of the range in batch production tends to cause localized overheating, rapid reaction and off-flavors and odors. A preferred temperature range for both batch and continuous processes is from about 250° to about 400°F.

The correct time of heating can readily be determined by observation of the flavor produced and, in many instances, the color. When color is used as an indicium and the heat exchanger is not transparent, the ingredients are fed into the exchanger and the temperature and contact time are adjusted to obtain the preferred yellow coloration of the product. Generally, it is preferred to utilize times on the order of from about one-quarter minute to about three hours. In batch operation, it is preferred to use times on the order of from about ten minutes to about three hours. Shorter times on the order of from about one-quarter to about three minutes at 250°—400°F. are preferably used in high heat transfer-rate heat exchangers.

The flavor compositions of this invention can be used to flavor gravies, sauces, soups, dressings salads, aspices, purees, and the like without any further treatment. On the other hand, they can be admixed with carrier materials or with other flavoring ingredients or foodstuffs for incorporation into finished products.

The following examples are given to illustrate embodiments of the invention as it is now preferred to practice it. It will be understood that these Examples are illustrative and the invention is not to be considered as restricted thereto except as indicated by the appended claims.

EXAMPLE I

The following mixture is prepared:

Ingredients	Parts
Fat	642.67
Salt	321.65
Glutamic acid	5.14
L-cysteine hydrochloride	10.28
β-Alanine	1.28
Glycine	5.14
Thiamine hydrochloride	10.28
Mixture of disodium inosinate and disodium guanylate	3.34

One hundred grams of the foregoing mixture is heated for 10—15 minutes at a temperature of about 350—390°F. A yellow color is obtained.

After cooling, 0.12 parts of diacetyl and 0.10 parts of hexanal are added. The mixture has an excellent chicken flavor. This chicken flavor is suitable for use in gravies, sauces, soups, and the like. In the foregoing reaction mixture, the cysteine can be substited by cystine or glutathione with excellent results. By varying the proportions of the individual ingredients a number of different poultry flavor can be produced. Exemplary of poultry flavor notes produced by the processes of this invention are chicken, turkey, duck, goose, and the like.

While the foregoing Example has disclosed novel poultry flavors and the process for obtaining them, it will be understood that this invention is further applicable to the preparation of edible compositions having other types of sweet meaty flavor notes. For example, the method of this invention can also be used to produce pork flavors by slight variations in the proportions of the ingredients. The edible compositions so produced can be combined with other flavor ingredients such as smoky materials to give a bacon flavor or spices to produce a ham flavor or a sausage flavor. Where a pork flavor note is to be produced, the intensity of yellowing produced by heating is generally not as deep as when a poultry flavor is desired.

EXAMPLE II

To produce an edible composition having a pork flavor note, the following mixture is prepared:—

Ingredients	Parts
Lard	648.12
Salt	323.20
β-Alanine	.50
Glutamic acid	6.4
Glycine	6.4
Thiamine hydrochloride	6.4
Mixture of disodium inosinate and disodium guaylate	6.4
L-cysteine hydrochloride	6.4

About 386 grams of the foregoing mixture is heated at a temperature of 365°F. for five to ten minutes to obtain a light yellow color.

After cooling, 0.04 parts of each of diacetyl and hexanal are added to the reaction product. The mixture has an excellent pork flavor. This pork flavor is combined with other materials to produce excellent ham, bacon and sausage flavors. In the foregoing reaction mixture, the cysteine can be substituted by cystine or glutathione with excellent results.

EXAMPLE III

The following mixture is prepared:—

Ingredients	Parts
Fat	642.67
Salt	321.65
Glutamic acid	5.14
L-cysteine hydrochloride	10.28
β-Alanine	1.28
Glycine	5.14
Thiamine hydrochloride	10.28
Mixture of disodium inosinate and disodium guanylate	3.34

The foregoing mixture is continuously fed to a scraped-wall heat exchanger where it is heated for ½ minute at 325°F. The mixture is then immediately cooled to 100°F. in a second scraped-wall heat exchanger.

After cooling, 0.12 parts of diacetyl and 0.10 parts of hexanal are added. The mixture has an excellent chicken flavor which is suitable for use in gravies, sauces, soups, and the like.

EXAMPLE IV

The following mixture is prepared:—

Ingredients	Parts
Fat	642.67
Salt	321.61
Glutathione	10.00
β-Alanine	1.28
Thiamine hydrochloride	10.28
Mixture of sodium inosinate and disodium guanylate	3.34

This mixture is heated as in Example I and after cooling 0.12 parts of diacetyl and 0.10 parts of hexanal (50% pure) are added. The mixture so produced has a very good chicken flavor.

The novel edible compositions of this invention comprise a food and the novel flavor composition prepared as described above. If desired, the flavor composition can be admixed directly with the food, or it can first be blended with other food additives and then admixed with the food. Additives suitable for admixture with the flavor compositions of this invention include carriers, thickeners, condiments, spices, encapsulating agents, vehicles, coloring agents, other flavoring materials, flavor intensifiers, and the like. For example, the flavor compositions of this invention can be admixed with food additives such as alginates, allspice, ascorbic acid, basil, capsicum extract, onion oil, oregano extract, pyroligneous acid, sage oil, sodium citrate, thyme, monosodium glutamate, and the like.

Carriers are useful in extending the flavor compositions of this invention. Such carriers do not appreciably affect the quality of the flavor, but they frequently stabilize the flavor compositions and increase their shelf life. Saccharides such as gum arabic are useful for this purpose, as are mixtures of salts and suitable carbohydrates such as karaya, tragacanth, carboxymethylcellulose, and the like.

In formulating the edible compositions according to this invention, a small but effective amount of the flavor composition is added to the food to impart a chicken, turkey, duckling, pork, or other sweet-type meat flavor The novel flavor compositions of this invention will also enhance such flavors in foods which already has a sweet meaty flavor. It will be understood that the amount of flavor composition used depends upon a variety of factors, and accordingly, can vary over a wide range. The factors which determine the amount of flavor composition of this invention to be used are the intensity of flavor desired, the specific reaction mixture and/or carbonylic materials employed, the reaction conditions, the type of food to which it is added, and the cooking or other treatment to which the total edible composition will be subjected prior to consumption. Generally, from about 0.1 to about 15 parts of the poultry flavor composition is added to each 100 parts of the food to be flavored, and preferably from about 0.2 to about 10 parts of the flavor composition is used for each 100 parts of the food. The flavor composition of this invention can be added to meat-containing or to meatless foods. For example, it can be added to beef, lamb, pork, chicken, turkey, duckling, and the like, or to gravies, ragouts, soups, fricassees, spreads, dips, salads, pot pies, dressings, sauces, pates, purees, snack products such as crackers, marinades, and the like.

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EXAMPLE V

A chicken-flavored bouillon mix is prepared by admixing the following ingredients:

Ingredients	Parts
Salt-fine	1.50
Malto-Dextrin	1.10
Monosodium glutamate	0.40
Vegetable protein hydrolysate	0.40
Onion flavor	0.17
Celery stalk powder	0.10
Celery seed powder	0.03
Garlic powder	0.02
White pepper powder	0.02
Chicken flavor of Example III	0.50

If desired, coloring material can be added to the foregoing mix to obtain the desired shade.

A bouillon is prepared from the foregoing composition by adding 40 parts of boiling water to the mix and stirring to disperse the ingredients. A bouillon having an excellent chicken flavor is obtained.

EXAMPLE VI

A mix for the preparation of chicken-flavored gravy is prepared by blending the following ingredients:—

Ingredients	Parts
All-purpose flour	360.0
Cornstarch	120.0
Non-fat dry milk solids	80.0
Dextrose	40.0
Chicken flavor of Example III	270.0
Monosodium glutamate	40.0
Onion powder	16.0
Celery stalk powder	4.0
Chicken spice	8.0

About 9.7 parts of the gravy mix is thoroughly dispersed in 100 parts of cold water. The dispersion is then brought to a boil and simmered for two minutes. A gravy having an excellent chicken flavor is obtained.

WHAT WE CLAIM IS:—

1. A flavor composition comprising the reaction product obtained by heating a mixture of (1) a sulfur containing polypeptide or a mixture of amino acids, at least one of which is sulfur containing and (2) thiamine, and wherein, if desired, there is added during or after the heating an alkanone or hydroxy-substituted alkanone having four to eight non-quaternary carbon atoms and an alkyl aldehyde having 5 to 8 carbon atoms.

2. A flavor composition according to claim 1, in which the heating is carried out until the reaction product has a yellow color.

3. A flavor composition according to claim 1 or 2, in which the heating has been at a temperature in the range of 200°F. to 420°F.

4. A flavor composition according to any one of the preceding claims, in which the heating has been for a period of time in the range of 10 minutes to three hours.

5. A flavor composition according to any one of the preceding claims, wherein the reaction mixture is heated in the presence of a triglyceride fat.

6. A flavor composition according to any one of the preceding claims, wherein the triglyceride fat is present in the range of from 10 to 100 times the weight of the mixture.

7. A flavor composition according to any one of the preceding claims, wherein the amino acid mixture is a mixture of cysteine, glycine and glutamic acid.

8. A flavor composition according to any one of the preceding claims, wherein there is added during or, preferably, after heating diacetyl and hexanal.

9. An edible composition comprising a food and an amount of the flavor composition according to any one of the preceding claims effective to impart a sweet meaty flavor.

10. An edible composition according to claim 9, wherein said flavor composition is present in the range of 0.1 to 15 parts by weight for each 100 parts of the food.

11. A process for preparing a flavor composition which comprises heating a mixture of (1) a sulfur-containing polypeptide or a mixture of amino acids, at least one of which is sulfur-containing and (2) thiamine, and, if desired, adding to the mixture either during or after heating an alkanone or hydroxy-substituted alkanone having from four to eight non-quaternary carbon atoms and an alkyl aldehyde having 5 to 8 carbon atoms.

12. A process according to claim 11, in which the heating is carried out until the reaction product has a yellow color.

13. A process according to claim 11 or 12, in which the heating is at a temperature in the range of 200°F. to 420°F.

14. A process according to any one of claims 11 to 13, in which the heating is for a period of time in the range of 10 minutes to 3 hours.

15. A process according to any one of claims 11 to 14, in which the reaction mixture is heated in the presence of a triglyceride fat.

16. A process according to any one of claims 11 to 15, in which the triglyceride fat is present in the range of from 10 to 100 times the weight of the mixture.

17. A process according to any one of claims 11 to 16, in which the amino acid mixture is a mixture of cysteine, glycerine and glutamic acid.

18. A process according to any one of claims 11 to 17, wherein there is added during or, preferably, after heating diacetyl and hexanal.

19. A process for preparing a flavor composition substantially as described.

20. A flavor composition whenever prepared by the process substantially as described.

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COMPLETE SPECIFICATION

NO DRAWINGS

Seasoning Compositions

We, AJINOMOTO CO., INC., a corporation organized under the law of Japan, of No. 7, 1-chome, Takara-cho, Chuo-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to seasoning compositions and to food products containing the same.

Recently, the demand for seasonings which can contribute a beef or meat-like flavor to foods has increased, and it is expected that such demand will further significantly increase in the future. However, the supply of beef extracts is limited and suitable seasonings are currently in short supply.

Up to the present time, much research has been conducted relating to determination of the chemical constituents of meat itself, the soluble components of meat and the components of beef extracts. Materials such as creatinine, 5'-inosinic acid, hydroxyproline and so forth are indicated in literature relating to such research to be essential to the flavor of meat. However, we have found that the flavour and taste of a mixture of these materials, was significantly different from a beef or meat-like flavour.

According to the present invention, there is provided a seasoning composition comprising a mixture of amino acids, at least one non-toxic and edible organic acid, at least one phosphate, and at least one 5'-nucleotide.

The seasoning materials of the invention possess a beef or meat-like flavour and are capable of imparting a beef or meat-like flavour to foods. The seasoning materials can be used as a partial or complete replacement for beef extract.

Thus, according to the invention, amino acids, organic acids, phosphates and 5'-nucleotides are mixed together as essential constituents of the seasoning material. Alanine, histidine, arginine, threonine, methionine, leucine and glutamic acid are essential amino acids for the seasoning materials of the invention, without which a beef or meat-like flavour is not obtained.

The total amount of alanine, histidine, arginine, threonine, methionine and leucine employed in the composition is preferably more than 30% by weight of the total quantity of added amino acids, exclusive of glutamic acid. In addition, the amount of organic acids is preferably limited to less than three times by weight of the total quantity of amino acids, exclusive of glutamic acid.

Among the amino acids suitable for use in the compositions of the invention are alanine, histidine, lysine, threonine, methionine, leucine, arginine, glutamic acid, aspartic acid glyceine, isoleucine, valine, proline, serine, phenylalanine, tyrosine and tryptophan. These amino acids are employed for the purpose of providing a feeling of increased flavour body known as "mouthfullness".

Six kinds of amino acids (namely, alanine, histidine, arginine, threonine, methionine and leucine) plus the additional amino acid, glutamic acid, are especially important for realizing a beef or meat-like flavour. Further, even more effective results are obtained when employing lysine, aspartic acid, glycine, isoleucine, valine, proline, serine, phenylalanine, tryptophan and tyrosine, together with the seven above-mentioned amino acids. As indicated above, the total amount of the six first-mentioned amino acids should preferably be more than 30% by weight of the total quantity of all amino acids used, exclusive of the glutamic acid.

[Price 4s. 6d.]

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When the percentage amount is under 30%, it is most difficult to realize a satisfactory beef or meat-like flavour and the optimum percentage amount is under 30%, it is most difficult to realize a satisfactory beef or meat-like flavour and the optimum percentage range is from about 40-60%.

The precise quantitative balance between these six amino acids cannot be readily precisely determined, but according to our experiments it is desirable that the quantity of alanine employed should be larger than that of any of the other amino acids. It is not essential to employ in the compositions amino acids other than the above-mentioned seven amino acids. For example, the beef or meat-like flavour of the seasoning will not be appreciably influenced if, for example, pyroline and serine are excluded. The amino acids employed in the compositions of the invention are preferably of high purity in aroma, taste and colour.

Generally speaking, it is not desirable to employ in the compositions amino acid mixtures, such as soy sauce, or the amino acid mixtures prepared by hydrolysis of various kinds of protein, because of the somewhat strange odours peculiar thereto. However, refined products of these amino acid mixtures are useful as sources of amino acids to be employed in the present compositions; for example when the refined products of said amino acid mixtures are supplemented by the addition of other amino acids, a mixture of suitable amino acid balance can be obtained for realizing a beef or meat-like flavour.

A further essential component of the seasoning material of the invention comprises one or more organic acids. Such organic acid(s), together with amino acids and 5′-nucleotide(s), are especially effective for simulating more closely a balanced beef-extract flavour. Among the suitable organic acids, lactic acid and succinic acid are the most effective, and one or more organic acids selected from tartaric acid, fumaric acid, malic acid, citric acid, gluconic acid, pyruvic acid and α-ketoglutaric acid are also useful for use in the compositions. The only criteria in the choice of the organic acid is that the acid should be non-toxic and edible.

The quantitative ratio between the amino acids content (exclusive of glutamic acid) and the organic acids content of the seasoning compositions is also of importance. More specifically, as mentioned above, the total quantity by weight of organic acids, as free acids, should be limited to less than three times the weight of amino acids. If organic acids are employed in an amount appreciably exceeding the limitation mentioned above, the acidic taste of the product is increased and the flavour changes substantially from the desired beef or meat-like flavour. Generally speaking, a range of from 0.1 to 2 parts by weight, calculated as free acid, based on the weight of amino acids, is the preferred range. The use of succinic acid, which provides a dimension to the flavour of the composition is desirable, but it is undesirable to employ too much succinic acid because it tends to give foods a shell-fish like flavour.

In processes for preparing the seasoning compositions when, for example, lactic acid in liquid form is employed as organic acid together with other components, the products are usually obtained in pasty or damp state, whereas when, for example, the calcium salt of lactic acid is employed, the product is in a powdery form.

Examples of phosphates which can be employed in the compositions of the invention include potassium, sodium and ammonium salts of phosphoric acid, which are typical materials effective for adding to the seasoning mouth-fullness or mouth satisfaction. Organic phosphates, such as phosphoethanolamine, phosphoserine, Na-glycerophosphate and β-Na-glycerophosphate have similar effect to inorganic phosphates and can also be used. The quantity of the above-mentioned phosphates should be limited to less than 0.5 parts by weight, calculated in terms of P_2O_5, based on one part by weight of amino acids (exclusive of glutamic acid), because a larger proportion of phosphate produces a strong salty taste in the composition. The normal lower limit to the phosphate content is about 0.05.

The alteration of the pH value of a foodstuff by employment of certain phosphates may have an effect on the contribution of a beef or meat-like flavour to the foodstuff. Therefore, it is desirable to employ phosphates such as KH_2PO_4, K_2HPO_4, NaH_2PO_4, Na_2HPO_4, $NH_4H_2PO_4$ and $(NH_4)_2HPO_4$, being phosphates which are obtained by neutralizing phosphoric acids with NaOH, KOH, ammonia and other alkalis, in order to keep the pH value of the seasoning mixtures in the range of from 4.5 to 7.5 when they are dissolved in water, since this pH range has a positive influence on the preferable flavour.

Examples of 5′-nucleotides suitable for use in the seasoning materials include 5′-inosinic acid, 5′-guanylic acid, 5′-adenylic acid and 5′-xanthylic acid. Of these, 5′-inosinic acid and 5′-guanylic acid are usually employed. The quantity of 5′-nucleotide employed (calculated as free acid) should be more than 0.01 parts by weight for each part of amino acids (exclusive of glutamic acid) employed in the seasoning composition.

As examples of suitable organic acids,

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there have been listed above monocarboxylic and polycarboxylic acids containing one and two or three carboxyl groups, respectively.

Although NaCl is generally a necessary component for contributing a beef or meat-like flavour to foods, it is usually unnecessary to include a separate amount of NaCl in the seasoning compositions of the invention because it is already present in almost all foodstuffs.

In addition to amino acids, organic acids, phosphates, 5'-nucleotides and NaCl as stated above, the use of sweetening materials (e.g. sugars and artificial sweetening materials), peptides, soluble high molecular substances (e.g. starch or gelatine) minor amounts of nitrogen-containing compounds and/or minerals is also effective for adjusting the flavour of the present seasoning compositions closer to that of meat. However, as these substances are frequently supplied as components of other seasonings or foodstuffs with or to which the present seasoning is applied, it is not always necessary actually to employ these substances in the seasoning materials.

As mentioned in detail hereinbefore, the seasoning compositions of the present invention are of high quality and capable of contributing a beef or meat-like flavour to a wide variety of food products. These seasonings are prepared very easily by admixture of the above-mentioned materials, which are obtainable by industrial means, instead of by employing meat from animals. The present seasoning compositions constitute an excellent replacement for high-grade beef extract and the flavouring effect of the compositions is approximately 3 times as strong as that of beef extract. With the seasoning compositions of the invention a beef or meat-like flavour can be imparted to many kinds of foods. Thus, by employment of the present seasoning compositions not only can the beef or meat-like flavour of processed foods, such as sausage, ham, canned meat and bottled meat be enhanced, but economies can be made on meat use by partial replacement thereof.

The powder form seasoning compositions of the invention can be produced easily, because the various ingredients employed are easily commercially obtainable in crystal or powder form. The above powder form seasoning material is very convenient for application to foods and processed food. The present seasoning can also be readily produced in paste or granule form.

In the use of the seasoning of the present invention, the colours of the foods are not affected because the seasoning has practically no colour of its own. It is, however, readily possible to give to the seasoning compositions any desired colour or supplementary aroma.

The following Examples illustrate the invention.

EXAMPLE 1

A seasoning composition was prepared by mixing the following ingredients: 15 g of an amino acid mixture which was prepared by mixing the following six amino acids in the specified amounts, namely —10.43 g of DL-alanine, 1.86 g of L-histidine, 3.98 g of L-leucine, 3.29 g of L-arginine, 1.88 g of DL-methionine and 2.58 g of L-threonine; together with 4.4 g of monosodium glutamate monohydrate, 1.25 g of disodium inosinate 7.5 hydrate, 16.7 g of calcium lactate, 0.56 g of sodium tartrate, 2.37 g of potassium dihydrogen phosphate, 0.63 g of disodium hydrogen phosphate 12 hydrate, 3.0 g of sodium chloride and 5.0 g of glucose.

Ten grams of the mixture obtained were added to 1.5 litres of tap water and after the pH value of the solution had been adjusted to 5.1, the solution was boiled for 3 minutes. After cooling the solution, it was offered for an organolephtic test by a panel of 49 members specially trained for this kind of test. As a result of the test, 42 persons indicated that the flavour of the thus obtained solution was very similar to that of an extracted soup obtained by boiling fresh beef meat, especially in respect of the flavour in the mouth.

EXAMPLE 2

An amino acid mixture was prepared by mixing 20.9 g of DL-alanine, 6.5 g of L-arginine, 4.2 g of monosodium L-aspartate monohydrate, 17.8 g of monosodium L-glutamate monohydrate, 3.9 g of glycine, 3.7 g of L-histidine, 4.7 g of L-isoleucine, 7.9 g of L-leucine, 12.4 of L-lysine hydrochloride, 3.8 g of DL-methionine, 5.3 g of L-phenylalanine, 5.2 g of L-threonine, 1.7 g of DL-triptophan, 5.4 g of L-tyrosine, 7.2 g of L-valine and 1.5 g of L-ornithine. 23 g of this amino acid mixture was mixed with 2.0 g of disodium inosinate 7.5 hydrate, 33.5 g of calcium lactate, 2.0 g of sodium tartarate, 3.5 g of succinic acid, 4.7 g of potassium dihydrogen phosphate, 1.3 g of disodium hydrogen phosphate 12 hydrate, 10 g of glucose, 6 g of sodium chloride, 6 g of creatinine, 2 g of glycine betain hydrochloride, 3.0 g of ammonium chloride, 1.0 g of cornstarch and 3.0 g of lactose to produce a seasoning composition.

Ten grams of the thus prepared mixture was dissolved in 1.5 litres of tap water and the pH value of the solution was adjusted to 5.0. The solution was cooled after boiling for 3 minutes and was marked as solution A. 0.7%, 1.4% and 2.1% solutions of top-grade beef extracts were prepared by dissolving the beef extracts in hot water and were marked solutions.

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An organolephic test for the similarity of flavour between solution A (in which the concentration of included materials was 0.7% by weight) and solutions B (in which the concentrations were 0.7%, 1.4% and 2.1% by weight) was performed by employing a panel of 49 members.

All members of the panel indicated the similarity of A and B and indicated that the flavour of solution A was substantially that of beef extract. 47 persons of the panel also indicated that the flavour of the solution B having a concentration of 2.1% by weight, was closest to that of solution A. It appeared, therefore, that the flavouring effect of the above-indicated seasoning composition is approximately 3 times that of beef extract.

EXAMPLE 3

A seasoning composition was prepared following a similar procedure to that described in Example 2, except that 0.5 g of disodium inosinate 7.5 hydrate and 0.5 g of disodium guanylate were employed in place of the 2 g of disodium inosinate 7.5 hydrate and that the ammonium chloride was omitted.

An 0.7% solution of the thus obtained mixture was prepared in the same way as mentioned in Example 2 and was marked as solution C. All members of the panel mentioned in Example 2 indicated that this solution also tasted like beef and had a milder sweetness than solution A.

It was also shown by the result of the following test that the taste of the above-prepared seasoning composition was very similar to that of meat. According to such test, beef soup stock was prepared as follows. 4 kg of fresh beef meat (beef shank meat) was cut into small pieces and these were boiled in 1 litre of water for 1.5 hours and then filtered with gauze to give a filtrate amounting to 800 ml. As a result of a panel test, all members of the panel (20 members) indicated the very intimate similarity of flavour between the artificially prepared seasoning composition and the above-mentioned soup stock.

EXAMPLE 4

An amino acids mixture was prepared by mixing and grinding to a powder 6.2 g of DL-alanine, 3.9 g of monosodium L-aspartate monohydrate, 4.1 g of monosodium L-glutamate monohydrate, 1.4 g of glycine, 1.1 g of L-histidine, 1.4 g of L-isoleucine, 2.5 g of L-leucine, 4.2 g of L-lysine hydrochloride, 1.1 g of DL-methionine, 0.38 g of L-phenylalanine, 1.7 g of L-proline, 1.3 g of L-serine, 0.78 g of L-threonine, 0.91 g of L-tyrosine and 2.1 g of L-valine. 30 g of this mixture was mixed with 2.5 g of dosodium inosinate 7.5 hydrate, 33.5 g of calcium lactate, 1.1 g of sodium tartarate, 4.5 g of succinic acid, 4.7 g of potassium dihydrogen phosphate, 1.3 g of disodium hydrogen phosphate 12 hydrate, 10 g of glucose, 3 g of ammonium chloride, 6 g of sodium chloride, 3 g of cornstarch and 1 g of lactose and the mixture was ground to a powder.

Meat sausage was prepared by adding 8 g of the above composition to 1.5 kg of sausage meat at the beginning of preparation of the sausage and meat sausage was also prepared for comparison purposes by adding only 5 g of monosodium L-glutamate to the same quantity of sausage meat.

A preference test in respect of the flavour of the sausages was carried out, with the result that 25 persons of a panel (whose members totalled 33) preferred the flavour of the sausage containing the seasoning composition to that of the comparison sausage.

EXAMPLE 5

A gravy sauce (sauce of roast beef) was prepared as follows: 400 ml of water, 15 g of sodium chloride, 4 g of cornstarch and a small amount of spice were added to 30 g of commercial beef extract of high grade and the mixture was boiled for 5 minutes with agitation. The thus obtained gravy sauce was marked as sauce A. Gravy sauce was also prepared as above, but employing 15 g of the seasoning composition prepared in Example 4 in place of the 30 g of commercial beef extract and was marked as sauce B.

Organoleptic tests were performed employing a panel of 27 members to compare the flavour of the above-prepared gravy sauces A and B. As a result of a difference test, no significant difference was found between A and B. In addition, no significant difference between A and B was obtained as a result of a preference test; namely, 15 persons indicated that A was more preferable, but 12 persons preferred B.

EXAMPLE 6

Three different kinds of soup were prepared as follows:

A: One kilogram of fresh beef meat (beef shank meat) was cut into small pieces and boiled with 4 litres of tap water. To the thus obtained broth, 250 g of fresh onions, 100 g of fresh carrot, 100 g of fresh celery, 50 g of fresh leek, a laurel leaf and 0.5 g of pepper were added and the resulting preparation was boiled for 2 hours with a weak flame. The thus obtained broth was filtered and 14 g of NaCl were added to the broth, to give 2 litres of soup which was marked as a soup A.

B: 2 litres of soup B was similarly prepared, except that only 200 g of beef meat was employed.

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C: Soup C was prepared by adding 3.5 g of the seasoning composition prepared in Example 2 to soup B and heating it for 5 minutes.

An organoleptic test was performed with a panel of 28 members who had been specially trained for this kind of test. As a result of comparison of the flavour between the three soups, the panel members indicated as follows:

(1) All members of the panel indicated that soup A was of meat identity, but that soup B had a vegetable flavour.

(2) 26 members of the panel indicated that soup C had more of a beef or meat-like flavour than soup B.

(3) When the flavour effects of soup A and soup C were examined, 15 of the panel preferred soup A and 12 preferred soup C

Therefore, it appeared that the seasoning composition of the invention is extremely useful as a substitute for meat.

EXAMPLE 7

A dry soup powder was prepared by mixing the following materials: 35 g of beef fat, 5.5 g of sage-thyme-pepper, 2.5 g of garlic powder, 3.0 g of carrot powder, 2.0 g of caramel colour, 40.0 g of beef extract, 44 g of sugar, 180 g of salt, 1.0 g of onion powder, 35 g of monosodium glutamate and 50 g of commercial hydrolyzed vegetable protein. Another soup was also prepared in similar manner, but employing 12 g of beef-extract instead of the above 40 g and also employing 9 g of the seasoning powder prepared in Example 2.

45 g of each dry soup was dissolved in 2 litres of hot water. The obtained soups were offered for a difference test by the triangle method organoleptically by a panel of 49 persons as mentioned in Example 2. Only 18 persons of the panel answered correctly. Therefore, it was considered that no significant difference existed between the control soup and the soup containing the seasoning composition.

A test of the quality of these soups was performed by 5 expert evaluation panels and they indicated that there were no significant differences in the quality of the two kinds of soup.

EXAMPLE 8

A slice of mutton about 0.7 cm thick was carved and both sides were smeared with the seasoning material prepared in Example 4 in an amount of 0.4 per cent based on the meat. To the thus obtained mutton was added 0.5 per cent NaCl and the mixture kept for 3 hours at 5°C. Almost equal degrees of roasting were effected on both sides of the meat with an oiled iron plate on a gas range, whereafter an aroma of roasted beef was percieved. By organoleptic judgements from 5 specialized test panels, it was shown that the flavour of the thus cooked mutton was very similar to that of beef.

WHAT WE CLAIM IS:—

1. A seasoning composition comprising a mixture of amino acids, at least one non-toxic and edible organic acid, at least one phosphate, and at least one 5′-nucleotide.

2. A composition according to Claim 1, wherein the amino acids mixture includes the amino acids glutamic acid, alanine, histidine, arginine, threonine, tethionine and leucine.

3. A composition according to Claim 2, wherein the amount of said amino acids, exclusive of the glutamic acid, is more than 30% by weight of the total amount of amino acids in the composition, exclusive of glutamic acid.

4. A composition according to any preceding claim, wherein the amino acids and/or organic acid(s) are in the form of the free acids, their salts or mixtures thereof.

5. A composition according to any preceding claim, wherein the amount of organic acid in the composition is not more than three times the weight of the total amino acids in the composition, exclusive of glutamic acid.

6. A composition according to Claim 5, wherein the amount of organic acid in the composition, based on the weight of free organic acid, is from 0.1 to 2 times the weight of amino acids therein, exclusive of the glutamic acid.

7. A composition according to any preceding claim, wherein the organic acid(s) is/are selected from lactic, succinic, tartaric, fumaric, malic, citric, gluconic, pyruvic and α-ketoglutaric acids, and mixtures thereof.

8. A composition according to any preceding claim, wherein the 5′-nucleotide(s) is/are selected from 5′-inosinic acid, 5′-guanylic acid, 5′-adenylic acid and 5′-xanthylic acid and mixtures thereof.

9. A composition according to any preceding claim, wherein 5′-nucleotide is employed in an amount which is more than 0.01 times the weight of the total amino acids, exclusive of glutamic acid.

10. A composition according to any preceding claim, wherein phosphate is present in an amount of not more than 0.5 times, calculated as P_2O_5, the weight of the total amino acids, exclusive of glutamic acid.

11. A composition according to any preceding claim, wherein the phosphate comprises one or more of inorganic phosphates, phosphoethanolamine, phosphoserine, Na-glycerophosphate, and β-Na-glycerophosphate.

12. A composition according to Claim 2 or any of Claims 3 to 12 and Claim 2,

wherein said amino acids, constitute about 40-60% of the total weight of amino acids employed, exclusive of the glutamic acid.

13. A composition according to any preceding claim, wherein the amino acids mixture includes one or more of lysine, aspartic acid, glycine, isoleucine, valine, proline, serine, phenylalanine and tyrosine.

14. A composition according to any preceding claim, wherein the organic acid is a carboxylic acid.

15. A composition according to any preceding claim, wherein an organic acid in liquid form is employed to result in the formation of a composition in pasty form.

