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The materials selected for this section were meant to be a general overview of materials available not a complete bibliography of food safety issues. Omission or inclusions does not constitute endorsement of any document over another.

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March 3, 1994 - *Afternoon Session*

12:45 p.m. **Highlights of Morning Session and Introduction to Afternoon Session**

Dr. Larry Miller, Senior Staff Veterinarian, Swine Health Staff, VS, APHIS

Panel Discussions - Preharvest Roles and Responsibilities

Moderator - Dr. George Winegar, Acting Director, Operational Support, VS

1:00 p.m. ***Panel 1: Public Health and Consumer Perspectives***

Dr. Ralph T. Bryan, Project Coordinator, Emerging Infections - CDC, National Center for Infectious Diseases

Dr. Bert Mitchell, Director, Office of Surveillance and Compliance - Food and Drug Administration, Center for Veterinary Medicine

Ms. Carolyn Smith DeWaal, Director of Legal Affairs, Public Voice for Food and Health Policy

1:45 p.m. ***Panel 2: Research Community Perspectives***

Dr. Tom Walton, National Program Leader, Animal Health - Agricultural Research Service

Dr. Dale Hancock, Associate Professor, College of Veterinary Medicine - Washington State University

Dr. Fred Troutt, Chairman, Food Animal Production Medicine Consortium

2:30 p.m. **Break**

Moderator - Dr. Al Strating, Director, Center for Epidemiology and Animal Health and National Veterinary Services Laboratories, VS, APHIS

2:45 p.m. ***Panel 3: Regulatory and Clinical Veterinarian Perspectives***

Dr. Thomas J. Hagerty, Past President - U.S. Animal Health Association

Dr. Lyle Vogel, Assistant Director, Membership and Field Services - American Veterinary Medical Association (AVMA)

3:15 p.m. ***Panel 4: Industry Perspectives***

Dr. Beth Lautner, Director, Swine Health and Pork Safety - National Pork Producers Council

Dr. Keith Rinehart, Vice President, Technical Services, Perdue - National Broiler Council

Mr. John B. Adams, Director, Milk Safety and Animal Health - National Milk Producers Federation

Mr. Gary Wilson, Director of Research, Animal Health/Inspection and Food Policy, National Cattelmen's Association

4:15 p.m. **Review of the Day's Events**

Dr. Donald W. Luchsinger

4:30 p.m. **Adjourn**

5:30 p.m. **Reception - Dinner (Founder's Room)**

Speaker

Congressman Charles W. Stenholm, Chairman, U.S. House of Representatives Subcommittee on Livestock, Dairy, and Poultry

8:30 a.m. **Introduction to Morning Session**

Dr. Larry Miller

8:45 a.m. **Small Group Breakout Discussions (Rooms 1109-11 and 1101)**

Participants will be divided into five groups, each with a facilitator and chairperson, to develop recommendations on three topics:

- ❐ Areas of agreement and disagreement concerning respective sector roles in preharvest food safety
- ❐ Areas of agreement and disagreement concerning APHIS' role in preharvest food safety
- ❐ Next steps for all sectors in developing a unified approach to preharvest food safety

Chairpersons

Dr. George W. Beran, Chairman, Food Safety Subcommittee - AVMA *(Group 1)*

Dr. Jim Cullor, Associate Professor, College of Veterinary Medicine - University of California *(Group 2)*

Mr. John Lang, President, Livestock Conservation Institute *(Group 3)*

Dr. Bret D. Marsh, State Veterinarian, Indiana Board of Animal Health *(Group 4)*

Ms. Nancy Robinson, Associate Manager, Government and Industry Affairs - Livestock Marketing Association *(Group 5)*

9:45 a.m. **Break**

10:00 a.m. **Breakout Groups Reports to Full Session and General Discussion**

Moderator

Dr. William Hueston, Director, Center for Animal Health Monitoring, VS, APHIS

11:00 a.m. **Implication of the Meeting's Events and Future Plans**

Dr. Lonnie J. King

11:30 a.m. **Evaluation**

11:45 p.m. **Adjourn**

John B. Adams

Director Milk Safety and Animal Health

Business Address:

National Milk Producers Federation
1840 Wilson Boulevard
Arlington, VA 22201

Current Duties:

Food safety, public health, interstate milk shipment, quality control, animal health, food standards and quality.

Education:

B.S. Pennsylvania State 1964, Agricultural Science and Industry
M.S. Clemson University, 1966, Dairy Science
Food Science and Quality Control, University of Maryland, 1966-1970

Awards:

Distinguished Service Award, National Mastitis Council, 1978-1992

Offices/Professional Memberships:

Secretary-Treasurer, National Mastitis Council
Executive Committee, U.S. Animal Health Association
Past President, Washington Food Group
Forum for Animal Agriculture Steering Committee
Sigma Xi, American Dairy Science Association
International Association of Milk Food and Environmental Sanitarians
Association of Agriculture Chemists
National Mastitis Council
Diary Technology Society, Dairy Shrine

Residence/Married

Lives in Leesburg, Virginia along with MaryLee Adams, John and Andrew Adams (twin boys).

Major Focus

Developing and Implementing preharvest quality control.

Ralph T. Bryan

Project Coordinator, Emerging Infections

Business Address:

Office of the Director
National Center for Infectious Diseases
Mailstop C-12
Centers for Disease Control and Prevention
Atlanta, GA 30333

Current Duties:

Coordinates emerging infections project activities for the National Center for Infectious Diseases, CDC; oversees writing and production of CDC's plan for emerging infections, "Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States;" serves as a principal liaison for emerging infections activities with other agencies and organizations.

Background Data:

1978	BA, University of Texas, Austin
1982	MD, University of Texas Medical Branch, Galveston, TX
1982-83	Intern in Medicine, George Washington University Medical Center, Washington, D.C.
1983-85	Resident in Medicine, George Washington University Medical Center, Washington, D.C.
1986-87	Clinical Fellow in Infectious Diseases, George Washington University Medical Center, Washington, D.C.
1987-89	Epidemic Intelligence Service Officer, Commissioned Corps, USPHS (0-4), Parasitic Disease Branch, Division of Parasitic Diseases, Centers for Disease Control and Prevention (CDC), Atlanta, GA
1989-	Medical Epidemiologist, Commissioned Corps, USPHS (0-5), Parasitic diseases Branch, Division of Parasitic Diseases, CDC, Atlanta, GA
1990-	Clinical Assistant Professor of Medicine, Department of Medicine, Emory University School of Medicine
1993-	Project Coordinator, Emerging Infections, Office of the Director, National Center for Infectious Diseases, CDC

Caroline Smith DeWaal

Director of Legal Affairs, Public Voice for Food and Health Policy

Business Address:

1001 Connecticut Avenue, NW
Suite 522
Washington, DC 20036

Current Duties:

Caroline Smith DeWaal is the Director of Legal Affairs for Public Voice for Food and Health Policy, a national consumer organization that promotes a safe, health and affordable food supply for all Americans. She represents Public Voice in Congress and in the regulatory area and on such issues as seafood safety, meat and poultry safety, other food safety issues, and safe and health eating for children. Public Voice is the leading advocate to have seafood comprehensively regulated to assure its safety.

Background Data:

During the 102nd Congress, Caroline spearheaded Public Voice's lobbying effort on seafood safety in Congress. In addition, she developed two petitions asking FDA to take specific interim steps to improve their regulation of seafood. The first petition urged FDA to mandate a warning label for use on raw molluscan seafood to alert specific persons with certain medical conditions, such as AIDS, cancer, diabetes and alcoholism, to avoid these products. The second petition urged the FDA to set a legal limit for methylmercury in seafood that is fully protective of pregnant women, children and other groups that may be particularly vulnerable to adverse effects from mercury exposure.

Prior to coming to Public Voice, Ms. DeWaal was a staff attorney at Public Citizen, where she lobbied on insurance and antitrust issues. She was Chief Legislative Counsel for the Massachusetts Commissioner of Insurance in the Dukakis administration before coming to Washington.

Ms. DeWaal graduated from the University of Vermont and Antioch School of Law. She is a member of the Massachusetts Bar.

Thomas M. Gomez

Veterinary Medical Officer/Epidemiologist

Business Address:

Centers for Disease Control and Prevention (CDC)
1600 Clifton Road
Mailstop C-09
Atlanta, Georgia 30333

Current Duties:

Liaison duties between the USDA/APHIS and CDC. Activities include surveillance and investigation of Salmonella Enteritidis and E. coli 0157:H7 human infections.

Background Data:

1985	Received DVM and MS from Colorado State University
1985-87	Private practice in Colorado.
1987 - present	USDA, APHIS, Veterinary Services (VS).
1987-1988	Section Veterinary Medical Officer, California.
1988-1990	Section Veterinary Medical Officer and National Animal Health Monitoring System (NAHMS) Coordinator, Indiana.
1990-1992	Epidemic Intelligence Services (EIS) Officer, ODC, Atlanta, Georgia.
1992	Staff Epidemiologist, Salmonella Enteritidis Task Force, Hyattsville, Maryland.
1992-Present	Staff Epidemiologist, CDC, National Center for Infectious Diseases, Division of Bacterial and Mycotic Disease, Foodborne Diseases Branch, Atlanta, Georgia. Also, serves on the USDA, APHIS, VS committee to develop the APHIS role in the national food safety agenda.

Thomas J. Hagerty, DVM

Executive Secretary, Minnesota Board of Animal Health

Business Address:

Agriculture Building
90 West Plato Boulevard
St. Paul, Minnesota 55107

Current Duties:

Minnesota State Veterinarian
Chair USAHA PRV Program Standards Subcommittee
Member Board of Directors Livestock Conservation Institute

Background Data:

Past President USAHA
Ex Vice Chair USAHA TB Committee
Minnesota State Veterinarian 1985 - present
Food Animal Practice, St. Michael, Minnesota 1959 - 1985
Graduate University of Minnesota 1959

Dale Hancock

Associate Professor/Epidemiologist

Business Address:

Field Disease Investigation Unit
College of Veterinary Medicine
Veterinary Clinical Sciences
McCoy Hall
Washington State University
Pullman, Washington 99164-6610

Background Data:

Dale Hancock is a native Texan, born in Hamilton County and reared in Erath County. He attended Tarleton State College in Stephenville, Texas and received a DVM from Texas A&M University in 1975. After a 1 year ambulatory residency at The Ohio State University, he served as an associate practitioner in a predominately dairy practice in Stephenville, Texas. From 1978 to 1983 he was a research associate in the Department of Veterinary Preventive Medicine at The Ohio State University where he received an MS in 1981 and PhD in 1983. His research, conducted mostly at the Ohio Agricultural Research and Development Center at Wooster, focuses on the epidemiology of neonatal calf disease. From 1983 to 1984, Hancock briefly served as Assistant Professor at the College of Veterinary Medicine at Mississippi State University. In 1984 he accepted a position with the newly formed Field Disease Investigation Unit at Washington State University where he is currently an Associate Professor. His activities have centered on the epidemiology of foodborne disease and on the development of outbreak investigational strategies. From September 1, 1992 to March 1, 1993 Hancock served as temporary analytical epidemiologist with the National Animal Health Monitoring System in the analysis of data from *E. coli* 0157:H7 and other sampling conducted as part of the National Dairy heifer Evaluation Project. Since January, 1988, he has been the editor and chief writer of *Population Medicine News*.

Jill Hollingsworth, DVM

Assistant to the Administrator

Business Address:

USDA/Food Safety and Inspection Service
1400 Independence Avenue, SW
Washington, DC 20250

Current Duties:

As the Assistant to the Administrator, she provides scientific and technical advice to the FSIS Administrator on policy, program, and a variety of issues. She has played a significant role in the development and implementation of the USDA Pathogen Reduction Plan. She served as the point person for the Department during the *E. coli* 0157:H7 foodborne outbreak in January 1993.

Background Data:

Dr. Jill Hollingsworth is Assistant to the Administrator. In this capacity, she serves as a special assistant and advisor to the Administrator and works on special projects.

Dr. Hollingsworth acts as a representative of the Administrator within the Department and with outside groups such as industry trade associations and consumer groups. Her background in slaughter operations and inspection enables her to review and advise on a wide variety of proposals, plans, and initiatives related to inspection activities.

Dr. Hollingsworth was recently appointed as the Agency lead on the investigation of the E. coli 0157:H7 outbreak in January, 1993. She coordinated all Agency activity, including liaison with the Centers for Disease Control and served as the USDA spokesperson.

Dr. Hollingsworth was selected as a member of the FSIS Management Review Team, a team that was responsible for a 4 month study of FSIS management and organization. The results of this study were published in a document titled, "Setting the Food Safety and Inspection Service on a Path to Renewal."

Dr. Hollingsworth served on a detail from July 1990 to October 1991 as Assistant Director for the Agency's Hazard Analysis and Critical Control Point (HACCP) project.

Prior to this assignment, Dr. Hollingsworth was the Director of Slaughter Inspection Standards and Procedures Division of Science and Technology. This Division is responsible for the design, development and testing of inspection programs and to provide technical support for the program policy and procedures.

Jill Hollingsworth, DVM

Assistant to the Administrator

Dr. Hollingsworth began her FSIS career in 1978 as a Veterinary Medical Officer where she served as the Inspector-in-Charge at various slaughter and processing plants. She was the Export Coordinator for the Southeastern Region from 1983 - 1986, and the Assistant Area Supervisor for the State of Georgia from 1986 - 1988. She was selected as the National Poultry Correlator in 1988 where she was responsible for ensuring uniform interpretation and application of inspection policy for poultry.

Dr. Hollingsworth graduated cum laude from the University of Georgia in 1974 with a B.S. degree in Agricultural Science and received her doctorate in Veterinary Medicine from the University of Georgia in 1977.

Dr. Hollingsworth has served on many task forces and special project groups for FSIS, and has received numerous awards including the Dr. Daniel E. Salmon award for the Advancement of the Human Health aspects of Veterinary Science.

Dr. Hollingsworth is from Atlanta, Georgia. She is married and has two children.

William D. Hueston, D.V.M., Ph.D.

Epidemiologist and Director - Center for Animal Health Monitoring

Business Address:

USDA/APHIS/VS/Centers for Epidemiology and Animal Health
555 South Howes, Suite 200
Fort Collins, CO 80523

Current Duties:

Dr. Hueston is Director for the Center for Animal Health Monitoring (CAHM) and Program Leader for the National Animal Health Monitoring System (NAHMS). He heads a multi-disciplinary team of veterinary epidemiologists, statisticians, economists, and information management specialists who function as animal health information brokers in the areas of animal disease, product wholesomeness, animal production, animal welfare and the environment in order to benefit both producers and consumers.

Background Data:

Dr. Hueston received his BA Degree in Biology from the University of Virginia, his Doctor of Veterinary Medicine, MS in Preventive Medicine, and Ph.D. in Epidemiology from the Ohio State University. He is Board Certified in veterinary preventive medicine and the specialty of epidemiology. Prior to joining USDA, Dr. Hueston has been in private veterinary practice, worked for industry and held various teaching and research positions at the Ohio State University. Dr. Hueston is an Affiliate Faculty Member at Colorado State University's Department of Environmental Health.

Lonnie J. King

Associate Administrator
Animal and Plant Health Inspection Service
U.S. Department of Agriculture

Dr. Lonnie J. King was selected Associate Administrator for APHIS in February 1992. In his position, Dr. King serves with the Administrator in providing executive leadership and direction for ensuring the health and care of animals and plants, to improve agricultural productivity and competitiveness, and to contribute to the national economy and public health. APHIS is responsible for 42 domestic programs and maintains an international cadre of professionals to promote agricultural trade. The Agency also plays a vital role in enforcing animal welfare legislation and managing wildlife resources. Dr. King is also responsible for ensuring and strengthening the scientific and technical foundation of the Agency, including biotechnology, diagnostic and methods development laboratories, and information technology strategies. Since October 1992, he has also served as the Acting Administrator of APHIS.

Before beginning his Government career in 1977, Dr. King was in private practice for 7 years in Dayton, Ohio and Atlanta, Georgia. Until his current appointment, his assignments have included field veterinary medical officer in Georgia and station epidemiologist. He spent 5 years in Hyattsville, Maryland, in staff assignments in Emergency Programs as well as Animal Health Information. While in Hyattsville, Dr. King directed the development of the Agency's National Animal Health Monitoring System. He left APHIS briefly to serve as the Director of Governmental Relations Division of the American Veterinary Medical Association in Washington, D.C. From 1988 to 1991, Dr. King was the Deputy Administrator for Veterinary Services. In that position he was responsible for directing national veterinary and animal health programs.

As a native of Wooster, Ohio, Dr. King received his bachelor of science and Doctor of Veterinary Medicine degrees from Ohio State University. He earned his master of science degree in epidemiology from the University of Minnesota while on special assignment with the U.S. Department of Agriculture in 1980. He also received his master's degree in public administration from American University in Washington, D.C. in 1991. Dr. King has a broad knowledge of animal agriculture and the veterinary profession through his work with other governmental agencies, universities, major livestock and poultry industry groups, and private practitioners. Dr. King is a board-certified member of the American College of Veterinary Preventive Medicine and has completed the Senior Executive Fellowship program at Harvard University.

Dr. King resides in the metropolitan Washington, D.C., area with his wife Sylvia and their two children.

March 1993

Beth Lautner, DVM, M.S.

Director - Swine Health and Pork Safety

Business Address:

P.O. Box 10383
Des Moines, Iowa 50306

Current Duties:

Dr. Lautner joined the National Pork Producers Council (NPPC) in April 1991 as Director of Producer Education. In August of 1992, she assumed the position of Director of Swine Health and Pork Safety. She is responsible for the development and coordination of food safety programs and information as they relate to pork production and development, and planning and management of the Pork Quality Assurance Program. Her duties also include communication with producers, allied industry, and regulatory authorities on drug issues and overseeing the council's involvement in the Pseudorabies Eradication Program. Additionally, she participates in long range policy planning on swine health programs and drug usage/availability.

Background Data:

After graduating from Michigan State University College of Veterinary Medicine, Dr. Lautner joined a mixed animal practice in LeMars, Iowa. She was associated with this practice from 1978 to 1986 when she opened her own practice, Swine Health Services. Her practice provided herd health programs and computerized records for area pork producers. In 1990, Dr. Lautner completed her master of science degree at the University of Minnesota with her research area being transmission of pseudorabies virus.

Dr. Lautner is a member of the American Association of Swine Practitioners (AASP), the American Veterinary Medical Association (AVMA), and the Iowa Veterinary Medical Association (IVMA). She has served on the Membership Services Committee and Editorial Board of the newsletter for AASP. She currently serves on two AASP committees, Animal Welfare and National Animal Health Monitoring system (NAHMS). Dr. Lautner is also involved in the IVMA's Swine Practitioner Committee. She represents NPPC on the National Pseudorabies Control Board.

Donald W. Luchsinger

Acting Deputy Administrator, Veterinary Services

Business Address:

USDA/APHIS/VS
Room 317-E Administration Building
14th & Independence Avenue
Washington, DC 20050

Home:

Minnesota

Graduated:

University of Minnesota
DVM 1961
Masters in Public Health 1966

Background Data:

Animal and Plant Health Inspection Service	
Associate Deputy Administrator, Veterinary Services	1992-1994
Director, Operational Support, Veterinary Services	1990-1992
U.S. Agency for International Development	
Animal Health Advisor	1988-1990
Animal and Plant Health Inspection Service	
Chief, Foreign Animal Disease Diagnostic Laboratory	1984-1988
Area Veterinarian in Charge - Minnesota	1980-1984
Section Head - NVSL Diagnostic Bacteriology Laboratory	1979-1980
Staff Veterinarian - Import-Export Staff	1978-1979
Pan American Health Organization	
Animal Health Project Manager - Jamaica	1973-1977
Animal and Plant Health Inspection Service	
Regional Epidemiologist - Brucellosis and Tuberculosis	1967-1973
Brucellosis Epidemiologist - Minnesota	1963-1967
Field Veterinary Medical Officer	1961-1963

John Mason

Director - Salmonella Enteritidis Program (APHIS)

Business Address:

Suite 205
6525 Belcrest Road
Hyattsville, Maryland 20782

Current Duties:

Supervise the SE Traceback Program
Technical Consultant - Pennsylvania SE Pilot Project
Promotion - Technical Consultant for SE Quality Assurance Programs

Background Data:

DVM, MPH

State Epidemiologist/Dir. Div. Communicable Disease Control, New Mexico Department of Public Health 1956-1960

Malaria Advisory - Malaria Eradication Programs (CDC/AID) - Indonesia - Honduras - Haiti -Philippines - El Salvador

Co-Director - FMD Prevention Program 1974 - 1990

Director SE Control Program 1990 - 1994

Terry L. Medley
Acting Associate Administrator
Food Safety and Inspection Service
U.S. Department of Agriculture

As of February 28, 1994, Mr. Medley was detailed to the Food Safety and Inspection Service (FSIS) as the interim Acting Associate Administrator. Since February 5, 1993, Mr. Medley has served as the Acting Associate Administrator for the Animal and Plant Health Inspection Service. In addition, he is the Director of the Biotechnology, Biologics, and Environmental Protection (BBEP) unit. As Director of the BBEP unit, Mr. Medley overseas and directs the activities of the National Monitoring and Residue Analysis Laboratory; Biotechnology Coordination and Technical Assistance; Veterinary Biologics; Veterinary Biologics Field Office; Biotechnology Permits; Environmental Analysis and Documentation; and the Technology Support Staff. These staffs are responsible for coordinating biotechnology regulatory activities within USDA and acting as liaison between USDA and other Federal Agencies on matters pertaining to biotechnology regulation; issuing permits for genetically engineered organisms; regulating and licensing veterinary biological products; providing internal policies and procedures for pesticide registration; conducting chemical analysis for pesticide residues; and ensuring that APHIS programs comply with the applicable environmental laws. Previously, he served as the Director for the Biotechnology and Environmental Coordination Staff of APHIS. He was born in Union, South Carolina, on September 12, 1951. Mr. Medley graduated cum laude from Amherst College in 1974. He earned a Doctor of Jurisprudence degree from the University of Virginia School of Law in 1977 and was elected to the Raven Society for his scholastic achievement and service to the community. Mr. Medley is a member of the Virginia Bar Association.

