Appendix CV

June A. Munford
Curriculum Vitae

Education

University of Wisconsin-Milwaukee - MS, Library & Information Science, 2009
Milwaukee, WI

- Coursework included cataloging, metadata, data analysis, library systems, management strategies and collection development.
- Specialized in library advocacy, cataloging and public administration.

Grand Valley State University - BA, English Language & Literature, 2008
Allendale, MI

- Coursework included linguistics, documentation and literary analysis.
- Minor in political science with a focus in local-level economics and government.

Professional Experience

Researcher / Expert Witness, October 2017 – present
Freelance ● Pittsburgh, Pennsylvania & Grand Rapids, Michigan

- Material authentication and public accessibility determination. Declarations of authenticity and/or public accessibility provided upon research completion. Experienced with appeals and deposition process.

- Research provided on topics of public library operations, material publication history, digital database services and legacy web resources.

- Past clients include Alston & Bird, Arnold & Porter, Baker Botts, Fish & Richardson, Erise IP, Irell & Manella, O'Melveny & Myers, Perkins-Coie, Pillsbury Winthrop Shaw Pittman and Slayden Grubert Beard.

Library Director, February 2013 - March 2015
Dowagiac District Library ● Dowagiac, Michigan

- Executive administrator of the Dowagiac District Library. Located in

Southwest Michigan, this library has a service area of 13,000, an annual operating budget of over $400,000 and total assets of approximately $1,300,000.

● Developed careful budgeting guidelines to produce a 15% surplus during the 2013-2014 & 2014-2015 fiscal years while being audited.

● Using this budget surplus, oversaw significant library investments including the purchase of property for a future building site, demolition of existing buildings and building renovation projects on the current facility.

● Led the organization and digitization of the library's archival records.

● Served as the public representative for the library, developing business relationships with local school, museum and tribal government entities.

● Developed an objective-based analysis system for measuring library services - including a full collection analysis of the library's 50,000+ circulating items and their records.

November 2010 - January 2013
Librarian & Branch Manager, Anchorage Public Library ● Anchorage, Alaska

● Headed the 2013 Anchorage Reads community reading campaign including event planning, staging public performances and creating marketing materials for mass distribution.

● Co-led the social media department of the library's marketing team, drafting social media guidelines, creating original content and instituting long-term planning via content calendars.

● Developed business relationships with The Boys & Girls Club, Anchorage School District and the US Army to establish summer reading programs for children.

June 2004 - September 2005, September 2006 - October 2013
Library Assistant, Hart Area Public Library
Hart, MI

● Responsible for verifying imported MARC records and original MARC

cataloging for the local-level collection as well as the Michigan Electronic Library.

● Handled OCLC Worldcat interlibrary loan requests & fulfillment via ongoing communication with lending libraries.

Professional Involvement

Alaska Library Association - Anchorage Chapter
- Treasurer, 2012

Library Of Michigan
- Level VII Certification, 2008
- Level II Certification, 2013

Michigan Library Association Annual Conference 2014
- New Directors Conference Panel Member

Southwest Michigan Library Cooperative
- Represented the Dowagiac District Library, 2013-2015

Professional Development

Library Of Michigan Beginning Workshop, May 2008
Petoskey, MI
- Received training in cataloging, local history, collection management, children's literacy and reference service.

Public Library Association Intensive Library Management Training, October 2011
Nashville, TN
- Attended a five-day workshop focused on strategic planning, staff management, statistical analysis, collections and cataloging theory.

Alaska Library Association Annual Conference 2012 - Fairbanks, February 2012
Fairbanks, AK
- Attended seminars on EBSCO advanced search methods, budgeting, cataloging, database usage and marketing.

Depositions

2019 ● Fish & Richardson

Apple v. Qualcomm (IPR2018-001281, 39521-00421IP, IPR2018-01282 and 39521-00421IP2)

2019 ● Erise IP

Implicit, LLC v. Netscout Systems, Inc (Civil Action No. 2:18-cv-53-JRG)

2019 ● Perkins-Coie

Adobe Inc. v. RAH Color Technologies LLC (Cases IPR2019-00627, IPR2019-00628, IPR2019-00629 and IPR2019-00646)

2020 ● O'Melveny & Myers

Maxell, Ltd. v. Apple Inc. (Case No. 5:19-cv-00036-RWS)

2021 ● Pillsbury Winthrop Shaw Pittman LLP

Intel v. SRC (IPR2020-1449)

2022 ● Perkins-Coie

Realtek v. Future Link (IPR2021-01182)

2023 ● Fish & Richardson

Neuroderm Ltd. v. Abbvie, Inc (Case No. PGR2022-00040)

2023 ● Fish & Richardson

Nearmap US Inc. v. Pictometry International Corp. (IPR2022-00735)

2023 ● Fish & Richardson

Samsung Electronics v. MemoryWeb LLC (Case No. 39843-0136PS1)

2023 ● Pillsbury Winthrop Shaw Whitman LLP

Gravel Rating Systems v. Costco Wholesale Corp. (Civil Action No. 4:21-cv-149-ALM)

2024 ● Willkie-Farr

Netflix, Inc. v. VideoLabs. Inc. (IPR2023-00628)

Limited Case and Clientele History

Alston & Bird

- Ericsson

  v. Collision Communications (IPR2022-01233)

- Nokia

  v. Neptune Subsea, Xtera (Case No. 1:17-cv-01876)

- Universal Electronics Inc

  v. Roku Inc (IPR2022-00818)

Arnold & Porter

- Ivantis

  v. Glaukos (Case No. 8:18-cv-00620)

- Samsung

  v. Jawbone (Case No. 2:21-cv-00186)

Benesch Friedlander Coplan & Aronoff

- Voyis

  v. Cathx (Case No. 5:21-cv-00077-RWS)

Deschert LLP

- Smaxtec Animal Care

  v. ST Reproductive Technologies, LLC (IPR2024-00885)

Erise I.P.

- Apple

  v. Ericsson Inc. (IPR2022-00715)

  v. Future Link Systems (IPRs 6317804, 6622108, 6807505, and 7917680)

  v. INVT (Case No. 20-1881)

  v. Navblazer LLC (IPR2020-01253)

  v. Qualcomm (IPR2018-001281, 39521-00421IP, IPR2018-01282, 39521-00421IP2)

  v. Quest Nettech Corp (Case No. 2:19-cv-00118-JRG)

  v. Telefonaktiebolaget LM Ericsson (IPR2022-00275)

  v. Theta IP, LLC (IPR2024-00818)

- Fanduel

  v. CGT (Case No. 19-1393)

- Garmin

  v. Phillips North America LLC (Case No. 2:19-cv-6301-AB-KS)

- Netscout
    - v. Longhorn HD LLC (Case No. 2:20-cv-00349)
    - v. Implicit, LLC (Civil Action No. 2:18-cv-53-JRG)

- Sony Interactive Entertainment LLC
    - v. Bot M8 LLC (IPR2020-01288)
    - v. Infernal Technology LLC (Case No. 2:19-CV-00248-JRG)

- Unified Patents
    - v. GE Video Compression (Civil Action No. 2:19-cv-248)

Fish & Richardson

- Apple
    - v. AliveCor (3:21-cv-03958)
    - v. LBS Innovations (Case No. 2:19-cv-00119-JRG-RSP)
    - v. Koss Corporation (IPR2021-00305)
    - v. Masimo (IPR 50095-0012IP1, 50095-0012IP2, 50095-0013IP1, 50095-0013IP2, 50095-0006IP1, 50095-0135IP1)
    - v. Neonode (Case No. 21-cv-08872-EMC)
    - v. Qualcomm (IPR2018-001281, 39521-00421IP, IPR2018-01282, 39521-00421IP2)

- Dell
    - v. Neo Wireless (IPR2022-00616)

- Dish Network
    - v. Entropic Communications, LLC (Case No. 2:2023-CV-01043)

v. Realtime Adaptive Streaming (Case No. 1:17-CV-02097-RBJ)

v. TQ Delta LLC (Case No. 18-1798)

- Evapco Dry Cooling

v. SPG Dry Cooling (IPR2021-00688)

- Genetec

v. Sensormatic Electronics (Case No. 1:20-CV-00760)

- Huawei

v. Bell Northern Research LLC (IPR2019-01174)

- Kianxis

v. Blue Yonder (Case No. 3:20-cv-03636)

- LG Electronics

v. Bell Northern Research LLC (Case No. 3:18-cv-2864-CAB-BLM)

- Metaswitch

v. Sonus Networks (IPR2018-01719)

- Microsoft

v. Throughputer Inc (IPR2022-00757)

- Mom Enterprises

v. Ddrops Company (Case No. 1:22-cv-00332)

- MLC Intellectual Property

v. MicronTech (Case No. 3:14-cv-03657-SI)

- Nearmap Inc
    v. EagleView Technologies (IPR2022-01009)

- Neuroderm Ltd.
    v. Abbvie, Inc (Case No. PGR2022-00040)

- Realtek Semiconductor
    v. Future Link (IPR2021-01182)

- Quectel
    v. Koninklijke Philips (Case No. 1:20-cv-01710)

- Samsung
    v. Aire Technology (IPR2022-00877)
    v. Bell Northern Research (Case No. 2:19-cv-00286-JRG)
    v. Communication Technologies Inc (IPR2022-01221)
    v. Jawbone Innovations (IPR2022-00865)
    v. MemoryWeb LLC (IPR2022-00885)
    v. Dodots Licensing Solutions (IPR2023-00701)
    v. Telefonaktiebolaget LM Ericsson (IPR2021-00615)

- Texas Instruments
    v. Vantage Micro LLC (IPR2020-01261)

- Xilinx
    v. Sentient Sensors LCC (Case No. 1:22-cv-00173)

Groombridge Wu

- Nearmap

  v. Eagle View Technologies Inc. and Pictometry International Corp. (Case No. 2:21-cv-00283-TS-DAO)

Irell & Manella

- Curium

O'Melveny & Myers

- Apple

  v. Maxell (Case No. 5:19-cv-00036-RWS)

- Disney Media & Entertainment Distribution LLC

  v. Digital Media Technology Holdings, LLC (Case No. 2:22-cv-01642)

- Micron Technology Inc.

  v. Besang Inc (IPR2023-00900)

- Samsung

  v. Daedalus Prime LLC (1335 Investigation)

Perkins-Coie

- Amazon

  v. Nokia (IPR2024-00847 and IPR2024-00848)

- Heru Industries

  v. The UAB Research Foundation (IPR2022-01148)

- Intel Corporation

  v. BeSang Inc. (IPR2023-00991)

  v. BitMICRO (Case No. 5:23-cv-00625)

  v. Telefonaktiebolaget L M Ericsson (IPR2024-00610)

- Realtek Semiconductor

  v. Future Link (IPR2021-01182)

- Twitter Inc

  v. VOIP-Pal.com (Case No. 3:20-cv-02397-JD)

- TCL Industries

  v. Koninklijke Philips NV (IPR2021-00495, IPR2021-00496 and IPR2021-00497)

Pillsbury Winthrop Shaw Pittman

- Intel

  v. FG SRC LLC (Case No. 6:20-cv-00315)

- Gravel Rating Systems

  v. Costco (Case No. 4:21-cv-149)
  v. Lowe's Home Centers (Case No. 4:21-cv-150)
  v. T-Mobile USA (Case No. 4:21-cv-152)
  v. Kohl's Inc. (Case No. 4:21-cv-258)
  v. Under Armor (Case No. 4:21-cv-356)

Quinn Emanuel

- ServiceNow, Inc.

  v. InQuisient, Inc. (Case No. 22-900-CJB)

- Wolfspeed

  v. The Trustees of Purdue University (Case No. 1:2021-cv-00840)

Sheppard, Mullin, Richter & Hampton LLP

- Cadence Design Systems Inc.

  v. Semiconductor Design Technologies (Case No. 3:23-cv-01001)

Stern, Kessler, Goldstein & Fox

- Preliminary Research

Willkie, Farr & Gallagher LLP

- Neurent

  v. The Foundry, LLC (IPR2024-00669)

- Netflix, Inc.

  v. VideoLabs, Inc. (IPR2023-00628)

Appendix IMPERIALE01

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210	0		a| New Engl. j. med. b| (Online)
222		0	a| New England journal of medicine b| (Online)
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Subject(s)

Medicine—Periodicals
Surgery—Periodicals
Surgery
Medicine
General Surgery

Genre(s)

Electronic journals

ISSN

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Other Forms

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Multitarget Stool DNA Testing for Colorectal-Cancer Screening

Imperiale, Thomas F; Ransohoff, David F; Itzkowitz, Steven H; Levin, Theodore R; Lavin, Philip ; et al. › The New England Journal of Medicine; **Boston** Vol. 370, Iss. 14, (Apr 3, 2014): 1287-1297. DOI:10.1056/NEJMoa1311194



Abstract

Background

An accurate, noninvasive test could improve the effectiveness of colorectal-cancer screening.

Methods

We compared a noninvasive, multitarget stool DNA test with a fecal immunochemical test (FIT) in persons at average risk for colorectal cancer. The DNA test includes quantitative molecular assays for *KRAS* mutations, aberrant *NDRG4* and *BMP3* methylation, and β-actin, plus a hemoglobin immunoassay. Results were generated with the use of a logistic-regression algorithm, with values of 183 or more considered to be positive. FIT values of more than 100 ng of hemoglobin per milliliter of buffer were considered to be positive. Tests were processed independently of colonoscopic findings.

More

Details

Subject

Genetic testing;
Hemoglobin;
Actin;

Deoxyribonucleic acid--DNA;

Colorectal carcinoma;

Dysplasia;

Colorectal cancer;

Polyps;

Colon;

Medical screening;

Cancer screening

Location United States--US

Identifier / keyword Screening; Colonoscopy; Fecal immunochemical test; Colorectal cancer; Genetic testing

Title Multitarget Stool DNA Testing for Colorectal-Cancer Screening

Author Imperiale, Thomas F; Ransohoff, David F; Itzkowitz, Steven H; Levin, Theodore R; Lavin, Philip; Lidgard, Graham P; Ahlquist, David A; Berger, Barry M [1]

[1] From the Department of Medicine, Indiana University School of Medicine, the Regenstrief Institute, the Simon Cancer Center, and the Center for Innovation at Roudebush Veterans Affairs Medical Center — all in Indianapolis (T.F.I.); the Departments of Medicine and Epidemiology and the Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, Chapel Hill (D.F.R.); the Dr. Henry D. Janowitz Division of Gastroenterology, Department of Medicine, Icahn School of Medicine at Mount Sinai, New York (S.H.I.); Kaiser Permanente Medical Center, Walnut Creek, CA (T.R.L.); Boston Biostatistics

Research Foundation, Framingham MA (P.L.); Exact Sciences, Madison, WI (G.P.L., B.M.B.); and the Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN (D.A.A.).

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Database	Nursing & Allied Health Premium

Suggested sources

Looking for more sources on the same subject? Try these 5 suggestions:



Multi-Target Stool DNA Test: A New High Bar for Noninvasive Screening

Ahlquist, David A. **Digestive Diseases and Sciences; New York** Vol. 60, Iss. 3, (Mar 2015): 623-633.

Gut microbiome development along the colorectal adenoma-carcinoma sequence.

Feng, Qiang; Liang, Suisha; Jia, Huijue; Stadlmayr, Andreas; Tang, Longqing; et al. **Nature communications** Vol. 6, (March 11, 2015): 6528.

Gut microbiome development along the colorectal adenoma-

Feng, Qiang; Liang, Suisha; Jia, Huijue; Stadlmayr, Andreas; Tang, Longqing; et al. **Nature Communications; London** Vol. 6, (Mar 2015): 6528.

PROVEN GUILTY: AN EXAMINATION OF THE PENALTY-FREE WORLD OF

Carroll, Gwendolyn. **Journal of Criminal Law & Criminology; Chicago** Vol. 97, Iss. 2, (Winter 2007): 665-698.

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Appendix IMPERIALE02

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 APRIL 3, 2014 VOL. 370 NO. 14

Multitarget Stool DNA Testing for Colorectal-Cancer Screening

Thomas F. Imperiale, M.D., David F. Ransohoff, M.D., Steven H. Itzkowitz, M.D., Theodore R. Levin, M.D., Philip Lavin, Ph.D., Graham P. Lidgard, Ph.D., David A. Ahlquist, M.D., and Barry M. Berger, M.D.

ABSTRACT

BACKGROUND

An accurate, noninvasive test could improve the effectiveness of colorectal-cancer screening.

METHODS

We compared a noninvasive, multitarget stool DNA test with a fecal immunochemical test (FIT) in persons at average risk for colorectal cancer. The DNA test includes quantitative molecular assays for *KRAS* mutations, aberrant *NDRG4* and *BMP3* methylation, and *β*-actin, plus a hemoglobin immunoassay. Results were generated with the use of a logistic-regression algorithm, with values of 183 or more considered to be positive. FIT values of more than 100 ng of hemoglobin per milliliter of buffer were considered to be positive. Tests were processed independently of colonoscopic findings.

RESULTS

Of the 9989 participants who could be evaluated, 65 (0.7%) had colorectal cancer and 757 (7.6%) had advanced precancerous lesions (advanced adenomas or sessile serrated polyps measuring ≥1 cm in the greatest dimension) on colonoscopy. The sensitivity for detecting colorectal cancer was 92.3% with DNA testing and 73.8% with FIT (P=0.002). The sensitivity for detecting advanced precancerous lesions was 42.4% with DNA testing and 23.8% with FIT (P<0.001). The rate of detection of polyps with high-grade dysplasia was 69.2% with DNA testing and 46.2% with FIT (P=0.004); the rates of detection of serrated sessile polyps measuring 1 cm or more were 42.4% and 5.1%, respectively (P<0.001). Specificities with DNA testing and FIT were 86.6% and 94.9%, respectively, among participants with nonadvanced or negative findings (P<0.001) and 89.8% and 96.4%, respectively, among those with negative results on colonoscopy (P<0.001). The numbers of persons who would need to be screened to detect one cancer were 154 with colonoscopy, 166 with DNA testing, and 208 with FIT.

CONCLUSIONS

In asymptomatic persons at average risk for colorectal cancer, multitarget stool DNA testing detected significantly more cancers than did FIT but had more false positive results. (Funded by Exact Sciences; ClinicalTrials.gov number, NCT01397747.)

From the Department of Medicine, Indiana University School of Medicine, the Regenstrief Institute, the Simon Cancer Center, and the Center for Innovation at Roudebush Veterans Affairs Medical Center — all in Indianapolis (T.F.I.); the Departments of Medicine and Epidemiology and the Lineberger Comprehensive Cancer Center, University of North Carolina at Chapel Hill, Chapel Hill (D.F.R.); the Dr. Henry D. Janowitz Division of Gastroenterology, Department of Medicine, Icahn School of Medicine at Mount Sinai, New York (S.H.I.); Kaiser Permanente Medical Center, Walnut Creek, CA (T.R.L.); Boston Biostatistics Research Foundation, Framingham MA (P.L.); Exact Sciences, Madison, WI (G.P.L., B.M.B.); and the Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN (D.A.A.). Address reprint requests to Dr. Imperiale at Indiana University Medical Center–Regenstrief Institute, 1050 Wishard Blvd., Indianapolis, IN 46202.

This article was published on March 19, 2014, at NEJM.org.

N Engl J Med 2014;370:1287-97.
DOI: 10.1056/NEJMoa1311194
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Colorectal cancer is a major cause of death and disease among men and women in the United States.[1] The underlying neoplastic processes of colorectal carcinogenesis lend themselves to screening.[2] Evidence supports and guidelines endorse several tests and strategies,[3-5] and screening for colorectal cancer has been found to be cost-effective.[5-7]

Despite the supporting evidence, recommendations, and availability of several screening tests, a substantial proportion of the U.S. population is not up to date with screening.[8] A simple, noninvasive test with high sensitivity for both colorectal cancer and advanced precancerous lesions might increase uptake and adherence rates, which could improve clinical outcomes.

Colorectal cancer arises from accumulated genetic and epigenetic alterations, which provide a basis for the analysis of stool to identify tumor-specific changes.[9] Large-scale screening studies of previously available stool-based DNA tests showed only fair sensitivity for the detection of colorectal cancer (i.e., the capacity to detect cancers, or true positive tests [see Glossary]) and low sensitivity for the detection of advanced adenomas.[10,11] Important advances have since been incorporated, including the use of a stabilizing buffer,[12,13] more discriminating markers,[14,15] more sensitive analytic methods,[14,16,17] automation,[16] and an overall determination of results with the use of a logistic-regression algorithm, which together result in higher sensitivity for the detection of both cancer and advanced precancerous lesions.[14,16] However, evaluation of the more recent tests was based largely on analyses of archived specimens, including those collected from patients after the diagnosis but before the resection of colorectal cancer or advanced precancerous polyps.

In this study, we evaluate the multitarget stool DNA test as a tool for screening. The primary aim was to determine the performance characteristics of the DNA test in the detection of colorectal cancer. The secondary aims were to determine the performance of the DNA test in the detection of advanced precancerous lesions and to compare it with a commercially available fecal immunochemical test (FIT) for human hemoglobin in the detection of both colorectal cancer and advanced precancerous lesions.

Methods

Study Design

From June 2011 through November 2012, we enrolled participants in this cross-sectional study at 90 sites throughout the United States and Canada, including private-practice and academic settings. The study was approved by the institutional review board at each site, and all participants provided written informed consent.

The study, which was funded by Exact Sciences, was designed by the authors; Health Decisions, a contract research organization, gathered and monitored the data. The first author wrote the first draft of the manuscript, incorporating the other authors' contributions; one of the authors, who is a statistician, analyzed the data and, along

Glossary of Screening Terms

Sensitivity (true positive rate): The proportion of persons with disease who have a positive test (positive test results among persons with disease).

Specificity (true negative rate): The proportion of persons without disease who have a negative test (negative test results among persons without disease).

False negative rate (1 minus sensitivity): The proportion of persons with disease who have a negative test (negative test results among persons with disease).

False positive rate (1 minus specificity): The proportion of persons without disease who have a positive test (positive test results among persons without disease).

Positive predictive value: The proportion of persons with disease among those with a positive test (disease present among those with positive test results).

Negative predictive value: The proportion of persons without disease among those with a negative test (disease absent among those with negative test results).

Number needed to screen: The number of persons who would need to be screened to identify one person with the disease.

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with the last author, vouches for the data and adherence to the study protocol, which is available with the full text of this article at NEJM.org. All the authors signed confidentiality agreements with Exact Sciences.

STUDY POPULATION

The target population was asymptomatic persons between the ages of 50 and 84 years who were considered to be at average risk for colorectal cancer and who were scheduled to undergo screening colonoscopy. Enrollment was weighted toward persons 65 years of age or older in order to increase the prevalence of cancer. We excluded participants who had a personal history of colorectal neoplasia, digestive cancer, or inflammatory bowel disease; had undergone colonoscopy within the previous 9 years or a barium enema, computed tomographic colonography, or sigmoidoscopy within the previous 5 years; had positive results on fecal blood testing within the previous 6 months; had undergone colorectal resection for any reason other than sigmoid diverticula; had overt rectal bleeding within the previous 30 days; had a personal or family history of colorectal cancer; had participated in any interventional clinical study within the previous 30 days; or were unable or unwilling to provide written informed consent.

CLINICAL PROCEDURES

All participants were required to provide a stool specimen and undergo screening colonoscopy within 90 days after providing informed consent. Stool was collected before routine bowel preparation. No dietary or medication restrictions were required. Colonoscopists were required to describe the extent of the examination, document cecal visualization, rate the quality of preparation (on a modified Aronchick scale),[18] and record the size and location of lesions.

Although colonoscopists reported the location and size of all lesions, only the most advanced colorectal epithelial lesion (the index lesion) and its location (proximal or distal) were used to categorize participants for the analysis. If two similarly advanced lesions were present, the larger of the two was designated as the index lesion. The proximal colon was considered to include the splenic flexure and all segments proximal to it, an insertion depth of more than 60 cm, or any part described by the phrase "right colon"; the distal colon was considered to include all other segments, an insertion depth of 60 cm or less, or any part described by the phrase "left colon."

The biopsy and surgical specimens underwent histopathological analysis at the laboratory typically used by each study site. Polyps with high-grade dysplasia or 25% or more villous elements in adenomas measuring less than 1 cm, as well as sessile serrated or hyperplastic polyps measuring 1 cm or larger, were re-reviewed centrally by a gastrointestinal pathologist for confirmation, with diagnostic disagreements resolved by consensus of at least two central pathologists.

PRIMARY AND SECONDARY OUTCOMES

The primary outcome was the ability of the DNA test to detect colorectal cancer (i.e., adenocarcinoma), with disease stage determined with the use of the American Joint Committee on Cancer (AJCC) staging system.[19] The secondary outcome was the performance of the DNA test for the detection of advanced precancerous lesions, including advanced adenomas (high-grade dysplasia or with ≥25% villous histologic features or measuring ≥1 cm in the greatest dimension) and sessile serrated polyps measuring 1 cm or more in diameter.

LABORATORY PROCEDURES

A central biorepository received all stool specimens. Laboratory testing was performed without knowledge of the results of either the comparator FIT or clinical findings. (Details of stool collection and processing for DNA testing are shown in Fig. S1 in the Supplementary Appendix, available at NEJM.org.) Buffered stool samples were homogenized, separated into aliquots, and frozen at −80°C on receipt. Stool aliquots were subsequently sent in batches to one of three laboratories: Exact Sciences (Madison, WI), Mayo Medical Laboratory (Rochester, MN), and Molecular Pathology Laboratory Network (Knoxville, TN). Each laboratory received, in a blinded fashion, a similar distribution of specimens on the basis of colonoscopic findings.

The multitarget stool DNA test consists of molecular assays for aberrantly methylated *BMP3* and *NDRG4* promoter regions, mutant *KRAS*, and β-actin (a reference gene for human DNA quantity), as well as an immunochemical assay for

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human hemoglobin. Quantitative measurements of each marker were incorporated into a validated, prespecified logistic-regression algorithm, with a value of 183 or more indicating that the test result was positive (for details, see the Supplementary Appendix). Analytic results were transferred to the study's biostatistician.

FIT (OC FIT-CHEK, Polymedco) was performed according to the manufacturer's instructions with the use of the same stool sample used for the DNA test.[20] Samples were refrigerated on receipt and sent in batches to a separate single laboratory for blinded analysis. Stool samples with more than 100 ng of hemoglobin per milliliter of buffer were considered to be positive.[20]

STATISTICAL ANALYSIS

The study was designed to have a power of 90% to test the prespecified hypothesis that the DNA test would have a sensitivity of 65% or more for the detection of colorectal cancer (AJCC stages I through IV) under the null hypothesis, at a one-sided type I error rate of 0.05. A secondary hypothesis was to rule out a 5% noninferiority margin for sensitivity for the detection of colorectal cancer with the DNA test as compared with FIT, at a one-sided type I error rate of 0.05. Testing of the two hypotheses with a power of at least 80% required the diagnosis of 49 and 56 adjudicated colorectal cancers, respectively, which required the enrollment of 10,500 to 12,000 participants, under the assumption of a colorectal-cancer prevalence of 4.5 cases per 1000 population.

We conducted prespecified analyses to determine the sensitivity of the multitarget DNA test, as compared with FIT, for the detection of screening-relevant colorectal cancer (AJCC stages I through III); the specificity of the multitarget

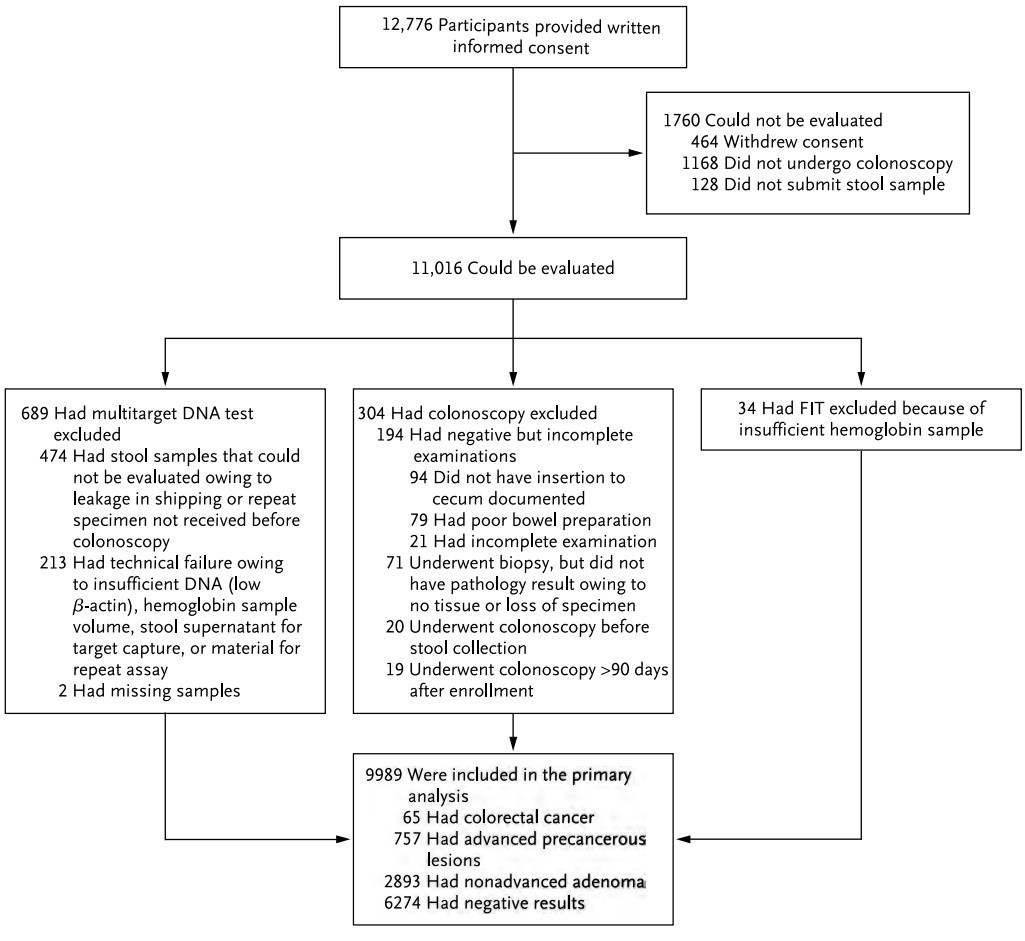


Figure 1. Enrollment and Outcomes.

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DNA stool test (i.e., true negative rate), with advanced precancerous lesions on colonoscopy excluded and only nonadvanced adenomas and negative results included (the primary measure of specificity) and with only negative results included (the secondary measure of specificity); and the sensitivity of the multitarget stool DNA test, as compared with FIT, for the detection of advanced precancerous lesions. The analyses were based on data from all participants who had valid results on multitarget stool DNA testing, FIT, and colonoscopy; all reported subgroup analyses were prespecified.

For test characteristics, 95% lower boundaries were computed with the use of an exact binomial test. Lower 95% confidence limits for comparative analyses were computed with the use of a one-sided McNemar paired-comparisons test for the observed difference in sensitivity between the DNA test and FIT. The Hanley–McNeil method was used to calculate P values for the analysis of the receiver operating characteristic (ROC) curve.[21] There were no interim analyses of the data. All analyses were conducted with the use of SAS software, version 9.1, and StatXact software, version 7.

RESULTS

STUDY POPULATION

A total of 12,776 participants were enrolled at 90 sites; 9989 of these participants (78.2%) had results that could be fully evaluated (Fig. 1). The participants whose results could be fully evaluated and those whose results could not be fully evaluated differed significantly with respect to mean age and race, although the magnitudes of the differences were small (Table S1 in the Supplementary Appendix).

A total of 65 participants who could be evaluated were found to have colorectal cancer on colonoscopy (prevalence, 0.7%). Of these participants, 60 had screening-relevant (stage I to III) cancers. A total of 757 participants who could be evaluated had advanced precancerous lesions (prevalence, 7.6%).

DNA TEST CHARACTERISTICS

Multitarget stool DNA testing identified 60 of 65 participants with cancer, including 56 of the 60 participants with screening-relevant cancers, for respective sensitivities of 92.3% (95% confidence interval [CI], 83.0 to 97.5) and 93.3% (95% CI,

Table 1. Sensitivity and Specificity of the Multitarget Stool DNA Test and the Fecal Immunochemical Test (FIT) for the Most Advanced Findings on Colonoscopy.

Most Advanced Finding	Colonoscopy (N=9989)	Multitarget DNA Test (N=9989)		FIT (N=9989)	
		Positive Results	Sensitivity (95% CI)	Positive Results	Sensitivity (95% CI)
	no.	*no.*	%	*no.*	%
Colorectal cancer					
Any	65	60	92.3 (83.0–97.5)	48	73.8 (61.5–84.0)
Stage I to III*	60	56	93.3 (83.8–98.2)	44	73.3 (60.3–83.9)
Colorectal cancer and high-grade dysplasia	104	87	83.7 (75.1–90.2)	66	63.5 (53.5–72.7)
Advanced precancerous lesions†	757	321	42.4 (38.9–46.0)	180	23.8 (20.8–27.0)
Nonadvanced adenoma	2893	498	17.2 (15.9–18.6)	220	7.6 (6.7–8.6)
			Specificity (95% CI)		Specificity (95% CI)
All nonadvanced adenomas, non-neoplastic findings, and negative results on colonoscopy	9167	1231	86.6 (85.9–87.2)	472	94.9 (94.4–95.3)
Negative results on colonoscopy	4457	455	89.8 (88.9–90.7)	162	96.4 (95.8–96.9)

* These stages of colorectal cancer, as defined by the system recommended by the American Joint Committee on Cancer, are associated with an increased rate of cure.
† Advanced precancerous lesions include advanced adenomas and sessile serrated polyps measuring 1 cm or more.

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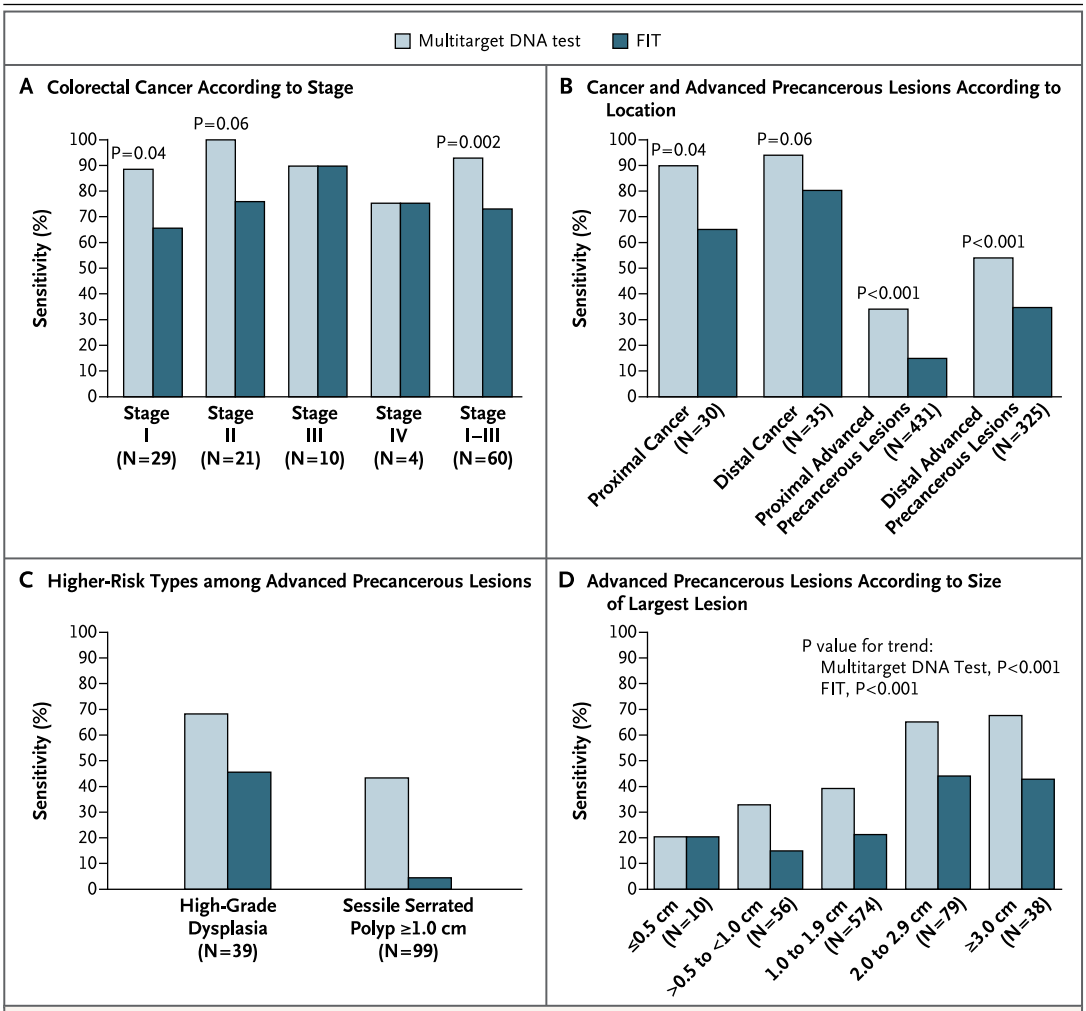


Figure 2. Sensitivity of the Multitarget Stool DNA Test and the Commercial Fecal Immunochemical Test (FIT), According to Subgroup.