16. A composition according to any of Claims 1 to 14, wherein each ingredient is employed in powder, granule or crystal form to result in the formation of a composition in dry, particulate form.

17. A composition according to any preceding claim and further comprising at least one sweetening material, peptide, soluble high molecular substance, nitrogen-containing compound and/or mineral substance.

18. A seasoning composition having a beef or meat-like flavour, substantially as described in any foregoing Example.

19. A food product, comprising a foodstuff and, in seasoning quantity, a seasoning composition as claimed in any preceding claim.

20. A food product according to Claim 19, wherein the foodstuff comprises a processed food.

21. A food product according to Claim 19 or 20, wherein the foodstuff consists at least in part of meat.

22. A food product according to Claim 19, 20 or 21, wherein the foodstuff comprises beef extract.

23. A food product, substantially as described in the foregoing Example 4, 6, 7 or 8.

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1,082,504

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COMPLETE SPECIFICATION

Flavouring Compositions

We, CHAS. PFIZER & CO. INC., a corporation organized under the laws of the State of Delaware, United States of America, of 235, East 42nd Street, New York 17, State of New York, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to new and useful flavoring compositions. More particularly, it is concerned with mixtures comprising reaction products of sugars with amino acids, vegetable protein hydrolysates and 5'-ribonucleotides, which are useful in imparting a beef-type flavor to foods.

The beef flavor in many commercially-available foods such as soups and gravies is obtained by the incorporation therein of a product known as beef extract. Beef extract is prepared by a time-consuming and expensive process which generally comprises acid hydrolysis of the meat tissue from slaughtered cattle. In a commonly employed commercial procedure, the meat is hydrolyzed and then the mixture is neutralized and concentrated until the liquid portion has largely evaporated and there remains a brown and substantially completely hydrolyzed residue, the so-called beef extract. This procedure is expensive in that it requires fairly large equipment and much heat to convert a large quantity of beef tissue into the relatively small quantity of concentrated extract which is finally obtained.

Beef extract is a commodity which normally is imported into the United States from areas where meat is relatively low in cost and the processing expenses are minimized. As with many imported commodities, the price of beef extract tends to fluctuate with the season of the year and is sometimes affected by the competitive demand for cuts of meat for table use. Furthermore, it is noticed that the quality of the extract tends to vary since the manufacturers are forced at times to use predominantly poorer cuts of meat for extract preparations. This generally results when prevailing market conditions force prices of the better cuts too high. As a result of these problems, means have long been sought to free food processsors from dependence on beef extract. It has now been found that through use of the flavoring compositions of the present invention it is possible to dispense with beef extract in the preparation of beef flavored foods. This is accomplished by replacing beef extract with compositions prepared from commercially-available chemical and vegetable materials which are stable in price and some of which are expected to be available at steadily decreasing prices in the future. A particularly important advantage of the new compositions is found in comparison of their price with that of beef extract, the use of beef extract in the preparation of foods costs about three times as much as the use of the flavoring compositions of this invention.

It is, therefore, a principle object of the present invention to provide a meatless beef-flavored composition which can replace all or part of beef extract in food.

A further object of this invention is to provide compositions for obtaining meatless beef-flavored foods at a substantial savings in cost.

A still further object of this invention is to provide flavoring compositions which are of uniform quality, readily available in all seasons and economical to use.

These and other objects of the present invention are readily obtainable through use of the composition of this invention which is, in essence:

a) the beef flavored substance formed by heating a compound selected from the group consisting of hexose and pentose monosaccharides with cysteine in the presence of water;

[F]

b) vegetable protein hydrolysate in an amount to provide from 5 to 15 parts by weight per part of said beef-flavored substance; and

c) a 5′-ribonucleotide selected from the group consisting of inosinic acid, guanylic acid, physiologically-acceptable salts thereof and mixtures of these in an amount to provide from 0.5 to 1.5 parts by weight per part of said beef-flavored substance.

Special mention is made of an embodiment of this invention, which provides an especially pleasing and well-balanced beef-flavor: a composition as defined hereinabove which includes a compound selected from the group consisting of glutamic acid and physiologically acceptable salts thereof in an amount to provide from 5 to 15 parts by weight per part of said beef-flavored substance.

Also contemplated by the present invention is an embodiment wherein the said hexose is dextrose and the said pentose is arabinose. This provides compositions with an excellent balance of flavor and economy.

Still another embodiment contemplated by the present invention is the mild-flavored composition as defined hereinabove wherein for each part by weight of beef-flavored substance there is provided from 0.05 to 0.5 parts of alanine and of glycine.

A further embodiment of the present invention with especially mild flavor and a lack of bitterness when used in high concentrations is a composition as defined hereinabove wherein for each part by weight of said beef-flavored substance there is provided from 1 to 4 parts of sucrose.

An embodiment of the present invention which has been found by taste panel testing to be fully equivalent to beef extract in every respect comprises:

a) the beef-flavored substance formed by heating dextrose and arabinose with cysteine in the presence of water;

b) vegetable protein hydrolysate in an amount to provide from 5 to 15 parts by weight per part of said beef-flavoured substance;

c) monosodium glutamate in an amount to provide from 5 to 15 parts by weight of said beef-flavored substance;

d) sucrose in an amount to provide from 1 to 4 parts by weight per part of said beef-flavored substance;

e) alanine and glycine, each in an amount to provide from 0.05 to 0.5 parts by weight per part of said beef-flavored substance; and

f) a mixture consisting of 1 part of inosinic acid per part by weight of guanylic acid, said mixture being present in an amount to provide from 0.5 to 1.5 parts by weight per part of said beef-flavored substance.

The ingredients of the above mentioned compositions are readily obtainable either commercially, or by synthesis.

With respect to the "beef-flavored substance", designated a) the teachings of Specification No. 836,694, and of the examples herein, are illustrative.

The monosaccharide used to make the beef-flavored substance may be a pentose or hexose or mixtures of both. Illustrative pentose are ribose, arabinose, xylose; illustrative hexoses are glucose, dextrose, fructose.

The term "vegetable protein hydrolysate" are used herein contemplates artificial digests of protein derived by acid, enzymatic or other hydrolysis of vegetable proteins such as a mixture of plant proteins occurring in cereal grains, especially wheat, and known as gluten. The said protein hydrolysates, which are freely available commercially, comprise the constituent amino acids representative of the source protein.

The term "physiologically-acceptable salts" as used herein and in the appended claims contemplates non-toxic alkali metal, alkaline earth metal and organic base salts of 5′-ribonucleotides, of which inosine-5′-phosphoric acid, also well known in the art as inosinic acid, is a member of special importance, and glutamic acid. Particular mention is made of the sodium and calcium salts, which are desirable because of their ready availability and low toxicity. Also important are the potassium salts, the ammonium salts and the salts with glycine and other non-toxic organic bases.

It has been found that, in addition to, or in place of inosinic acid, other 5′-ribonucleotides may be employed in the practice of the instant invention. In this connection, special mention is made of certain 5′-ribonucleotides derivable from a commonly employed source of inosinic acid, namely, yeast ribonucleic acid: cytidine-5′-phosphoric acid, uridine-5′-phosphoric acid and guanosine-5′-phosphoric acid; this latter substance commonly is referred to as guanylic acid.

It is critical to this invention that there is present all three ingredients set forth hereinabove; the beef-flavored substance, the vegetable protein hydrolysate and the 5′-ribonucleotide, in order for the composition to serve adequately as a replacement for beef extract. For example, in taste panel testing of the replacement of beef extract in a soup-base with the novel composition, the herein disclosed and claimed mixture is completely acceptable while mixtures without the vegetable protein hydrolysate and mixtures without the 5′-nucleotides are decidedly bitter and not an adequate replacement at all.

For the practice of this invention it is important to maintain the ratio of vegetable protein hydrolysate to beef-flavored substance as disclosed herein and as set forth in the appended claims. If more than about 15 parts by weight of hydrolysate per one part of beef-flavored substance is used, then the

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beef taste is not as pronounced anymore. If, on the other hand, the amount of hydrolysate is such as to provide less than about 5 parts per part of beef-flavored substance, there begins to be noticed a distinctly bitter flavor note.

Also, in the practice of this invention it is very desirable to maintain the ratio of 5'-ribonucleotide to beef-flavored substance as disclosed herein. If more than 1.5 parts by weight of the said nucleotide are present for each part of the beef-flavored substance, the economic advantage of the present invention is diminished, and if less than 0.5 parts of the nucleotide are present per part of the beef-flavored substance, there begins to be noticed a tendency for the beef flavor to be reduced.

It is found that a particularly effective ratio for a beef extract type preparation with well-balanced mild flavor and economy is 1:10:0.65 parts of beef-flavored substance per part of vegetable protein hydrolysate per part of 5'-ribonucleotide, respectively.

As will be exemplified hereinafter, the flavoring compositions are obtained and may be used in the form of substantially dry solids or pastes or in solutions. When the flavoring compositions are used as replacements for beef extract, a certain amount of adjustment in the concentration may be needed depending on individual preference and the nature of the final product in order to arrive at the most desirable flavor or essence. These adjustments are well within the ability of those skilled in the art and, as is obvious, the need for such adjustments by the consumer is largely abviated by providing a synthetic mixture of this invention with a flavoring strength equivalent to that of beef extract. Such a composition can readily be made by suitable selection of concentrations and will be exemplified hereinafter.

The present invention, in one of its embodiments especially useful to prepare beef-flavored gravy with roast meat flavor and odor, contemplates a composition as defined above wherein for each part of the said beef-flavored substance there is provided from 5 to 15 parts of edible fat. As will be exemplified, to obtain the strongest roast meat flavor it is necessary to heat the fat together with the other ingredients to a temperature of at least 90° C. and to maintain the temperature for at least 10 minutes.

With respect to the edible fat, both animal and vegetable fats may be used. For example, pork fat and beef fat, margarine, butter and safflower oil can be employed. While the reactions leading to roast meat odor and flavor are not clearly understood, the heating together of the mixture under these conditions leads to a very pleasing product, different from that obtained when fat is not present.

The amount of edible fat can be varied. Based on the beef-flavored substance, for example, there can be used from 5 to 15 parts of fat per part of beef-flavored substance or even more. There appears to be no disadvantage inherent in a decrease of fat below 5 parts. An especially pleasing result is obtained when there is provided 8 parts of fat per part of beef-flavored substance.

A convenient method of combining the ingredients to form the present novel composition comprises:

a) heating in admixture a compound selected from the group consisting of hexose and pentose monosaccharides with cysteine in the presence of water until a beef-flavored mixture is obtained and

b) adding for each part by weight of said beef-flavored mixture from 5 to 15 parts of vegetable protein hydrolysate and from 0.5 to 1.5 parts of a 5'-ribonucleotide as defined above and heating for about two hours at at least 70° C.

The beef-flavored substance is formed conveniently by mixing cysteine with about four parts by weight of monosaccharide and about 5 parts of water, heating to 90—100° C for 2 hours, cooling to 55° C and adjusting to pH 6.9 with 50% aqueous NaOH. This is then treated with about one-half its weight of water and the vegetable protein hydrolysate and 5'-nucleotide are added, then the mixture is heated for about 2 hours at 70° C, cooled and homogenized to obtain a heavy, honey-like paste in an especially convenient form for consumer use.

The following examples are illustrative of the novel compositions of the present invention. They are not intended to limit the inventive compositions, many variations of which are possible.

Example I

A beef-flavored composition is prepared by adding 25 ml. of water to a mixture of 12.5 g. of dextrose, 9.75 g. of arabinose and 6.5 g. of cysteine hydrochloride, heating the mixture to 100° C. for 2 hours, cooling to 55° C., adjusting from pH 3.2 to pH 6.9 with 50% aqueous sodium hydroxide, adding 35 ml. of water, 275 g. of vegetable protein hydrolysate and 18 g. of a mixture of 1 part of inosinic acid per part by weight of guanylic acid, then heating for 2 hours at 70° C., cooling and stirring until a smooth, honey-like consistency is obtained.

Example II

A beef-flavored composition is obtained by dissolving 12.05 g. of dextrose, 9.75 g. of arabinose, 9.75 g. of monosodium glutamate, 6.5 g. of cysteine, 4.65 g. of alanine and 3.3 g. of glycine in 300 ml. of water. The mixture is heated at 100° C. with vigorous stirring for two hours, then is nuetralized to pH 6.7 with 30.5 cc. of 10% aqueous

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NaOH. The mixture is concentrated at 75—80° C. until there is obtained a beef-flavored substance with the consistency of honey and a dark brown color.

The beef-flavored substance, 261.3 g. of vegetable protein hydrolysate, 59.75 g. of sucrose and 97.80 g. of monosodium glutamate and 17.15 g. of a mixture of 1 part of inosinic acid per part by weight of guanylic acid are dissolved in 500 ml. of water and heated at 100° C. with vigorous stirring for 6 hours. The substance is cooled and is suitable as a replacement for beef extract.

EXAMPLE III

A beef-flavored composition eminently suitable for preparing gravy with a roast meat odor and flavor is prepared by the procedure of Example II, adding 200 g. of prime beef fat to the 500 ml. of water before the final heating step. After heating at 100° C. for 6 hours, 165 g. of fat is skimmed off leaving the product, 698 g., including 118 g. of water, which can be used to make gravy.

EXAMPLE IV

Beef-flavored compositions are prepared by the procedure of Example I, substituting for the dextrose the following hexoses: glucose and fructose; and for the arabinose the following pentoses: ribose and xylose. Substantially the same results are obtained.

EXAMPLE V

Beef-flavored compositions are prepared by the procedure of Example I, substituting respectively for the mixture of inosinic acid and guanylic acid, disodium inosinate, dipotassium inosinate, calcium inosinate, diammoniuum inosinate, and for the monosodium glutamate, glutamic acid, monopotassium glutamate, monocalcium di-glutamic acid and monoammonium glutamate. Fully acceptable beef-flavored compositions are obtained, some of which are suitable for use by those whose dietart needs require restriction of their intake of sodium.

EXAMPLE VI

The procedure of Example III is repeated substituting for the beef fat an amount of margarine to provide 8 parts by weight based on the beef-flavored substance. An eminently satisfactory gravy base is obtained.

EXAMPLE VII

The procedure of Example II is repeated substituting for the amino acids, sugars, vegetable protein hydrolysate and 5'-ribonucleotides at the ratios set out a series of compositions providing different ratios. Satisfactory beef-flavored compositions are obtained with the following tabulated mixtures:

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TABLE I—Flavoring Compositions

arabinose-dextrose-cysteine*, parts	veg. protein hydrolysate, parts	5′-ribonucleotide parts	alanine, parts	glycine, parts	sucrose, parts	MSG**, parts
1	10	0.65	0.18	0.09	2.3	7.65
1	10	0.65	0.18	0.09	2.3	5.0
1	10	0.65	0.18	0.09	2.3	15.0
1	5	0.65	0.18	0.09	2.3	7.65
1	15	0.65	0.18	0.09	2.3	7.65
1	10	0.50	0.18	0.09	2.3	7.65
1	10	1.5	0.18	0.09	2.3	7.65
1	10	0.65	0.05	0.09	2.3	7.65
1	10	0.65	0.5	0.09	2.3	7.65
1	10	0.65	0.18	0.05	2.3	7.65
1	10	0.65	0.18	0.5	2.3	7.65
1	10	0.65	0.18	0.09	1.0	7.65
1	10	0.65	0.18	0.09	4.0	7.65

* Combined weight of beef-flavored substance
**MSG—Monosodium glutomate.

EXAMPLE VIII

The procedure of Example III is repeated substituting the flavoring compositions in Table I, Example VII, and using, respectively, 5 and 16 parts of prime beef fat per part of arabinose-dextrose-cysteine mixture. Beef-flavored gravy bases with roast meat odor and flavor are obtained.

WHAT WE CLAIM IS:—

1. A process for preparing a beef-flavored substance which comprises heating in admixture, a hexose or pentose monosaccharide with cysteine, in the presence of water, until a beef-flavored mixture is obtained, adding for each part by weight of said beef-flavored mixture from 5 to 15 parts of vegetable protein hydrolysate and from 0.5 to 1.5 parts of a 5′-ribonucleotide and heating for about 2 hours at at least 70° C.

2. A process according to claim 1 wherein the 5′-ribonucleotide is inosinic acid, guanylic acid, or a physiologically-acceptable salt of the aforesaid acids or mixtures thereof.

3. A process according to claim 2 or 3, wherein cysteine is mixed with about 4 parts by weight of monosaccharide and about 5 parts of water, the mixture is heated to 90—100° C. for 2 hours, cooled to 53° C., adjusted to pH 6.9 with 50% aqueous sodium hydroxide, then treated with about one-half its weight of water followed by addition of vegetable protein hydrolysate and 5′-ribonucleotide, heating the mixture, cooling and then homogenizing.

4. Process according to any one of the preceding claims wherein there is included, prior to heating of the mixture for about 2 hours at at least 70° C., glutamic acid or a physiologically acceptable salt thereof in an amount to provide from 5 to 15 parts by weight per part of the beef-flavored substance.

5. A process according to any one of the preceding claims wherein the hexose is dextrose and the pentose is arabinose.

6. A process according to any one of the preceding claims wherein for each part by weight of beef-flavored substance, there

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is provided .05 to 0.5 parts of alanine and glycine.

7. A process according to any one of the preceding claims wherein for each part of beef-flavored substance, there is provided from 1 to 4 parts of sucrose.

8. A process according to any one of the preceding claims wherein for each part of beef-flavored substance there is provided from 5 to 15 parts of edible fat.

9. A process for preparing a beef-flavored substance substantially as described herein with particular reference to the Examples herein.

10. A beef-flavored substance whenever prepared by a process according to any one of the preceding claims.

11. A flavoring composition comprising:

a) the beef-flavored substance formed by heating a hexose or a pentose monosaccharide with cysteine in the presence of water;

b) vegetable protein hydrolysate in an amount to provide from 5 to 15 parts by weight per part of said beef-flavored substance and

c) a 5'-ribonucleotide in an amount to provide from 0.5 to 1.5 parts by weight per part of said beef-flavored substance.

12. A flavoring composition according to claim 11 which includes glutamic acid and physiologically-acceptable salts thereof in an amount to provide from 5 to 15 parts by weight per part of said beef-flavored substance.

13. A flavoring composition according to claim 11 or 12 wherein the hexose is dextrose and the pentose is arabinose.

14. A flavoring composition according to any one of claims 11—13 wherein for each part by weight of beef-flavored substance there is provided from 0.05 to 0.5 parts of alanine and of glcine.

15. A flavoring composition according to any one of claims 11—14 wherein for each part by weight of the beef-flavored substance there is provided from 1 to 4 parts of sucrose.

16. A flavoring composition according to any one of claims 10—15 wherein for each part of the beef-flavored substance there is provided from 5 to 15 parts of edible fat.

17. A flavoring composition according to any one of claims 10—16 comprising:

a) the beef-flavored substance formed by heating dextrose and arabinose with cysteine in the presence of water;

b) vegetable protein hydrolysate in an amount to provide from 5 to 15 parts by weight per part of said beef-flavored substance;

c) monosodium glutamate in an amount to provide 5 to 15 parts by weight of said beef-flavored substance;

d) sucrose in amount to provide from 1 to 4 parts by weight per part of said beef-flavored substance;

e) alanine and glycine, each in an amount to provide from 0.05 to 0.5 parts by weight per part of said beef-flavored substance; and

f) a mixture consisting of about 1 part of inosinic acid per part by weight of guanylic acid, said mixture being present in an amount to provide from 0.5 to 1.5 parts by weight per part of said beef-flavored substance.

18. A flavoring composition according to claim 17 wherein there is present edible fat in an amount to provide from 5 to 15 parts by weight per part of the beef-flavored substance.

19. A flavoring composition substantially as described herein with particular reference to the Examples herein.

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COMPLETE SPECIFICATION

ERRATUM

SPECIFICATION No. 1,084,619

Page 1, line 36, *delete* "by the various" second occurrence

THE PATENT OFFICE
4th June 1968

This invention relates to novel food flavoring compositions and to processes for producing them, and more particularly, it relates to novel meat flavors and meat flavoring compositions and to the processes for producing them.

Reproduction of the flavor and aroma of meats and meat-based products has been the subject of a long and continuing search by food and fragrance chemists. The severe shortage of foods, especially protein foods, in many parts of the world has given rise to the need for utilizing non-meat sources of proteins and making such proteins as palatable and as meat-like as possible. Hence, flavoring and aromatic materials which will closely simulate or exactly reproduce the flavor and aroma of meats and meat products are urgently needed.

Moreover, there are a great many meat-containing or meat-based foods presently distributed in a preserved form, examples being condensed soups, dried meats, freeze-dried or lyophilized meats, packaged gravies, and the like. These products contain meat or meat extracts, but frequently the fragrance and taste are changed by the various by the various processing operations, and it would be desirable to supplement or enhance the flavors of these preserved meat foods. A good source of meat flavor and aroma would also be highly useful as an element in or supplement to known meat flavoring and aromatic compositions.

This invention provides compositions having meat fragrance, aroma or flavor and the ability to act either as a meat flavor or aroma, a meat

can be formed in situ during the cooking or other preparation of the food product, or can be partially formed at one stage and reacted to completion at a subsequent stage such as after addition to the food product and during its cooking or other preparation. The process of this invention comprises reacting a sulfur-containing compound in the presence of organic carboxylic acid and adding sufficient of the product to the food. The reaction of the sulfur-containing material in the presence of the carboxylic acid is carried out by heating the two materials together, preferably in a suitable liquid reaction medium.

The novel fragrance and flavor compound of the compositions of this invention is a material having the empirical formula $C_{16}H_{14}O_3S$. This material is produced according to a process in which it is formed by the reaction of certain sulfur substances in the presence of organic carboxylic acids, and the resulting material is recovered and isolated.

Fig. 1 is an infra-red absorption spectrum of the material, and

Fig. 2 is a high-resolution nuclear magnetic resonance (NMR) spectrum of this material.

For convenience herein, the $C_{16}H_{14}O_3S$ material, as further elucidated by the accompanying drawings, will be referred to as the "meat peak material". The meat peak material possesses a very strong, intense, and pure aroma of freshly roasted meat, such as beef, pork, chicken, or ham. When the meat peak material is added to other flavoring materials or to edible compositions, it imparts this aroma

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Flavoring Compositions

We, INTERNATIONAL FLAVORS & FRAGRANCES, INC., a Corporation organized under the laws of the State of New York, United States of America, of 521 West 57th Street, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to novel food flavoring compositions and to processes for producing them, and more particularly, it relates to novel meat flavors and meat flavoring compositions and to the processes for producing them.

Reproduction of the flavor and aroma of meats and meat-based products has been the subject of a long and continuing search by food and fragrance chemists. The severe shortage of foods, especially protein foods, in many parts of the world has given rise to the need for utilizing non-meat sources of proteins and making such proteins as palatable and as meat-like as possible. Hence, flavoring and aromatic materials which will closely simulate or exactly reproduce the flavor and aroma of meats and meat products are urgently needed.

Moreover, there are a great many meat-containing or meat-based foods presently distributed in a preserved form, examples being condensed soups, dried meats, freeze-dried or lyophilized meats, packaged gravies, and the like. These products contain meat or meat extracts, but frequently the fragrance and taste are changed by the various by the various processing operations, and it would be desirable to supplement or enhance the flavors of these preserved meat foods. A good source of meat flavor and aroma would also be highly useful as an element in or supplement to known meat flavoring and aromatic compositions.

This invention provides compositions having meat fragrance, aroma or flavor and the ability to act either as a meat flavor or aroma, a meat flavor base, or as an enhancer for other meat fragrance and meat flavoring materials and a method for producing such compositions.

Briefly, the compositions of this invention are edible meat-flavored compositions formed by admixing with, adding to, or incorporating in a food the product obtained by reacting a sulfur-containing compound, as hereinafter further described, in the presence of an organic carboxylic acid. The meat flavor composition can be formed in situ during the cooking or other preparation of the food product, or can be partially formed at one stage and reacted to completion at a subsequent stage such as after addition to the food product and during its cooking or other preparation. The process of this invention comprises reacting a sulfur-containing compound in the presence of organic carboxylic acid and adding sufficient of the product to the food. The reaction of the sulfur-containing material in the presence of the carboxylic acid is carried out by heating the two materials together, preferably in a suitable liquid reaction medium.

The novel fragrance and flavor compound of the compositions of this invention is a material having the empirical formula $C_{10}H_{14}O_3S$. This material is produced according to a process in which it is formed by the reaction of certain sulfur substances in the presence of organic carboxylic acids, and the resulting material is recovered and isolated.

Fig. 1 is an infra-red absorption spectrum of the material, and

Fig. 2 is a high-resolution nuclear magnetic resonance (NMR) spectrum of this material.

For convenience herein, the $C_{10}H_{14}O_3S$ material, as further elucidated by the accompanying drawings, will be referred to as the "meat peak material". The meat peak material possesses a very strong, intense, and pure aroma of freshly roasted meat, such as beef, pork, chicken, or ham. When the meat peak material is added to other flavoring materials or to edible compositions, it imparts this aroma

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to the flavoring materials and to edible products to which the flavoring materials are added.

It has been found that the material of this invention is particularly useful not only as a meat fragrance, but also in the preparation of meat products having enhanced meat flavor and aroma, and in imparting the meat flavor and aroma to foodstuffs which contain little or no meat. To prepare complete food compositions according to this invention, the meat peak material can be admixed with food in small amounts effective to impart a roasted meat flavor and/or aroma to the composition. In practice the amount used can be varied over a wide range according to the type of product desired, preferences of the user, and conditions under which the material is added or used. It has been found that a perceptible and desirable roasted meat aroma can be imparted to foodstuffs by the addition of as little as 50 parts per million (ppm) of the meat peak composition on a dry weight basis. It is generally preferred that the composition be used in foodstuffs in amounts on the order of from about 100 ppm to about 2000 ppm. At usage levels above this preferred upper amount, the meat aroma is generally unnecessarily intense and wasteful of the composition. All parts, percentages, proportions, and ratios herein are by weight, unless otherwise indicated.

It will be understood that the term meat-flavored composition as used herein means a material which has a cooked or roasted meat flavor such as beef, pork, chicken, or ham, and is capable of imparting a cooked meat flavor to and enhancing such meat flavors in foodstuffs. The products are characterized by their meat-like flavor. They have food, flavor, or aroma value themselves, and they can be used as such or in the preparation of gravies, soups, and other food products, including non-meat-containing foods, to enhance the flavor thereof.

The sulfur-containing compounds useful in the practice of this invention are 3-acetyl-3-mercaptopropanol-1, thiamine (Vitamin B_1). When thiamine is utilized, it can be in the form of the free base or preferably as an acid salt. Desirable acid salts are the halogen acid salts, preferably the hydrochloride.

The compositions of this invention are prepared by reacting the sulfur-containing compounds in the presence of the organic carboxylic acids. While it is believed that the theoretical explanation of the reaction is that the sulfur-containing compounds actually react with all or part of the acid molecule, the term "in the presence of" is herein taken to mean only that the acid must be present. The acid could also conceivably produce the flavoring compositions by causing some intermolecular and/or intramolecular reaction in the sulfur-containing compounds themselves, and this possibility is likewise encompassed by the term.

The organic carboxylic acids suitable for use in the formation of the reaction products can be chosen from a large group of such acids. Generally, the preferred organic acids have equivalent weights in the range of from 45 to about 100. Such organic carboxylic acids, include unsubstituted and hydroxy- and amino-substituted carboxylic acids, and preferably aliphatic carboxylic acids. Carboxylic acids which are at least partially water-soluble and having relatively low equivalent weights are generally found to produce the strongest meat flavors, and are especially desirable for use in this invention. Organic aliphatic carboxylic acids including monocarboxylic acids such as propionic acid, dicarboxylic acids such as oxalic and maleic acid, amino-substituted acids, such as glycine, hydroxy-substituted acids such as citric, and similarly substituted dicarboxylic acids such as glutamic and tartaric acids can be used as the carboxylic acid. Since most of the compositions of this invention are used in foodstuffs, edible non-toxic carboxylic acids are greatly preferred. Examples of such greatly preferred acids are amino acids such as glycine, proline, valine, glutamic acid, and the like; hydroxy-substituted acids such as citric, lactic, tartaric, and the like; and unsubstituted carboxylic acids, such as formic, acetic, propionic, adipic, fumaric, crotonic, and the like. In those instances where inedible carboxylic acids such as oxalic or maleic are used, any residual inedible material must be removed from the flavoring composition.

It will be understood that not only are pure carboxylic acids and carboxylic acids of commercial purity suitable for use in this invention, but mixtures of such acids can also be used. An example of a mixture of carboxylic acids which is useful in this invention is the mixture occurring in protein hydrolysates, preferably carbohydrate-free hydrolysates. Such protein hydrolysates afford an inexpensive source of amino acid mixtures, and many such hydrolysates are available for use in this process. These include animal, fish, and vegetable hydrolysates such as those vegetable hydrolysates obtained from yeast, corn, or wheat. If desired, the protein hydrolysate can be supplemented with one or more of the carboxylic acids disclosed above.

The reaction mixture can additionally contain other materials which aid the desired reaction. An example of materials which aid formation of the meat flavor and improve the yield from the process are certain auxiliary sulfur-containing compounds. Either organic or inorganic auxiliary sulfur materials can be added, and the auxiliary sulfur compounds can be sulfur-containing amino acids liberating hydrogen sulfide under the reaction conditions, or can be lower alkyl mercaptans, lower alkyl sulfides, lower alkyl disulfides, hydrogen sulfide itself, or inorganic compounds

designated by the formula MS_x, where M is an alkali-metal, an alkaline earth metal, or ammonium, and S_x is sulfide or sulfhydrate.

When hydrogen sulfide or a lower alkyl mercaptan is used, the amounts are controlled so as to avoid overpowering the aroma of the product with the mercaptan or sulfide aroma. Generally, it is desirable to use from about 0.1 to about 1 part of auxiliary sulfur compounds for each 100 parts of the total mixture, including the reaction medium. The lower alkyl mercaptans and sulfides preferably contain one to six carbon atoms, while the alkyl groups of the lower alkyl disulfide preferably contain from one to about three carbon atoms.

Methionine can be used as an auxiliary sulfur-containing material, especially for pork-flavored compositions. The inorganic auxiliary sulfur-containing compounds include sodium sulfhydrate and sodium sulfide. Instead of the sodium compounds, corresponding compounds of potassium, calcium, ammonium, or substituted ammonium can be used.

Organic auxiliary sulfur compounds useful in the practice of this invention in addition to cysteine and cystine are methyl mercaptan, propyl mercaptan, dimethyl sulfide, dimethyl disulfide, and ethyl methyl sulfide.

Other materials can be added to enhance or accelerate the reaction or to provide a neutral base for the flavors. For example, salts such as sodium chloride can be added to the reaction mixture.

The pH of the initial mixture can be varied over wide limits in the process to obtain the meat flavor compositions. Because of the nature of the reactants, it will be understood that the pH will normally lie within the acidic range, and it is desirable to maintain the pH at a value between about 3.5 and about 7.0. It is especially preferred that the pH of the reaction mixture lie between about 4.5 and 5.5, since optimum results are often obtained at about a 4.75 pH. The pH can be adjusted to desired values with additives, although it is preferred to adjust the pH with the acidic material producing the reaction product.