Upon graduation from law school, he began his Federal career as an attorney for the Regulation Division of USDA's Office of the General Counsel, providing legal services to APHIS and the Food Safety and Inspection Service (FSIS). In 1982, he was promoted to Senior Attorney and advisor for APHIS' Plant Protection and Quarantine programs. As part of the coordinated Federal effort to regulate biotechnology, he assisted in the drafting of the Federal "Coordinated Framework for Regulation of Biotechnology." He was an author of the USDA regulations for genetically engineered organisms that may be plant pests. He is a member of the Federal Biotechnology Research Subcommittee, Chair of the USDA Biotechnology Council, APHIS' liaison to the Agricultural Biotechnology Research Advisory Committee, and served as a member of the National Keystone Advisory Board for Biotechnology. He currently represents APHIS at the Organization for Economic Cooperation and Development meetings of the Joint Working Party for Environment and Agriculture and national experts on safety in biotechnology. He is Chairman of the

Biotechnology ad hoc Committee of the North American Plant Protection Organization, member of the Biotechnology Advisory Commission of the Stockholm Environment Institute, and Agency Environmental Compliance Coordinator.

He is a frequent speaker-participant at biotechnology and environmental conferences in the United States and abroad and his papers have been published in numerous proceedings. He has received the USDA's Award for Superior Service from the Secretary of Agriculture for Outstanding Leadership in the Development and Implementation of Biotechnology Regulatory Policy on Behalf of APHIS and USDA; the USDA's Federal Women Interagency Boards' Achievement Award for Outstanding Contributions to the Federal Women's Program, and the USDA Office of Advocacy and Enterprise Partnership Award. Mr. Medley currently resides in Arlington, Virginia, with his wife Gerre and their two children.

February 1994

Larry E. Miller

Senior Staff Veterinarian

Business Address:

Animal and Plant Health Inspection Service
Suite 204, Presidential Building
6525 Belcrest Road
Hyattsville, MD 20782

Current Duties:

Larry is a Senior Staff Veterinarian for the APHIS Swine Health Staff in Hyattsville, Maryland. He initially joined APHIS in 1989 through its Program Planning and Development Unit, and moved in 1990 to the Swine Health Staff.

Background Data:

Prior to joining APHIS, Larry worked as a lobbyist for the American Veterinary Medical Association Governmental Relations Division in Washington, D.C. He received his Doctor of Veterinary Medicine from Auburn University. He also possesses Masters' degrees in both population medicine and cardiovascular physiology from N.C. State University and Aburn University respectively, an internship certificate in small animal medicine and surgery from the University of Missouri, and a Bachelors degree in poultry science from N.C. State University. Presently, he is working primarily on preharvest food safety issues for APHIS.

Dr. G. A. (Bert) Mitchell

Director, Office of Surveillance and Compliance

Business Address:

Center for Veterinary Medicine
MPN II - Rm. E481 - HFV-200
7500 Standish Place
Rockville, Maryland 20855

Curriculum:

Dr. G. A. (Bert) Mitchell, a native of Canada, graduated from the Ontario Agriculture College in 1960 with special training in animal husbandry and nutrition, and from the Ontario Veterinary College in 1964. He served as Director, Health Industry Research at Ralston Purina for 18 years and as the Director of the Bureau of Veterinary Drugs in Canada for 6 years before becoming an Associate Director of the Food and Drug Administration, Center for Veterinary Medicine and Director of the Office of Surveillance and Compliance in 1988.

As Director, he is the senior advisor on surveillance and compliance policy in respect to animal drugs, feeds, feed additives, and veterinary medical devices. The office plans, develops, monitors, and evaluates surveillance and compliance programs to ensure the safety and effectiveness of animal drugs, feed additives, and devices.

Dr. Mitchell has been recognized through performance awards from industry and government. He is the recipient of many awards including the McGillivary Award for excellence in leadership as an undergraduate; Supergoal Winner for outstanding achievement over a period of 1,000 days; and Boss of the Year from the St. Louis Chapter of Professional Secretaries International.

Keith E. Rinehart

Vice President, Technical Services, Perdue, Inc.

Business Address:

P.O. Box 1537
Salisbury, Maryland 21801

Current Duties:

Responsible for Nutrition, Research, Feed Mill Technician Direction, Laboratories (Analytical; Product Research - i.e. yield, tenderness, nutritional labeling etc.; microbiology research,) Feed Mill Quality Control.

Background Data:

BS, MS - University of Arkansas, Agriculture & Poultry Nutrition
Ph.D.. Purdue University 1966 - Biochemistry

Ralston Purina Co	1966-1976
Fieldale Corp	1976-1982
Perdue Inc	1982 - Present

Have been past president of Poultry Science Association
Have been past president of Delmarva Poultry Industry
On Executive Committee of CAST
Chaired Scientific Advisory Committee for SEPEA
Chaired Growout Committee for NBC

Served in U.S. Army for 2 years - Retired as Captain

Member of Rotary Club

Charles W. Stenholm

Congressman - 17th Congressional District of Texas

Business Address:

1211 Longworth House Office Building
Washington, DC 20515-4317

Current Duties:

Democratic Deputy Whip, 1989 to present
Speaker's Working Group on Policy Development

Congressional Committees and Caucuses:

Agriculture Committee,
Subcommittees: Department Operations and Nutrition (Chairman); General Commodities; Specialty Crops and Natural Resources; Livestock; Foreign Agriculture and Hunger
Budget Committee
Conservative Democratic Forum (CDF), Founder and Coordinator
Rural Health Care Coalition, Co-Chairman
Cong. Leaders United for a Balanced Budget (Clubb). Founder
Dem. Congressional Campaign Comm. Speaker's Appt. to the Board
Democratic Caucus Advisory Group and Task Force on the Economy
Committee on Organization, Study & Review of Democratic Caucus
Sunbelt Caucus

Education:

Stamford High School, graduated 1957
Tarelton State Junior College, graduated 1959
B.S. in Agriculture Education, Texas Tech University 1961
M.S. in Agriculture Education, Texas Tech University, 1962
Honorary Doctor of Laws, McMurry College, 1983
Honorary Doctor of Laws, Abilene Christian University, 1991

Charles W. Stenholm

Congressman - 17th Congressional District of Texas

Membership and Honors:

National Rural Health Association Legislative Award, 1991
Watchdogs of the Treasury Awards, 1980-92
Guardian of Small Business Awards, 1980-92
MORE Common Sense Sound Dollar Awards, 1988, 1990
Spirit of Enterprise Awards, 1988, 1990
"1992 Legislator of the Year" award by the Chemical Producers and Distributors Association
Progressive Farmer's 1993 Man of the Year
Distinguished Service Award, 1993, Texas Society for Biomedical Research and the Texas Medical Association
1993 Richard E. Lyng Award for Public Service
1987 Texas Tech University Distinguished Alumnus Award
19877 Texas ASCS Employee Appreciation Award
1981 Texas Future Farmers of America President's Council Award
1979 Texas Tech University Gerald W. Thomas Outstanding Agriculturalist Award
Past President, Texas State Society of Washington, D.C.
Past President, Texas Breakfast Club of Washington, D.C.
Past President, Texas Electric Cooperatives
Past President, Rolling Plains Cotton Growers
Past President, Stamford Chamber of Commerce
Former member, Texas State ASC Committee
Former member, State Democratic Executive Committee
Charter Trustee, Cotton Producer Institute
Member, Bethel Lutheran Church, Erickdahl, Texas

Personal:

Married to the former Cynthia Watson of Dumas, Texas.
Three children: Chris, Cary, Courtney Ann.

Background Data:

For over 14 years, Congressman Charles Stenholm has served the 17th District of Texas in the U.S. House of Representatives. This 28,000 square mile area, making up 11 percent of the total land mass in Texas, is larger than the areas of Massachusetts, Rhode Island, Delaware, New Jersey, Hawaii, Peurto Rico and the District of Columbia combined. Life in the 17th revolves around cattle, cotton, oil, gas and peanuts economically, and maintains a predominantly conservative edge politically.

Charles W. Stenholm

Congressman - 17th Congressional District of Texas

Stenholm has been an Agriculture Committee member since being sworn into Congress in January, 1979. He serves as Chairman of the Department Operations and Nutrition Subcommittee of the House Agriculture Committee. Most recently, he has been successful in addressing problems in the areas of farm credit, disaster relief and animal product safety. Although in his eighth congressional term, Stenholm continues to be actively involved in his family cotton farming operation in Jones County, Texas.

Stenholm became a member of the House Budget Committee in January, 1991. This has given him an even greater opportunity to actively pursue goals of fiscal responsibility through his efforts to reduce federal spending and achieve a balanced federal budget.

As the founder and coordinator of the Conservative Democratic Forum (CDF), Stenholm has been referred to as the voice of reason in addressing some of the leading issues of the day. Founded in 1980, the 50-plus member CDF is dedicated to an affordable, common sense, democratic legislative process.

Since 1989, Stenholm has served as a Democratic Deputy Whip. In addition, in 1993 he was appointed to the Speaker's Policy Council. Both positions give him the ability to bring his conservative views to the Democratic leadership negotiating table.

In keeping with his concern for the availability of health care in rural areas, Stenholm was elected co-chairman of the House Rural Health Care Coalition. This bi-partisan organization, comprised of representatives from 47 states, works to address the problems of health care in less populated areas. Because of the expertise he has developed in the area of health care, he was asked to served on the White House Health Care Task Force.

Stenholm is one of the most active legislators in the House of Representatives. He consistently leads and is involved in floor debates on a variety of major issues. During his tenure, he has been present for more than 97 percent of all recorded votes.

Al Strating

Director
Centers for Epidemiology and Animal Health
National Veterinary Services Laboratories
Animal and Plant Health Inspection Service
U.S. Department of Agriculture

Dr. Al Strating is the director of the Centers for Epidemiology and Animal Health (CEAH) and the National Veterinary Services Laboratories (NVSL) at the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS). CEAH, which is in Fort Collins, CO, conducts epidemiological studies, maintains an information management system for assessing issues affecting public and animal health, and identifies trends in agricultural production. NVSL, in Ames, IA, is a world-renowned diagnostic laboratory that develops advanced methods to diagnose diseases and coordinates testing procedures for disease eradication programs.

Since beginning his career with APHIS in 1967, Dr. Strating has proven his commitment to the continual improvement of agency programs through the development of science-based information and tools.

Prior to his current position, he was the director of Science and Technology, where he was responsible for all of the agency's laboratories and guided the agency to pursue solid, objective scientific goals. His dedication to scientific excellence has helped encourage over 25 percent of APHIS veterinarians to attain postdoctoral degrees. Previous managerial positions with APHIS' Veterinary Services include western and central regional director and director of NVSL.

Dr. Strating was asked to conduct a management evaluation of USDA's Food Safety and Inspection Service (FSIS) in 1991. He also oversaw a taskforce last year that evaluated FSIS' organizational structure. In 1987, he was awarded a Presidential Rank Award for his model leadership and scientific accomplishments at APHIS.

Dr. Strating received his doctor of veterinary medicine degree from the University of Minnesota in 1965 and later earned a postdoctoral degree in virology from Colorado State University.

Dr. Strating grew up on a small family farm in Minnesota. He and his wife Trudy have three children.

February 1994

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H. Fred Troutt, VMD, PhD

Professor and Head of Department

Business Address:

Department of Veterinary Clinical Medicine
University of Illinois

Current Duties:

Department Head
Chairman, Food Animal Production Medicine Consortium
Teacher: Internal Medicine and Applied Nutrition of Dairy Cattle

Background Data:

BS	'58 The Pennsylvania State University
VMD	'62 University of Pennsylvania
MS	'67 Purdue University
PhD	'70 University of Missouri

Dr. H. Fred Troutt is a 1958 graduate of The Pennsylvania State University, and in 1962 The School of Veterinary Medicine, University of Pennsylvania. From 1962 to 1964 he was engage in private practice, predominately dairy, in Quakertown, Pennsylvania. In 1964 he joined the faculty of the Department of Veterinary Clinics at Purdue University and in 1967 received a Masters degree from that institution.

In 1970 as a NIH Special Postdoctoral Fellow at the University of Missouri, he earned a Ph.D. degree in Comparative Pathology and joined the faculties of the Department of Large Animal Medicine and Surgery and the Department of Veterinary Pathology at the College of Veterinary Medicine, University of Georgia. At Georgia, he initiated herd health programs for cattle and swine and participated in the instructional programs in both medicine and pathology. Dr. Troutt's research was in the area of infectious disease, especially salmonellosis. The herd health program developed by Troutt while at Georgia included utilization of mobile laboratory facilities and was among the first comprehensive herd health programs emphasizing preventive food animal medicine in academic veterinary medicine in the United States.

In July 1975, Dr. Troutt was appointed Professor and Head of the Department of Veterinary Science at Virginia Polytechnic Institute and State University in Blacksburg, Virginia. He participated in the founding of the Virginia-Maryland Regional College of Veterinary Medicine and served at that college as Acting Chairman of the Department of Large Animal Studies, as Associate Dean for Research and Service, and also as

H. Fred Troutt, VMD, PhD

Professor and Head of Department

Assistant Director of the Virginia Agricultural Experiment Station. As Associate Dean, Dr. Troutt was responsible for the early development of the physical plant at the college, the establishment of the research program, including the development and initial presentation of the graduate program. He additionally instituted the clinical programs and managed the college's Cooperative Extension efforts. As Assistant Director of the Virginia Agricultural Experiment Station, Dr. Troutt developed the first Animal Health Research Plan for VPI and Virginia.

In 1986, Dr. Troutt accepted the position of Director of the Veterinary Medicine Teaching and Research Center at the University of California, Davis, also holding appointments as professor in the Department of Medicine as well as in the Department of Epidemiology and Preventive Medicine, School of Veterinary Medicine. The number of personnel and the extramural research programs were significantly expanded during Dr. Troutt's tenure at the Veterinary Medicine Teaching and Research Center.

In September 1988, Dr. Troutt accepted the position as Head of the Department of Veterinary Clinical Medicine and Professor of Veterinary Clinical Medicine at the College of Veterinary Medicine at the University of Illinois.

Dr. Troutt is the author or co-author of numerous scientific papers and articles and frequent lecturer to both producer and veterinary groups. He is a Diplomate of the American College of Veterinary Nutrition and an Honorary Diplomate of the American Board of Veterinary Practitioners. He is the recipient of the Norden Distinguished Teaching Award and American Association of Bovine Practitioners' Award for Excellence in Preventive Medicine. Dr. Troutt is currently Chair of the Food Animal Production Medicine Consortium and was Principal Investigator of the Interinstitutional Food Animal Production Medicine Program funded by the Pew National Veterinary Education Program.

Dr. Troutt has done research in areas of metabolic and infectious diseases of cattle and swine. He has instruction, research, and extension experience and he has extensive clinical experience at the farm level in various regions of the United States -- East, Southeast, Midwest, and West Coast.

Dr. Troutt is married to the former Mary Loesch of Norristown, Pennsylvania, and they have three children: Elizabeth, presently in graduate school at the University of Wisconsin-Madison; Sarah, a second year law student at Willamette University in Salem, Oregon; and Andrew, employed by a publishing firm in Champaign, Illinois.

William W. Utterback

Area Veterinarian-in-Charge

Business Address:

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Dixon, CA 95620

Current Duties:

Present position is Area Veterinarian in Charge of California for USDA, APHIS, Veterinary Services.
Also serving as Director of the Brucellosis Critical Area Task Force in Ontario, Ca.
Program organizer and author of the California Dairy Beef Quality Assurance, 10 Point Plan Plus.

Background Data:

Education:

Graduate 1963 UC Davis D.V.M.
Graduate 1970 UC Davis M.P.V.M.
Member of AVMA, USAHA, NAFV, CPSVMA
President in California Public Service Veterinary Medical Association

Previous Employment:

In private practice for 3 years in Redding, Ca.
Employed in field VMO position with USDA, APHIS, VS 3 years in Ca..
Served as State and Regional Epidemiologist with USDA, APHIS, VS on several disease eradication programs i.e.. Brucellosis, TB, and Cattle Fever Ticks
Served as Epidemiologist with USDA, APHIS, VS, on many National Emergency Task Force Operations i.e.. VVND, Hog Cholera, VEE, ASF and AI.
Assistant Area VIC for USDA, APHIS, VS in Ca. from 1977-91.
Area VIC for USDA, APHIS, VA in Ca. from 1991 to Present.

Dr. Lyle P. Vogel

Assistant Director, Membership and Field Services (Public Health, Animal Disease Control and Management), American Veterinary Medical Association

Business Address:

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Current Duties:

Staff Consultant to the AVMA Council on Public Health and Regulatory Veterinary Medicine. Also serves as the Staff Consultant to the AVMA-USDA Relations Committee. Will also become the Coordinator of Emergency Preparedness for the AVMA.

Background Data:

Education:

Master of Public Health, University of Minnesota, 1978
Doctor of Veterinary Medicine, University of Minnesota, 1967

Professional Achievements:

Board certified by the American College of Veterinary Preventive Medicine (formally the American Board of Veterinary Public Health). Awarded the "A" proficiency designator by the U.S. Army Surgeon General in recognition of exceptional expertise and accomplishments in veterinary public health. Long-term significant accomplishments recognized by induction into the Order of Military Medical Merit.

Dr. Thomas E. Walton

National Program Leader for Animal Health

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Current Duties:

Responsible to ensure the relevance of the ARS animal disease and preharvest food safety programs to the needs of the American consumer, industry, and the USDA regulatory agencies.

Background Data:

D.V.M - Purdue University, 1964
Ph.D. - Cornell University, 1968
1972 to present - Diplomate of the American College of Veterinary Microbiologists

Gary Wilson

Director of Animal Health/Inspection, Research and Education
for the National Cattlemen's Association

Business Address:

National Cattlemen's Association
1301 Pennsylvania Avenue, NW
Suite 300
Washington, DC 20004-1701

Current Duties:

Gary assists NCA's Animal Health/Inspection, and Research and Education committees in formulating the national policy and research priorities of the beef cattle industry.

Background Data:

Gary was raised on a purebred Angus operation in Southeastern Ohio. He graduated from The Ohio State University with a B.S. and a Master's degree in Animal Science. Previous to his current position at NCA, Gary managed the beef cattle research and teaching herd for the Animal Science Department of the Ohio State University.

Gary, his wife Cindy, and their son Josh make their home in Germantown, Maryland.

Cardinal

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Inspection
Service

APHIS 10-05-002

DRAFT

National Food Safety Agenda:

An APHIS Perspective

Contents

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Issued March 1994

National Food Safety Agenda: An APHIS Perspective

National Food Safety Agenda: An Overview

Supplying the American public with food involves many participants and several different systems that are linked together in a complex chain extending from farm to harvestor slaughter to processing plant to table. Contamination of our meat, poultry, eggs, and dairy products can occur at any link in this chain. The winter 1992–93 outbreak of the *Escherichia coli* 0157:H7 *(E. coli)* infection in the Western United States focused national attention on the vulnerability of this chain to disease-causing pathogens.

Verotoxin-producing *E. coli* is just one of many foodborne pathogens causing illness in people in the United States today. Even the most optimistic estimates of illness resulting from food contamination reflect the need for improved food safety in this country. The economy suffers an estimated $7.7 billion to $8.4 billion in annual losses because of the costs of diagnosis, treatment, lost productivity, and death associated with food contamination (Bean and Griffin 1990).

The U.S. Department of Agriculture (USDA) currently protects consumers against foodborne pathogens by testing for drug and pesticide residues and by inspecting livestock in federally inspected slaughter plants for infections caused by micro-organisms. However, this system has weaknesses. Micro-organisms that can cause sickness in humans cannot be detected visually.

Animals are susceptible to infection or contamination with chemical and biological pathogens. Such exposure can take place on the farm, during transport, or at the market on the way to slaughter. Intensified food-animal production systems may increase the risks of such exposure.

These animal production and meat inspection factors, coupled with consumers' increasing concern about the quality, safety, and nutritional value of their food, have confirmed the need for a better integrated government–industry system that will enhance the safety of our food supply.

To accomplish this, USDA is designing a farm-to-table food safety strategy that will provide a way to minimize pathogen contamination throughout the food production process.

Such a strategy will systematize food safety by creating a process in which USDA looks carefully at the risks at each critical point in the food production process. And once the risks are identified, we can begin reducing or eliminating them in a scientifically sound manner.