Shown are the sensitivities of the DNA test and FIT for the detection of colorectal cancer according to tumor stage (Panel A), for the detection of colorectal cancer and advanced precancerous lesions according to the location in the colon (Panel B), and for the detection of higher-risk subtypes among participants with advanced precancerous lesions (Panel C) and according to lesion size (Panel D). The numbers in parentheses are the number of participants in each category. In Panel A, the stage of 1 of 65 colorectal cancers was not available. In Panel B, the location of 1 of 757 advanced precancerous lesions was not available.

83.8 to 98.2) (Table 1). Sensitivity did not vary significantly according to cancer stage (Fig. 2A) or location within the colon (Fig. 2B). Among 757 participants with advanced precancerous lesions, DNA testing detected 321 (42.4%; 95% CI, 38.9 to 46.0). A total of 69.2% (95% CI, 52.4 to 83.0) of 39 participants with high-grade dysplasia and 42.4% (95% CI, 32.6 to 52.8) of 99 participants with sessile serrated polyps measuring 1 cm or larger were identified on DNA testing (Fig. 2C). The sensitivity of the DNA test was higher for distal advanced precancerous lesions (177 of 325 [54.5%; 95% CI, 48.9 to 60.0]) than for proximal lesions (143 of 431 [33.2%; 95% CI, 28.8 to 37.8]) (Fig. 2B); test sensitivity increased as the lesion size increased (Fig. 2D). The sensitivity for the detection of cancer or advanced precancerous lesions did not differ significantly ac-

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cording to age or laboratory-testing site (data not shown).

Among 9167 participants who had findings other than colorectal cancer or advanced precancerous lesions (e.g., nonadvanced adenomas or negative results), the specificity of the DNA test (true negative rate) was 86.6% (95% CI, 85.9 to 87.2). Among the 4457 participants with totally negative results on colonoscopy, the specificity was 89.8% (95% CI, 88.9 to 90.7); within this subgroup, the specificity was 94.0% among participants younger than 65 years of age and 87.1% among those 65 years of age or older (P<0.001).

COMPARISON WITH FIT

FIT detected 48 of 65 cancers (73.8%; 95% CI, 61.5 to 84.0), 44 of 60 AJCC stage I to III cancers (73.3%; 95% CI, 60.3 to 83.9), and 180 of 757 advanced precancerous lesions (23.8%; 95% CI, 20.8 to 27.0), findings that were all significantly inferior to those with DNA testing (Table 1). FIT detected 20 of 30 proximal cancers (66.7%) and 28 of 35 distal cancers (80.0%) (P=0.35 for the comparison between proximal and distal location). Comparative results for the detection of cancer according to stage and for higher-risk subsets of advanced precancerous lesions are shown in Figure 2. The DNA test was more sensitive than FIT for the detection of lesions with high-grade dysplasia (69.2% vs. 46.2%, P=0.004) or sessile serrated polyps measuring 1 cm or more (42.4% vs. 5.1%, P<0.001) (Fig. 2C) and for the detection of advanced precancerous lesions within the size ranges observed (Fig. 2D).

DNA testing detected 13 of 60 screening-relevant cancers that were undetected by FIT, whereas FIT detected 1 cancer that was undetected by DNA testing (P<0.001). DNA testing detected 170 of 757 advanced precancerous lesions (22.5%) that were undetected by FIT, whereas FIT detected 29 such lesions (3.8%) undetected by DNA testing (P<0.001).

Among 9167 participants with findings other than colorectal cancer or advanced precancerous lesions, the specificity of FIT was 94.9% (95% CI, 94.4 to 95.3). Among 4457 participants with negative results on colonoscopy, the specificity was 96.4% (95% CI, 95.8 to 96.9). In these two subgroups, the specificity values were superior to those of the DNA test (Table 1).

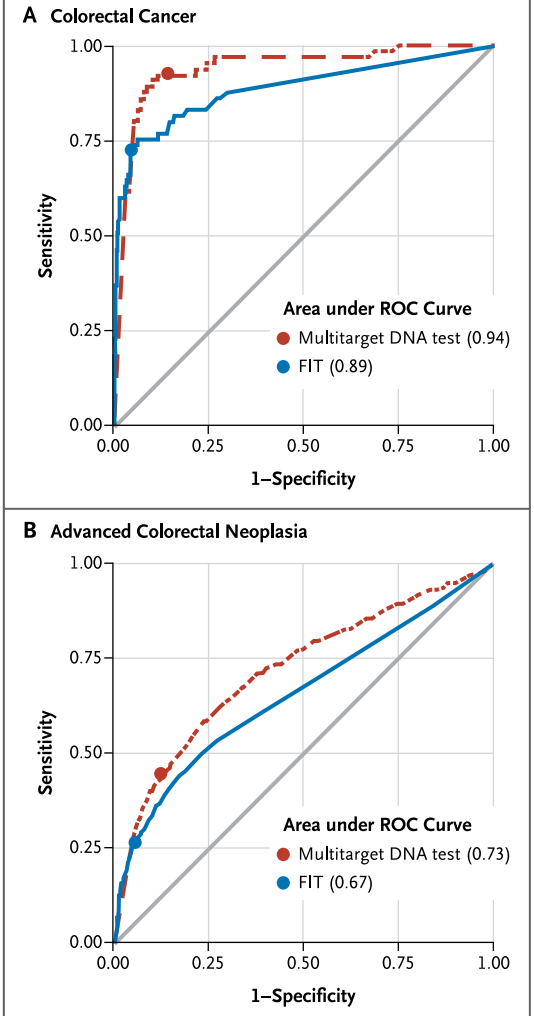


Figure 3. Receiver Operating Characteristic (ROC) Curves Comparing DNA Testing and FIT for the Detection of Colorectal Cancer and Advanced Colorectal Neoplasia.

Shown are ROC curves for the multitarget stool DNA test and FIT for the detection of colorectal cancer (Panel A) and advanced colorectal neoplasia (colorectal cancer plus advanced precancerous lesions) (Panel B). For colorectal cancer, the area under the ROC curve was 0.94 for the DNA test and 0.89 for FIT (95% confidence interval [CI] for the difference in area, 0.003 to 0.10; P=0.04). For advanced colorectal neoplasia, the area under the ROC curve was 0.73 for the DNA test and 0.67 for FIT (95% CI for the difference in area, 0.04 to 0.09; P<0.001). The respective performance thresholds were a value of 183 or more for the DNA test and more than 100 ng of hemoglobin per milliliter of buffer for FIT.

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The specificity of FIT varied minimally according to age.

As measured by the area under the ROC curve (AUC), the discrimination between colorectal cancer and the combination of nonadvanced neoplasia and lesser findings was significantly higher with DNA testing than with FIT (0.94 vs. 0.89, P=0.04) (Fig. 3A); the AUC values for discrimination between advanced colorectal neoplasia (colorectal cancer plus advanced precancerous lesions) and all other findings were 0.73 and 0.67, respectively (P<0.001) (Fig. 3B). Positive and negative predictive values are shown in Table S2 in the Supplementary Appendix.

The isolated performance of the hemoglobin immunoassay component of the multitarget DNA test was similar to that of FIT, with specificities of 94.8% and 94.9%, respectively; sensitivities were 72.3% and 73.8%, respectively, for the detection of colorectal cancer and 22.7% and 23.8%, respectively, for the detection of advanced precancerous lesions.

Table 2 shows the number of persons who would need to be screened with colonoscopy, multitarget DNA testing, and FIT in order to detect one colorectal cancer (154 with colonoscopy, 166 with multitarget DNA testing, and 208 with FIT) and to detect one advanced precancerous polyp (13, 31, and 55 persons, respectively). These calculations show that multitarget DNA testing detected clinically significant lesions more efficiently than FIT.

EXTRAPOLATION TO AN EXPANDED SCREENING POPULATION

In an extrapolation of our results to a hypothetical reference population of 10,000 participants at average risk for colorectal cancer, the various screening techniques of colonoscopy, DNA testing, and FIT would identify, respectively, 65, 60, and 48 persons with colorectal cancer; 758, 321, and 180 persons with advanced precancerous lesions; 2896, 498, and 220 persons with nonadvanced adenomas; and 6281, 732, and 248 persons with non-neoplastic findings or negative results on colonoscopy (Table 3).

The protocol specified the detection of colorectal cancer and advanced precancerous polyps as positive findings and the detection of nonadvanced adenomas as negative findings. In the hypothetical reference population of 10,000 persons, the numbers of persons who would be referred for colonoscopy on the basis of positive test results would be 1611 (16.1%) with DNA testing and 696 (7.0%) with FIT. Of the positive test results, the numbers that would be viewed as false positives would be 1230 of 1611 (76.4%) with DNA testing and 468 of 696 (67.2%) with FIT. Of 8389 negative results for DNA testing, 442 (5.3%) would be viewed as false negatives, consisting of 5 cancers and 437 advanced precancerous polyps. Of 9304 negative results for FIT, 595 (6.4%) would be viewed as false negatives, consisting of 17 cancers and 578 precancerous polyps. If nonadvanced adenomas were considered to be positive findings, then the proportions of positive tests viewed as false positives would be 732 of 1611 (45.4%) with DNA testing and 248 of 696 (35.6%) with FIT. The numbers of negative tests viewed as false negatives would be 2840 of 8389 (33.9%) with DNA testing and 3271 of 9304 (35.2%) with FIT. Most of these false negative results would be small, nonadvanced adenomas (in 2398 of 2840 participants [84.4%] with DNA testing and 2676 of 3271 participants [81.8%] with FIT), with only rare instances of colorectal cancers (5 of 2840 [0.2%] and 17 of 3271 [0.5%], respectively).

DISCUSSION

We compared a multitarget stool DNA test with a commercial FIT among patients at average risk for colorectal cancer. The sensitivity of the DNA

Table 2. Numbers of Persons Who Would Need to Be Screened with Colonoscopy, Multitarget DNA Test, and FIT to Detect One Colorectal Cancer and One Advanced Precancerous Lesion.

Finding	Number Needed to Screen (95% CI)		
	Colonoscopy	Multitarget DNA Test	FIT
Any colorectal cancer	154 (120–200)	166 (130–217)	208 (156–286)
Stage I to III colorectal cancer	166 (130–217)	178 (140–238)	227 (169–313)
Advanced precancerous lesion	13 (12–14)	31 (28–35)	55 (48–65)

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Table 3. Extrapolation of Findings to an Expanded Population of 10,000 Persons at Average Risk for Colorectal Cancer Undergoing Screening with Colonoscopy, Multitarget Stool DNA Test, and FIT.*

Colonoscopy Finding	Persons with Finding	Multitarget DNA Test		FIT	
		Positive Results (N=1611)	Negative Results (N=8389)	Positive Results (N=696)	Negative Results (N=9304)
	no.	*no. (%)*			
Colorectal cancer	65	60 (3.7)	5 (0.06)	48 (6.9)	17 (0.18)
Advanced precancerous lesions	758	321 (19.9)	437 (5.2)	180 (25.9)	578 (6.2)
Nonadvanced adenomas	2896	498 (30.9)	2398 (28.6)	220 (31.6)	2676 (28.8)
Negative results: no colorectal cancer, advanced precancerous lesions, or nonadvanced adenomas	6281	732 (45.4)	5549 (66.1)	248 (35.6)	6033 (64.8)

* Listed are data from the study that have been extrapolated to a theoretical population of 10,000 persons.

test for the detection of both colorectal cancer (92.3%) and advanced precancerous lesions (42.4%) exceeded that of FIT by an absolute difference of nearly 20 percentage points. This difference may be attributed to the DNA marker and algorithm components of the test, since the test performance of the hemoglobin immunoassay component of the DNA test was nearly identical to that of FIT. However, FIT was more specific for the detection of both colorectal cancer and advanced precancerous lesions, by absolute differences of 6.6 to 8.3 percentage points.

Sensitivity is the most important characteristic for screening tests because the primary role of such testing is to rule out diseases such as cancer. The sensitivity of the DNA test for the detection of advanced precancerous lesions was approximately half that for the detection of colorectal cancer; it exceeded the performance of the FIT overall and in important subsets of lesions, including adenomas measuring 2 cm or more (in which the prevalence of high-grade dysplasia is 5 to 44%[22-25]) and large, sessile serrated polyps (which may account for up to one third of colorectal cancers[26,27]). In our study, DNA testing was associated with a relative increase of 27% in the rate of detection of stage I to III colorectal cancers and a relative increase of 78% in the rate of detection of advanced precancerous lesions, as compared with FIT. A negative result on DNA testing reduced the chance of having colorectal cancer to a greater extent than did a negative result on FIT, from a baseline risk of approximately 1 in 154 (0.7%) to 1 in 1675 (0.06%) after DNA testing and 1 in 556 (0.18%) after FIT.

Although high sensitivity is the most important attribute of cancer-screening tests, specificity is also important, since it affects the number of persons who have positive test results, a majority of whom will have false positive results because of the low prevalence of cancer. The specificity of FIT (94.9 to 96.4%) was superior to that of the DNA test (86.6 to 89.8%), with false positive rates of 3.6 to 5.1% and 10.2 to 13.4%, respectively. Positive results on the DNA test increased the probability of having colorectal cancer from 0.7% to 3.7%, as compared with 6.9% for FIT, and increased the probability of having an advanced precancerous lesion from 7.3% to 19.9%, as compared with 25.9% for FIT.

Two points regarding the specificity of DNA testing deserve comment. First, analysis of the primary measure of specificity (86.6%) included participants with nonadvanced adenomas, which can cause the test to be positive, and those with a negative result on colonoscopy. Among persons with only a negative result on colonoscopy, the specificity of the DNA test was nearly 90%, although that was still inferior to the specificity of FIT, which exceeded 96%. Second, specificity correlated inversely with age. Among participants with any findings other than advanced neoplasia, specificity varied from 91.5% among participants between the ages of 50 and 64 years to 83.7% among those 65 years of age or older. Among persons 50 to 64 years of age with a negative result on colonoscopy, the specificity of

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the DNA test was 94%, which was similar to that of FIT. Age-related variation in specificity could be due to the presence of lesions that were missed on colonoscopy (which are more prevalent among persons older than 70 years[28]) or to age-related DNA methylation.[29,30]

The performance of FIT in our study was similar to that in previous studies in which colonoscopy was the reference standard.[31,32] For FIT in our study, we used the manufacturer's threshold of 100 ng of hemoglobin per milliliter of buffer.[20] Whether results would differ with the use of another type of FIT is not known; however, the detection rate with the FIT we used was higher than the rate with at least one other FIT.[33]

A discussion of the role of multitarget stool DNA testing in colorectal-cancer screening is beyond the scope of this report because it requires the assessment of several factors aside from sensitivity and specificity, which are the focus of this report. Other factors include performance characteristics of alternative tests, testing intervals, complications, costs, patient acceptance, and adherence.[34,35] Downstream effects of these factors on outcomes, including both cause-specific and overall morbidity and mortality, require modeling studies to compare various screening tests and strategies. Although our study provides some of the important values for modeling, it cannot determine which test or strategy is better or preferred.

Screening rates for colorectal cancer remain low despite strong evidence of the effectiveness of several tests and strategies. The U.S. Preventive Services Task Force states that there is no preferable screening test, as supported by several cost-effectiveness analyses.[5-7] Offering a choice among tests may improve uptake of screening.[32,36] A noninvasive test with a high single-application sensitivity for curable-stage cancer may provide an option for persons who prefer noninvasive testing. Questions about testing intervals and tailoring require further consideration.

In conclusion, a stool test combining altered human DNA and fecal hemoglobin showed higher single-application sensitivity than a commercial FIT for both colorectal cancer and advanced precancerous lesions, although with lower specificity.

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Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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530		$aAlso published in a Spanish translation.
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550 a| Official journal of the American Gastroenterological Association.
590 a| Hershey material includes American Gastroenterological Association Presidential Addresses 1902-1982
650 2 a| Gastroenterology.
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949 a| RC799.A634 v.64 no.4-6 1973 w| LCPER c| 1 i| 000074417094 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.65 no.1-3 1973 w| LCPER c| 1 i| 000074417100 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.65 no.4-6 1973 w| LCPER c| 1 i| 000074417117 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.66 no.1-3 1974 w| LCPER c| 1 i| 000074417124 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.66 no.4-6 1974 w| LCPER c| 1 i| 000074417131 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.67 no.1-3 1974 w| LCPER c| 1 i| 000074417148 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.67 no.4-6 1974 w| LCPER c| 1 i| 000074417155 d| 2/18/2019 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.68 no.1-3 1975 w| LCPER c| 1 i| 000074417162 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.68 no.4-6 1975 w| LCPER c| 1 i| 000074417179 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.69 no.1-3 1975 w| LCPER c| 1 i| 000074417261 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.69 no.4-6 1975 w| LCPER c| 1 i| 000074417254 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.70 no.1-3 1976 w| LCPER c| 1 i| 000074417247 d| 5/12/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.70 no.4-6 1976 w| LCPER c| 1 i| 000074417230 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.71 no.1-3 1976 w| LCPER c| 1 i| 000074417223 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.71 no.4-6 1976 w| LCPER c| 1 i| 000074417216 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.72 no.1-3 1977 w| LCPER c| 1 i| 000074417209 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.72 no.4-6 1977 w| LCPER c| 1 i| 000074417193 d| 8/1/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.73 no.1-3 1977 w| LCPER c| 1 i| 000074417186 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.73 no.4-6 1977 w| LCPER c| 1 i| 000074417278 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.74 no.4-6 1978 w| LCPER c| 1 i| 000074417285 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.75 no.1-3 1978 w| LCPER c| 1 i| 000074417292 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.75 no.4-6 1978 w| LCPER c| 1 i| 000074417308 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.76 no.1-3 1979 w| LCPER c| 1 i| 000074417315 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.76 no.4-6 1979 w| LCPER c| 1 i| 000074417322 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.77 no.1-3 1979 w| LCPER c| 1 i| 000074417339 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.77 no.4-6 1979 w| LCPER c| 1 i| 000074417346 d| 2/26/2024 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.78 no.1-3 1980 w| LCPER c| 1 i| 000074417353 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.78 no.4-6 1980 w| LCPER c| 1 i| 000074417445 d| 11/6/2017 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.79 no.1-3 1980 w| LCPER c| 1 i| 000074417438 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.79 no.4-6 1980 w| LCPER c| 1 i| 000074417421 d| 3/26/2014 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.80 no.1-3 1981 w| LCPER c| 1 i| 000074417414 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.80 no.4-5 1981 w| LCPER c| 1 i| 000074417407 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.80 no.6 1981 w| LCPER c| 1 i| 000074417391 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.81 no.1-2 1981 w| LCPER c| 1 i| 000074417384 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.81 no.3-4 1981 w| LCPER c| 1 i| 000074417377 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.81 no.5-6 1981 w| LCPER c| 1 i| 000074417360 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.82 no.1-2 1982 w| LCPER c| 1 i| 000074417537 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.82 no.3-4 1982 w| LCPER c| 1 i| 000074417520 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.82 no.5-6 1982 w| LCPER c| 1 i| 000074417513 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.83 no.1-2 1982 w| LCPER c| 1 i| 000074417506 d| 4/17/2014 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.83 no.3-4 1982 w| LCPER c| 1 i| 000074417490 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.83 no.5-6 1982 w| LCPER c| 1 i| 000074417483 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.84 no.1-2 1983 w| LCPER c| 1 i| 000074417476 d| 4/28/2017 l| PATERNO-4 m| UP-PAT q| 3 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.84 no.3-4 1983 w| LCPER c| 1 i| 000074417469 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.84 no.5-6 1983 w| LCPER c| 1 i| 000074417452 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.85 no.1-2 1983 w| LCPER c| 1 i| 000074417544 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.85 no.3-4 1983 w| LCPER c| 1 i| 000074417551 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.85 no.5-6 1983 w| LCPER c| 1 i| 000074417568 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.76-85 1979-83 index w| LCPER c| 1 i| 000074417575 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.86 no.1-2 1984 w| LCPER c| 1 i| 000074417582 d| 5/8/2023 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013

949 a| RC799.A634 v.86 no.3-4 1984 w| LCPER c| 1 i| 000074417599 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.86 no.5 1984 w| LCPER c| 1 i| 000074417605 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.86 no.6 1984 w| LCPER c| 1 i| 000074417612 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.87 no.1-2 1984 w| LCPER c| 1 i| 000074417629 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.87 no.3-4 1984 w| LCPER c| 1 i| 000074417711 d| 8/16/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.87 no.5-6 1984 w| LCPER c| 1 i| 000074417704 d| 11/14/2013 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.88 no.1-2 1985 w| LCPER c| 1 i| 000074417698 d| 3/16/2023 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.88 no.5 1985 w| LCPER c| 1 i| 000074417674 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.88 no.6 1985 w| LCPER c| 1 i| 000074417667 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.89 no.1-2 1985 w| LCPER c| 1 i| 000074417650 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.89 no.3 1985 w| LCPER c| 1 i| 000074417643 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.89 no.4-6 1985 w| LCPER c| 1 i| 000074417636 d| 9/24/2021 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.1-2 1986 w| LCPER c| 1 i| 000074417728 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.3-4 1986 w| LCPER c| 1 i| 000074417735 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.5 1986 w| LCPER c| 1 i| 000074417742 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.90 no.6 1986 w| LCPER c| 1 i| 000074417759 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.91 no.1-2 1986 w| LCPER c| 1 i| 000074417766 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.92 no.1-3 1987 w| LCPER c| 1 i| 000074417773 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.92 no.4-6 1987 w| LCPER c| 1 i| 000074417780 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.93 no.1-3 1987 w| LCPER c| 1 i| 000074417797 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.93 no.4-6 1987 w| LCPER c| 1 i| 000074417803 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.1-2 1988 w| LCPER c| 1 i| 000074417896 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.3-4 1988 w| LCPER c| 1 i| 000074417889 d| 10/12/2023 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.5 1988 w| LCPER c| 1 i| 000074417872 d| 9/28/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.94 no.6 1988 w| LCPER c| 1 i| 000074417865 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.95 no.1-2 1988 w| LCPER c| 1 i| 000074417858 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.95 no.3-4 1988 w| LCPER c| 1 i| 000074417841 d| 7/19/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.95 no.5-6 1988 w| LCPER c| 1 i| 000074417834 d| 3/22/2017 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.86-95 1984-88 index w| LCPER c| 1 i| 000074417827 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.1-2 1989 w| LCPER c| 1 i| 000074417810 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.3-4 1989 w| LCPER c| 1 i| 000074417988 d| 1/3/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.5 1989 w| LCPER c| 1 i| 000074417971 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.96 no.6 1989 w| LCPER c| 1 i| 000074417964 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.97 no.1-2 1989 w| LCPER c| 1 i| 000074417957 d| 5/23/2017 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.97 no.3-4 1989 w| LCPER c| 1 i| 000074417940 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.97 no.5-6 1989 w| LCPER c| 1 i| 000074417933 d| 5/3/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.1-2 1990 w| LCPER c| 1 i| 000074417926 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.3-4 1990 w| LCPER c| 1 i| 000074417919 d| 11/2/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.5 pt.1 1990 w| LCPER c| 1 i| 000074417902 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/6/2013
949 a| RC799.A634 v.98 no.5 pt.2 1990 w| LCPER c| 1 i| 000074417995 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.98 no.6 1990 w| LCPER c| 1 i| 000074418008 d| 6/30/2021 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.1 1990 w| LCPER c| 1 i| 000074418015 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.3 1990 w| LCPER c| 1 i| 000074418039 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.4 1990 w| LCPER c| 1 i| 000074418046 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.2 1990 w| LCPER c| 1 i| 000074418022 d| 11/11/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.5 1990 w| LCPER c| 1 i| 000074418053 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.99 no.6 1990 w| LCPER c| 1 i| 000074418060 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.1 1991 w| LCPER c| 1 i| 000074418077 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.2 1991 w| LCPER c| 1 i| 000074418169 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.3 1991 w| LCPER c| 1 i| 000074418152 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.4 1991 w| LCPER c| 1 i| 000074418145 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.5 pt.1 1991 w| LCPER c| 1 i| 000074418138 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.100 no.5 pt.2 1991 w| LCPER c| 1 i| 000074418121 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013

949 a| RC799.A634 v.100 no.6 1991 w| LCPER c| 1 i| 000074418114 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.1 1991 w| LCPER c| 1 i| 000074418107 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.2 1991 w| LCPER c| 1 i| 000074418091 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.3 1991 w| LCPER c| 1 i| 000074418084 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.4 1991 w| LCPER c| 1 i| 000074418176 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.5 1991 w| LCPER c| 1 i| 000074418183 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.101 no.6 1991 w| LCPER c| 1 i| 000074418190 d| 11/26/2019 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.1 1992 w| LCPER c| 1 i| 000074418206 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.2 1992 w| LCPER c| 1 i| 000074418213 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.3 1992 w| LCPER c| 1 i| 000074418220 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.4 1992 w| LCPER c| 1 i| 000074418237 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.5 1992 w| LCPER c| 1 i| 000074418244 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.102 no.6 1992 w| LCPER c| 1 i| 000074418251 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.1 1992 w| LCPER c| 1 i| 000074418343 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.2 1992 w| LCPER c| 1 i| 000074418336 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.3 1992 w| LCPER c| 1 i| 000074418329 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.4 1992 w| LCPER c| 1 i| 000074418312 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.5 1992 w| LCPER c| 1 i| 000074418305 d| 11/15/2019 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.103 no.6 1992 w| LCPER c| 1 i| 000074418299 d| 5/24/2024 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.1 1993 w| LCPER c| 1 i| 000074418282 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.2 1993 w| LCPER c| 1 i| 000074418275 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.3-4 1993 w| LCPER c| 1 i| 000074418268 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.4 1993 suppl. w| LCPER c| 1 i| 000074418435 d| 11/30/2017 l| PATERNO-4 m| UP-PAT q| 3 r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.5 1993 w| LCPER c| 1 i| 000074418428 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.104 no.6 1993 w| LCPER c| 1 i| 000074418411 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.1 1993 w| LCPER c| 1 i| 000074418404 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.2 1993 w| LCPER c| 1 i| 000074418398 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.4 1993 w| LCPER c| 1 i| 000074418381 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.5 1993 w| LCPER c| 1 i| 000074418374 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.105 no.6 1993 w| LCPER c| 1 i| 000074418367 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/7/2013
949 a| RC799.A634 v.106 no.1-2 1994 w| LCPER c| 1 i| 000074418350 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.3 1994 w| LCPER c| 1 i| 000074418442 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.5 1994 w| LCPER c| 1 i| 000074418466 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.4 1994 w| LCPER c| 1 i| 000074418459 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.6 1994 w| LCPER c| 1 i| 000074418473 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.106 no.4 1994 suppl. w| LCPER c| 1 i| 000074418480 d| 1/4/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.1 1994 w| LCPER c| 1 i| 000074418497 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.2 1994 w| LCPER c| 1 i| 000074418503 d| 10/8/2021 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.3-4 1994 w| LCPER c| 1 i| 000074418510 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.5 1994 w| LCPER c| 1 i| 000074418527 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.107 no.6 1994 w| LCPER c| 1 i| 000074418619 d| 2/17/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.1-2 1995 w| LCPER c| 1 i| 000074418602 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.3 1995 w| LCPER c| 1 i| 000074418596 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.4 1995 w| LCPER c| 1 i| 000074418589 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.5 1995 w| LCPER c| 1 i| 000074418572 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.6 1995 w| LCPER c| 1 i| 000074418565 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.108 no.4 1995 suppl. w| LCPER c| 1 i| 000074418558 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.1-2 1995 w| LCPER c| 1 i| 000074418541 d| 10/15/2014 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.3 1995 w| LCPER c| 1 i| 000074418534 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.4 1995 w| LCPER c| 1 i| 000074418626 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.5 1995 w| LCPER c| 1 i| 000074418633 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.109 no.6 1995 w| LCPER c| 1 i| 000074418640 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.1 1996 w| LCPER c| 1 i| 000074418657 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.2 1996 w| LCPER c| 1 i| 000074418664 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.3-4 1996 w| LCPER c| 1 i| 000074418671 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.5 1996 w| LCPER c| 1 i| 000074418688 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.6 1996 w| LCPER c| 1 i| 000074418695 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.110 no.4 1996 suppl. w| LCPER c| 1 i| 000074418701 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013

949 a| RC799.A634 v.111 no.1-2 1996 w| LCPER c| 1 i| 000074418794 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.3 1996 w| LCPER c| 1 i| 000074418787 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.4 1996 w| LCPER c| 1 i| 000074418770 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.5 1996 w| LCPER c| 1 i| 000074418763 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.111 no.6 1996 w| LCPER c| 1 i| 000074418756 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.1 1997 w| LCPER c| 1 i| 000074418749 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.2 1997 w| LCPER c| 1 i| 000074418732 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.3 1997 w| LCPER c| 1 i| 000074418725 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.4 1997 w| LCPER c| 1 i| 000074418718 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.5-6 1997 w| LCPER c| 1 i| 000074418886 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.112 no.4 1997 suppl. w| LCPER c| 1 i| 000074418879 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.1 1997 w| LCPER c| 1 i| 000074418862 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.2 1997 w| LCPER c| 1 i| 000074418855 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.3 1997 w| LCPER c| 1 i| 000074418848 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.4 1997 w| LCPER c| 1 i| 000074418831 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.5 1997 w| LCPER c| 1 i| 000074418824 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.113 no.6 1997 & suppl. w| LCPER c| 1 i| 000074418817 d| 1/30/2018 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.1-2 1998 w| LCPER c| 1 i| 000074418800 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.3-4 pt.1 1998 w| LCPER c| 1 i| 000074418893 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.4 pt.2 1998 w| LCPER c| 1 i| 000074418909 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.114 no.5-6 1998 w| LCPER c| 1 i| 000074418916 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.1-2 1998 w| LCPER c| 1 i| 000074418923 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.3 1998 w| LCPER c| 1 i| 000074418930 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.4 1998 w| LCPER c| 1 i| 000074418947 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.5 1998 w| LCPER c| 1 i| 000074418954 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.115 no.6 1998 w| LCPER c| 1 i| 000074418961 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.1 1999 w| LCPER c| 1 i| 000074418978 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.2 1999 w| LCPER c| 1 i| 000074419067 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.3 1999 w| LCPER c| 1 i| 000074419050 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.4 pt.1 1999 w| LCPER c| 1 i| 000074419043 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.4 pt.2 1999 w| LCPER c| 1 i| 000074419036 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.5 1999 w| LCPER c| 1 i| 000074419029 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.116 no.6 1999 w| LCPER c| 1 i| 000074419012 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.1 1999 w| LCPER c| 1 i| 000074419005 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.2-3 1999 w| LCPER c| 1 i| 000074418992 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.4 1999 w| LCPER c| 1 i| 000074418985 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.5 1999 w| LCPER c| 1 i| 000074419074 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.117 no.6 1999 w| LCPER c| 1 i| 000074419081 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.1 2000 w| LCPER c| 1 i| 000074419098 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.2 2000 & suppl. w| LCPER c| 1 i| 000074419104 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.3 2000 w| LCPER c| 1 i| 000074419111 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.4 2000 w| LCPER c| 1 i| 000074419128 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.4 2000 suppls. w| LCPER c| 1 i| 000074419135 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.5 2000 w| LCPER c| 1 i| 000074419142 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.118 no.6 2000 w| LCPER c| 1 i| 000074419159 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.1 2000 w| LCPER c| 1 i| 000074419241 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.2 2000 w| LCPER c| 1 i| 000074419234 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.3 2000 w| LCPER c| 1 i| 000074419227 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.119 no.6 2000 w| LCPER c| 1 i| 000047190634 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/8/2013
949 a| RC799.A634 v.88 no.3-4 1985 w| LCPER c| 1 i| 000074417681 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/27/2013
949 a| Periodical 1952 21 w| ASIS c| 1 i| 32239001031059 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1952 22 w| ASIS c| 1 i| 32239001031067 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1953 23 w| ASIS c| 1 i| 32239001031075 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1953 24 w| ASIS c| 1 i| 32239001031083 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1953 25 w| ASIS c| 1 i| 32239001031091 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1954 26 w| ASIS c| 1 i| 32239001031109 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1954 27 w| ASIS c| 1 i| 32239001031117 d| 4/16/2007 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1955 28 w| ASIS c| 1 i| 32239001031125 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1955 29, Index w| ASIS c| 1 i| 32239001031133 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1956 30 w| ASIS c| 1 i| 32239001031141 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949 a| Periodical 1956 31 w| ASIS c| 1 i| 32239001031158 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1963 44 w| ASIS c| 1 i| 32239001031273 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1963 45 w| ASIS c| 1 i| 32239001031281 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1964 46 w| ASIS c| 1 i| 32239001031299 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1964 47 w| ASIS c| 1 i| 32239001031307 d| 4/28/2005 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1965 48 w| ASIS c| 1 i| 32239001031315 d| 8/28/2006 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1965 49 w| ASIS c| 1 i| 32239001031323 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1966 50 w| ASIS c| 1 i| 32239001031331 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1966 51 w| ASIS c| 1 i| 32239001031349 d| 8/7/2015 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1967 52 w| ASIS c| 1 i| 32239001031356 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1967 53 w| ASIS c| 1 i| 32239001031364 d| 7/22/2002 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1968 54 w| ASIS c| 1 i| 32239001031372 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1968 55 w| ASIS c| 1 i| 32239001031380 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1969 56 w| ASIS c| 1 i| 32239001031398 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1969 57 w| ASIS c| 1 i| 32239001031406 d| 2/15/2007 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1970 58 w| ASIS c| 1 i| 32239001031414 d| 4/28/2005 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1970 59 w| ASIS c| 1 i| 32239001031422 d| 5/4/2008 e| 1/27/2003 l| CATO-2 m| UP-ANNEX n| 1 q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1971 60 w| ASIS c| 1 i| 32239001031430 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1971 61 w| ASIS c| 1 i| 32239001031448 d| 2/6/2024 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1972 62 w| ASIS c| 1 i| 32239001031455 d| 2/22/2008 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1972 63 w| ASIS c| 1 i| 32239001031463 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1973 64 w| ASIS c| 1 i| 32239001031471 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1973 65 w| ASIS c| 1 i| 32239001031489 d| 8/17/2005 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1974 66 w| ASIS c| 1 i| 32239001031497 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1974 67 w| ASIS c| 1 i| 32239001031505 d| 4/11/2007 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1975 68 w| ASIS c| 1 i| 32239001031513 d| 10/6/2008 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1975 69 w| ASIS c| 1 i| 32239001031521 d| 2/15/2007 l| CATO-2 m| UP-ANNEX q| 3 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1976 70 w| ASIS c| 1 i| 32239000933875 d| 10/10/2008 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1976 71 w| ASIS c| 1 i| 32239001031539 d| 8/18/2006 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1977 72 w| ASIS c| 1 i| 32239001031547 d| 12/8/2004 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1977 73 w| ASIS c| 1 i| 32239001031554 d| 8/17/2005 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1978 74 w| ASIS c| 1 i| 32239001031562 d| 4/15/2024 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1978 75 w| ASIS c| 1 i| 32239001031570 d| 9/14/2008 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1979 76 w| ASIS c| 1 i| 32239000477949 d| 12/1/2008 e| 11/25/2008 l| CATO-2 m| UP-ANNEX n| 1 q| 3 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1979 77 w| ASIS c| 1 i| 32239000372959 d| 10/10/2008 e| 8/21/2005 l| CATO-2 m| UP-ANNEX n| 1 q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1980 78 AP-JN, Index w| ASIS c| 1 i| 32239001031596 d| 9/20/2004 l| CATO-2 m| UP-ANNEX q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1980 78 JA-MR w| ASIS c| 1 i| 32239001031588 d| 10/19/2008 l| CATO-2 m| UP-ANNEX q| 6 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1980 79 w| ASIS c| 1 i| 32239001031604 d| 8/25/2007 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1981 80 w| ASIS c| 1 i| 32239000948691 d| 9/15/2008 e| 8/29/2006 l| CATO-2 m| UP-ANNEX n| 1 q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1981 81 w| ASIS c| 1 i| 32239001031612 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1982 82 w| ASIS c| 1 i| 32239001031620 d| 8/16/2004 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949 a| Periodical 1982 83 w| ASIS c| 1 i| 32239001031638 d| 5/14/2009 e| 4/2/2009 l| CATO-2 m| UP-ANNEX n| 3 q| 8 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083