The reaction can be carried out over a wide range of temperature and other reaction conditions. Generally, it is preferred to use a liquid medium to facilitate the reaction. The liquid reaction medium, or vehicle, can be aqueous or it can be non-aqueous, such as a lipid material. Examples of satisfactory non-aqueous reaction media are a fat which can be hydrogenated oil or a natural fat or mixtures such as a combination of fat and flour, and other lipid-based media can also be utilized. When the reaction medium is primarily lipid in character, temperatures in the range of from about 180°F to about 350°F are conveniently used.

For aqueous reaction media, temperatures in the range of from about 180°F to about 225°F are desirable and temperatures in the range of from about 200°F to about 220°F are preferred. With such aqueous reaction media, it is especially preferred to conduct the reaction under reflux conditions.

The time of the reaction can likewise be varied over a range to obtain the novel compositions of this invention. In general the time will depend upon a variety of factors, including the nature of the reactants, temperature, pressure, and nature of the medium, if any. The times ordinarily range from a few minutes to about ten hours. For a product to be employed in a mixture or a food which is additionally heated before consumption, only a very short heating cycle is required. In such event, a time as short as 15 minutes can be used. Likewise, where a lipid reaction medium is used, higher temperatures are conveniently attainable and the reaction can in some cases be carried out in a matter of minutes. In aqueous media, it is preferred that the time be in the range of from about 15 minutes to about six hours. The best properties of the compositions are often brought out by permitting them to age for from about two to about four days after the heat treatment, but such ageing is not essential.

The proportion of carboxylic acid to sulfur-containing substance can be widely varied. Thus, it is possible to use quantities of carboxylic acid ranging from about one-quarter the weight of the sulfur material to about fifty times the weight of the sulfur material. It is desirable to utilize from about three-quarters to about forty times as much carboxylic acid as sulfur material to produce the greatest flavor intensity per unit weight, and the ratio preferably ranges from about 1:1 to about 40:1. It will be understood that the higher ratios of carboxylic acids to sulfur material are utilized when a crude acid mixture is involved, such as that obtained from protein hydrolysates. Where relatively pure carboxylic acids are utilized the ratio is preferably from about 1:1 to about 4:1.

Where aqueous reaction media are employed, a large excess of water is desirably used. Varying amounts of water, for example from about one to about ten times as much water as reactants, can be used. After heat treatment and any subsequent ageing, the water can be at least partially evaporated to provide more concentrated liquid compositions, or it can be almost entirely removed to produce solid, edible compositions.

The compositions can be employed in liquid form, for example as dispersions, solutions and emulsions, or they can be utilized in the form of dried products. Drying can be accomplished by any convenient means, such as roller drying, flash-drying, freeze-drying and the like, and spray drying is particularly effective.

The process for the production of the meat peak material of this invention in a more purified form can briefly be described as reacting

a sulfur-containing compound in the presence of a carboxylic acid and separating and isolating the meat peak material so formed from the reaction mixture. The reaction products formed by heating the sulfur compound and the acids contain a mixture of various substances including the desired meat peak material. While the meat peak material can be used in admixture with the various other substances in the reaction mixture, it is possible to extract the composition itself from the reaction mixture, either directly as obtained from the heating or else after spray-drying and redissolution in water, with a solvent, desirably a liquid hydrocarbon. A preferred solvent for use in extraction of the meat peak material is isopentane. After extraction, the hydrocarbon is removed by conventional methods, for example by distillation, and preferably distillation under vacuum.

The meat peak material is isolated from the extract of the reaction mixture by gas-liquid chromatography. The meat peak material of this invention exhibits the infra-red spectrum shown in Fig. 1. The Fig. 1 spectrum is obtained with a spectrophotometer at a path length of 0.1 mm. with an NaCl prism, in a 2% solution of carbon disulfide with air as the reference. The spectrogram shows characteristic carbonyl absorption at 5.64 μ and ether absorption at 9.08, 9.45, and 10.7 μ.

Fig. 2 shows the NMR spectrum of the meat peak material obtained on a 100-megacycle spectrometer. A 10% solution of the material is deuterated chloroform solvent is run at a temperature of 35°C and a sweep time of 250 seconds with a sweep width of 50 cps. The manual oscillator frequency field strength is 0.07 milligauss, and the sweep frequency field strength is 0.3 milligauss.

Table I is a representation of the relative intensities of the important peaks of a mass spectrogram of the meat peak material with inlet temperature of 150°C, magnet current of 370 ma., ion current of 50 ma., and ion potential of 70 v. The intensities are calculated relative to the 43 mass/charge (m/e) which is given a ratio equal to 100%.

Table II is a representation of the m/e peaks obtained on a high-resolution magnetic-scanning mass spectrogram. The sample is run at a gas inlet temperature of 80°C, source temperature of 120°C, accelerating potential of 8kV, and an ion potential of 70 ev.

TABLE I

m/e Ratio	Relative Intensity (%)	m/e Ratio	Relative Intensity (%)
26	6.1	81	3.3
27	32.6	83	3.1
29	14.2	84	3.6
30	1.5	85	3.9
31	5.4	91	2.3
39	17.8	93	4.9
41	16.1	97	12.2
42	5.4	98	20.9
43	100.0	99	97.0
45	26.0	100	7.5
46	2.8	101	5.3
47	5.6	111	93.0
51	3.8	112	7.4
53	8.9	113	6.3
55	14.1	116	4.0
57	3.8	125	17.6
58	5.7	127	5.5
59	8.3	128	2.7
61	2.7	143	3.2
65	8.4	171	1.4
67	3.5	186	0.7
69	2.7	214	2.5
71	7.8	215	0.3
73	4.9	216	0.16
77	4.8		
79	6.4		

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TABLE II

m/e	Found	Calculated For	Check	Compared Against
214	214.06598	$C_{10}H_{14}O_3S$ (214.06636)	−1.8 ppm.	$C_{12}H_8O_2$ (208)
186	186.07215	$C_9H_{14}O_2S$ (186.07145)	+3.4	$C_{13}H_8O$ (180)
171	171.04709	$C_8H_{11}O_2S$ (171.04793)	−4.9	$C_{13}H_8O$ (180)
143	143.05378	$C_7H_{11}OS$ (143.05302)	+5.3	$C_{12}H_8$ (152)
126	126.05067	$C_7H_{10}S$ (126.05028)	+3.1	143.05378
111	111.02772	C_6H_7S (111.02680)	+8.3	126.05067
99	99.02650	C_5H_7S (99.02680)	−3.0	111.02772
178*	178.07852	$C_{14}H_{10}$ (178.07825)	+1.5	$C_{13}H_8O$ (180)

*Check: Anthracene against Anthraquinone.

EXAMPLE I.

A mixture of 8.8 g. of cysteine-hydrochloride, 8.8 g. of thiamine hydrochloride, and 309.4 g. of carbohydrate-free vegetable protein hydrolysate is brought to a standard weight of 1000 grams by the addition of water, and adjusted to 4.75 pH with acid or base as required. This mixture is then boiled under reflux conditions at atmospheric pressure for four hours and allowed to cool. The reaction mixture so obtained has good roasted meat flavor quality.

For a material which is to be employed in a food which will be retorted, the time or four hours in this Example can be reduced to fifteen minutes.

If a dried solid product is desired, 15 parts of gum arabic are added to a quantity of the liquid reaction product of Example I containing 85 parts of solids, and the gum arabic-containing mixture is spray-dried to obtain a dry solid material having a good roasted meat flavor quality.

If the "meat peak material" is desired, the cooled reaction mixture is extracted with ten 25 ml. portions of iso-pentane is a separatory funnel, and the iso-pentane is evaporated under nitrogen to produce an extract containing small quantities of the solvent. This extraction procedure is repeated several times and the resulting extracts are combined.

The meat peak material is isolated from this extract by gas-liquid chromatography. The meat peak material has an I_E of 16.51 on an 8 foot by 1/4-inch stainless steel column packed with 60/80-mesh firebrick containing 20% "Carbowax" [Registered Trade Mark] 20M polyethylene glycol having a molecular weight of 15,000—20,000 and I_E of 11.48 on an 8 foot by 1/4-inch stainless steel column packed with 60/80-mesh Chromosorb W diatomaceous earth containing 25% Silicone SE 30 high-viscosity dimethyl polysiloxane, both columns being programmed from 75°C to 250°C at the rate of 2.3°C per minute with a helium flow of 80 ml/min.

The expression "I_E" is defined as a dimensionless number which relates (A) the retention time of a specific compound in a coated GLC column to (B) the retention time of an internal standard known compound in a coated GLC column. The measurements for the internal standard compound and the aforesaid specific compound are for:

(1) A specific column;
(2) A specific column temperature;
(3) A specific gas flow rate (in the column);
(4) A specific substrate; and
(5) A specific heating rate (for the column)

The I_E is calculated according to the method set out by E. Kovats in *Helvetica Chimica Acta, 41,* 1915 (1958), with the modifications of H. Van Den Dool and P. DeC. Kratz in *Journal of Chromatography, 11,* 463 (1963).

This meat peak material has the infrared spectrum shown in Fig. 1, the NMR spectrum shown in Fig. 2, and the relative m/e intensities at low resolution shown in Table I and at high resolution as shown in Table II. Elemental analysis calculated of $C_{10}H_{14}O_3S$: C, 56%; H, 6.6%, S, 15%; S, 15% shows: C, 56.34%; H, 6.64%; S, 15.28% found.

This meat peak material so obtained is a white solid with a strong roasted meat aroma. The melting point as determined with a Hoover-Thomas melting point apparatus is 113.0—116.6°C. The yield obtained is about 5 mg.

While the foregoing Example was carried out utilizing a mixture of cysteine, thiamine, and protein hydrolysate, it will be understood

that the meat peak material having the foregoing characteristics and aroma can be prepared by reacting thiamine in the presence of glutamic, glutaric, lactic, succinic, acetic, propionic, and tartaric acids, as well as glycine; and 3-acetyl-3-thiopropanol-1 in the presence of the foregoing acids; followed by chromatographic separation as hereinabove described.

Similar experiments are shown in Tables III to V. The crude reaction products were useful as flavor imparting materials or the meat peak material can be isolated and used.

TABLE III
Thiamine Hydrochloride (8.8 g.)
Procedure of Example I Followed

Carboxylic Acid : Amount	Auxiliary Sulfur Compound : Amount	Flavor	Meat Peak Material Isolated
Carbohydrate-free vegetable protein hydrolysate : 309.4 g.	Sodium sulfide : 4.4 g.	Good roasted meat	Yes
" " "	Methionine : 8.3 g.	" " "	Yes
" " "	None	" " "	Yes
" " "	Ethyl mercaptan : 0.034	Good roasted meat almost as good as Example I	No
" " "	H_2S : 50 micrograms	" " "	
" " "	Ethyl sulfide : 0.051 g.	" " "	No
" " "	Methyl disulfide : 0.026 g.	" " "	No
Aspartic acid : 7.2 g.	Sodium sulfide : 4.4 g.	Roasted meat	Yes
Glutamic acid : 36.8 g.	" " "	" "	Yes
Proline : 5.5 g.	" " "	" "	Yes
Carbohydrate-free vegetable protein hydrolysate : 309.4 g.	Ethyl mercaptan : 3.7 g.(1)	" "	Yes
" " "	H_2S bubbled through during reaction(1)	Good roasted meat	

(1) Excess hydrogen sulfide or ethyl mercaptan is removed by sweeping with nitrogen after the reaction.

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TABLE IV

Procedure of Example I(1)
Thiamine Hydrochloride (8.8 g.) Plus 100 g. Sodium Chloride

Carboxylic Acid:	Amount	Flavor
(2) Glutamic acid:	36.8 g.	Meat Flavor
Glutamic acid:	36.8 g.	Good, meaty roasted flavor
(3) " "	36.8 g.	" " " "
Glutaric acid:	11 g.	Good, roasted meat flavor
Citric acid:	20 g.	Roasted meat flavor
Lactic acid:	20 g.	" " "
Glycine:	20 g.	" " "
Valine:	20 g.	" " "
α-Aminoburyric acid:	4.8 g.	" " "
Glutamic acid:	20 g.	Good, roasted meat flavor
Adipic acid:	20 g.	" " " "
Succinic acid:	20 g.	" " " "
Glutaric:	20 g.	" " " "

(1) In all experiments the crude reaction product is tested for flavor with the results as shown. Also, the meat peak material was isolated from each reaction product.

(2) In this Example 5 g. of 3-acetyl-3-mercaptopropanol-1 was used instead of 8.8 g. of thiamine hydrachloride.

(3) pH is adjusted to 5.69.

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TABLE V
Procedure of Example 1

Thiamine Hydrochloride (8.8 g.) Plus 100g. Sodium Chloride
Plus 4.4 g. Sodium Sulfide
Meat Peak Material Isolated in all Cases

Carboxylic Acid : Amount	Flavor
(1) Glutamic acid: 36.8 g.	Good Roasted Meat
(2) Glutaric acid: 20 g.	" " " (More intense than product made without sodium sulfide)
(3) Lactic acid: 20 g.	" " "
(5) Succinic acid: 20 g.	" " "
Acetic acid: 20 g.	Good roasted meat
Propronic acid: 20 g.	Roasted Meat
Oxalic acid: 20 g.	Good Roasted Meat (excess oxalic acid removed)
Malonic acid: 20 g.	Good Meat Flavor
(4) Tartaric acid: 20 g.	Meat Flavor (more intense than product made without sodium sulfide)
(5) Glycine: 20 g.	" " "

(1) No difference in yield of product when reaction carried out with exclusion of oxygen by fluxing under a nitrogen blanket.
(2) When compared with the same reaction products made without added sodium sulfide, these Experiments are found to produce a yield of the meat peak material which is about seven times as great as obtained in the absence of sulfide.
(3) It is found that ten times as much meat peak material is obtained in this Example than in the same reaction without sodium sulfide.
(4) The amount of meat peak material obtained is thirty times as great as when tartaric acid s used in the absence of sodium sulfide.
(5) A much greater yield of meat peak material is obtained than when glycine is reacted in the absence of sodium sulfide.

EXAMPLE II.

A mixture of 8.8 g. cysteine hydrochloride, 8.8 g. thiamine hydrochloride, 309.4 g. carbohydrate-free vegetable protein hydrolysate, and 100 g. dextrose is brought to the standard weight, pH-adjusted, and reacted as in Example I. A roasted meat flavor is obtained and the meat peak material is isolated as in Example I.

EXAMPLE III.

A mixture is prepared by combining 3.8 g. of a 40% methanolic solution of 3-acetyl-3-mercaptopropanol-1 with 20 g. acetic acid, 100 g. sodium chloride, and 4.4 g. sodium sulfide. Sufficient water is added to bring the total mass to 1000 g. and the pH is adjusted to 4.75. The mixture is reacted by boiling under reflux conditions for four hours. A product having a good roasted meat flavor is obtained. Before use in a food or with a food the methanol is removed. In a preferably alternate method, an ethanolic solution of the acetylmercaptopropanol is used. The meat peak material may be isolated as in Example I.

Further similar examples are shown on Table VI.

TABLE VI
Procedure of Example III
3-Acetyl-3-Mercaptopropanol-1

Carboxylic Acid : Amount	Sodium Chloride	Auxiliary Sulfur Compound : Amount	Flavor	Meat Peak Material Isolated
Acetic Acid : 20 g.	100 g.	Sodium sulfide : 4.4 g.	Good roasted meat	Yes
Formic Acid : 20 g.	100 g.	Sodium sulfide : 4.4 g.	" " "	Yes
Acetic Acid : 20 g.	100 g.		" " "	Yes
Carbohydrate free Protein hydrolysate : 309.4 g.		Cysteine hydrochloride : 8.8 g.	" " "	Yes
(1)Fumaric Acid : 20 g.	100 g.	Sodium sulfide : 4.4 g.	" " "	Yes

(1) Other unsaturated carboxylic acids, such as maleic and crotonic acid can also be used with good results.

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EXAMPLE IV.

The following ingredients are refluxed for four hours, aged for three days, and spray dried to produce a solid product having a beef flavor. Before drying, sufficient gum arabic is added to provide a composition containing 0.5 parts gum arabic and one part flavor solids.

Ingredient	Parts
L-Cysteine hydrochloride	1.32
Carbohydrate-free vegetable protein hydrolysate	44.05
Thiamine hydrochloride	1.32
Beta-alanine	.50
Water	53.31

The reaction product is then aged for three days after which the meat peak material having the infrared, NMR and mass spectral characteristics as set forth in Example I is isolated as in Example I.

EXAMPLE V.

The following ingredients are refluxed for four hours:

Ingredient	Parts
L-Cysteine hydrochloride	.88
Carbohydrate-free vegetable protein hydrolysate	30.94
Thiamine hydrochloride	.88
Water	67.30

The resulting mixture is then aged for three days and an aliquot portion is withdrawn and dried. Sufficient gum arabic is added to the batch to provide a composition containing one part by weight of gum arabic per part of dry solid obtained. The composition is spray dried to produce a beef-flavored product.

EXAMPLE VI.

The following ingredients are refluxed for three hours:

Ingredient	Parts
L-Cysteine hydrochloride	5.44
Thiamine hydrochloride	5.06
Carbohydrate-free vegetable protein hydrolysate	15.19
Water	50.05
Palmitic acid	.35
Glutamic acid	.53
Potassium chloride	.44
Dibasic potassium phosphate	.35
Dibasic ammonium phosphate	2.11
Phosphoric acid	.30
Calcium lactate	.18

The mixture is cooled and 20.00 parts alcohol is added. The liquid product obtained thereby has an intense beef flavor.

EXAMPLE VII.

A beef bouillon cake formulation is made containing the ingredients listed, in the amounts shown:

Ingredient	Gms/Unit
Salt	1.80
The spray dried flavor of Example V	0.50
Gelatin (180 bloom)	0.40
Mono-sodium glutamate	0.20
Brown coloring	0.01
Garlic powder	0.04
Pepper, ground	0.01

A bouillon cube will weigh from 4 to 5 grams. One cube is used with 6 ounces of boiling water.

EXAMPLE VIII.

A beef gravy is made by formulating a gravy flavor composition of the ingredients and in the amounts indicated:

Ingredient	Gms/Unit
Cornstarch	10.50
The spray dried product of Example V	3.00
Caramel color	.30
Garlic powder	.05
White pepper	.05
Salt	1.92
Mono-sodium glutamate	.20

To one unit of gravy flavor concentrate, 8 ounces of water are added, and the mixture is stirred thoroughly to disperse the ingredients; brought to a boil, simmered for one minute, and served. This 'meatless" gravy shows excellent beef flavor.

EXAMPLE IX.

A soup is made by adding 22 ounces of water to the recipe given in Example VIII for the gravy.

EXAMPLE X.

A shaker composition for enhancing the flavor of meats is prepared from a variety of flavors. A powdered composition to enhance a ham flavor is made of:

Ingredient	% Composition
Ham spices	2.5
Mono-sodium glutamate, fine grind	2.5
Salt, fine grind	55.0
The spray dried flavor of Example V	40.0

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EXAMPLE XI.

A beef soup is prepared by mixing together:

Ingredient	Gms/Unit
Salt	5.00
The spray dried flavor of Example V	3.00
Gelatin (180 bloom)	1.00
Mono-sodium glutamate	.40
Caramel color	.40
Garlic powder	.10
White pepper, ground	.06
Mixed vegetables pieces	36.00

Three cups of water are added to the above mixture; and the mix is brought to a full boil, simmered for five minutes, and is then ready to serve.

It will be appreciated from the foregoing disclosure and Examples that the reaction products of this invention can be used to impart a meat-like flavor to meatless edible compositions and can be used to enhance the flavor of meat-containing compositions. The compositions of this invention can be incorporated in foods such as soups and soup mixes, casserole dishes, canned and frozen vegetables, animal and pet foods, sauces, gravies, stews, simulated meat products, meat spreads and dips, bakery products, and replacements for meat extracts and the like. In these applications the flavor composition of this invention can be used alone, or it is frequently combined with other food additive ingredients or constituents to impart special characteristics. Such ingredients include carriers, thickeners, condiments, spices, encapsulating agents, vehicles, coloring agents, flavoring materials, flavor intensifiers, and the like. For example, the compositions of this invention can be admixed with other food additive constituents such as alginates, allspice, ascorbic acid, basil, capsicum extract, cloves, eugenol, onion oil, oregano extract, pyroligneous acid, sage oil, sodium citrate, or thyme.

Carriers are useful in extending the flavor of the compositions when they are utilized in dried forms. Such carriers do not appreciably affect the quality of the flavor, but they frequently stabilize the compositions and increase their shelf life. Saccharides such as gum arabic are useful for this purpose, as are mixtures of salts and suitable carbohydrates such as karaya, tragacanth, carboxymethylcellulose and the like.

To prepare compositions according to this invention the reaction product, (without isolation of the meat peak material) is admixed with the food in small amounts effective to impart a roasted meat flavor and aroma to the compositions. In practice, the amount of reaction product to be used will vary over a wide range according to the type of product desired, individual preferences of the user, and conditions under which the reaction product is to be added or used with the food. Generally, it is desirable to use from about 0.5 per cent to about 20 per cent on a dry weight basis of the product in the finished composition. It is preferred in many uses that the reaction product comprise from about 5 to about 10 per cent of the composition.

The meat peak material can be isolated and can further be used, if desired, in admixture with the other products of the reaction of the sulfur-containing compounds in the presence of acidic materials. It is also possible to utilize the meat peak material in a partially purified form produced, for example, by extracting the mixture of reaction products with an appropriate solvent such as an aliphatic hydrocarbon. Regardless of whether the material of this invention is added to a food in the pure form, in admixture with other reaction products, or in admixture with other constituents of a flavoring composition, it will impart a cooked or roasted meat flavor to the food.

WHAT WE CLAIM IS:—

1. A process for imparting a flavor and aroma to an edible composition which comprises associating with said composition a material having the empirical formula $C_{10}H_{14}O_2S_2$, the infrared absorption spectrum shown in Figure 1, the high resolution nuclear magnetic resonance spectrum shown in Figure

2, and the relative m/e intensities obtained from a mass spectrogram shown in Tables I and II.

2. A process according to claim 1, wherein said material is prepared by reacting 3-acetyl-3-mercapto-propanol-1 or thiamine in the presence of an organic carboxylic acid and then, if desired, isolating the material from the reaction mixture.

3. A process according to claim 2, wherein said acid is an edible non-toxic carboxylic acid.

4. A process according to claim 2 or 3, wherein said acid has an equivalent weight in the range of 45 to 100.

5. A process according to any one of the preceding claims 2 to 4, wherein said acid is an aliphatic carboxylic acid.

6. A process according to any one of the preceding claims 2 to 5, wherein said acid is an unsubstituted aliphatic acid, an amino substituted aliphatic acid, a hydroxy substituted aliphatic acid, or a protein hydrolysate.

7. A process according to any one of the preceding claims 2 to 6, wherein said acid is glutamic acid, acetic acid, lactic acid or tartaric acid.

8. A process according to any one of the preceding claims 2 to 7, wherein said reaction is effected by heating at a temperature range of 180°F. to 350°F.

9. A process according to any one of the preceding claims 2 to 8, wherein there is also present during the reaction an auxiliary sulfur-containing material which is a sulfur-containing amino acid liberating hydrogen sulfide or methyl mercaptan, under the reaction conditions, a lower alkyl mercaptan, a lower alkyl sulfide, a lower alkyl disulfide, hydrogen sulfide, or a compound of the formula MS_x where M is an alkali metal, alkaline earth metal or ammonium and S_x is sulfide or sulfhydrate.

10. A process for preparing a flavor and aroma imparting ingredient substantially as described.

11. A flavor and aroma imparting ingredient whenever prepared by the process substantially as described.

12. The material having the empirical formula $C_{10}H_{14}O_3S$, the infrared absorption spectrum shown in Figure 1, the high resolution nuclear magnetic resonance spectrum shown in Figure 2, and the relative m/e intensities obtained from a mass spectrogram shown in Tables I and II.

13. An edible composition comprising a food and an amount of the material according to claim 12 effective to impart a roasted meat flavor and aroma to the composition.

14. An edible composition comprising a food and an amount effective to impart a roasted meat flavor and aroma to the composition of the product produced by reacting 3-acetyl-3-mercaptopropanol-1 or thiamine in the presence of an organic carboxylic acid.

15. A composition according to claim 14, wherein said acid is an edible non-toxic carboxylic acid.

16. A composition according to claim 14 or 15, wherein said acid has an equivalent weight in the range of 45 to 100.

17. A composition according to claim 14, 15 or 16, wherein said acid is an aliphatic carboxylic acid.

18. A composition according to claims 14 to 17, wherein said acid is an unsubstituted aliphatic acid, an amino substituted aliphatic acid, a hydroxy substituted aliphatic acid, or a protein hydrolysate.

19. A composition according to claims 14 to 18, wherein said acid is glutamic acid, acetic acid, lactic acid or tartaric acid.

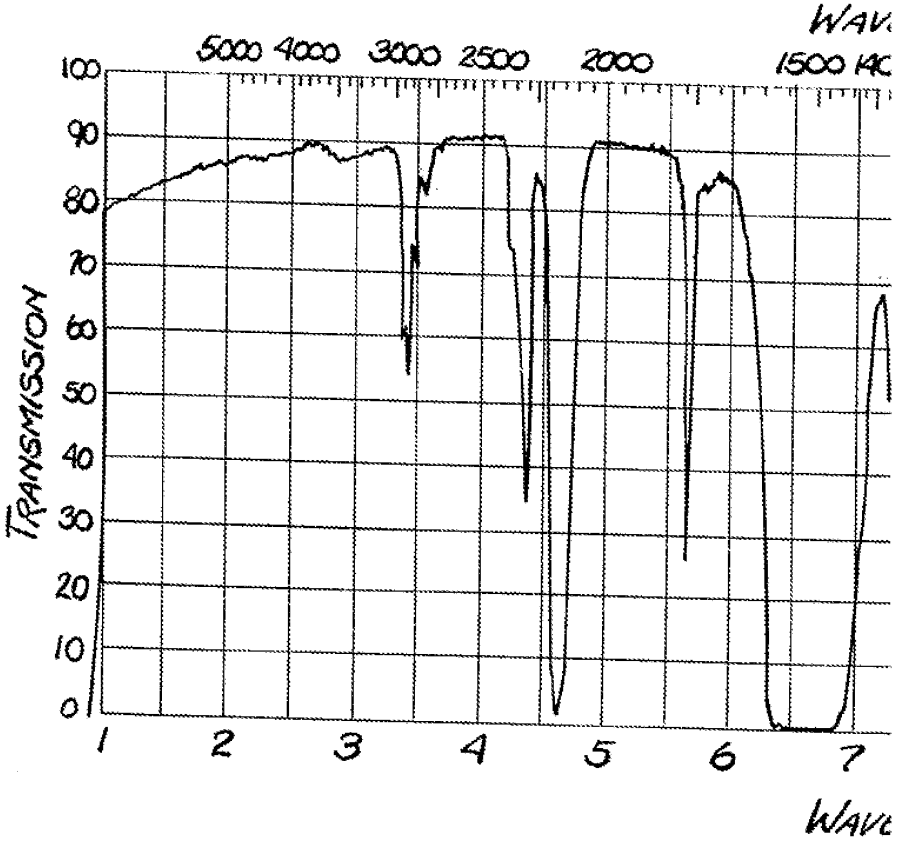
20. A composition according to claims 14 to 19, wherein said reaction is effected by heating at a temperature range of 180°F. to 350°F.

21. A composition according to claims 14 to 20, wherein there is also present during the reaction an auxiliary sulfur-containing material which is a sulfur-containing amino acid liberating hydrogen sulfide or methyl mercaptan under the reaction conditions, a lower alkyl mercaptan, a lower alkyl sulfide, a lower alkyl disulfide, hydrogen sulfide, or a compound of the formula MS_x where M is an alkali metal, alkaline earth metal or ammonium and S_x is sulfide or sulfhydrate.

STEVENS, LANGNER, PARRY
& ROLLINSON,
Chartered Patent Agents,
Agents for the Applicants.

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from which copies may be obtained.

INFRARED SPECTRUM



1,084,619
2 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

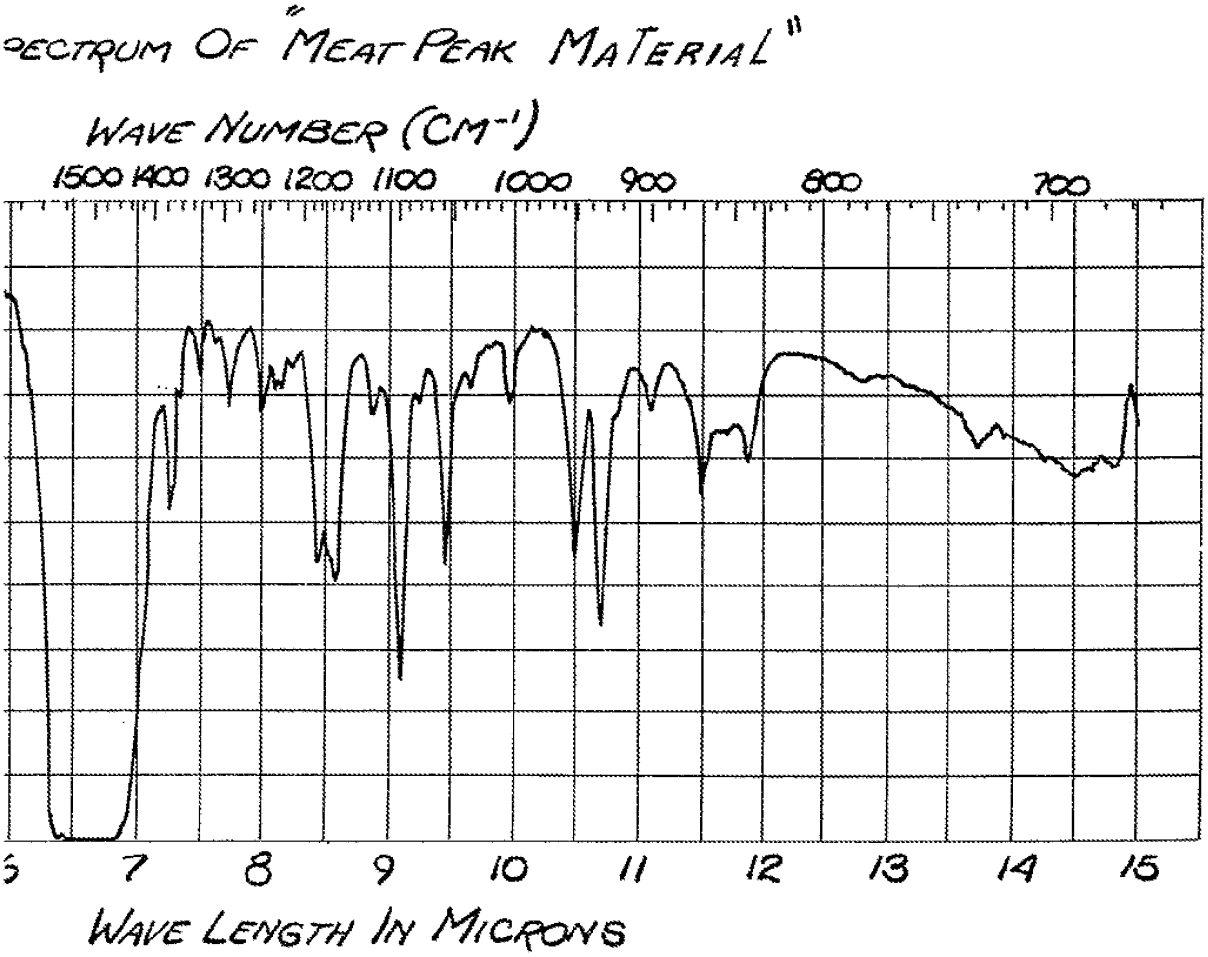


Fig. 1.