The benefits of implementing a more comprehensive national food safety program are many. Such a program will focus on the prevention of human foodborne illnesses through reduction of biological and chemical contamination on the farm, during processing and distribution, and during food preparation, thereby reducing the losses associated with foodborne illnesses and increasing the value of U.S. food products.

Four prinicipal outcomes flow from a coordinated national food safety program.

First, a safer food supply will significantly reduce the incidence of foodborne illness and the economic losses connected with it. A safer food supply will also help meet the goals listed in the U.S. Department of Health and Human Services' "Healthy People 2000 National Health Promotion and Disease Prevention Objectives" (hereafter referred to as "Healthy People 2000"). These objectives aim at reducing infections caused by key foodborne pathogens such as *E. coli* and *Salmonella enteritidis* (SE).

Second, safer food leads directly to improved consumer confidence. If USDA can assist agricultural producers in growing, harvesting, and manufacturing even safer foods, consumer confidence in the food supply will ultimately be strengthened.

Third, higher food safety standards will give U.S. producers a decided advantage in securing competitive international markets.

Finally, practices that improve the safety of food animal products also will benefit animal health and production efficiency.

A Coordinated Effort

The U.S. food chain begins on the farm. From there, animals are transported to markets and then to slaughtering plants. These links compose the preharvest portion of our food chain. A recent report from the Centers for Disease Control and Prevention (CDCP) concluded that most pathogens appear to enter the food chain before animals arrive at processing plants.

The preharvest portion in the food chain is indeed critical. The Animal and Plant Health Inspection Service (APHIS) has accepted the challenge of providing leadership in preharvest pathogen reduction because we believe we can help reduce microbiological pathogens and chemical contamination in this portion of the food chain. But APHIS' role in preharvest pathogen reduction must be viewed within the context of a larger, national food safety agenda in which other agencies have primary responsibility. We will coordinate our pathogen-reduction activities with those allied regulatory agencies to ensure a governmentwide team approach to food safety programs.

A Governmentwide Approach

USDA has committed to establishing a Pathogen Reduction Task Force to coordinate efforts to reduce pathogens in meat and poultry. This task force will be chaired by the Deputy Assistant Secretary for Marketing and Inspection Services. Membership will include the Administrators from APHIS, the Agricultural Marketing Service (AMS), the Food Safety and Inspection Service (FSIS), the Packers and Stockyards Administration (P&SA), the Extension Service (ES), the Agricultural Research Service (ARS), and the Cooperative State Research Service (CSRS). In addition, officials from the U.S. Department of Health and Human Services' Food and Drug Administration (FDA) and CDCP, which oversee certain segments of the food chain, will participate in the task force.

The task force is responsible for providing leadership, coordination, and oversight so that the Department's ongoing efforts to reduce pathogens in the meat and poultry supply are realized in a timely, professional, and scientifically supportable manner. The activities of the pathogen-reduction program can be divided into three broad areas: preharvest, harvest processing, and information and consumer services. The preharvest area consists of projects dealing with on-the-farm, transport, and market critical control points. Harvest processing includes slaughter and processing activities. The information and consumer services area is made up of sales, food service, and consumer critical control points.

Within the USDA task force, APHIS will lead the preharvest area and FSIS will lead both the postharvest and information and consumer services areas. While the focus of these efforts centers on pathogen reduction, the same team and coordinated actions will consider the reduction of chemical contaminants as well.

As a first step, the task force will thoroughly review the proposed pathogen reduction program to provide refinements and further suggestions about projects that will contribute to the overall goal. The task force will be responsible for the development of plans, evaluation of progress, program adjustments, and leadership and will function as an intergovernmental team, using innovative and creative strategies to achieve the program's mission.

APHIS Involvement in the National Food Safety Agenda: Preharvest Pathogen-Reduction Activities

APHIS is advantageously situated to assume a leadership role in preharvest food safety because many critical points in food safety occur at precisely those points where our Veterinary Services (VS) personnel already conduct animal health surveillance, disease control, and eradication missions. Such VS activities are occurring on the farm, in transport, and at livestock markets and auctions.

The VS field force consists of veterinarians and animal health technicians with experience in livestock identification, animal movement, disease investigation, monitoring and surveillance, epidemiology, preventive medicine, and public health.

Our APHIS VS Centers for Epidemiology and Animal Health (CEAH) maintain a cadre of analytical epidemiologists, economists, statisticians, and computer specialists who can support the field operations in the design and implementation of large-scale epidemiologic projects that are national in scope.

In addition, our APHIS VS National Veterinary Services Laboratories (NVSL) provide disease diagnostic services and play a pivotal role in conducting applied research and developing diagnostic tests for emerging diseases.

Finally, APHIS VS headquarters staff provides an umbrella function by maintaining liaison with the Nation's commodity groups, coordinating projects of intra- and interagency scope, resolving policy and regulatory issues, providing technical expertise, and managing national disease programs.

Industry Involvement

While APHIS can use its many assets to help ensure a safer preharvest food-production process, food safety will continue to be a responsibility shared by all participants in the food chain. The successful implementation of a national food safety program depends on coordination between Federal and State agencies, the food industries, and consumers. Producers obviously play a critical part in this effort.

Preharvest food safety may not necessarily require additional regulations. It will, however, require agricultural industries to take a more responsible and proactive role in reducing microbiological and chemical contamination. Together, industry and government can develop onfarm techniques to accomplish better decisionmaking and safer production practices.

A number of industry-sponsored quality-assurance programs already contribute to a safer food supply. Examples include the Milk and Dairy Beef Quality Assurance Program, a ten-point grassroots education effort by the National Milk Producers Federation and the American Veterinary Medical Association; pork and beef quality-assurance programs developed by the National Pork Producers Council and the National Cattlemen's Association; the American Veal Association's quality-assurance program; the "good manufacturing practice" guidelines developed by the National Broiler Council and several quality-assurance efforts by the United Egg Producers; the chemical-residue avoidance program of the National Turkey Federation; and the flock health-certification program of the American Sheep Industry Association. All these programs focus on actions that individual producers can take to improve the quality and safety of the products they market. These programs provide the foundation for building future preharvest food-safety initiatives.

There also is great potential for creativity in this area. Producers can take advantage of research that enhances the resistance of food-producing animals and minimizes their exposure to chemical and biological pathogens. In addition, innovations in biotechnology may provide producers with new approaches to producing better products that have more resistance to infectious agents.

APHIS' Core Strengths and Services

This document identifies the services VS currently provides and the APHIS strengths that we believe can be useful in a national food safety initiative. We are requesting input from our Federal, State, and local cooperators to help us identify specific ways to use our capabilities in working together to ensure the safety of animal-derived food products.

The following section includes detailed descriptions of three APHIS core strengths and eight disease-management services provided in our current animal health programs that can be used to implement preharvest pathogen-reduction initiatives.

For each core strength and service, we explain the activities APHIS currently performs and, for the service areas, explore how these can be expanded under blueprints for action.

A table on page 14 indicates APHIS services in the food chain and when the services can be implemented for food safety activities.

Core Strengths

Three core strengths in APHIS' Veterinary Services form the basis for its preharvest food-safety activities.

Epidemiologic Delivery System

Epidemiology is the branch of medicine concerned with investigating causes and controls of epidemics in a population. VS has in place an epidemiologic delivery system that is used to collect, analyze, and disseminate information on diseases, diagnostic data, and surveillance efforts.

A National Food Safety Agenda requires the existing infrastructure to be further developed so that a full spectrum of food-safety-related services can be provided. Such services include disease monitoring and surveillance, traceback capabilities, outbreak and hazard investigation, animal identification, risk assessment, economic analyses, research and development, communication and education, and risk management.

To provide for strategic and operational preharvest food-safety planning, we are establishing a Food Safety Management Team within APHIS led by a full-time staff officer. The team will consist of a staff member for each commodity staff group, one for each laboratory discipline involved in diagnosis of foodborne diseases, one for the epidemiology centers, and one for the epidemiology field staff. This team will interact with APHIS cooperators (e.g., FSIS, AMS, producers, packers, and market personnel) to determine specific activities APHIS will conduct in implementing its preharvest pathogen-reduction activities.

The team will identify resources needed for national preharvest surveillance and monitoring, risk assessment, economic analyses, and identification of hazards on the farm, in transport, and at the market. It also will coordinate all VS monitoring and surveillance activities, including banking of diagnostic specimens.

As a part of this effort, each State will establish multidisciplinary food-safety teams representing both government and industry. Included on the teams will be representatives from APHIS, FSIS, AMS, FDA, State counterparts and cooperators, university faculty, State diagnostic laboratories, producers, private veterinarians, and extension agents. The purpose of the teams will be to begin communication, education, and planning among participants and to identify their respective roles and responsibilities.

As our agenda takes hold and resources are identified, the team will become a full-time permanent staff function.

Information Technology Management

Managing the U.S. food safety continuum will require the use of advanced information technology equipment coordinated among all participants.

Information systems used by State and Federal governments, packers, producers, marketers, and diagnostic laboratories must coordinate data on animal identification, farm location, chemical and microbiological agent identifications, quality assurance programs, and herd certifications to provide consumers and producers with current and integrated food safety information.

Improved information sharing through a national information technology management strategy will enhance programs in disease prevention, investigation, and control. It will help producers attain the level of quality assurance that is important so the products of American animal agriculture can continue to compete in a global market.

A coordinated USDA system will eliminate duplication of data and therefore help conserve resources.

APHIS and State cooperators have substantial experience in establishing large data-base programs to monitor and track animal disease eradication programs. APHIS has a cadre of computer professionals who are qualified to lead such an initiative.

There is a critical need to collect, analyze, and disseminate preharvest food-safety information in order to identify critical control points in production. It is essential that we learn more about how these preharvest factors influence disease prevention. The information learned from studying individual premises must then be distributed throughout the industry. APHIS is qualified to assume an important role in this area.

Diagnostic Laboratory Participation and Support

Identifying animals that harbor agents of potential health risk to humans requires sensitive and specific laboratory diagnostic procedures. The laboratories at NVSL have these capabilities, and their services can be expanded to provide an extensive foodborne pathogen and residue surveillance system. This arm of APHIS serves as the national animal-disease diagnostic reference laboratory and is a multidisciplinary advisory and technical resource for state-of-the-art diagnostic activities.

NVSL's professional staff is proficient in the diagnostic disciplines of pathology, microbiology, virology, immunology, chemistry, toxicology, parasitology, and molecular biology. This staff provides diagnostic support and technical expertise for APHIS disease-eradication programs. It lends diagnostic reference assistance, produces diagnostic reagents, and provides professional consultation to State-funded animal diagnostic laboratories. NVSL also collaborate with CDCP, ARS, and research laboratories of universities and commercial industries.

In carrying out these responsibilities, NVSL provides data on pathogens responsible for causing foodborne illnesses in humans. The laboratories have the capability to assist the network of State-funded diagnostic laboratories with quality-assurance testing.

Many of the State laboratories are interconnected through a computerized reporting mechanism. APHIS can monitor the health of the animal agriculture community nationwide through this system.

APHIS Services

As USDA enters its second 100 years of promoting animal health, it can look to APHIS to build on the successful disease eradication programs of the past. The knowledge we have gained and our relationships with industry provide a base from which we can address the public-health implications of food animal production. The SE program is a good example of how industry and government can work together to address preharvest issues of public-health concern.

Animal Identification

APHIS has in place a system for animal identification so that diseased or exposed animals or those suspected of having certain infectious diseases can be traced back to their premises of origin. The system uses identification devices such as eartags and backtags that are attached to animals in interstate commerce.

Because animal identification provides the link to the premises of origin, it will be critical in the implementation of a National Food Safety Agenda. This link can be used to identify animals and animal products that are contaminated with biological or chemical pathogens.

Blueprint for the Future

- In conjunction with industry, evaluate available electronic methods for entering and tracking animal identification information and establish the data bases and protocols for storing this information.

- Develop a national identification program for all livestock to facilitate accurate and timely tracebacks. This program will involve working with industry representatives to develop an identification and recordkeeping system for premises of origin. Such a system must generate fast and accurate identification concerning the producer's animals and may lead to the awarding of quality incentives at slaughter. This system will promote consumer confidence and producer accountability.

- Identify ways to supplement APHIS' current traceback systems to increase speed and accuracy of tracebacks.

- Implement a multidisciplinary team approach to find an animal identification solution to the problems that FSIS has identified with cull dairy cows, injured cows, and veal calves.

- Establish APHIS as the national traceback linkage for all Federal food safety agencies.

Monitoring and Surveillance

APHIS has conducted animal-health monitoring and surveillance activities throughout the country for several years, and the success of many prior disease eradication programs can be largely attributed to these activities. More recently, VS' National Animal Health Monitoring System (NAHMS)—begun in the early 1980's—has provided us with more accurate and more complete information on the incidence and prevalence of various diseases and disease conditions. Dairy heifer, swine, and beef cow surveys are but three of the large-scale monitoring and surveillance initiatives NAHMS is conducting.

Currently, the data collected at NVSL and through cooperative efforts with States, industry, and universities are used in epidemiologic studies to determine the prevalence and distribution of diseases of economic and human health significance. We also use these data to develop future animal health strategies. Data collected through monitoring and surveillance activities are distributed to animal health professionals and industry representatives through CEAH. A separate line-item budget for this activity creates added flexibility to respond to and study outbreaks of foodborne illnesses.

Blueprint for the Future

- Provide input, via the APHIS Food Safety Management Team, into the development of programs to identify and monitor agents of food-animal origin implicated in outbreaks of human disease.

- Monitor slaughter surveillance test results provided to State and Federal field personnel to obtain data on contaminants identified at slaughter. This process can be the key to establishing baseline studies and occurrences of potential pathogens.

- Expand APHIS surveys to address additional food safety concerns of the poultry and feedlot-cattle industries and to generate national prevalence estimates of specific foodborne pathogens of animal origin.

- Via industry quality-assurance programs in herds and flocks, develop programs that can be used to certify animals and products from such herds for export and provide other marketing advantages to the producer.

- Promote quality assurance on the farm to minimize the amount of retesting required at slaughter. Assist producers with laboratory support for verification of their quality assurance efforts.

- Use epidemiologic methods to evaluate alternative sampling approaches and diagnostic technologies to support monitoring and surveillance initiatives.

- Design and implement prevalence and incidence studies of targeted pathogens and other potential food contaminants. These studies will originate at slaughter plants and on the farm, and will help identify data gaps.

- Determine which kinds of animals are most likely to carry disease agents or other food contaminants and focus sampling efforts on these species.

- Design case-control studies to determine risk factors that will help identify those farms likely to experience specific types of food contamination. Implement monitoring and intervention strategies for those farms.

- Develop reporting and data-entry mechanisms to identify livestock and poultry operations (using geographic coordinates) for various parameters, such as quality assurance and participation in disease certification programs, quarantines, and diagnostic testing data.

- Create a simple, easy-to-use, automated record and information system to handle the data from surveillance activities at the local and national levels.

- Coordinate VS monitoring and surveillance activities, including banking of diagnostic specimens.

Outbreak and Hazard Investigation

When outbreaks of animal diseases occur, APHIS has the expertise to respond immediately by conducting epidemiologic investigations, laboratory tests, and animal tracebacks; by identifying critical control point failures; by evaluating solution options; and by implementing a control, reduction, or eradication plan. We can use these same skills to investigate food safety problems of animal origin and learn how to respond to them. In addition, our emergency response capabilities can be expanded through enhanced cooperative efforts with other government agencies.

Blueprint for the Future

- Secure statutory authority to assist FDA and FSIS in conducting tracebacks and onfarm investigations of contaminated food of animal origin. Then expand epidemiologic surveys to include food safety concerns along with animal health issues.

- Establish APHIS procedures for investigating potential foodborne pathogens on the farm.

- Enhance the VS field staff's capability to conduct traceback and onfarm biologic and chemical hazard investigations by training personnel in rapid epidemiologic assessment techniques.

- Integrate disease outbreak investigations into ongoing food safety programs. Collect baseline data for control farms while completing disease outbreak investigations.

- Identify data gaps that limit epidemiologic analyses of the five key foodborne disease agents in "Healthy People 2000."

- Establish clear goals and procedures so that information that is collected and analyzed can be used to promote quality assurance and risk management.

Risk Assessment

Improving food safety requires that we measure the risk of animal-derived pathogens entering each stage of production, from the farm to the table. Methodologies exist to quantify the magnitude of these risks.

Risk assessment involves three steps: identifying the hazards, estimating the likelihood of the hazard occurring, and evaluating the event's impact should it occur.

Timely and accurate risk assessments will enhance VS' capability to respond to real versus perceived food safety concerns. The hazard analysis critical control point (HACCP) approach, currently used at slaughter and in the food-service industry, can be expanded to identify critical control points within the entire food safety chain.

Using risk assessment techniques and a critical control point approach will make it possible to create strategies to reduce the overall risk to the consumer.

The process of risk assessment is already incorporated in the APHIS decisionmaking process concerning import–export matters, program implementation, and identification of emerging issues. For example, risk assessment was used in responding to SE by calculating the potential for human exposure to SE through egg consumption. APHIS has also used risk assessment to evaluate the potential for an epidemic of bovine spongiform encephalopathy in this country.

Blueprint for the Future

- Conduct risk assessments on the five key foodborne pathogens of animal origin identified in "Healthy People 2000."

- Conduct epidemiologic studies designed to identify risk factors for *E. coli* and SE and the critical points in the food chain where these organisms can enter, with special emphasis on the preharvest portion of the chain.

- Broaden risk assessments and hazard analyses to include other potential foodborne pathogens of animal origin, and expand hazard analysis models to allow various risk management and prevention alternatives to be evaluated.

- Initiate studies of risk factors to support the development of voluntary food-safety certification programs by commodity groups.

- Evaluate the human health risks that may be associated with emerging animal diseases, such as bovine spongiform encephalopathy, or diseases affecting new animal populations, such as bovine tuberculosis in Cervidae.

- Augment APHIS' risk-assessment and hazard-analysis capabilities through recruitment and training of multidisciplinary teams.

- Begin forecasting potential changes in food safety risks that may result from changing human demographics and consumption patterns in association with changing animal demographics and production practices.

Risk Management

APHIS has a cadre of experienced professionals who can conduct disease, residue, or contaminant risk assessments, prepare cost-benefit analyses, or devise risk-avoidance and risk-management strategies. These strengths will enable the agency to intervene successfully in human foodborne outbreaks of animal origin. With special emphasis on zoonotic diseases, APHIS has successfully eradicated animal diseases from this country using risk-management techniques.

Blueprint for the Future

- Review current information available on the five key foodborne pathogens identified in "Healthy People 2000." Cooperate with ARS, universities, and allied Federal agencies in conducting research on preharvest risk-management strategies for those pathogens.

- Establish an APHIS task force to determine the most advantageous preharvest risk-management strategies for a National Food Safety Agenda. Meet with each commodity group to determine their priorities for preharvest intervention for additional pathogens.

- Establish graduate training positions for the major commodity groups (swine, poultry, beef, dairy). The personnel in these new positions will be trained in the area of preharvest food safety. In time, they will be able to assist in the design of the necessary interventions to reduce the risk of human illness caused by farm-origin pathogens.

- Provide the field force with training in herd health management, quality assurance, and food safety issues that affect farm-production management, transportation, and marketing.

- With other agencies and universities, develop an integrated approach for the research, design, and pilot testing of intervention strategies. Determine, through a review of available data, if preharvest is the most appropriate position in the food safety continuum for initiation of pilot intervention strategies for the most common microbiological contaminants.

- Continue to develop and implement SE intervention strategies for egg-laying flocks.

- Establish management strategies for minimizing pathogens from individual farms, thereby reducing the need for antibiotics that can enter the food chain.

- With the help of industry and consumers, structure voluntary national animal health schemes that focus on risk reduction and producer incentives. Reach agreements with industry officials to support programs that continue to move toward reducing the prevalence of a given pathogen.

- Form local, regional, and national partnerships with government, industry, and academia for conducting biological and chemical contaminant-awareness programs. These programs will monitor biological and chemical pathogens and establish acceptable risk baselines.

Economic Analyses

Historically, the economics of food safety initiatives have not always been established before launching new programs. With the tightening Federal budget and public concerns for a low-cost, safe, and abundant food supply, the importance of the economics of a food safety initiative has increased.

Economic analyses can not only characterize the potential costs of specific foodborne pathogens but also provide insights into alternative approaches for achieving a balance among animal health and welfare, food safety, production efficiency, and environmental quality.

Economic analyses are playing an increasingly important role in the APHIS decisionmaking process. Information gathered from economic analyses and risk assessments is used to construct effective risk management strategies. APHIS employs economists who are capable of conducting complex analyses. We will also coordinate efforts with economists from the Economic Research Service, ARS, FSIS, AMS, and universities in evaluating complex economic scenarios of national scope.

Blueprint for the Future

- Compile existing economic information concerning the five key foodborne pathogens of animal origin identified in "Healthy People 2000."

- Ascertain data needs for economic analyses of foodborne pathogens of animal origin. This includes evaluating the cost-effectiveness of potential intervention programs identified through the risk assessment process and measuring benefits that consumers and private industry will experience as a result of improvements in food safety.