949			a| Periodical 1983 84 JA-MR w| ASIS c| 1 i| 32239001031646 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1983 84 AP-JN, Index w| ASIS c| 1 i| 32239001031653 d| 7/16/2009 l| CATO-2 m| UP-ANNEX q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1983 85 w| ASIS c| 1 i| 32239000412268 d| 9/28/2006 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1984 86 w| ASIS c| 1 i| 32239001031661 d| 4/18/2007 l| CATO-2 m| UP-ANNEX q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1984 87 JL-SE w| ASIS c| 1 i| 32239001031679 d| 9/9/2010 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1984 87 OC-DE w| ASIS c| 1 i| 32239000897724 d| 5/8/2011 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1985 88 JA-MR w| ASIS c| 1 i| 32239001031695 d| 8/9/2006 e| 6/7/2004 l| CATO-2 m| UP-ANNEX n| 1 q| 5 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1985 88 AP-JN, Index w| ASIS c| 1 i| 32239001031703 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical 1985 89 JL-DE w| ASIS c| 1 i| 32239001031711 d| 8/2/2004 e| 7/30/2004 l| CATO-2 m| UP-ANNEX n| 1 q| 2 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7083
949			a| Periodical AGA Presidential Addresses w| ASIS c| 1 i| 000067508518 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 7/16/2015 z| 7083
949			a| Periodical 1957 32 w| ASIS c| 1 i| 32239001031166 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1957 33 w| ASIS c| 1 i| 32239001031174 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1958 34 w| ASIS c| 1 i| 32239001031182 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1958 35 w| ASIS c| 1 i| 32239001031190 d| 4/22/2016 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1959 36 w| ASIS c| 1 i| 32239001031208 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1959 37 w| ASIS c| 1 i| 32239000555710 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1960 38 w| ASIS c| 1 i| 32239001031216 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1960 39 w| ASIS c| 1 i| 32239001031224 d| 3/1/2009 l| CATO-2 m| UP-ANNEX q| 4 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1961 40 w| ASIS c| 1 i| 32239001031232 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1961 41 w| ASIS c| 1 i| 32239001031240 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1962 42 w| ASIS c| 1 i| 32239001031257 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1962 43 w| ASIS c| 1 i| 32239001031265 d| 1/12/2004 e| 1/10/2004 l| CATO-2 m| UP-ANNEX n| 1 q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7086
949			a| Periodical 1943 1 w| ASIS c| 1 i| 32239001030861 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1944 2 w| ASIS c| 1 i| 32239001030879 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1944 3 w| ASIS c| 1 i| 32239001030887 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1945 4 w| ASIS c| 1 i| 32239001030895 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1945 5 w| ASIS c| 1 i| 32239001030903 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1946 7 w| ASIS c| 1 i| 32239001030929 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1947 8 w| ASIS c| 1 i| 32239001030937 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1947 9 w| ASIS c| 1 i| 32239001030945 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1948 10 w| ASIS c| 1 i| 32239001030952 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1948 11 w| ASIS c| 1 i| 32239001030960 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
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949			a| Periodical 1949 13 w| ASIS c| 1 i| 32239001030986 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1950 14 w| ASIS c| 1 i| 32239001030994 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1950 15 w| ASIS c| 1 i| 32239001031000 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1950 16 w| ASIS c| 1 i| 32239001031018 d| 3/2/2011 l| CATO-2 m| UP-ANNEX q| 1 r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1951 17 w| ASIS c| 1 i| 32239000948816 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1951 18 w| ASIS c| 1 i| 32239001031026 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1951 19 w| ASIS c| 1 i| 32239001031034 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1952 20 w| ASIS c| 1 i| 32239001031042 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/13/2001 z| 7099
949			a| Periodical 1946 6 w| ASIS c| 1 i| 32239001030911 l| CATO-2 m| UP-ANNEX r| Y s| Y t| BNDSER-HY u| 12/4/2015 z| 7099
852	8	1	a| PSt b| UP-ANNEX c| CATO-2 h| Periodical
866		0 8| 0 a| v.1(1943)-v.89(1985)	
852	8	1	a| PSt b| UP-PAT c| PATERNO-4 h| RC799 i| .A634
866		0 8| 0.1 a| v.56(1969), v.58(1970)-v.61(1971), v.64(1973)-v.73(1977), v.74:no.4(1978)-v.133(2007)	

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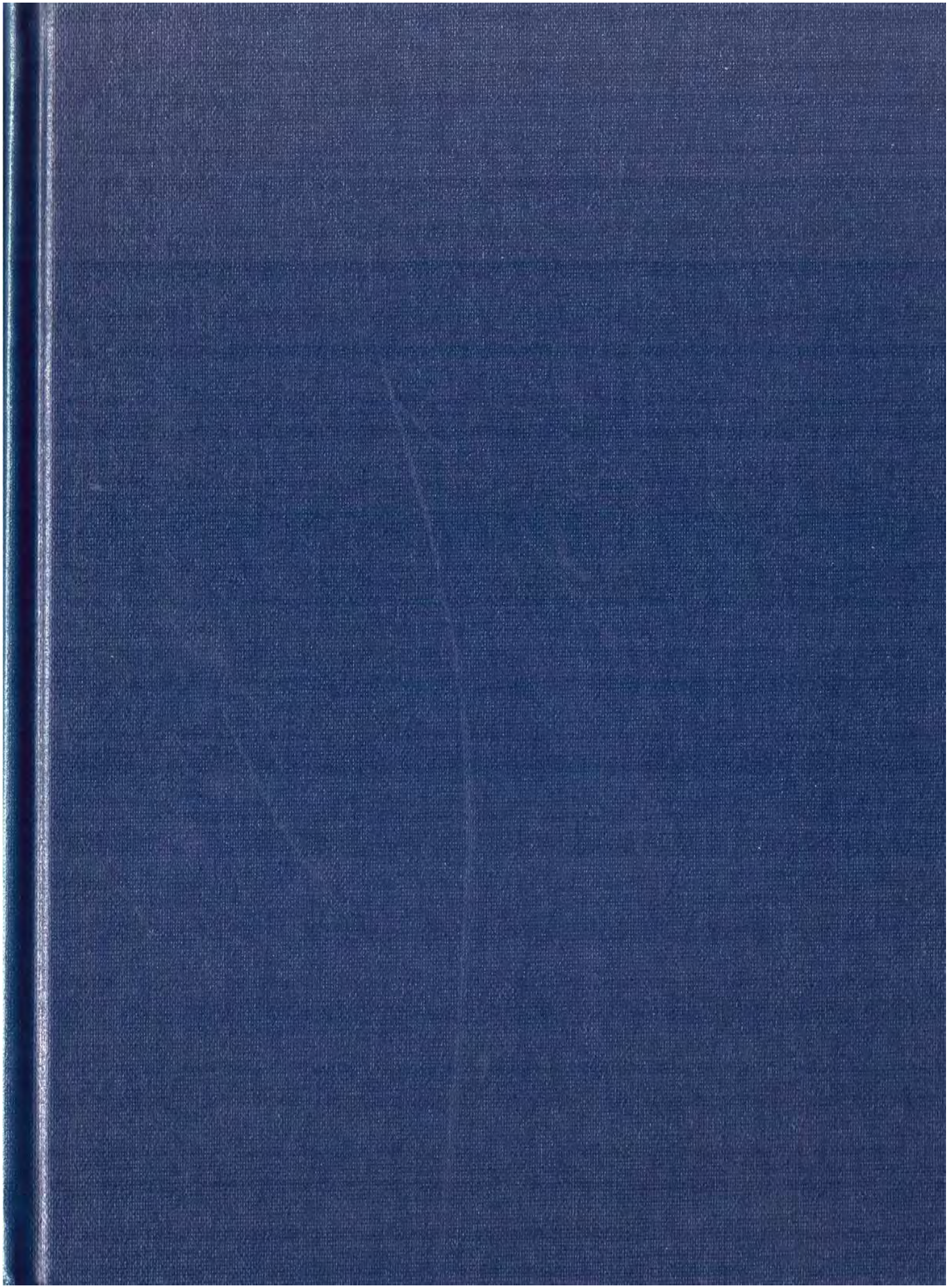
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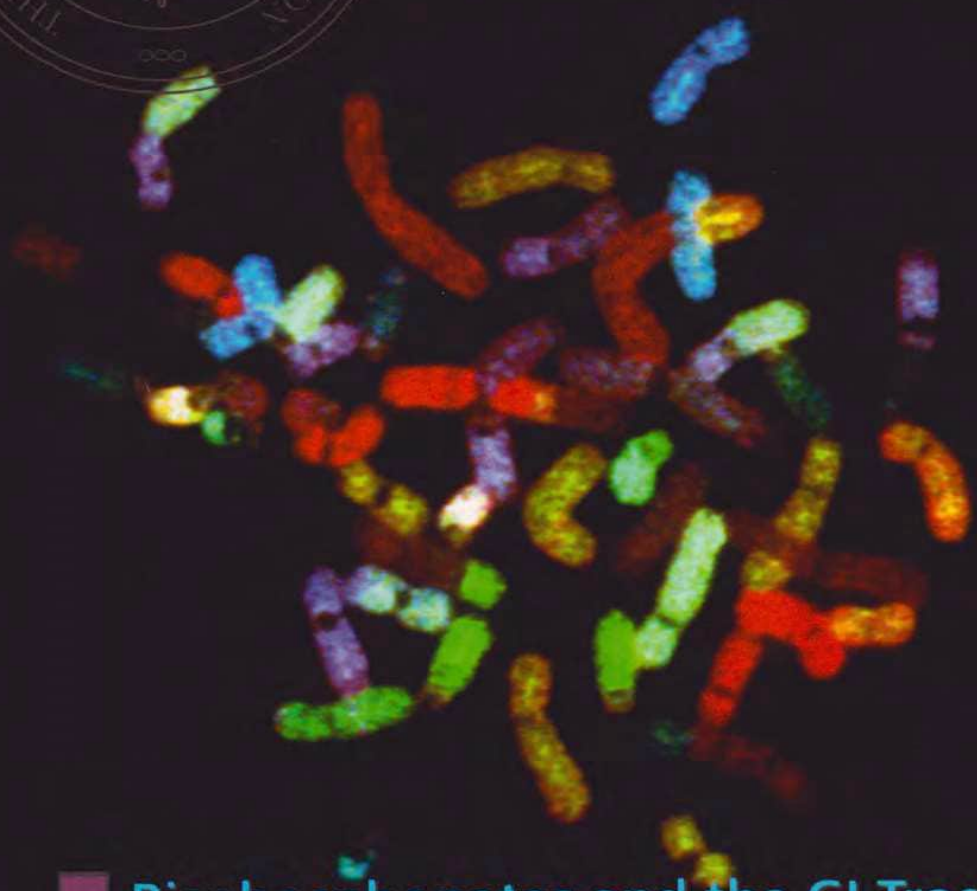
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Spectral karyotype by FISH (flourescent in situ hybridization) analysis demonstrating multiple chromosome abnormalities in a human colon cancer cell. See Burt on page 837 and Chung on page 854. (Picture Courtesy of Dr. Thomas Ried, National Human Genome Research Institute.)

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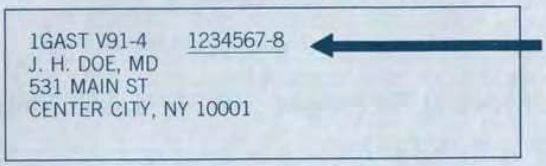
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The Genetic Basis of Colorectal Cancer: Insights Into Critical Pathways of Tumorigenesis

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The impact that modern molecular biology has had on elucidating the genetic basis of neoplasia is best illustrated by the paradigm of colon cancer. Several unique features of colon cancer biology have served to accelerate the discovery process. The development of a readily evident precursor lesion, the adenomatous polyp, has made it possible to construct a model of the sequential genetic events in cancer initiation and progression. Insights into the molecular basis of the relatively rare inherited syndromes familial adenomatous polyposis (FAP) and hereditary nonpolyposis colorectal cancer (HNPCC) have had profound implications for tumorigenesis in the more widespread sporadic forms of colon cancer.

Information on the genetics of neoplasia has increased at an exponential rate; the goal of this review is to focus on the pathways that seem to be uniquely relevant to colorectal cancer pathogenesis. It is clear that multiple events involving tumor-suppressor genes, oncogenes, and DNA mismatch repair genes contribute to the development of colorectal cancer, and the order in which these mutations occur is critical. Table 1 outlines some of the key genetic alterations that have been identified.

In 1990, a stepwise model of colorectal tumorigenesis was developed in which (1) mutations in the adenomatous polyposis coli tumor-suppressor gene (*APC*) were proposed to occur early during the development of polyps, (2) oncogenic *KRAS* mutations arose during the adenomatous stage, and (3) mutations of *TP53* and deletions on chromosome 18q coincided with the transition to malignancy.[1] This model has been generally validated. Subsequent work has identified additional genetic events as well as the specific molecular pathways perturbed by each of these mutations. These pathways regulate important cellular processes in neoplastic cells including proliferation and apoptosis. Ras and p53 pathways underlie tumorigenesis in a broad array of tumor types, and have been extensively reviewed.[2–5] This article will focus on three critical mechanistic pathways that characteristically affect colonic epithelia: the APC/β-catenin, DNA mismatch repair, and transforming growth factor (TGF)-β/SMAD pathways.

The final section will address the role of epigenetics in tumor development. While clonal gene mutations that provide a selective growth advantage are considered the sine qua non of molecular tumor pathogenesis, the importance of epigenetic mechanisms that regulate gene expression is becoming increasingly clear. Defects in DNA methylation may play an especially critical role in colon cancer pathogenesis.

The APC/β-Catenin Pathway

The clinical and hereditary features of the FAP syndrome implied the existence of a single gene that regulates the formation of adenomatous polyps, the precursor for most colorectal cancers. The identification of an interstitial deletion on chromosome 5q in a patient with the Gardner's variant of FAP combined with classical linkage analysis facilitated the positional cloning of the *APC* gene in 1991.[6,7] The 15-exon gene encodes a multifunctional 2843–amino acid protein of 310 kilodaltons that, when mutated in the germline, results in either FAP or Gardner's syndrome.

Subsequent studies have suggested that the *APC* tumor-suppressor gene also plays a critical early role in sporadic colon cancer, and *APC* is mutated in more than 70% of all colorectal cancers. This high mutational rate is unique to colorectal cancer. Although germline inactivating mutations of *APC* are distributed throughout the entire gene, somatic mutations are somewhat clustered at the 5′ end of exon 15 between amino acid residues 1280–1500.[8] This overlaps with the 15–amino acid repeat domains between residues 1020 and 1169 and 20–amino acid repeat domains between residues 1324 and 2075 that have been implicated in β-catenin

Abbreviations used in this paper: APC, adenomatous polyposis coli; COX, cyclooxygenase; DNMT, DNA methyltransferase; FAP, familial adenomatous polyposis; GSK, glycogen synthase kinase; HNPCC, hereditary nonpolyposis colorectal cancer; LOH, loss of heterozygosity; MSI, microsatellite instability; PPAR, peroxisome proliferator–activated receptor; TCF, T-cell factor; TGF, transforming growth factor.

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Table 1. Overall Prevalence of Genetic Mutations in Colorectal Cancer

Gene	Chromosomal location	Prevalence of mutations	Comment
Oncogenes			
KRAS2	12p	~50%	Consensus activating point mutations at codons 12 and 13
CTNNB1	3p22	~4%–15%	Identified in 50% of tumors without APC mutations; most mutations in exon 3 at GSK-3β phosphorylation sites
SRC	20q11	2%	Identified only in metastatic tumors
Tumor-suppressor genes			
APC	5q21	~70%	Most mutations are truncating and occur early at adenoma stage
TP53	17p13	~50%–70%	Rarely identified in benign adenomas; mutant p53 protein detectable immunohistochemically
SMAD4	18q21	16%	>70% of colorectal tumors show allelic loss on 18q; many potential tumor-suppressor gene targets including *SMAD4*, *SMAD2*, and *DCC*
SMAD2	18q21	6%	
DCC	18q21	3%	
DNA mismatch repair genes			
hMSH2	2p21		>90% of identified germline mutations are in *hMSH2* or *hMLH1*; limited mutational data in sporadic tumors, but maximum of 26% with MSI have somatic *hMSH2* mutations
hMLH1	3p21		
hPMS1	2q31–33	~15%[a]	
hPMS2	7p22		
hMSH6	2p21		

[a]Overall, 15% of tumors display MSI.

interactions,[9,10] as well as the SAMP (Ser-Ala-Met-Pro) domains located between the 20–amino acid repeats that interact with axin.[11] Consistent with the model of tumor-suppressor gene inactivation first proposed by Knudsen, mutations in 1 copy of *APC* are typically coupled with chromosomal deletions of the second wild-type allele. However, biallelic inactivation may occur through alternative routes. In some tumors from FAP patients with a germline *APC* mutation, deletions of the wild-type *APC* allele are not observed. Rather, there are deletions of the inherited mutant allele, and these are accompanied by new somatic mutations in the remaining allele.[8,12]

Regardless of the mechanism through which they are acquired, more than 90% of *APC* mutations result in a premature stop codon and thus a truncated gene product.[8,13] This observation serves as the basis for the most commonly used clinical assay for *APC* gene testing, the in vitro synthesized protein truncation test (Figure 1).[14] As predicted by the stepwise model of colonic tumorigenesis cited above, alterations in *APC* are characteristically present in benign polyps and the prevalence does not increase with advancing tumor stage.[13,15]

Several fascinating correlations between genotype and phenotype have been found in families with germline *APC* mutations. Mutations between codons 463 and 1387 are associated with congenital hypertrophy of the retinal pigmented epithelium.[16] An increased risk of desmoid tumor formation is observed in families with germline mutations between codons 1445 and 1578.[17] In addition, mutations at the 5′ end of the gene proximal to codon 157[18] or at the 3′ end distal to codon 1900[19] are associated with a more attenuated form of the disease (attenuated APC), in which fewer polyps develop than found in classic FAP and the onset of cancer is delayed until the sixth decade of life. However, these correlations are not uniform, and families with identical mutations may display variable phenotypes.[7]

Specific polymorphisms of *APC* are also associated with an increased risk of colorectal cancer. Individuals with the I1307K polymorphism (a transition from T to A at nucleotide 3920 of APC) have a 2-fold increase in the risk of colon cancer compared with the general population.[20] Tumors develop when new inactivating mutations in *APC* arise on the same allele carrying the I1307K polymorphism; curiously, most such mutations are situated within 36 nucleotides of the 8–base pair polyA tract that results from this polymorphism. The mechanisms underlying this unusual susceptibility to somatic mutations associated with certain *APC* alleles remain to be defined.

The APC gene product is a large protein with multiple functional domains that mediate both oligomerization and binding to many intracellular proteins including β-catenin, γ-catenin, glycogen synthase kinase (GSK)-3β, axin, tubulin, EB1, and hDLG.[21] The greatest progress in understanding the function of APC has been made in studying its interaction with GSK-3β and β-catenin, each an essential component of the Wingless/Wnt signaling pathway, which was first characterized in *Drosophila* and mice. As outlined in Figure 2, GSK-3β complexes with and phosphorylates APC, β-catenin, and

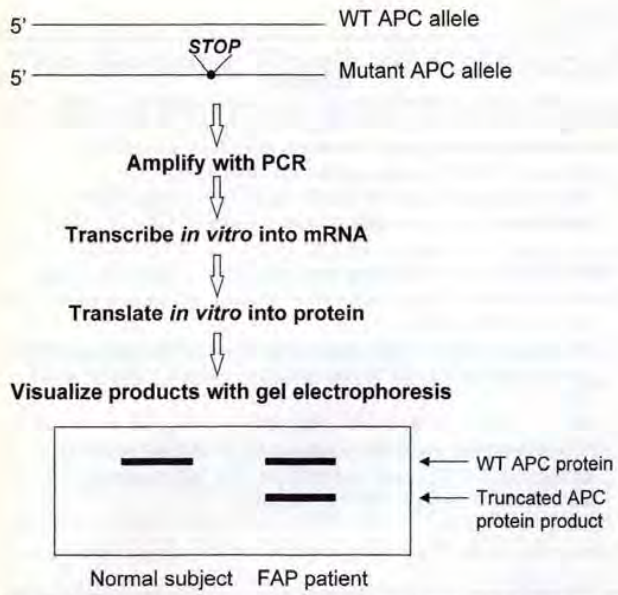


Figure 1. The APC protein truncation assay. Genomic DNA or complementary DNA is harvested from peripheral blood leukocytes, and fragments of the *APC* gene are amplified with polymerase chain reaction. Each fragment is then transcribed and translated in vitro, and the synthesized protein products are visualized with gel electrophoresis. A truncated protein product is detected in addition to the normal full-length product in patients who carry an *APC* mutation in 1 allele. This assay will detect germline mutations in 80% of patients with classic FAP. WT, wild-type.

axin. Phosphorylation targets β-catenin for degradation via a ubiquitin-mediated proteasomal pathway.[22] Truncation of APC results in the disruption of complex formation and ultimately increased cytoplasmic levels of β-catenin. Free β-catenin is translocated to the nucleus, where it interacts with T-cell factor (TCF)/lymphoid enhancer factor high-mobility group transcription factors. TCF-4 is the predominant member of this family of transcription factors in colonic epithelial cells, and activation of this pathway up-regulates the oncogenes c-Myc and cyclin D1, as well as matrilysin, c-jun, fra-1, and urokinase-type plasminogen activator receptor through binding to TCF-response elements.[23–26] Another recently identified target is the peroxisome proliferator–activated receptor (PPAR) δ gene, which is also regulated by nonsteroidal anti-inflammatory drugs (NSAIDs).[27] It is likely that additional important gene targets of TCF still remain to be identified.

Collectively, these findings suggest that β-catenin is a "driver" that up-regulates TCF-responsive genes critical for proliferation and transformation of colonic epithelial cells. In this context, it is noteworthy that gain-of-function mutations in the β-catenin gene (*CTNNB1*) have been identified in as many as 50% of colon tumors with intact *APC*.[28] Overall, 4%–15% of all sporadic colorectal adenomas and carcinomas harbor *CTNNB1* mutations,[28,29] and these localize predominantly to the amino-terminal regulatory region (amino acids 29–45) of exon 3 where critical serine and threonine phosphorylation sites are altered. Because mutant forms of β-catenin constitutively activate TCF-promoter elements and transform cells in culture,[30,31] it is now clear that β-catenin can function as an oncogene.

Consistent with the essential role of this pathway in early tumorigenesis, β-catenin mutations are also identified in benign adenomatous polyps. Because it is "downstream" of APC, mutations in β-catenin can promote polyp formation even when *APC* is intact. In contrast to *APC*, the frequency of mutations in benign adenomas (12.5%) decreases significantly in invasive cancers (1.4%), suggesting that adenomas with alterations in β-catenin are less likely to progress to malignancy.[29] Interestingly, no germline mutations in *CTNNB1* have yet been described in FAP kindreds with wild-type *APC*.[32] Similarly, no mutations of GSK-3β or axin have

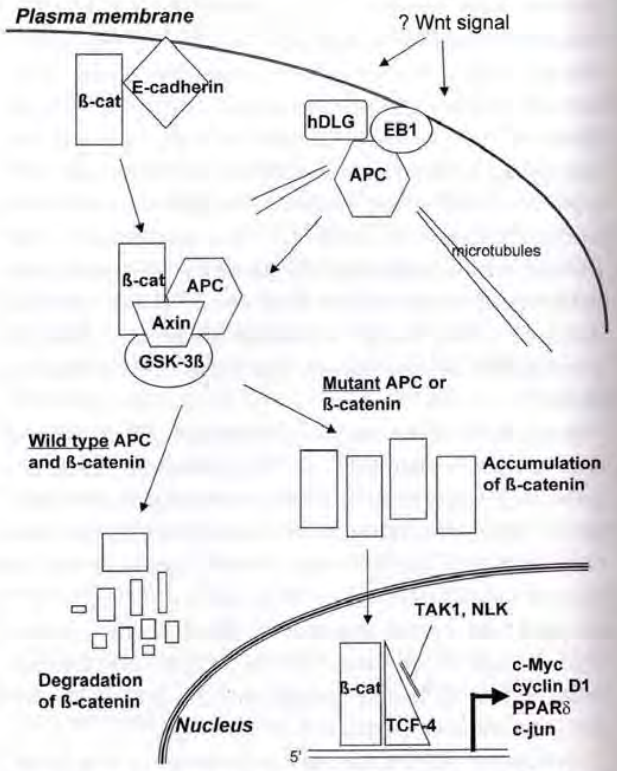


Figure 2. The APC/β-catenin pathway. APC together with GSK-3 provides a signal that targets the degradation of cytoplasmic β-catenin (β-cat). Axin functions as a scaffold for this multimeric complex. In the presence of either mutant APC or β-catenin, this process is disrupted. Excess β-catenin is translocated to the nucleus where it binds with TCF-4 to up-regulate target genes including c-myc, cyclin D1, PPARδ, and c-jun. β-Catenin binds to APC in a mutually exclusive manner with E-cadherin at the plasma membrane. The nature of the extracellular Wnt signal that may regulate colonic epithelial cells is unknown.

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yet been found in colorectal tumors with intact *APC* and *CTNNB1*. *TCF4* mutations have been identified, but only in a unique subset of colon tumors; 39% (19/49) of tumors with microsatellite instability (MSI) harbored a 1–base pair deletion within a polyA tract,[33] although the functional significance of this frameshift has not yet been defined.

The mechanisms that counterbalance signaling through this pathway are only beginning to be characterized. The mitogen-activated protein kinase–related enzymes TAK1 and NLK are mammalian homologues of the MOM-4 and LIT-1 kinases that regulate Wnt signaling in *Caenorhabditis elegans*. Both TAK1 and NLK inhibit β-catenin–mediated up-regulation of a TCF-response element, and this inhibition results from direct phosphorylation of TCF-4 by NLK.[34] The B56 subunit of protein phosphatase 2A also regulates β-catenin signaling, and its effects may be mediated through dephosphorylation of GSK-3β.[35] Mutations of a phosphatase 2A subunit were identified in 2 of 13 primary colon tumors, suggesting that alterations in these counterregulatory pathways may play a role in the pathogenesis of colorectal cancer.[36]

Specific localization of the APC protein to discrete puncta at the ends of microtubules implies an important role in regulation of the cytoskeleton and cellular migration.[37] In colonic epithelial cells, APC also interacts with hDLG through its COOH terminus, and hDLG and APC colocalize along the lateral plasma membrane.[38] However, animal studies suggest that this interaction may not be essential for adenoma formation. Mice with a truncating *Apc* mutation at codon 1638 (Apc1638T) that eliminates the COOH-terminus DLG-binding domain do not develop intestinal adenomas.[39] In contrast, animals carrying a nonsense *Apc* mutation at either codon 850 or 716 eliminating β-catenin interaction sites develop widespread intestinal polyposis.[40,41] A similar polyposis phenotype is observed in mice with a mutant β-catenin gene (Table 2).[42]

The DNA Mismatch Repair Pathway

Identification of the genes responsible for the HNPCC syndrome has led to insights into a novel mechanism of tumorigenesis in colon cancer. Mutations in five different genes (*hMSH2*, *hMSH6*, *hMLH1*, *hPMS1*, and *hPMS2*) have now been associated with the syndrome.[43] As many as 45%–70% of HNPCC families who meet the Amsterdam criteria have mutations in one of these genes, most frequently either *hMSH2* or *hMLH1*.[44,45] Each of the five genes encodes a protein involved in DNA mismatch repair, a complex enzymatic proofreading system that corrects base pair mismatches that arise during DNA replication.

In yeast, MSH2 complexes with either MSH6 to recognize single base pair mismatches, insertions, or deletions or MSH3 to recognize larger 2– to 4–base pair insertions or deletions.[46] The MLH1 and PMS2 gene products then excise the mismatched nucleotides from the newly synthesized strand. Cells with a defective mismatch repair system display a mutator phenotype in which many genes exhibit mutations because of uncorrected errors in DNA replication. Genes with simple repetitive sequences such as polyA tracts or CA-repeat microsatellites are particularly susceptible targets. Tumors with such alterations are said to display MSI or the replication error phenotype. A recent National Cancer Institute workshop proposed a consensus panel of five

Table 2. Summary of Selected Genetic Mouse Models of Colorectal Cancer

Model	Genetic alteration	Intestinal tumors				Comment
		+++	++	+	o	
Apc-Min +/−	Truncation at *Apc* codon 850	√				
× Dnmt1 +/−	Heterozygous inactivation of DNMT in Min mice			√		
× p53 −/−	Homozygous inactivation of p53 in Min mice	√				No change in intestinal tumors
Apc716 +/−	Truncation at *Apc* codon 716	√				
× Ptgs2 −/−	Homozygous inactivation of cox2 in Apc716 mice			√		
× Smad4 +/−	Heterozygous inactivation of Smad4 in Apc716 mice	√				Tumors are more malignant
Apc1638T +/− or −/−	Truncation at *Apc* codon 1638				√	
Apc1638N +/−	Insertion of neomycin gene at *Apc* codon 1638		√			Results in an unstable Apc protein
× Mlh1 −/−	Homozygous deletion of Mlh1 in Apc1638N mice	√				Tumors are also more malignant
Ctnnb ex3 +/−	Heterozygous deletion of exon 3 of β-catenin gene	√				
Msh2 −/−	Homozygous deletion of *Msh2*			√		Frequent lymphomas
Mlh1 −/−	Homozygous deletion of *Mlh1*		√			Frequent lymphomas
Msh3 −/−	Homozygous deletion of *Msh3*				√	
Msh6 −/−	Homozygous deletion of *Msh6*			√		Frequent lymphomas
× Msh3 −/−	Homozygous deletion of *Msh3* in Msh6 null mice		√			

mononucleotide and dinucleotide microsatellite markers for MSI testing. On this basis, tumors could be classified as demonstrating high frequency MSI (MSI-H, ≥2 markers unstable), low frequency MSI (MSI-L, 1 marker unstable), or microsatellite stability (MSS, 0 markers unstable).[47]

HNPCC accounts for as much as 3%–6% of colorectal cancer; virtually all of these tumors display MSI. Up to 15% of sporadic colorectal tumors exhibit MSI. However, only a small fraction (4%–26%) of these have identifiable somatic mutations in *hMSH2*,[48,49] and only 6%–10% of unselected sporadic cases with MSI harbor germline mutations in *hMSH2* or *hMLH1*.[50,51] Tumors with MSI show distinctive clinical features including a proximal colonic location, mucinous or undifferentiated histology, prominent infiltration of lymphocytes, and improved prognosis compared with stage-matched microsatellite stable controls.[47,52] The molecular basis for these unique clinical phenotypes remains to be defined.

Germline mutations in *hMSH2* and *hMLH1* are widely distributed throughout the 16 exons spanning 73 kilobases of *hMSH2* or the 19 exons spanning 58 kilobases of *hMLH1*.[53] The majority are point mutations arising from single base pair substitutions, deletions, or insertions. In *hMSH2*, this results primarily in frameshifts (60%) or premature truncations (23%), whereas frameshifts (40%) or missense mutations of unknown significance (31%) are typically observed in families with a mutant *hMLH1* gene. Simple assays to determine the functional consequences of these frequent missense mutations are not yet available. The absence of either consensus mutational hotspots or a high frequency of truncating mutations has hampered efforts to develop an inexpensive and simple mutational assay. Correlations between genotype and phenotype have not yet been defined, with the exception of an increased risk of extraintestinal tumors of the urinary tract, stomach, and ovary in carriers of germline *hMSH2* mutations.[54]

Inactivation of both alleles of *hMSH2* or *hMLH1* is necessary to generate the MSI-H phenotype, and this occurs through several routes. Loss of heterozygosity (LOH) is often coupled with point mutations of *hMSH2* or *hMLH1*, consistent with the two-hit model of tumor-suppressor gene inactivation.[50] Epigenetic mechanisms may also play a role because *hMLH1* can be silenced through hypermethylation of CpG islands in its promoter. More than 80% of MSI-positive sporadic colorectal tumors show hypermethylation of the *hMLH1* promoter, suggesting that this may be a primary mechanism underlying the MSI phenotype in sporadic tumors.[55] Furthermore, both alleles of *hMLH1* were hypermethylated in five of six MSI-positive colon cancer cell lines without identifiable mismatch repair gene mutations, and the demethylating agent 5-azacytidine restored the expression of both *hMLH1* alleles as well as functional mismatch repair activity.[55,56] A third mechanism of gene inactivation is a dominant negative effect caused by a germline truncating *hPMS2* mutation at codon 134.[57] In this instance, MSI occurs in cells that still contain a wild-type *hPMS2* allele. In mice, homozygous inactivation of DNA mismatch repair genes can lead to intestinal tumorigenesis[58–60]; some of these models are outlined in Table 2.