1,084,619
2 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.

SHEET 1

INFRARED SPECTRUM OF "MEAT PEAK MATERIAL"

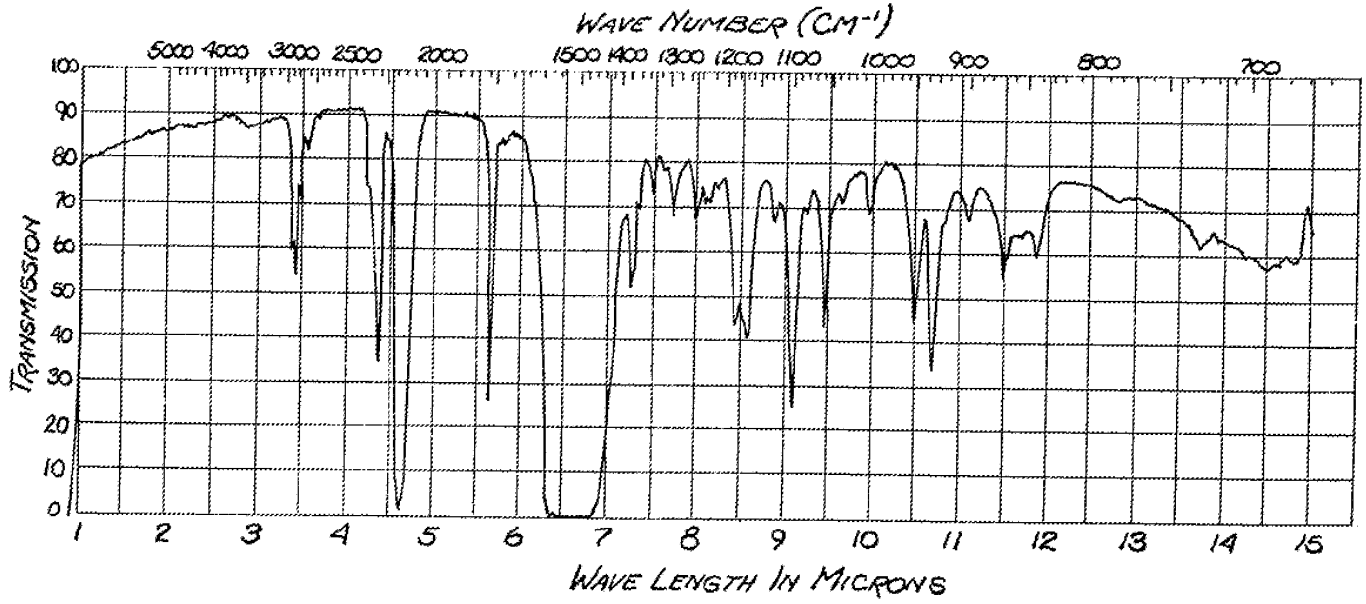
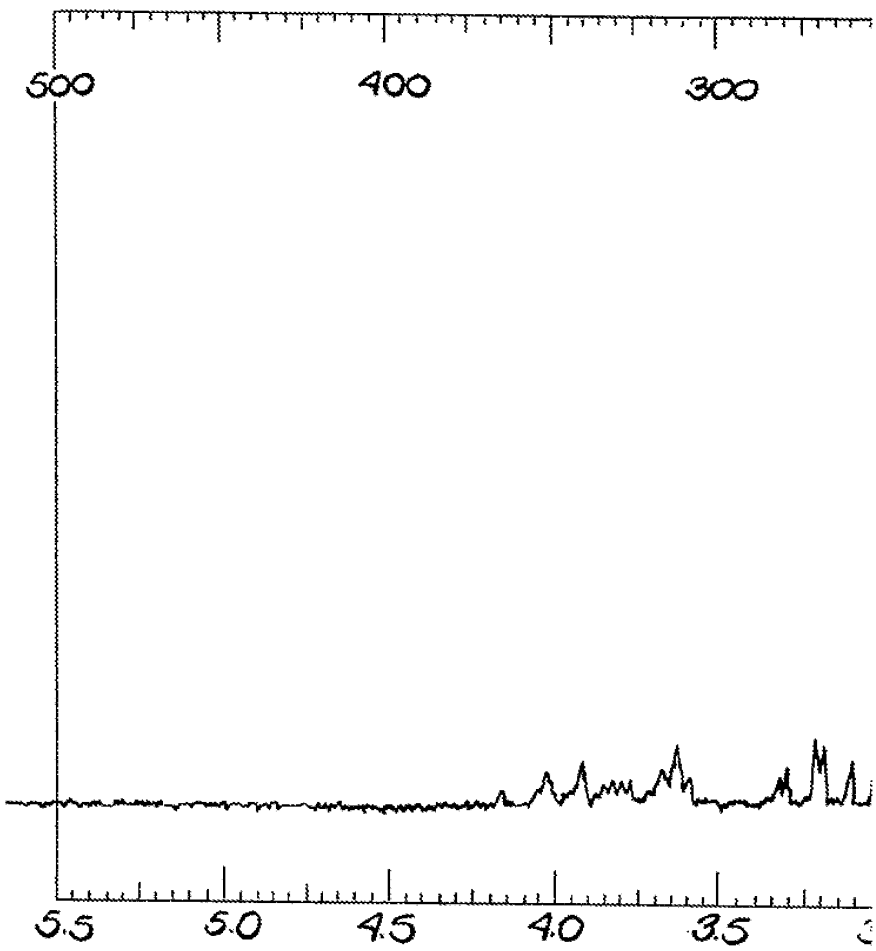


Fig. 1.

Motif Exhibit 1150, Page 741 of 1599

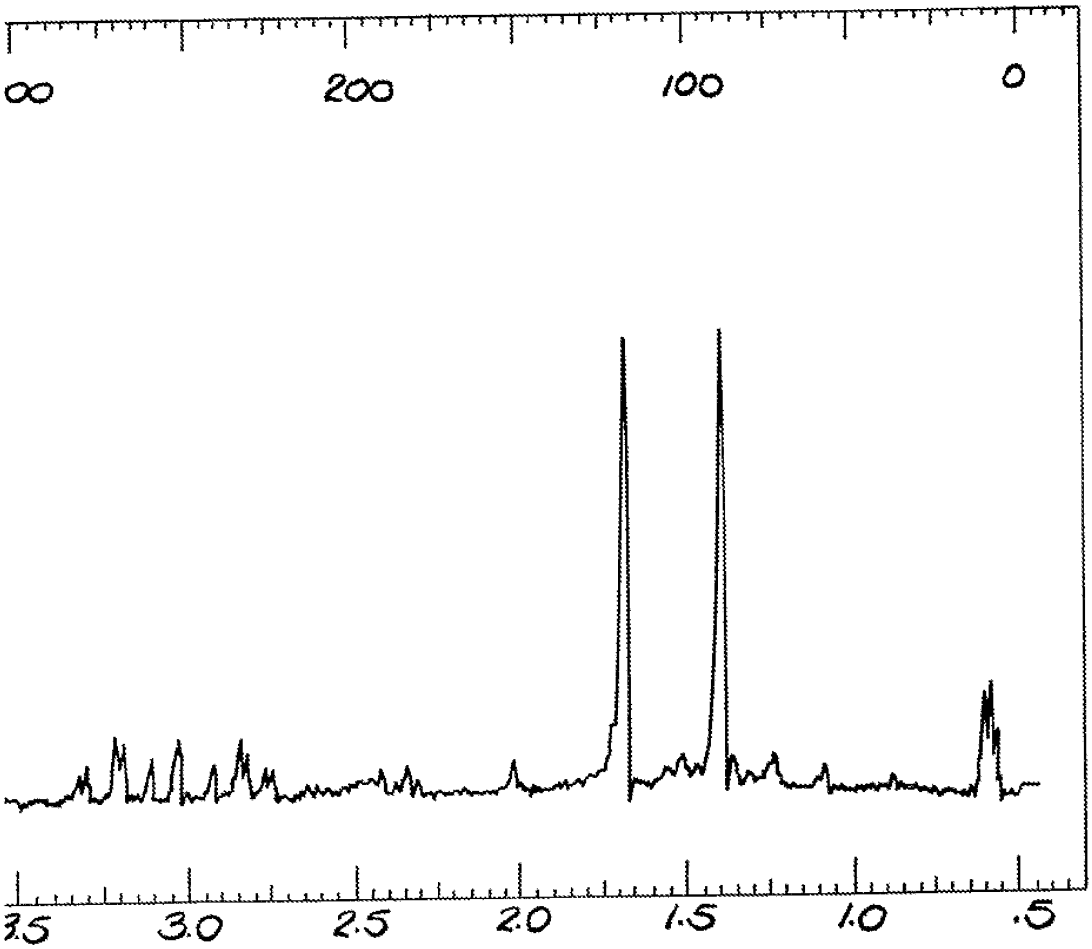
Case No.: IPR2023-00208
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1,084,619 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEET 2

RESONANCE SPECTRUM OF "MEAT PEAK MATERIAL"



PARTS PER MILLION

FIG. 2.

1,084,619
2 SHEETS

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.
SHEET 2

NUCLEAR MAGNETIC RESONANCE SPECTRUM OF "MEAT PEAK MATERIAL"

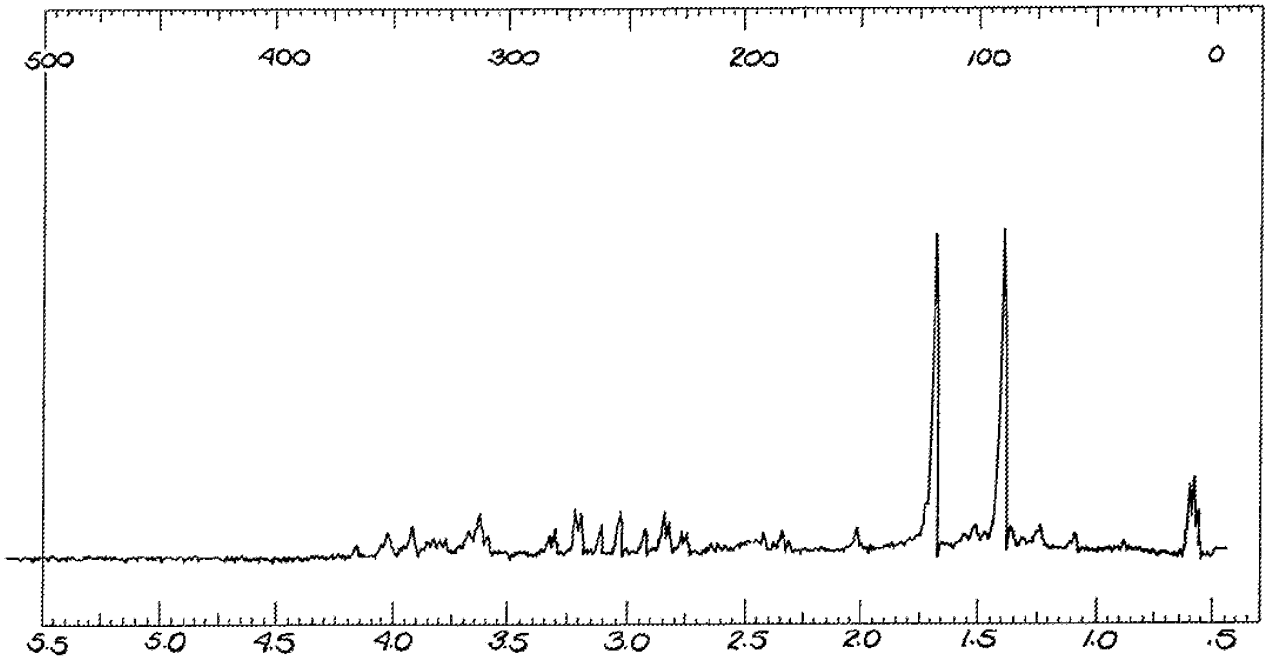


Fig. 2.

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PATENT SPECIFICATION

NO DRAWINGS

1,099,711

1,099,711

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Index at acceptance:—C3 H2; A2 B(1L, 6A)
Int. Cl.:—C07 g 7/00

COMPLETE SPECIFICATION

Composition and Process for Preparation thereof

We, INTERNATIONAL FLAVORS & FRAGRANCES INC., a Corporation organized under the laws of the State of New York, United States of America, of 521 West 57th Street, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to edible compositions and their production. The products are characterized by their meat-like flavor. They may have food and/or aroma value per se, and may be used as such or in the preparation of soups, gravy and other food products to enhance the flavor thereof.

It is an object of this invention to provide edible compositions having a meat-like flavor and aroma and to do so by simple and efficient processes.

Of interest to the subject matter of this invention is United States Patent 2,918,376, 2,934,436, 2,934,437, 2,934,435. Each of the above patents described require as an essential component of the reaction a third ingredient not found in the process of this application and not found as a component in the resultant product.

Thus, United States Patent 2,934,435 requires in addition to cysteine or cystine a furan compound and the flavoring composition is formed by reacting together such a furan compound with cysteine or cystine. United States Patent 2,918,376 deals with a ham or bacon flavoring composition derived from the reaction of cysteine or cystine and a fractionated liquid wood smoke and United States Patent 2,934,436 produces its artificial flavoring by reacting together cysteine or cystine and glyceraldehyde. In the case of United States Patent 2,934,437 the coreactant with cysteine or cystine is a mono-saccharide.

In none of the references is there a disclosure of the essence of this invention which is the preparation of meat like flavor compositions by reacting a proteinaceous substance and the defined sulfur-containing compound (e.g., cystine or cysteine) as the essential ingredients and that satisfactory and improved meatlike flavor compositions may be obtained without utilizing such materials as furan compounds, mono-saccharides, or fractionated wood smoke as coreactants. Of course other non-essential materials may be present during the reaction or may be added after the reaction.

The invention comprises the novel products as well as the novel processes and steps of processes according to which such products are manufactured, the specific embodiments of which are described hereinafter by way of example, and in accordance with which we now prefer to practice the invention.

In accordance with this invention edible compositions are prepared comprising the product of the reaction, at temperatures above 35° C., and in absence of mono-saccharides, acyclic aldehydes, furan compounds and fractionated liquid wood smoke, so as to obtain a meaty-flavoured reaction product, of a proteinaceous substance and a sulfur-containing compound, more particularly defined below.

It has heretofore been proposed to employ mono-saccharides in various edible compositions. We have found, however, that the use of such saccharides in preparing the composition of our invention is not necessary, and in fact a superior product in flavour, aroma and other characteristics is obtained by the omission of such mono-saccharides in the reaction.

Sulfur-containing compounds may be organic compounds having the formula RST, where R is an amino acid group or a lower alkyl group and T is hydrogen, a lower alkyl

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group or the group —SR (a lower alkyl group containing from 1 to 6 carbon atoms), or may be an inorganic sulfur compound, or hydrogen sulfide itself, each of which is adapted to liberate a meaty flavour under heating with a proteinaceous substance, or mixture of such proteinaceous substances, in the absence of a mono-saccharide. Such inorganic sulfur compounds are designated herein as having the formula MS_x, where M is selected from the group consisting of an alkali metal, an alkaline earth metal, ammonium and substituted ammonium, and S_x is selected from the group consisting of sulfide and sulfhydrate.

When hydrogen sulfide or a lower alkyl mercaptan is used it is necessary to control the amounts used so as to avoid overpowering the aroma of the product with the aroma of the mercaptan or the hydrogen sulfide. The lower alkyl mercaptans and sulfides contain 1 to 6 carbon atoms. The lower alkyl disulfides preferably contain 1 to 3 carbon atoms per alkyl group.

The products of the invention, as exemplified in the Examples below, all have meaty flavours and aromas. They may have flavours and aromas resembling beef, pork, chicken or other meats.

Cysteine is mentioned especially as a preferred sulfur-containing amino acid. Especially preferred products resembling natural beef in their flavour and aroma are produced from mixtures of cysteine and their salts with protein hydrolysates.

An additional roasted flavor may be introduced into the product by the use of pyruvic acid or pyruvic aldehyde or dihydroxyacetone.

The products of the invention may be provided as dry solids, in liquid mixtures or in pastes. Preferably, they are prepared by heating aqueous mixtures of the selected components. The resulting liquid products may be used as such, or they may be concentrated for use. If solid products are desired, the same may be obtained by drying the liquid mixtures. The aqueous compositions are dehydrated by spray drying, although drum, freeze and other drying procedures are applicable. A solid carrier is often added to the liquid mixture before drying.

According to the preferred process of this invention the ingredients are taken up with water and the mixture heated. Although the time and temperature are not critical, if refluxing is used, it is most convenient to reflux the aqueous mixture for a period of from three to five hours. Longer periods may be used at less than reflux temperature, and shorter periods may be used when the treatment is carried out under pressure at higher than reflux temperature. During reflux or heating as above the reaction product is formed.

The best properties of the compositions are often brought out by permitting the compositions to age for from two to four days after the heat treatment. Aging is not essential, however.

A large weight excess of water is preferably used in preparing the aqueous liquid compositions of this invention, although such excess is not essential. Varying amounts of water, for example from about 1:1 to about 10:1 by weight, based on the total weight of the mixture, can be used. After heat treatment and aging if desired, the water can be at least partially evaporated to provide more concentrated liquid compositions; or fully evaporated to produce solid, edible compositions.

As aforesaid, compositions resembling natural beef products in their flavor and aroma are produced from mixtures containing cysteine or cystine and a proteinaceous substance. The most useful of these products are obtained from mixtures containing one or more of these acids together with thiamine, suitably as an acid salt, and a protein hydrolysate.

By the term "proteinaceous substance", is meant an edible protein, an edible protein hydrolysate or mixtures thereof which may contain some free amino acids together with various protein derivatives such as proteoses, peptones, polypeptides and dipeptides. Among the proteins which may be used are albumins, globulins, glutelins, prolamines, albuminoids, histrones, protamines, nucleoproteins, glycoproteins, phosphoproteins, chromoproteins and lipoproteins. These may be used in the natural state, e.g., as meat or meat scraps or other meat protein concentrates.

Many protein hydrolysates are available which are useful for the preparation of the compositions of this invention. These include animal, fish and vegetable protein hydrolysates. The preferred hydrolysates are vegetable products such as those from yeast, corn or wheat.

The amount of proteinaceous substance used in our compositions may vary within wide limits. For example, liquid compositions may be prepared using as little as 4% by weight or as much as 40% by weight of proteinaceous substance based on the total weight of the composition. We prefer to use protein hydrolysates in our compositions to obtain the best flavors.

Thiamine may be used as a free base, but is preferably employed as an acid salt. The preferred salts are halogen acid salts and, of these, the hydrochloride is especially suitable. The amount of thiamine used in the preparation of meat flavors whether as the free base or as the acid salt generally varies from about 0.2% to about 20%, by weight, based on the total weight of the liquid composition, although useful products may be prepared with greater or lesser amounts.

Cysteine and cystine are sulfur-containing amino acids readily available as free amino acids or as salts, both acid and basic. Preferably the acid salts, especially the halogen

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acid salts, such as the hydrochloride, are utilized. For most purposes the desired flavor quality is achieved by the use of from about 0.2% to about 20% by weight of each of these amino acids as free acids or as salts, or a combination of them totalling the same proportion by weight based on the total weight of the liquid composition. Useful products may be obtained using somewhat greater or lesser amounts.

For pork flavored compositions, the sulfur containing amino acid of choice is methionine which also may be used as the free acid or as an acid or basic salt. The proportion used is the same as in the production of beef flavored substances with cystine, cysteine or their salts.

The inorganic sulfur-containing compounds include sodium sulfhydrate and sodium sulfide. Instead of sodium compounds, corresponding compounds of potassium, calcium and ammonium or substituted ammonium may be substituted. Any such compound employed should be capable of reacting to give the desired meaty note.

Organic sulfur-containing compounds useful in the practice of this invention include methyl mercaptan, ethyl mercaptan and propyl mercaptan, dimethyl sulfide, dimethyl disulfide, and methyl ethyl sulfide.

Useful products can be obtained using somewhat greater or lesser amounts of the sulfur-containing amino acid or acids, but it should be understood that the preferred amounts of sulfur-containing amino acid in the compositions as defined above are over and above the amounts of these acids or any of them which may be present either free or combined in the proteinaceous substance.

Varying amounts of other ingredients can be employed to impart special notes to the food compositions. Phenylalanine imparts a desirable sweet tangy note and β-alanine a meat sweet note.

The compositions of this invention can be employed as liquids, i.e., dispersions or solutions, or as dried products. Drying may be accomplished by any convenient method. Spray drying is particularly effective.

We have found that carriers are useful in extending the flavour of our products when prepared and utilized as dry compositions. These carriers do not appreciably diminish the quality of the flavor, but they stabilize it and increase the shelf life of the product. Polysaccharides such as gum arabic are useful, as are mixtures of salts and suitable carbohydrates such as karaya, tragacanth or carboxy methyl cellulose and the like.

In a preferred process an aliquot of the liquid composition is dried and the flavor solids content of the composition determined. An amount of carrier substantially equal to the calculated solids content of the liquid composition is added thereto and the mixture dried, preferably by spray drying. Alternatively, an amount of carrier substantially equal to the weight of the original dry ingredients is added to the liquid composition after reaction of the ingredients, and then dried. The preferred amounts of carrier are from about 0.5:1 to about 2:1, based on the solids content of the liquid mixture.

The following examples of edible substances illustrate the manner in which we now prefer to practice our invention. It is to be understood that this invention is not to be considered as limited thereto, except as indicated in the appended claims. In the Examples, the various ingredients are listed in parts by weight.

EXAMPLE 1

The following ingredients were refluxed for four hours. The resulting mixture was then aged for three days and an aliquot withdrawn and dried. Based on the weight of the dry solid product obtained, sufficient gum arabic was added to the bath to provide a composition containing one part by weight of flavor solids and one part by weight of gum arabic. The composition was spray dried to produce a beef flavoured product.

L - cysteine hydrochloride	.88
Carbohydrate - free vegetable protein hydrolysate	30.94
Thiamine hydrochloride	.88
Water	67.30

EXAMPLE 2

The following ingredients with the exception of alcohol were refluxed for three hours. The mixture was cooled and the alcohol was added. The liquid product obtained thereby had an intense beef flavor:—

L-cysteine hydrochloride	5.44
Thiamine hydrochloride	5.06
Carbohydrate - free vegetable protein hydrolysate	15.19
Water	50.05
Palmitic acid	.35
Glutamic acid	.53
Potassium chloride	.44
Dibasic potassium phosphate	.35
Dibasic ammonium phosphate	2.11
Phosphoric acid	.30
Calcium lactate	.18
Alcohol	20.00

EXAMPLE 3

The following ingredients were refluxed for three hours. An aliquot was withdrawn and dried to obtain a dried product. Based on the weight of this dried product, sufficient gum arabic was added to the batch to provide a composition containing one part by weight of flavor solids and one part by weight of gum arabic. The mixture was spray dried to produce a product having the flavor and aroma of pork.

Water	77.83
Dibasic ammonium phosphate	1.20
Monosodium glutamate	1.00
Potassium chloride	.25
Phosphoric acid	.20
Dibasic potassium phosphate	.20
Calcium lactate	.10
Lard	3.20
Ammonium bicarbonate	1.00
Methionine	.20
Carbohydrate-free vegetable protein hydrolysate	15.02

EXAMPLE 4

The following ingredients were refluxed for two hours and spray dried to produce a product resembling chicken in flavor:—

Dibasic ammonium phosphate	1.01
Monosodium glutamate	.84
Beta alanine	.84
Glycine	.51
Palmitic acid	.34
Betaine	.34
Ascorbic acid	.17
Choline chloride	.17
Dibasic potassium phosphate	.17
Potassium chloride	.17
Glutamic acid	.34
L-cysteine hydrochloride	.26
Thiamine hydrochloride	.05
Water	85.39
Carbohydrate-free vegetable protein hydrolysate	9.40

EXAMPLE 5

The following ingredients were refluxed for five hours, aged for three days and spray dried to produce a product having a beef-like flavor:

L-cysteine hydrochloride	1.75
Carbohydrate - free vegetable protein hydrolysate	29.31
Beta alanine	.50
Thiamine hydrochloride	1.75
Water	66.69

EXAMPLE 6

The following ingredients were refluxed for four hours, aged for three days and spray dried to produce a dry solid having a beef flavor. Before spray drying 1 part of sodium chloride was added.

L-cysteine hydrochloride	1.71
Carbohydrate-free vegetable protein hydrolysate	28.63
Thiamine hydrochloride	1.71
Water	67.95

EXAMPLE 7

The following ingredients were refluxed for four hours, aged for three days and spray dried to produce a solid product having a beef flavor. Before drying sufficient gum arabic was added to provide a composition containing 0.5 parts gum arabic and 1 part flavor solids.

L-cysteine hydrochloride	1.32
Carbohydrate-free vegetable protein hydrolysate	44.05
Thiamine hydrochloride	1.32
Beta alanine	.50
Water	53.31

EXAMPLE 8

The following ingredients were refluxed for four hours, aged three days and spray dried to produce a dried product having a beef flavor:

Water	53.74
Dibasic ammonium phosphate	1.06
Thiamine hydrochloride	.63
L-cysteine hydrochloride	.27
Potassium chloride	.27
Phosphoric acid (85%)	.21
Dibasic potassium phosphate	.21
Calcium lactate	.10
Salt	5.30
Beef fat	21.20
Carbohydrate-free vegetable protein hydrolysate	17.54

EXAMPLE 9

The following ingredients were refluxed for three hours, aged for three days and spray dried using sufficient gum arabic to provide a composition containing 1 part of gum arabic and one part flavor solids. The resulting dry produce had a flavor closely resembling that of natural beef.

L-cysteine hydrochloride	.66
Carbohydrate-free vegetable protein hydrolysate	23.20
Thiamine hydrochloride	.66
Water	78.48

EXAMPLE 10

The following ingredients were refluxed for three hours and thereafter sufficient gum arabic added to provide a composition having one part by weight gum arabic and one part by weight flavor solids. The composition was spray dried to produce a product having a flavor resembling that of pork.

Dibasic ammonium phosphate	1.28
Monosodium glutamate	1.07
Potassium chloride	.27
Phosphoric acid	.22
Dibasic potassium phosphate	.22
Calcium lactate	.11
Lard	3.43
Ammonium bicarbonate	1.07
D-L Methionine	.22
Water	83.66
Carbohydrate-free vegetable protein hydrolysate	8.55

EXAMPLE 11

The following ingredients were refluxed for two hours and thereafter sufficient gum arabic added to provide a composition containing two parts gum arabic and one part flavor solids by weight. The composition was spray

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dried to produce a dry product with a flavor resembling that of chicken.

Dibasic ammonium phosphate	.81
Monosodium glutamate	.67
Beta alanine	.67
Glycine	.41
Palmitic acid	.27
Betaine	.27
Ascorbic acid	.14
Choline chloride	.14
Dibasic potassium phosphate	.14
Potassium chloride	.14
Glutamic acid	.28
L-cysteine hydrochloride	.21
Thiamine hydrochloride	.05
Water	69.80
Pork meat	26.00

EXAMPLE 12

The following ingredients were refluxed for two hours and sufficient gum arabic added to provide a composition containing one part gum arabic and one part flavor solids by weight. The composition was drum dried to produce a dry product with a flavor resembling beef.

L-cysteine hydrochloride	2.00
Thiamine hydrochloride	2.00
Water	67.00
Meat protein concentrate	29.00

EXAMPLE 13

The following ingredients were refluxed for four hours and sufficient gum arabic added to provide a composition containing one part gum arabic and one part flavor solids by weight. The composition was spray dried to produce a product with a flavor resembling that of beef.

L-cysteine hydrochloride	.88
Thiamine hydrochloride	.88
Water	67.30
Carbohydrate-free vegetable protein hydrolysate	30.94

EXAMPLE 14

The following ingredients were refluxed for four hours and sufficient gum arabic added to provide a composition containing one part gum arabic and one part flavor solids by weight. The composition was spray dried to produce a product with a flavor resembling that of chicken.

L-cysteine hydrochloride	.72
Thiamine hydrochloride	.88
Water	67.46
Carbohydrate-free vegetable protein hydrolysate	30.94

EXAMPLE 15

The following ingredients were refluxed for four hours. The resulting mixture was then aged for three days and an aliquot withdrawn and dried. Based on the weight of the dry product obtained, sufficient gum arabic was added to provide a composition containing one part by weight of flavor solids and one part by weight of gum arabic. The composition was spray dried to produce a beef flavored product.

L-cysteine hydrochloride	.72
Carbohydrate-free vegetable protein hydrolysate	30.94
Thiamine hydrochloride	.88
Water	67.46

It has been found that inorganic sources of sulfur notes can be used to replace cysteine hydrochloride and similar amino acids in the above Examples. Such resulting compositions are edible, and are constituted as are the compositions above. They are products of sulfur-containing inorganic material and a proteinaceous substance.

Examples of such use are as follows:—

EXAMPLE 16

The following ingredients were refluxed for four hours:

Sodium sulfhydrate	.88
Thiamine hydrochloride	.88
Carbohydrate-free vegetable protein hydrolysate	30.94
Water	67.30

The composition was spray dried to produce a product with a beef flavor.

EXAMPLE 17

The following ingredients were refluxed for two hours:

Sodium sulfhydrate	.88
Thiamine hydrochloride	.88
Water	67.30
Carbohydrate-free vegetable protein hydrolysate	30.94

The composition was spray dried to produce a product with a beef flavor.

EXAMPLE 18

The following ingredients were refluxed for two hours:

Sodium sulfide	.88
Thiamine hydrochloride	.88
Water	67.30
Carbohydrate-free vegetable protein hydrolysate	30.94

The composition was spray dried to produce a product with a beef flavor.

In order to give a cooked note to the beef or other flavors in the above Examples to produce flavors which suggest cooked products, such as baked, roasted or toasted products, we have found that such notes may be produced by heating the proteinaceous material and amino acids with dihydroxyacetone or pyruvic acid or pyruvic aldehyde. As Examples of this we give the following:

EXAMPLE 19

The following ingredients were refluxed for four hours:

L-cysteine hydrochloride	.88
Thiamine hydrochloride	.88
Carbohydrate-free vegetable protein hydrolysate	31.00
Water	67.00
Pyruvic aldehyde	0.50

The composition was spray dried to produce a product with a beef flavor with a roasted type note.

EXAMPLE 20

The following ingredients were refluxed for four hours:

Pyruvic acid	.24
Water	67.00
Carbohydrate-free vegetable protein hydrolysate	31.00
Thiamine hydrochloride	.88
L-cysteine hydrochloride	.88

The composition was spray dried to produce a product with a beef flavor with a roasted type note.

A typical "pan drippings" note is added to the beef flavor of the above Examples by the addition of animal tallow. This note is a very desirable one. In addition, animal tallow when used directly in the refluxing procedure or in the subsequent spray drying has the ability to trap meat flavor volatiles resulting in an improved overall flavor with an increase in the total flavor intensity.

EXAMPLE 21

The following ingredients were refluxed for four hours:

Water	39.24
Beef tallow	28.00
Carbohydrate-free vegetable protein hydrolyzate	31.00
L-cysteine hydrochloride	.88
Thiamine hydrochloride	.88

The composition was spray dried to produce a product with a beef flavor having a "pan drippings" note.