- Expand economic data-collection systems to support analyses and risk management. Evaluate voluntary market incentives and potential participation levels of stakeholders with regard to various food safety initiatives, such as producer certification programs and quality assurance initiatives. Compare alternative approaches that reward producers for improvements in food safety while reducing the economic impacts of specific foodborne pathogens.

- Incorporate economic data into the prioritization of food safety issues of concern to APHIS and into the risk communication processes on food safety issues.

Communication and Education

Working with USDA's Extension Service, the media, and other outlets, APHIS successfully provides information and training to States and industry on disease control and eradication programs. We can expand our existing infrastructure to provide essential communication and education in the preharvest arena and to coordinate a team effort among industry, State and Federal agencies, academia, and consumers.

Information derived from risk assessment, economic analyses, and research and development can be shared with these groups to educate them about biological and chemical pathogen control and safety strategies.

Education of field personnel in epidemiology has strengthened the APHIS infrastructure. These qualified professionals not only provide an effective and responsive epidemiologic delivery system, but can be a source of valuable food safety information at the grassroots level.

Blueprint for the Future

- Form a task force to discuss information sharing and integration. Define the communication responsibilities for food safety issues for each unit in the food chain, e.g., Federal agencies, industries, and consumers.

- Establish and communicate APHIS food safety priorities to all participants in the epidemiologic delivery system. Enhance the education and training of the APHIS field force to prepare for epidemiologic support and traceback activities and to give individuals an understanding of emerging food safety issues. This project will focus initially on *E. coli* and SE and will define the roles of APHIS personnel in a food safety initiative.

- Disseminate results of the APHIS *E. coli* survey of dairy cattle to consumers, producers, and veterinary organizations.

- Provide intensive risk-communication training to APHIS personnel.

- Expand risk communication efforts concerning *E. coli* and SE. Target this to all participants in the farm-to-table food chain as well as to U.S. trading partners.

- In conjunction with the Extension Service, provide information to all participants in the food chain that results from our risk assessment activities and our economic analyses of key foodborne pathogens of animal origin. Our risk communication efforts will be focused at the preharvest level but will also include the balance of the food chain.

- Analyze risks and intervention strategies and transfer results of these analyses through educational programs for producers and their veterinary practitioners in support of herd-certification and quality-assurance programs. The focus of these educational efforts will be on preventing disease, rather than treating it. This will help producers make informed risk-reduction decisions.

- Establish an integrated APHIS-wide information network that maintains updates on food safety initiatives, risk assessments and hazard analyses, risk communication materials, and information on investigations and tracebacks of specific biological and chemical contaminants. This food-safety communication network—to include APHIS headquarters and fields staffs, CEAH, and NVSL—will provide electronic mail, access to program data, and specific information on biologic or chemical hazards being investigated.

- As a next step, link this APHIS information network with networks of CDCP and other agencies and groups interested in food safety. Through this expanded network, share risk-assessment information with all other interested animal and human health agencies.

Research and Development

Historically, a gap has existed between research findings and their practical application to animal health program needs. In cooperation with ARS and CSRS, APHIS works to fill this gap through methods development.

In the preharvest pathogen-reduction initiative, APHIS and all supporting research entities must learn to increase their coordination and implementation efforts. Because of the complexity of some issues, combined efforts of Federal, State, and university researchers will be required.

Research and development activities must be conducted to provide state-of-the-art methods for epidemiologic delivery, diagnostic technology, sevelopment of intervention strategies, and pathogen reduction.

APHIS can use its existing system to identify information gaps in the food safety continuum and to assist in designing research initiatives to fill these gaps. Information derived from tailored research initiatives can immediately be applied to real-world food safety problems.

Blueprint for the Future

- Prioritize future research needs. These needs can be addressed within ARS and CSRS and by forming partnerships with university consortiums and biologics companies.

- Investigate technology currently available that will provide accurate diagnostic information for the top five pathogens listed in "Healthy People 2000" (*Salmonella* sp., *Campylobacter jejuni, E. coli, Listeria monocytogenes,* and SE). Prepare a plan to provide the technology for diagnosing these diseases. Such diagnostic technology must include tests with adequate sensitivity and specificity to differentiate pathogenic from nonpathogenic serotypes.

- Determine the methods of choice for testing food-producing animals for antibiotics, pesticides, and other contaminants. Standardize test methodologies with FSIS so that onfarm surveillance and at-slaughter test results can be correlated.

- Work with research laboratories and biologics companies to develop onfarm tests to help producers monitor their animals for chemical and biological pathogens. These tests can also serve as tools for APHIS' epidemiologic studies of zoonotic diseases.

- Determine the level of diagnostic services that will be needed to give full support to the National Food Safety Agenda. Determine the role of State-funded diagnostic laboratories in supporting program needs, and determine the cost to contract these services.

- Implement a plan to provide diagnostic tests for additional food pathogens beyond those listed in "Healthy People 2000." Identify the laboratory technology necessary to obtain the desired results for the specific food contaminant being studied. Focus on rapid, accurate test procedures that can be performed on live animals. Establish the sensitivity and specificity of these tests. Prioritize a list of disease agents for which there is no adequate diagnostic test according to their degree of hazard to the food supply. Provide information and reference micro-organisms to ARS, universities, and commercial firms for research to develop identification tests.

- Coordinate a national network of animal disease diagnostic laboratories participating in a national food monitoring and surveillance program. Integrate the diagnostic reporting system, and promote standardized diagnostic methods for all participating laboratories.

- Let NVSL serve as a national reference laboratory by providing standardized procedures for investigating farms suspected of being sources of human illness caused by chemical contamination. Expand proficiency testing for State-funded diagnostic laboratories to help standardize the diagnostic laboratory network that supports the National Food Safety Agenda.

- Develop and implement molecular biological techniques to help evaluate the source of foodborne outbreaks and to differentiate the pathogenic micro-organism strains from those not associated with human disease.

Summary

APHIS' objective in the National Food Safety Agenda initiative is to reduce the incidence of foodborne illness, improve consumer confidence, and improve animal health and production by focusing on the preharvest segment of the food chain. Emphasis will be placed on shared responsibility between government and industry.

Cost–benefit analyses must be conducted to ensure that interventions are implemented at the most-effective critical control points and that both producers and consumers are receiving the maximum benefit from expended resources.

Because APHIS has an existing infrastructure and a successful track record in identifying and controlling infectious diseases of livestock, additional resources required to accomplish pathogen-reduction programs can be held to a minimum. With our current infrastructure, APHIS will be an active partner with the private sector and with other Federal and State agencies that have food-safety and quality-assurance responsibilities.

Increased levels of funding will allow more-active implementation of a National Food Safety Agenda by incorporating developmental projects that will help define the long-term goals of the initiative. Working in conjunction with FSIS, ES, and universities, APHIS can conduct training courses in food safety and assume a leadership role in preharvest issues in partnership with other public and private agencies.

We will be able to monitor food safety concerns and prioritize issues for further intervention.

We will be able to cooperate actively with FSIS, ES, public health officials, and veterinary practitioners to trace back and investigate foodborne disease outbreaks where animal pathogens are implicated.

We will expand diagnostic testing for potential foodborne pathogens using samples generated by existing monitoring and surveillance programs.

Funding will allow for the design of an identification and recordkeeping system that will enhance identification of premises of origin.

A food safety hotline between APHIS, other food safety agencies, and States will be established.

We will expand our monitoring and surveillance capabilities to include additional microbiological and chemical agents of concern.

We also will expand our risk assessment expertise to identify problems of greatest human-health concern and coordinate the development of intervention strategies to reduce risk to the consumer.

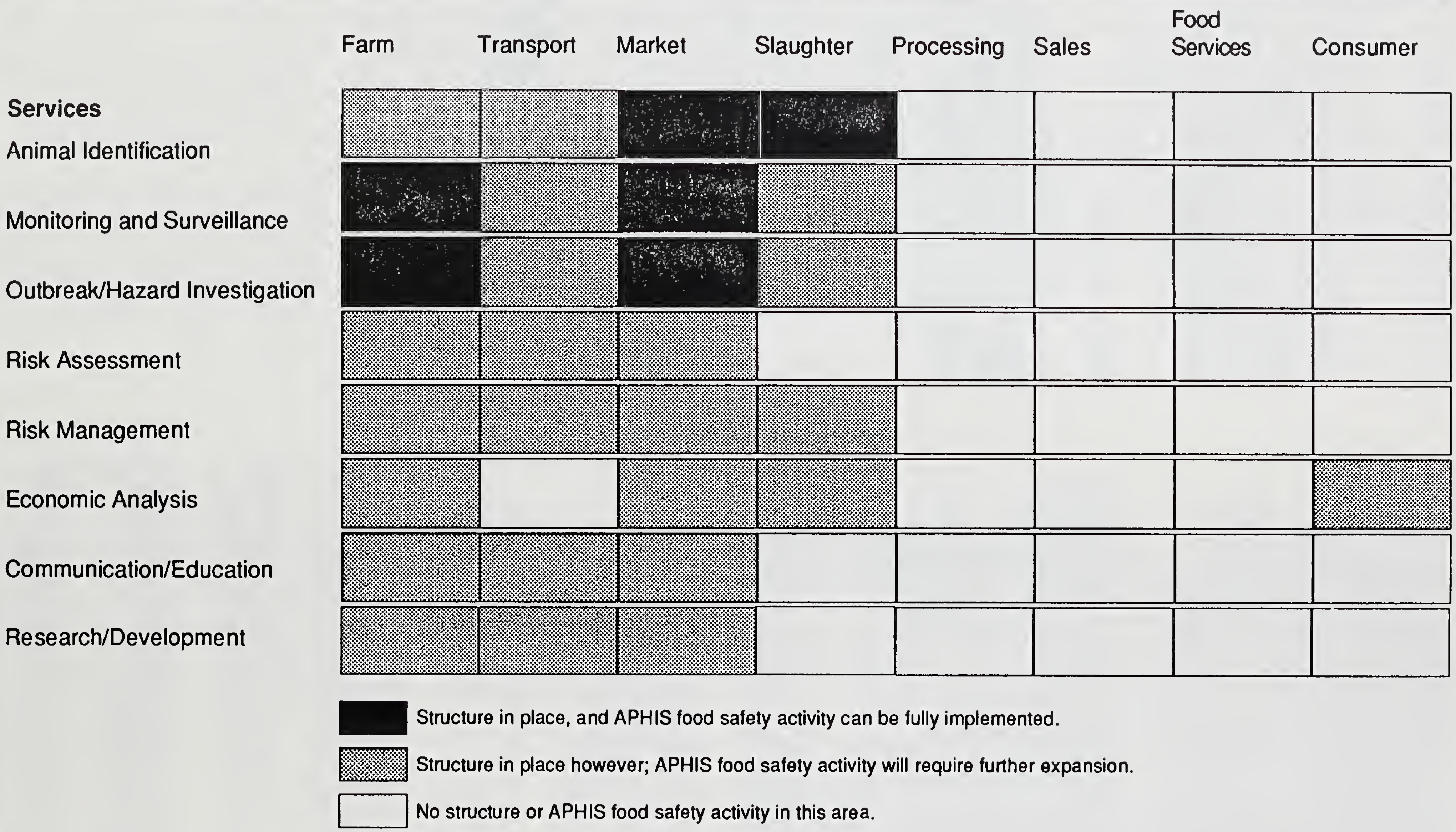
Additional resources will be required to carry out foodborne outbreak investigations. Additional resources will also be needed to develop diagnostic tests for antibiotics, mycotoxins, and other chemical agents and to provide check tests and training opportunities for State laboratories.

Reference Cited

Bean, N. H.; Griffin, P. M. 1990. Foodborne disease outbreaks in the United States, 1973–1987: pathogens, vehicles, and trends. Journal of Food Protection 53(9): 804–817.

DRAFT

The following chart depicts core strengths and services provided by APHIS as they relate to the farm-to-table food safety continuum.



Core Strengths
Epidemiological Delivery System
Information Technology Management
National Diagnostic Laboratory

Cardinal

United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Veterinary
Services

A Public Health Concern: Escherichia coli 0157:H7

Serious human illnesses associated with verotoxic *E.coli* 0157:H7 (ECO157), including bloody diarrhea and renal disease, have been reported with increasing frequency since the first recorded case in 1982. Cattle have been implicated as the reservoir of this agent. In North America, reports of both sporadic cases and outbreaks have come mainly from the northern tier of U.S. states and Canada. A spring 1993 outbreak in several western states, the largest ever reported - involving hundreds of cases, prompted the following questions from veterinarians:

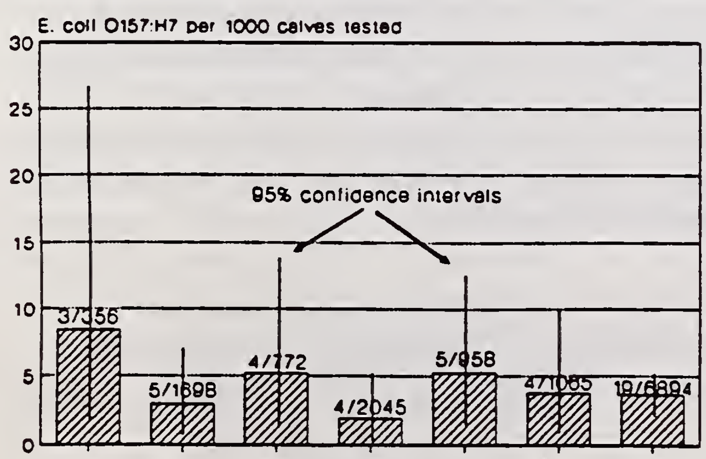
1. Who is the most susceptible to disease due to ECO157 infections ?

The group which is consistently reported to be at highest risk is children under 5 years of age. They are at increased risk for both ECO157-associated hemorrhagic colitis and hemorrhagic uremic syndrome (HUS) as a sequel to gastrointestinal disease. The increased risk to young children stems not only from foodborne exposures but from secondary exposure in day care centers, etc. The elderly and persons with previous gastrectomies have also been cited as being at increased risk.

2. What are the signs in people? animals?

The most common sign in ECO157 infections is bloody diarrhea commencing 2- to 9-days after exposure. Fever is not prominent. Ten to 20 percent of persons having diarrhea develop more serious symptoms, the most common of these is HUS. HUS may lead to death (~ 5%) or chronic renal insufficiency (~ 5%). Other complications include thrombotic thrombocytopenic purpura, strokes, and destruction of parts of the large bowel.

Figure 1. Regional Prevalence of E. coli 0157:H7 in U.S. Dairy Calves



USDA:APHIS:VS, National Dairy Heifer Evaluation Project

There is no evidence to suggest that ECO157 is an animal pathogen. Based on a lack of isolates among diagnostic lab *E. coli* cases, even if ECO157 were an animal pathogen, it is not a common one.

3. Are there carrier states: man? animal? What is the duration of shedding?

Infected humans have been shown to carry the organism for several days to weeks. Longer-term carriage has not been described; however, it has not been ruled out. The epidemiologic pattern is not consistent with long-term human carriage being a major source of human infection.

Published studies support a conclusion that ECO157 is present as part of the intestinal flora in 1 percent or less of dairy cattle. Several authors have speculated that the prevalence in beef cattle is lower, but available data do not support such a conclusion. As part of the National Dairy Heifer Evaluation Project conducted by Veterinary Services (USDA:APHIS), 6,894 heifer calves in 1,068 dairy herds were sampled in 28 states. The study found a prevalence of ECO157 of 3.6/1000 calves. Herd prevalence was roughly estimated at around 5 percent. Positive calves were found in all regions of the country (Figure 1). The issue of long-term carrier states in cattle has not yet been examined.

4. How does it enter the food chain?

Outbreaks of ECO157-associated disease have, on a number of well documented occasions, been traced to foods of bovine origin. Hamburger is the most commonly identified food vector of ECO157. Although the manner in which ECO157 comes to contaminate meat has not been specifically described, some bacterial contamination of carcasses is inevitable during skinning and processing, even in the absence of direct fecal contamination. Bacterial monitoring can be used within processing plants to identify and correct problems which result in high bacterial counts of meat, but this is not being done on an industry-wide basis in the U.S. Some recent discussion has focused on the possibility that ECO157 is deposited in deeper tissues

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as a result of bacteremia in cattle; however, ECO157 does not appear to be invasive, and this is not required to explain the presence of bacteria in meat.

In addition to meat, raw milk can be a source of ECO157. Though human cases of ECO157-associated disease resulting from raw milk consumption have been described, pasteurization results in the destruction of ECO157 along with all other zoonotic pathogens.

Water has also been described as a source of infection in at least two outbreaks. And, as with all foodborne pathogens, it is possible for humans who are infected with ECO157 to pass the infection to other humans (through food contamination, hand-hand, etc.); transmission in day care centers is a particular concern.

5. Are medicated animals (feed additives) related to carrier state?

No published studies exist to support this hypothesis; however, it merits further investigation. Studies are currently underway to examine this issue with particular attention on products and practices which have emerged in the past 10 years.

6. What is the risk to dairy practitioners of infection? to carrier status?

Presently, there is no evidence that veterinarians, producers, or abattoir workers are at any different risk of disease associated with ECO157 than is the general public. Nevertheless, some excess risk might be expected, and careful hand washing and handling of soiled clothing is warranted. Also, as mentioned previously, raw milk drinking is a known risk factor for ECO157 infection.

The issue of carriage of ECO157 among humans who work with cattle in herds endemic for ECO157 is an interesting one that has not, to our knowledge, been investigated.

7. How frequent are ECO157 outbreaks in the U.S. and Canada and the world?

The Centers for Disease Control and Prevention (CDC) identified 17 outbreaks in the United States that warranted alert status[1] from 1982 through 1992, and an additional 17 occurred in 1993 alone. Reporting of outbreaks with animal sources has risen with increased monitoring and surveillance by U.S. state health departments. In 1987, only two states had mandatory reporting of ECO157. By the end of 1992, 11 states required reporting, and by the end of 1993, the number was 18. Canada has also experienced outbreaks.

Based on intense monitoring in limited areas, many unreported sporadic cases likely occur. In Washington state, where ECO157 is reportable, rates of ECO157-associated disease have been estimated at 8.0/100,000 people per year (roughly the same as the reported rate of Salmonellosis). During the past decade, reports of ECO157-associated disease have been made from a number of coutries around the world.

More than 75 percent of outbreaks for which a food source was identified were due to undercooked beef. One outbreak was traced to apple cider and another to raw milk. As mentioned above, waterborne outbreaks have also been reported.

8. Is the disease preventable? What steps would be required? Are there any rapid tests for ECO157 or other E. coli?

There are good prospects that the hazard of ECO157-associated disease can be reduced. Available evidence indicates that effective risk reduction will require measures at food production, processing, and preparation levels.

Adequate cooking of meat such that the center of any serving is heated to 155° F (i.e., not pink) will kill *E. coli*, and hand washing will prevent secondary spread. However, even though consumer education efforts have been helpful, the increasing rate of foodborne disease (particularly Salmonellosis, Campylobacteriosis, and disease associated with ECO157) indicates that consumer education alone will not be enough.

The recent outbreak focused attention on measures that could be taken at the processing level. A workable approach to food safety is based on the Hazard Analysis Critical Control Point (HACCP) system as proposed in the mid-1980's by two National Academy of Sciences reports (1985, 1987). Under such systems,the processes by which clean meat is produced are monitored. Agent specific, rapid microbial tests are not required for monitoring critical control points and thus reducing fecal-origin zoonotic agents in food.

Good reasons exist to think that farm-level food safety efforts (i.e., pre-harvest) might be successful for ECO157. Epidemiologic evidence suggests emergence of an ecologic niche for ECO157 in cattle populations during the 1980's. A particular management change introduced in the 1980's may have created the niche and could potentially be modified in control efforts. The 1993 outbreak with its human suffering and negative publicity to beef demonstrated the importance of intensive investigation of the natural history of ECO157 and development of effective intervention strategies.

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N131.0194

[1] Alert status is given to an outbreak in which the CDC determines to have national importance.