DNA mismatch repair gene defects in HNPCC syndrome are presumed to lead to tumor development as a result of the accumulation of widespread mutations within short repetitive sequences. Because most stretches of microsatellite DNA lie in noncoding sequences, many such alterations are unlikely to be functionally significant. However, mutations also occur in genes with repetitive sequences in coding exons. The type II TGF-β receptor gene was the first such target to be identified, and frameshift mutations occurred in a short GT-repeat sequence or a stretch of 10 adenines as a consequence of either an insertion or deletion of the repeated nucleotides.[61] This finding provided independent validation of the importance of the TGF-β signaling pathway in colorectal tumorigenesis because TGF-β is a potent inhibitor of colonic epithelial cell growth.[62,63] Additional mutational targets include the apoptosis regulator BAX,[64] the insulin-like growth factor II receptor,[65] the cell cycle–regulated transcription factor E2F-4,[66] TCF-4,[33] caspase 5,[67] the intestinal homeobox factor CDX2,[68] and even the mismatch repair genes hMSH3 and hMSH6 themselves.[69] The latter provides a unique positive feedback loop in which tumors with MSI can enhance their own phenotype. Table 3 summarizes the unique association between this specific class of frameshift mutations and MSI-positive tumors. Although the relative importance of these alterations in tumorigenesis is unknown, they are likely to play a pathogenic role because no mutations of short repeat sequences are identified in genes (e.g., histone) that are not intimately linked to the tumorigenic process.[70]

The relationship between the MSI phenotype and mutations of *APC*, *KRAS*, or *TP53* remains unsettled. Initial reports suggested that *APC* mutations were present in only 21% of tumors with MSI,[71] but more recent studies have noted that 43% of tumors with wild-type *APC* harbor *CTNNB1* gene mutations.[72] Thus, alterations in the APC/β-catenin pathway are common in tumors irrespective of MSI. Although some

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Table 3. Prevalence of Somatic Frameshift Mutations in Colorectal Tumors With and Without MSI

Gene	Mutated target sequence	MSI$^+$ tumors (HNPCC)	MSI$^+$ tumors (sporadic)	MSS tumors
TGFβRII	$(A)_{10}$	78%–83%	82%–90%	0%[a]
IGF2R	$(G)_8$	13%	9%	0%
BAX	$(G)_8$	52%–55%	13%–50%	0%
hMSH3	$(A)_8$	50%–58%	39%–46%	0%
hMSH6	$(C)_8$	33%	28%–36%	0%
E2F4	$(CAG)_{13}$	71%	42%–57%	0%
Caspase-5	$(A)_{10}$	—	62%	0%
TCF4	$(A)_9$	—	39%	2%
CDX2	$(G)_7$	5%	—	0%

MSS, microsatellite stable; —, data not available.
[a]Fifteen percent of MSS colorectal cancer cell lines exhibit TGFβRII mutations that are not frameshifts in the polyA tract.

investigators have identified *KRAS* mutations in only 7% of MSI-positive tumors,[71] others have noted frequencies as high as 22%–31%, similar to the rates seen in control tumors with MSS.[16,73] Finally, fewer p53 mutations seem to be present in tumors with MSI; mutation rates range from 0%–5%, 13%–40%, and 31%, compared with rates of 33%–50%, 55%–67%, and 55%, respectively, for tumors without MSI.[71,73,74]

Collectively, these observations establish the overriding importance of the APC/β-catenin pathway in the initiation of tumors regardless of MSI status. The mechanisms that then govern the accumulation of additional mutations after initial polyp formation diverge depending on the underlying basis for genetic instability. In contrast to MSI-positive tumors that are typically diploid and possess a narrowly defined mutator phenotype affecting simple sequence repeats, the larger population of MSS tumors shows more global chromosomal instability manifested by aneuploidy and frequent LOH.[75] The molecular basis for this type of chromosomal instability is beginning to be understood, and it seems that alterations in mitotic checkpoint genes such as *hBUB1* may be important.[76] Both types of genetic instability can be observed in benign polyps, and the specific rates at which subsequent mutations develop during the transition to malignancy are unknown. However, the clinical observation that HNPCC-associated polyps become malignant more rapidly than sporadic MSS polyps suggests that the MSI mutator phenotype may accelerate tumor progression. This contrasts with FAP-associated polyps, in which the process of tumor initiation is accelerated. Figure 3 summarizes the timing of the key genetic events in colon cancer pathogenesis, based on whether there is underlying chromosomal instability or MSI.

The TGF-β/SMAD Pathway

TGF-β and related family members mediate a wide variety of biological effects, the most characteristic being its potent inhibition of proliferation.[77] TGF-β initiates its broad spectrum of cellular responses through binding to the type II TGF-β receptor (TGFβRII). Binding to TGFβRII recruits and activates the type I receptor through phosphorylation of specific serine and threonine residues; signaling to the nucleus is then mediated through the so-called SMAD proteins, which are phosphorylated by the type I receptor. To date, nine SMAD proteins have already been identified. In mammalian cells, the type I receptor kinase first phosphorylates SMAD2 and SMAD3; SMAD4 then joins the complex. After translocation to the nucleus, this hetero-oligomeric complex modulates transcription of specific genes through cis-regulatory SMAD-binding sequences. The SMAD pathway has been shown to regulate genes encoding plasminogen activator inhibitor1,[78] the CDK inhibitors p15 and p21,[79,80] cyclin D1,[81] and TGF-β itself,[82] among others.

The identification of TGFβRII mutations in most colorectal tumors with MSI first suggested that genetic alterations in this pathway may contribute to colorectal tumorigenesis. Functional studies confirmed that these mutations render cells resistant to the effects of TGF-β.[61] Type II receptor mutations are also present in 15% of MSS colorectal cancer lines. Not surprisingly, these are not frameshifts of the $(A)_{10}$ tract typically mutated in tumors with MSI.[83] However, the number of mutations identified in the multiple SMAD genes has been relatively small; 16% (5/31) of primary colorectal tumors harbor alterations of *SMAD4*,[84] and missense mutations of *SMAD2* are identified in 6% (4/66) of cases.[85] *SMAD4* and *SMAD2* (as well as *DCC*, the "deleted in colon cancer" locus) lie on chromosome 18q21 within 10 cM of each other, and all three are thus potential tumor-suppressor gene targets of the LOH on 18q present in as many as 70% of colorectal cancers.[86] So far, no mutations of the remaining SMADs (*SMAD1, SMAD3, SMAD5,* or *SMAD6*) have been documented.[87] Of note, deletion of *Smad4* in *Apc* null mice results in more malignant intestinal tumors than those in *Apc* null mice alone (Table 2), suggesting that SMAD4 plays a functional role in tumor progression.[88]

The importance of the TGF-β pathway in colorectal tumorigenesis is further underscored by the description of a colon cancer family exhibiting a germline mutation in the TGFβRII gene.[89] Colorectal tumors developed in members of this kindred with the loss of the remaining wild-type allele. In contrast to classic HNPCC syn-

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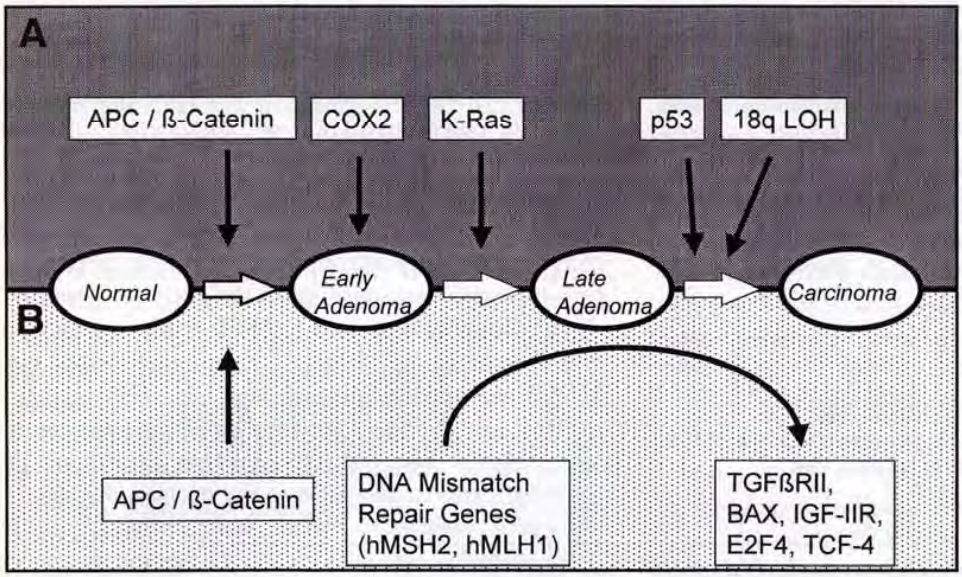


Figure 3. Overall scheme of key genetic events in colorectal tumorigenesis. The critical genes involved in the development of colorectal polyps and cancer are illustrated. The specific timing of each genetic event is crucial in tumor pathogenesis. These genetic events can be grouped into two broad categories. Eighty-five percent of tumors exhibit chromosomal instability but stability of microsatellite DNA; the typical genetic events associated with these tumors are illustrated in *A*. The remaining 15% of tumors are characterized by MSI; the key genetic events in these tumors are illustrated in *B*.

drome, tumors in this family were diagnosed after age 60 and no metachronous lesions were found. Furthermore, no extracolonic malignancies were reported, illustrating the unique dependence of intestinal epithelia on the actions of TGF-β.

Additional Genetic Events in Colorectal Tumorigenesis

KRAS is mutated in approximately 50% of colorectal tumors, and alterations in this small GTP-binding protein almost uniformly occur as activating point mutations in codons 12, 13, and to a lesser extent, 61. Among their many functions, K-ras pathways transduce signals from extracellular growth factors to regulate progression through the cell cycle and proliferation.[2,3] *KRAS* mutations are associated with up-regulation of DNA methyltransferase, cyclin D1, and gastrin, all of which may be important in colon cancer pathogenesis.[90–92] Mutations are frequently present in aberrant crypt foci, which may represent the earliest precursor of an adenoma. However, these mutations are present in 80%–92% of nondysplastic or hyperplastic aberrant crypt foci but only 57% of dysplastic or adenomatous aberrant crypt foci,[93] casting doubt on their importance in tumorigenesis given that hyperplastic changes are generally not thought to be precursors of adenomas.

TP53 mutations are also identified in 50% or more of colorectal tumors; mutations localize primarily to exons 5–8. The *TP53* tumor-suppressor gene product (p53) is a sequence-specific transcriptional activator that plays diverse and complex roles in the regulation of cell cycle progression and apoptosis.[4,5] Most p53 mutations result in a protein with an abnormally long half-life, and the accumulation of mutant p53 can be detected immunohistochemically. Inactivating mutations in p53 occur as a late event during the transition from adenoma to carcinoma and are typically accompanied by deletions of the remaining wild-type allele on chromosome 17p.

The *DCC* tumor-suppressor gene was cloned in 1990 and encodes a cell surface receptor for the ligand netrin. Point mutations have been detected in 2 of 30 human colorectal cancer samples.[94] The large size of the gene (>1300 kilobases) has hampered efforts to analyze a greater number of tumors for mutations in this gene. Loss of DCC protein is associated with a poor prognosis, suggesting an important functional role for the protein.[95] Data on the specific biological activities of DCC are limited, but regulation of apoptosis has been implicated.[96]

SRC encodes a nonreceptor tyrosine kinase that is frequently up-regulated in advanced colonic malignancies. A truncating mutation at codon 531 was found in 12% of metastatic colorectal tumors in one study.[97] Truncation results in increased src kinase activity and tumorigenicity in both colony-formation assays and nude mice.

PPARγ, a member of the nuclear hormone receptor superfamily, is a key regulator of adipocyte differentiation. Interestingly, PPARγ is also expressed in colorectal cancers, and in vitro studies indicate that ligand activation can induce differentiation of colon cancer cells, partially reversing the malignant phenotype.[98,99] However, there are conflicting data because ligand activation in Apc^{min} mice results in enhanced tumorigenesis.[100,101]

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Monoallelic inactivating mutations of PPARγ have been found in 4 of 55 sporadic colon cancers, suggesting that ligand signaling through PPARγ may prevent colon tumor development in humans.[102]

Several genes are also consistently up-regulated but not mutated in colon cancer. Cyclooxygenase (COX)-2 is overexpressed in as many as 43% of adenomas and 86% of carcinomas, and the increased levels of COX-2 play a role in regulating angiogenesis and apoptosis.[103–105] Furthermore, inhibition of COX-2 activity blocks the growth of cultured colon cancer cells[106] and dramatically reduces the number of intestinal polyps in *Apc*-mutant mice (Table 2).[107] Interestingly, several mouse models of colonic tumorigenesis suggest that it is the stromal cells within these tumors that overexpress COX-2.[108] Overexpression of insulin-like growth factor II and incompletely processed forms of gastrin also seem to play a role in colorectal tumorigenesis.[109–111] Up-regulation of these tumor-promoting genes cannot be easily classified as a clonal genetic event underlying tumor formation. Although these events seem to be secondary, they likely play an important role in tumor pathogenesis.

The number of genes already implicated in colorectal cancer development is impressive, but the list is undoubtedly incomplete. Initial allelotyping studies performed over a decade ago suggested critical tumor-suppressor gene loci on 5q, 8p, 17p, 18q, and 22q.[112] Although the *APC, TP53*, and *DCC/SMAD4/SMAD2* genes have been mapped to 5q, 17p, and 18q, respectively, no candidates have yet been identified on 8p or 22q. LOH on 22q has been confirmed in independent analyses, inferring the presence of a novel tumor-suppressor gene.[113]

Epigenetic Mechanisms in Colorectal Tumorigenesis

The transformation of a normal colonic epithelial cell to a malignant clone is the consequence of a complicated program in which the inappropriate activation of some genes is accompanied by the specific inactivation of others. Tumorigenesis requires that this altered program is passed on to subsequent generations of cells. Thus far, this review has focused primarily on the specific alterations in gene sequence (i.e., mutations) that fulfill these criteria. However, epigenetic mechanisms, especially DNA methylation, also seem to play an important role.

Widespread genomic hypomethylation in both benign adenomas and malignant colon cancers was first reported in 1985.[114] Interestingly, this global hypomethylation occurs in the setting of localized hypermethylation.[115] As noted above, hypermethylation of CpG islands within promoter sequences of specific tumor-suppressor genes can have a potent silencing effect. In addition to *hMLH1*, hypermethylation of the $INK4A^{p16}$ gene is observed in 28%–55% of colon tumors.[90,116]

DNA methyltransferase (DNMT) enzymes catalyze the transfer of methyl groups from *S*-adenosyl methionine to cytosine residues. DNMT-1 is the best studied form in eukaryotic cells. The specific mechanisms that regulate DNMT activity and the methylation status of the genome are poorly understood. Mutant K-ras signaling is associated with up-regulation of DNA methyltransferase activity.[90] Furthermore, elevated DNA methyltransferase activity is detected in colon cancer cells,[117] and overexpression of *DNMT1* can lead to cellular transformation.[118] The most compelling in vivo data directly implicating altered methylation in colorectal tumorigenesis come from Apc^{min} mice crossed with *Dnmt1* null mice. A dramatic reduction in the number of intestinal polyps is observed, suggesting that DNA methylation plays a critical role in tumor pathogenesis.[119]

Implications for Clinical Management

Dramatic insights into the genetic basis of colon cancer have been achieved. These advances will undoubtedly have many direct applications to clinical management of patients with colorectal cancer. The feasibility of K-ras and p53 molecular analysis of stool for the diagnosis of colon cancer has already been shown and awaits further refinement.[120,121] Germline testing for the FAP and HNPCC syndromes is now commercially available and plays a valuable role in the counseling of high-risk families. The search for molecular prognostic markers that may predict outcomes is ongoing and will hopefully build on initial observations that the status of chromosome 18q LOH and loss of DCC protein staining can be used to stratify patients.[95,122] It is clear that optimal responses to chemotherapy are influenced by the underlying tumor genotype, e.g., the efficacy of DNA alkylating agents is dependent on an intact DNA mismatch repair system.[123] Similarly, p53-deficient colorectal cancer cells display an enhanced sensitivity to doxorubicin but are resistant to the commonly used antimetabolite, 5-fluorouracil.[124] Finally, advances in our understanding of COX-2 up-regulation in colon cancer are already enabling strategies for the prevention of colon cancer with NSAIDs.[125]

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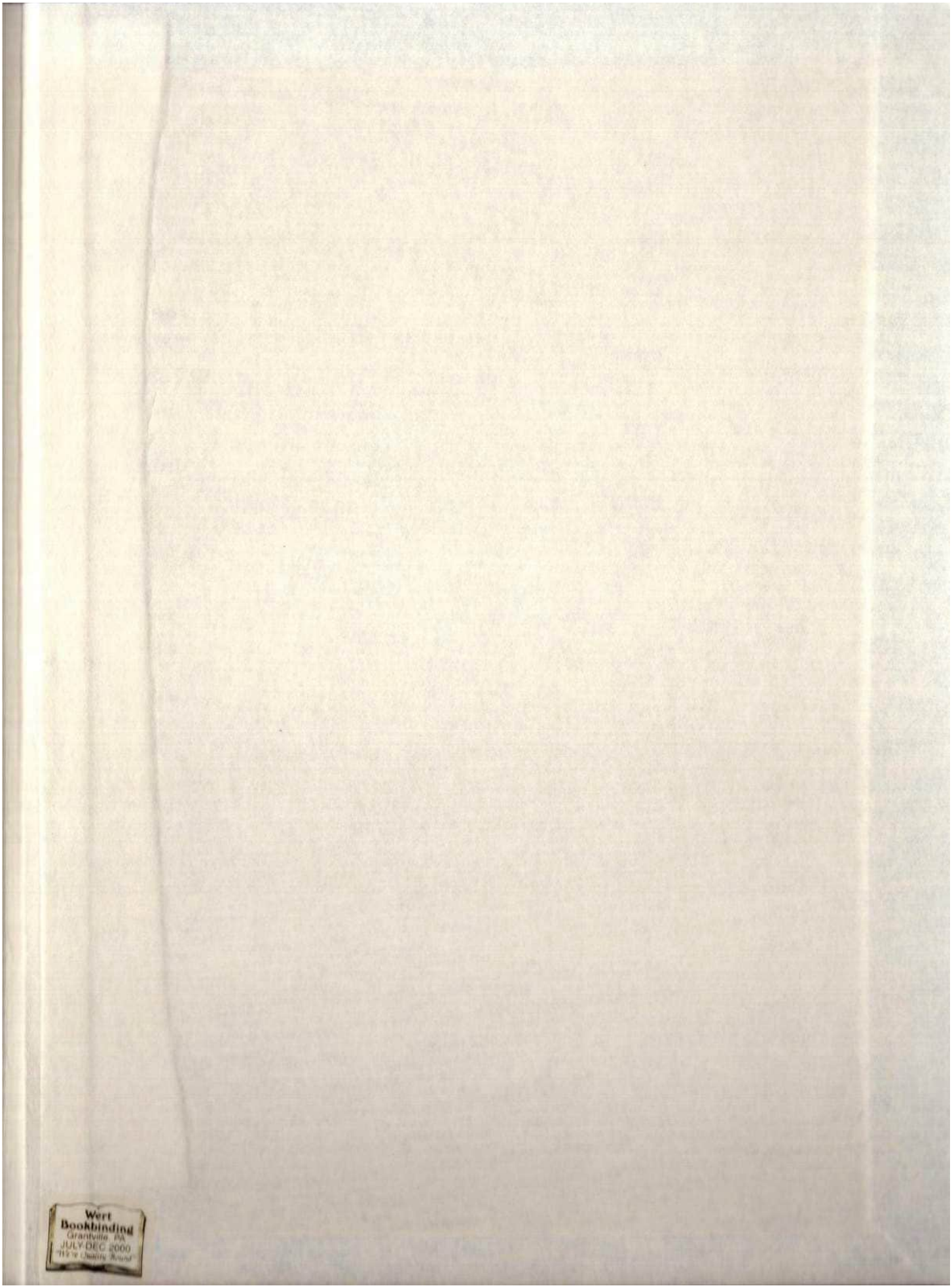
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Risk of progression of advanced adenomas to colorectal cancer by age and sex: estimates based on 840 149 screening colonoscopies

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Appendix BRENNER02

COLORECTAL CANCER

Risk of progression of advanced adenomas to colorectal cancer by age and sex: estimates based on 840 149 screening colonoscopies

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Objectives: To derive age and sex specific estimates of transition rates from advanced adenomas to colorectal cancer by combining data of a nationwide screening colonoscopy registry and national data on colorectal cancer (CRC) incidence.
Design: Registry based study.
Setting: National screening colonoscopy programme in Germany.
Patients: Participants of screening colonoscopy in 2003 and 2004 (n = 840 149).
Main outcome measures: Advanced adenoma prevalence, colorectal cancer incidence, annual and 10 year cumulative risk of developing CRC among carriers of advanced adenomas according to sex and age (range 55–80+ years)
Results: The age gradient is much stronger for CRC incidence than for advanced adenoma prevalence. As a result, projected annual transition rates from advanced adenomas to CRC strongly increase with age (from 2.6% in age group 55–59 years to 5.6% in age group ⩾80 years among women, and from 2.6% in age group 55–59 years to 5.1% in age group ⩾80 years among men). Projections of 10 year cumulative risk increase from 25.4% at age 55 years to 42.9% at age 80 years in women, and from 25.2% at age 55 years to 39.7% at age 80 years in men.
Conclusions: Advanced adenoma transition rates are similar in both sexes, but there is a strong age gradient for both sexes. Our estimates of transition rates in older age groups are in line with previous estimates derived from small case series in the pre-colonoscopy era independent of age. However, our projections for younger age groups are considerably lower. These findings may have important implications for the design of CRC screening programmes.

Most colorectal cancers (CRCs) develop from adenomas, among which "advanced" adenomas are considered to be the clinically relevant precursors of CRC. The natural history of colorectal adenomas is a decisive factor for the design of CRC screening measures and their cost effectiveness. Since advanced adenomas need to be removed once they are detected, any direct observation of their natural history would be unethical. Thus, available estimates for the progression of adenomas mostly stem from radiological surveillance data or from autopsy series collected prior to the colonoscopy era.[1–9] However, these data are rather vague as they were derived from small and potentially selective samples. For example, a major source for the estimation of adenoma transition rates has been a retrospective review of Mayo Clinic records from 226 patients with colonic polyps ⩾10 mm in diameter in whom periodic radiographical examination of the colon was performed, and in whom 21 invasive carcinomas were identified during a mean follow up of 9 years.[9] Despite the undoubted usefulness of available data sources from the pre-colonoscopy era, sample size limitations did not allow reliable estimates of adenoma transition rates according to key factors, such as age and sex. Accordingly, a common estimate of these transition rates for all ages and both sexes has generally been assumed in previous studies on effectiveness and cost effectiveness of CRC screening.[10–17] Given that sensitivity analyses in these studies showed that the advanced adenoma–carcinoma transition rate represents a very influential parameter,[10 11 13 18] its variation by age and sex might have a large impact on relative effectiveness and cost effectiveness of various screening schemes.

The aim of this paper was to estimate risk for developing CRC according to age and sex among carriers of advanced adenomas by combining data from a large national colonoscopy screening database and national data on CRC incidence in Germany.

METHODS

Data sources

German national registry of screening colonoscopies

Prevalences of advanced adenomas (defined as presence of at least one adenoma with at least one of the following features: ⩾1 cm in size, tubulovillous or villous adenoma, high grade dysplasia; no further distinction according to number of adenomas) by 5 year age groups and sex were obtained from a nationwide registry of screening colonoscopies, which was established after implementation of colonoscopic screening for women and men aged ⩾55 years in Germany in late 2002.[19] Only experienced endoscopists (internists/gastroenterologists or surgeons with pertinent certified specialisations, having conducted at least 200 colonoscopies and at least 50 polypectomies under supervision in the preceding two calendar years) are admitted to conduct screening colonoscopies. Requirements for maintenance of admission include conduction of at least 200 colonoscopies and at least 10 polypectomies per year. Histopathological examination is performed decentrally by certified pathological labs.

Abbreviation: CRC, colorectal cancer

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Table 1 Advanced adenoma prevalence, colorectal cancer incidence and estimated annual progression of advanced adenomas according to sex and age

		National colonoscopy registry		National estimates of colorectal cancer occurrence		
Sex	Age(y)	Number screened	Advanced adenomas n (%)	Observed "incidence" *	Estimated onset†	Annual transition in %‡
Women	55–59	112 399	3866 (3.4)	82.1	104.3	2.6
	60–64	160 880	6773 (4.2)	113.0	161.3	3.3
	65–69	125 133	6005 (4.8)	180.1	238.4	4.2
	70–74	55 582	3219 (5.8)	261.0	326.2	4.8
	75–79	27 414	1785 (6.5)	351.5	440.4	5.8
	80+	9492	691 (7.3)	479.0	481.2	5.6
Men	55–59	66 330	4130 (6.2)	132.4	188.7	2.6
	60–64	110 597	8312 (7.5)	210.5	284.8	3.2
	65–69	97 411	8217 (8.4)	313.6	405.7	4.1
	70–74	47 018	4336 (9.2)	441.5	452.6	4.2
	75–79	21 220	2051 (9.7)	456.9	512.9	4.5
	80+	6673	632 (9.5)	551.4	564.7	5.1

*Patients diagnosed with colorectal cancer within age group per 100 000 per year; †patients estimated to have onset of CRC within age group per 100 000 per year; ‡onset of colorectal cancers per 100 advanced adenomas.

In the nationwide screening colonoscopy registry, basic sociodemographic variables and results of screening colonoscopy are collected anonymously for all screening colonoscopies conducted in Germany using a standardised reporting form to be completed by the gastroenterologists. In case of multiple adenomas, only the largest is recorded (categories used for classification of size of adenomas: >1 cm, ⩽1 cm; categories used for histopathological classification of adenomas: tubular, tubulovillous, villous, high grade dysplasia).

The forms are scanned, processed and checked for completeness and plausibility using standardised algorithms at regional data centres before transmission to the national data centre for analysis. For this analysis, 840 149 records from screening colonoscopies conducted by more than 2000 endoscopists in 2003 and 2004 were available.

Population-based cancer registry data

National estimates of colorectal cancer incidence by age and sex are provided by the Robert Koch Institute, a Federal Institute for Disease Surveillance in Germany.[20] These estimates are derived from the best available incidence data from multiple state cancer registries and nationwide available CRC mortality data. Coding of cancers in the cancer registries follows international standards for epidemiological cancer registries.[21] For this analysis, we used CRC incidence data for the year 2002, the year immediately preceding introduction of screening colonoscopy, as the latter may affect observed CRC incidence by prevention of CRC or by detection of asymptomatic CRC.

Statistical analysis

For each 5 year age group i (i = 55–59, 60–64, 65–69, 70–74, 75–79, 80+ years) and each sex j (j = females, males), annual transition rates from advanced adenomas to CRC, denoted A_{ij}, were estimated from CRC incidence I_{ij} and advanced adenoma prevalence P_{ij} as follows:

$A_{ij} = (I_{ij} \times Q)/P_{ij}$.

The factor Q reflects the proportion of CRCs assumed to develop through adenomas. This proportion has been assumed to equal values between 0.7 and 1.0 by various authors (regardless of age and sex).[10–13 15–18] Similar to the recent study by Ladabaum and Song,[17] we set Q to 0.85 in our main analysis and we varied it between 0.7 and 1.0 in additional sensitivity analyses.

Rates of CRC reported by population-based cancer registries are in reality clinical detection rates rather than true incidence rates. It has been estimated that onset of preclinical CRC on average precedes clinical detection by 3.6 years.[13] We therefore recalculated age specific rates of CRC onset by "shifting" age specific observed incidence rates to younger ages. In the main analysis, a shift by 3.6 years was made. In sensitivity analyses, this shift was varied between 2 and 5 years, according to the range of duration from preclinical CRC onset to CRC diagnosis estimated by other authors.[12 15 22]

Finally, cumulative risk of developing CRC within 10 years (conditional on not dying from other causes) among carriers of advanced adenomas at the beginning of each age group i—that is, at ages 55, 60, 65, 70, 75 and 80 years—was calculated as $1\text{-}\exp(-5(A_{ij} + A_{(i+1)j}))$.[23]

RESULTS

In total, records from the national screening colonoscopy database of 840 149 women and men who underwent a screening colonoscopy in Germany in 2003 or 2004 were included in the estimates of advanced adenoma prevalences (table 1). Prevalences of advanced adenomas were higher in men than in women, and they increased with age in both sexes (from age 55–59 years to ⩾80 years they increased from 3.4% to 7.3% among women, and from 6.2% to 9.5% among men, table 1). All age and sex specific prevalence estimates were based on at least 600 cases and most prevalence estimates were based on more than 2000 cases.

The age gradient was considerably stronger for observed CRC "incidence". For women, a more than fivefold increase between ages 55–59 and 80+ years was observed. For men, higher incidence rates at all ages and a more than fourfold increase from the youngest to the oldest age group was observed. Within each age group, estimated CRC onset was somewhat higher than observed incidence, given that a substantial proportion of cases diagnosed in each age group were assumed to have had their onset in the preceding younger age group and given the strong increase of incidence with age. The age gradient of estimated rates of CRC onset was somewhat lower than the age gradient of observed incidence rates, but it was still considerably stronger than the age gradient of advanced adenoma prevalence (table 1).

Combining the advanced adenoma prevalences and the estimated CRC onset rates as outlined in the Methods section, and assuming that 85% of CRCs arise from advanced adenomas, yielded estimates of annual transition rates from 2.6% in the youngest age group to 5.6% in age group 80+ among women, and from 2.6% in the youngest age group to 5.1% in the oldest age group among men (table 1 and fig 1, left graph).

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Estimates of 10 year cumulative risk increased from 25.4% at age 55 years to 42.9% at age 80 years in women, and from 25.2% at age 55 to 39.7% at age 80 years among men (table 2 and fig 1, right graph). These estimates varied by ±3.8–3.9 percentage points at age 55 years and by ±5.1–5.9 percentage points at age 80 years when the proportion of CRCs arising from adenomas was varied between 70% and 100% in sensitivity analyses. Variation of the time from CRC onset to CRC diagnosis between 2 and 5 years led to relatively minor variation in the estimated 10 year cumulative risk (table 2).

DISCUSSION

In this paper, we combined data from a unique nationwide colonoscopy registry and from population-based cancer registries from Germany to project age and sex specific risk of CRC development among carriers of advanced colorectal adenomas. Any direct estimation of this parameter from cohorts of adenoma carriers would be unethical, as advanced adenomas have to be removed once they are detected, and pertinent data from the pre-colonoscopy era are very sparse. Our analysis shows that the risk of advanced adenoma–CRC transition is comparable among women and men, but strongly increases with age.

Our projections of advanced adenoma progression to CRC in the older age groups are in line with previous estimates based on much smaller samples, which have been used for all age groups in previous analyses of cost effectiveness of CRC screening. For example, the cost effectiveness analyses of colorectal cancer screening by Frazier *et al*[11] and O'Leary *et al*[16] assumed a base-case value of 5% for the annual transition rate from high-risk polyps to localised cancer regardless of age, citing the 1987 report of Stryker *et al* from the Mayo clinic case series as pertinent reference.[9] The same estimate was used, again for all age groups and both sexes, in the recent cost-effectiveness analysis by Ladabaum and Song.[17] Furthermore, polyp dwell time, which is closely related to the adenoma–CRC transition rate, has been found to be an important influential parameter in pertinent sensitivity analyses in a number of cost effectiveness studies.[10 13 16 18] Therefore, the finding of a strongly age-dependent transition rate may be of high relevance for the optimal design of CRC screening programmes.

In our analysis, we implicitly made the assumption that all CRCs arising from adenomas were arising from advanced adenomas—that is, advanced adenomas represent a necessary interim stage in the adenoma–CRC sequence. A similar assumption (eg large adenomas or high risk polyps being necessary intermediate stages in the development of CRC from small adenomas or from low risk polyps, respectively) has been implicitly or explicitly made by other authors, and it appears plausible on biological grounds.[11 16 17]

In the interpretation of our results, specific strengths and limitations of this study require careful consideration. Strengths include the large population-based data sources, especially a unique nationwide registry with more than 840 000 records from screening colonoscopies. The latter allowed estimating age and sex-specific prevalences of advanced adenomas in an unselected screening population with very small random error. Unfortunately, no data for age group 50–54 years could be provided, as colonoscopy screening in Germany is offered from 55 years on only. Given the lack of information on adenoma location in the national colonoscopy database, it was not possible to further assess potential differences in transition rates of proximal and distal advanced adenomas. The latter might be of interest when (cost-) effectiveness of screening colonoscopy and screening sigmoidoscopy are compared. Furthermore, although high levels of qualification and experience are a prerequisite for conducting screening colonoscopies and for certification of pathology labs in Germany, and all screening colonoscopies have to be documented on a standardised form, the degree of standardisation of information given on colonoscopy reports is likely to be less perfect in such a nationwide database than it could be achieved in a trial conducted by a few specialised centres with centralised review of all adenomas. However, our results might be more relevant for judging the risk that advanced adenomas detected in routine practice will progress to cancer. Furthermore, potentially less than perfect classification of adenomas provided on colonoscopy reports would be expected to apply to all ages. The resulting potential misclassification would therefore be

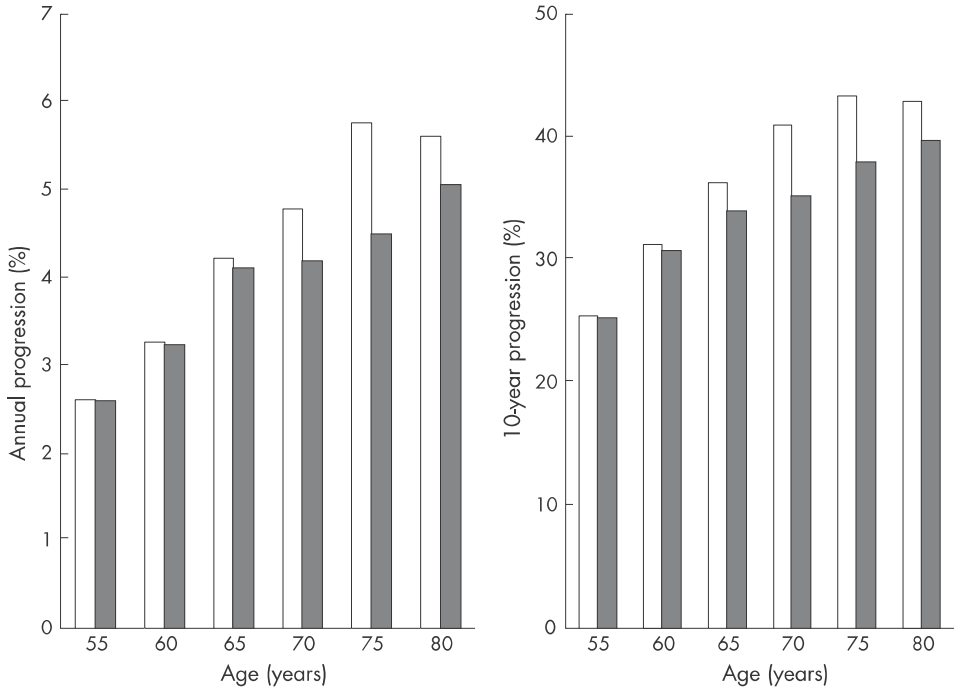


Figure 1 Projected annual progression (left graph) and 10 year progression (right graph) of advanced adenomas to colorectal cancer according to sex and age in Germany. Women = left columns, men = right columns.