EXAMPLE 22

The following ingredients were refluxed for four hours and aged three days, and sufficient gum arabic was added to provide a composition containing one part of gum arabic to one part of flavor solids by weight. Sufficient water was added for emulsification. The emulsion was then spray dried to produce a product with a flavor resembling pork.

L-cysteine hydrochloride	.80
Thiamine hydrochloride	.80
Carbohydrate-free vegetable protein hydrolyzate	20.00
Tallow	77.46
Palmitic acid	.30
Oleic acid	.44
L-leucine	.10
Methionine	.10

Instead of thiamine hydrochloride in the above Examples an equivalent amount of a substituted thiazole may be used.

The composition of this invention may be used for imparting a meat-like flavor to meatless edible compositions, and may be used to enhance the flavor of meat-containing compositions. The compositions of this invention may be incorporated in soups and soup mixes, casserole dishes, canned and frozen vegetables, animal and pet foods, sauces, gravies, stews, simulated meat products, meat spreads and dips, bakery products, and replacement for beef extracts and the like. In these applications the flavor composition of this invention is usually combined with spices, condiments, mono-sodium glutamate, water, flour, fats, or other edible products or flavors.

Some of the applications of the compositions of this invention are illustrated by the following Examples:—

EXAMPLE 23

A beef bouillon cake formulation was made containing the ingredients listed, in the amounts shown:—

Ingredient	Gms/Unit
Salt	1.80
The spray dried flavor of Example 13	0.50
Gelatin (180 bloom)	0.40
Mono-sodium glutamate	0.20
Brown coloring	0.01
Garlic powder	0.04
Pepper, ground	0.01
Total	2.96

A bouillon cube will weigh from 4 to 5 grams. One cube is used with 6 ounces of boiling water.

EXAMPLE 24

A beef gravy was made by formulating a gravy flavor composition of the ingredients and in the amounts indicated:—

Ingredient	Gms/Unit
Cornstarch	10.50
The spray dried product of Example 13	3.00
Caramel color	.30
Garlic powder	.05
White pepper	.03
Salt	1.92
Mono-sodium glutamate	.20
	16.00

To one unit of gravy flavor concentrate, 8 ounces of water were added, and the mixture was stirred thoroughly to disperse the ingredients; brought to a boil, simmered for one minute, and served. This "meatless" gravy showed excellent beef flavor.

EXAMPLE 25

A soup was made by adding 22 ounces of water to the recipe given in Example 24 for the gravy.

EXAMPLE 26

A shaker composition for enhancing the flavor of meats was prepared from a variety of flavors. A powdered composition to enhance a ham flavor was made of:—

Ingredient	% Composition
Ham spices	2.5
Mono-sodium glutamate, find grind	2.5
Salt, fine grind	55.0
The spray dried flavor of Example 13	40.0
	100.0%

EXAMPLE 27

A beef noodle soup was prepared by mixing together:

Ingredients	Gms/Unit
Salt	5.00
The spray dried flavor of Example 13	3.00
Gelatin (180 bloom)	1.00
Mono-sodium glutamate	.40
Caramel color	.40
Garlic powder	.10
White pepper, ground	.06
Mixed vegetable pieces	36.00
	45.96

Three cups of water were added to the above mixture; and the mix was brought to a full boil, simmered for five minutes, and was then ready to serve.

WHAT WE CLAIM IS:—

1. A process for preparing an edible composition characterized by

(a) reacting, at temperatures above 35° C., and in the absence of mono-saccharides, acyclic aldehydes, furan compounds and fractionated liquid wood smoke, so as to obtain a meaty-flavoured reaction product, a mixture containing as the essential reacting ingredients.

(1) a proteinaceous substance, or mixtures of such proteinaceous substances with

(2) a sulfur-containing compound which is an organic compound having the formula RST, where R is an amino acid group or a lower alkyl group and T is hydrogen, a lower alkyl group or the group —SR; or hydrogen sulfide; or a sulfide or a sulfhydrate of an alkali metal, an alkaline earth metal, an ammonium group or a substituted ammonium group; or mixtures of these sulfur-containing compounds (a lower alkyl group containing from 1 to 6 carbon atoms).

(b) and, if desired, and in any order doing one or more of the following:

(3) concentrating the resulting product

(4) aging the resulting product

(5) adding at any stage or stages of the process additional materials, including solvents, thickeners, carriers, flavouring or aroma-imparting ingredients, or mixtures of these.

2. A process according to claim 1, characterized by the fact that said proteinaceous substance is a protein, a protein hydrolysate, or mixtures of these.

3. A process according to claim 1 or 2, characterized by the fact that said sulfur-containing compound is selected from cysteine, cystine, methionine, the acid and basic salts of these, and mixtures of these compounds.

4. A process according to any one of the preceding claims, characterized by the fact that said additional flavouring and aroma imparting ingredients include an acid salt of thiamine, pyruvic acid, pyruvic aldehyde, dihydroxyacetone, or mixtures of these.

5. A process according to any one of the preceding claims, characterized by the fact that thiamine or a salt thereof is added during the reaction in step (a).

6. A process according to any one of the preceding claims, characterized by the fact that said carrier is gum arabic.

7. A process according to any one of the preceding claims, characterized by the fact that the reaction is effected by heating the aqueous reaction mixture under reflux.

8. A process for preparing an edible composition substantially as described in any one of Examples 1 to 22.

9. A process for enhancing the flavour and/or aroma value of foods characterized by adding to said food an edible composition prepared by the process according to any one of claims 1 to 8.

10. An edible composition whenever prepared by the process claimed in any one of claims 1 to 9.

11. An edible composition, characterized by the fact that it is produced by

(a) reacting, at temperatures above 35° C., and in the absence of mono-saccharides, acyclic aldehydes, furan compounds and fractionated liquid wood smoke, so as to obtain a meaty-flavoured reaction product, a mixture containing as the essential reacting ingredients.

(1) a proteinaceous substance, or mixtures of such substances with

(2) a sulfur-containing compound which is an organic compound having the formula RST where R is an amino acid group or a lower alkyl group, and T is hydrogen, a lower alkyl group or the group —SR; or hydrogen sulfide, or a sulfide or a sulfhydrate of an alkali metal, an alkaline earth metal, an ammonium group or a substituted ammonium group; or mixtures of these sulfur-containing compounds (a lower alkyl group containing from 1 to 6 carbon atoms)

(b) and, if desired, and in any order doing one or more of the following:

(3) concentrating the resulting product

(4) aging the resulting product

(5) adding at any stage or stages of the process additional materials, including solvents, thickeners, carriers, flavouring or aroma-imparting ingredients, or mixtures of these.

12. A composition according to claim 11, characterized by the fact that said proteinaceous substance is a protein, a protein hydrolysate, or mixtures of these.

13. A composition according to claim 11 or 12, characterized by the fact that said sulfur-containing compound is selected from cysteine, cystine, methionine, the acid and basic salts of these, and mixtures of these compounds.

14. A composition according to claim 11, 12 or 13, characterized by the fact that said additional flavouring and aroma imparting ingredients include an acid salt of thiamine, pyruvic acid, pyruvic aldehyde, dihydroxyacetone, or mixtures of these.

15. A composition according to claims 11 to 14 characterized by the fact that thiamine or a salt thereof is added during the reaction in step (a).

16. A composition according to claims 11 to 15, characterized by the fact that said carrier is gum arabic.

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COMPLETE SPECIFICATION

Flavouring Substance and Process for Producing the same

We, KYOWA HAKKO KOGYO CO. LTD., of 4, Ohtemachi 1-chome, Chiyoda-ku, Tokyo, Japan, a Corporation duly organised and existing under the laws of Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a flavoring substance having a natural cooked meat flavor. This invention also concerns a process for renovating animal fat so as to make it suitable for re-extraction of flavoring substances. More particularly, the invention is directed to flavoring substances and a process for producing the same from mixtures comprising amino acids or from animal fat.

Many investigations have been carried out on the origin of the flavor of cooked meat. It has been thought that such a flavor is produced by a complicated chemical change in which sugars such as glucose, ribose, amino acids such as alanine, β-alanine, serine, leucine, isoleucine, glycine, glutamic acid, creatine, histidine, very small amounts of organic compounds containing nitrogen and sulfur, the constitution of which has not been determined, and phosphoric acid esters such as inosinic acid participate. However, the actual substance which originates the flavor or the mechanism of its generation has never been accurately or completely explained.

In thoroughly investigating the substance which originates the flavor as well as the mechanism of its generation, the present inventors at first studied the flavor characteristic of corned beef, a food which is in extensive general use. Fresh corned beef taken out from a can was ground as finely as possible by a mixer and divided into a fat part and a protein part by repeatedly extracting with ethyl ether in order to pursue the fate of the flavor. It was found that the greater part of the flavor characteristic of the corned beef was transferred into the fat part and that, significantly, only a weak boiled beef flavor remained in the protein part. Furthermore, it was found that the original characteristic flavor was reproduced by adding the fat part, in which the greater part of the flavor was contained, to the meat part of the extraction residue. This fact shows that the said flavor is not changed by the procedure of ether extraction and, moreover that the flavor of corned beef originally exists in the fat part thereof. Moreover, as the result of repeatedly extracting the fat part containing the main substance of flavor after the removal of ether under reduced pressure with hot water, only a slightly weak meat extract flavor is obtained, while the flavor characteristic of corned beef remains almost completely in the fat part. This suggests the hypothesis that the accepted theory that fat scarcely participates in the generation of the flavour or cooked meat is not correct.

It is believed that experiments such as the one described above show that the fat contained in the starting material becomes an important factor in the generation of flavor. Thus, it is believed that a main part of the flavor of corned beef, a representative flavor of cooked meat, exists inseparately in a close relationship in the fat part. In order to confirm this fact, a mixture of the above-mentioned various amino acids, an aqueous concentrated solution of glucose and a small amount of phosphoric acid were added to beef tallow and heated at 120°C. in an autoclave. A remarkable cooked meat flavor was produced. On the contrary, when beef tallow as heated by a similar procedure but without the addition of any of these

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compounds, only a weak characteristic fat odor was obtained.

When an aqueous solution containing amino acids, glucose and phosphoric acid without beef tallow was similarly heated, a flavor suggestive of delicious food was obtained, but a cooked meat flavor was not produced.

Hence, it is apparent that the existence of animal fat is effective for the production of a cooked meat flavor and, furthermore, it is thought that the animal fat takes part in the respective flavor characteristic of the particular kind of animal.

Thus, the present invention has evolved as a result of a thorough investigation on the substances which originate cooked meat flavor and the mechanism of its generation.

Accordingly, one of the objects of the present invention is to provide a flavoring substance having a natural cooked meat flavor and a process for producing the same.

Another object of the present invention is to provide a process for producing a flavoring substance capable of giving a natural cooked meat flavor by the use of animal fat.

Still another object of the present invention is to provide a process for renovating animal fat after the extraction of flavoring substances therefrom so as to reproduce from the fat a flavoring substance having a natural cooked meat flavor which closely resembles that obtained from fresh animal fat.

Yet another object of the present invention is to provide a flavoring substance having a natural cooked meat flavor and a process for producing the same which may be carried out efficaciously and readily.

These and other objects and advantages of the present invention will become apparent to those skilled in the art from a consideration of the following specification and claims.

In accordance with the present invention, it has been found that mixtures of C_{16}, C_{18} saturated and unsaturated fatty acids, esters thereof and a very small amount of thiamine compounds are effective for producing a cooked meat flavor. When mixtures of C_{16}, C_{18} saturated and unsaturated fatty acids, esters thereof or substances containing them and a very small amount of thiamine compound are added to amino acids, sugars and phosphoric acid esters and then heated together, a flavoring substance is obtained having a cooked meat flavor. Moreover, it has been found that a desirable flavoring substance may be extracted from spent animal fat after it has been heated with an aqueous concentrated solution of amino acids and sugars, phosphoric acid or phosphoric acid esters and a very small amount of thiamine compounds.

Thus, pursuant to this invention, it has been found that the existence of a very small amount of thiamine compounds gives a significant effect on the generation of a cooked meat flavor. This is demonstrated by the following experiment. Beef tallow, lard, chicken fat and whale fat were added to an aqueous solution of amino acids, sugars, a small quantity of phosphoric acid and a very small amount of thiamine tetrahydrofurfuryl disulfide and then heated with stirring in an autoclave. The effect of the flavor produced by these various animal fats was then examined. The results of this experiment are shown in Table 1, demonstrating that the addition of thiamine compounds is effective for generating a cooked meat flavor.

TABLE 1

Kinds of animal fat	Flavor produced
Beef tallow	Cooked beef flavor
Lard	Pork bone soup flavor
Chicken fat	Chicken soup flavor
Whale fat	Whale bacon flavor

Thiamine hydrochloride or thiamine compounds known as active vitamin B_1 as well as thiamine tetrahydrofurfuryl disulfide show almost the same effect for the generation of a cooked meat flavor. Nucleotides such as inosinic acid, cytidylic acid, uridylic acid and phosphoric acid have an entirely similar effect for the generation of cooked meat flavor.

A greater part of the cooked meat flavor can be extracted by repeatedly extracting the thus prepared heated product with a small amount of hot water. Only the corned beef flavor remains in the fat part of the extract residue. This shows that the flavoring substance to give a cooked meat or meat extract flavor can be produced by extracting the heated product with hot water.

As described above, the present inventors have found that the existence of animal fat is an important factor for the production of a cooked meat flavor. Based on this factor, it has further been found that the production of cooked meat flavor originates in the free fatty acids produced by heating animal fat with an aqueous solution of phosphoric acid.

Specifically, a dilute phosphoric acid solution prepared by dissolving 0.05 gram of phosphoric acid in 5 ml. of water was added to 10 grams of beef tallow, one of the animal fats, and the mixture heated at 120°C. in an autoclave. Subsequently, the fat fraction was examined by paper chromatography. Respective clear spots coincident with the existence of stearic acid, palmitic acid and oleic acid were detected. From these experimental results, it may be postulated that higher fatty acids produced by hydrolysis themselves participate in the reaction and, furthermore, that the decomposition reaction by cleavage at the position of the double bond

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participates in the production of the flavoring substance.

In order to confirm the latter proposal, the present inventors have examined the flavor of the product obtained by adding higher fatty acids such as palmitic acid, stearic acid, oleic acid, linoleic acid, singly or in mixtures of two or more, to an aqueous concentrated solution containing one or more than one amino acid such as β-alanine, DL-alanine, DL-serine, L-leucine, L-isoleucine, glycine, L-glutamic acid, creatine, histidine, a small amount of glucose, a very small amount of thiamine tetrahydrofurfuryl disulfide and a small amount of phosphoric acid and then heating with stirring in an autoclave. The results are shown in Table 2.

TABLE 2

Fatty acids added	Flavor produced
Stearic acid	Slight cooked meat flavor
Palmitic acid	A little cooked meat flavor with fragrant flavor
Oleic acid	A little cooked meat flavor with fragrant flavor
Mixture of palmitic acid and oleic acid	A little cooked meat flavor with fragrant flavor
Linoleic acid	Fragrant flavor with a little fat odor
Mixture of stearic acid palmitic acid, oleic acid and linoleic acid	Cooked meat flavor

From these results, it can be seen that the main substance giving a cooked meat flavor is the fatty acids.

The present invention also includes a process for producing a flavoring substance by the use of animal fat as the substance containing the fatty acids and the esters thereof. Animal fat produces free fatty acids and their esters when heated with an aqueous phosphoric acid solution. Beef tallow, lard, chicken fat and whale fat are suitable exemplary animal fats. In the case of using animal fat as the source of C_{16}, C_{18} saturated and unsaturated fatty acids and the esters thereof, it is economical and desirable to re-use spent animal fat after the separation therefrom of flavoring substances, this being another embodiment of the present invention.

The greater part of the flavoring component is extracted by adding animal fat to a mixture containing an aqueous concentrated solution of amino acids and sugars, a small amount of phosphoric acid or phosphoric acid esters and a very small amount of thiamine, heating this mixture and then extracting the reactant with hot water. In re-using the residual animal fat after the production of flavoring substances according to this process under the same conditions, the flavor produced is just like the flavor of preserved food which has been boiled down in beef soy sauce and has lost its fresh cooked meat flavor. However, the difference in strength of flavor is not recognized between fresh animal fat and the residual animal fat in an examination by dilution of the flavoring substance produced. This shows that fresh animal fat and spent or residual animal fat scarcely differ in the amount of flavoring component produced. It is reasonable to thus consider that the main component in animal fat which reacts with amino acids, sugars or thiamine compounds added in the presence of a small amount of phosphoric acid is the decomposition product obtained by heat-decomposition under these reaction conditions. Moreover, it is also considered that the component which is not contained in the decomposition of recovered animal fat exists in the decomposition product of new animal fat and that the different flavors produced between the new animal fat and re-used animal fat which has been recovered are caused by the same component.

In the present invention, the flavoring substance giving a cooked meat flavor which remarkably resembles that obtained from new animal fat is produced by adding extremely small amounts of volatile α- or β-diketones such as diacetyl, acetylpropionyl, acetylbutylyl or volatile α- or β-keto-alcohols such as acetoin, acetylethylcarbinol, acetylpropylcarbinol to the spent or already extracted animal fat.

The following examples are given merely as illustrative of the present invention and are not to be considered as limiting. Unless otherwise noted, percentages set forth throughout this disclosure are by weight.

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EXAMPLE 1

1.4 g. of β-alanine, 0.28 g. of DL-serine, 0.18 g. of DL-alanine, 0.08 g. of L-leucine, 0.04 g. of L-isoleucine, 0.04 g. of glycine, 0.03 g. of L-glutamic acid, 0.15 g. of creatine, 0.1 g. of histidine, 0.5 g. of glucose, 0.005 g. of thiamine tetrahydrofurfuryl disulfide and 0.05 g. of phosphoric acid were dissolved in 20 ml. of distilled water. Then, 4 g. of stearic acid, 1.8 g. of palmitic acid, 3.3 g. of oleic acid and 0.2 g. of linoleic acid were added thereto. The resultant mixture was then heated with stirring at a pressure of 0.5 atmosphere and a temperature of 120°C. for two hours in an autoclave and subsequently sufficiently cooled. The unreacted portion of the mixture solidified in the upper part thereof and was filtered. After dilution by 500 fold, a flavoring substance having a remarkable cooked meat flavor was obtained.

EXAMPLE 2

1.4 g. of β-alanine, 0.28 g. of DL-serine, 0.18 g. of DL-alanine, 0.8 g. of L-leucine, 0.04 g. of L-isoleucine, 0.04 g. of glycine, 0.03 g. of L-glutamic acid, 0.15 g. of creatine, 0.1 g. of histidine, 0.5 g. of glucose, 0.005 g. of thiamine tetrahydrofurfuryl disulfide, 0.05 g. of phosphoric acid and 20 ml. of distilled water were added to 50 g. of beef tallow. The mixture was heated with stirring at 0.5 atmospheric pressure and at 120°C. for two hours in an autoclave. After dilution by 500 fold, a flavoring substance having a remarkable cooked beef flavor was produced.

EXAMPLE 3

1.4 g. of β-alanine, 0.28 g. of DL-serine, 0.18 g. of DL-alanine, 0.08 g. of L-leucine, 0.04 g. of L-isoleucine, 0.04 g. of glycine, 0.03 g. of L-glutamic acid, 0.15 g. of creatine, 0.1 g. of histidine, 0.5 g. of glucose, 0.005 g. of thiamine tetrahydrofurfuryl disulfide, 0.05 g. of phosphoric acid and 20 ml. of distilled water were added to chicken fat. The mixture was heated with stirring at 0.5 atmospheric pressure and at 120°C. for two hours in an autoclave. The resultant product was extracted with 100 ml. of hot water five times, and the water layer extracted was concentrated under vacuum to give a total volume of 20 ml. After dilution by about 6,000 fold, a flavoring substance having a remarkable chicken soup flavor was obtained.

EXAMPLE 4

1.4 g. of β-alanine, 0.28 g. of DL-serine, 0.18 g. of DL-alanine, 0.08 g. of L-leucine, 0.04 g. of L-isoleucine, 0.04 g. of glycine, 0.03 g. of L-glutamic acid, 0.15 g. of creatine, 0.1 g. of histidine, 0.5 g. of glucose, 0.005 g. of thiamine tetrahydrofurfuryl disulfide, 0.05 g. of phosphoric acid and 20 ml of distilled water were added to 50 g. of beef tallow. The mixture was then heated with stirring at 0.5 atmospheric pressure and 120°C. for two hours in an autoclave. Subsequently, the reactant was extracted with 100 ml. of hot water five times, and the flavoring substance produced was removed by extraction.

To 40 g. of the residual fat part, 0.001 g. of diacetyl was added as well as the same amounts of the various components named hereinabove. The mixture was then heated under the same conditions as described above. Thereafter, the reactant was extracted with 100 ml. of hot water five times, and the extracted water layer was concentrated under vacuum to an amount of 20 ml. A flavoring substance was thereby produced having a cooked beef flavor.

EXAMPLE 5

0.005 g. of acetoin (methylacetylcarbinol) was added to 50 g. of chicken fat used for the production of chicken soup flavoring substances. Also added thereto were 1.4 g. of β-alanine, 0.28 g. of DL-serine, 0.18 g. of DL-alanine, 0.08 g. of L-leucine, 0.04 g. of L-isoleucine, 0.04 g. of glycine, 0.03 g. of L-glutamic acid, 0.15 g. of creatine, 0.1 g. of histidine, 0.5 g. of glucose, 0.005 g. of thiamine tetrahydrofurfuryl disulfide, 0.05 g. of phosphoric acid and 20 ml. of distilled water. The mixture was heated with stirring at 0.5 atmospheric pressure and 120°C. for two hours in an autoclave. The reactant was extracted with 100 ml. of hot water five times, and the extracted water layer was concentrated to give a total amount of 20 ml. After dilution by 1,000 fold, a flavoring substance giving a remarkable chicken soup flavor was obtained.

WHAT WE CLAIM IS:—

1. A process for producing a flavoring substance having a cooked meat flavor which comprises adding a first mixture comprising an aqueous solution of at least one amino acid, at least one sugar and a phosphorus-containing compound selected from the group consisting of phosphoric acid, esters of phosphoric acid and mixtures thereof to at least one substance selected from the group consisting of C_{16}, C_{18} saturated and unsaturated fatty acids and their esters and mixtures thereof, heating the resultant mixture, and then separating the unreacted portion of the heated mixture, thereby obtaining a flavoring substance having a cooked meat flavor.

2. The process of Claim 1, wherein a small amount of at least one thiamine compound is included in said first mixture.

3. The process of Claim 1, wherein said amino acid is selected from the group consisting of alanine, β-alanine, serine, leucine, isoleucine, glycine, glutamic acid, creatinic acid, creatine and histidine.

4. The process of Claim 1, wherein said esters of phosphoric acid are nucleotides.

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5. The process of Claim 4, wherein said nucleotides are selected from the group consisting of inosinic acid, cytidylic acid and uridylic acid.

6. A process for producing a flavoring substance having a cooked meat flavor which comprises heating a mixture comprising animal fat, an aqueous solution of at least one amino acid, at least one sugar and a phosphorus-containing compound selected from the group consisting of phosphoric acid, esters of phosphoric acid and mixtures thereof, and then separating the resultant reacted substance from the heated mixture, said substance having a cooked meat flavor.

7. The process of Claim 6, wherein a small amount of at least one thiamine compound is included in said mixture.

8. The process of Claim 6, wherein said amino acid is selected from the group consisting of alanine, β-alanine, serine, leucine, isoleucine, glycine, glutamic acid, creatinic acid, creatine and histidine.

9. The process of Claim 6, wherein said esters of phosphoric acid are nucleotides.

10. The process of Claim 9, wherein said nucleotides are selected from the group consisting of inosinic acid, cytidylic acid and uridylic acid.

11. A process for producing a flavoring substance having a cooked meat flavor which comprises heating a first mixture comprising animal fat, an aqueous solution of at least one amino acid, at least one sugar and a phosphorus-containing compound selected from the group consisting of phosphoric acid, esters of phosphoric acid and mixtures thereof, separating the resultant reacted substance from the heated mixture, adding a small amount of at least one compound selected from the group consisting of volatile α-diketones, β-diketones, α-ketoalcohols and β-ketoalcohols and the components of said aqueous mixture to the spent animal fat, heating the resultant second mixture, separating the resultant reacted substance from the heated second mixture, and repeatedly conducting heating, extraction and recovery steps as necessary to give a flavoring substance having a cooked meat flavor.

12. The process of Claim 11, wherein a small amount of at least one thiamine compound is included in said aqueous mixture.

13. The process of Claim 11 wherein said amino acid is selected from the group consisting of alanine, β-alanine, serine, leucine, isoleucine, glycine, glutamic acid, creatinic acid, creatine and histidine.

14. The process of Claim 11, wherein said esters of phosphoric acid are nucleotides.

15. The process of Claim 14, wherein said nucleotides are selected from the group consisting of inosinic acid, cytidylic acid and uridylic acid.

16. The process of Claim 11, wherein said α- and β-diketones are selected from the group consisting of diacetyl, acetylpropionyl and acetylbutylyl.

17. The process of Claim 11, wherein said α- and β-ketoalcohols are selected from the group consisting of acetoin, acetylethylcarbinol and acetylpropylcarbinol.

18. The flavoring substance produced by the process of Claim 1.

19. The flavoring substance produced by the process of Claim 6.

20. The flavoring substance produced by the process of Claim 11.

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COMPLETE SPECIFICATION.

Meat Flavour.

We, KYOWA HAKKO KOGYO CO. LTD., of 4, Ohtemachi-1-chome, Chiyoda-ku, Tokyo, Japan, a corporation organised under the laws of Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a meat flavour composition and to a process for preparing the same. More particularly, it relates to a composition having a beef-like fragrance. Even more particularly, the invention relates to a fragrance composition and to a process for preparing the same on the basis of the Maillard reaction of ribose and amino acids.

Many investigations have been made in the prior art on the preparation of colored substances by the Maillard reaction of saccharides, especially those of glucose and amino acids. Some of these have been put to practical use, chiefly in the food industry field. However, there has been very little work done on the fragrance component of the obtained Maillard reaction products. In fact, most of the investigations have centered only on the reaction with glucose [W. J. Herz and R. S. Shallenberger, *Food Research*, Volume 25, page 491 (1960)]. Thus, the meat-like fragrance component has not as yet been found.

The present inventors reasoned that there was some relationship between the peculiar fragrance component of cooked meat and the combination of ribose, a saccharide constituting the nucleic acid present in meat, and the amino acids which exist in meat. Thus, they concluded that there was a possibility of preparing a fragrance component of this kind by utilizing the Maillard reaction of a saccharide, ribose and amino acids. With this approach, the present inventors have investigated the fragrance component of the reaction products of ribose and each of amino acids and their mixtures in detail and, in accordance with the present invention, have found that the appetizing fragrance component peculiar to cooked meat is formed in the reaction product of ribose-5-phosphate and an amino acid or mixture of amino acids.

Accordingly, one of the objects of the present invention is to provide an efficacious process for preparing a meat-like flavour composition.

Another object of the present invention is to provide a novel flavour composition.

A further object of the invention is to provide a flavour composition and a process for preparing the same which may be carried out easily in an advantageous manner.

These and other objects and advantages of the present invention will become apparent to those skilled in the art from a consideration of the following specification and claims.

The reaction in accordance with the present invention for producing a flavour composition is carried out by preparing an aqueous solution of a mixture of ribose-5-phosphate and an amino acid at an appropriate concentration and heating this solution at a temperature between 100°C. and 250°C. for some time in an autoclave. The Maillard reaction is a non-enzymatic reaction which occurs between the amino group of an amino

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acid, a peptide or protein and the hydroxyl group of saccharides which are capable of forming a glucoside. The saccharide-amino acid condensation is the first step of the reaction. This is followed by a decomposition reaction by which various volatile carbonyl compounds are formed. The obtained volatile carbonyl compounds may constitute a part of the fragrance component in meat.

It has been found that the use of an ordinary saccharide such as glucose or fructose does not give a meat-like fragrance composition.

Suitable amino acids for the reaction are lysine or a hydrolytic product of protein. As pointed out above, reaction therewith is carried out at a temperature between 100°C. and 250°C. The preferred reaction temperature range is between 150°C. and 180°C.

The reaction product has a slightly stimulative odor immediately after the reaction. However, it is aged for several days in order to obtain the favorable and desirable peculiar fragrance of meat. If the obtained reaction solution is tightly sealed and frozen, for example, in a refrigerator, it can be preserved for several months. If it is subjected to freeze-drying to obtain a dry powder, it is even more preserved and can be easily transported without deterioration quite conveniently.

With the recent development of the chemistry of flavoring components, various chemical seasonings have become popular and are now essential in daily cooking. Many people find it desirable to add artificial favorable appetizing fragrance components to their foods. The meat-like fragrance composition according to the present invention satisfies such desires. Thus, for example, the fragrance of meat cooking can be obtained by adding a small amount of the herein described fragrance composition to a soup or to a cooked solid food. Moreover, the artificial meat which has recently been prepared from various protein sources can be even further improved to a more perfect foodstuff by adding thereto the meat flavour composition of the present invention.

The following example is given merely as illustrative of the present invention and is not to be considered as limiting. Unless otherwise noted, the percentages therein are by weight.

EXAMPLE 1

A starting solution is prepared by mixing 80 ml. of a 10% aqueous solution of disodium D-ribose phosphate with 80 ml. of a 10% aqueous solution of a casein hydrolysate. This solution is subjected to heat treatment at 150°C. for 30 minutes in an autoclave with continuous stirring. The reaction solution is taken out of the autoclave and kept at room temperature for five days. The solution is then treated by freeze-drying the same so as to obtain a fragrant powder.

Other suitable amino acids which may be used within the scope of the present invention for reaction with ribose-5-phosphate include for example arginine, ornithine, methionine, cystine and cysteine, lysine being, however, generally preferred.

The proportion of components to be utilized may vary within wide proportions. However, it is preferred to react the ribose component in a proportion of 0.5 to 2 parts by weight per 1 part by weight of amino acid.

WHAT WE CLAIM IS:—

1. A process for preparing a meat flavour composition which comprises heating ribose-5-phosphate with at least one amino acid at a temperature between 100°C. and 250°C.

2. The process of claim 1, further comprising the step of aging the resultant reaction product for at least 24 hours.

3. The process of claim 1 or 2, wherein said temperature of heating is between 150° and 180°C.

4. The process of claim 1, 2 or 3, wherein said amino acid is lysine.

5. The process of claim 1, 2 or 3, wherein said amino acid is a hydrolyzed protein.

6. The process of claim 1, 2 or 3, wherein said amino acid is a casein hydrolysate.

7. A process for preparing a meat-like fragrance composition which comprises heating an aqueous solution of ribose-5-phosphate with at least one amino acid at a temperature between 150° and 180°C. and then aging the resultant reaction product for at least 24 hours.

8. The process of claim 7, wherein from 0.5 to 2 parts by weight of said ribose-5-phosphate reactant is employed per part by weight of said amino acid.

9. The process of claim 7 or 8, further comprising the step of freeze-drying the resultant aged product to obtain a fragrant powder.

10. Process for preparing a meat flavour composition substantially as described in the foregoing Example.

11. The meat flavour composition prepared by the process of any preceding claim.

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Inventors: CHARLES GERARD MAY and CORNELIS JOHANNES SOETERS

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COMPLETE SPECIFICATION

Edible Products

We, UNILEVER LIMITED, a Company registered under the laws of Great Britain, of Port Sunlight, in the County of Chester, England, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to artificial flavouring substances and to their preparation.