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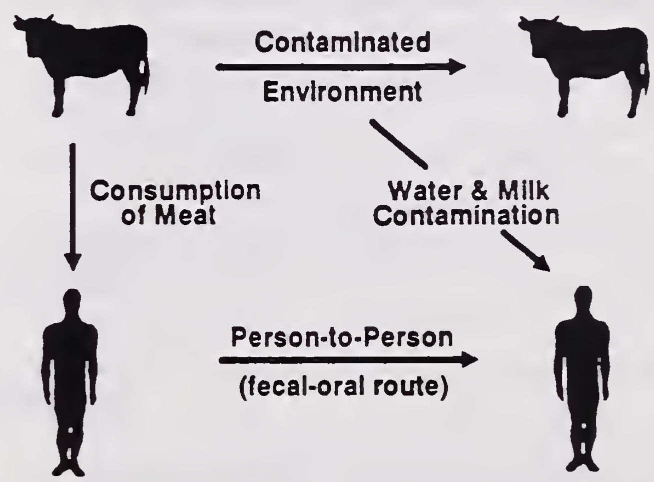
Escherichia coli 0157:H7 in U.S. Dairy Calves

National Animal Health Monitoring System

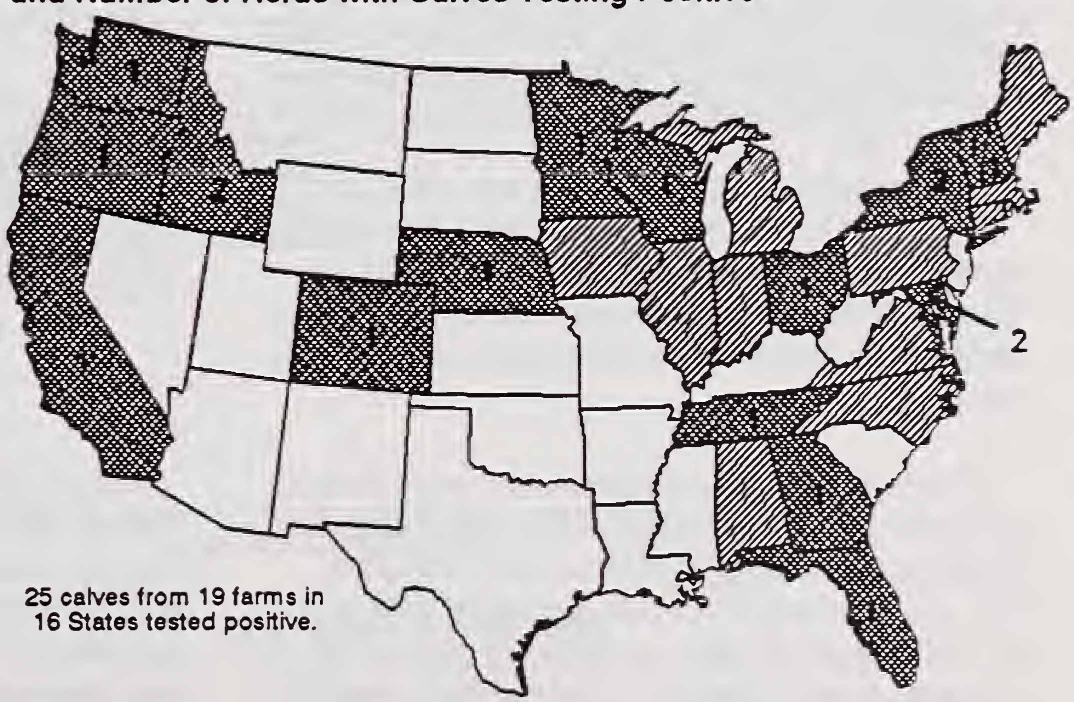
Human illnesses associated with *E. coli* 0157:H7, including hemorrhagic uremic syndrome (HUS), bloody diarrhea, and renal disease, can have serious implications. Sources of *E. coli* 0157:H7 human infection vary, but many documented outbreaks of disease have been traced to meat of bovine origin. *E. coli* 0157:H7 is transmitted by the fecal-oral route. Animals shed the organism in their feces which can contaminate the environment and expose other animals (Figure 1). Humans become exposed through contaminated meat, water, or milk. Person-to-person transmission is also an important source of secondary infections in humans.

Figure 1. E. coli 0157:H7 Route of Transmission



The National Dairy Heifer Evaluation Project (NDHEP) was a one-year study conducted through the U.S. Department of Agriculture's National Animal Health Monitoring System (NAHMS). The study followed the neonatal calf to weaning. The NDHEP included 1,811 dairy operations in 28 states (shown at right). To be included in the study, the operations had to have 30 or more milking cows. Participants were randomly chosen so that the results would be representative of 78 percent of the National dairy cow population. Fecal samples were collected from approximately 7,000 preweaned calves from over 1,000 operations and tested for presence of *E. coli* 0157:H7.

Figure 2. States Participating in the NDHEP E. coli 0157:H7 Studies and Number of Herds with Calves Testing Positive



Samples from a total of 25 calves from 19 farms (from 16 states) tested positive for the organism, for a prevalence of 3.6 per 1,000 preweaned calves. Figure 2 shows the wide distribution of operations with dairy calves found to be positive for *E. coli* 0157:H7. Positive operations were spread across the country, and no regional or seasonal clustering was found.

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To more clearly understand the relationship between the organism and the farm environment, a follow-up study was conducted. Objectives of the NAHMS follow-up study were to describe shedding (expelling the organism in feces) patterns in infected herds and to determine management factors associated with infection.

Producers from 50 negative NDHEP (control) herds and 14 positive NDHEP (case) herds agreed to participate in the follow-up study. Positive calves were found in 11 of the 50 herds that originally tested negative (22 percent) and 7 of the 14 herds that originally tested positive (50 percent). Although case herds were more likely to be found positive when retested, the two studies showed that herd status can change and, therefore, should not be defined by testing a few animals one time.

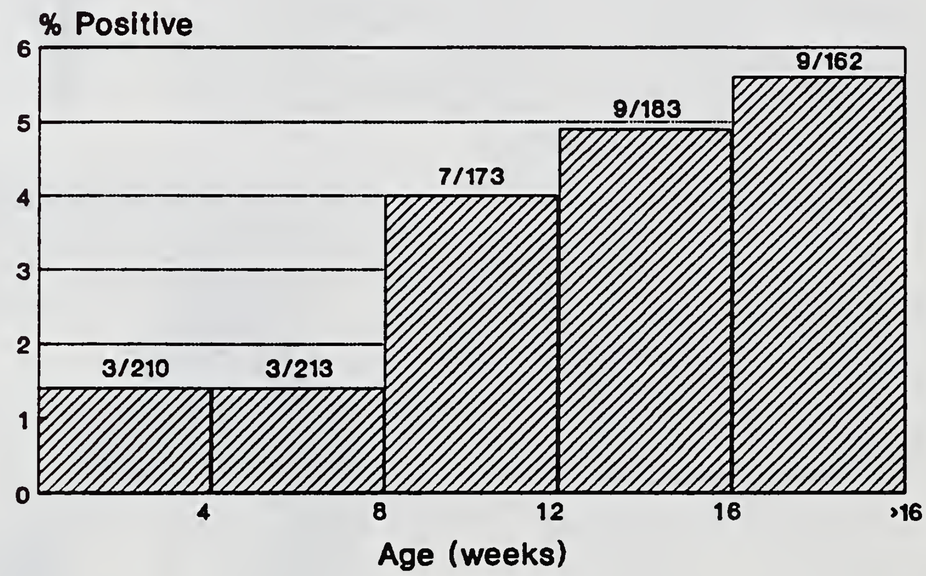
Positive animals ranged in age from 10 days to 8 months (Figure 3). *E. coli* 0157:H7 in animals less than 8 weeks of age had a prevalence of slightly over 1 percent. An increase in prevalence was shown at 8 weeks of age, which was identified as the average age of weaning (NDHEP results). Prevalence remained around 5 percent through 16 weeks of age.

E. coli 0157:H7 shedding was significantly associated with weaning. Weaned calves were three times more likely to test positive than preweaned calves.

When fecal specimens were collected, calves were examined for diarrhea, dehydration, and body condition. Such signs of illness were not associated with the presence of *E. coli* 0157:H7 in the feces.

Management factors on dairy operations were evaluated, including a decrease in brucellosis vaccination in the northern tier of U.S. states, where *E. coli* 0157:H7 infection in humans is more commonly reported. Though some sources have proposed that brucellosis vaccination may provide some cross protection against *E. coli* 0157:H7, the NAHMS follow-up study did not support this hypothesis. No association was found between brucellosis vaccination and *E. coli* 0157:H7 shedding status in tested animals.

Figure 3. E. coli 0157:H7 Infection in Dairy Heifers by Age in Weeks (NAHMS Follow-up Study)



Although postweaned calves were more likely to be shedding, the preweaned period appears to have some impact on the ECO157 status of the herd. One previous factor that was associated with *E. coli* 0157:H7 status was when preweaned calves were grouped on the operation. If calves were grouped before weaning, the herd was nine times more likely to test positive than if they were grouped after weaning. This may indicate that grouping calves at early ages may increase transmission to other calves or precipitate shedding in already affected calves.

Participants in the NDHEP included the USDA's National Agricultural Statistics Service, State and Federal Veterinary Medical Officers, and National Veterinary Services Laboratories. The Cooperative Extension Service provided editorial assistance. For more information on National Dairy Heifer Evaluation Project and other NAHMS programs, please contact:

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Cryptosporidium parvum Outbreak

Hundreds, possibly thousands, of Milwaukee residents became ill during an outbreak of Cryptosporidium parvum during March and April of 1993. The source of the outbreak was probably the public water supply which is drawn from Lake Michigan. Several contributing factors may have allowed the parasite to enter and survive in the treatment system:

- Milwaukee, unlike most coastal towns, uses surface water instead of ground water for its public water supply. (Cryptosporidium contamination generally is not a problem in ground water.)
- The Milwaukee area has various environmental sources that could have contributed to the contamination of run-off water: dairy farms, wildlife, and human sewage.
- Spring thaw and recent rains produced a heavy influx of run-off water into Lake Michigan, the source of Milwaukee's water.
- In one of the Milwaukee's three water purification plants, the type of filtering system had recently been changed, and, when checked after the onset of the problem, the filtering process was not functioning at full efficiency. (The implicated plant was shut down.)

1. What is Cryptosporidium?

Cryptosporidium is a protozoan of the subclass of coccidia that includes Eimeria and Isospora. It was first recognized as a pathogen in cattle in 1971 and the first human cases were identified in 1976.

2. Is Cryptosporidium species-specific?

Each of the six currently recognized species of cryptosporidia infect different hosts. C. parvum infects mammals, including bovines and humans. C. muris infects mice and has recently been found in the abomasum of cattle. Other species infect avians and reptiles.

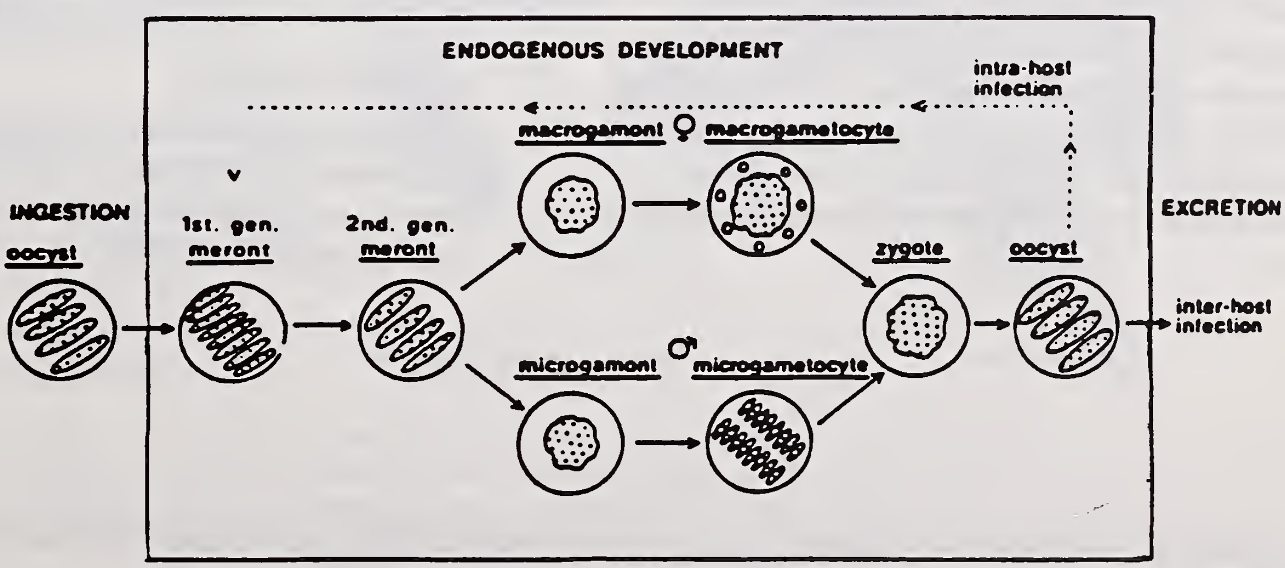
3. What is the source of Cryptosporidium parvum?

There is a large reservoir for C. parvum including domestic and wild animals, rodents, and water. Press reports have suggested that dairy farms are a primary source of the C. parvum outbreak in Milwaukee. There have been other documented water-borne outbreaks, often without a known source of contamination.

4. What is the prevalence of Cryptosporidium in healthy dairy calves?

A USDA:APHIS:VS study estimated that on any given day, 22 percent of preweaned dairy calves, and as many as 50 percent of dairy calves in the 1- to 3-week age

Figure 1. Life Cycle of Cryptosporidium parvum.*



*Modified from an illustration in O'Donoghue, P.J. "Cryptosporidium infections in man, animals, birds, and fish." Australian Veterinary Journal, 1985;62:256.

group, are shedding Cryptosporidium. It is estimated that the parasite is present on nearly 90 percent of dairy farms. Although oocysts are shed in greater numbers during the diarrheic phase, the organism has been found in normal feces.

5. Can Cryptosporidium multiply in the environment?

No, reproduction takes place in the intestinal tract. However, the oocyst is very hardy in the environment (may or may not be destroyed by freezing and drying) and is resistant to most disinfectants. See Figure 1 on page 1 for information on the parasite's life cycle.

6. Can Cryptosporidium cause disease in cattle by itself or is it a secondary disease agent?

Although mixed infections are quite common (since many organisms affect the same age group of calves), Cryptosporidium can cause clinical diarrhea in calves in the absence of other pathogens.

7. How is C. parvum diagnosed in dairy animals and what are the clinical signs?

In calves, the predominant sign of infection is diarrhea which may be bloody. Symptoms persist for about 8 days and clinical recovery is the usual outcome. The organism can be found by intestinal biopsy and oocysts can be found on fecal examination. In diarrheic animals, the flotation method is usually adequate to identify oocysts (found in the plane immediately under the coverslip) but they may be confused with yeast. More sensitive tests include acid fast stains and monoclonal antibody tests.

8. How do you treat cryptosporidiosis in calves?

There is no specific anticryptosporidial treatment currently available, so treatment is limited to supportive care for diarrhea and dehydration.

9. Can cryptosporidiosis be controlled on the farm?

Control of C. parvum is difficult because it is immediately infective upon shedding, unlike other coccidia, and is resistant to most disinfectants. It is resistant to chlorine, and because it is so small, it can pass through many water filter systems (including municipalities). However, hygienic management practices in the calf facilities will reduce the pathogen load.

10. How do humans contract Cryptosporidium?

As mentioned, the three major sources of cryptosporidial contamination are farm animals, human sewage, and wildlife. Transmission can occur through water supplies and animal- or person-to-person contact. Human cases have been documented worldwide.

11. How does Cryptosporidium affect humans?

The incubation period in humans ranges from 5 to 28 days and is most commonly 7 to 10 days. Symptoms in humans can be mild to severe diarrhea, abdominal cramps, vomiting, and fever. Symptoms are usually self-limiting, lasting about two weeks in immunocompetent patients, but can last six months and be fatal in immunocompromised patients. Both adults and children are susceptible, although the disease is more common in children.

12. How are human patients diagnosed and treated?

Diagnosis in humans is by fecal examination or intestinal biopsy. Cryptosporidiosis is not a reportable disease in humans. As in animals, treatment is limited to supportive care, since there are no specific anticryptosporidial medications currently available.

13. What is the best way to prevent the spread of Cryptosporidium in humans?

Since transmission is by the fecal-oral route, careful hygiene is the best method of controlling spread. Personnel in day-care centers and food handlers should take particular precautions. During outbreaks, it is advisable to boil water for drinking and washing foods.

14. Are bovine producers and practitioners at higher risk?

One source of infection is animal feces, so producers and practitioners should take particular care of their personal hygiene after contact with animal feces, especially from diarrheic calves. Immunocompromised persons should avoid animal contact.

For more information:

Additional information on Cryptosporidium parvum is available through the USDA:APHIS:VS; Center for Animal Health Monitoring; 555 South Howes, Suite 200; Fort Collins, Colorado 80523.

Compiled by the Centers for Epidemiology and Animal Health (CEAH), the National Veterinary Services Laboratories (NVSL), and the Wisconsin Veterinary Services' Area Office, April 1993.

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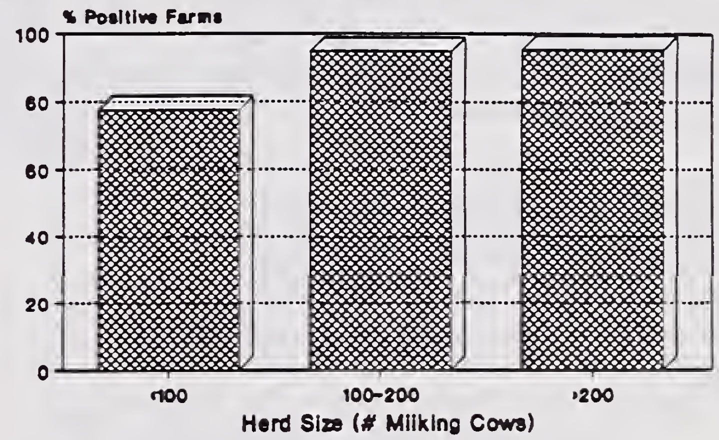
Cryptosporidium is Common in Dairy Calves

National Dairy Heifer Evaluation Project

Figure 1. Estimated Cryptosporidium Prevalence on Dairy Farms by Herd Size



Cryptosporidium is a very widespread diarrheal agent of preweaned dairy calves. A USDA: APHIS study estimates that the parasite is present on more than 90 percent of dairy farms.

Although Cryptosporidium was first discovered in mice in 1907, it was not identified in cattle until 1971. Since then, evidence of the parasite in dairy animals has been found most commonly in calves less than 3 weeks of age.

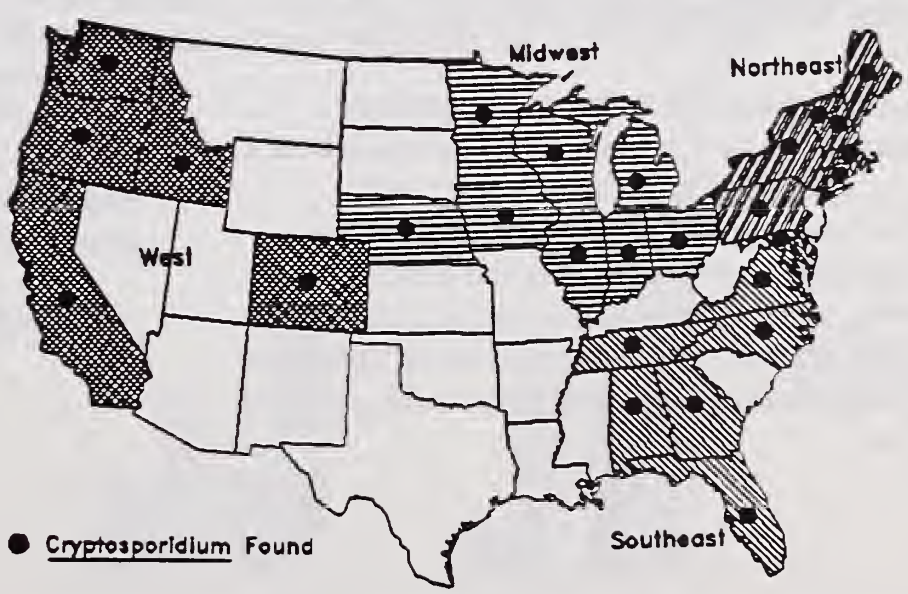
Today, cryptosporidiosis is not recognized as a major cause of death in calves, but as a potential economic loss in the dairy industry - the result of scours, weight loss, dehydration, and other symptoms. Since it can be transmitted to humans, it is also a public health concern.

Because of both the animal and public health concerns, the National Animal Health Monitoring System (USDA:APHIS:VS) chose to include cryptosporidia in the list of topics to be addressed in its National Dairy Heifer Evaluation Project (NDHEP). The NDHEP included 1,811 farms in 28 states.[1] During the 1991-92 study of heifer health and management practices, fecal specimens were collected from 7,369 preweaned dairy calves on 1,103 farms to test for the parasite.

The NDHEP estimates show that on any given day, 22 percent of preweaned heifers are shedding Cryptosporidium. The estimated proportion of farms with the parasite present is more than 90 percent. The prevalence increases slightly with increasing herd size (Figure 1). Cryptosporidium occurs in virtually all large and medium-sized herds, but a small percent of herds with less than 100 cows may be free of the agent.

Figure 2 shows that Cryptosporidium was found in every state participating in the NDHEP. The

Figure 2. National Dairy Heifer Evaluation Project States and Location of Dairy Herds with Preweaned Heifers Testing Positive for Cryptosporidium



[1]States participating in the National Dairy Heifer Evaluation Project (NDHEP): Alabama, California, Colorado, Connecticut, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nebraska, New Hampshire, New York, North Carolina, Pennsylvania, Ohio, Oregon, Rhode Island, Tennessee, Vermont, Virginia, Washington, and Wisconsin.

March 1993

prevalence of the parasite in western states is higher, perhaps because of its association with larger herds. However, it may be present on more than 80 percent of farms in every region.

Cases peak in heifers 1 to 3 weeks of age - nearly one-half of animals in this age range test positive at any single point in time (Figure 3). It is most often found in calves 12 days of age. The percentage drops to 22 for calves 3 to 5 weeks of age, and is less than 15 percent for calves over 5 weeks of age.