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Table 2 Estimated 10 year cumulative risk of colorectal cancer among women and men with advanced adenomas at various ages

		10 year cumulative risk (%)				
		Main analysis Q=0.85	One-way sensitivity analyses			
Sex	Age (y)	D=3.6y	Q=0.70	Q=1.00	D=2y	D=5y
Women	55	25.4	21.5	29.2	22.9	27.3
	60	31.2	26.5	35.6	28.1	33.5
	65	36.2	31.0	41.1	33.4	38.3
	70	41.0	35.2	46.2	38.1	43.0
	75	43.3	37.4	48.7	41.8	44.5
	80	42.9	37.0	48.3	42.7	43.0
Men	55	25.2	21.3	29.0	22.5	27.2
	60	30.7	26.1	35.0	27.9	32.7
	65	33.9	28.9	38.6	32.4	35.1
	70	35.2	30.0	40.0	34.3	35.8
	75	38.0	32.5	43.0	36.9	38.7
	80	39.7	34.0	44.8	38.9	40.2

The proportion of colorectal cancers (CRC) arising from polypoid adenomas Q and the duration from CRC onset to CRC detection D are set to 0.85 and 3.6 years, respectively, in the main analyses, and they are varied between 0.7 and 1.0 and between 2 and 5 years, respectively, in the sensitivity analyses.

expected to be "non-differential" with respect to age, which, according to epidemiological theory, implies that differences in age-specific transition rates would tend to be underestimated rather than overestimated.[24] Potentially less than perfect classification of histopathological findings would thus not explain the major differences in estimates of CRC transition rates between age groups.

A possible concern could be that adenoma prevalences among screening participants might not be representative for adenoma prevalences among the general population. On the one hand, prevalences could be somewhat lower among screening participants, assuming that they are more health conscious than non-participants. However, in contrast to other cancers, no major variation of CRC risk by factors related to health consciousness, such as indicators of education or socioeconomic status, has been found. However, adenoma prevalences among screening participants might even be somewhat higher than in the general population, assuming that people at higher risk of CRC, such as people with a family history of CRC, might be more likely to undergo screening. Overall, the estimates of advanced adenoma prevalences from the German national screening registry were in line with[25–27] or somewhat lower than[28] previous, less detailed, estimates from much smaller colonoscopy studies conducted in the USA. Although selection patterns could have led to some underestimation or overestimation of advanced adenoma prevalences overall, it is unlikely that they could account for the strong age gradient in advanced adenoma progression estimates found in our study.

National estimates of CRC incidence in Germany referred to the year 2002—the year immediately preceding introduction of screening colonoscopy to avoid "contamination" by detection of asymptomatic CRC by screening colonoscopy. As described in the Methods section, CRC onset rates were derived from CRC incidence rates in our calculations. Therefore, major changes in CRC incidence in the years preceding 2003 and 2004 could, in theory, have influenced our results. However, incidence rates of colorectal cancer have been very stable in Germany since the middle of the 1990s,[20] and it appears particularly unlikely that the strong age gradient, which is a universal finding in CRC incidence,[29] should have markedly changed in recent years.

Like other studies, we had to rely on external sources for estimates of the proportion of CRC arising from adenomas, but uncertainty with respect to this parameter was taken care of in sensitivity analyses. The same applies to estimates of the duration from CRC onset to CRC detection. The main finding of our study, the strong age dependency of adenoma–CRC transition rates, was not affected by variation of overall levels of these parameters. However, we cannot rule out that potential variation of these parameters between age groups might affect the projections of age-specific CRC transition rates to some extent.

Despite its limitations, our analysis provides information on age and sex-specific advanced adenoma transition rates, which could be helpful in the design of endoscopy based screening programmes and their optimisation regarding effectiveness and cost effectiveness. Our finding that advanced adenoma transition rates are strongly age-dependent could have important clinical implications, possibly including a higher age at first screening or differential endoscopy intervals according to age. However, additional risk factors, such as family history of CRC, also have to be taken into account. To further differentiate estimates of the natural history of colorectal adenomas—for example, by various types and by location—large studies with more detailed information about colonoscopic findings are needed.

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EDITOR'S QUIZ: GI SNAPSHOT

Robin Spiller, editor

History of bilious vomiting: a tale with a twist

Clinical presentation

A 16-year old girl was admitted with a 9-month history of bilious vomiting, colicky central abdominal pain and 3 stone weight loss. There was no previous medical history or psychiatric problems. Blood investigations were normal.

On examination she looked well. Her abdomen was soft and non-tender. There was a sucussion splash. Abdominal radiograph and gastroscopy were normal. A barium meal follow-through examination was arranged (fig 1).

Question

What is the cause of this young girl's vomiting?

See page 1598 for answer

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Figure 1 Barium meal.

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Original contribution

Colorectal cancer screening compliance by medicine residents: perceived and actual

David L Zack (D.O.) [a], John K DiBaise M.D. [a], Eamonn M.M Quigley M.D. (F.A.C.G.) [a b], Hemant K Roy M.D. [a]

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Abstract

OBJECTIVE:

Implementation of colorectal cancer (CRC) screening with widely available techniques can result in a significant reduction in CRC-related mortality. Clinical practice paradigms are often ingrained in physicians during residency. We, therefore, investigated both compliance and perceived obstacles to CRC screening in the practices of physicians-in-training.

METHODS:

We conducted a retrospective analysis of medical records of patients who were receiving their primary care in the internal medicine resident clinics at the University of Nebraska Medical Center and were at average risk for CRC. In addition to demographics, data on the use of screening mammography, Pap smear, cholesterol, fecal occult blood testing (FOBT), and flexible sigmoidoscopy (FS) were collected. A questionnaire was also distributed to all internal medicine residents to assess their CRC screening knowledge and perceived screening compliance.

RESULTS:

One hundred eight patient charts were reviewed. The percentage of patients appropriately screened for each test was as follows: mammography 66%, Pap smear 65%, cholesterol 53%, FOBT 13%, and FS 16%. Residents dramatically overestimated their perceived FS and FOBT screening rates, 78% and 88%, respectively. Most residents identified barriers to FS screening. Although rudimentary CRC screening knowledge appeared adequate, a number of knowledge-based deficiencies were identified.

CONCLUSIONS:

Internal medicine residents at our institution demonstrate poor CRC screening compliance especially when compared with other health care maintenance interventions. This cannot be entirely accounted for by inadequate knowledge; discrepancy between the perceived and actual implementation of CRC screening may be important. Efforts to improve screening compliance should include a focus on physicians-in-training.

Previous Next

Introduction

Colorectal cancer (CRC) is the second leading cause of cancer mortality in the United States. Approximately 135,400 new cases of CRC and 56,700 CRC-related deaths are forecast in 2001 (1). When diagnosed at an early stage, colon cancer is almost invariably curable. Unfortunately, CRC is often asymptomatic until it has reached an advanced stage. Screening strategies have been designed to enable early diagnosis of colon cancer and prevention of this malignancy through removal of its precursor lesion, the adenomatous polyp (2). Flexible sigmoidoscopy (FS), fecal occult blood tests (FOBT), air-contrast barium enema, and colonoscopy have been recommended as acceptable screening techniques in a recent consensus statement; of these, only FS and FOBT are widely available, relatively inexpensive, and have been unequivocally demonstrated to reduce mortality (3).

Despite these screening strategies and the increased attention that preventive care has received in the public and medical communities, most colon cancers still present at relatively advanced stages. As clinical practice paradigms are often ingrained in physicians' during their training, we wished to assess whether screening strategies were being properly employed in the ambulatory care practice of our internal medicine residents. Assessment was made of the rate of compliance with CRC screening in comparison with other well-established preventive healthcare techniques. Finally, because little data exist on factors related to CRC screening (4), we wanted to identify potential obstacles to the implementation of CRC screening programs in this setting.

Materials and methods

Ambulatory care resident education

The University of Nebraska Medical Center Internal Medicine residency program is a traditional, accredited 3-yr program consisting of both hospital and ambulatory-based training. The ambulatory care portion consists of two half-day clinics weekly throughout all 3 yr of training. Thirty-six medicine residents provide longitudinal care each year in these clinics. Formal lectures addressing preventive care cancer screening are interspersed throughout the academic year. Specifically, two lectures focus on colon cancer with an emphasis on screening in the average-risk patient. Furthermore, all residents rotate, at least once, on the gastroenterology inpatient consult service where didactic and practical instruction is given on FOBT and FS. Residents perform screening video FS in a dedicated procedure room located in the outpatient clinic facility. All procedures are performed under the supervision of general internal medicine attending physicians.

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Study population

A retrospective chart review of patients who received their care in the internal medicine resident clinics at the University of Nebraska Medical Center over a consecutive 4-wk period was performed. Patients considered appropriate candidates for CRC screening included those aged >50 yr at average risk for developing CRC and who had been followed by an internal medicine resident over a period of at least 6 months duration during which they had a minimum of two clinic visits. Exclusion criteria included patients who were at increased risk to develop CRC (family or personal history of adenomatous polyps, CRC, or polyposis syndromes), ongoing GI complaints necessitating colonic evaluation, severe comorbid illness for which screening was believed to be inappropriate, a previous lower GI evaluation by colonoscopy or barium enema in the preceding 3 yr, medical care provided directly by an attending physician, and patients who were only evaluated on a single occasion for a specific problem. The study was approved by the Institutional Review Board of the University of Nebraska Medical Center.

Data collection

Two hundred consecutive medical records of patients seen in internal medicine residents clinics were screened by two investigators (D.L.Z. and J.K.D.), using a standardized form. Those charts that met the eligibility criteria were reviewed in further detail. Data recorded included patient demographics and details regarding performance of FOBT, FS, and other well-accepted preventive health care techniques (mammography, breast exam, pelvic exam, Pap smear, cholesterol testing, and rectal exam). An acceptable screening interval for each test was defined as follows: mammography, breast exam, cholesterol, and FOBT performed on a yearly basis; pelvic exam and pap smear performed every 3 yr; and sigmoidoscopy performed every 5 yr. Screening methods were considered offered and/or completed if there was documentation in the medical record.

Questionnaire

After pilot testing, a questionnaire, comprised of 25 questions, was distributed to all internal medicine residents. The survey was designed to assess: 1) habits regarding preventive care screening; 2) CRC screening knowledge; 3) perceived CRC screening compliance; 4) specific barriers to performing FS including difficulty scheduling/staffing procedures, technical problems with the equipment, residents uncomfortable performing the procedure and residents' perception of patients' reluctance to undergo the procedure, and/or the bowel preparation required before the procedure; and 5) personal attitudes toward performing FS.

Statistical analysis

Data were analyzed using the SAS statistical program (SAS Institute, Cary, NC). The Fisher's exact test and χ^2 test were used to compare the proportion of patients receiving colon cancer screening with screening for other diseases. Student's *t* test was used to compare age between screening groups. Analysis of variance was used to compare age for the FOBT. Statistical significance was defined as $p < 0.05$. Analysis of the questionnaire was determined by calculations of the percentage of correct answer.

Results

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One hundred eight patients were considered appropriate for detailed chart review. The study population consisted of 36 men with a mean age of 60.3 yr (range = 51–77 yr) and 72 women with a mean age of 62.2 yr (range = 50–80 yr). Sixty-seven (62%) of the patients were white, and 41 (38%) were black. The residents performed FOBT in 13% of the patients and FS in only 16%. Table 1depicts patient characteristics in terms of gender and race. No differences in CRC screening were present between men and women. Although whites were offered FS more often than blacks, no differences were identified in the actual performance rate. In contrast to CRC screening, the same residents appropriately performed mammography in 66%, cholesterol testing in 53%, and Pap smear in 65% of patients. Table 2demonstrates the residents perceived rate of offering various preventive care services compared with the actual rates of those services being performed.

Table 1. CRC Screening According to Gender and Race

	Total Offered		Performed		Refused	
	FS (%)	FOBT (%)	FS (%)	FOBT (%)	FS (%)	FOBT (%)
Total (n = 108)	21 (19)	28 (26)	17 (16)	14 (13)	4 (4)	14 (13)
Gender						
Male (n = 36)	10 (28)	10 (28)	8 (22)	5 (14)	2 (6)	5 (14)
Female (n = 72)	11 (15)	18 (25)	9 (13)	9 (13)	2 (3)	9 (13)
Race						
White (n = 67)	18 (27)	20 (30)	13 (19)	10 (15)	5 (7)	10 (15)
Black (n = 41)	3 (7)*	8 (20)	3 (7)	4 (10)	0 (0)	4 (10)

* $p = 0.01$.

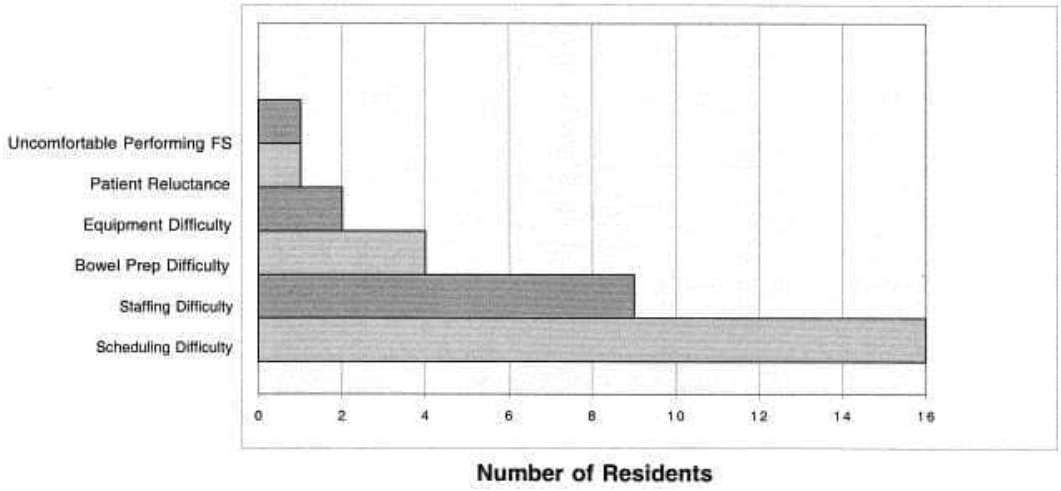
Table 2. Perceived and Actual Screening Rates by Medicine Residents

	Perceived Offered (%)	Actually Performed (%)	*p*
Mammography	100	66	ns
Cholesterol	100	53	ns
Pap smear	100	65	ns
FOBT	88	13	<0.05
Sigmoidoscopy	78	16	<0.05

Nineteen of 36 (53%) questionnaires were returned after a single mailing with the following breakdown by postgraduate year (PGY): four PGY-1, nine PGY-2, and six PGY-3. According to the report, residents believed they offered screening FS and FOBT to their patients most of the time; however, only 26% of the residents believed their patients were actually completing FS greater than half of the time. When asked to identify

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barriers to CRC screening using FS, 16 (84%) of the residents responding to the survey listed difficulty scheduling the procedure as the dominant barrier despite having a dedicated FS room and equipment available (Fig. 1).



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Figure 1. Resident perception of barriers to performing screening FS.

All of the responding residents correctly identified both the age at which CRC screening should begin in an average-risk patient and the recommended interval between successive FOBT and FS screening after a negative initial exam. In contrast, only 50% correctly identified the appropriate means of follow-up for a positive FOBT, and 60% were unaware that the number of positive guaiac cards is irrelevant when deciding on the appropriate next step in management.

Discussion

We demonstrate that the rate of CRC screening with FOBT and FS by our internal medicine residents was remarkably poor. Indeed, our data indicate that most of the patients in our analysis received inadequate CRC screening. This is particularly alarming as these simple and inexpensive tests have been unequivocally demonstrated to reduce mortality. For instance, Mandel *et al.* demonstrated a 33% decrease in mortality with yearly FOBT, whereas Selby *et al.* showed a 60% reduction in deaths from cancers in the surveyed bowel with sigmoidoscopy 2, 5. Moreover, a more recent report by Mandel *et al.* suggests that FOBT can actually decrease the incidence of cancers, presumably through detection and removal of premalignant lesions (6). Unfortunately, the dismal screening rate found in this study is consistent with the national average. During 1973–1997, Ries *et al.* reported that only 30.6% of adults aged >50 yr had undergone a sigmoidoscopy/proctoscopy in the preceding 5 yr (7). Furthermore, the FOBT rate found by Ries *et al.*(7) was 15% in 1987 and, despite vigorous patient education campaigns, only improved to 18% by 1998.

Data similar to ours have been reported in other internal medicine residency programs. Borum recently showed that only 29% and 13% of traditional 3-yr internal medicine residents at her program appropriately used screening FOBT and FS, respectively (8). In contrast, residents in a primary care track program performed CRC screening at a considerably higher rate with FS and FOBT performance rates of 71% and 81%, respectively. This indicates that we may be able to achieve substantially higher screening by modifying

physician training. Although issues of patient reluctance to undergo procedures performed by physicians-in-training have been offered to explain poorer screening rates, recent data suggest that patient satisfaction is comparable when FS is perfomed by residents or staff physicians (9).

Our data suggest a difference in the rate of CRC screening offered to blacks compared with whites. Racial bias in screening may, possibly, be at least one of the reasons that blacks have more advanced CRC at diagnosis than whites and, hence, a poorer prognosis (10). Although it is difficult to assess the significance of this finding, given our relatively small patient population, similar results have been described with regards to cardiovascular screening in blacks (11). Indeed, given the higher incidence of colon cancer among blacks, it has been demonstrated that CRC screening is most cost-effective in the black population (12). Further studies are needed to clarify this issue.

The low level of FS and FOBT implementation in this study is in dramatic contrast to the adequate use of other health care maintenance strategies, such as mammography, cholesterol testing, and Pap smears. The clinical/public health consequences of the discrepancy between colon cancer screening and other screening practices is underscored by recent data, which suggest that CRC screening is slightly more cost-effective than a variety of other health care interventions including pneumococcal vaccinations and treatment of hypertension, whereas it is markedly more cost-effective than breast cancer screening (13). Indeed, a recent analysis indicates that the costs incurred by FS will be offset by the savings from early diagnosis and prevention of CRC (14).

The reason for the discordance between CRC screening and other health care maintenance practices reported in this study remains unclear. Previous reports on cancer screening practices among resident physicians have suggested that both physician and patient factors may be important. Myers *et al.* recently reported that there was substantial variability in physician intention to recommend colon cancer screening based on the physicians' perception of CRC screening effectiveness, board certification, and length of time in practice (15). Although our residents appeared to have a solid grasp of screening indications and strategies, fewer than half were able to appropriately manage a positive FOBT. This is consistent with results from a recent survey of primary care physicians in which only one-half of practitioners answered questions correctly regarding the evaluation of a heme-positive stool (16). Moreover, a survey of CRC screening knowledge in 168 internal medicine residents at four institutions demonstrated remarkably similar results, with only 29% recommending colonoscopy to evaluate a positive FOBT (17). Findings from our study suggest that at least part of the problem with poor screening rates appears to be a misperception by the residents of their colon cancer screening implementation. This may reflect both patient and physician reluctance to aggressively deal with colon cancer because of social norms reflecting distaste for CRC.

There are several caveats to the interpretation of these data. First, chart reviews have intrinsic weaknesses including their retrospective nature and their reliance upon information being appropriately documented. Nevertheless, Montano and Phillips recently demonstrated that, in cancer screening, the correlation between chart audits and patient surveys was very high (18). This methodology is also supported by a report from Luck *et al.* in which an assessment of quality of care was determined through chart review of encounters with standardized patients (19). They demonstrated that scores from chart review underestimated actual quality of care by only 14%, thus suggesting that the magnitude of the differences found in our study would not be adequately explained solely by these methodological differences alone (19). Secondly, the size of our patient population was modest and, despite a concerted effort, the internal medicine resident survey

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response rate was only 53%. This poor rate is, however, comparable with that seen in most physician surveys. Finally, our exclusion of patients having undergone full colonic evaluation within the last 3 yr only is more conservative than the screening guidelines currently recommended (*i.e.*, barium enema every 5 yr or colonoscopy every 10 yr); however, none of our 108 patients had previously undergone either study.

Despite these limitations, our data suggest that physicians have an important role in the underuse of colon cancer screening. With regard to physicians, it is particularly disturbing that residents, despite lectures on CRC and preventive medicine, had a screening rate comparable with the national average. It can be speculated that if these clinical habits are not ingrained during a residency program, they are even less likely to be nurtured in a busy primary care practice. Potential ways to improve physician implementation might include enhancing education on colon cancer and its prevention as well as offering structured FS instruction. Improved teaching aides, such as a virtual reality FS simulator, may also be helpful (20). The importance of having confidence in the performance of the procedure is underscored by the finding of Lewis *et al.*, who determined that the main reason that half of primary care physicians, who were trained in FS, did not perform this examination was self-perceived technical inadequacy (21). Finally, targeting differences in the perceived *versus* actual frequency of CRC implementation is also possible. Data from our institution suggest that an automated computer-based reminder system improves CRC cancer screening and other facets of health care maintenance (22).

In summary, in this audit of internal medicine resident practices, we have demonstrated that implementation of CRC screening guidelines was poor, especially when compared with other health care maintenance techniques. Factors that may account for this poor compliance include deficiencies in certain elements of CRC screening knowledge and differences between actual and perceived rates of CRC screening. Our study suggests that, in addition to increasing public awareness, an aggressive focus on physicians-in-training is important. This should include both didactic practical instruction and also feedback on CRC screening implementation. Further studies are necessary to determine how to optimize CRC screening compliance.

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Colorectal Cancer Screening Compliance by Medicine Residents: Perceived and Actual

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OBJECTIVE: Implementation of colorectal cancer (CRC) screening with widely available techniques can result in a significant reduction in CRC-related mortality. Clinical practice paradigms are often ingrained in physicians during residency. We, therefore, investigated both compliance and perceived obstacles to CRC screening in the practices of physicians-in-training.

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INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer mortality in the United States. Approximately 135,400 new cases of CRC and 56,700 CRC-related deaths are forecast in 2001 (1). When diagnosed at an early stage, colon cancer is almost invariably curable. Unfortunately, CRC is often asymptomatic until it has reached an advanced stage. Screening strategies have been designed to enable early diagnosis of colon cancer and prevention of this malignancy through removal of its precursor lesion, the adenomatous polyp (2). Flexible sigmoidoscopy (FS), fecal occult blood tests (FOBT), air-contrast barium enema, and colonoscopy have been recommended as acceptable screening techniques in a recent consensus statement; of these, only FS and FOBT are widely available, relatively inexpensive, and have been unequivocally demonstrated to reduce mortality (3).

Despite these screening strategies and the increased attention that preventive care has received in the public and medical communities, most colon cancers still present at relatively advanced stages. As clinical practice paradigms are often ingrained in physicians' during their training, we wished to assess whether screening strategies were being properly employed in the ambulatory care practice of our internal medicine residents. Assessment was made of the rate of compliance with CRC screening in comparison with other well-established preventive healthcare techniques. Finally, because little data exist on factors related to CRC screening (4), we wanted to identify potential obstacles to the implementation of CRC screening programs in this setting.

MATERIALS AND METHODS

Ambulatory Care Resident Education

The University of Nebraska Medical Center Internal Medicine residency program is a traditional, accredited 3-yr program consisting of both hospital and ambulatory-based training. The ambulatory care portion consists of two half-day clinics weekly throughout all 3 yr of training. Thirty-six medicine residents provide longitudinal care each year in these clinics. Formal lectures addressing preventive care cancer screening are interspersed throughout the academic year. Specifically, two lectures focus on colon cancer with an emphasis on screening in the average-risk patient. Furthermore, all residents rotate, at least once, on the gastroenterology inpatient consult service where didactic and practical instruction is given on FOBT and FS. Residents

Table 1. CRC Screening According to Gender and Race

	Total Offered		Performed		Refused	
	FS (%)	FOBT (%)	FS (%)	FOBT (%)	FS (%)	FOBT (%)
Total (n = 108)	21 (19)	28 (26)	17 (16)	14 (13)	4 (4)	14 (13)
Gender						
Male (n = 36)	10 (28)	10 (28)	8 (22)	5 (14)	2 (6)	5 (14)
Female (n = 72)	11 (15)	18 (25)	9 (13)	9 (13)	2 (3)	9 (13)
Race						
White (n = 67)	18 (27)	20 (30)	13 (19)	10 (15)	5 (7)	10 (15)
Black (n = 41)	3 (7)*	8 (20)	3 (7)	4 (10)	0 (0)	4 (10)

* $p = 0.01$.

perform screening video FS in a dedicated procedure room located in the outpatient clinic facility. All procedures are performed under the supervision of general internal medicine attending physicians.

Study Population

A retrospective chart review of patients who received their care in the internal medicine resident clinics at the University of Nebraska Medical Center over a consecutive 4-wk period was performed. Patients considered appropriate candidates for CRC screening included those aged >50 yr at average risk for developing CRC and who had been followed by an internal medicine resident over a period of at least 6 months duration during which they had a minimum of two clinic visits. Exclusion criteria included patients who were at increased risk to develop CRC (family or personal history of adenomatous polyps, CRC, or polyposis syndromes), ongoing GI complaints necessitating colonic evaluation, severe comorbid illness for which screening was believed to be inappropriate, a previous lower GI evaluation by colonoscopy or barium enema in the preceding 3 yr, medical care provided directly by an attending physician, and patients who were only evaluated on a single occasion for a specific problem. The study was approved by the Institutional Review Board of the University of Nebraska Medical Center.

Data Collection

Two hundred consecutive medical records of patients seen in internal medicine residents clinics were screened by two investigators (D.L.Z. and J.K.D.), using a standardized form. Those charts that met the eligibility criteria were reviewed in further detail. Data recorded included patient demographics and details regarding performance of FOBT, FS, and other well-accepted preventive health care techniques (mammography, breast exam, pelvic exam, Pap smear, cholesterol testing, and rectal exam). An acceptable screening interval for each test was defined as follows: mammography, breast exam, cholesterol, and FOBT performed on a yearly basis; pelvic exam and pap smear performed every 3 yr; and sigmoidoscopy performed every 5 yr. Screening methods were considered offered and/or completed if there was documentation in the medical record.

Questionnaire

After pilot testing, a questionnaire, comprised of 25 questions, was distributed to all internal medicine residents. The survey was designed to assess: 1) habits regarding preventive care screening; 2) CRC screening knowledge; 3) perceived CRC screening compliance; 4) specific barriers to performing FS including difficulty scheduling/staffing procedures, technical problems with the equipment, residents uncomfortable performing the procedure and residents' perception of patients' reluctance to undergo the procedure, and/or the bowel preparation required before the procedure; and 5) personal attitudes toward performing FS.

Statistical Analysis

Data were analyzed using the SAS statistical program (SAS Institute, Cary, NC). The Fisher's exact test and χ^2 test were used to compare the proportion of patients receiving colon cancer screening with screening for other diseases. Student's t test was used to compare age between screening groups. Analysis of variance was used to compare age for the FOBT. Statistical significance was defined as $p < 0.05$. Analysis of the questionnaire was determined by calculations of the percentage of correct answer.

RESULTS

One hundred eight patients were considered appropriate for detailed chart review. The study population consisted of 36 men with a mean age of 60.3 yr (range = 51–77 yr) and 72 women with a mean age of 62.2 yr (range = 50–80 yr). Sixty-seven (62%) of the patients were white, and 41 (38%) were black. The residents performed FOBT in 13% of the patients and FS in only 16%. Table 1 depicts patient characteristics in terms of gender and race. No differences in CRC screening were present between men and women. Although whites were offered FS more often than blacks, no differences were identified in the actual performance rate. In contrast to CRC screening, the same residents appropriately performed mammography in 66%, cholesterol testing in

Table 2. Perceived and Actual Screening Rates by Medicine Residents

	Perceived Offered (%)	Actually Performed (%)	*p*
Mammography	100	66	ns
Cholesterol	100	53	ns
Pap smear	100	65	ns
FOBT	88	13	<0.05
Sigmoidoscopy	78	16	<0.05

53%, and Pap smear in 65% of patients. Table 2 demonstrates the residents perceived rate of offering various preventive care services compared with the actual rates of those services being performed.

Nineteen of 36 (53%) questionnaires were returned after a single mailing with the following breakdown by postgraduate year (PGY): four PGY-1, nine PGY-2, and six PGY-3. According to the report, residents believed they offered screening FS and FOBT to their patients most of the time; however, only 26% of the residents believed their patients were actually completing FS greater than half of the time. When asked to identify barriers to CRC screening using FS, 16 (84%) of the residents responding to the survey listed difficulty scheduling the procedure as the dominant barrier despite having a dedicated FS room and equipment available (Fig. 1).

All of the responding residents correctly identified both the age at which CRC screening should begin in an average-risk patient and the recommended interval between successive FOBT and FS screening after a negative initial exam. In contrast, only 50% correctly identified the appropriate means of follow-up for a positive FOBT, and 60% were unaware that the number of positive guaiac cards is irrelevant when deciding on the appropriate next step in management.

DISCUSSION

We demonstrate that the rate of CRC screening with FOBT and FS by our internal medicine residents was remarkably poor. Indeed, our data indicate that most of the patients in our analysis received inadequate CRC screening. This is particularly alarming as these simple and inexpensive tests have been unequivocally demonstrated to reduce mortality. For instance, Mandel *et al.* demonstrated a 33% decrease in mortality with yearly FOBT, whereas Selby *et al.* showed a 60% reduction in deaths from cancers in the surveyed bowel with sigmoidoscopy (2, 5). Moreover, a more recent report by Mandel *et al.* suggests that FOBT can actually decrease the incidence of cancers, presumably through detection and removal of premalignant lesions (6). Unfortunately, the dismal screening rate found in this study is consistent with the national average. During 1973–1997, Ries *et al.* reported that only 30.6% of adults aged >50 yr had undergone a sigmoidoscopy/proctoscopy in the preceding 5 yr (7). Furthermore, the FOBT rate found by Ries *et al.* (7) was 15% in 1987 and, despite vigorous patient education campaigns, only improved to 18% by 1998.

Data similar to ours have been reported in other internal medicine residency programs. Borum recently showed that only 29% and 13% of traditional 3-yr internal medicine residents at her program appropriately used screening FOBT and FS, respectively (8). In contrast, residents in a primary care track program performed CRC screening at a considerably higher rate with FS and FOBT performance rates of 71% and 81%, respectively. This indicates that we may be able to achieve substantially higher screening by modifying physician training. Although issues of patient reluctance to undergo procedures performed by physicians-in-training have been offered to explain poorer screening rates, recent data suggest that patient satisfaction is comparable when FS is perfomed by residents or staff physicians (9).

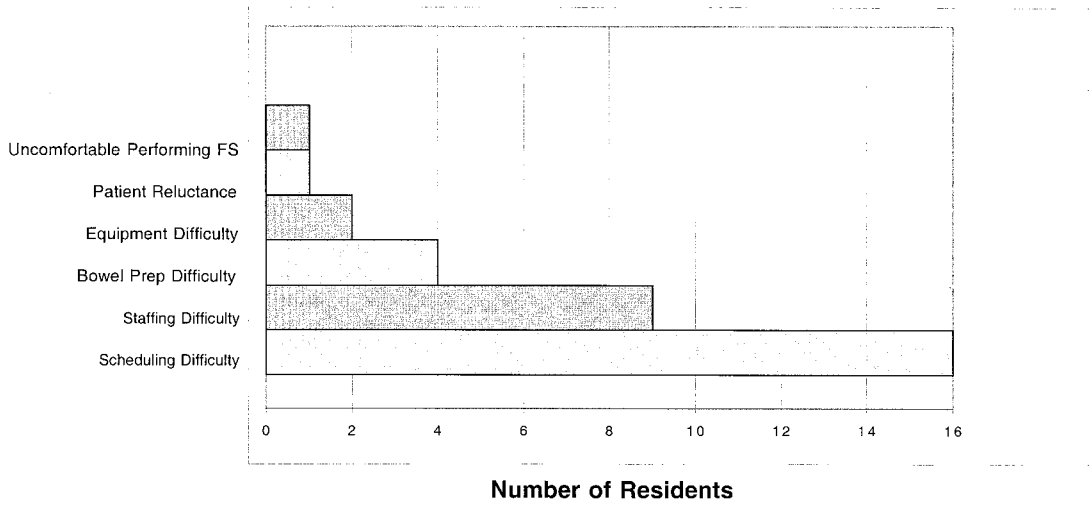


Figure 1. Resident perception of barriers to performing screening FS.

Our data suggest a difference in the rate of CRC screening offered to blacks compared with whites. Racial bias in screening may, possibly, be at least one of the reasons that blacks have more advanced CRC at diagnosis than whites and, hence, a poorer prognosis (10). Although it is difficult to assess the significance of this finding, given our relatively small patient population, similar results have been described with regards to cardiovascular screening in blacks (11). Indeed, given the higher incidence of colon cancer among blacks, it has been demonstrated that CRC screening is most cost-effective in the black population (12). Further studies are needed to clarify this issue.

The low level of FS and FOBT implementation in this study is in dramatic contrast to the adequate use of other health care maintenance strategies, such as mammography, cholesterol testing, and Pap smears. The clinical/public health consequences of the discrepancy between colon cancer screening and other screening practices is underscored by recent data, which suggest that CRC screening is slightly more cost-effective than a variety of other health care interventions including pneumococcal vaccinations and treatment of hypertension, whereas it is markedly more cost-effective than breast cancer screening (13). Indeed, a recent analysis indicates that the costs incurred by FS will be offset by the savings from early diagnosis and prevention of CRC (14).

The reason for the discordance between CRC screening and other health care maintenance practices reported in this study remains unclear. Previous reports on cancer screening practices among resident physicians have suggested that both physician and patient factors may be important. Myers *et al.* recently reported that there was substantial variability in physician intention to recommend colon cancer screening based on the physicians' perception of CRC screening effectiveness, board certification, and length of time in practice (15). Although our residents appeared to have a solid grasp of screening indications and strategies, fewer than half were able to appropriately manage a positive FOBT. This is consistent with results from a recent survey of primary care physicians in which only one-half of practitioners answered questions correctly regarding the evaluation of a heme-positive stool (16). Moreover, a survey of CRC screening knowledge in 168 internal medicine residents at four institutions demonstrated remarkably similar results, with only 29% recommending colonoscopy to evaluate a positive FOBT (17). Findings from our study suggest that at least part of the problem with poor screening rates appears to be a misperception by the residents of their colon cancer screening implementation. This may reflect both patient and physician reluctance to aggressively deal with colon cancer because of social norms reflecting distaste for CRC.

There are several caveats to the interpretation of these data. First, chart reviews have intrinsic weaknesses including their retrospective nature and their reliance upon information being appropriately documented. Nevertheless, Montano and Phillips recently demonstrated that, in cancer screening, the correlation between chart audits and patient surveys was very high (18). This methodology is also supported by a report from Luck *et al.* in which an assessment of quality of care was determined through chart review of encounters with standardized patients (19). They demonstrated that scores from chart review underestimated actual quality of care by only 14%, thus suggesting that the magnitude of the differences found in our study would not be adequately explained solely by these methodological differences alone (19). Secondly, the size of our patient population was modest and, despite a concerted effort, the internal medicine resident survey response rate was only 53%. This poor rate is, however, comparable with that seen in most physician surveys. Finally, our exclusion of patients having undergone full colonic evaluation within the last 3 yr only is more conservative than the screening guidelines currently recommended (*i.e.*, barium enema every 5 yr or colonoscopy every 10 yr); however, none of our 108 patients had previously undergone either study.

