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Preface to the second edition

In the first edition of this book (ICMSF, 1974; reprinted 1978), a group of food microbiologists and statisticians discussed the statistical aspects of sampling foods for microbiological analysis, presented the concept of 2- and 3-class attribute sampling plans, and suggested microbiological criteria for a range of food products and ingredients that move in international trade.

In subsequent years, these concepts have been increasingly embraced by the food industries and by national and international food-control authorities. In related activities, ICMSF undertook a series of international collaborative and comparative trials on media and methods for the isolation and enumeration of microorganisms in foods (Appendix 4) and at the request of the World Health Organization an ICMSF committee prepared a document on the application to food processing of the Hazard Analysis and Critical Control Point (HACCP) concept (WHO/ICMSF, 1982). Also during this period the ICMSF's first volume on laboratory methods was revised (ICMSF, 1978) and its third book (ICMSF, 1980a, b) was published. The latter book presents the principles of food microbiology and discusses in detail microbiological ecology in relation to both food processes and individual foods. It includes treatment of microbial hazards in foods and the reasoning behind the selection of cases for attributes sampling plans.

The purposes and organization of this book are described in detail in the preface to the first edition (see pp. xix–xxii below). The present edition preserves the statistical treatment, but Part II has been reorganized to follow the commodity categories in the ecology book (ICMSF, 1980b). Consideration of the 'General Principles for the Establishment and Application of Microbiological Criteria for Foods' (Codex, 1981), accumulated microbiological data, and experience in the use of the

criteria cited in the first edition have resulted in either addition or deletion of criteria for some foods and modification of criteria for others.

These criteria are generally recommended for port-of-entry sampling and examination of foods. They are not necessarily appropriate to control of processing. However, guidelines are also suggested in some chapters to assist in process control in food plants.

The sampling plans suggested in this book are statistically based and derived from the best available microbiological data. In applying them, however, the microbiologist must make the final judgment based on experience and on the prevailing circumstances.

The Commission hopes that this edition will be of even greater value to food microbiologists than the first has been, and that they will continue to provide members of the Commission with advice and data on the microbiology of foods.

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The Commission is most grateful for advice and assistance from many scientists in the revision of this book, and in particular for the help of Mr D. Kilsby and Dr. G. Jarvis in statistical matters. Thanks are also due to the Editorial Committee chaired by Dr T.A. Roberts and to the chairmen of the chapter subcommittees.

This revision would have been impossible without financial sponsorship from many quarters, and the Commission is indebted to the World Health Organization and to many companies within the food industry for their generous support (see Appendix 3). Much of the revision was centred on workshops held in Stresa, Italy (1980), Chexbres, Switzerland (1981), and Anaheim, USA (1982) and on editorial discussions in Los Angeles, USA (1982), Montreux, Switzerland (1983), and Bedford, England (1983). Sincere thanks are extended to the hosts and organizers of these meetings.

Finally the Commission expresses its gratitude to various national governments, universities, and private companies for supporting the participation of their staff in the activities of the ICMSF.

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Preface to the first edition

Microbiological methods, no matter how accurate and reproducible, are inadequate to appraise the microbiological quality of food without a satisfactory sampling plan. Sampling plans in current use are often badly understood and highly unsatisfactory, and the level of safety they provide is generally not well known. At present, no comprehensive publication exists dealing with statistically based sampling plans, broadly applicable to the field of food microbiology. The facts that the production of foodstuffs is gradually being centralized in enlarging enterprises and that foodstuffs are moving in international commerce on a rapidly increasing scale make the need for such plans still more obvious. The Commission decided to try to fill this gap and, to that end, called upon expert statisticians and commodity specialists to supplement its own areas of competence.

The primary aim of this book is instructional: to draw attention to the unsatisfactory nature of casual sampling, and to provide information necessary to improve the situation. The immediate objectives are: to describe what different sampling plans can achieve in principle; to establish their significance for the interpretation of the results of microbiological testing of foods; and to offer guidance as to the choice of appropriate sampling plans in different situations.

The cost of sampling and testing and inadequate awareness of the principles involved nearly always preclude the use of an ideal sampling plan, and lead to the use of sampling procedures that are far from satisfactory in both nature and scope. Such a situation seems likely to produce an unjustified feeling of security in those responsible for the interpretation of the results. Improved sampling plans as indicated in this book will give a basis for statistically valid and realistic judgment of the microbiological quality of foods under test.

The Commission has limited its scope both in the previously published book and in the present text to the range of competence of its members and advisers. Thus neither includes the fields of parasitology, virology, and mycology. Incomplete survey data imposed additional limitations. The criteria proposed herein were based primarily on the knowledge of experts in the various commodity fields. They will apply to many situations, but must be tempered with good judgment in particular instances. The Commission intends to collect further information on these matters, which will probably make imperative a revision of this text in the relatively near future.

The scope and limitations, as outlined above, indicate that the book is intended primarily for people dealing with the microbiological safety of food moving in international and domestic commerce. National food control and public health authorities, food manufacturers, international organizations, and teachers in food microbiology should also find it useful.

The substance of the book falls into two parts: the principles of sampling (Part I), and the application of these principles to suggest sampling plans for various foods (Part II). Part I defines the statistical concepts and terms used in the book, describes the kind of sampling plans available and their purposes, outlines the procedures for selecting the best plan for the food and organism in question, and explains the principles of randomization. Part II describes practical applications of the principles set out in Part I and treats the procedures for collecting and handling sampling units for various food categories.

The text ends with general conclusions and a glossary of special terms.

The text is the result of five years of study by ICMSF members and consultants, involving workshops held in Dubrovnik, Yugoslavia (1969), Mexico City, Mexico (1970), Opatija, Yugoslavia (1971), Langford, England (1972), and Ottawa, Canada (1973). The project was proposed and planned by the chairman, F.S. Thatcher, after initial phases of collaboration with the chairman of the Statistics Committee, D.F. Bray. Major segments of the work were first studied by subcommittees and then discussed in plenary sessions. Results were compiled as minutes by the secretary, D.S. Clark, and later drafted into book form by the chairman, F.S. Thatcher. Subsequent compilation and rewriting was done by the various subcommittees. Editing was the responsibility of an editorial committee under Chairman M. Ingram.

The group represented a range of opinions and principles, whose

expression required constructive compromise. For example, the impracticability at present of insisting that *Salmonella* be undetectable in some raw meats had to be reconciled with the reluctance to sanction the presence of a pathogen in any food. The sampling plans described herein are not inflexible standards. If applied with increasing stringency they should permit improvement in microbiological quality without making necessary the condemnation, in prohibitive proportion, of important foodstuffs.

NOTICE

The main aims of this book are to show what sampling plans can do and what their advantages are over casual sampling procedures. The examples set out in Part II are only intended to illustrate the organisms important in the different foods and how, for each, limits might be set. The Commission has not decided whether there is a sufficient need to apply all these limits. Moreover, the actual limits chosen are based on information readily available to the Commission, which is mainly derived from a restricted range of countries and conditions; hence the suggested values are likely to need revision if applied to different circumstances. The values indicated are certainly not intended as hard and fast limits for universal application.

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herein. Finally, thanks are also expressed to the respective national governments, universities, and private companies for supporting the participation of their staff in the work of the Commission, of which the present text is but one result.