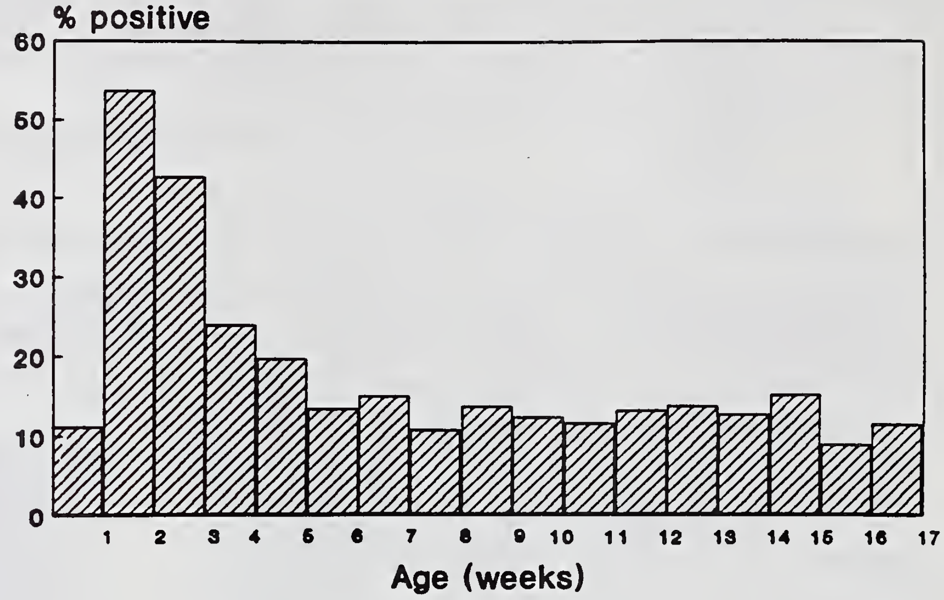
Prevalence is higher in the summer than in other months and is higher for farms using multiple-animal maternity facilities than for those using individual-animal facilities.

How aware are the dairy producers? Only 2 percent of the producers indicated that they had a cryptosporidiosis problem in their herds in the previous 6 months. This indicates that in general, calves and Cryptosporidium co-exist in harmony.

Some previous studies have reported that the parasite is rarely found in normal fecal specimens. While results of the NDHEP did show an association with diarrhea, many positive calves were not reported to have diarrhea. Thus, Cryptosporidium infects calves on many farms that have very low disease and mortality rates.

There is no specific anti-cryptosporidiosis treatment, so producers and veterinarians can only treat the symptoms to relieve diarrhea and dehydration. The NDHEP producers received individual farm reports showing the positive and negative results on the animals tested and were advised to consult with a veterinarian or extension agent who could help identify if any actions should be taken.

Figure 3. Cryptosporidium Infection by Age in Preweaned Heifers (Number of Animals Tested = 7,369)



The organism is remarkably stable in the environment making elimination of the parasite difficult. Although herd size, season, and calf age are strongly associated with Cryptosporidium infection, they are not controllable factors. Avoiding multiple animal maternity facilities, especially during the summer months, may help reduce infection. Good hygienic measures are the producer's best bet to reduce parasite load in the environment as well as other organisms which can complicate the problem.

Participants in the NDHEP included the National Agricultural Statistics Service (USDA) and State and Federal Veterinary Medical Officers. The National Veterinary Services Laboratories (USDA:APHIS:VS) performed the tests on the fecal specimens collected and are maintaining the specimen bank for future uses. The Cooperative Extension Service provided editorial assistance. For more information on National Dairy Heifer Evaluation Project and other NAHMS programs, please contact:

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Cryptosporidium and Giardia in Beef Calves

National Animal Health Monitoring System

Cryptosporidium is commonly associated with neonatal diarrhea in calves. *Giardia* has been reported to cause diarrhea among humans, dogs, cats, calves, and horses. Little information has been available on fecal shedding patterns of *Cryptosporidium* and *Giardia* among beef calves.

As part of a 1992-93 study of cattle health and management on the nation's cow/calf operations, beef cow/calf producers were offered the opportunity to submit fecal samples from scouring beef calves less than 3 months of age. The samples were tested for the presence of *Cryptosporidium* and *Giardia*. In addition, fecal pats from nonscouring calves less than 6 months of age were collected and evaluated similarly.

The USDA's National Animal Health Monitoring System (NAHMS) collected the samples and other data during the Beef Cow/Calf Health and Productivity Audit (CHAPA). The National Veterinary Services Laboratories (also of the USDA) performed the tests. An objective of the CHAPA was to describe health and management for 70 percent of U.S. beef cow inventory.

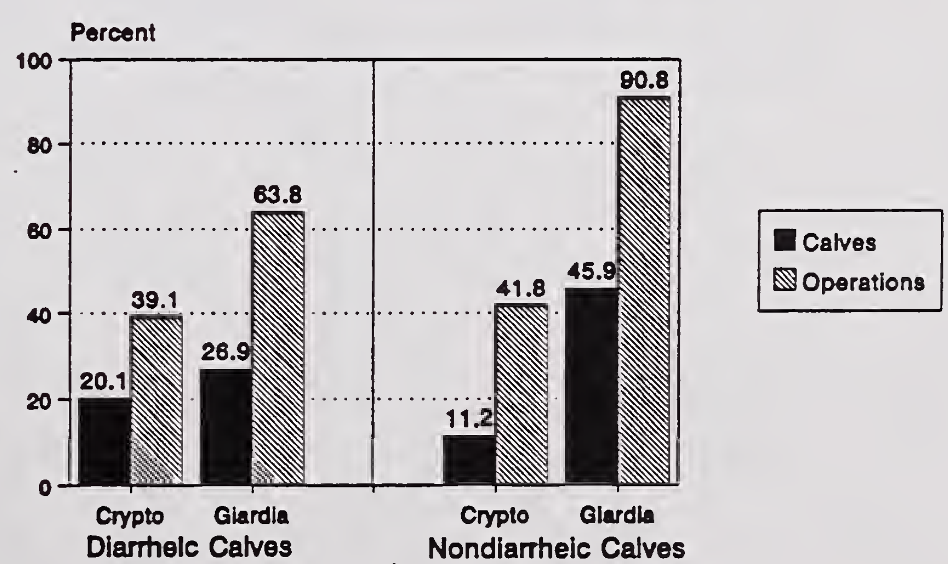
Producers from a total of 69 operations submitted 391 samples from diarrheic calves for *Cryptosporidium* and *Giardia* evaluation. A total of 1,053 samples were submitted from nondiarrheic calves from 141 operations.

Percentages of calves positive for each evaluation are shown in Figure 1. Just over 20 percent of the samples from diarrheic calves submitted for *Cryptosporidium* evaluation were positive, as were 11.2 percent of those submitted from nondiarrheic calves. *Giardia* was more common than *Cryptosporidium* in diarrheic calves and nondiarrheic calves. Just over one-quarter (26.9 percent) of samples from diarrheic calves submitted for *Giardia* evaluation were positive, as were 45.9 percent of those from nondiarrheic calves. Differences in prevalences between diarrheic and nondiarrheic calves are probably at least partly due to an older average age of calves in the nondiarrheic group.

Figure 1 also shows that *Cryptosporidium* and *Giardia* commonly exist on beef operations. Nearly 40 percent of operations submitting samples from diarrheic calves had at least one positive for *Cryptosporidium*. Also, 41.8 percent of operations submitting samples from nondiarrheic calves had at least one positive. Nearly two-thirds of the

Figure 1

Percent of Operations and Calves Positive for Cryptosporidium and Giardia



January 1994

operations for which diarrheic samples were tested for *Giardia* had at least one positive result, and 90.8 percent of the operations with nondiarrheic calf samples tested had at least one positive.

Some of the test results were related to calf age. Among diarrheic calves, those positive for *Giardia* tended to be older than those that were negative, 47.1 days for positive and 35.3 days for negative (Figure 2).

Figures 3 and 4 show the results of testing for both organisms by age group. The percentage of diarrheic calves positive for *Giardia* was highest for those in the 31- to 60-day age group (37.1 percent, Figure 3). More than one-half of the nondiarrheic calves from 61 to 90 days of age tested positive for *Giardia* (Figure 4).

Overall, there was a trend to decreasing prevalence of positive samples among nondiarrheic calves as the average age of the calves increased.

In summary, *Cryptosporidium* and *Giardia* appear to be common in beef calves whether they have diarrhea or not and are common in beef herds. Fecal shedding of both organisms is related to calf age with oldest calves being much less likely to shed than young calves.

Figure 2

Average Age of Calves by Results of Fecal Evaluation for Cryptosporidium and Giardia

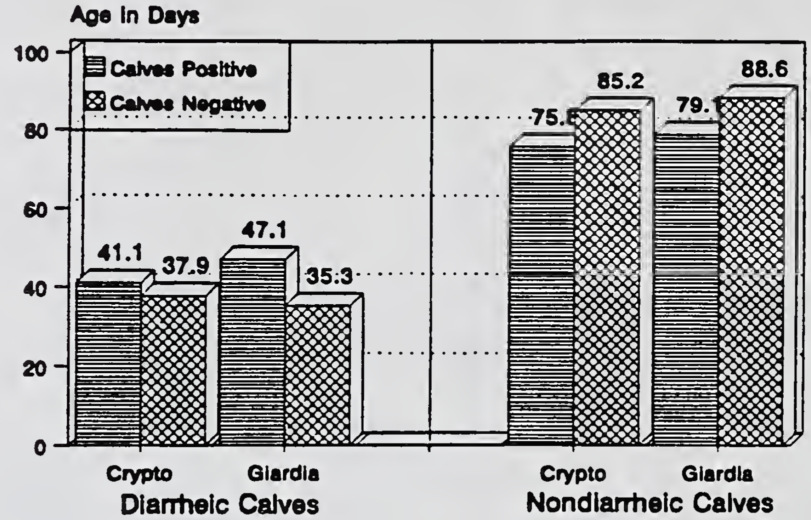


Figure 3

Prevalence of Cryptosporidium & Giardia Among Calves With Diarrhea

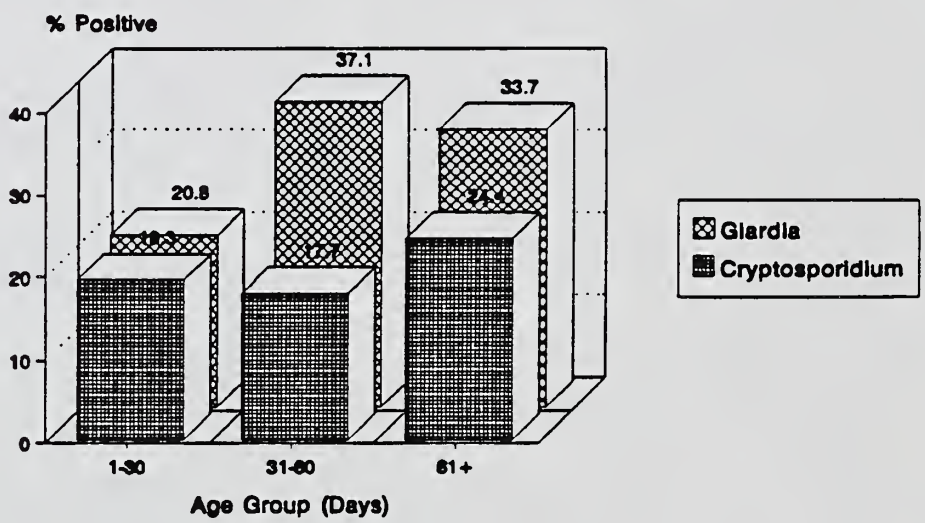
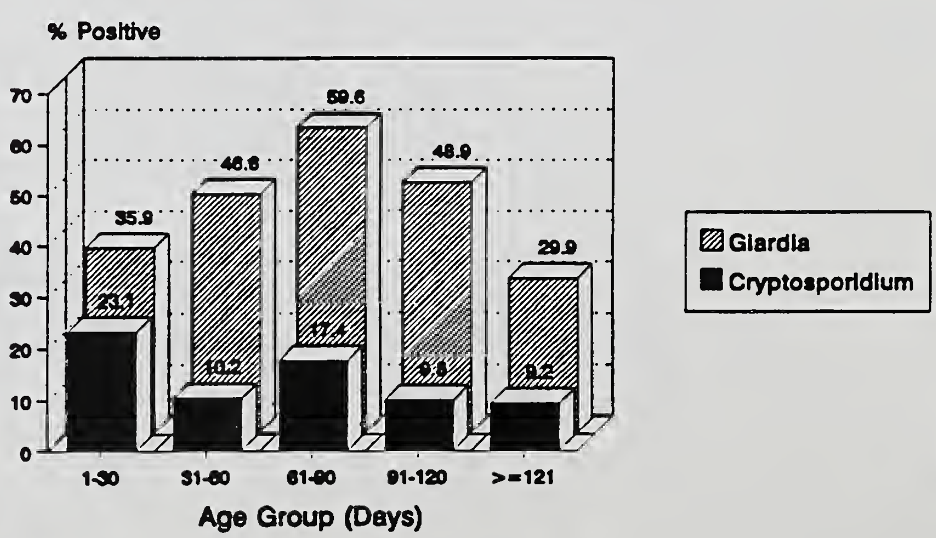


Figure 4

Prevalence of Cryptosporidium & Giardia Among Calves Without Diarrhea



Other NAHMS collaborators included the National Agricultural Statistics Service (USDA) and State and Federal Veterinary Medical Officers.

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Salmonella in Dairy Calves

National Animal Health Monitoring System

Salmonella infection occurs in dairy calves throughout the United States at levels that vary by region, season, and herd size.

In cattle, Salmonella may cause disease in older animals, although most cases occur in the young calf. Of critical importance to the dairy producer is that treatment or therapy is usually unsuccessful. Prevention is the key.

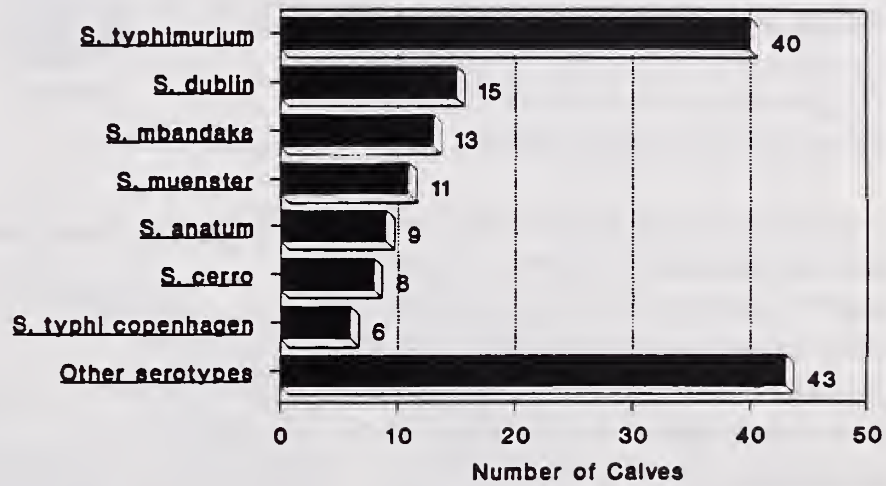


Figure 1. Number of Dairy Calves Positive for Salmonella Serotypes (145 of 6,862 Tested)

In 1991-92, the U.S. Department of Agriculture conducted a study called the National Dairy Heifer Evaluation Project (NDHEP) which determined Salmonella prevalence rates across the nation. Dairy producers from 28 states (shown below) were selected to represent herds of 30 or more cows and also represent 78 percent of the National dairy cow population. Participating producers could elect to have fecal samples from a number of preweaned calves tested for Salmonella.

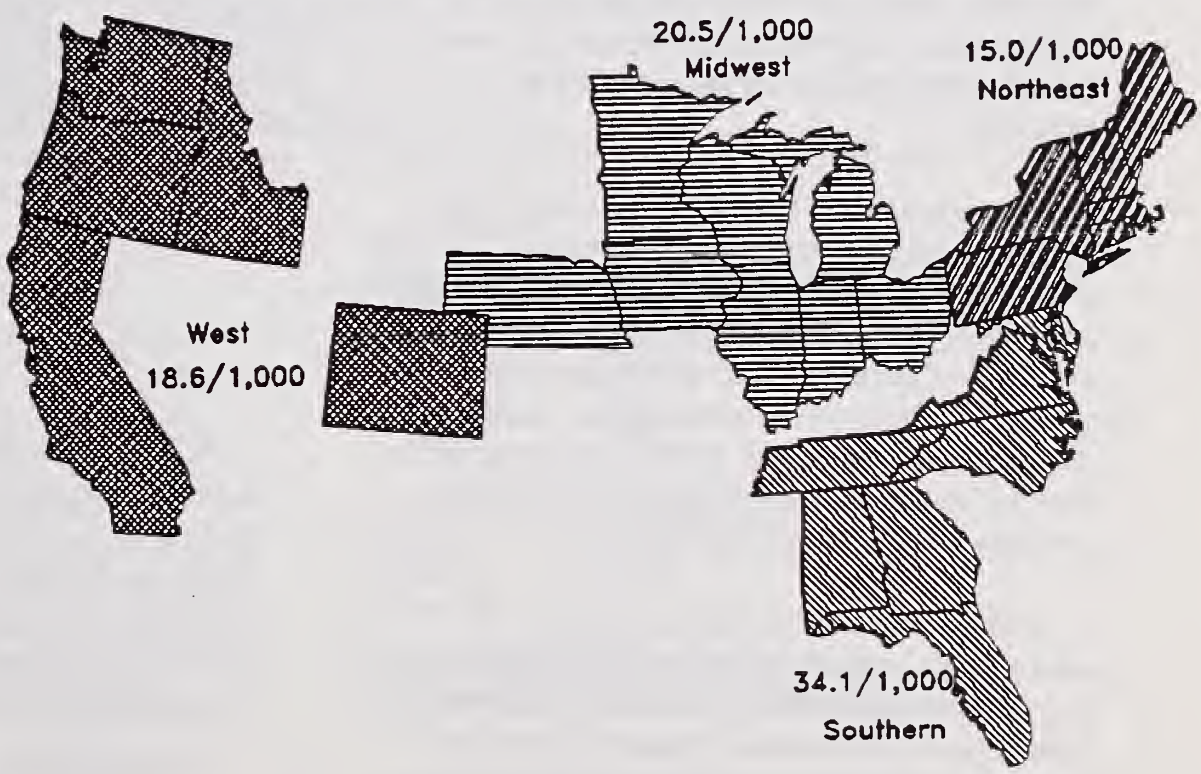


Figure 2. Regional Prevalence of Salmonella per 1,000 Dairy Calves

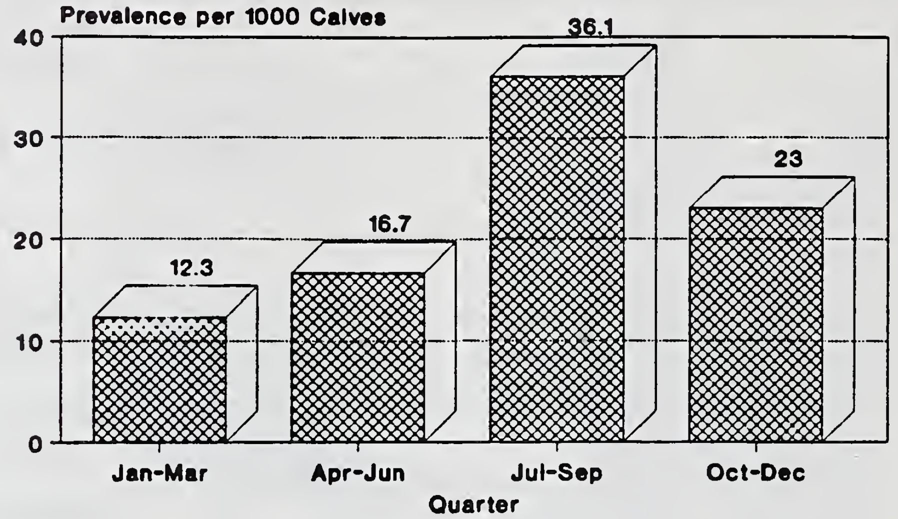
The National Veterinary Services Laboratories (USDA:APHIS:VS) tested 6,862 calf fecal samples and found 145 (2.1 percent) positive for Salmonella. Figure 1 shows that the serotype found most often was S. typhimurium (40 samples or 27.6 percent of the positive samples) followed by S. dublin (10.3 percent of the positive samples).

The NDHEP results indicate *shedding* of bacteria rather than *cases* of disease. Shedding means that the organism is found in the animal's feces, but the animal may or may not become sick. During the NDHEP, fecal specimens were collected and examined for Salmonella regardless of existence of disease.

While positive results were found all over the U.S., the prevalence was highest in the south (Figure 2). In the Southern region, 34.1 out of 1,000 calf fecal samples cultured had evidence of Salmonella. The Northeast had the lowest prevelance at 15.0 positive per 1,000 samples. Reasons for these differences are not clear, but may involve regional management or environmental factors.