Despite these limitations, our data suggest that physicians have an important role in the underuse of colon cancer screening. With regard to physicians, it is particularly disturbing that residents, despite lectures on CRC and preventive medicine, had a screening rate comparable with the national average. It can be speculated that if these clinical habits are not ingrained during a residency program, they are even less likely to be nurtured in a busy primary care practice. Potential ways to improve physician implementation might include enhancing education on colon cancer and its prevention as well as offering structured FS instruction. Improved teaching aides, such as a virtual reality FS simulator, may also be helpful (20). The importance of having confidence in the performance of the procedure is underscored by the finding of Lewis *et al.*, who determined that the main reason that half of primary care physicians, who were trained in FS, did not perform this examination was self-perceived technical inadequacy (21). Finally, targeting differences in the perceived *versus* actual frequency of CRC implementation is also possible. Data from our institution suggest that an automated computer-based reminder system improves CRC cancer screening and other facets of health care maintenance (22).

In summary, in this audit of internal medicine resident practices, we have demonstrated that implementation of CRC screening guidelines was poor, especially when compared with other health care maintenance techniques. Factors that may account for this poor compliance include deficiencies in certain elements of CRC screening knowledge and differences between actual and perceived rates of CRC screening. Our study suggests that, in addition to increasing public awareness, an aggressive focus on physicians-in-training is important. This should include both didactic practical instruction and also feedback on CRC screening implementation. Further studies are necessary to determine how to optimize CRC screening compliance.

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Appendix SONNENBERG01

MARC View

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001 127577
003 SIRSI
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035 a| LIAS182089
019 a| MARS
022 a| 0003-9926
040 a| PSt c| PSt d| WaOLN
245 0 0 a| Archives of internal medicine.
247 1 0 f| Oct. 1950-June 1960, a| A. M. A. archives of internal medicine.
260 a| Chicago : b| American Medical Association.
362 0 a| v. 1- 1908-
650 0 a| Medicine v| Periodicals.
710 2 a| American Medical Association.
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949 a| R11.A87 v.162 no.20-22 2002 w| LCPER c| 1 i| 000051699130 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/13/2003
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949 a| R11.A87 v.166 no.9-12 2006 w| LCPER c| 1 i| 000055096249 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/11/2007
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949 a| R11.A87 v.168 no.18-22 2008 w| LCPER c| 1 i| 000059774761 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/4/2009
949 a| R11.A87 v.169 no.1-6 2009 w| LCPER c| 1 i| 000059779469 d| 3/9/2015 l| PATERNO-4 m| UP-PAT q| 2 r| Y s| Y t| PERIODICAL u| 9/29/2009
949 a| R11.A87 v.169 no.7-12 2009 w| LCPER c| 1 i| 000061840638 d| 7/9/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 12/23/2009
949 a| R11.A87 v.169 no.13-17 2009 w| LCPER c| 1 i| 000061886667 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/6/2010
949 a| R11.A87 v.169 no.18-22 2009 w| LCPER c| 1 i| 000061886674 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/6/2010
949 a| R11.A87 v.79 1947 w| LCPER c| 1 i| 000060017369 d| 8/16/2010 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/6/2010
949 a| R11.A87 v.118 1966 w| LCPER c| 1 i| 000060016928 d| 8/23/2010 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/23/2010
949 a| R11.A87 v.126 1970 w| LCPER c| 1 i| 000070482669 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 3/3/2011
949 a| R11.A87 v.2 1908 w| LCPER c| 1 i| 000070478495 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.3 1909 w| LCPER c| 1 i| 000070478501 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.4 1909 w| LCPER c| 1 i| 000070478518 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.5 1910 w| LCPER c| 1 i| 000070478525 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.6 1910 w| LCPER c| 1 i| 000070478532 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.7 1911 w| LCPER c| 1 i| 000070478549 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.8 1911 w| LCPER c| 1 i| 000070478556 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.9 1912 w| LCPER c| 1 i| 000070478563 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.10 1912 w| LCPER c| 1 i| 000070478570 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.11 1913 w| LCPER c| 1 i| 000070478587 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.12 1913 w| LCPER c| 1 i| 000070478594 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.13 1914 w| LCPER c| 1 i| 000070478600 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.14 1914 w| LCPER c| 1 i| 000070478617 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.15 1915 w| LCPER c| 1 i| 000070478624 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.16 1915 w| LCPER c| 1 i| 000070478631 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.18 1916 w| LCPER c| 1 i| 000070478648 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.19 1917 w| LCPER c| 1 i| 000070478655 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.20 1917 w| LCPER c| 1 i| 000070478662 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.21 1918 w| LCPER c| 1 i| 000070478679 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.22 1918 w| LCPER c| 1 i| 000070478686 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.23 1919 w| LCPER c| 1 i| 000070478693 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.24 1919 w| LCPER c| 1 i| 000070478709 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.25 1920 w| LCPER c| 1 i| 000070478716 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.26 1920 w| LCPER c| 1 i| 000070478723 d| 2/26/2024 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.27 1921 w| LCPER c| 1 i| 000070478730 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.28 1921 w| LCPER c| 1 i| 000070478747 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.29 1922 w| LCPER c| 1 i| 000070478754 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.30 1922 w| LCPER c| 1 i| 000070478761 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.31 1923 w| LCPER c| 1 i| 000070478778 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.32 1923 w| LCPER c| 1 i| 000070478785 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.33 1924 w| LCPER c| 1 i| 000070478792 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.34 1924 w| LCPER c| 1 i| 000070478808 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.35 1925 w| LCPER c| 1 i| 000070478815 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.36 1925 w| LCPER c| 1 i| 000070478822 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.37 1926 w| LCPER c| 1 i| 000070478839 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.38 1926 w| LCPER c| 1 i| 000070478846 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.39 1927 w| LCPER c| 1 i| 000070478853 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.40 1927 w| LCPER c| 1 i| 000070478860 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.41 1928 w| LCPER c| 1 i| 000070478877 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.42 1928 w| LCPER c| 1 i| 000070478884 l| CATO-2 m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011 z| 6613

949 a| R11.A87 v.43 1929 w| LCPER c| 1 i| 000070478891 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.44 1929 w| LCPER c| 1 i| 000070478907 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.45 1930 w| LCPER c| 1 i| 000070478914 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.46 1930 w| LCPER c| 1 i| 000070478921 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.47 1931 w| LCPER c| 1 i| 000070478938 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.48 1931 w| LCPER c| 1 i| 000070478945 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.49 1932 w| LCPER c| 1 i| 000070478952 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.50 1932 w| LCPER c| 1 i| 000070478969 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.51 1933 w| LCPER c| 1 i| 000070478976 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.52 1933 w| LCPER c| 1 i| 000070478983 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.53 1934 w| LCPER c| 1 i| 000070478990 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.54 1934 w| LCPER c| 1 i| 000070479003 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.55 1935 w| LCPER c| 1 i| 000070479010 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.56 1935 w| LCPER c| 1 i| 000070479027 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.57 1936 w| LCPER c| 1 i| 000070479034 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.58 1936 w| LCPER c| 1 i| 000070479041 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.59 1937 w| LCPER c| 1 i| 000070479058 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.60 1937 w| LCPER c| 1 i| 000070479065 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.61 1938 w| LCPER c| 1 i| 000070479072 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.62 1938 w| LCPER c| 1 i| 000070479089 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.63 1939 w| LCPER c| 1 i| 000070479096 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.64 1939 w| LCPER c| 1 i| 000070479102 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.65 1940 w| LCPER c| 1 i| 000070479119 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.66 1940 w| LCPER c| 1 i| 000070479126 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.67 1941 w| LCPER c| 1 i| 000070479133 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.68 1941 w| LCPER c| 1 i| 000070479140 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.69 1942 w| LCPER c| 1 i| 000070479157 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.70 1942 w| LCPER c| 1 i| 000070479164 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.71 1943 w| LCPER c| 1 i| 000070479171 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.72 1943 w| LCPER c| 1 i| 000070479188 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.73 1944 w| LCPER c| 1 i| 000070479195 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.74 1944 w| LCPER c| 1 i| 000070479201 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.75-76 1945 w| LCPER c| 1 i| 000070479218 d| 7/2/2013 e| 7/1/2013 l| ACAD-BLDG m| UP-ANNEX n| 1 r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.77 1946 w| LCPER c| 1 i| 000070479225 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.78 1946 w| LCPER c| 1 i| 000070479232 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.80 1947 w| LCPER c| 1 i| 000070479249 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.81 1948 w| LCPER c| 1 i| 000070479256 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.82 1948 w| LCPER c| 1 i| 000070479263 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.83 1949 w| LCPER c| 1 i| 000070479270 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.84 1949 w| LCPER c| 1 i| 000070479287 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.85 1950 w| LCPER c| 1 i| 000070479294 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.86 1950 w| LCPER c| 1 i| 000070479300 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.87 1951 w| LCPER c| 1 i| 000070479317 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.88 1951 w| LCPER c| 1 i| 000070479324 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.89 1952 w| LCPER c| 1 i| 000070479331 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.90 1952 w| LCPER c| 1 i| 000070479348 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.91 1953 w| LCPER c| 1 i| 000070479355 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.92 1953 w| LCPER c| 1 i| 000070482331 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.93 1954 w| LCPER c| 1 i| 000070482348 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.94 1954 w| LCPER c| 1 i| 000070482355 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.95 1955 w| LCPER c| 1 i| 000070482362 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.96 1955 w| LCPER c| 1 i| 000070482379 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.97 1956 w| LCPER c| 1 i| 000070482386 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.98 1956 w| LCPER c| 1 i| 000070482393 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.99 1957 w| LCPER c| 1 i| 000070482409 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.100 1957 w| LCPER c| 1 i| 000070482416 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.101 1958 w| LCPER c| 1 i| 000070482423 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.102 1958 w| LCPER c| 1 i| 000070482430 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.103 1959 w| LCPER c| 1 i| 000070482447 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.104 1959 w| LCPER c| 1 i| 000070482454 d| 12/14/2015 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.105 1960 w| LCPER c| 1 i| 000070482461 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.106 1960 w| LCPER c| 1 i| 000070482478 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.107 1961 w| LCPER c| 1 i| 000070482485 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.108 1961 w| LCPER c| 1 i| 000070482492 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.109 1962 w| LCPER c| 1 i| 000070482508 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011

949 a| R11.A87 v.110 1962 w| LCPER c| 1 i| 000070482515 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.111 1963 w| LCPER c| 1 i| 000070482522 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.112 1963 w| LCPER c| 1 i| 000070482539 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/20/2011
949 a| R11.A87 v.113 1964 w| LCPER c| 1 i| 000070482546 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.114 1964 w| LCPER c| 1 i| 000070482553 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.115 1965 w| LCPER c| 1 i| 000070482560 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.116 1965 w| LCPER c| 1 i| 000070482577 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.117 1966 w| LCPER c| 1 i| 000070482584 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.119 1967 w| LCPER c| 1 i| 000070482591 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.120 1967 w| LCPER c| 1 i| 000070482607 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.121 1968 w| LCPER c| 1 i| 000070482614 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.122 1968 w| LCPER c| 1 i| 000070482621 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.123 1969 w| LCPER c| 1 i| 000070482638 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.124 1969 w| LCPER c| 1 i| 000070482645 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.125 1970 w| LCPER c| 1 i| 000070482652 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 5/27/2011
949 a| R11.A87 v.127 1971 w| LCPER c| 1 i| 000073908517 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.128 1971 w| LCPER c| 1 i| 000073908500 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.129 1972 w| LCPER c| 1 i| 000073908593 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.130 1972 w| LCPER c| 1 i| 000073908609 d| 8/6/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.131 1973 w| LCPER c| 1 i| 000073908616 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.132 1973 w| LCPER c| 1 i| 000073908623 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.133 1974 w| LCPER c| 1 i| 000073908630 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.134 1974 w| LCPER c| 1 i| 000073908647 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 9/27/2012
949 a| R11.A87 v.135 no.1-6 1975 w| LCPER c| 1 i| 000073908654 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.135 no.7-12 1975 w| LCPER c| 1 i| 000073908661 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.136 no.1-6 1976 w| LCPER c| 1 i| 000073908678 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.136 no.7-12 1976 w| LCPER c| 1 i| 000073908760 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.137 no.1-6 1977 w| LCPER c| 1 i| 000073908753 d| 4/7/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.137 no.7-12 1977 w| LCPER c| 1 i| 000073908746 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.138 no.1-6 1978 w| LCPER c| 1 i| 000073908739 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.138 no.7-12 1978 w| LCPER c| 1 i| 000073908722 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.139 no.1-6 1979 w| LCPER c| 1 i| 000073908715 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.139 no.7-12 1979 w| LCPER c| 1 i| 000073908708 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.125-139 1970-79 Index w| LCPER c| 1 i| 000073908692 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.140 no.1-6 1980 w| LCPER c| 1 i| 000073908685 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.140 no.7-12 1980 w| LCPER c| 1 i| 000073908777 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.141 no.1-7 1981 w| LCPER c| 1 i| 000073908784 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.141 no.8-13 1981 w| LCPER c| 1 i| 000073908791 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.142 no.1-4 1982 w| LCPER c| 1 i| 000073908807 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.142 no.5-8 1982 w| LCPER c| 1 i| 000073908814 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.142 no.9-13 1982 w| LCPER c| 1 i| 000073908821 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.143 no.1-4 1983 w| LCPER c| 1 i| 000073908838 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.143 no.5-8 1983 w| LCPER c| 1 i| 000073908845 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.143 no.9-12 1983 w| LCPER c| 1 i| 000073908852 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.1-4 1984 w| LCPER c| 1 i| 000073908944 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.5-6 1984 w| LCPER c| 1 i| 000073908937 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.7-8 1984 w| LCPER c| 1 i| 000073908920 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.144 no.9-12 1984 w| LCPER c| 1 i| 000073908913 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.1-3 1985 w| LCPER c| 1 i| 000073908906 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.4-6 1985 w| LCPER c| 1 i| 000073908890 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.7-9 1985 w| LCPER c| 1 i| 000073908883 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.145 no.10-12 1985 w| LCPER c| 1 i| 000073908876 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.1-3 1986 w| LCPER c| 1 i| 000073908869 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.4-6 1986 w| LCPER c| 1 i| 000073909033 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.7-9 1986 w| LCPER c| 1 i| 000073909026 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.146 no.10-12 1986 w| LCPER c| 1 i| 000073909019 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.1-3 1987 w| LCPER c| 1 i| 000073909002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.4-6 1987 w| LCPER c| 1 i| 000073908999 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.7-9 1987 w| LCPER c| 1 i| 000073908982 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.147 no.10-12 1987 w| LCPER c| 1 i| 000073908975 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.1-3 1988 w| LCPER c| 1 i| 000073908968 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.4-6 1988 w| LCPER c| 1 i| 000073908951 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.7-9 1988 w| LCPER c| 1 i| 000073909040 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.148 no.10-12 1988 w| LCPER c| 1 i| 000073909057 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/1/2012
949 a| R11.A87 v.149 no.1-3 1989 w| LCPER c| 1 i| 000073909064 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012

949 a| R11.A87 v.149 no.4-6 1989 w| LCPER c| 1 i| 000073909071 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.149 no.7-9 1989 w| LCPER c| 1 i| 000073909088 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.149 no.10-12 1989 w| LCPER c| 1 i| 000073909095 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.1-3 1990 w| LCPER c| 1 i| 000073909101 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.4-6 1990 w| LCPER c| 1 i| 000073909118 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.7-9 1990 w| LCPER c| 1 i| 000073909125 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.150 no.10-12 1990 w| LCPER c| 1 i| 000073909217 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.1-3 1991 w| LCPER c| 1 i| 000073909200 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.4-6 1991 w| LCPER c| 1 i| 000073909194 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.7-9 1991 w| LCPER c| 1 i| 000073909187 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.151 no.10-12 1991 w| LCPER c| 1 i| 000073909170 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.1-2 1992 w| LCPER c| 1 i| 000073909163 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.3-4 1992 w| LCPER c| 1 i| 000073909156 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.5-6 1992 w| LCPER c| 1 i| 000073909149 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.7-8 1992 w| LCPER c| 1 i| 000073909132 d| 8/1/2022 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.9-10 1992 w| LCPER c| 1 i| 000073909224 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.152 no.11-12 1992 w| LCPER c| 1 i| 000073909231 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.1-4 1993 w| LCPER c| 1 i| 000073909248 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.5-8 1993 w| LCPER c| 1 i| 000073909255 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.9-12 1993 w| LCPER c| 1 i| 000073909262 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.13-16 1993 w| LCPER c| 1 i| 000073909279 d| 3/30/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.17-20 1993 w| LCPER c| 1 i| 000073909286 d| 4/3/2023 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.153 no.21-24 1993 w| LCPER c| 1 i| 000073909293 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.1-4 1994 w| LCPER c| 1 i| 000073909309 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.5-8 1994 w| LCPER c| 1 i| 000073909392 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.9-12 1994 w| LCPER c| 1 i| 000073909385 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.13-16 1994 w| LCPER c| 1 i| 000073909378 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.17-20 1994 w| LCPER c| 1 i| 000073909361 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.154 no.21-23 1994 w| LCPER c| 1 i| 000073909354 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.1-4 1995 w| LCPER c| 1 i| 000073909347 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.5-8 1995 w| LCPER c| 1 i| 000073909330 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.9-12 1995 w| LCPER c| 1 i| 000073909323 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.13-15 1995 w| LCPER c| 1 i| 000073909316 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.16-19 1995 w| LCPER c| 1 i| 000073909484 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.155 no.20-22 1995 w| LCPER c| 1 i| 000073909477 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.1-4 1996 w| LCPER c| 1 i| 000073909460 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.5-8 1996 w| LCPER c| 1 i| 000073909453 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.9-12 1996 w| LCPER c| 1 i| 000073909446 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.13-15 1996 w| LCPER c| 1 i| 000073909439 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.16-19 1996 w| LCPER c| 1 i| 000073909422 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.156 no.20-22 1996 w| LCPER c| 1 i| 000073909415 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.1-4 1997 w| LCPER c| 1 i| 000073909408 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.5-8 1997 w| LCPER c| 1 i| 000073909491 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.9-12 1997 w| LCPER c| 1 i| 000073909507 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.13-16 1997 w| LCPER c| 1 i| 000073909514 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.17-19 1997 w| LCPER c| 1 i| 000073909521 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.157 no.20-22 1997 w| LCPER c| 1 i| 000073909538 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.1-4 1998 w| LCPER c| 1 i| 000073909545 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.5-8 1998 w| LCPER c| 1 i| 000073909552 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.9-12 1998 w| LCPER c| 1 i| 000073909569 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.13-17 1998 w| LCPER c| 1 i| 000073909576 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.158 no.18-22 1998 w| LCPER c| 1 i| 000073909668 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.1-4 1999 w| LCPER c| 1 i| 000073909651 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.5-8 1999 w| LCPER c| 1 i| 000073909644 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.9-12 1999 w| LCPER c| 1 i| 000073909637 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.13-16 1999 w| LCPER c| 1 i| 000073909620 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.17-19 1999 w| LCPER c| 1 i| 000073909613 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.159 no.20-22 1999 w| LCPER c| 1 i| 000073909606 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.1-4 2000 w| LCPER c| 1 i| 000073909590 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.5-8 2000 w| LCPER c| 1 i| 000073909583 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.9-12 2000 w| LCPER c| 1 i| 000073909675 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.13-16 2000 w| LCPER c| 1 i| 000073909682 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
949 a| R11.A87 v.160 no.17-19 2000 w| LCPER c| 1 i| 000073909699 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/2/2012
852 0 1 a| PSt b| UP-ANNEX c| ANNEX h| R11 i| .A87

866		0	8| 0 a| v.1(1908)-v.126(1970)
852	0		a| PSt b| UP-PAT c| PATERNO-4 h| R11 i| .A87
866		0	8| 0 a| v.127(1971)-v.169(2009)

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R11.A87 v.169 no.7-12 2009	Bound Journal	Paterno - 4th Floor
R11.A87 v.169 no.1-6 2009	Bound Journal	Paterno - 4th Floor
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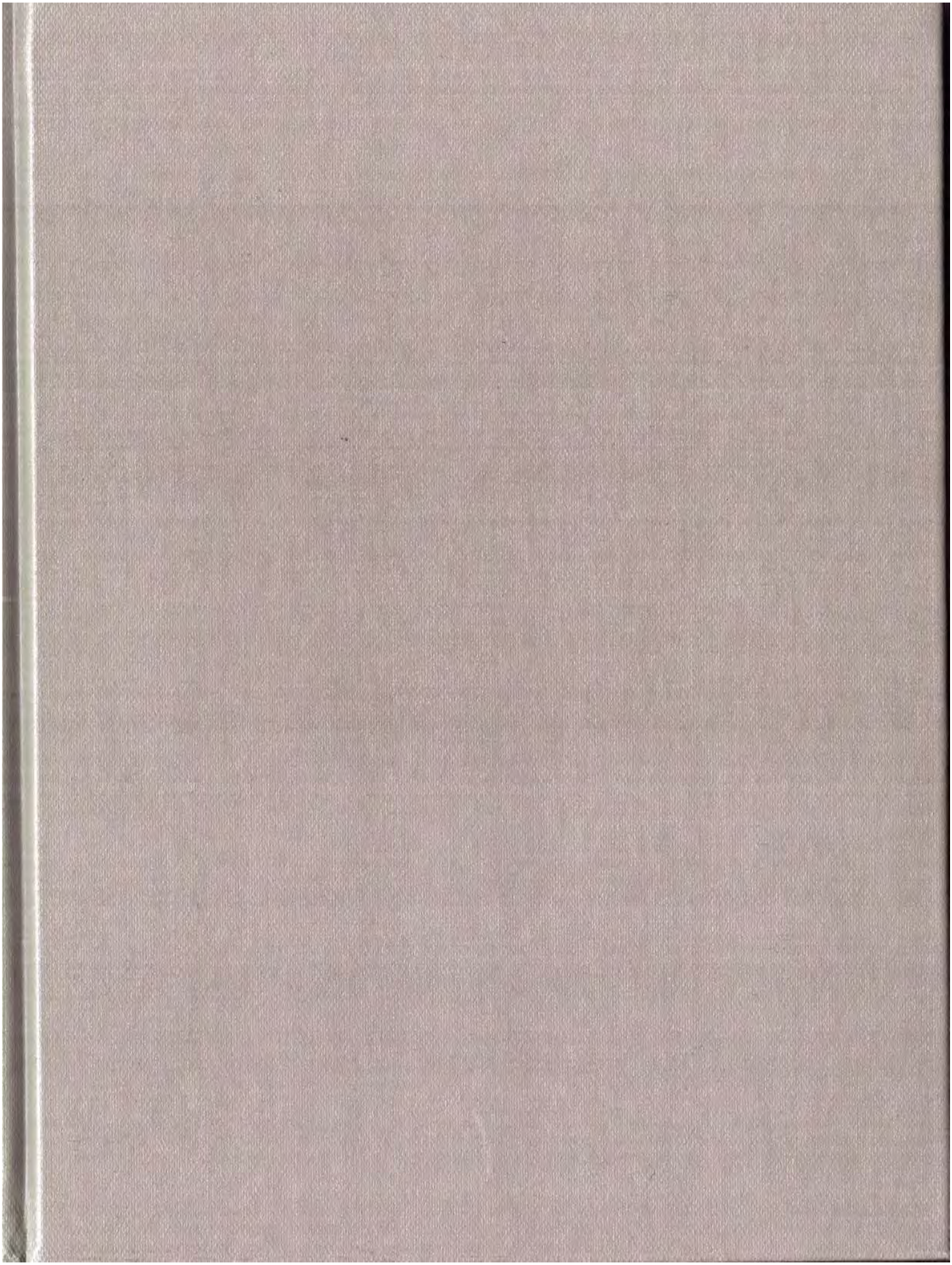
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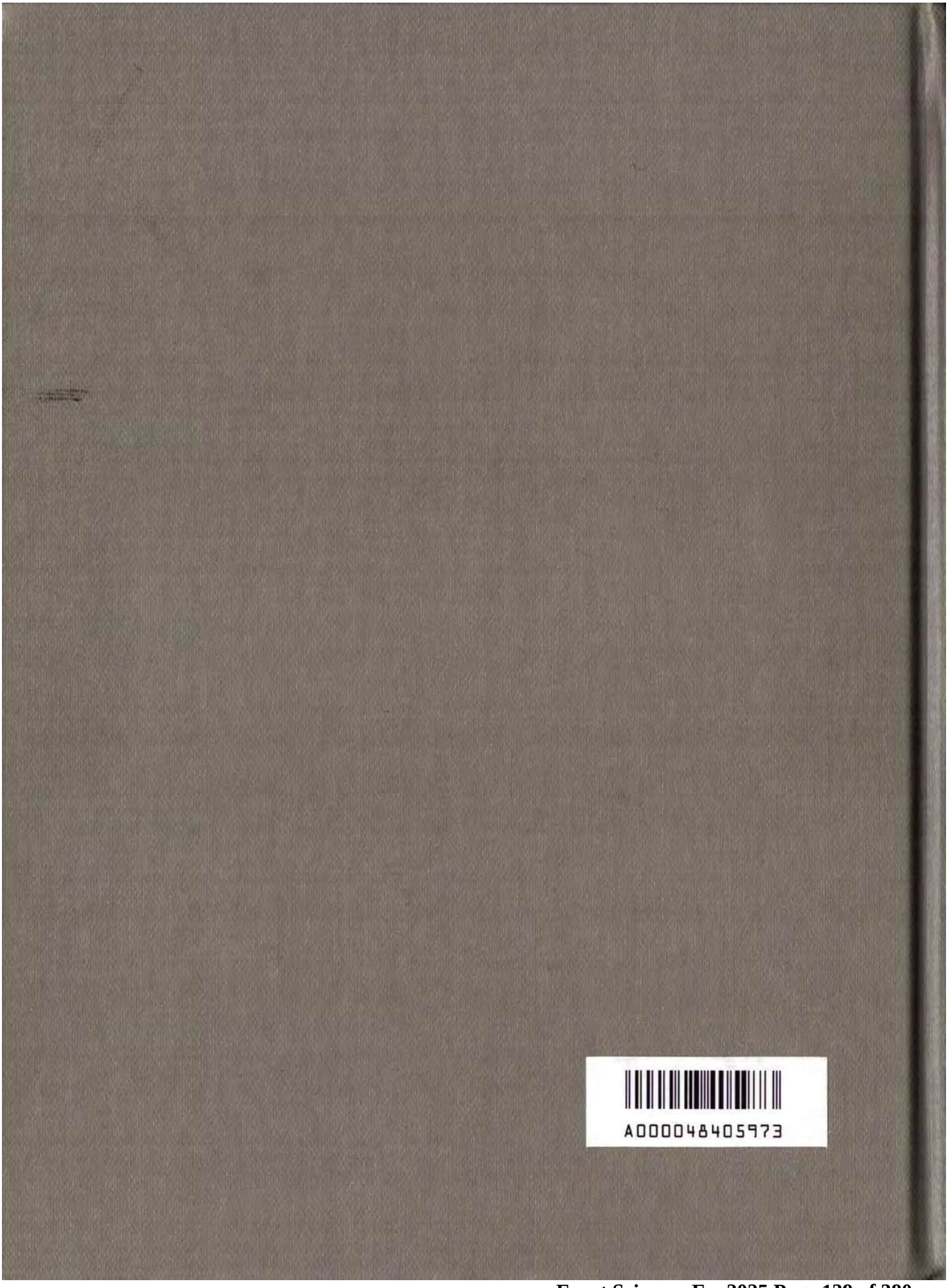
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ORIGINAL INVESTIGATION

Cost-effectiveness of a Single Colonoscopy in Screening for Colorectal Cancer

Amnon Sonnenberg, MD, MSc; Fabiola Delcò, MD, MPH

Background: A single colonoscopy at the age of 65 years has been recommended as a potential option to screen for colorectal cancer. This study compares the cost-effectiveness of 2 screening programs based on a single or repeated colonoscopy.

Methods: The cost-effectiveness of screening is analyzed with a computer model of a Markov process. A hypothetical population of 100 000 subjects aged 50 years undergoes a single colonoscopy at the age of 65 years or repeated colonoscopy every 10 years starting at the age of 50. Transition rates are estimated from US vital statistics and cancer statistics and published data on polyp incidence, patient compliance, and efficacy of colonoscopy plus polypectomy in cancer prevention. Costs of screening and cancer care are estimated from the 1998 Medicare reimbursement data using the perspective of a third-party payer.

Results: Compared with no screening, the incremental cost-effectiveness ratio of a single or repeated colonoscopy amounts to $2981 or to $10 983 per life year saved, respectively. A single colonoscopy saves most life years if done at the age of 60, but becomes most cost-effective after the age of 70. Depending on the level of compliance, repeated colonoscopies save 2 to 3 times more lives than a screening program based on a single colonoscopy.

Conclusions: A repeated colonoscopy every 10 years offers better prevention against colorectal cancer and represents a medically more desirable screening option. If high costs or low patient compliance renders this option not feasible, a single colonoscopy at the age of 65 would represent a highly cost-effective alternative.

Arch Intern Med. 2002;162:163-168

SEVERAL ECONOMIC analyses[1-5] have shown that screening of asymptomatic elderly subjects by colonoscopy would represent a cost-effective means to reduce mortality from colorectal cancer (CRC) in the general population. In a head-to-head comparison,[5] colonoscopy once per 10 years was found to be more cost-effective than a screening strategy based on flexible sigmoidoscopy every 5 or 10 years and annual fecal occult blood tests. Although screening with either flexible sigmoidoscopy or fecal occult blood testing was cheaper than screening with colonoscopy, in the long run colonoscopy prevented more cancers and saved more life years. The seeming cost advantage of the 2 cheaper screening programs became negated by subsequent costs for care of cancers that the initial screening by fecal occult blood testing or flexible sigmoidoscopy failed to prevent. The cost advantage of colonoscopy over the other screening options held up under a wide range of medical and economic conditions. Even if performed every 10 years, however, screening colonoscopy of the entire adult population older than 50 years would lead to appreciable health care expenditures.[5,6] Because of the high costs, predicted low patient compliance, and potential for complications associated with repeated colonoscopies, some researchers[2,7,8] have recommended a 1-time only screening colonoscopy during the entire lifetime. The highest yield in life years by preventing death from CRC would be achieved if the only colonoscopy per lifetime were scheduled between the ages of 65 and 70 years.[8] To our knowledge, the outcomes of 2 screening strategies based on a single or repeated colonoscopy have not been compared in a head-to-head comparison. The present study, therefore, aims to evaluate the cost-effectiveness of a screening program for CRC based on a single colonoscopy. The 2 screening methods, single vs repeated colonoscopy, are compared for the number of prevented CRCs and the costs spent per life year saved.

From the Gastroenterology Section, Department of Veterans Affairs Medical Center, and the Division of Gastroenterology, University of New Mexico, Albuquerque.

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MATERIALS AND METHODS

MARKOV MODEL

The cost-effectiveness of cancer screening is analyzed by a Markov process, using a spreadsheet (Excel; Microsoft, Redmond, Wash).[9] Medical events are modeled as transitions of patients among a set of predefined health states, the occurrence of each transition being governed by a probability value (**Figure 1**). The circles in Figure 1 symbolize the various health states, while the arrows symbolize transition probabilities among them. The time of the analysis is divided into equal increments of 1 year, during which patients may cycle from one state to another. The initial population is composed of 100 000 subjects aged 50 years who at the start are offered the screening colonoscopy. Depending on the initial compliance rate, subjects undergo a colonoscopy or enter the pool of noncompliant persons. After a normal colonoscopy result is obtained (there is no adenomatous polyp), subjects enter a new state labeled "status postcolonoscopy." In subjects compliant with a repeated screening, a colonoscopy is scheduled every 10 years. In the case of an adenomatous polyp, surveillance colonoscopy is repeated every 3 years until adenomatous polyps are no longer found. Subjects in any Markov state can develop CRC, the probability being given by the age-specific incidence rate. The likelihood of developing cancer is reduced in subjects after a normal colonoscopy result or after a polypectomy, depending on the rate of preventive efficacy assigned to the procedure. The time for which colonoscopy plus polypectomy provide protection against CRC is equal to the screening interval. The population in each state is also subjected to the annual age-specific death rate of the US population.[10] Screening by a single colonoscopy at the age of 65 years is modeled similarly to screening by multiple colonoscopies (Figure 1). However, no repeated colonoscopy is scheduled after the initial colonoscopy or after a successful polypectomy. Between the ages of 50 and 64 years and after the age of 75 years, subjects are exposed to the age-specific incidence rate of CRC without any potential protection from colonoscopy and polypectomy.

TRANSITION PROBABILITIES

The transition probabilities built into the model and their range tested in the sensitivity analyses are listed in **Table 1**. Under baseline conditions, subjects are assumed to be compliant with the screening program. In the sensitivity analyses, the compliance rates are varied within the ranges shown in Table 1. In a multicenter trial[13] of compliance rates, 45% of a random population accepted the offer of a screening sigmoidoscopy. Because no reliable data on colonoscopy are available, to our knowledge, compliance with the initial colonoscopy is estimated to be similar to that reported for flexible sigmoidoscopy. An 80% compliance rate for repeated colonoscopy is based on similar rates reported for repeated sigmoidoscopy and surveillance colonoscopy after polypectomy.[11,14] The prevalence rates of adenoma per 10-year age groups are available through autopsy studies.[12,21] An annual 1% incidence rate is calculated as the average difference between the prevalence rates of 2 consecutive age groups. The annual age-specific incidence rate of CRC is taken from published statistics of the Surveillance, Epidemiology, and End Results Program.[18] The efficacy of colonoscopy in reducing the incidence of CRC is estimated from data of the National Polyp Study.[14] Of all subjects with CRC, 40% are assumed to die of their disease.[18]

EFFECTIVENESS AND COSTS

The effectiveness of screening is measured in life years saved through prevention of death from CRC. The life years lost by the age-dependent fractions of patients dying prematurely of CRC are accumulated for each cycle during the entire expected lifetime. The life years saved through screening correspond to the difference in life years lost from cancer-related deaths between 2 Markov models with and without screening.

Medical, surgical, and diagnostic services are assigned code numbers using the physicians' *Current Procedural Terminology*[22] or diagnosis-related group[23] to identify the health care resources used for each patient. The code numbers are converted into costs for each health care resource used (Table 1). The costs represent the average payments allowed for each coded procedure by the US Health Care Financing Administration during fiscal year 2000. The cost also includes the possibility of hospitalization for bleeding or perforation after endoscopy with or without polypectomy.[15-17,24] The most recent cost estimates for the medical care of subjects with CRC range between $40 000 and $45 000.[20,25] All future costs arising from screening or care of CRC and all future life years saved through screening are discounted by an annual rate of 3%.[19]

The incremental cost-effectiveness ratio compares each type of intervention with the previous less effective option, including a strategy of no screening. The incremental cost-effectiveness ratio is calculated as the difference in costs divided by the corresponding difference in effectiveness.[26,27] In the present analysis, a negative incremental cost-effectiveness ratio indicates that a strategy would save lives and cost less than the comparative strategy of no screening.

RESULTS

BASELINE ASSUMPTIONS

Table 2 shows the outcomes of modeling screening programs to prevent CRC. The total number of CRCs represents all cancers to be expected during the remaining lifetime of a cohort of 50-year-old persons without screening. Under baseline conditions, screening by a single colonoscopy prevents 23% of all CRCs, compared with 75% prevented by screening with multiple colonoscopies. The higher fraction of cancers prevented through screening with repeated vs single colonoscopy also results in more life years saved. The fewer colonoscopies in single vs repeated screening translates into fewer complications. In the repeated colonoscopy program, 85% of the total costs arise from the endoscopic procedure itself. By contrast, the endoscopic procedure contributes only 28% to the total costs of the single colonoscopy screening program. In the latter program, the largest fraction of costs stems

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from care for unprevented cancer. The total costs of managing CRC increase going from no screening to single and then to repeated colonoscopy. At the same time, the effectiveness of screening, as evidenced by the number of life years saved, increases in the same order. Compared with no screening, single colonoscopy represents a cost-effective screening strategy of less than $3000 per life year saved. Repeated colonoscopy triples the overall amount of life years saved at the added expense of $14878 per additional life year saved compared with a single screening colonoscopy (Table 2). Compared with no screening, repeated colonoscopy is associated with an incremental cost-effectiveness ratio of $10983. In subsequent 1-way sensitivity analyses, the outcomes of the 2 screening strategies are further evaluated by systematically varying all assumptions built into the models.