The invention provides a process for making a flavouring substance by heating a mixture comprising a carbohydrate and at least one amino acid in the presence of a fatty material under the conditions described below, the carbohydrate being a monosaccharide or capable of yielding a monosaccharide under the reaction conditions.

The carbohydrate may be a pentose, such as ribose, arabinose or xylose, or a hexose, for example glucose. It may be advantageous to use a mixture of carbohydrate which contains either pentoses or hexoses or both.

Di-, tri- or poly-saccharides, or simple derivatives of mono-, di-, tri or poly-saccharides which yield a mono-saccharide under the conditions of reaction, may also be used. Thus invert sugar or monoacetone glucose may be used as a suitable source of glucose and methyl-riboside as a source of ribose.

The amino acid may be a single amino acid or a mixture of two or more amino acids. A wide range of amino acids may be employed in accordance with the invention. However, phenylalanine and methionine tend to give undesirable floral or potato-like aromas, while large amounts of tyrosine and tryptophan may also give rise to objectionable odours.

Amino acid for use according to the present invention may also be obtained by hydrolysis of proteins of animal or vegetable origin. Good results are obtained with acid- or enzyme-hydrolysed wheat gluten, soya protein and casein.

Preferably the amino acid comprises cysteine or cystine, or a derivative that will give rise to one of these amino acids under the reaction condition employed. Such derivatives may, for example, be salts, esters, hydroxy compounds, peptides or proteins. Generally cysteine or derivatives giving rise to cysteine are preferred to cystine. A protein hydrolysate supplemented with up to 20% cysteine yields a particularly good flavour.

The taste, odour and colour of the product are influenced by the relative quantities of amino acid and carbohydrate used. Although the compounds of the reaction mixture can be used in widely varying proportions, an excessive amount of carbohydrate may give rise to excessive sweetness of flavour or may result in caramellisation during heating at high temperatures.

In one embodiment of the invention in which the reaction is carried out in the presence of water we use the amino acid and the carbohydrate in weight ratios between 2:1 and 2:5, while optimal results may be obtained using weight ratios between 1:1 and 1:2.

The fatty material may be a fat, an oil, or a higher fatty acid; the type of flavour obtained is generally affected by the type of fatty material used. For instance, lard may give rise to a cooked chicken flavour, while palmitic acid may produce the flavour of roast pork and oleic acid the flavour of roast mutton.

The type and intensity of flavour produced is also influenced by the amount of fatty mater-

ial present. The use of as little as 1% by weight of the fatty material, calculated on the total non-aqueous constituents, may give a satisfactory flavouring substance, but it is preferred that the reaction mixture, excluding any water that may be present, should contain between 5% and 40% by weight of the fatty material. If desired, greater proportions of fat or fatty acid may be used.

The physical properties of the fatty material employed will also influence the physical nature of the flavouring substance. For example, when it is intended to prepare a flavour concentrate which is liquid at room temperature, it will probably be convenient to use an oil which is liquid at room temperature as the fatty material; a fat which is solid at room temperature may be used to prepare a solid end product such as a gravy tablet.

The amount of water present in the reaction mixture of amino acid, carbohydrate and fatty material will influence the character of flavour product obtained. For example, the amount of water present may suitably be 5 or even 15 to 25 times the amount by weight of the total carbohydrate. Amounts of up to 1,500 times may occasionally be used.

Alternatively the reaction may be carried out in the presence of smaller amounts or even trace amounts of water. This procedure is preferable when the process is carried out at a high temperature; the resulting product so obtained may be substantially water-free.

Accordingly in a further embodiment of the invention the amino acid carbohydrate and fat are heated at a temperature between 100°C. and 140°C. in such a way that the mixture after heating is substantially water-free. The preferred ratios of amino acid to carbohydrate in this process are from 2:1 to 2:5.

The pH at which the reaction is carried out is not critical, although the pH of the mixture at the end of the reaction must not be alkaline. It is preferable to carry out the reaction at a pH of from 3 to 6.

It is desirable to stir the mixed reactants during heating in order to reduce the risk of local overheating and to disperse the fatty ingredients. Vigorous stirring during heating may reduce the time required to complete the reaction.

The reaction is preferably carried out at a temperature between 60°C and 140°C; the characteristics of the flavour obtained may depend on this reaction temperature. Thus, at temperatures of 60° to 100°C, the flavour may resemble boiled meat, whereas at temperatures approaching 140°C, the flavour may be more like roast or fried meat.

The reaction may be carried out by heating the mixture under reflux for a suitable period, which will depend upon the temperature employed. At lower temperatures, for example 70°C, a long heating time may be necessary, for example 24 to 30 hours. At higher temperatures usually a short heating time is preferable, (for example 5 minutes to 4 hours) since it is desirable that volatile flavour components should not escape or be decomposed. The selection of a suitable reaction time is quite easily determined by simple trial.

The reaction may also be carried out under a pressure below or above that of atmospheric pressure, in which case the temperature and time of heating may be varied to suit the circumstances.

The reaction products may be used as such or they may be converted into powder by any suitable method of drying. When spray-drying is the method employed, it is desirable first to disperse the fat with a suitable emulsifying agent such as glyceryl monostearate, and then to mix it with an inert vehicle, such as corn flour or wheat flour, which is suitable for use in the spray-drying process. Alternatively an inert vehicle, for example toasted flour may be added to the reaction product and the flavoured powder so obtained either with or without further drying, may be used directly as a gravy powder or compressed to form gravy tablets or tubes. In compressed form, flavour deterioration is minimized.

The flavouring composition thus obtained may be used to prepare an excellent gravy substitute by the addition of a suitable volume of hot water.

The invention may also be performed in the presence of the food product in which is is desired to incorporate a savoury or meat-like flavour. Thus, for example, the amino acid, carbohydrate and fatty material may be added to the foodstuff in a can which is then sealed and autoclaved. When carrying out the reaction by adding these reactants to a food product, it may be necessary to add a small amount of water, but generally such products will already contain sufficient water to enable the reaction to proceed.

In a preferred embodiment of the invention further substances, for example onion, may be added before the heating stage. By 'onion' we mean 'Spanish' onions, spring onions and other suitable members of the genus Allium, such as garlic and leek and products derived from them. An excellent gravy flavour concentrate may thus be obtained.

Further suitable substances that may be used alone or in combination with onion are tomato, carrot, celery, mustard and products derived from them. All these substances may be used in a fresh, pickled or powdered form. Spices, for example bay leaves, monosodium glutamate and oil of citron may be added after the reaction products are cool. The product so obtained by the addition of tomato and subsequent heating under comparable conditions is more suitable as a flavour for soups.

When onion as such is used it is convenient to suspend it in finely divided form in the fatty

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material. When onion products are used, it is preferable to ensure that at least part of the water-soluble components of onion are present in these products. An extract obtained by extracting onion with water and then drying, is suitable. Less suitable are onion oil, and several synthetic onion flavours which do not contain these water-soluble components.

Because onion extracts contain small amounts of carbohydrate and amino acid, a flavour obtained by heating in the presence of fat is formed as previously described, although the amount of carbohydrate is generally not sufficient to obtain good results and additional carbohydrate is preferred for optimal results. In order to avoid the formation of a sediment which would stick to the bottom and wall of the reaction vessel during the heating stage, additives such as lecithin and cooking salt may be added. As the reaction product obtained is usually a sticky, fatty mass, it is preferred to add binding materials such as vegetable gum, for example guar gum, to the fatty material. It is preferable, in view of the sticky nature of the end product, to carry out the heating step using a vessel equipped with a heating packet instead of in a vessel containing heating coils.

Water vapour evolved during the heating will protect the fatty material against oxidative reversion, but further blanketing of the reaction mixture with nitrogen or carbon dioxide may result in an improved product.

Flavouring substances according to the invention may be incorporated in a wide range of meat or meat-like products. They may, for instance, be incorporated, either as solutions or powders, in protein gels, in luncheon meats, in dry soup mixes and in meat spreads.

The flavouring compositions obtained according to the invention will generally be found to consist of a water-soluble fraction and a fat-soluble fraction, these two fractions having different flavour characteristics. The water-soluble fraction is generally concentrated in solid fat-insoluble decomposition products, which often have a brown colour. The water-soluble fraction may, therefore, if desired, be easily removed by filtration of the fatty material. In general the water-soluble fraction has a pronounced taste but relatively little odour, whereas the fat-soluble fraction has a pronounced savoury odour but the taste is appreciably weaker than that of the water-soluble fraction.

The invention is illustrated by the following Examples:

EXAMPLE 1

Wheat gluten hydrolysate, cysteine, hydrochloride, xylose and oleic acid dispersed in water, were heated, with stirring under reflux for 2 hours, on an oil bath at 120°C. After cooling to 50°C, an aqueous cornflour slurry was added with stirring and the resulting mixture spray-dried to a yellowish-brown powder. This product, when dispersed in a little water, had the flavour and odour of roast mutton.

The proportions of each constituent used were as follows:

wheat gluten hydrolysate	480 g.
cysteine hydrochloride	56 g.
xylose	70 g.
oleic acid	50 g.
water	1500 ml.
cornflour	400 g. in 600 ml. water

EXAMPLE 2

This Example follows that of Example 1, except that the oleic acid was replaced by palmitic acid. A product with the flavour and odour of roast pork was obtained.

EXAMPLE 3

Onion extract, tomato powder, dextrose, cysteine and a white powder-like protein hydrolysate as commercially available were added together with a small quantity of water, to salt and flour and mixed until a coarse-grained powder was obtained.

Hydrogenated groundnut oil (melting point 38°C) containing a small amount of lecithin was heated to 140°C. Under continued heating and brisk stirring the mixture described above was added to the oil; this dosing was carried out at such a rate that the temperature was not allowed to drop below 120°C, while care was taken that the oil did not bubble over as a result of excessive steam development. After 10 minutes the temperature was raised to 130°C and then the mass was allowed to cool to 40°C under continued stirring. At a temperature of about 40°C additional ingredients such as monosodium glutamate and spices were added and the liquid mixture was poured into moulds.

In such a way four types of gravy tablets were prepared from the following components (parts by weight):

	a	b	c	d
Onion extract	0.92	0.79	—	—
Dextrose	0.88	0.75	1.05	1.15
Cysteine hydrochloride	0.04	0.14	0.32	0.45
Protein hydrolysate (approx. 25% amino acid)	1.76	1.67	4.83	5.25
Tomato powder	—	3.25	—	—
Cooking salt	15.00	15.00	15.00	8.00
Wheat flour	11.00	11.00	11.00	—
Water	0.4	0.4	0.4	—
Hydrogenated groundnut oil	70.00	67.00	67.4	85.00
Soda	—	—	—	0.15

EXAMPLE 4

The procedure of Example 3 was repeated using soya bean oil instead of hydrogenated groundnut oil, and the mixture was heated under a blanket of nitrogen. Liquid flavour concentrates were obtained.

EXAMPLE 5

The following ingredients (parts by weight) were heated to a temperature of 130°C during 1 to 2 minutes and cooled rapidly.

91 parts groundnut oil
5 parts caseine hydrolysate
3 parts glucose
1 part water

The resulting product had a pleasant savoury flavour.

EXAMPLE 6

Example 5 was repeated using lard in place of groundnut oil.

EXAMPLE 7

70 parts of hydrogenated soya bean oil were heated to 130°C and the following ingredients were added in the form of a mixture (all parts by weight):

0.92 parts onion
0.88 parts glucose
0.04 parts cysteine-hydrochloric acid
1.76 parts protein hydrolysate
15 parts cooking salt
11 parts wheat flour
0.4 parts water

The mixture was kept under vigorous stirring at a temperature of 130°C for two minutes, after which the mixture was allowed to cool.

10 g. of aroma-containing fat was mixed with 20 g. of toasted flour which contained a little fat and the mixture was pressed into tablets at a pressure of 1.2 kg/cm². From the tablets a gravy could be prepared by dissolving them in a 10—20 fold quantity of water.

EXAMPLE 8

Example 7 was repeated using lard in place of hydrogenated soya bean oil.

EXAMPLE 9

Example 7 was repeated using tallow in place of soya bean oil.

EXAMPLE 10

The following ingredients were heated together with stirring for 1 hour at 100°C:

'Saroline' (Trade Mark) onion extract	4.6 g.
Dextrose	4.4 g.
'Protex' (Trade Mark) hydrolysate (mixed protein hydrolysates)	13.2 g.
Cysteine hydrochloride	0.22 g.
Chicken fat	350 g.
Water	8 g.

The product which was substantially water-free had a strong beefy flavour.

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EXAMPLE 11

Example 10 was repeated using xylose in place of dextrose. A similar beef flavour product was obtained.

WHAT WE CLAIM IS:—

1. A process for preparing flavour compositions in which a mixture comprising an amino acid, carbohydrate and fatty material is heated in the presence of water, the carbohydrate being a monosaccharide or capable of yielding a monosaccharide under the reaction conditions, the proportion of amino acid to carbohydrate in the mixture being from 2:1 to 2:5 by weight, and the pH of the mixture at the end of the reaction being not more than 7.

2. A process according to Claim 1 or Claim 2, in which the mixture is heated at a temperature exceeding 60°C.

3. A process for preparing flavour compositions in which a mixture comprising an amino acid, carbohydrate and fatty material is heated at a temperature between 100°C and 140°C in such a way that the mixture after heating is substantially water-free, the carbohydrate being a monosaccharide or a carbohydrate capable of yielding a monosacharide under the reaction conditions.

4. A process as claimed in Claim 3, in which the proportion of amino acid to carbohydrate in the mixture is from 2:1 to 2:5 by weight.

5. A process according to any one of Claims 1 to 4, in which the proportion of amino acid to carbohydrate in the mixture is from 1:1 to 1:2 by weight.

6. A process according to any one of Claims 1 to 5, in which the amino acid is cysteine.

7. A process according to any one of the preceding claims, in which the carbohydrate is a hexose.

8. A process according to any one of Claims 1 to 6, in which the carbohydrate is a pentose.

9. A process according to any one of the preceding claims, in which the fatty material is a fatty acid.

10. A process according to any of Claims 1 to 8, in which the fatty material is liquid at room temperature.

11. A process according to any Claims 1 to 8, in which the fatty material is solid at room temperature.

12. A process according to any one of the preceding claims, in which the mixture is heated in the presence of a foodstuff.

13. A process according to Claims 12, in which the foodstuff is onion.

14. A flavour composition prepared according to any one of the preceding claims.

15. A flavour composition prepared according to any one of the preceding claims substantially as described in any of the Examples.

16. A method of flavouring a foodstuff which comprises adding to the foodstuff the flavour composition of Claim 15 or Claim 16.

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Agent for the Applicant.

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COMPLETE SPECIFICATION

Flavoring Composition

We, CHAS. PFIZER & Co., INC., a Corporation organized under the laws of the State of Delaware, United States of America, of 235 East 42nd Street, New York 17, New York, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to new and useful flavoring compositions. More particularly, it is concerned with mixtures comprising reaction products of sugars with amino acids, vegetable protein hydrolysates and 5 - ribonucleotides, which are useful in imparting a beef-type flavor to foods.

The beef flavor in many commercially-available foods such as soups and gravies is obtained by the incorporation therein of a product known as beef extract. Beef extract is prepared by a time-consuming and expensive process which generally comprises acid hydrolysis of the meat tissue from slaughtered cattle. In a commonly employed commercial procedure, the meat is hydrolyzed and then the mixture is neutralized and concentrated until the liquid portion has largely evaporated and there remains a brown and substantially completely hydrolyzed residue, the so-called beef extract. This procedure is expensive in that it requires fairly large equipment and much heat to convert a large quantity of beef tissue into the relatively small quantity of concentrated extract which is finally obtained.

Beef extract is a commodity which normally is imported into the United States from areas where meat is relatively low in cost and the processing expenses are minimized. As with many imported commodities, the price of beef extract tends to fluctuate with the season of the year and is sometimes affected by the competitive demand for cuts of meat for table use. Furthermore, it is noticed that the quality of the extract tends to vary since the manufacturers are forced at times to use predominantly poorer cuts of heat for extract preparations. This generally results when prevailing market conditions force prices of the better cuts too high. As a result of these problems, means have long been sought to free food processors from dependence on beef extract. It has now been found that through use of the flavoring compositions of the instant invention it is possible to dispense with beef extract in the preparation of beef flavored foods. This is accomplished by replacing beef extract with compositions prepared from commercially-available chemical and vegetable materials which are stable in price and some of which are expected to be available at steadily decreasing prices in the future. A particularly important advantage of the new compositions is found in comparison of their price with that of beef extract, the use of beef extract in the preparation of foods costs about three times as much as the use for the flavoring compositions for this invention.

It is, therefore, a principal object of the present invention to provide beef-flavored composition which can replace all or part of beef extract in food.

A further object of this invention is to provide compositions for obtaining meatless beef-flavored foods at a substantial savings in cost.

A still further object of this invention is to provide flavoring compositions which are of uniform quality, readily available in all seasons and economical to use.

These and other objects of the present invention are readily obtainable through use of the composition of this invention which is, in essence:

a) the beef-flavored substance formed by heating a compound selected from the group consisting of hexose and pentose monosaccharides with cysteine and cystine in the presence of water;

b) vegetable protein hydrolysate in an

amount to provide from about 3 to about 15 parts by weight per part of said beef-flavored substance where cystine is used, and from about 3 to less than 5 parts by weight per part of said beef flavored substance when cysteine is used and

c) a 5'-ribonucleotide selected from the group consisting of inosinic acid, guanylic acid, physiologically-acceptable salts thereof and mixtures of these in an amount to provide from about 0.02 to about 1.5 parts by weight per part of said beef-flavored substance.

Special mention is made of an embodiment of this invention, which provides an especially pleasing and well-balanced beef-flavor; a composition as defined hereinabove which includes a compound selected from the group consisting of glutamic acid and physiologically-acceptable salts thereof in an amount to provide from about 2 to about 15 parts by weight per part of said beef-flavored substance.

Also contemplated by the present invention is an embodiment wherein the said hexose is dextrose and the said pentose is arabinose. This provides compositions with an excellent balance of flavor and economy.

Still another embodiment contemplated by the instant invention is the mild-flavored composition as defined hereinabove, wherein for each part by weight of beef-flavored substance there is provided from about 0.05 to about 0.5 parts of alanine and of glycine.

A further embodiment of the present invention, with especially mild flavor and a lack of bitterness when used in high concentrations, is a composition as defined hereinabove wherein for each part by weight of said beef-flavored substance there is provided from about 1 to about 4 parts of sucrose.

An embodiment of the present invention which has been found by taste panel testing to be fully equivalent to beef extract in every respect comprises:

a) the beef-flavored substance formed by heating dextrose and arabinose with cysteine or cystine in the presence of water;

b) where cystine is used, vegetable protein hydrolysate in an amount to provide from about 3 to about 15 parts by weight per part of said beef-flavored substance; and where cysteine is used, from about 3 to less than 5 parts by weight per part of the beef flavored substance;

c) monosodium glutamate in an amount to provide from about 2 to about 15 parts by weight of said beef-flavored substance;

d) sucrose in an amount to provide from about 1 to about 4 parts by weight per part of said beef-flavored substance;

e) alanine and glycine, each in an amount to provide from about 0.05 to about 0.5 parts by weight per part of said beef-flavored substance; and

f) a mixture consisting of about 1 part of inosinic acid per part by weight of guanylic acid, said mixture being present in an amount to provide from about 0.02 to about 1.5 parts by weight per part of said beef-flavored substance.

The ingredients of the above mentioned compositions are readily obtainable either commercially, or by synthesis.

With respect to the "beef-flavored substance", designated (a) the teachings of Specification No. 836,694, and of the examples herein, are illustrative.

The monosaccharide used to make the beef-flavored substance may be a pentose or a hexose or mixtures of both. Illustrative pentoses are ribose, arabinose and xylose; illustrative hexoses are glucose, dextrose and fructose.

The term "vegetable protein hydrolysate" as used herein contemplates artificial digests of protein derived by acid, enzymatic or other hydrolysis of vegetable proteins such as the mixture of plant proteins occurring in cereal grains, especially wheat, and known as gluten. The said protein hydrolysates, which are freely available commercially, comprise the constituent amino acids representative of the source protein.

The term "physiologically-acceptable salts" as used herein and in the appended claims contemplates non-toxic alkali metal, alkaline earth metal and organic base salts of 5'-ribonucleotides, of which inosine-5'-phosphoric acid, also well known in the art as inosinic acid, is a member of special importance, and glutamic acid. Particular mention is made of the sodium and calcium salts, which are desirable because of their ready availability and low toxicity. Also important are the potassium salts, the ammonium salts and the salts with glycine and other non-toxic organic bases.

It has been found that, in addition to, or in place of inosinic acid, other 5'-ribonucleotides may be employed in the practice of the instant invention. In this connection, special mention is made of certain 5'-ribonucleotides derivable from a commonly employed source of inosinic acid, namely, yeast ribonucleic acid: cytidine-5'-phosphoric acid, uridine-5'-phosphoric acid and guanosine-5'-phosphoric acid; this latter substance commonly is referred to as guanylic acid.

It is critical to this invention that there be present all three ingredients set forth hereinabove; the beef-flavored substance, the vegetable protein hydrolysate and the 5'-ribonucleotide, in order for the composition to serve adequately as a replacement for beef extract. For example, in taste panel testing of the replacement of beef extract in a soup-base with the novel compositions, the herein disclosed and claimed mixture is completely acceptable while mixtures without the vege-

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table protein hydrolysate and mixtures without the 5′-nucleotides are decidedly bitter and not an adequate replacement at all.

For the practice of this invention it is important to maintain the ratio of vegetable protein hydrolysate to beef-flavored substance as disclosed herein and as set forth in the appended claims. If more than about 15 parts by weight of hydrolysate per one part of beef-flavored substance is used, then the beef taste is not as pronounced anymore. If, on the other hand, the amount of hydrolysate is such as to provide less than about 3 parts per part of beef-flavored substance, there begins to be noticed a distinctly bitter flavor note.

Also, in the practice of this invention it is very desirable to maintain the ratio of 5′-ribonucleotide to beef-flavored substance as disclosed herein. If more than 1.5 parts by weight of the said nucleotide are present for each part of the beef-flavored substance, the economic advantage of the instant invention is diminished, and if less than 0.02 parts of the nucleotide are present per part of the beef-flavored substance, there begins to be noticed a tendency for the beef flavor to be reduced.

It is found that a particularly effective ratio for a beef extract type preparation with a well-balanced mild flavor and economy is 1:5:0.30 parts of beef-flavored substance per part of vegetable protein hydrolysate per part of 5′-ribonucleotide, respectively.

As will be exemplified hereinafter, the flavoring compositions are obtained and may be used in the form of substantially dry solids or pastes or in solutions. When the flavoring compositions are used as replacements for beef extract, a certain amount of adjustment in the concentration may be needed depending on individual preference and the nature of the final product in order to arrive at the most desirable flavor or essence. These adjustments are well within the ability of those skilled in the art and, as is obvious, the need for such adjustments by the consumer is largely obviated by providing a synthetic mixture of this invention with a flavoring strength equivalent to that of beef extract. Such a composition can readily be made by suitable selection of concentrations and will be exemplified hereinafter.

The instant invention, in one of its embodiments especially useful to prepare beef-flavored gravy with roast meat flavor and odor, contemplates a composition as defined above wherein for each part of the said beef-flavored substance there is provided from about 0.5 to about 15 parts of edible fat.

As will be exemplified, to obtain the strongest roast meat flavor, it is desirable to heat the other ingredients with the aforementioned beef-flavored substance to a temperature of from about 70° C. to about 100° C. for a period of from 10 minutes to about 4 hours. As will be obvious to those skilled in the art, the higher the temperature chosen, the shorter the time required to obtain an adequate flavor. An excellent beef-flavored food is also prepared by heating the beef extract replacement with the final food.

With respect to the edible fat, both animal and vegetable fats may be used. For example, pork fat and beef fat, margarine, butter and safflower oil, can be employed. While the reactions leading to roast meat odor and flavor are not clearly understood, the heating together of the mixture with fat under these conditions leads to a very pleasing product, different from that obtained when fat is not present.

The amount of edible fat can be varied. Based on the beef-flavored substance, for example, there can be used from about 0.5 to about 15 parts of fat per part of beef-flavored substance or even more. An especially pleasing result is obtained when there is provided 8 parts of fat per part of beef-flavored substance.

A convenient method of combining the ingredients to form the instant novel composition comprises:

a) heating in admixture a compound selected from the group consisting of hexose and pentose monosaccharides with an amino acid selected from the group consisting of cystine and cysteine in the presence of water until a beef-flavored mixture is obtained and

b) Adding for each part by weight of said beef-flavored mixture in the case of cystine from about 3 to about 15 parts of vegetable protein hydrolysate, and when cysteine is used, from about 3 to less than 5 parts of vegetable protein hydrolysate and from about 0.02 to about 1.5 parts of a 5′-ribonucleotide as defined above and heating for about two hours at at least 70° C.

The beef-flavored substance is formed conveniently by mixing cysteine with about 4 to 4½ parts by weight of monosaccharide and about 5 parts of water, heating to 90—100° C. for 2 hours, cooling to 55° C. and adjusting to about pH 6.9 with 50% aqueous NaOH. This is then treated with about one-half its weight of water and the vegetable protein hydrolysate and 5′-nucleotide are added, then the mixture is heated for about 2 hours at 70° C., cooled and homogenized to obtain a heavy, honey-like paste in an especially convenient form for consumer use.

The following examples are illustrative of the novel compositions of the present invention. They are not intended to limit the inventive compositions, many variations of which are possible.

Example I

A beef-flavored composition is prepared by adding 25 ml. of water to a mixture of 12.5 g. of dextrose, 9.75 g. of arabinose and 6.5 g. of cysteine hydrochloride, heating the mixture to 100° C. for 2 hours, cooling to 55° C., ad-

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justing from pH 3.2 to pH 6.9 with 50% aqueous sodium hydroxide, adding 35 ml. of water, 275 g. of vegetable protein hydrolysate and 18 g. of a mixture of 1 part of inosinic acid per part by weight of guanylic acid, then heating for 2 hours at 70° C., cooling and stirring until a smooth, honey-like consistency is obtained.

Beef-flavored compositions are prepared by the above procedure substituting respectively for the mixture of inosinic acid and guanylic acid, disodium inosinate, dipotassium inosinate, calcium inosinate, di-ammonium inosinate and a 1:1 by weight mixture of disodium inosinate and disodium guanylate.

Example II

A beef-flavored composition is obtained by dissolving 12.05 g. of dextrose, 9.75 g. of arabinose, 9.75 g. of monosodium glutamate, 6.5 g. of cysteine, 4.65 g. of alanine and 3.3 g. of glycine in 300 ml. of water. The mixture is heated at 100° C. with vigorous stirring for two hours, then is neutralized to pH 6.7 with 30.5 cc. of 10% aqueous NaOH. The mixture is concentrated at 75—80° C. until there is obtained a beef-flavored substance wth the consistency of honey and a dark brown color.

The beef-flavored substance, 261.3 g. of vegetable protein hydrolysate, 59.75 g. of sucrose and 97.80 g. of monosodium glutamate and 17.15 g. of a mixture of 1 part of inosinic acid per part by weight of guanylic acid are dissolved in 500 ml. of water and heated at 100° C. with vigorous stirring for 6 hours. The substance is cooled and is suitable as a replacement for beef extract.

The procedure set out above is repeated substituting for the amino acids, sugars, vegetable protein hydrolysate and 5'-ribonucleotides at the ratios set out a series of compositions providing different ratios. Satisfactory beef-flavored compositions are obtained with the following tabulated mixtures:

Table I

Flavoring Compositions

arabinose-dextrose-cysteine* parts	veg. protein hydrolysate, parts	5'-ribonucleotide parts	alanine parts	glycine parts	sucrose parts	** MSG parts
1	3	0.30	0.18	0.09	1.2	3.0
1	5	0.30	0.10	0.05	1.2	7.65
1	5	0.30	0.10	0.05	1.2	4.0
1	3	0.2	0.10	0.05	1.2	4.0
1	3	0.2	0.05	0.05	1.2	2.0
1	3	0.02	0.05	0.05	1.0	2.0

* Combined weight of beef-flavored substance

** MSG — Monosodium glutamate Beef flavored compositions are prepared when glutamic acid, monopotassium glutamate, monocalcium di-glutamic acid and monoammonium glutamate are substituted for the monosodium glutamate of Example II.

Example III

A beef-flavored composition eminently suitable for preparing gravy with a roast meat odor and flavor is prepared by the procedure of Example II, adding 200 g. of prime beef fat to the 500 ml. of water before the final heating step. After heating at 100° C. for 6 hours, 165 g. of fat is skimmed off leaving the product, 689 g., including 118 g. of water, which can be used to make gravy.

The above procedure is repeated substituting the flavoring compositions in Table I, Example II and using 0.5 parts of prime beef fat per part of arabinose-dextrose-cysteine mixture. Beef-flavored gravy bases with roast meat odor and flavor are obtained.

Example IV

A beef-flavored composition is obtained by dissolving 13.30 g. of cysteine hydrochloride, 33.24 g. of dextrose, 26.09 g. of arabinose, 26.09 g. of monosodium glutamate, 6.65 g. of glycine hydrochloride and 13.30 g. of alanine in 66.48 grams of water. The mixture is heated to 90° C. and maintained at this temperature with vigorous stirring for two hours. The mixture is cooled to 20° C. and 99.71

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grams of water are added. The mixture is neutralized to pH 6.8 with 12.8 ml. of a 50% aqueous sodium hydroxide solution. To the beef-flavored substance obtained, are added with rapid agitation, 166.19 g. sucrose, 531.80 g. monosodium glutamate, 99.71 g. beef fat and 731.23 g. of vegetable protein hydrolysate. The mixture is heated with vigorous stirring to 70° C. and maintained at that temperature for four hours. The mixture is then cooled to between 50 and 55° C. and 39.89 g. of a 50:50 weight mixture of disodium inosinate and disodium guanylate are added. The mixture is blended for fifteen minutes and a composition suitable for flavoring food is obtained.

EXAMPLE V

The procedure of Example IV is repeated substituting 39.89 g. of disodium guanylate for the 50:50 weight mixture of disodium inosinate and disodium guanylate. A composition suitable for flavoring foods is obtained.

EXAMPLE VI

The procedure of Example IV is repeated substituting 13.30 grams of cystine for cysteine. A composition suitable for flavoring foods is obtained.

WHAT WE CLAIM IS:—

1. A process for preparing a beef-flavored substance which comprises heating in admixture, a hexose or a pentose monosaccharide with cystine or cysteine, in the presence of water, until a beef-flavored mixture is obtained, adding for each part by weight of said beef-flavored mixture, in the case of cystine from 3 to 15 parts of vegetable protein hydrolysate and in the case of cysteine, from 3 to 5 parts of vegetable protein hydrolysate, from 0.02 to 1.5 parts of a 5′-ribonucleotide and heating the mixture for about 2 hours at at least 70° C.

2. A process according to claim 1 wherein the 5′-ribonucleotide is inosinic acid guanylic acid, or a physiologically acceptable acid salt of the aforesaid acids or mixtures thereof.

3. A process according to claim 1 or 2 wherein there is included prior to heating of the mixture for about 2 hours at at least 70° C., glutamic acid or a physiologically acceptable salt thereof in an amount to provide from 2 to 15 parts by weight per part of the beef-flavored substance.