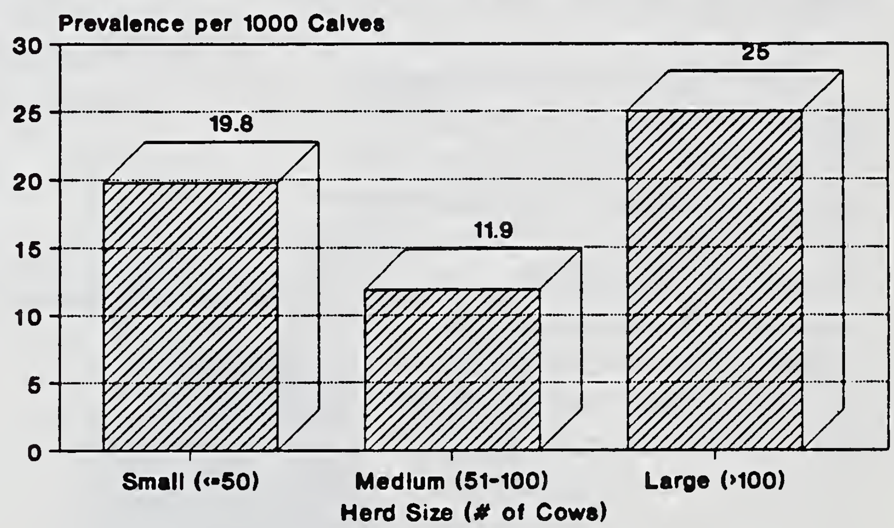
More Salmonella-positive calves were found in late summer with 36.1 of every 1,000 samples testing positive (Figure 3). This finding may be attributed to a warmer, moister environment which can aid in the survival and dissemination of Salmonella. The prevalence was lowest (12.3) in the winter, January through March.

Figure 3. Prevalence of Salmonella in Dairy Calves by Season



Positive samples were more common in herds of more than 100 cows (25.0 per 1,000 samples), while herds of 51 to 100 cows had a low prevalence of 11.9 positive samples per 1,000 tested (Figure 4). Variations in herd management practices, partly based on herd size, may account for the differences in prevalence. It should be noted that since samples were collected at a single visit, more calves were sampled from larger herds. Therefore, the likelihood of finding positive samples in larger herds was increased.

Figure 4. Prevalence of Salmonella in Dairy Calves by Herd Size



Primary sources of infection are feedstuffs and other infected farm animals. Other routes of infection include contaminated bedding or buckets for feeding and drinking. Newborns, older animals, and animals with other infections are most susceptible to the disease salmonellosis. Animals undergoing the physiologic stresses of transportation, exercise, malnutrition, feed changes, pregnancy, or surgery are also more susceptible to disease.

In calves, infection and disease can lead to salmonellosis epidemics, often with high death losses. The most effective means of eliminating losses due to salmonellosis is prevention. Prevention goals are to identify infected animals, isolate them, and disinfect contaminated premises. A producer's best actions are sound management and sanitation practices and consultation with the herd veterinarian to determine the best course for the herd and situation.

Participants in the NDHEP included the USDA's National Agricultural Statistics Service, State and Federal Veterinary Medical Officers, and National Veterinary Services Laboratories. The Cooperative Extension Service provided editorial assistance. For more information on National Dairy Heifer Evaluation Project and other NAHMS programs, please contact:

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Injection Sites in U.S. Beef Cow/Calf Herds

Beef Cow/Calf Health and Productivity Audit

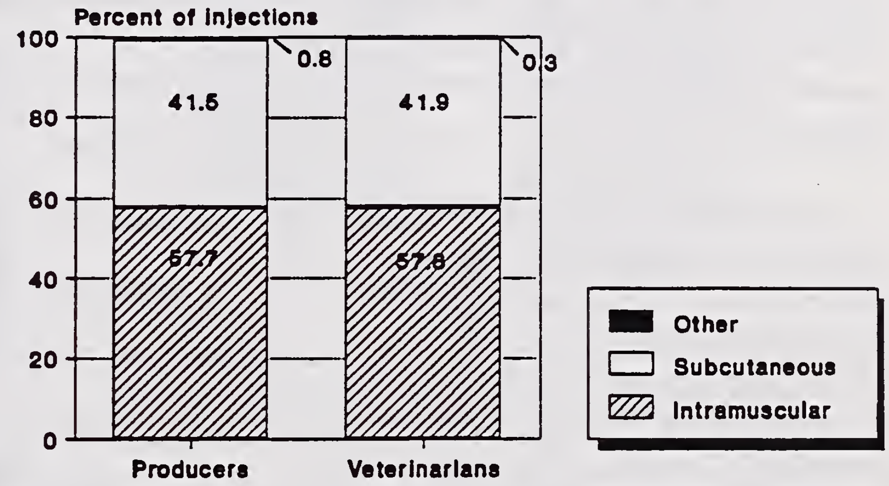
In 1992, 57.7 percent of the injections cow/calf producers, their employees, and families gave to beef cattle were in the muscle, and 41.5 percent were given under the skin. According to producers, the percentages of injections delivered by their veterinarians were similar (Figure 1).

The 1991 National Beef Quality Audit[1] identified injection site blemishes as the second greatest concern to those who sell beef, next to excess external fat. Their primary concerns were the image blemishes project about the wholesomeness and quality of meat products and the 46 million dollar losses in 1991 due to meat that had to be trimmed from the top sirloin butt. The quality audit identified the primary cause for blemishes as injections given in the muscle of the upper hip.

The beef industry has focused considerable resources toward correcting this problem, currently 41 states have beef quality assurance programs working to improve the situation. To provide information on the interaction between animal health and product wholesomeness, the National Animal Health Monitoring System (NAHMS) included questions on injection sites in the 1992-93 Cow/Calf Health and Productivity Audit (CHAPA). The questions were designed to identify who was giving injections on cow/calf operations and the location of injection sites on the animal. In October 1992, the questions were asked of 3,379 producers from operations throughout the lower 48 states. Producers were selected randomly so the study results would represent U.S. beef cow/calf producers. Figure 2 shows the injection sites referenced in the questions.

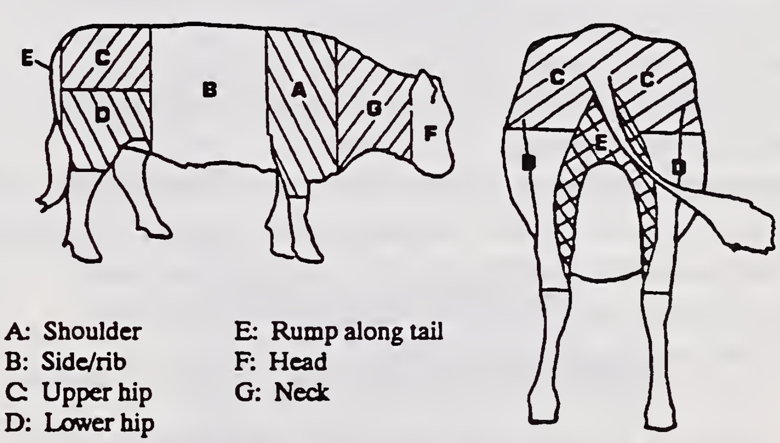
Figure 1

Injection Routes Used by Producers and Veterinarians*



*According to producers.

Figure 2



A: Shoulder
B: Side/rib
C: Upper hip
D: Lower hip
E: Rump along tail
F: Head
G: Neck

Injection Sites Defined for the Beef Cow/Calf Health and Productivity Audit

[1] G.C. Smith (ed.), The Final Report of the National Beef Quality Audit - 1991. Colorado State University, Fort Collins, CO, and Texas A & M University, College Station, TX.

August 1993

Figure 3

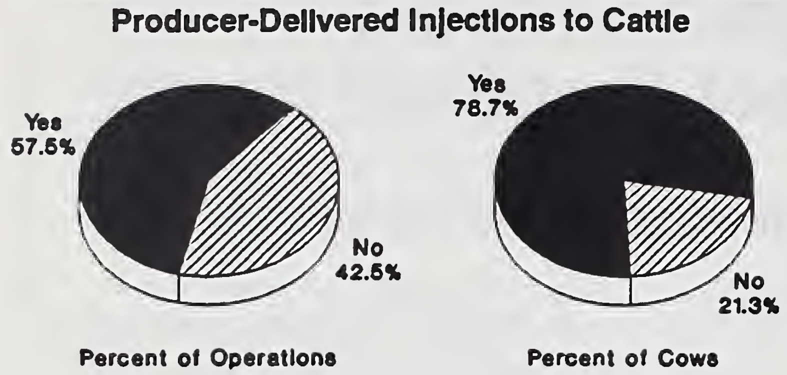
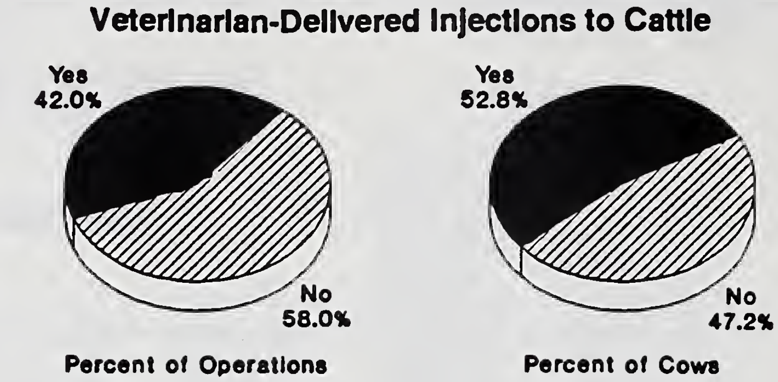
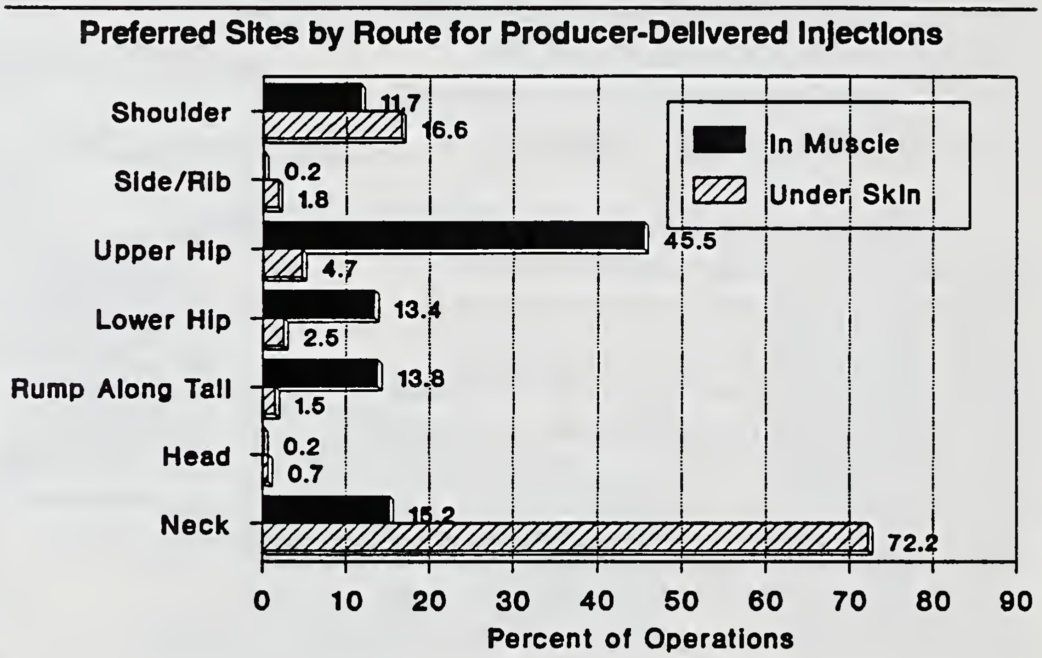


Figure 4



Nearly 58 percent of U.S. beef producers gave some injections to their animals in the preceding 12 months. Those operations accounted for 78.7 percent of the nation's beef cows (Figure 3).

Figure 5



Producers were also asked about injections administered by their veterinarians. Forty-two percent of producers reported that some injections had been given by veterinarians on their operation in the preceding 12 months (Figure 4). These operations represented 52.8 percent of the U.S. beef cow herd.

Of the producers giving injections, 79 percent gave some of them in the muscle. As shown in Figure 5, the two most commonly preferred sites were the upper hip (45.5 percent) and the neck (15.2 percent). Over 72 percent of producers giving injections in the muscle preferred a site on the hind leg. Sixty-two percent of the producers giving injections gave some under the skin, and most of those (72.2 percent) chose the neck as the primary site.

Just over 72 percent of the producers reported that some injections given by veterinarians were placed in the muscle. According to the producers, the most commonly preferred site for muscle injections given by a veterinarian was the upper hip (32.2 percent), followed by the neck (28.2 percent) and the shoulder (16.1 percent).

Nearly 58 percent of producers also reported that at least some of the veterinarian-given injections were placed under the skin. According to producers, 80.1 percent of the veterinarians selected the neck as the preferred site for subcutaneous injections.

Collaborators in the CHAPA included the National Agricultural Statistics Service (USDA) and State and Federal Veterinary Medical Officers, and the National Veterinary Services Laboratories (USDA:APHIS:VS). For more information on the National Cow/Calf Health and Productivity Audit and other NAHMS programs, please contact:

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Bulk Tank Milk Somatic Cell Counts and Your Milk Quality Assurance Program

The Milk and Dairy Beef Quality Assurance Program[1](MDBQAP) was designed to educate producers about the importance of quality milk and meat free of adulterants and residues. A recent national study found a relationship among MDBQAP participation, lower somatic cell counts (SCC), and increased milk production.

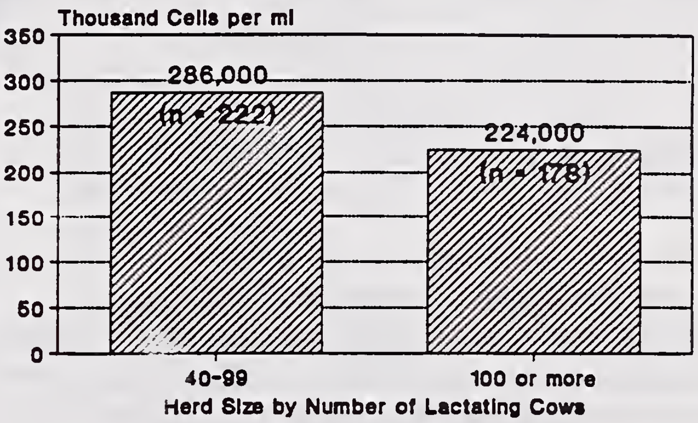
The U.S. currently lacks a national assessment of milk quality. In 1989, the National Mastitis Council's Milk Quality Monitoring Committee released a National Dairy Herd Improvement Association Somatic Cell Count Summary (DHIA SCC) with state-level estimates. While these data are reflective of DHIA SCC's voluntary participants, it may not represent the national dairy herd.

In May of 1993, the U.S.D.A.'s National Animal Health Monitoring System (NAHMS) conducted a study in conjunction with Rockwood Research of St. Paul, Minnesota, to identify health and management levels in the dairy industry. Specific objectives were to assess associations between SCC and completion of the MDBQAP.

The study included 400 farms from 21 states. These states account for 80 percent of the milk cow operations in the U.S. Participating operations were chosen randomly from FARMAIL, a data base of Farm Journal, Inc., so that the results would be representative of subscribers with 40 or more lactating cows. This group of herds does not necessarily represent the national dairy herd.

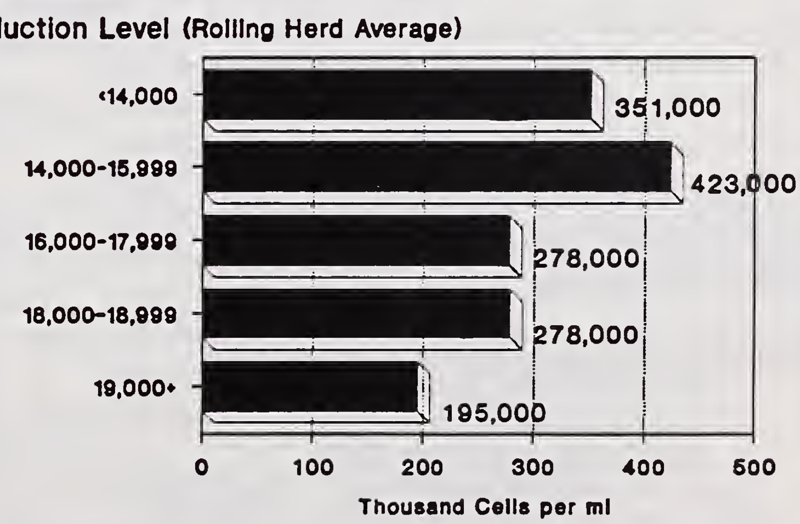
The average somatic cell count of milk from all participating producers was 257,000 cells per ml. Figure 1 shows that the mean for larger herds (100 or more lactating cows) was 224,000, lower than the mean for smaller herds (40 to 99 lactating cows) at 286,000.

Figure 1. Average Bulk Tank Somatic Cell Count by Herd Size



Average SCC varied widely by production level, but lower counts were associated with higher milk production. Study herds producing 19,000 pounds of milk per cow or more (rolling herd average) had an average somatic cell count of 195,000, while herds producing less milk per cow had significantly higher average somatic cell counts, as shown in Figure 2.

Figure 2. Bulk Tank Somatic Cell Count by Production Level



1 A voluntary milk quality and residue avoidance program sponsored and developed by the American Veterinary Medical Association (AVMA), National Milk Producer's Federation, and the USDA's Cooperative Extension Service (CES).

SCC also varied by region (Figure 3). The western region had the lowest average SCC (170,000), and the south had the highest (356,000). This variation was likely associated with management practices associated with higher production due, at least in part, to the high average production levels in the west: milk yields per cow above 19,000 were reported by 62 percent of western producers and by only 16 percent of southern producers. Interestingly, participation in the MDBQAP varied by region. Thirty percent of the producers in the western region completed the program compared to a low of 16 percent in the southern region.

NAHMS study results showed SCC differed between participants and nonparticipants in the MDBQAP (Figure 4). Average SCC of milk from producers that completed the MDBQAP (219,000 cells per ml) was significantly lower than the average SCC of those who did not complete the program (270,000).

Figure 5 shows that the rolling herd average production level for the producers who completed the MDBQAP was greater than for others (19,413 and 18,331, respectively).

This study provides an indication that management practices used by dairy producers that completed the MDBQAP are associated with a higher quantity of higher quality milk.

For more information on the National Dairy Heifer Evaluation Project and other NAHMS programs, please contact:

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Figure 3. Average Bulk Tank Somatic Cell Counts by Region (Cells per ml)

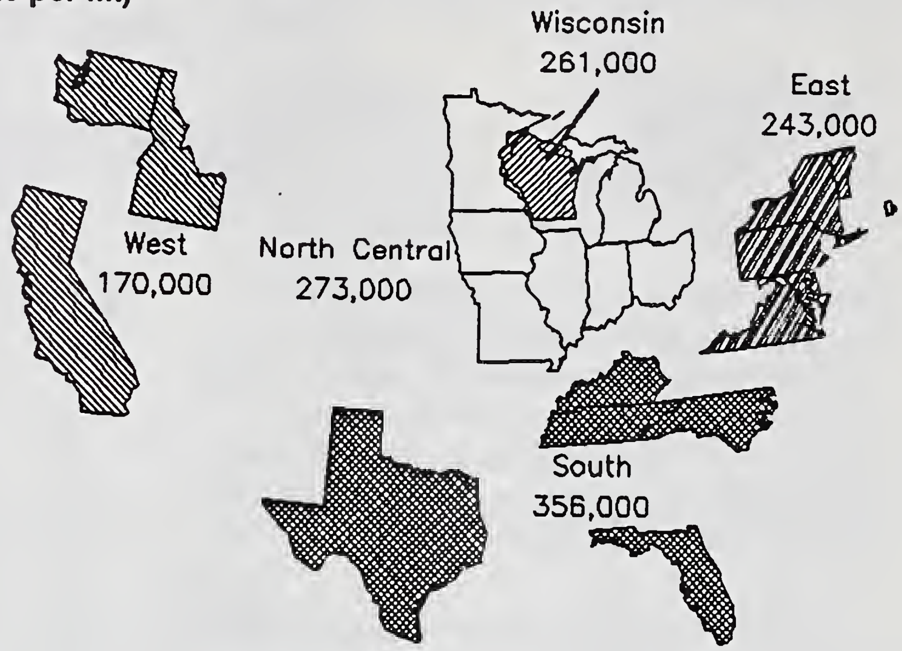
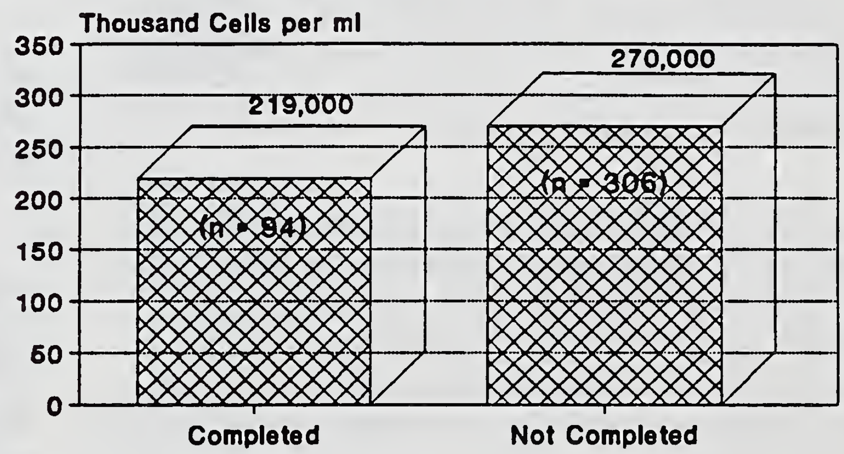
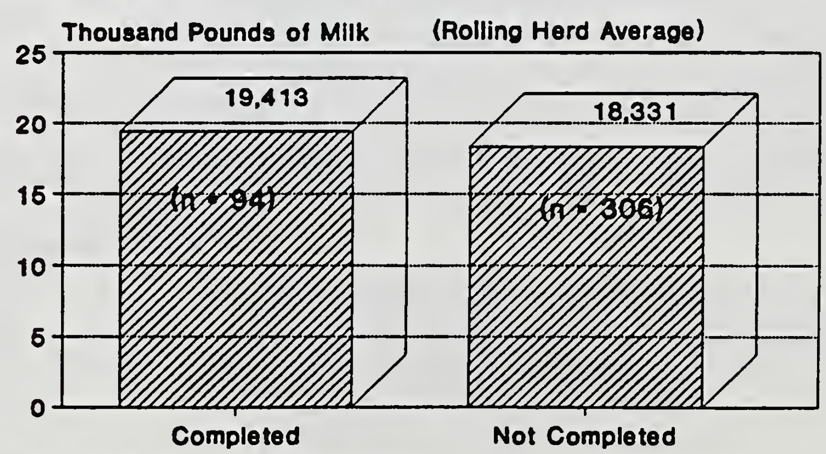


Figure 4. Average Bulk Tank Somatic Cell Count for Producers Who Completed or Did Not Complete the MDBQAP*



*Milk & Dairy Beef Quality Assurance Program

Figure 5. Average Milk Production for Producers Who Completed or Did Not Complete the MDBQAP*



*Milk & Dairy Beef Quality Assurance Program

Backgrounder

June 1993

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Preharvest Food Safety: An APHIS Design

Supplying the American public with food involves many participants and several stages that are linked together in a complex chain. Every link in this chain is vulnerable to disease-causing pathogens. The first link is the farmers, who raise crops and livestock. Next come the transporters, who move these products to markets and then to slaughtering plants and processors. These links compose the preharvest area of the U.S. food chain.