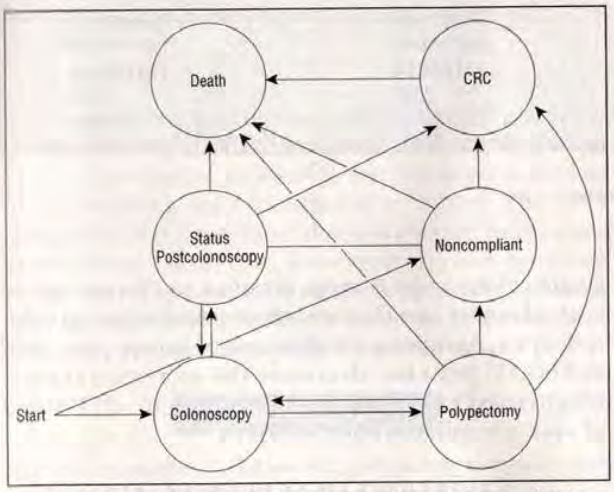


Figure 1. Markov state diagram of screening for colorectal cancer (CRC) by repeated colonoscopy. Circles indicate various health states; arrows, transitions between the various states; and noncompliant, subjects noncompliant with initial or repeated colonoscopy.

VARIATIONS OF COMPLIANCE RATES

Because the initial compliance determines how many persons enter the screening program, it influences in a linear fashion the overall number of cancers prevented and the total costs of the screening program. The incremental cost-effectiveness remains unaffected. For obvious reasons, any decrease in the repeated compliance rate affects only the program composed of multiple endoscopies. It reduces the overall number of cancers prevented and the number of life years saved through colonoscopy. The loss in compliance for test repetition makes the program of multiple colonoscopies become more similar to the program of a single colonoscopy. Because the incidence of CRC is characterized by an age-dependent increase, the yield of screening colonoscopy increases with age. The program of multiple colonoscopies initiated at the age of 50 years is especially hurt if many subjects leave the screening program after the first or second colonoscopy, before they come to benefit from the higher effectiveness of the screening program at an older age. Assuming a compliance rate of 80% with repeated colonoscopy results in an incremental cost-effectiveness ratio of $20533 per additional life year saved compared with a single screening colonoscopy and $13081 compared with no screening.

VARIATIONS OF COSTS

A lesser efficacy of colonoscopy plus polypectomy in preventing CRC reduces the overall effectiveness of both programs similarly, ie, fewer life years are saved. Because the

Table 1. Baseline Assumptions and Range Tested in the Sensitivity Analysis*

Variable	Baseline Model	Sensitivity Analysis	Source
Incidence of adenomas per year, %	1	0-6	Riff et al[11] and Williams et al[12]
Screening interval for colonoscopy, y	10	3-10	Winawer et al[4]
Surveillance interval after polypectomy, y	3	1-5	Winawer et al[4]
Compliance, %			
With initial colonoscopy	100	45	Atkin et al[13]
With repeated colonoscopy	100	80	Winawer et al[14]
Efficacy of colonoscopy in preventing CRC, %	75	50-100	Winawer et al[14]
Bleeding, %			
Colonoscopy	0.15	...	Haert and Classen[15]
Polypectomy	2.00	...	Waye et al[16]
Perforation, %			
Colonoscopy	0.20	...	Haert and Classen[15]
Polypectomy	0.38	...	Waye et al[16]
Sigmoidoscopy	0.01	...	Waye et al[17]
Mortality from CRC, %	40	...	Ries et al[18]
Annual discount, %	3	...	Weinstein and Stason[19]
Expenditures, $†			
Colonoscopy	696	100-1000	...
Polypectomy	1004	150-1500	...
Bleeding	4360	...	...
Perforation	13 000	...	...
Medical care for incurable CRC	45 228	60 000	Lee et al[20]

*CRC indicates colorectal cancer; ellipses, unchanged data in the sensitivity analysis or absence of particular references for cost data.
†Includes professional fees and facility costs.

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Table 2. Outcome of Screening Programs to Prevent CRC*

Variable	Screening Option		
	No Screening	Single Colonoscopy	Multiple Colonoscopies
Expected No. of CRCs without screening	5904	5904	5904
No. of prevented CRCs	0	1352	4428
Prevented/total CRCs, %	0	23	75
Life years saved	0	2604	7952
No. of colonoscopies	0	86 184	365 457
Diagnostic (without polypectomy)	0	77 566	328 911
Therapeutic (with polypectomy)	0	8618	36 546
No. of bleeding complications	0	289	1224
No. of screening-related perforations	0	188	797
No. of screening-related deaths	0	9	37
Costs, $			
Colonoscopy	0	41 091 209	189 667 598
Care for CRC	136 452 922	103 124 901	34 113 230
Total	**136 452 922**	**144 216 110**	**223 780 828**
Increment of costs/saved life year†	...	2981	14 878
Increment of many colonoscopies vs none	...	...	10 983

*CRC indicates colorectal cancer; ellipses, data not applicable.
†Incremental cost-effectiveness ratio, comparing each 2 consecutive screening options.

costs of colonoscopy remain unaffected by changes in effectiveness, the incremental cost-effectiveness ratios of both programs increase. For instance, a decrease of the efficacy rate from baseline of 75% to 50% increases the incremental cost-effectiveness ratio of single and repeated screening to $10 872 and $22 909, respectively, compared with no screening.

The incremental cost-effectiveness ratio of both screening programs (compared with no screening) decreases with decreasing cost of colonoscopy. If the colonoscopy cost decreases below a certain threshold, screening saves more money from preventing cancer than the money spent on the screening procedure itself. For instance, varying the cost of colonoscopy between $100 and $1000 changes the incremental cost-effectiveness ratio of a single colonoscopy between −$5664 and $19 309, the threshold for the cost per colonoscopy being $304. Secondary to the larger number of colonoscopies involved, the program of repeated screening is more sensitive to changes in the colonoscopy cost. Varying the cost of colonoscopy to between $100 and $1000 changes the incremental cost-effectiveness ratio of repeated colonoscopy to between −$2086 and $35 661. The threshold cost per colonoscopy is $150. Because complications of colonoscopy make the procedure overall more expensive, changes in the incidence or the cost of complications affect the outcome as similarly as the colonoscopy cost. Secondary to their relatively infrequent occurrence, however, the overall impact of complications on the cost-effectiveness ratio is rather small.

The introduction of new and expensive chemotherapy for advanced CRCs, such as raltitrexed, irinotecan hydrochloride, and oxaliplatin, may increase the costs associated with cancer care.[28] As a general rule, more expensive cancer care renders prevention a more cost-effective medical option. Fewer cancers are prevented and more costs arise from cancer care in the single vs the repeated screening program. Therefore, screening with a single colonoscopy is more sensitive to changes in the costs of cancer care than is screening with repeated colonoscopies. Assuming a higher cost of cancer care, such as $60 000 per case, decreases the incremental cost-effectiveness ratio of single colonoscopy to −$1199 and of multiple colonoscopies to $6779.

VARIATIONS OF SCREENING AGE

The effectiveness of any type of screening is directly correlated with the incidence of the disease for which it is designed. Because the incidence rate of CRC shows a marked age-dependent increase, the number of cancers prevented per single colonoscopy is higher in an older than a younger population of screenees. If repeated screening is started at ages older than 50, the less effective initial colonoscopy (at the age of 50) is saved at the expense of missing some CRCs affecting relatively few subjects between the ages of 50 and 60. The subsequent colonoscopies performed every 10 years will still be able to prevent most cancers that occur in the older age groups. Screening by a single colonoscopy is far more likely to lose its preventive power if scheduled too early or too late. **Figure 2** shows the relationship between the age at a single screening and the effectiveness of the program for the percentage of life years saved. The analyses are based on the assumption of a 100% compliance rate. It appears that most life years could be saved by a single colonoscopy done at the age of 60. As subjects grow older, their risk of developing CRC increases, but the benefit of cancer prevention decreases because of the concomitant decrease in life expectancy. Preventing cancer in subjects much younger than 60 may be associated with an appreciable increase in life expectancy for the individual patient, but the chance of actually being able to do so is limited by the overall low incidence rate of CRC.

Figure 3 shows the relationship between the age at screening and the incremental cost-effectiveness ra-

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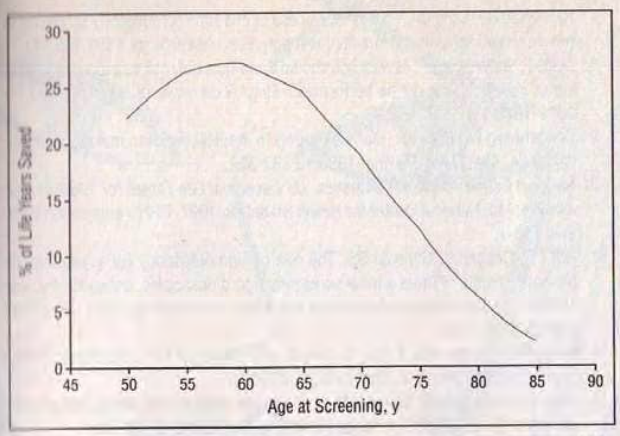


Figure 2. Influence of age at the single colonoscopy on the percentage of life years saved.

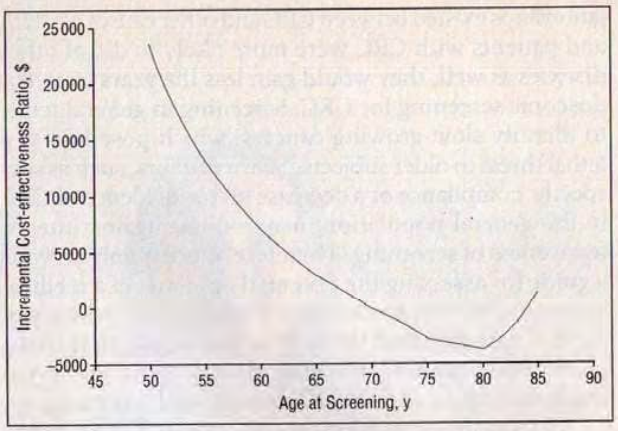


Figure 3. Influence of age at the single colonoscopy on the incremental cost-effectiveness ratio of screening compared with no screening.

tio of a single colonoscopy screening program. The curve exhibits a steady decline that crosses the 0 line at the age of 70. The negative ratios indicate that beyond the age of 70, screening costs less than no screening. The costs spent on screening are more than outweighed by the costs saved by less cancer care. From a strictly money-saving perspective, the best age for a single screening colonoscopy lies between 75 and 80, because the screening program may actually save rather that incur costs.

COMMENT

In previous studies,[1-5] the use of colonoscopy every 10 years has been demonstrated to be a cost-effective means to prevent mortality from CRC that compares favorably with flexible sigmoidoscopy or annual fecal occult blood testing. When applied to the general population, however, colonoscopic screening every 10 years after the age of 50 becomes a costly health measure.[5] The aim of the present economic analysis was to provide a head-to-head comparison between 2 screening programs using either a single colonoscopy once per lifetime or repeated colonoscopies every 10 years. Depending on the level of compliance, repeated colonoscopies could save 2 to 3 times more lives than a screening program based on a single colonoscopy. If third-party payers were able to provide the financial resources and subjects were willing to participate, a screening program composed of multiple colonoscopies represents the better yet more expensive alternative. Under tighter economic conditions with only limited funds available for cancer screening, a single colonoscopy between the ages of 65 and 70 offers a relatively cheap and highly cost-effective means of screening for CRC.

The same type of Markov process was used to model the impact of single and repeated colonoscopies. In the past, this model was also used to study fecal occult blood testing and flexible sigmoidoscopy.[5] The comparisons among the different screening strategies are based on the same set of transition probabilities and cost estimates built into the model. This facilitates the direct comparisons between the various screening alternatives, because it eliminates the need to adjust for differences in the assumptions built into various economic models. To be able to compare a screening with a no screening strategy, the cost estimates of cancer care also need to be considered by the economic model. This increases the total costs associated with each program, because each program is penalized for the cancers it fails to prevent.

A previous analysis[8] suggested that the best age for a single colonoscopy to save most life years from death due to CRC would be between 65 and 70 years. This previous analysis looked at the gains of colonoscopy screening from a strictly medical perspective, with the primary focus on the interests of the individual subject undergoing a single screening procedure. Each remaining year lived at a different age was weighted by an age-weight function that took into account the age-dependent decline in life's social value.[29,30] In contradistinction, the present analysis looks at the gains of a single screening colonoscopy from a societal perspective, with the primary focus on the amount of life years saved in the total population. This variable is influenced not only by the life expectancy of the individual screenee but also by the total number of subjects within the population who at each age will benefit from cancer prevention. Future gains in life years are discounted by a constant annual rate of 3%, but not by an age-dependent weight function. Despite these differences, both studies reach a similar conclusion. The greatest economic advantage results from screening after the age of 70, while the greatest medical advantage is achieved by screening at the age of 60. Screening at the age of 65 seems to provide a good compromise between the 2 different perspectives. At this age, the number of life years saved is still close to the maximum value, yet the incremental cost-effectiveness ratio is markedly less than at the age of 60. In any case, the incremental cost-effectiveness ratio of a single colonoscopy is far less than that of any other competing screening strategy.

The decision models of the present article are built on the assumption that endoscopic prevention could negate cancer-related loss in life years and that patients would fully benefit from the restored life expectancy of an average population without CRC. The models do not consider the presence of other competing medical risks in some of the subjects undergoing screening at the age of 65 to 70 years. Such subjects may already have serious heart disease, hypertension, or diabetes, which could shorten their life expectancy irrespective of CRC. If re-

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lationships existed between CRC and other causes of death and patients with CRC were more likely to die of other diseases as well, they would gain less life years from endoscopic screening for CRC. Screening in general tends to identify slow-growing cancers, which pose less of a lethal threat to older subjects.[31] Other factors, such as sex-specific compliance or a decrease in the incidence of CRC in the general population, may militate against the effectiveness of screening. Therefore, models only serve as a guide for assessing the potential outcome of a medical strategy. Decision models do not obviate the primacy of clinical data gathered through controlled clinical trials, because they cannot account for all factors that may eventually determine the cost-effectiveness of screening.

In conclusion, the present economic analysis suggests that a single colonoscopy at the age of 65 years represents a cost-effective means to screen for CRC. It is more cost-effective than fecal occult blood testing or flexible sigmoidoscopy every 5 or 10 years. Such screening is, however, less effective in saving life years than a repeated colonoscopy every 10 years. At an incremental increase in cost-effectiveness that would seem still economically feasible, repeated screening offers a much greater potential for prevention and represents a medically more desirable option. For political and economic reasons, however, repeated screening by colonoscopy every 10 years may remain an elusive goal. It also may not be accepted by the general consumer as a worthwhile means to prolong life expectancy. Under such circumstances, a single colonoscopy at the age of 65 would represent the next best alternative.

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949 a| R15.A48 v.146 no.1-9 1951 w| LCPER c| 1 i| 000047776746 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.146 no.10-17 1951 w| LCPER c| 1 i| 000047776753 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.147 no.1-9 1951 w| LCPER c| 1 i| 000047776760 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.147 no.10-18 1951 w| LCPER c| 1 i| 000047776777 d| 9/22/2002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.148 no.1-8 1952 w| LCPER c| 1 i| 000047776784 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.148 no.9-17 1952 w| LCPER c| 1 i| 000047776791 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.149 no.1-9 1952 w| LCPER c| 1 i| 000047776807 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.149 no.10-18 1952 w| LCPER c| 1 i| 000047776814 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.150 no.1-8 1952 w| LCPER c| 1 i| 000047776821 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.150 no.9-17 1952 w| LCPER c| 1 i| 000047776838 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.151 no.1-9 1953 w| LCPER c| 1 i| 000047776845 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.151 no.10-17 1953 w| LCPER c| 1 i| 000047776852 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.152 no.1-9 1953 w| LCPER c| 1 i| 000047776869 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.152 no.10-18 1953 w| LCPER c| 1 i| 000047776876 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.153 no.1-9 1953 w| LCPER c| 1 i| 000047776883 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.153 no.10-17 1953 w| LCPER c| 1 i| 000047776890 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.154 no.1-9 1954 w| LCPER c| 1 i| 000047776906 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.154 no.10-17 1954 w| LCPER c| 1 i| 000047776913 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.155 no.1-9 1954 w| LCPER c| 1 i| 000047776920 d| 9/22/2002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.155 no.10-18 1954 w| LCPER c| 1 i| 000047776937 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.156 no.1-9 1954 w| LCPER c| 1 i| 000047776944 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.156 no.10-17 1954 w| LCPER c| 1 i| 000047776951 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.157 no.1-9 1955 w| LCPER c| 1 i| 000047776968 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.157 no.10-18 1955 w| LCPER c| 1 i| 000047776975 d| 4/7/2004 e| 4/7/2004 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.158 no.1-8 1955 w| LCPER c| 1 i| 000047776982 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.158 no.9-17 1955 w| LCPER c| 1 i| 000047776999 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.159 no.1-9 1955 w| LCPER c| 1 i| 000047777002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.159 no.10-18 1955 w| LCPER c| 1 i| 000047777019 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.160 no.1-8 1956 w| LCPER c| 1 i| 000047777026 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.160 no.9-17 1956 w| LCPER c| 1 i| 000047777033 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.161 no.1-9 1956 w| LCPER c| 1 i| 000047777040 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.161 no.10-17 1956 w| LCPER c| 1 i| 000047777057 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.162 no.1-9 1956 w| LCPER c| 1 i| 000047777064 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.162 no.10-18 1956 w| LCPER c| 1 i| 000047777071 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.163 no.1-8 1957 w| LCPER c| 1 i| 000047777088 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.163 no.9-17 1957 w| LCPER c| 1 i| 000047777095 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.164 no.1-9 1957 w| LCPER c| 1 i| 000047777101 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.164 no.10-18 1957 w| LCPER c| 1 i| 000047777118 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.165 no.1-8 1957 w| LCPER c| 1 i| 000047777125 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.165 no.9-17 1957 w| LCPER c| 1 i| 000047777132 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.166 no.1-8 1958 w| LCPER c| 1 i| 000047777149 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.166 no.9-17 1958 w| LCPER c| 1 i| 000047777156 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.167 no.1-9 1958 w| LCPER c| 1 i| 000047777163 d| 4/8/2015 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.167 no.10-18 1958 w| LCPER c| 1 i| 000047777170 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.168 no.1-4 1958 w| LCPER c| 1 i| 000047777187 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.168 no.5-8 1958 w| LCPER c| 1 i| 000047777194 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.168 no.9-17 1958 w| LCPER c| 1 i| 000047777200 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.169 no.1-9 1959 w| LCPER c| 1 i| 000047777217 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.169 no.10-17 1959 w| LCPER c| 1 i| 000047777224 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.170 no.1-9 1959 w| LCPER c| 1 i| 000047777231 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.170 no.10-18 1959 w| LCPER c| 1 i| 000047777248 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.171 no.1-9 1959 w| LCPER c| 1 i| 000047777255 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.171 no.10-17 1959 w| LCPER c| 1 i| 000047777262 d| 9/22/2002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.172 no.1-9 1960 w| LCPER c| 1 i| 000047777279 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.172 no.10-18 1960 w| LCPER c| 1 i| 000047777286 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.173 no.1-8 1960 w| LCPER c| 1 i| 000047777293 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.173 no.9-17 1960 w| LCPER c| 1 i| 000047777309 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.174 no.1-9 1960 w| LCPER c| 1 i| 000047777316 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.175 1961 w| LCPER c| 1 i| 000047777323 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.176 1961 w| LCPER c| 1 i| 000047777330 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.177 1961 w| LCPER c| 1 i| 000047777347 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.178 1961 w| LCPER c| 1 i| 000047777354 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.179 1962 w| LCPER c| 1 i| 000047777361 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.180 1962 w| LCPER c| 1 i| 000047777378 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.181 1962 w| LCPER c| 1 i| 000047777385 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.182 1962 w| LCPER c| 1 i| 000047777392 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.183 1963 w| LCPER c| 1 i| 000047777408 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.184 1963 w| LCPER c| 1 i| 000047777415 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.186 1963 w| LCPER c| 1 i| 000047777439 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.187 no.1-7 1964 w| LCPER c| 1 i| 000047777446 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.187 no.8-13 1964 w| LCPER c| 1 i| 000047777453 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.188 no.1-6 1964 w| LCPER c| 1 i| 000047777460 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.188 no.7-13 1964 w| LCPER c| 1 i| 000047777477 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.189 no.1-6 1964 w| LCPER c| 1 i| 000047777484 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.189 no.7-13 1964 w| LCPER c| 1 i| 000047777491 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.190 no.1-7 1964 w| LCPER c| 1 i| 000047777507 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.190 no.8-13 1964 w| LCPER c| 1 i| 000047777514 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.191 no.1-7 1965 w| LCPER c| 1 i| 000047777521 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.191 no.8-13 1965 w| LCPER c| 1 i| 000047777538 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.192 no.1-7 1965 w| LCPER c| 1 i| 000047777545 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.192 no.8-13 1965 w| LCPER c| 1 i| 000047777552 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.193 no.1-6 1965 w| LCPER c| 1 i| 000047777569 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.193 no.7-13 1965 w| LCPER c| 1 i| 000047777576 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.194 no.1-6 1965 w| LCPER c| 1 i| 000047777583 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.194 no.7-13 1965 w| LCPER c| 1 i| 000047777590 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.195 no.1-6 1966 w| LCPER c| 1 i| 000047777606 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.195 no.7-13 1966 w| LCPER c| 1 i| 000047778016 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.196 no.1-6 1966 w| LCPER c| 1 i| 000047778023 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.196 no.7-13 1966 w| LCPER c| 1 i| 000047778030 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.197 no.1-7 1966 w| LCPER c| 1 i| 000047778047 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.197 no.8-13 1966 w| LCPER c| 1 i| 000047778054 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.198 no.1-7 1966 w| LCPER c| 1 i| 000047778061 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.198 no.8-13 1966 w| LCPER c| 1 i| 000047778078 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.199 no.1-7 1967 w| LCPER c| 1 i| 000047778085 d| 2/17/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.199 no.8-13 1967 w| LCPER c| 1 i| 000047778092 d| 2/17/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.200 no.1-6 1967 w| LCPER c| 1 i| 000047778108 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.201 no.1-7 1967 w| LCPER c| 1 i| 000047778115 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.201 no.8-13 1967 w| LCPER c| 1 i| 000047778122 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.202 no.1-7 1967 w| LCPER c| 1 i| 000047778139 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.202 no.8-13 1967 w| LCPER c| 1 i| 000047778146 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.203 no.1-5 1968 w| LCPER c| 1 i| 000047778153 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.203 no.6-9 1968 w| LCPER c| 1 i| 000047778160 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.203 no.10-13 1968 w| LCPER c| 1 i| 000047778177 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.204 no.1-5 1968 w| LCPER c| 1 i| 000047778184 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.204 no.6-9 1968 w| LCPER c| 1 i| 000047778191 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.204 no.10-13 1968 w| LCPER c| 1 i| 000047778207 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.205 no.1-5 1968 w| LCPER c| 1 i| 000047778214 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.205 no.6-9 1968 w| LCPER c| 1 i| 000047778221 d| 8/26/2003 e| 8/26/2003 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.205 no.10-13 1968 w| LCPER c| 1 i| 000047778238 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.206 no.1-5 1968 w| LCPER c| 1 i| 000047778245 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.206 no.6-9 1968 w| LCPER c| 1 i| 000047778252 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.206 no.10-13 1968 w| LCPER c| 1 i| 000047778269 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.207 no.1-4 1969 w| LCPER c| 1 i| 000047778276 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.207 no.5-8 1969 w| LCPER c| 1 i| 000047778283 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.207 no.9-13 1969 w| LCPER c| 1 i| 000047778290 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.208 no.1-4 1969 w| LCPER c| 1 i| 000047778306 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.208 no.5-8 1969 w| LCPER c| 1 i| 000047778313 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.208 no.9-13 1969 w| LCPER c| 1 i| 000047778320 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.209 no.1-4 1969 w| LCPER c| 1 i| 000047778337 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.209 no.5-8 1969 w| LCPER c| 1 i| 000047778344 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.209 no.9-13 1969 w| LCPER c| 1 i| 000047778351 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.210 no.1-4 1969 w| LCPER c| 1 i| 000047778368 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.210 no.5-8 1969 w| LCPER c| 1 i| 000047778375 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.210 no.9-13 1969 w| LCPER c| 1 i| 000047778382 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.211 no.1-4 1970 w| LCPER c| 1 i| 000047778399 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.211 no.5-8 1970 w| LCPER c| 1 i| 000047778405 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.211 no.9-13 1970 w| LCPER c| 1 i| 000047779211 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.212 no.1-4 1970 w| LCPER c| 1 i| 000047779228 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.212 no.5-8 1970 w| LCPER c| 1 i| 000047779235 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.212 no.9-13 1970 w| LCPER c| 1 i| 000047779242 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.213 no.1-4 1970 w| LCPER c| 1 i| 000047779259 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.213 no.5-9 1970 w| LCPER c| 1 i| 000047779266 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.213 no.10-13 1970 w| LCPER c| 1 i| 000047779273 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.214 no.1-4 1970 w| LCPER c| 1 i| 000047779280 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.214 no.5-9 1970 w| LCPER c| 1 i| 000047779297 d| 12/12/2017 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.214 no.10-13 1970 w| LCPER c| 1 i| 000047779303 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.215 no.1-4 1971 w| LCPER c| 1 i| 000047779310 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.215 no.5-8 1971 w| LCPER c| 1 i| 000047779327 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.215 no.9-13 1971 w| LCPER c| 1 i| 000047779334 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.216 no.1-4 1971 w| LCPER c| 1 i| 000047779341 d| 3/22/2005 e| 3/22/2005 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.216 no.5-9 1971 w| LCPER c| 1 i| 000047779358 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.216 no.10-13 1971 w| LCPER c| 1 i| 000047779365 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.217 no.1-4 1971 w| LCPER c| 1 i| 000047779372 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.217 no.5-9 1971 w| LCPER c| 1 i| 000047779389 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.217 no.10-13 1971 w| LCPER c| 1 i| 000047779396 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.218 no.1-4 1971 w| LCPER c| 1 i| 000047779402 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.218 no.5-9 1971 w| LCPER c| 1 i| 000047779419 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.218 no.10-13 1971 w| LCPER c| 1 i| 000047779426 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.219 no.1-5 1972 w| LCPER c| 1 i| 000047779433 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.219 no.6-9 1972 w| LCPER c| 1 i| 000047779440 d| 3/22/2005 e| 3/22/2005 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.219 no.10-13 1972 w| LCPER c| 1 i| 000047779457 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.220 no.1-4 1972 w| LCPER c| 1 i| 000047779464 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.220 no.5-9 1972 w| LCPER c| 1 i| 000047779471 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.220 no.10-13 1972 w| LCPER c| 1 i| 000047779488 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.221 no.1-5 1972 w| LCPER c| 1 i| 000047779495 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.221 no.6-9 1972 w| LCPER c| 1 i| 000047779501 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.221 no.10-13 1972 w| LCPER c| 1 i| 000047779518 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.222 no.1-5 1972 w| LCPER c| 1 i| 000047779525 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.222 no.6-9 1972 w| LCPER c| 1 i| 000047779532 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.222 no.10-13 1972 w| LCPER c| 1 i| 000047779549 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.223 no.1-5 1973 w| LCPER c| 1 i| 000047779556 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.223 no.6-9 1973 w| LCPER c| 1 i| 000047779563 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.223 no.10-13 1973 w| LCPER c| 1 i| 000047779570 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.224 no.1-5 1973 & suppl. w| LCPER c| 1 i| 000047779587 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.224 no.6-9 1973 w| LCPER c| 1 i| 000047779594 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.224 no.10-13 1973 w| LCPER c| 1 i| 000047779600 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.225 no.1-5 1973 w| LCPER c| 1 i| 000047779617 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.225 no.6-9 1973 & suppl. w| LCPER c| 1 i| 000047779624 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.225 no.10-13 1973 w| LCPER c| 1 i| 000047779631 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.226 no.1-5 1973 w| LCPER c| 1 i| 000047779648 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.226 no.6-9 1973 w| LCPER c| 1 i| 000047779655 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.226 no.10-13 1973 w| LCPER c| 1 i| 000047779662 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.227 no.1-4 1974 w| LCPER c| 1 i| 000047779679 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.227 no.5-8 1974 w| LCPER c| 1 i| 000047779686 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.227 no.9-12 1974 w| LCPER c| 1 i| 000047779693 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.228 no.1-5 1974 w| LCPER c| 1 i| 000047779709 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.228 no.6-9 1974 w| LCPER c| 1 i| 000047779716 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.228 no.10-13 1974 w| LCPER c| 1 i| 000047779723 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.229 no.1-5 1974 w| LCPER c| 1 i| 000047779730 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.229 no.6-9 1974 w| LCPER c| 1 i| 000047779747 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.229 no.10-14 1974 w| LCPER c| 1 i| 000047779754 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.230 no.1-4 1974 w| LCPER c| 1 i| 000047779761 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.230 no.5-12 1974 w| LCPER c| 1 i| 000047779778 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.231 no.1-4 1975 w| LCPER c| 1 i| 000047779785 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.231 no.5-8 1975 w| LCPER c| 1 i| 000047779792 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.231 no.9-13 1975 w| LCPER c| 1 i| 000047779808 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.232 no.1-4 1975 w| LCPER c| 1 i| 000047779815 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.232 no.5-8 1975 w| LCPER c| 1 i| 000047779822 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.232 no.9-13 1975 w| LCPER c| 1 i| 000047779839 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.233 no.1-4 1975 w| LCPER c| 1 i| 000047779846 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.233 no.5-8 1975 w| LCPER c| 1 i| 000047779853 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.233 no.9-13 1975 w| LCPER c| 1 i| 000047779860 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.234 no.1-4 1975 w| LCPER c| 1 i| 000047779877 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.234 no.5-8 1975 w| LCPER c| 1 i| 000047779884 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.234 no.9-13 1975 w| LCPER c| 1 i| 000047779891 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.235 no.1-4 1976 w| LCPER c| 1 i| 000047779907 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.235 no.5-8 1976 w| LCPER c| 1 i| 000047779914 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.235 no.9-13 1976 w| LCPER c| 1 i| 000047779921 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.235 no.14-17 1976 w| LCPER c| 1 i| 000047779938 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.235 no.18-22 1976 w| LCPER c| 1 i| 000047779945 d| 9/22/2002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.235 no.23-26 1976 w| LCPER c| 1 i| 000047779952 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.236 no.1-4 1976 w| LCPER c| 1 i| 000047779969 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.236 no.5-9 1976 & suppl. w| LCPER c| 1 i| 000047779976 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.236 no.10-13 1976 w| LCPER c| 1 i| 000047779983 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.236 no.14-17 1976 w| LCPER c| 1 i| 000047779990 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.236 no.18-22 1976 w| LCPER c| 1 i| 000047780002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.236 no.23-26 1976 w| LCPER c| 1 i| 000047780019 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.237 no.1-5 1977 w| LCPER c| 1 i| 000047780026 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.237 no.6-9 1977 w| LCPER c| 1 i| 000047780033 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.237 no.10-17 1977 w| LCPER c| 1 i| 000047780040 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.237 no.18-26 1977 w| LCPER c| 1 i| 000047780057 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.238 no.1-9 1977 w| LCPER c| 1 i| 000047780064 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.238 no.10-18 1977 w| LCPER c| 1 i| 000047780071 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.238 no.19-26 1977 w| LCPER c| 1 i| 000047780088 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.211-230 1970-74 index w| LCPER c| 1 i| 000047780095 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.239 no.1-9 1978 w| LCPER c| 1 i| 000047780101 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.239 no.10-17 1978 w| LCPER c| 1 i| 000047780118 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.239 no.18-26 1978 w| LCPER c| 1 i| 000047780125 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.240 no.1-8 1978 w| LCPER c| 1 i| 000047780132 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.240 no.9-18 1978 w| LCPER c| 1 i| 000047780149 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.240 no.19-26 1978 w| LCPER c| 1 i| 000047780156 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.241 no.1-8 1979 w| LCPER c| 1 i| 000047780163 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.241 no.9-17 1979 w| LCPER c| 1 i| 000047780170 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.241 no.18-26 1979 w| LCPER c| 1 i| 000047780187 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.242 no.1-8 1979 w| LCPER c| 1 i| 000047780194 d| 6/24/2024 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.242 no.9-17 1979 w| LCPER c| 1 i| 000047780200 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.242 no.18-26 1979 w| LCPER c| 1 i| 000047780217 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.231-242 1975-79 index w| LCPER c| 1 i| 000047780224 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.243 no.1-8 1980 w| LCPER c| 1 i| 000047780231 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.243 no.9-16 1980 w| LCPER c| 1 i| 000047780248 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.243 no.17-24 1980 w| LCPER c| 1 i| 000047780255 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.244 no.1-8 1980 w| LCPER c| 1 i| 000047780262 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.244 no.9-17 1980 w| LCPER c| 1 i| 000047780279 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.244 no.18-25 1980 w| LCPER c| 1 i| 000047780286 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.245 no.1-8 1981 w| LCPER c| 1 i| 000047780293 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.245 no.9-16 1981 w| LCPER c| 1 i| 000047780309 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.245 no.17-24 1981 w| LCPER c| 1 i| 000047780316 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.246 no.1-9 1981 w| LCPER c| 1 i| 000047780323 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.246 no.10-17 1981 w| LCPER c| 1 i| 000047780330 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.246 no.18-25 1981 w| LCPER c| 1 i| 000047780347 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.247 no.1-8 1982 w| LCPER c| 1 i| 000047780354 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.247 no.9-16 1982 w| LCPER c| 1 i| 000047780361 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.247 no.17-24 1982 w| LCPER c| 1 i| 000047780378 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.248 no.1-8 1982 w| LCPER c| 1 i| 000047780385 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.248 no.9-16 1982 w| LCPER c| 1 i| 000047780392 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.248 no.17-20 1982 w| LCPER c| 1 i| 000047780408 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.248 no.21-24 1982 w| LCPER c| 1 i| 000047780415 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.249 no.1-4 1983 w| LCPER c| 1 i| 000047780422 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.249 no.5-8 1983 w| LCPER c| 1 i| 000047780439 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.249 no.9-12 1983 w| LCPER c| 1 i| 000047780446 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.249 no.13-16 1983 w| LCPER c| 1 i| 000047780453 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.249 no.17-20 1983 w| LCPER c| 1 i| 000047780460 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.249 no.21-24 1983 w| LCPER c| 1 i| 000047780477 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.250 no.1-4 1983 w| LCPER c| 1 i| 000047780484 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.250 no.5-8 1983 w| LCPER c| 1 i| 000047780491 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.250 no.9-12 1983 w| LCPER c| 1 i| 000047780507 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.250 no.13-16 1983 w| LCPER c| 1 i| 000047780514 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.250 no.17-20 1983 w| LCPER c| 1 i| 000047780521 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.250 no.21-24 1983 w| LCPER c| 1 i| 000047780538 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.251 no.1-4 1984 w| LCPER c| 1 i| 000047780545 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.251 no.5-8 1984 w| LCPER c| 1 i| 000047780552 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.251 no.9-12 1984 w| LCPER c| 1 i| 000047780569 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.251 no.13-16 1984 w| LCPER c| 1 i| 000047780576 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.251 no.17-20 1984 w| LCPER c| 1 i| 000047780583 d| 8/27/2008 e| 8/27/2008 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.251 no.21-24 1984 w| LCPER c| 1 i| 000047780590 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.252 no.1-4 1984 w| LCPER c| 1 i| 000047780606 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.252 no.5-8 1984 w| LCPER c| 1 i| 000047780613 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.252 no.9-12 1984 w| LCPER c| 1 i| 000047780620 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.252 no.13-16 1984 w| LCPER c| 1 i| 000047780637 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.252 no.17-20 1984 w| LCPER c| 1 i| 000047780644 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.252 no.21-24 1984 w| LCPER c| 1 i| 000047780651 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.253 no.1-4 1985 w| LCPER c| 1 i| 000047780668 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.253 no.5-8 1985 w| LCPER c| 1 i| 000047780675 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.253 no.9-12 1985 w| LCPER c| 1 i| 000047780682 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.253 no.13-16 1985 w| LCPER c| 1 i| 000047780699 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.253 no.17-20 1985 w| LCPER c| 1 i| 000047780705 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.253 no.21-24 1985 w| LCPER c| 1 i| 000047780712 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.254 no.1-4 1985 w| LCPER c| 1 i| 000047780729 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.254 no.5-8 1985 w| LCPER c| 1 i| 000047780736 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.254 no.9-12 1985 w| LCPER c| 1 i| 000047780743 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.254 no.13-16 1985 w| LCPER c| 1 i| 000047780750 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.254 no.17-20 1985 w| LCPER c| 1 i| 000047780767 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.254 no.21-24 1985 w| LCPER c| 1 i| 000047780774 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.255 no.1-4 1986 w| LCPER c| 1 i| 000047780781 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.255 no.5-8 1986 w| LCPER c| 1 i| 000047780798 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.255 no.9-12 1986 w| LCPER c| 1 i| 000047780804 d| 1/7/2003 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.255 no.13-16 1986 w| LCPER c| 1 i| 000047780811 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.255 no.17-20 1986 w| LCPER c| 1 i| 000047780828 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.255 no.21-24 1986 w| LCPER c| 1 i| 000047780835 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.256 no.5-8 1986 w| LCPER c| 1 i| 000047780842 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.256 no.9-12 1986 w| LCPER c| 1 i| 000047780859 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.256 no.13-16 1986 w| LCPER c| 1 i| 000047780866 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.256 no.17-20 1986 w| LCPER c| 1 i| 000047780873 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.256 no.21-24 1986 w| LCPER c| 1 i| 000047780880 d| 1/3/2002 e| 1/3/2002 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.257 no.1-4 1987 w| LCPER c| 1 i| 000047780897 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.257 no.5-8 1987 w| LCPER c| 1 i| 000047780903 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.257 no.9-12 1987 w| LCPER c| 1 i| 000047780910 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.257 no.13-16 1987 w| LCPER c| 1 i| 000047780927 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.257 no.17-20 1987 w| LCPER c| 1 i| 000047780934 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.257 no.21-24 1987 w| LCPER c| 1 i| 000047780941 d| 9/12/2004 e| 9/12/2004 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.258 no.1-4 1987 w| LCPER c| 1 i| 000047780958 d| 6/29/2008 e| 6/28/2008 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.258 no.5-8 1987 w| LCPER c| 1 i| 000047780965 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.258 no.9-12 1987 w| LCPER c| 1 i| 000047780972 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.258 no.13-16 1987 w| LCPER c| 1 i| 000047780989 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.258 no.17-20 1987 w| LCPER c| 1 i| 000047780996 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.258 no.21-24 1987 w| LCPER c| 1 i| 000047781009 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.259 no.1-4 1988 w| LCPER c| 1 i| 000047781016 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.259 no.5-8 1988 w| LCPER c| 1 i| 000047781023 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.259 no.9-12 1988 w| LCPER c| 1 i| 000047781030 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.259 no.13-16 1988 w| LCPER c| 1 i| 000047781047 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.259 no.17-20 1988 w| LCPER c| 1 i| 000047781054 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.259 no.21-24 1988 w| LCPER c| 1 i| 000047781061 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.260 no.1-4 1988 w| LCPER c| 1 i| 000047781078 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.260 no.5-8 1988 w| LCPER c| 1 i| 000047781085 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.260 no.9-12 1988 w| LCPER c| 1 i| 000047781092 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.260 no.13-16 1988 w| LCPER c| 1 i| 000047781108 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.260 no.17-20 1988 w| LCPER c| 1 i| 000047781115 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.260 no.21-24 1988 w| LCPER c| 1 i| 000047781122 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.261 no.1-4 1989 w| LCPER c| 1 i| 000051690045 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.261 no.5-8 1989 w| LCPER c| 1 i| 000047781146 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.261 no.9-12 1989 w| LCPER c| 1 i| 000047781153 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.261 no.13-16 1989 w| LCPER c| 1 i| 000047781160 d| 1/7/2003 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.261 no.17-20 1989 w| LCPER c| 1 i| 000047781177 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.261 no.21-24 1989 w| LCPER c| 1 i| 000047781184 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.262 no.1-4 1989 w| LCPER c| 1 i| 000047781191 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.262 no.5-8 1989 w| LCPER c| 1 i| 000047781207 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.262 no.13-16 1989 w| LCPER c| 1 i| 000047781214 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.262 no.21-24 1989 w| LCPER c| 1 i| 000047781221 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.263 no.1-4 1990 w| LCPER c| 1 i| 000055785631 d| 7/7/2005 e| 5/26/2005 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.263 no.5-8 1990 w| LCPER c| 1 i| 000047781245 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.263 no.9-12 1990 w| LCPER c| 1 i| 000047781252 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.263 no.13-16 1990 w| LCPER c| 1 i| 000047781269 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.263 no.17-20 1990 w| LCPER c| 1 i| 000047781276 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.263 no.21-24 1990 w| LCPER c| 1 i| 000055785624 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.264 no.1-4 1990 w| LCPER c| 1 i| 000047781290 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.264 no.5-8 1990 w| LCPER c| 1 i| 000047781306 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.264 no.9-12 1990 w| LCPER c| 1 i| 000047781313 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.264 no.13-16 1990 w| LCPER c| 1 i| 000047781320 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.264 no.17-20 1990 w| LCPER c| 1 i| 000047781337 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.264 no.21-24 1990 w| LCPER c| 1 i| 000047781344 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.265 no.1-4 1991 w| LCPER c| 1 i| 000047781351 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.265 no.5-8 1991 w| LCPER c| 1 i| 000047781368 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.265 no.9-12 1991 w| LCPER c| 1 i| 000047781375 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.265 no.13-16 1991 w| LCPER c| 1 i| 000047781382 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.265 no.17-20 1991 w| LCPER c| 1 i| 000047781399 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.265 no.21-24 1991 w| LCPER c| 1 i| 000047781405 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.266 no.1-4 1991 w| LCPER c| 1 i| 000047781412 d| 5/7/2024 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.266 no.5-8 1991 w| LCPER c| 1 i| 000047781429 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.266 no.9-12 1991 w| LCPER c| 1 i| 000047781436 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.266 no.13-16 1991 w| LCPER c| 1 i| 000047781443 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.266 no.17-20 1991 w| LCPER c| 1 i| 000047781450 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.267 no.1-4 1992 w| LCPER c| 1 i| 000047781467 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.267 no.5-8 1992 w| LCPER c| 1 i| 000047781474 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.267 no.9-12 1992 w| LCPER c| 1 i| 000047781481 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.267 no.13-16 1992 w| LCPER c| 1 i| 000047781498 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.267 no.17-20 1992 w| LCPER c| 1 i| 000047781504 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.267 no.21-24 1992 w| LCPER c| 1 i| 000047781511 d| 5/5/2021 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.268 no.1-4 1992 w| LCPER c| 1 i| 000047781528 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.268 no.5-8 1992 w| LCPER c| 1 i| 000047781535 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.268 no.9-12 1992 w| LCPER c| 1 i| 000047781542 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.268 no.13-16 1992 w| LCPER c| 1 i| 000047781559 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.268 no.17-20 1992 w| LCPER c| 1 i| 000047781566 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.268 no.21-24 1992 w| LCPER c| 1 i| 000047781573 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.269 no.1-4 1993 w| LCPER c| 1 i| 000047781580 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.269 no.5-8 1993 w| LCPER c| 1 i| 000047781597 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.269 no.9-12 1993 w| LCPER c| 1 i| 000047781603 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.269 no.13-16 1993 w| LCPER c| 1 i| 000047781610 d| 2/1/2006 e| 2/1/2006 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.269 no.17-20 1993 w| LCPER c| 1 i| 000047781627 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.269 no.21-24 1993 w| LCPER c| 1 i| 000047781634 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.270 no.1-4 1993 w| LCPER c| 1 i| 000047781641 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.270 no.5-8 1993 w| LCPER c| 1 i| 000047781658 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.270 no.9-12 1993 w| LCPER c| 1 i| 000047781665 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.270 no.13-16 1993 w| LCPER c| 1 i| 000047781672 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.270 no.17-20 1993 w| LCPER c| 1 i| 000047781689 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.270 no.21-24 1993 w| LCPER c| 1 i| 000047781696 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.271 no.1-4 1994 w| LCPER c| 1 i| 000047781702 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.271 no.5-8 1994 w| LCPER c| 1 i| 000047781719 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.271 no.9-12 1994 w| LCPER c| 1 i| 000047781726 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.271 no.13-16 1994 w| LCPER c| 1 i| 000047781733 d| 6/7/2024 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.271 no.17-20 1994 w| LCPER c| 1 i| 000047781740 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.271 no.21-24 1994 w| LCPER c| 1 i| 000047781757 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.272 no.1-4 1994 w| LCPER c| 1 i| 000047781764 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.272 no.5-8 1994 w| LCPER c| 1 i| 000047781771 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.272 no.9-12 1994 w| LCPER c| 1 i| 000047781788 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.272 no.13-16 1994 w| LCPER c| 1 i| 000047781795 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.272 no.17-20 1994 w| LCPER c| 1 i| 000047781801 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.272 no.21-24 1994 w| LCPER c| 1 i| 000047781818 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.273 no.1-4 1995 w| LCPER c| 1 i| 000047781825 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.273 no.5-8 1995 w| LCPER c| 1 i| 000047781832 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.273 no.9-12 1995 w| LCPER c| 1 i| 000047781849 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.273 no.13-16 1995 w| LCPER c| 1 i| 000047781856 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.273 no.17-20 1995 w| LCPER c| 1 i| 000047781863 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.273 no.21-24 1995 w| LCPER c| 1 i| 000047781870 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.274 no.1-4 1995 w| LCPER c| 1 i| 000047781887 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.274 no.5-8 1995 w| LCPER c| 1 i| 000047781894 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.274 no.9-12 1995 w| LCPER c| 1 i| 000047781900 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.274 no.13-16 1995 w| LCPER c| 1 i| 000047781917 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.274 no.17-20 1995 w| LCPER c| 1 i| 000047781924 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.274 no.21-24 1995 w| LCPER c| 1 i| 000047781931 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.275 no.1-4 1996 w| LCPER c| 1 i| 000047781948 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.275 no.5-8 1996 w| LCPER c| 1 i| 000047781955 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.275 no.9-12 1996 w| LCPER c| 1 i| 000047781962 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.275 no.13-16 1996 w| LCPER c| 1 i| 000047781979 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.275 no.17-20 1996 w| LCPER c| 1 i| 000047781986 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.276 no.1-4 1996 w| LCPER c| 1 i| 000047781993 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.276 no.5-8 1996 w| LCPER c| 1 i| 000047782006 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.276 no.9-12 1996 w| LCPER c| 1 i| 000047782013 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.276 no.13-16 1996 w| LCPER c| 1 i| 000047782020 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.276 no.17-20 1996 w| LCPER c| 1 i| 000047782037 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.276 no.21-24 1996 w| LCPER c| 1 i| 000047782044 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.277 no.1-4 1997 w| LCPER c| 1 i| 000047782051 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.277 no.5-8 1997 w| LCPER c| 1 i| 000047782068 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.277 no.9-12 1997 w| LCPER c| 1 i| 000047782075 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.277 no.13-16 1997 w| LCPER c| 1 i| 000047782082 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.277 no.17-20 1997 w| LCPER c| 1 i| 000047782099 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.277 no.21-24 1997 w| LCPER c| 1 i| 000047782105 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.278 no.1-4 1997 w| LCPER c| 1 i| 000047782112 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.278 no.5-8 1997 w| LCPER c| 1 i| 000047782129 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.278 no.9-12 1997 w| LCPER c| 1 i| 000047782136 d| 5/1/2007 e| 5/1/2007 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.278 no.13-16 1997 w| LCPER c| 1 i| 000047782143 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.278 no.17-20 1997 w| LCPER c| 1 i| 000047782150 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.278 no.21-24 1997 w| LCPER c| 1 i| 000047782167 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.279 no.1-4 1998 w| LCPER c| 1 i| 000047782174 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.279 no.5-8 1998 w| LCPER c| 1 i| 000047782181 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.279 no.9-12 1998 w| LCPER c| 1 i| 000047782198 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.279 no.13-16 1998 w| LCPER c| 1 i| 000047782204 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.279 no.17-20 1998 w| LCPER c| 1 i| 000047782211 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.279 no.21-24 1998 w| LCPER c| 1 i| 000047782228 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.280 no.1-4 1998 w| LCPER c| 1 i| 000047782235 d| 6/22/2011 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.280 no.9-12 1998 w| LCPER c| 1 i| 000047782242 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.280 no.13-16 1998 w| LCPER c| 1 i| 000047782259 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.280 no.17-20 1998 w| LCPER c| 1 i| 000047782266 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.280 no.21-24 1998 w| LCPER c| 1 i| 000047782273 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.281 no.1-4 1999 w| LCPER c| 1 i| 000047782280 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.281 no.5-8 1999 w| LCPER c| 1 i| 000047782297 d| 5/10/2012 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.281 no.9-12 1999 w| LCPER c| 1 i| 000047782303 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.281 no.13-16 1999 w| LCPER c| 1 i| 000047782310 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.281 no.17-20 1999 w| LCPER c| 1 i| 000047782327 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.281 no.21-24 1999 w| LCPER c| 1 i| 000047782334 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.282 no.1-4 1999 w| LCPER c| 1 i| 000047782341 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.282 no.5-8 1999 w| LCPER c| 1 i| 000047782358 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.282 no.9-12 1999 w| LCPER c| 1 i| 000047782365 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.282 no.13-16 1999 w| LCPER c| 1 i| 000047782372 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.282 no.17-20 1999 w| LCPER c| 1 i| 000047782389 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.283 no.1-4 2000 w| LCPER c| 1 i| 000047782396 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.283 no.5-8 2000 w| LCPER c| 1 i| 000047782402 d| 9/22/2002 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.283 no.9-12 2000 w| LCPER c| 1 i| 000047782419 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.283 no.17-20 2000 w| LCPER c| 1 i| 000047782426 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.283 no.21-24 2000 w| LCPER c| 1 i| 000047782433 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.284 no.1-4 2000 w| LCPER c| 1 i| 000047782440 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.284 no.5-8 2000 w| LCPER c| 1 i| 000047782457 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.284 no.9-12 2000 w| LCPER c| 1 i| 000047782464 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001