4. A process according to any one of the preceding claims wherein the hexose is dextrose and the pentose is arabinose.

5. A process according to any one of the preceding claims wherein for each part by weight of beef-flavored substance, there is added during the preparation of the beef-flavored substance .05 to 0.5 parts of alanine and glycine.

6. A process according to any one of the preceding claims wherein for each part of the beef-flavored substance, there is added during the preparation of the beef-flavored substance from 1 to 4 parts of sucrose.

7. A process according to any one of the preceding claims wherein for each part of beef-flavored substance, there is provided from 0.5 to 15 parts of edible fat before heating the second time.

8. A process for preparing a beef-flavored substance substantially as described herein with particular reference to the Examples herein.

9. A beef-flavored substance whenever prepared by a process according to any one of the preceding claims.

10. A flavoring composition comprising:

a) the beef-flavored substance formed by heating hexose or pentose monosaccharides with cystine or cysteine in the presence of water;

b) where cystine is used, vegetable protein hydrolysate in an amount to provide from 3 to 15 parts by weight per part of said beef-flavored substance and where cysteine is used from 3 to 5 parts by weight per part of the beef-flavored substance is added and the mixture is heated for two hours at at least 70° C. and

c) a 5′-ribonucleotide in an amount to provide from 0.02 to 1.5 parts by weight per part of said beef-flavored substance.

11. A flavoring composition according to claim 10, which includes glutamic acid or physiologically-acceptable salts thereof in an amount to provide from about 2 to 15 parts by weight per part of said beef-flavored substance.

12. A flavoring composition according to claim 10 or 11 wherein the hexose is dextrose and the pentose is arabinose.

13. A flavoring composition according to any of claims 10—12 wherein for each part by weight of beef-flavored substance there is provided from 0.05 to 0.5 parts of alanine and of glycine.

14. A flavoring composition according to any of claims 10 to 13 wherein for each part by weight of said beef-flavored substance there is provided from 1 to 4 parts of sucrose.

15. A flavoring composition according to any of claims 10 to 14 wherein for each part by weight of the beef-flavored substance there is provided from 0.5 to 15 parts of edible fat.

16. A flavoring composition according to any of claims 10 to 15 comprising:

a) the beef-flavored substance formed by heating to approximately 70° C for two hours dextrose and arabinose with cysteine in the presence of water;

b) vegetable protein hydrolysate in an amount to provide from 3 to 5 parts by weight per part of said beef-flavored substance;

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c) monosodium glutamate in an amount to provide from 2 to 15 parts by weight per part of said beef-flavored substances;

d) sucrose in an amount to provide from about 1 to about 4 parts by weight per part of said beef-flavored substance;

e) alanine and glycine, each in an amount to provide from 0.05 to 0.5 parts by weight per part of said beef-flavored substance;

f) a mixture consisting of about 1 part of inosinic acid per part by weight of guanylic acid, said mixture being present in an amount to provide from 0.02 to 1.5 parts by weight per part of said beef-flavored substance.

17. A flavoring composition according to any of claims 10 to 16 wherein there is present edible fat in an amount to provide from 0.5 to 15 parts by weight per part of said beef-flavored substance.

18. A flavoring composition according to any of claims 10 to 17 comprising 0.3 part of a 50/50 by weight mixture of disodium guanylate and disodium inosinate, 5.3 parts of vegetable protein hydrolysate, 4 parts of monosodium glutamate, 0.7 part of edible fat, 0.1 part of alanine, 0.05 part of glycine hydrochloride and 1.2 parts of sucrose for each part by weight of beef-flavored substance.

19. A flavoring composition substantially as described herein with particular reference to the Examples herein.

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COMPLETE SPECIFICATION

Meat Flavor Compositions

We, INTERNATIONAL FLAVORS & FRAGRANCES, INC., a Corporation organised under the laws of the of the State of New York, United States of America, of 521 West 57th Street, New York, State of New York, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement :—

This invention relates to novel artificial meaty flavoring compositions and to processes for preparing them. More specifically, it relates to novel compositions having meaty flavor characteristics such as beef, pork and poultry flavor, compositions from which they may be prepared, methods for preparing them and to novel food compositions containing them.

Food products enhanced with meat-like flavors are well-known and have long been used. There is considerable demand for meat-flavored products in which the actual meat such as beef, pork, chicken, turkey, duck and the like is not needed or is actually undesirable. For example, in the preparation of some sauces, bouillons, broths and purees, the meat flavor is desired, but it is necessary to cook the food with the desired meat and then to remove the meat by straining or some similar operation to obtain the final product ready for use.

Additionally, where weight space or storage capability are a problem, e.g., when a convenience food is prepared, the presence of the actual meat may be undesirable because it will deteriorate in storage and spoil the food. Moreover, there are occasions when sterilizing or otherwise preserving the natural product is extremely deleterious to the flavor of the natural material and the desired natural flavor is lost. There are additionally those instances wherein the presence of the natural meat is desirable, but wherein because of cost factors, convenience or the like, consumer acceptance dictates in favor of enhancing the meat flavor already present. Artificial meat flavoring compositions would be eminently suited for this purpose if essentially true flavor reproduction and enhancement could be achieved. Prior attempts at preparing artificial meat flavor compositions have centered, to a large extent, around utilizing a spectrum of spices as in the case of attempting to simulate poultry flavor, or the use of meat extracts, in the case of beef flavor compositions. Such methods have not been entirely satisfactory, in that true flavor is generally not achieved in the case of spice formulations, whereas with extracts, cost and processing disadvantages are encountered.

It has now been discovered that when a pre-mix composition comprising 2-amino ethane sulfonic acid, also known as taurine, and thiamine is heated at an elevated temperature, there results a reaction mixture having a decided, marked meat flavor and which can be employed in a variety of ways. For example it can be used *per se* in a wide range of food stuffs, either as the dominant flavoring agent or as an aid in improving and enhancing existing flavor. It can serve as the basic flavor composition to which are added a variety of materials either before or after reaction or even re-reacted in the presence of such materials as hereinafter more specifically set forth. This invention contemplates, therefore, the novel flavor compositions produced therefrom, the novel composition used to prepare the flavor compositions, and the novel processes for making them. It contemplates also novel food products containing them.

As described above, the invention, in its broad aspect involves heating a mix com-

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position comprising taurine and thiamine at an elevated temperature for a period of time whereby a meaty flavor is developed. It is to be noted that the pre-mix composition *per se*, possesses no meaty characteristics and hence the invention may be regarded as being in the discovery that taurine has the ability to impart these characteristics when employed as a reactive component.

The prer-mix composition will result in meaty flavor characteristics after heat treatment as long as both taurine and thiamine are present. In general, suitable pre-mix compositions will comprise from 0.025 to 90 weight per cent taurine and from 0.025 to 50 weight per cent thiamine, based on the total weight of the pre-mix composition. It is generally preferred to use 0.5 to 5 parts of taurine per part of thiamine, although values outside this range may be employed.

In practice, it is usually preferred to incorporate within the prer-mix composition a vehicle which includes materials such as water, edible oils or fats to provide a medium for the reaction, in addition to other flavor adjuvants such as extenders and distribution agents as will be described in more detail hereinafter. For ease of processing, it is convenient to supply the vehicle in major amounts such that the pre-mix composition, based on the total weight thereof, comprises from 0.1 to 25, preferably 0.3 to 15 weight per cent taurine and 0.1 to 15, preferably 0.3 to 10 weight per cent thiamine. Lower or higher concentrations may be selected as desired since the characteristics of the composition may vary depending upon the nature and quantity of the vehicles employed.

Various other materials and ingredients can be incorporated into the compositions to provide a variety of flavor characteristics built upon the basic flavor of the taurine-thiamine reaction product. They can be added at any time, that is, before or after heat treatment, or at any stage in between. If added after the heat treatment they will thus be available for further reaction by the large food processor or the ultimate consumer. The nature and quality of such materials will vary depending on individual preferences. As noted, the basic reaction mixture is a composition which has a marked meat flavor and which can be utilized to develop meat flavors ranging from beef through pork to poultry such as chicken, turkey, and duck.

In general, development of a variety of flavors is achieved in separate compositions by providing in the pre-mix, or in the reacted composition, a quantity of a source of one or more amino acids such as one or more free amino acids, proteinaceous materials, such as proteins and polypeptides in which the amino acids are bound, or the partial or complete hydrolysates or autolysates thereof, or in which the amino acids are partially or completely free. By varying the type and proportion of amino acid bearing materials this variety is conveniently obtained. Generally, suitable results are obtained when the free amino acids, or mixture of free amino acids, or the proteinaceous material, or any combination of these are included preferably in the pre-mix, prior to reaction, but also in the reacted mix, at levels ranging up to about 50% by weight based on the total weight of the composition. In a preferred embodiment, wherein a vehicle or carrier is employed to aid in carrying out the reaction, the range is conveniently from 0.5 to about 35 per cent by weight of the total composition. The actual amounts employed will generally vary depending upon the type of flavor desired.

As "proteinaceous materials" there may be used an edible protein, an edible protein hydrolysate, autolysate, or mixtures thereof which may contain some free amino acids together with various protein derivatives such as proteoses, peptones, polypeptides and dipeptides. Among the proteins used which may be used are albumins, globulins, gluteline, prolamines, albuminoids, histrones, protamines, nucleo-proteins, glycoproteins, phosphoproteins, chromoproteins and lipoproteins. These may be used in the natural state, e.g., as meat or meat scraps or other meat protein concentrates. Vegetable derived proteins are preferred however. It may also be convenient to employ the hydrolysates or autolysates obtained at various stages of peptide degradation. Thus a source need not be completely hydrolysed to be effectively employed.

It has been discovered that development of beef flavor is especially aided when the amino acid or mixtures of amino acids or proteinaceous material is relatively low in certain amino acids such as phenylalanine. Suitable materials are hydrolyzed proteinaceous substances illustrated by animal, fish or vegetable hydrolysates. Vegetable hydrolysates, such as those obtained from corn, wheat, and yeast are preferred. The hydrolysates may contain carbo-hydrate materials or not, as desired. As indicated, these can be added to the pre-mix of taurine and thiamine therein to constitute a reaction component, or they can be added to the reacted mixture and thus be available for further reaction either by the food processor or the ultimate consumer. It will be appreciated by those skilled in the art that variations in flavor can be obtained by altering both the proportions and kind of amino acids employed. This will largely depend upon the personal preferences of the processor in consideration of what is thought most likely to appeal to the consumer. Since

entirely subjective considerations are involved, it is not possible to be more precise as to the nature and quality of the flavor ultimately produced. Hence the discussion herein may be considered as setting forth general guidelines with indications of preferred compositions to achieve generally acceptable flavor compositions.

There may be additionally present in the pre-mix composition small quantities of a sulfur containing amino acid such as cysteine ranging in amounts from 0.1 to 2 times the weight of taurine employed, although the use of such is not necessary. In fact, as will be discussed more fully hereinafter, it is an added benefit of the invention that the presence of taurine tends to diminish whatever benefit cysteine would contribute, such as to make the latter not a necessary ingredient.

When sweet meaty flavors such as pork and poultry flavors are desired, good results are obtained when either the pre-mix or reaction product, but preferably the pre-mix, is altered to include, as the source of amino acid a polypeptide, preferably a sulfur containing polypeptide or at least one, but preferably a mixture of the amino acid constituents of said polypeptide. It is important to emphasize at this point that the taurine-thiamine reaction mixture is perfectly well suited, without the inclusion of additional ingredients to be used as a meat flavor imparting agent in its own right or as a flavor enhancer when added to foods already having meat flavor. The modification described herein, wherein additional ingredients, in the form of various amino acid containing materials are provided in the compositions, are directed to refinements in the basic flavor compositions.

As polypeptides there may be employed a lower polypeptide such as a dipeptide or tripeptide. By "sulfur containing" is meant that at least one of the bound amino acid components or said polypeptide contains sulfur. Glutathione is especially useful as a sulfur-containing polypeptide in the present invention. In lieu thereof, there may be employed a mixture of the amino acid constituents of the polypeptide. For example, glycine, glutamic acid and cysteine (the sulfur-bearing amino acid), are the constituent amino acids of glutathione and may be used in admixture in varying proportions.

It is an added discovery of the present invention, that the taurine in the basic reaction mixture may be used as the sulfur containing amino acid and thus partially or completely replace the cysteine. It is preferred to use a mixture of the constituent amino acids rather than the polypeptide itself, although each amino acid need not be present in said mixture in the same proportion in which it is present in the polypeptide. Thus, while equal parts of glycine, cysteine, and glutamic acid are produced from glutathione, mixtures of varying amounts of the constituent amino acids, such as, for example, mixtures comprising one part of glycine, 0.05 to 20 parts of cysteine, and 0.05 to 10 parts of glutamic acid can be utilized. A preferred mixture comprises one part each of glycine and glutamic acid per 1 to 3 parts of cysteine. Although the benefits of the invention will be obtained when either the glycine or glutamic acid are omitted, it is preferred that they be present in the system. When the amino acid mixtures is used in this invention, cysteine can be replaced by cystine, or other sulfur containing amino acids and, each, in accordance with a further aspect of the present invention as alluded to above and as discussed more fully hereinafter, can be either partially or completely replaced by taurine.

The pre-mix compositions of the present invention which are reacted to produce meaty flavor reaction mixtures thus, preferably contain taurine, thiamine and a source of amino acids which may be any of a free amino acid or mixture of amino acids or proteinaceous materials such as polypeptides, proteins *per se*, or hydrolysates, and autolysates of these.

The taurine, as a reacted component with at least the thiamine and preferably with the source of amino acids is effective to produce a reacted composition having flavor characteristics. This effect is not noted when the taurine is added directly to an already reacted mixture, i.e., when it is used as an additive rather than a reacted component. In such instances the resulting composition, to which taurine has been added, takes on sour and astringent notes rather than meaty notes It is within the contemplation of the invention, however, that such compositions may be further reacted, as by a food processor or the ultimate consumer, to utilize the taurine as a reactive component.

Under some circumstances, it has been regarded as being highly desirable if not essential, to include cysteine in food flavor compositions. The present invention, however, is effective essentially completely to eliminate this requirement, although the compositions of the invention are amenable to the inclusion of cysteine as seen fit by the individual processors. With further regard to the amount of amino acid source to be employed in the compositions of the present invention, when a polypeptide is utilized it is suitably employed at levels of from 0.1 to 15 and preferably 0.5 to 10 weight per cent based on the total weight of a vehicle containing composition. The most preferred sweet meat or poultry flavor compositions of the present invention are those wherein the polypeptide is employed not as a discrete

compound rather in the form of a mixture containing at least one its constituent amino acids, as previously described. Thus pre-mix compositions containing up to 40 weight per cent cysteine, up to 25 weight per cent of that of glycine and glutamic acid will yield suitable flavor compositions upon reaction with the thiamine-taurine basic mixture. Viewed in the overall, such compositions prior to reaction suitably comprise

0.025 to 50 weight per cent thiamine,
0.025 to 90 weight per cent taurine,
0 to 50 weight per cent hydrolyzed protein,
0 to 40 weight per cent cysteine,
0 to 25 weight per cent glycine,
and 0 to 25 weight per cent glutamic acid.

Particularly suitable are mixtures comprising

0.1 to 15 and preferably 0.5 to 10 weight per cent thiamine,
0.1 to 25 and preferably 0.5 to 25 weight per cent taurine,
0 to 40 and preferably 0.5 to 35 weight per cent hydrolysed protein,
0 to 5 and preferably 0 to 2.5 weight per cent cysteine,
0 to 5 and preferably 0.1 to 2.5 weight per cent glycine,
0 to 5 and preferably 00.1 to 2.5 weight per cent glutamic acid.

with the remainder being a vehicle including flavor adjuvants as hereinafter more fully described. As indicated, the specific additional ingredient and the amount thereof will vary according to type of flavor desired. For beef flavors the hydrolyzed protein and possibly small amounts of cysteine may be employed whereas for pork and poultry the mixture of pure amino acids is more desirable than the use of the complex mixture afforded by the hydrolyzed protein.

It has been found, in preparing the reaction products of this invention, that the ingredients are desirably heated in a vehicle such as water, a triglyceride fat, natural fat, or vegetable fat. A triglyceride fat is preferred in the case of pork or poultry flavor compositions whereas water is preferred for beef formulations. The vehicle may constitute as much as 95 per cent by weight or more and as little as 10 per cent weight or less of the total weight of the pre-mix to be reacted. Suitable results are obtained, however, at levels ranging from 50 to 90%. Triglyceride fats such as esters (generally triesters) of glycerol with fatty acids, the fatty acids predominantly ranging in carbon chain length from ten carbon atoms to twenty-two carbon atoms, may be employed. The term triglyceride fat will be understood to mean both fats and oils. It is preferred that the triglyceride fats be refined, bleached, and deodorized. They can be in their natural form or they can be hydrogenated.

The pre-mix and reacted mixture can also contain other ingredients normally used in this art, such as salt, carbohydrates, flavor adjuvants such as carbonyl compounds, nucleotides, and binding or drying agents such as gum arabic. Lower alkyl carbonylic materials such as ketones and alkyl aldehydes can be admixed in the system prior to the heating to produce the reaction mixture or they can be added to the reaction product. It is generally preferred to use these in the poultry systems and to add them after heating the system since they are generally volatile, and losses thereof may occur during the heating.

The ketonic materials used in this aspect of the invention are preferably lower alkanones and hydroxy-substituted alkanones containing from 4 to 8 non-quaternary carbon atoms such as diacetyl, acetyimethylcarbinol and acetylpropionyl. The alkyl aldehydes and preferably the lower aldehydes containing from 5 to 8 carbon atoms. Especially preferred are pentanal, hexanal and heptanal. Conveniently, these are employed at levels ranging from 0.01 to 1 times the weight of taurine employed. There may also be added to the reaction mixture quantities of nucleotides and other amino acids, such as beta-alanine. The preferred nucleotides are mixtures of disodium inosinate and disodium guanylate.

It will be understood that all of the ingredients utilized herein can be admixed with inert carriers, or added in the form in which they are commercially available, or in pure form. The thiamine is conveniently used as an acid addition salt, such as a hydrohalide, and preferably, as the hydrochloride. Thiamine containing materials such as yeast and other natural products can be used as the source of thiamine. Similarly, when individual amino acids are utilized they can be in the form of a substance which will yield them under the reaction conditions, such as the acid addition salts, preferably the hydrochloride.

In accordance with an additional aspect of the invention, there may be added to the pre-mix a quantity of a saccharide material such as a mono saccharide or a poly-saccharide exemplified by di-and trisaccharides. Ribose, sucrose, dextrose and xylose are illustrative of those which may be employed. The presence of the saccharides results in a reacted composition having somewhat more intense flavor characteristics. Care should be exercized in utilizing these materials, however, since they may tend to contribute some burnt notes to the final reacted product. When used, suitable results are obtained at leve's ranging up to about 25 per cent by weight based on the total weight of a vehicle-containing pre-reacted system. Preferably, the range is from 0.5-5 weight per cent.

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The meat flavor of the compositions of the present invention is developed by heating the pre-mix compositions at an elevated temperature for a period of time. The time and temperature are interrelated, longer times being required at low temperatures for best flavor development and shorter times for higher temperatures. It is preferable to utilize temperatures of at least 200°F. in order to accomplish the reaction in a reasonable length of time. Generally, temperatures much above 420°F. make the reaction difficult to control and may well produce uncharacteristic burnt notes even with very short reaction times. Accordingly, it is preferred to carry out the reaction at temperatures of from about 200°F. to about 420°F. until the desired flavor development is achieved. The heating periods may range from about one-quarter minute to about 6 hours depending upon the heating method used.

The process can be carried out on a batch basis in small quantities of, for example, 50-100 grams or it can be carried out batchwise on much larger quantities of 500 kg or more.

The preferred process of this invention relative to producing beef flavor compositions involves refluxing an aqueous pre-mix. It is most convenient to reflux the aqueous mixture for a period of from one to six hours. Longer periods may be used at less than reflux temperature, and shorter periods may be used when the treatment is carried out under pressure at higher than reflux temperature. After reaction, the product is cooled and preferably allowed to age for a period of from 2 to 4 days. It may then be dried as for example by taking it up in a binding agent such as gum arabic.

For sweet meat and poultry flavors, it is preferred to conduct the heating continuously in high heat transfer-rate heat exchangers. With such exchangers the reaction mixture can quickly be brought to the reaction temperature and then quickly cooled in a second exchanger to a lower temperature at which no further reaction will take place. A preferred embodiment of this invention utilizes a scraped-wall heat exchanger. Generally, higher temperatures can be used in high heat exchangers than can be used in batch production. The use of temperatures at the upper end of the range in batch production tends to cause localized overheating, rapid reaction and off-flavors and odors. A preferred temperature range for both batch and continuous processes is from about 250° to about 400°F.

The appropriate time of heating can readily be determined by observation of the flavor produced. The reaction is sufficiently easy to control that the proper extent of heating can readily be determined simply by heating the reaction mixture for a sufficient period to produce the desired poultry flavor. Generally, it is preferred to utilize heating times of from one-quarter minute to about three hours. Shorter times of from one-quarter to three minutes at 250°-400°F. are preferably used in high heat transfer-rate heat exchangers. Where the flavor composition of this invention is added to a food which is to be subsequently heated or cooked, the reaction time can be reduced, and in some of these cases, heating the pre-mix independently of the food can even be eliminated. That is the processor or the ultimate consumer in effect conducts the reaction.

The use of high heat transfer equipment may tend to cause burnt notes uncharacteristic of the true pork or poultry flavor. To aid in avoiding this, it has been found convenient to use distributing agent, salt or a carbohydrate for example, but preferably salt, in the system. The salt is conveniently admixed with the other ingredients prior to reaction at a level of about 10 to 30 weight per cent based on the weight of the entire composition. It may thus be considered as part of the vehicle. It then serves as a means for distributing the system uniformly through the heat transfer equipment thereby minimizing the potential local hot spot effects.

The flavor compositions of this invention can be used to flavor various foods, liquid or dry. They are conveniently employed at levels of for example, from 0.05 to 15 weight per cent. For example, they can be incorporated into gravies, sauces, soups, dressings, salads, aspics, purees and other liquid preparations at levels of from 0.05 to 2 and preferably from 0.1 to 1 weight per cent. On the other hand, they can be admixed with carrier materials or with other flavoring ingredients or foods stuffs for incorporation into finished products, illustrative of which are the dry foods such as snacks, chips, and synthetic meat fibers. The compositions are conveniently employed at levels of 2 to 15 weight per cent or more and preferably 5 to 10 weight per cent in such applications. It will be understood that the concentration ranges are given for purposes of illustration only. It is well within the skill of the art to utilize as much or as little additional ingredients and foods in the compositions of the invention in order to obtain varieties of flavor and additional notes. The important consideration is that the basic flavor development is the result of a taurine-thiamine reaction product augmented as desired by a source of amino acids, as herein discussed.

The following examples are intended to be illustrative of the invention.

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EXAMPLE I

The following ingredients are selected:

Ingredients	*Parts by Weight*
Fat (vegetable shortening)	622.67
Salt	321.65
Glutamic acid	5.14
L-cysteine hydrochloride	10.28
Glycine	5.14
Beta-Alanine	1.28
Thiamine hydrochloride	10.28
Taurine	20.00
Mixture of disodium inosinate and disodium guanylate	3.34

The foregoing ingredients are mixed and the mixture continuously introduced into a high heat transferrate scraped wall heat exchanger wherein it is heated for about 30 seconds at a temperature of about 300°F.

The mixture, which has taken on a yellow color, is then cooled to about 100°F. in a second scraped wall heat exchanger and thereafter 0.12 parts of diacetyl and 0.10 parts of hexanal are added, and the resulting mixture is then blended into a paste. The mixture has an excellent chicken flavor definitely enhanced over that obtained when the taurine is omitted. In the foregoing reaction mixture, the cysteine can be substituted by cystine or glutathione with excellent results. By varying the proportions of the individual ingredients, a number of different poultry flavor notes can be produced. Other types of sweet meaty flavor notes, pork flavors, for example, can also be produced by substituting the fat with lard and slightly decreasing the reaction time. The edible compositions so produced can be combined with other flavor ingredients such as smoky materials to give a bacon flavor or spices to produce a ham flavor or a sausage flavor. When the foregoing procedure is repeated utilizing only the thiamine, taurine, fat and salt, an acceptable poultry flavor composition is obtained in which the flavor is somewhat less intense than that obtained from all ingredients.

EXAMPLE II

In the foregoing example, the taurine is employed at a level of approximately 2 weight per cent. When the procedure is repeated at levels of 0.1, 4, 8 and 20 weight per cent taurine, (the fat level being reduced correspondingly) similar improvements in flavor enhancement are noted.

EXAMPLE III

This example is illustrative of a chicken flavor composition produced when 50% of the cysteine used in Example I is replaced with taurine.

Ingredient	*Parts by Weight*
Fat	622.67
Salt	321.65
Beta-Alanine	1.28
Glutamic acid	5.14
Glycine	5.14
Thiamine hydrochloride	10.28
Mixture of disodium inosinate and disodium guanylate	3.24
L-cysteine hydrochloride	5.14
Taurine	5.14

The procedure of Example I is followed, using the above ingredients, to produce a composition having chicken flavor characteristics virtually indistinguishable from that obtained when taurine is omitted and the cysteine is used at twice the level shown above. Similar results are obtained when the procedure is repeated batchwise in an open vessel at a temperature of between 350 to 390°F. for a period of 10-15 minutes.

EXAMPLE IV

This example is illustrative of a chicken flavor composition produced when all of the cysteine used in Example I is replaced by taurine.

Ingredient	*Parts by Weight*
Fat	622.67
Salt	321.65
Glutamic acid	5.14
Taurine	10,28
Beta-Alanine	1.28
Glycine	5.14
Thiamine hydrochloride	10.28
Mixture of disodium inosinate and disodium guanylate	3.34

The above ingredients are mixed and the mixture continuously fed to a scraped-wall heat exchanger wherein it is heated for one-half minute at 325°F. It is then immediately cooled to 100°F. in a second scraped-wall heat exchanger after which 0.12 parts of diacetyl and 0.10 parts of hexanal are added. The resulting mixture has very good chicken flavor characteristics and is suitable for use in gravies, sauces and soups.

When the foregoing procedure is repeated utilizing ten parts glucose in the mixture to be reacted, a reaction mixture having very good chicken flavor is obtained.

EXAMPLE V

The following mixture is prepared:

Ingredient	*Parts by Weight*
Fat	622.67
Salt	321.61
Glutathione	10.00
Beta-Alanine	1.28
Thiamine hydrochloride	10.28
Taurine	10.00
Mixture of sodium inosinate and sodium guanylate	3.34

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The procedure of Example I is followed and after cooling, 0.12 parts of diacetyl and 0.10 parts of hexanal (50% pure) are added. The mixture so produced has a very good chicken flavor.

Novel edible food compositions of this invention comprise a food and the flavor compositions prepared as described above. If desired, the flavor composition can be admixed directly with the food, or it can first be blended with other food additives and then admixed with the food. Additives suitable for admixture with the flavor compositions of this invention include carriers, thickeners, condiments, spices, encapsulating agents, vehicles, coloring agents, other flavoring materials, and flavor intensifiers. For example, the flavor compositions of this invention can be admixed with food additives such as alginates, allspice, ascorbic acid, basil, capsicum extract, onion oil, oregano extract, pyroligneous acid, sage oil, sodium citrate, thyme, and monosodium glutamate.

Carriers are useful in extending the flavor compositions of this invention. Such carriers do not appreciably affect the quality of the flavor, but they frequently stabilize the compositions and increase their shelf life. Saccharides such as gum arabic are useful for this purpose, as are mixtures of salts and suitable carbohydrates such as karaya, tragacanth, and carboxymethylcellulose.

In formulating the edible compositions according to this invention, a small but effective amount of the flavor composition is added to the food to impart a chicken, turkey, duckling, pork, or other sweet-type meat flavor. The novel flavor compositions of this invention will also enhance such flavors in foods which already possess a meaty flavor. It will be understood that the amount of flavor composition used depends upon a variety of factors, and accordingly, can vary over a wide range. The factors which determined the amount of flavor composition of this invention to be used include the intensity of flavor desired, the specific reaction mixture, the reaction conditions, the type of food to which it is added, and the cooking or other treatment to which the total edible composition will be subjected prior to consumption. The flavor composition of this invention can be added to meat-containing or to meatless foods. For example, it can be added to beef, lamb, pork, chicken, turkey, duckling, and the like, or to gravies, ragouts, soups, fricassees, spreads, dips, salads, pot pies, dressings, sauces, pates, purees, snack products such as crackers, and marinades.

Experiments similar to the foregoing examples demonstrate that no meat flavor composition is obtained when hydrolyzed vegetable protein is refluxed for 4 hours in an aqueous medium.

Similarly, a mixture of the following ingredients is blended with 400 parts of vegetable shortening and 161 parts of sodium chloride:

Ingredient	*Parts by Weight*
Glutamic acid	5.14
Glycine	5.14
Beta-Alanine	1.28

The mixture is heated to a temperature of about 275°F. over a period of approximately 8 minutes and then cooled quickly to about 100°F. Thereafter, 0.1 parts hexanal (50%), 3.34 parts nucleotides and 0.12 parts diacetyl are added. The resulting mixture does not possess meaty flavor characteristics.

EXAMPLE VI

The following ingredients are refluxed for four hours. The resulting mixture is then aged for three days and gum arabic added thereto to provide a composition containing one part by weight of flavor solids and one part by weight of gum arabic. The composition is spray dried to produce a beef flavor product.

Ingredient	*Parts by Weight*
L-cysteine hydrochloride	3.52
Hydrolyzed vegetable protein	154.70
Thiamine hydrochloride	3.52
Water	336.50
Taurine	10.00

The flavor of this composition is decidedly improved over that obtained when the procedure is repeated without using taurine. When the foregoing procedure is repeated utilizing the taurine at concentrations of 0.1, 4, 8 and 20 per cent by weight, similar results are obtained.

EXAMPLE VII

The procedure of Example VI is repeated utilizing 1.72 parts of each of taurine and L-cysteine hydrochloride. The resulting reaction product has a beef flavor virtually indistinguishable from the product obtained in Example VI when taurine is absent.

EXAMPLE VIII

The procedure of Example VI is followed utilizing the following ingredients:

Ingredient	*Parts by Weight*
Taurine	3.52
Thiamine hydrochloride	3.52
Water	336.50
Hydrolyzed vegetable protein	154.70

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The resulting composition has very good beef flavor characteristics. When the procedure is repeated omitting the hydrolyzed vegetable protein, again a good meat flavor composition is obtained.

Other ingredients may be added, before or after reaction to the pre-mix compositions of Examples VI-VIII to impart special notes to the product. For example, materials such as phenylalanine, beta-alanine, pyruvic acid, pyruvic aldehyde, phosphoric acid, potassium phosphate (dibasic), ammonium phosphate (dibasic), and potassium chloride may be employed.

EXAMPLE IX

The following ingredients are used to prepare a beef bouillon cake:

Ingredient	*Gms/Unit*
Salt	1.80
Flavor compositions of Example VIII	0.50
Gelatin (180 bloom)	0.40
Mono-sodium glutamate	0.20
Brown coloring	0.01
Garlic powder	0.04
Pepper, ground	0.01
	2.96

A bouillon having excellent beef flavor is obtained.