949 a| R15.A48 v.284 no.13-16 2000 w| LCPER c| 1 i| 000047782471 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.284 no.17-20 2000 w| LCPER c| 1 i| 000047782488 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/17/2001
949 a| R15.A48 v.285 no.17-20 2001 w| LCPER c| 1 i| 000048233743 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/4/2001
949 a| R15.A48 v.285 no.5-8 2001 w| LCPER c| 1 i| 000047602175 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/12/2001
949 a| R15.A48 v.285 no.9-12 2001 w| LCPER c| 1 i| 000047614253 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/2/2001
949 a| R15.A48 v.285 no.1-4 2001 w| LCPER c| 1 i| 000047207189 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/20/2001
949 a| R15.A48 v.284 no.21-24 2000 w| LCPER c| 1 i| 000047198357 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/26/2001
949 a| R15.A48 v.285 no.21-24 2001 w| LCPER c| 1 i| 000048262996 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/18/2001
949 a| R15.A48 v.286 no.5-8 2001 w| LCPER c| 1 i| 000048262972 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/18/2001
949 a| R15.A48 v.286 no.9-12 2001 w| LCPER c| 1 i| 000048262989 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/18/2001
949 a| R15.A48 v.286 no.1-4 2001 w| LCPER c| 1 i| 000048261845 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 12/18/2001
949 a| R15.A48 v.286 no.13-16 2001 w| LCPER c| 1 i| 000048289672 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/19/2002
949 a| R15.A48 v.286 no.17-20 2001 w| LCPER c| 1 i| 000048289771 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/19/2002
949 a| R15.A48 v.286 no.21-24 2001 w| LCPER c| 1 i| 000048289764 d| 5/21/2012 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 3/19/2002
949 a| R15.A48 v.185 no.1-6 1963 w| LCPER c| 1 i| 000048318525 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/20/2002
949 a| R15.A48 v.185 no.7-13 1963 w| LCPER c| 1 i| 000048318532 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 5/20/2002
949 a| R15.A48 v.287 no.13-16 2002 w| LCPER c| 1 i| 000048397315 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/25/2002
949 a| R15.A48 v.287 no.9-12 2002 w| LCPER c| 1 i| 000048397308 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/25/2002
949 a| R15.A48 v.287 no.5-8 2002 w| LCPER c| 1 i| 000048397292 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/25/2002
949 a| R15.A48 v.287 no.1-4 2002 w| LCPER c| 1 i| 000048397285 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/25/2002
949 a| R15.A48 v.287 no.17-20 2002 w| LCPER c| 1 i| 000048457163 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/29/2002
949 a| R15.A48 v.287 no.21-24 2002 w| LCPER c| 1 i| 000048430937 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/6/2002
949 a| R15.A48 v.288 no.1-4 2002 w| LCPER c| 1 i| 000048430920 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/6/2002
949 a| R15.A48 v.288 no.13-16 2002 w| LCPER c| 1 i| 000051749453 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/9/2003
949 a| R15.A48 v.288 no.5-8 2002 w| LCPER c| 1 i| 000051749842 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/9/2003
949 a| R15.A48 v.288 no.9-12 2002 w| LCPER c| 1 i| 000051749835 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/9/2003
949 a| R15.A48 v.288 no.17-20 2002 w| LCPER c| 1 i| 000051855956 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 4/4/2003
949 a| R15.A48 v.288 no.21-24 2002 w| LCPER c| 1 i| 000051855512 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 4/4/2003
949 a| R15.A48 v.289 no.5-8 2003 w| LCPER c| 1 i| 000052494765 d| 6/16/2004 e| 6/16/2004 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 6/9/2003
949 a| R15.A48 v.289 no.1-4 2003 w| LCPER c| 1 i| 000052494772 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/9/2003
949 a| R15.A48 v.289 no.9-12 2003 w| LCPER c| 1 i| 000052519154 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 7/17/2003
949 a| R15.A48 v.289 no.13-16 2003 w| LCPER c| 1 i| 000052533396 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/15/2003
949 a| R15.A48 v.289 no.17-20 2003 w| LCPER c| 1 i| 000052533402 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 8/15/2003
949 a| R15.A48 v.290 no.1-4 2003 w| LCPER c| 1 i| 000052571718 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 10/17/2003
949 a| R15.A48 v.289 no.21-24 2003 w| LCPER c| 1 i| 000052569999 d| 1/23/2005 e| 1/23/2005 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 10/17/2003
949 a| R15.A48 v.290 no.9-12 2003 w| LCPER c| 1 i| 000052773754 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/8/2004
949 a| R15.A48 v.290 no.13-16 2003 w| LCPER c| 1 i| 000052773761 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/8/2004
949 a| R15.A48 v.290 no.17-20 2003 w| LCPER c| 1 i| 000052773778 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 1/8/2004
949 a| R15.A48 v.290 no.21-24 2003 w| LCPER c| 1 i| 000052798832 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/26/2004
949 a| R15.A48 v.291 no.1-4 2004 w| LCPER c| 1 i| 000052799488 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 2/26/2004
949 a| R15.A48 v.290 no.5-8 2003 w| LCPER c| 1 i| 000052807718 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/5/2004
949 a| R15.A48 v.291 no.5-8 2004 w| LCPER c| 1 i| 000052813931 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 3/18/2004
949 a| R15.A48 v.291 no.9-12 2004 w| LCPER c| 1 i| 000054750807 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/25/2004
949 a| R15.A48 v.291 no.17-20 2004 w| LCPER c| 1 i| 000054750722 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/25/2004
949 a| R15.A48 v.291 no.13-16 2004 w| LCPER c| 1 i| 000054750791 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 6/25/2004
949 a| R15.A48 v.291 no.21-24 2004 w| LCPER c| 1 i| 000054866102 d| 7/15/2016 l| PATERNO-4 m| UP-PAT q| 1 r| Y s| Y t| PERIODICAL u| 10/7/2004
949 a| R15.A48 v.35 no.1-8 1900 w| LCPER c| 1 i| 000047774568 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.35 no.9-17 1900 w| LCPER c| 1 i| 000047774575 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.35 no.18-26 1900 w| LCPER c| 1 i| 000047774582 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.36 1901 w| LCPER c| 1 i| 000047774599 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.37 1901 w| LCPER c| 1 i| 000047774605 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.38 1902 w| LCPER c| 1 i| 000047774612 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.39 1902 w| LCPER c| 1 i| 000047774629 d| 3/8/2005 e| 3/7/2005 l| ACAD-BLDG m| UP-ANNEX n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.40 1903 w| LCPER c| 1 i| 000047774636 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.41 1903 w| LCPER c| 1 i| 000047774643 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.42 1904 w| LCPER c| 1 i| 000047774650 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.43 1904 w| LCPER c| 1 i| 000047774667 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949 a| R15.A48 v.44 1905 w| LCPER c| 1 i| 000047774674 l| CATO-2 m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 7219
949 a| R15.A48 v.45 no.1-14 1905 w| LCPER c| 1 i| 000047774681 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203

949	a| R15.A48 v.45 no.15-27 1905 w| LCPER c| 1 i| 000047774698 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.46 no.1-13 1906 w| LCPER c| 1 i| 000047774704 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.46 no.14-26 1906 w| LCPER c| 1 i| 000047774711 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.47 1906 w| LCPER c| 1 i| 000047774728 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.48 1907 w| LCPER c| 1 i| 000047774735 d| 9/10/2018 e| 9/7/2018 l| ACAD-BLDG m| UP-ANNEX n| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.49 1907 w| LCPER c| 1 i| 000047774742 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.50 1908 w| LCPER c| 1 i| 000047774759 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.51 1908 w| LCPER c| 1 i| 000047774766 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1203
949	a| R15.A48 v.52 1909 w| LCPER c| 1 i| 000047774773 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.53 1909 w| LCPER c| 1 i| 000047774780 d| 3/27/2013 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.47-53 1906-09 index w| LCPER c| 1 i| 000047774797 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.54 no.1-13 1910 w| LCPER c| 1 i| 000047774803 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.54 no.14-26 1910 w| LCPER c| 1 i| 000047774810 d| 9/29/2015 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.55 1910 w| LCPER c| 1 i| 000047774827 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.56 1911 w| LCPER c| 1 i| 000047774834 d| 3/3/2014 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.57 no.1-9 1911 w| LCPER c| 1 i| 000047774841 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.57 no.10-18 1911 w| LCPER c| 1 i| 000047774858 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.57 no.19-27 1911 w| LCPER c| 1 i| 000047774865 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.58 pt.1 1912 w| LCPER c| 1 i| 000047774872 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.58 pt.2 1912 w| LCPER c| 1 i| 000047774889 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.59 pt.1 1912 w| LCPER c| 1 i| 000047774896 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.59 pt.2 1912 w| LCPER c| 1 i| 000047774902 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.60 pt.1 1913 w| LCPER c| 1 i| 000047774919 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.60 pt.2 1913 w| LCPER c| 1 i| 000047774926 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.61 1913 w| LCPER c| 1 i| 000047774933 d| 10/17/2017 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.62 no.1-13 1914 w| LCPER c| 1 i| 000047774940 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.62 no.14-20 1914 w| LCPER c| 1 i| 000047774957 d| 8/19/2014 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.63 1914 w| LCPER c| 1 i| 000047774964 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.64 no.10-17 1915 w| LCPER c| 1 i| 000047774971 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.64 no.1-13 1915 w| LCPER c| 1 i| 000047776333 d| 6/21/2005 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.64 no.14-26 1915 w| LCPER c| 1 i| 000047774988 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.65 no.1-9 1915 w| LCPER c| 1 i| 000047774995 d| 4/11/2013 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.65 no.10-18 1915 w| LCPER c| 1 i| 000047775008 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.65 no.19-26 1915 w| LCPER c| 1 i| 000047775015 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.66 no.1-13 1916 w| LCPER c| 1 i| 000047775022 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.66 no.14-26 1916 w| LCPER c| 1 i| 000047775039 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204
949	a| R15.A48 v.67 no.1-9 1916 w| LCPER c| 1 i| 000047775046 d| 3/27/2013 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204

949 a| R15.A48 v.67 no.10-18 1916 w| LCPER c| 1 i| 000047775053 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204

949 a| R15.A48 v.67 no.19-27 1916 w| LCPER c| 1 i| 000047775060 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 1204

949 a| R15.A48 v.68 no.1-8 1917 w| LCPER c| 1 i| 000047775077 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 534

949 a| R15.A48 v.68 no.9-17 1917 w| LCPER c| 1 i| 000047775084 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 534

949 a| R15.A48 v.68 no.18-26 1917 w| LCPER c| 1 i| 000047775091 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 534

949 a| R15.A48 v.69 1917 w| LCPER c| 1 i| 000047775107 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 534

949 a| R15.A48 v.70 1918 w| LCPER c| 1 i| 000047775114 d| 1/21/2015 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 534

949 a| R15.A48 v.71 1918 w| LCPER c| 1 i| 000047775121 d| 3/21/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.72 no.1-8 1919 w| LCPER c| 1 i| 000047775138 d| 5/22/2018 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.72 no.9-17 1919 w| LCPER c| 1 i| 000047775145 d| 5/22/2018 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.72 no.18-26 1919 w| LCPER c| 1 i| 000047775152 d| 5/22/2018 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.73 no.1-9 1919 w| LCPER c| 1 i| 000047775169 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.73 no.10-17 1919 w| LCPER c| 1 i| 000047775176 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.73 no.18-26 1919 w| LCPER c| 1 i| 000047775183 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.74 1920 w| LCPER c| 1 i| 000047775190 d| 3/2/2018 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.75 no.1-13 1920 w| LCPER c| 1 i| 000047775206 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.75 no.14-26 1920 w| LCPER c| 1 i| 000047775213 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.76 no.1-9 1921 w| LCPER c| 1 i| 000047775220 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.76 no.10-18 1921 w| LCPER c| 1 i| 000047775237 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.76 no.19-26 1921 w| LCPER c| 1 i| 000047775244 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.77 1921 w| LCPER c| 1 i| 000047775251 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.78 1922 w| LCPER c| 1 i| 000047775268 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.78 pt.1 1922 w| LCPER c| 1 i| 000047775275 d| 1/13/2014 e| 11/1/2013 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.78 pt.2 1922 w| LCPER c| 1 i| 000047775282 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.79 no.1-13 1922 w| LCPER c| 1 i| 000047775299 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.79 no.14-27 1922 w| LCPER c| 1 i| 000047775305 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.80 no.1-13 1923 w| LCPER c| 1 i| 000047775312 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.80 no.14-26 1923 w| LCPER c| 1 i| 000047775329 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.81 no.1-8 1923 w| LCPER c| 1 i| 000047775336 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 536

949 a| R15.A48 v.81 no.9-17 1923 w| LCPER c| 1 i| 000047775343 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.81 no.18-26 1923 w| LCPER c| 1 i| 000047775350 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.82 no.1-13 1924 w| LCPER c| 1 i| 000047775367 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.82 no.14-26 1924 w| LCPER c| 1 i| 000047775374 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.83 no.1-13 1924 w| LCPER c| 1 i| 000047775381 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.83 no.14-26 1924 w| LCPER c| 1 i| 000047775398 d| 6/13/2011 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874

949 a| R15.A48 v.84 no.1-13 1925 w| LCPER c| 1 i| 000047775404 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874

949	a| R15.A48 v.84 no.14-26 1925 w| LCPER c| 1 i| 000047775411 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874
949	a| R15.A48 v.85 no.1-13 1925 w| LCPER c| 1 i| 000047775428 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874
949	a| R15.A48 v.85 no.14-26 1925 w| LCPER c| 1 i| 000047775435 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874
949	a| R15.A48 v.86 no.1-13 1926 w| LCPER c| 1 i| 000047775442 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874
949	a| R15.A48 v.86 no.14-26 1926 w| LCPER c| 1 i| 000047775459 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874
949	a| R15.A48 v.87 no.1-13 1926 w| LCPER c| 1 i| 000047775466 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874
949	a| R15.A48 v.87 no.14-26 1926 w| LCPER c| 1 i| 000047775473 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 874
949	a| R15.A48 v.88 no.1-13 1927 w| LCPER c| 1 i| 000047775480 l| CATO-2 m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 6614
949	a| R15.A48 v.88 no.14-26 1927 w| LCPER c| 1 i| 000047775497 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.89 no.1-13 1927 w| LCPER c| 1 i| 000047775503 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.89 no.14-27 1927 w| LCPER c| 1 i| 000047775510 d| 10/24/2017 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.90 no.1-13 1928 w| LCPER c| 1 i| 000047775527 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.90 no.14-26 1928 w| LCPER c| 1 i| 000047775534 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.96 no.14-26 1931 w| LCPER c| 1 i| 000047775657 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.97 no.1-13 1931 w| LCPER c| 1 i| 000047775664 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.97 no.14-26 1931 w| LCPER c| 1 i| 000047775671 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.98 no.1-13 1932 w| LCPER c| 1 i| 000047775688 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.98 no.14-26 1932 w| LCPER c| 1 i| 000047775695 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.99 no.1-13 1932 w| LCPER c| 1 i| 000047775701 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.99 no.14-27 1932 w| LCPER c| 1 i| 000047775718 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.100 no.1-12 1933 w| LCPER c| 1 i| 000047775725 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.100 no.13-25 1933 w| LCPER c| 1 i| 000047775732 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.101 no.1-14 1933 w| LCPER c| 1 i| 000047775749 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.101 no.15-27 1933 w| LCPER c| 1 i| 000047775756 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111
949	a| R15.A48 v.91 no.1-13 1928 w| LCPER c| 1 i| 000047775541 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.91 no.14-26 1928 w| LCPER c| 1 i| 000047775558 d| 10/6/2015 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.92 no.1-13 1929 w| LCPER c| 1 i| 000047775565 d| 1/28/2019 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.92 no.14-26 1929 w| LCPER c| 1 i| 000047775572 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.93 no.1-13 1929 w| LCPER c| 1 i| 000047775589 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.93 no.14-26 1929 w| LCPER c| 1 i| 000047775596 d| 6/17/2008 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.94 no.1-13 1930 w| LCPER c| 1 i| 000047775602 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.94 no.14-26 1930 w| LCPER c| 1 i| 000047775619 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 875
949	a| R15.A48 v.95 no.1-13 1930 w| LCPER c| 1 i| 000047775626 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114
949	a| R15.A48 v.95 no.14-26 1930 w| LCPER c| 1 i| 000047775633 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114

949 a| R15.A48 v.96 no.1-13 1931 w| LCPER c| 1 i| 000047775640 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 114

949 a| R15.A48 v.102 no.1-13 1934 w| LCPER c| 1 i| 000047775763 d| 12/12/2005 l| ACAD-BLDG m| UP-ANNEX q| 2 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.102 no.14-26 1934 w| LCPER c| 1 i| 000047775770 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.103 no.1-13 1934 w| LCPER c| 1 i| 000047775787 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.103 no.14-26 1934 w| LCPER c| 1 i| 000047775794 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.104 no.1-13 1935 w| LCPER c| 1 i| 000047775800 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.104 no.14-26 1935 w| LCPER c| 1 i| 000047775817 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.105 no.1-13 1935 w| LCPER c| 1 i| 000047775824 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.105 no.14-26 1935 w| LCPER c| 1 i| 000047775831 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.106 no.1-13 1936 w| LCPER c| 1 i| 000047775848 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.106 no.14-26 1936 w| LCPER c| 1 i| 000047775855 d| 8/20/2007 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.107 no.1-9 1936 w| LCPER c| 1 i| 000047775862 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.107 no.10-18 1936 w| LCPER c| 1 i| 000047775879 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.107 no.19-26 1936 w| LCPER c| 1 i| 000047775886 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.108 no.1-9 1937 w| LCPER c| 1 i| 000047775893 d| 8/3/2007 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.108 no.10-17 1937 w| LCPER c| 1 i| 000047775909 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 111

949 a| R15.A48 v.108 no.18-26 1937 w| LCPER c| 1 i| 000047775916 d| 7/30/2007 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.109 no.1-9 1937 w| LCPER c| 1 i| 000047775923 d| 5/1/2008 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.109 no.10-18 1937 w| LCPER c| 1 i| 000047775930 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.109 no.19-26 1937 w| LCPER c| 1 i| 000047775947 d| 7/30/2007 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 10/22/2004 z| 540

949 a| R15.A48 v.110 no.1-9 1938 w| LCPER c| 1 i| 000047775954 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.110 no.10-18 1938 w| LCPER c| 1 i| 000047775961 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.110 no.19-26 1938 w| LCPER c| 1 i| 000047775978 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.111 no.1-9 1938 w| LCPER c| 1 i| 000047775985 d| 3/2/2018 l| ACAD-BLDG m| UP-ANNEX q| 1 r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.111 no.10-18 1938 w| LCPER c| 1 i| 000047775992 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.111 no.19-26 1938 w| LCPER c| 1 i| 000047776005 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.112 no.1-8 1939 w| LCPER c| 1 i| 000047776012 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.112 no.9-17 1939 w| LCPER c| 1 i| 000047776029 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.112 no.18-25 1939 w| LCPER c| 1 i| 000047776036 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.113 no.1-9 1939 w| LCPER c| 1 i| 000047776043 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.113 no.10-18 1939 w| LCPER c| 1 i| 000047776050 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.113 no.19-27 1939 w| LCPER c| 1 i| 000047776067 l| ACAD-BLDG m| UP-ANNEX r| Y s| Y t| PERIODICAL u| 8/17/2001 z| 540

949 a| R15.A48 v.292 no.1-4 2004 w| LCPER c| 1 i| 000054875364 d| 1/10/2005 e| 1/10/2005 l| PATERNO-4 m| UP-PAT n| 1 r| Y s| Y t| PERIODICAL u| 11/11/2004

949 a| R15.A48 v.292 no.5-8 2004 w| LCPER c| 1 i| 000054879560 l| PATERNO-4 m| UP-PAT r| Y s| Y t| PERIODICAL u| 11/18/2004

949 a| R15.A48 v.1-4 1883-85 & v.1-24 index w| LCPER c| 1 i| 000054483729 l| MFILM-NML m| UP-MICRO r| Y s| Y t| MICROFORM u| 1/13/2005