EXAMPLE X

A chicken-flavored bouillon mix is prepared by admixing the following ingredients:

Ingredient	*Parts by Weight*
Salt-fine	1.50
Malto-Dextrin	1.10
Monosodium glutamate	0.40
Vegetable protein hydrolysate	0.40
Onion flavor	0.17
Celery stalk powder	0.10
Celery seed powder	0.03
Garlic powder	0.02
White pepper powder	0.02
Chicken flavor of Example III	0.50

If desired, coloring material can be added to the foregoing mix to obtain the desired shade.

A bouillon is prepared from the foregoing composition by adding 40 parts of boiling water to the mix and stirring to disperse the ingredients. A bouillon having an excellent chicken flavor is obtained.

EXAMPLE XI

A mix for the preparation of chicken-flavored gravy is prepared by blending the following ingredients:

Ingredient	*Parts by Weight*
All-purpose flour	360.0
Cornstarch	120.0
Non-fat dry milk solids	80.0
Dextrose	40.0
Chicken flavor of Example IV	270.0
Monosodium glutamate	40.0
Onion powder	16.0
Celery stalk powder	4.0
Chicken spice	8.0

About 9.7 parts of the gravy mix is thoroughly dispersed in 100 parts of cold water. The dispersion is then brought to a boil and simmered for two minutes. A gravy having an excellent chicken flavor is obtained.

WHAT WE CLAIM IS:—

1. A process for preparing a product useful for flavoring which comprises preparing a mixture of 2-aminoethane sulfonic acid and thiamine, heating said mixture to provide a product, and, if desired, doing one or more of the following:
   (a) adding to the above mixture, prior to, during or after said heating, a source of one or more amino acids
   (b) adding the resultant product to a food.
2. A process according to claim 1, wherein said source of amino acid is any of one or more free amino acids or a proteinaceous material.
3. A process according to claim 1 or 2, wherein said source of amino acid is hydrolyzed vegetable protein.
4. A process according to claim 1 or 2, wherein the source of amino acid is one or more free amino acids at least one of which is glycine, cysteine or glutamic acid.
5. A process according to any one of the preceding claims, wherein based on the total weight of the mixture, from 0.025 to 90 weight per cent of 2-aminoethane sulfonic acid, from 0.025 to 50 weight per cent thiamine and up to 50 weight per cent of amino acid source are reacted.
6. A process according to claim 5, wherein the reaction is carried out in water and the 2-aminoethane sulfonic acid constitutes from 0.5 to 25 weight per cent, the thiamine constitutes 0.5 to 10 weight per cent, and the amino acid source constitutes from 0.5 to 35 weight per cent of said reaction mixture.
7. A process according to any one of the preceding claims, where there is a vehicle additionally present during the reaction.
8. A process according to claim 7, wherein said vehicle comprises a triglyceride fat.
9. A process according to any one of the preceding claims, wherein there is additionally present in said reaction mixture a saccharide material.

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10. A process according to any one of the preceding claims, wherein said heating is within the range of 200 to 420°F.

11. A process according to claim 10, wherein said heating is for a period of time between 15 seconds and 6 hours.

12. A process in accordance with claim 1 for preparing a product useful for flavoring substantially as described in any of the Examples.

13. A product useful for flavoring whenever prepared by the process of any one of the preceding claims.

14. A composition useful in producing flavor compositions which comprises 2-aminoethane sulfonic acid and thiamine.

15. The composition of claim 14, wherein there is additionally present a source of one or more amino acids.

16. The composition of claims 14 or 15, wherein the source of amino acid is any of one or more free amino acids or a proteinaceous material.

17. The composition of claims 14 to 16, wherein the source of amino acid is hydrolyzed vegetable protein.

18. The composition of claim 16, wherein the source of amino acid is one or more free amino acids at least one of which is glycine, cysteine or glutamic acid.

19. The elevated temperature reaction product of a mixture comprising 2-aminoethane sulfonic acid and thiamine.

20. The elevated temperature reaction product of a mixture comprising a source of one or more amino acids with a component which is any of

(a) a mixture of 2-aminoethane sulfonic acid and thiamine

or (b) the elevated temperature reaction product of a mixture comprising 2-aminoethane sulfonic acid and thiamine.

21. The reaction product of claim 20, wherein the source of amino acid is any of one or more free amino acids, or a proteinaceous material.

22. The reaction product of claim 21, wherein component (a) is employed.

23. The reaction product of claim 22, wherein the source of amino acid is hydrolyzed protein.

24. The reaction product of claim 22, wherein the source of amino acid is one or more free amino acids at least one of which is glycine, cysteine or glutamic acid.

25. The reaction product of claim 23, wherein the 2-aminoethane constitutes from 0.025 to 90 weight per cent, the thiamine constitutes from 0.025 to 50 weight per cent, and the hydrolyzed protein constitutes up to 50 weight per cent of said pre-reaction mixture based on the total weight of said pre-reaction mixture.

26. The reaction product of claim 25, wherein there is a vehicle additionally present in said pre-reaction mixture.

27. The reaction product of claim 26, wherein the vehicle comprises water and the 2-aminoethane sulfonic acid constitutes from 0.5 to 25 weight per cent, the thiamine constitutes from 0.5 to 10 weight per cent and the hydrolyzed protein constitutes from 0.5 to 35 weight per cent of said pre-reaction mixture all based on the weight of said mixture.

28. The reaction product of claim 24, wherein the 2-aminoethane sulfonic acid constitutes from 0.025 to 90 weight per cent, the thiamine constitutes from 0.025 to 50 weight per cent, the cysteine constitutes from 0 to 40 weight per cent, the glutamic acid constitutes from 0 to 25 weight per cent, and the glycine constitutes from 0 to 25 weight per cent of said pre-reaction mixture all based on the total weight of pre-reaction mixture.

29. The composition of claim 28, wherein there is a vehicle additionally present in said pre-reaction mixture.

30. The composition of claim 29, wherein the 2-aminoethane sulfonic acid constitutes from 0.5 to 25 weight per cent, the thiamine constitutes from 0.5 to 10 weight per cent, the cysteine from 0 to 25 weight per cent, the glycine from 0.1 to 2.5 weight per cent and the glutamic acid from 0.1 to 2.5 weight per cent of the said pre-reaction mixture all based on the total weight of said pre-reaction mixture.

31. The composition of claim 30, wherein the vehicle comprises a triglyceride fat.

32. The composition of claim 31, wherein there is additionally present in said pre-reaction mixture a saccharide material.

33. The composition of claim 25, wherein there is additionally present in said pre-reaction mixture a quantity of cysteine.

34. An edible composition comprising a food and the composition of claim 19, in an amount sufficient to impart flavor characteristics to said edible composition.

35. An edible composition comprising a food and the composition of claim 26, in an amount sufficient to impart flavor characteristics to said edible composition.

36. An edible composition comprising a food and the composition of claim 29, in an amount sufficient to impart flavor characteristics to said edible composition.

37. A flavouring composition in accordance with claim 19 substantially as hereinbefore described with reference to any of the Examples.

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COMPLETE SPECIFICATION

Process for the production of Seasonings with a Flavor similar to Meat Extract

We, CORN PRODUCTS COMPANY, a Corporation organized under the laws of the State of Delaware, United States of America, of 717 Fifth Avenue, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns a process for preparing seasonings, flavorings, condiments and the like having a taste remarkably similat to meat extract, and to the products so prepared.

Briefly, the process comprises reacting together amino acids, reducing sugars, and a sulfonic acid.

More particularly, the present invention provides process for the production of seasonings with a flavor similar to meat extract which comprises reacting together, in an aqueous medium, (a) an amino acid component comprising amino acids other than cysteine, protein hydrolyzates, and mixtures thereof; (b) a reducing sugar; and (c) a sulfonic acid component comprising lower aminoalkanesulfonic acids as hereinafter defined, salts of lower aminoalkanesulfonic acids, and mixtures thereof.

It is known that upon heating amino acids with reducing sugars the Maillard reaction (also called the "browning reaction") takes place, whereby not only brown-colored melanoidins are formed, but, depending upon the selection of the kind and quality of reactants and the reaction conditions, various flavors (e.g. malt, caramel, chocolate, bread, potato) can be produced.

A process for making a seasoning composition having a meat flavor has been described in Specification No. 836,694, comprising reacting cysteine (alone or in admixture with other amino acids or a protein hydrolyzate) with one or more reducing sugars. It has been believed that the presence of cysteine in the reaction mixture was necessary to the production of a product having a pronounced meat flavor.

We have now made the unexpected discovery that products having a pronounced meat flavor, which are practically indistinguishable from natural meat extract, can be prepared by reacting an amino acid other than cysteine, or a cysteine-free mixture of amino acids or protein hydrolyzate, with one or more reducing sugars, in the presence of a lower aminoalkanesulfonic acid or salt of such acid. By the term 'lower aminoalkanesulfonic acid' is meant an aminoalkanesulfonic acid containing a total of not more that 8 carbon atoms.

Prefeerably, from the standpoint of availability, the sulphuric acid component is taurine, (aminoethylsulfonic acid,

$$NH_2.CH_2.CH_2.SO_2H);$$

taurine occurs naturally in many foodstuffs such as meat, fish and cheese, and is found in natural meat extract in the proportion of about 1.2% to 1.5% by weight, dry basis.

As the amino acid component a single amino acid or its salt can be used; we have found glutamic acid and its salts (e.g. monosodiumglutamate) to be particularly effective. Also, mixtures of two or core amino acids (or salts) or a protein hydrolyzate (which is, of course, essentially a mixture of amino acids), can be used. Hydrolyzates of either animal or vegetable protein are effective in the process of the invention; we have used, for example, hydrolyzates of casein, meat flour, wheat gluten, corn gluten, and defatted soy grits with excellent results. The hydrolyzates can be prepared by any of the methods known in the art, e.g. by acids hydrolysis of the protein followed by neutralization, clarification and decolorization.

It should be emphasized that no cysteine is present in our reaction mixtures; despite the absence of the compound which has heretofore

[*Price 4s. 6d.*]

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been though to be essential to the development of a meat flavour, the products of our process have a pronounced, full-bodied meat flavour practically identical with that of natural meat extract.

The particular reducing sugar or sugars are not critical, but we prefer to use one or more pentoses of a mixture of one or more pentoses with one or more hexoses. The following sugars have been found eminently suitable: arabinose, dextrose, fructose, a lactose, ribose, and xylose.

The reaction should be conducted in an aqueous medium. Preferably, the ratio (by weight) of sulfonic acid component to reducing sugar component is within the range of 1/1 to 1/3. The sulfonic acid component should be present in an amount between about 1% and 5% (by weight) of the total amino acid component plus the reducing sugar component. Preferably, the reaction is conducted at a temperature between about 60 and 110°C. and at a pH within the range of about 4 to about 7. The reaction should be conducted to completion, that is, until all of the reducing sugar component has been reacted. The end point can readily be determined by testing the reacted mixture for free reducing sugar.

Additional materials, particularly compounds which are present in natural meat extract such as succinic acid, lactic acid, and phosphates, can advantageously be added either before or after the reaction in order to "round off" the full-bodied flavor of the final product.

The products resulting from the reaction are in liquid form; they can be used as flavorings or seasoning in this form, or can be concentrated (as by evaporation) to pastes or dehydrated (as by vacuum- or spray-drying) to dry powders. The products have an excellent full-bodied meat flavor, practically identical to that of natural meat extract; when added to foodstuffs such as soup or food preparations containing meat or fish they impart a delicious meat flavor, and greatly enhance any meat flavors which are already present in the foodstuff.

The following examples will illustrate the practice of the invention. They are presented for illustrative purposes only, and are not intended to limit the scope of the invention.

Example 1

250 grams of a protein hydrolyzate (obtained by the acid hydrolysis of casein) having a dry substance content of 40% and a pH of 5 to 6 was mixed with 75 grams of monosodiumglutamate, 6 grams of xylose, 3.2 grams of taurine, and 120 grams of water. The mixture was heated at 90°C. and reacted at this temperature for 15 to 20 hours. After this period, the mixture was analysed for free xylose, and none could be detected. The brown liquid resulting from the reaction had a pleasant taste similar to meat extract. The product was evaporated to a paste weighing 220 grams. The evaporation caused no deterioration in the flavor of the product.

Example 2

250 grams of a protein hydrolyzate (obtained by hydrolyzing wheat gluten) was mixed with 120 grams water, 2 grams xylose, 1 gram dextrose, and 2 grams taurine. The mixture was boiled for 5 hours under reflux. After this period, no reducing sugars could be detected in the mixture by analysis, indicating that the reaction had gone to completion. The product had a delicious meat flavor, barely distinguishable from natural meat extract. The product was then spray dried to a dry water-soluble powder. The dehydration had no adverse effect upon the flavor of the product.

Example 3

75 grams of sodium glutamate was dissolved in 90 ml. of water, and 3 grams arabinose, 3 grams dextrose, and 3.5 grams taurine were added to the solution. The reaction vessel was sealed and the contents heated to 110°C. for about 3 hours.The resultant liquid had a taste remarkably similar to natural meat extract.

Example 4

This example demonstrates the importance of sulfonic acid component to the development of a pronounced meat flavour, and also shows the advantages of adding additional materials which occur naturally in meat extract.

The following materials were added to 150 grams of water: 250 grams protein hydrolyzate (obtained from defatted soy grits), 45 grams potassium phosphate, 30 grams lactic acid, 3 grams succinic acid, 6 grams xylose, and 75 grams sodium glutamate. The solution was adjusted to a pH of about 5 to 7, and heated at 90°C., for about 20 hours. The product had a good, but mild, taste. The example was repeated except that 3.5 grams of taurine was added to the reaction mixture. The resultant product had a very pronounced full-bodied meat flavor, which was barely distinguishable from natural meat extract. The product was evaporated to obtain about 310 grams of paste; the evaporation had no adverse effect upon the delicious flavor.

Example 5

250 grams of a vegetable protein hydrolyzate, 75 grams glutamic acid, 3 grams ribose, 3 grams dextrose, 2.6 grams succinic acid and 3 grams taurine were dissolved in 200 grams of water. The solution was adjusted to a pH of about 6 and heated at 90°C. for about 20 hours. The reacted product was evaporated to the form of a paste (210 grams). The product had an excellent meat flavor.

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WHAT WE CLAIM IS:—

1. Process for the production of seasonings with a flavor similar to meat extract which comprises reacting together, in an aqueous medium, (a) an amino acid component comprising amino acids other than cysteine, protein hydrolyzates, and mixtures thereof; (b) a reducing sugar; and (c) a sulfonic acid component comprising lower aminoalkanesulfonic acids as hereinbefore defined, salts of lower aminoalkanesulfonic acids, and mixtures thereof.

2. The process of claim 1, wherein the amino acid component is glutamic acid or a salt thereof.

3. The process of claim 1, wherein the amino acid component is a cysteine-free protein hydrolyzate.

4. The process of claim 1, 2 or 3, wherein the reducing sugar is a pentose or a mixture pentose and a hexose.

5. The process of any of claims 1 to 4, wherein the sulfonic acid component is taurine.

6. The process of any of claims 1 to 5, wherein the sulfonic acid component is present in an amount of from 1% to 5% by weight, based on the total weight of the amino acid component and the reducing sugar, and the ratio of sulfonic acid component to reducing sugar is from 1/1 to 1/3 by weight.

7. The purpose of any of claims 1 to 6, wherein the reaction is carried out at a pH of from 4 to 7 and at a temperature of from 60 to 110°C.

8. The process of any of claims 1 to 7, wherein additional ingredients which are present in natural meat extract are added to the mixture before or after reaction.

9. The process of claim 8 wherein said additional ingredients comprise succinic acid, lactic acid or a phosphate or a mixture thereof.

10. The process of any of claims 1 to 9, including the additional step of concentrating the product resulting from the reaction to the form of a paste.

11. The process of any of claims 1 to 9, including the additional step of dehydrating the product resulting from the reaction to a dry powder.

12. Process according to any of claims 1 to 11 for the production of seasonings with a flavor similar to meat extract, substantially as herein described with particular reference to any one of the specific examples.

13. The product obtained by the process of any of claims 1 to 12.

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COMPLETE SPECIFICATION.

Poultry Flavor.

We, CHAS. PFIZER & CO., INC., a Corporation organized under the laws of the State of Delaware, United States of America, of 235 East 42nd Street, New York 17, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement.—

This invention relates to a new and useful method for making flavoring compositions. More particularly, it is concerned with a process for the preparation of a synthetic chicken flavor comprising sugars, amino acids, vegetable protein hydrolysates, 5'-ribonucleotides, and monosodium glutamate, which is useful in imparting a chicken flavor to foods. The commercially-available chicken-flavor extracts used in flavoring foods such as gravies and soups are obtained by a time-consuming and generally expensive process. Most chicken-flavor extracts contain a dehydrated chicken meat along with various spices and fillers.

The price of the chicken-flavored extract tends to fluctuate with the season of the year and the competitive demand for poultry for table use. Similar fluctuations are observed in the quality of the extract. It has now been found that by use of the process of this invention, it is possible to obtain chicken-flavored extracts which have uniformly high quality at a cost that does not vary with the season or availability of poultry. This is accomplished by replacing the usual chicken-flavor extract with composition prepared from commercially-available chemical and vegetable materials which are stable in price and some of which are expected to be available at steadily decreasing prices in the future.

We have surprisingly found that the synthetic chicken-flavor compositions of this invention have a taste and aroma of the natural chicken flavor and are suitable for flavoring gravies and soups. It is most important, in order to obtain a commercially-acceptable product, that every nuance and flavor note of natural poultry flavor be reproduced in a synthetic poultry flavor exactly as it is tasted and smelled in the natural product. While a beef-flavor extract can have a slightly stronger taste or a slightly saltier taste than natural beef flavor, a chicken flavor cannot and still be commercially acceptable. A chicken-flavored extract must have a certain mildness to be acceptable and yet retain its chicken flavor. This mildness cannot be obtained by merely diluting a strongly-flavored extract. It is inherent in the poultry-flavor itself. It was therefore most unexpected that we found that by blending certain ingredients in the proper amounts, we obtained a commercially-acceptable chicken flavor that serves as a substitute for natural chicken flavor without the addition of spices, or flavor modifiers.

It is known that a flavor such as that of roast beef, boiled beef, roast pork is obtained by reacting a monosaccharide such as hexose or pentose with cystine or cysteine in the presence of water at an elevated temperature. The teachings of Morton, et al., U.S. Patent 2,934,437 are illustrative thereof. We have surprisingly found that by combining a hexose or pentose with water, cystine or cysteine, and a particular amount of glycine, and thereafter neutralizing the mixture and heating at an elevated temperature, we obtain a distinct chicken flavor extract.

Broadly, this invention is a method for making a chicken-flavored composition which comprises mixing in an aqueous medium a hexose or pentose monosaccharide or mixtures thereof, cysteine or cystine or

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mixtures thereof, and glycine in an amount to provide from 0.05 to 0.5 part per part by weight of the total mixture; neutralizing to a pH of 6.5 to 7.5 and thereafter heating at from 70 to 100°C. for from 10 minutes to 4 hours.

Also included is the above-described process where the hexose is dextrose and the pentose is arabinose.

Furthermore, this invention includes the above-described process where the chicken-flavored product is cooled and there is then added from 0.2 to 15 parts by weight of edible fat.

Also included in this invention is the method for making a chicken-flavored composition which comprises mixing in an aqueous medium, dextrose, arabinose, cysteine and glycine in an amount to provide from 0.05 to 0.5 part per part by weight of the total mixture, neutralizing to a pH of 6.5 to 7.5 and thereafter heating at from about 90 to 100°C. for about 2 hours; cooling and thereafter adding to the chicken-flavored product

(a) from 2 to 15 parts by weight of monosodium glutamate,

(b) from 3 to 15 parts by weight of vegetable protein hydrolysate,

(c) from 1 to 4 parts by weight of sucrose, and thereafter heating to 70—75°C. for 1 to 4 hours.

Furthermore, this invention includes the aforesaid method wherein the chicken flavored composition is cooled and blended with from 0.2 to 15 parts of edible fat and from 0.01 to 0.1 part by weight of a 50:50 by weight mixture of disodium inosinate and disodium guanylate, based on the weight of chicken-flavored product and then heating to from 50 to 55°C. for from 10 to 30 minutes.

The ingredients of the above-mentioned processes are readily obtainable either commercially, or by synthesis.

The monosaccharides used in this invention may be a pentose or a hexose or mixtures of both. Illustrative pentoses are ribose, arabinose and xylose; illustrative hexoses are glucose, fructose, galactose and mannose.

The term "vegetable protein hydrolysate" as used herein contemplates artificial digests of protein derived by acid, enzymatic or other hydrolysis of vegetable proteins such as the mixture of plant proteins occurring in cereal grains, especially wheat, and known as gluten. The said protein hydrolysates, which are freely available commercially, comprise the constituent amino acids representative of the source protein. A particularly useful hydrolysate is that made by the Nestle Company and sold under the tradename Maggi 3H3 Paste.

The term "physiologically-acceptable salts" as used herein contemplates non-toxic alkali metal, alkaine earth metal and organic base salts of 5'-ribonucleotides, of which inosine-5'-phosphoric acid also well known in the art as inosinic acid, is a member of special importance, and glutamic acid. Particular mention is made of the sodium and calcium salts, which are desirable because of their ready availability and low toxicity. Also important are the potassium salts, the ammonium salts and the salts with glycine and other non-toxic organic bases.

It has been found that, in addition to, or in place of inosinic acid, other 5'-ribonucleotides may be employed in the practice of the instant invention. In this connection, special mention is made of certain 5'-ribonucleotides derivable from a commonly employed source of inosinic acid, namely yeast ribonucleic acid: cytidine-5'-phosphoric acid, uridine-5'-phosphoric acid and guanosine-5'-phosphoric acid, this latter substance commonly is referred to as guanylic acid.

By the term "chicken-flavored product" used herein and in the appended claims is meant the chicken-flavored composition obtained by mixing the hexose or pentose monosaccharide or mixtures thereof, the cysteine or cystine mixtures thereof, water and glycine; neutralizing to a pH of 6.5 to 7.5 and thereafter heating at from 70 to 100°C. for from 10 minutes to 4 hours.

It is critical to this invention that the hexose or pentose monosaccharide or mixture of hexose and pentose monosaccharide, the cystine or cysteine or mixture of cystine or cysteine, and the glycine, be mixed with water and neutralized to a pH of 6.5 to 7.5 prior to heating at 70 to 100°C. for from 10 minutes to 4 hours, in order to obtain a chicken-flavored product. When the glycine is not added or when the mixture is not neutralized a nondescript tasting composition is obtained.

For the practice of this invention when vegetable protein hydrolysate is added, it is important to maintain the ratio of vegetable protein hydrolysate to chicken-flavored product as disclosed herein and as set forth in the appended claims. If more than 15 parts by weight of hydrolysate per part of chicken-flavored product is used, then the poultry taste is not as pronounced. Also, in the practice of this invention when a 5'-ribonucleotide is added, it is very desirable to maintain the ratio of 5'-ribonucleotide to meat-flavored substance as disclosed herein. If more than 0.1 part by weight of the said nucleotide is present for each part of the chicken-flavored product, the economic advantage of the instant invention is diminished.

As will be exemplified hereinafter, the flavoring compositions are obtained and may

be used in the form of substantially dry solids or pastes or in solutions. When the flavoring compositions are used for replacements for poultry extract, a certain amount of adjustment in the concentration may be needed depending on individual preference and the nature of the final product in order to arrive at the most desirable flavor or essence. These adjustments are well within the ability of those skilled in the art and, as is obvious, the need for such adjustments by the consumer is largely obviated by providing a synthetic mixture of this invention with a flavoring strength equivalent to that of poultry extract. Such a composition can readily be made by suitable selection of concentrations and will be exemplified hereinafter.

It will be obvious to those skilled in the art of cookery, that the addition of suitable spices to the chicken-flavored composition prepared by the method of this invention or to foods prepared by utilization of the composition, will result in turkey, duck, Cornish hen, goose or pheasant-like tastes depending on the spices used and their amounts.

The present invention, in one of its embodiments especially useful to prepare chicken-flavored gravy with roast chicken flavor and odor, contemplates the process as described above wherein for each part of the said meat-flavored substance there is provided from about 0.5 to about 15 parts of edible fat.

As will be exemplified, to obtain the aforementioned chicken-flavored product it is necessary to heat the ingredients at from 70 to 100°C. for a period of from about 10 minutes to 4 hours. As will be obvious to those skilled in the art, the higher the temperature chosen, the shorter the time reqired to obtain an adequate flavor.

With respect to the edible fact, both animal and vegetable fats may be used. For example, chicken fat and beef fat, margaine, butter and safflower oil and coconut oil can be employed. While the reactions leading to roast meat odor and flavor are not clearly understood, the heating together of the mixture with fat under these conditions leads to a very pleasing product, different from that obtained when fat is not present.

The amount of edible fat can be varied. Based on the chicken-flavored substance, for example, there can be used from 0.5 to 15 parts of fat per part of chicken-flavored product.

A specific embodiment of this invention comprises heating in admixture a compound selected from hexose and pentose monosaccharides, or mixtures thereof, and preferably dextrose and arabinose to obtain the optimum in poultry flavor, with cystine or cysteine or mixtures thereof in the presence of water, adding for each part by weight of the mixture, glycine in an amount to provide from 0.05 to 0.5 parts by weight. The cystine or cysteine, monosaccharides and glycine are added to the water and the pH is adjusted to an acidity of from 6.5 to 7.5. The solution is then heated at from 70 to 100°C. for from 10 minutes to 4 hours, and preferably from 90—100°C. for about 2 hours to obtain the best tasting product, cooled to about room temperature and an amound of water about equal to the weight of the mixture is added. The acidity of the mixture is readjusted to pH of from 6.5 to 7.5 and preferably about 6.5 to 7.0 to obtain the optimum chicken flavor. To the mixture is added from 2 to 15 parts by weight of glutamic acid or a physiologically-acceptable salt thereof, for each part of chicken-flavored product. The glutamate salt may be added to the solution prior to neutralizing and heating in order to reduce the amount of alkali required for neutralization. However, in order to obtain a good poultry flavor only about 0.2 part per part of meat-flavoured substance should be so used. The remainder being added after neutralizing and heating. To the cooled mixture is added for each part of chicken-flavored product from about 3 to 15 parts by weight of vegetable protein hydrolysate and from about 1 to 14 parts of sucrose. The resulting mixture is heated at 70—75°C. for 1 to 4 hours, cooled to about 50°C., and from 0.2 to 15 parts of edible fat and from 0.01 to 0.1 part of a 5'-ribonucleotide selected from inosinic acid, guanylic acid, mixtures thereof and their physiologically-acceptable salts, for each part by weight of meat-flavored substance, is added. The mixture is stirred for about 15 minutes at 50—55°C. and bottled. Alternatively, the edible fat may be added prior to heating at 70—72°C. However, the 5'-ribonucleotide is preferably added after heating to avoid decomposition.

Example I

A chicken-flavored composition is formed by adding to a 2-liter, 3-necked flask fitted with a mechanical stirrer, thermometer and reflux condenser, 60 ml. water, 13.0 grams L-cysteine hydrochloride, 6.7 grams glycine hydrochloride, 10.8 grams dextrose and 8.0 grams L-arabinose. After the addition of each ingredient the mixture is stirred to dissolve the ingredient before the next ingredient is added. The total time to prepare this solution is about 30 minutes. The solution is adjusted to pH 7.0 by the addition of about 10 ml. 50% aqueous sodium hydroxide. The solution is then heated to 90—95°C., for 2 hours. After cooling to 20—25°C., 100 ml. water is added and the acidity adjusted to pH 6.8 with about

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20 ml. 1N sodium hydroxide solution. The resulting composition has a poultry taste and aroma reminiscent of roast chicken. Similar results are obtained when L-cysteine hydrochloride is replaced with L-cysteine, L-cystine, L-cystine hydrochloride or a mixture of L-cystein and L-cystine.

EXAMPLE II

In a 2-liter, 3-necked flask fitted with mechanical stirrer, thermometer and reflux condenser is added the following ingredients:

water	60 ml.
L-cysteine hydrochloride	13.0 grams
glycine hydrochloride	6.7 grams
dextrose	10.8 grams
L-arabinose	8.0 grams

The solution is adjusted to pH 7.0 with 10 ml. of 50% aqueous sodium hydroxide and is then heated at 90—95°C. for 2 hours. After cooling to 20—25°C., 100 ml. of water is added and the acidity is adjusted to pH 6.8 with 1N hydroxide solution. With the stirrer on, the following ingredients are added:

sucrose	166 grams
vegetable protein hydrolysate (VPH)	550 grams
monosodium gluatamate (MSG)	530 grams

The resulting solution is heated at 70—72°C for 4 hours. It is then cooled to 50°C. and 45 grams rendered chicken fat and 1.5 grams of a 50/50 mixture of disodium inosinate and disodium guanylate are added with stirring. The product is blended for 15 minutes at 50—55°C. and packaged in glass bottles. The composition has an excellent chicken flavor and is suitable for flavoring gravies and soups.

EXAMPLE III

Chicken-flavored compositions are prepared by the procedure of Example I, substituting for the dextrose the following hexoses: galactose, mannose and fructose; and for the arabinose the following pentoses: ribose and xylose. Substantially the same results are obtained.

EXAMPLE IV

Chicken-flavored compositions are prepared by the procedure of Example II substituting for the mixture of disodium inosinate and disodium guanylate: dipotassium inosinate, calcium inosinate, diammonium inosinate, inosinic acid or guanylic acid.

Similarly, chicken-flavored compositions are prepared according to the procedure of Example I when glutamic acid, monopotassium glutamate, monocalcium diglutamate and monoammonium gluatmate are substituted for monosodium glutamate.

EXAMPLE V

The procedure of Example II is repeated, substituting for the rendered chicken fat, an equal amount of coconut oil. An eminently satisfactory chicken-flavored composition is obtained.

Similarly, when margarine, in an amount equal to the amount of rendered chicken fat in Example II, is substituted for the chicken fat, a chicken gravy base is obtained.

EXAMPLE VI

In a 2-liter, 3-necked flask fitted with mechanical stirrer, thermometer, and reflux condenser is added the following ingredients:

water	60 ml.
L-cysteine hydrochloride	13.0 grams
glycine hydrochloride	6.7 grams
dextrose	10.8 grams
L-arabinose	8.0 grams
monosodium glutamate	17.0 grams

The solution is adjusted to pH 7.0 with 50% aqueous sodium hydroxide and then is heated at 90—95°C. for about 2 hours. After cooling to 20—25°C., 100 ml. of water is added and the acidity is adjusted to pH 6.8 with 1N sodium hydroxide solution. With the stirrer on, the following ingredients are added:

sucrose	166 grams
vegetable protein hydrolysate	550 grams
monosodium glutamate	513 grams

The resulting solution is heated at 70—72°C. for 4 hours. It is then cooled at 50°C. and 45 grams coconut oil and 1.5 grams of a 50/50 mixture of disodium inosinate and disodium guanylate are added with stirring. The product is blended for 15 minutes at 50—55°C. and packaged. The resulting composition is an excellent chicken gravy or chicken soup base. Similarly, when the 45 grams coconut oil are added prior to heating at 70—72°C., an excellent chicken-flavored composition is obtained.

EXAMPLE VII

When the procedure of Example II is repeated, substituting different proportions of certain ingredients as set forth in Table I, satisfactory chicken-flavored compositions are obtained.