The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) has accepted the challenge of providing leadership in an effort to reduce microbiological pathogens in the preharvest critical points of food production. The APHIS network of veterinarians and epidemiologists is strategically located to help control diseases that threaten animal and public health. Using its infrastructure, expertise, and alliances, APHIS can provide a formidable preharvest food-safety service. APHIS will be working closely with several other Government agencies as well as industry groups, university personnel, and private practitioners throught the country.

APHIS' Veterinary Services

The mission of APHIS' Veterinary Services is to control or eradicate pathogens that pose an economic threat to the livestock and poultry industries and that also, in some cases, endanger public health. Examples of the latter are salmonellosis, tuberculosis, and brucellosis.

Over the years, APHIS has worked with producers, veterinarians, State and international animal health professionals, public health agencies, academicians, shippers, and market operators to resolve animal and public health concerns. Through these efforts, APHIS has earned an international reputation for successful disease exclusion and eradication.

APHIS veterinarians and animal health technicians know how animals and birds are identified and how they are moved from farms to slaughter. This knowledge enables them to trace animals infected or exposed to diseases to their original herd or flock, where effective control or eradication of the pathogens can then begin. In addition to its own field work force, APHIS uses about 40,000 agency-accredited private veterinarians to assist with health certification and testing of animals.

Operating Systems and Programs

An APHIS headquarters staff at Hyattsville, MD, is developing preharvest intervention strategies for pathogens that threaten food safety. This staff cooperates closely with fellow epidemiologists, economists, statisticians, and computer specialists at the APHIS Center for Epidemiology and Animal Health (CEAH). CEAH develops risk assessments about food safety and animal health for agricultural industries and government cooperators. CEAH also designs and implements studies on specific pathogens.

The APHIS National Veterinary Services Laboratories (NVSL) serve as national reference laboratories and a technical resource for advanced diagnostic information. NVSL coordinates, monitors, and standardizes testing procedures for disease eradication programs. NVSL provides other government agencies, universities, and industry with improved techniques for detecting animal diseases.

Livestock industry groups are developing quality assurance programs to reduce drug residues and enhance the quality and safety of their products. For example, the Pork Quality Assurance Program and the Dairy Quality Assurance Program provide ways for U.S. producers to do their part in providing a safe, wholesome product for consumers. These programs show how the principles of Hazard Analysis Critical Control Points, or HACCP, can be applied at the farm and feedlot as well as at many other points along the food chain continuum.

Benefits of Preharvest Food Safety

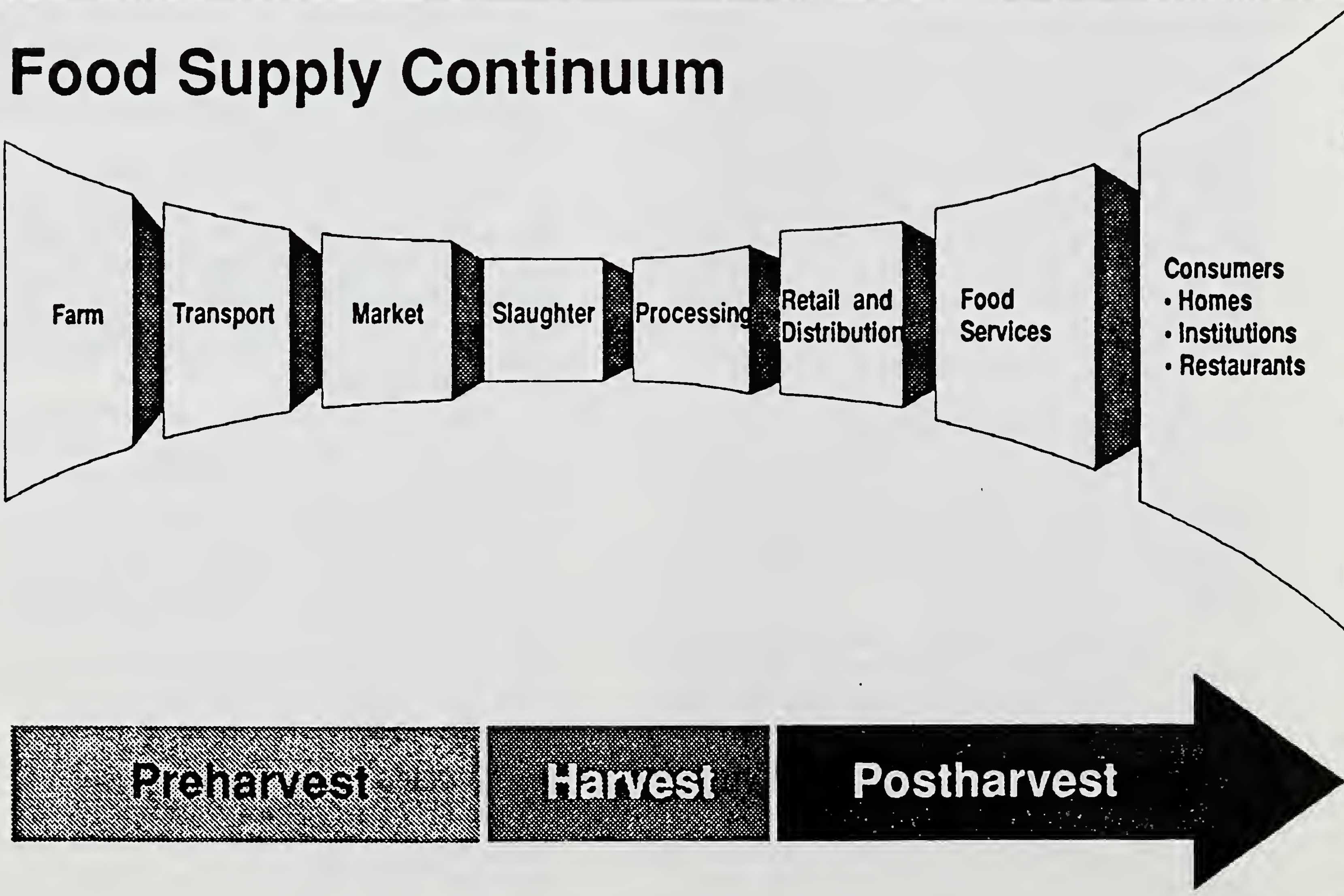
Reducing pathogens that cause food-borne illnesses at the earliest possible point will benefit everyone. The costs to control outbreaks of food-borne illnesses—including emergency diagnosis, treatment, and lost production—are enormous. The disease-prevention objectives put forth by the U.S. Public Health Service in 1991 set target goals for substantially reducing illness caused by pathogens of concern by the year 2000. APHIS is reviewing preharvest risk-management strategies for these pathogens, including Salmonella enteritidis (SE). The APHIS SE control program already has had an impact on reducing the health risk posed by this pathogen.

Increasing consumer confidence in the safety of the Nation's food supply will enhance the domestic and international marketing opportunities for meat, dairy, and poultry products made under safer conditions. Thus, availability of information about the health of the originating herds and flocks will make raising healthy animals economically advantageous for livestock and poultry producers as demand for safer food products increases. Using processes on the farm that minimize risk and enhance food safety will add to the value of these meats and dairy products.

New Partnerships

Preharvest food safety does not have to mean more regulations. It does, however, require better dissemination of the latest information on safe production practices, adoption of on-farm practices to reduce the risk of chemical and microbiological contamination, and the establishment of a new partnership between industry and public and private animal health professionals to develop strategies that ensure a safer food supply.

Food Supply Continuum



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HEALTHY PEOPLE 2000

National Health Promotion and Disease Prevention Objectives

Full Report, With Commentary

U.S. Department of Health and Human Services
Public Health Service

__Healthy People 2000__ is a statement of national opportunities. Although the Federal Government facilitated its development, it is not intended as a statement of Federal standards or requirements. It is the product of a national effort, involving 22 expert working groups, a consortium that has grown to include almost 300 national organizations and all the State health departments, and the Institute of Medicine of the National Academy of Sciences, which helped the U.S. Public Health Service to manage the consortium, convene regional and national hearings, and receive testimony from more than 750 individuals and organizations. After extensive public review and comment, involving more than 10,000 people, the objectives were revised and refined to produce this report.

Food and Drug Safety

12

Contents

12. Food and Drug Safety

Introduction

A major public health accomplishment during the 20th Century has been the development of Federal and State systems to provide nearly universal protection of consumers from dangers posed by unapproved food additives, unapproved uses of pesticides, food contaminants, and use of unapproved drugs. From Food and Drug Administration (FDA) and U.S. Department of Agriculture inspections of meat, poultry, dairy products, and processed foods to State and local public health regulation of restaurants and retail food sales, an unprecedented level of safety and assurance has been achieved for American consumers. For example, inspections of foods to test for pesticide residues consistently find between 96 and 98 percent of tested foods from both domestic and international sources to be within legally established levels (tolerances) and to contain no pesticides not permitted for use on the food. Tolerance levels are normally set conservatively at between 100 and 1,000 times lower than the level causing no effect in test animals.[2]

Similarly, procedures to ensure that new drugs developed and marketed by pharmaceutical companies are safe and effective are well established, as are regulations that provide for quick intervention in cases of adverse reactions to approved drugs. In a single year, for example, FDA officials inspect nearly one-third of the 18,000 drug and biologics establishments in the United States to ensure that medicines are being produced and handled appropriately. They sample nearly 7,000 domestically produced medicines to ensure that manufacturing and product standards are being met. Where necessary they use legal authority to seize products, initiate court injunctions, and engage in prosecutions against producers of unsafe drugs. In addition, they have legal authority to initiate product recalls.[6]

To monitor food and drug safety, regulatory agencies use modern technology and systematically conduct research themselves. Communication is an additional necessary element of the system. Communication may be targeted at industry, professional groups, or consumers. Consumer-oriented educational strategies are carefully structured and orchestrated to foster safety by providing information to consumers to fulfill their roles in preventing injury or illness.

Despite what many observers believe to be the most effective food and drug safety regulations in the world, this country still experiences outbreaks of foodborne diseases and incidents of drugs causing illness and even death rather than the desired therapeutic effects. In some instances, these outcomes result from failures in the protective systems at the Federal, State, or local levels. In many other instances, unintended outcomes result from improper handling of foods by consumers rather than producers, inadequate compliance by patients with prescribed drug therapies, and problems associated with polypharmacy or different health care providers prescribing drugs for the same patient resulting in interactions that produce adverse reactions. In short, food and drug safety is principally a matter of protective systems, but it also requires well-informed consumers.

This priority area focuses on maintaining and improving a part of the public health system in the United States that has already proved its effectiveness but requires continuing vigilance and support during the coming decade.

Note: Except as otherwise noted, all rates in the following objectives are annual. Where the baseline rate is age adjusted, it is age adjusted to the 1940 U.S. population, and the target is age adjusted also. If a rate is age adjusted, the crude baseline rate may be found in Appendix D.

Health Status Objectives

12.1 Reduce infections caused by key foodborne pathogens to incidences of no more than:

Disease (per 100,000)	*1987 Baseline*	*2000 Target*
Salmonella species	**18**	**16**
Campylobacter jejuni	**50**	**25**
Escherichia coli 0157:H7	**8**	**4**
Listeria monocytogenes	**0.7**	**0.5**

Baseline data source: Center for Infectious Diseases, CDC.

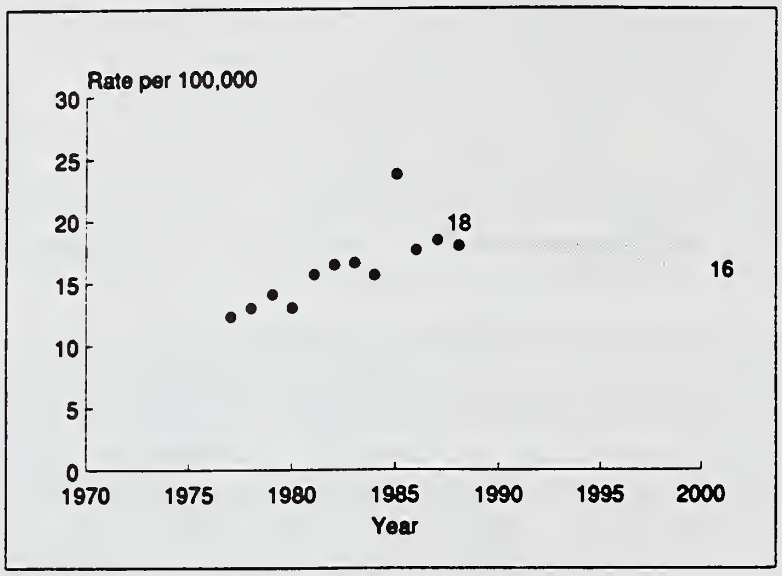

Fig. 12.1
Salmonella incidence rate

Salmonella enteritidis, *Campylobacter jejuni*, *Escherichia coli* 0157:H7, and *Listeria monocytogenes* are four of the most important foodborne pathogens in the United States, based on the number of reported cases that occur and their severity. Because infections by *Salmonella* and *E. coli* 0157:H7 are actually increasing in incidence, decreasing their occurrence will be difficult. The growing proportion of our population that is compromised by immunologic deficiencies and age exacerbates the problem, because these subpopulations are more susceptible to infection and to dying as a result of infection.

Educational materials to increase consumer awareness of methods to prevent foodborne diseases have been developed and distributed by public and private organizations at the national, State, and local levels. However, investigations of foodborne diseases have repeatedly shown that many consumers do not understand the hazards or do not take precautions to reduce their risks. Lack of effective consumer education is one reason for the concern about contamination of raw foods. Farm management strategies to reduce rates of colonization of farm animals by these four human pathogens should also be explored, including control of feed and water supplies as well as environmental controls. Sanitary shipping, slaughter, and processing operations are also vital to reducing cross-contamination.

Reduction in sporadic listeriosis cases will require altering food preparation habits through public information campaigns for foods associated with this disease. Indicators of microbial growth and/or time and temperature abuse should be used to alert food handlers at each stage of food processing when the product has been handled incorrectly. Such indicators would also increase the awareness of food handlers and the public at large about the importance of preventing time and temperature abuse. Methods that reduce the incidence of these four key pathogens may also reduce foodborne illnesses caused by certain other bacterial, viral, and parasitic pathogens.

This objective assumes that, during the coming decade, investigators in public and private sectors will be able to learn more about the natural reservoirs of these bacteria and their dissemination during food processing and will implement improvements in industry and regulatory agencies' detection of potential sources of contamination. In addition, existing surveillance efforts need to be strengthened to measure the clinical and economic impact of foodborne diseases and to monitor efforts to reduce the incidence of foodborne diseases.

12.2 Reduce outbreaks of infections due to *Salmonella enteritidis* to fewer than 25 outbreaks yearly. (Baseline: 77 outbreaks in 1989)

Baseline data source: Center for Infectious Diseases, CDC.

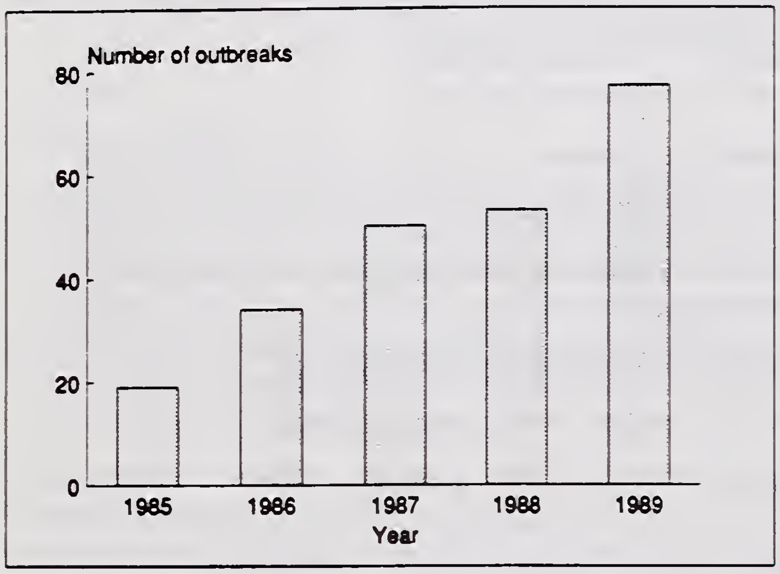

Fig. 12.2

Salmonella outbreaks per year

Outbreaks of *Salmonella enteritidis* infections increased dramatically over the decade of the 1980s, especially in the New England and mid-Atlantic States. This foodborne disease is often traced to contaminated eggs. It produces severe diarrhea, fever, vomiting, and cramps and can cause death. The 77 outbreaks reported in 1989 involved 2,394 cases and 14 deaths. This disease can be particularly dangerous for infants, older adults, and immunocompromised people. With the projected increase in the number of older people and people with AIDS, death and illness caused by Salmonella infections are expected to continue to increase.

Thorough cooking kills Salmonella, but heavily contaminated eggs used in some standard cooking methods (as in preparation of sauces, meringue, scrambled or soft-boiled eggs) may still not be safe. Risk increases significantly if raw or undercooked eggs are left at room temperature more than 2 hours. Outbreaks of salmonellosis often result from eating contaminated foods at picnics and parties for which food was prepared privately, rather than commercially. For this reason, public education about proper food preparation is crucial to efforts to reduce the number of outbreaks as well as individual cases. The U.S. Department of Agriculture provides information on safe cooking and handling of eggs, as well as other potentially hazardous foods, through both a central hotline and county extension home economists.

Risk Reduction Objective

12.3 Increase to at least 75 percent the proportion of households in which principal food preparers routinely refrain from leaving perishable food out of the refrigerator for over 2 hours and wash cutting boards and utensils with soap after contact with raw meat and poultry. (Baseline: For refrigeration of perishable foods, 70 percent; for washing cutting boards with soap, 66 percent; and for washing utensils with soap, 55 percent, in 1988)

Baseline data source: Food Safety Survey, FDA; Diet-Health Knowledge Survey, USDA.

Government inspection and strict standards within the food industry assist in the job of keeping the American food supply safe and wholesome. The law requires that inspectors check and recheck the safety and quality of meat and poultry from the time the animals arrive at the packing plant until the final product is ready for sale. The individual consumer also plays an important role in keeping food safe. Preventing food poisoning must begin when food is purchased at the supermarket and must continue through storing, preparing, cooking, and serving the food at home. The U.S. Department of Agriculture has developed 7 commandments of food safety:

1. Wash hands before handling food.
2. Keep it safe, refrigerate.
3. Don't thaw food on the kitchen counter.
4. Wash hands, utensils and surfaces again after contact with raw meat and poultry.
5. Never leave perishable food out over 2 hours.
6. Thoroughly cook raw meat, poultry, and fish.
7. Freeze or refrigerate leftovers promptly.

Services and Protection Objectives

12.4 Extend to at least 70 percent the proportion of States and territories that have implemented model food codes for institutional food operations and to at least 70 percent the proportion that have adopted the new uniform food protection code ("Unicode") that sets recommended standards for regulation of all food operations. (Baseline: For institutional food operations currently using FDA's recommended model codes, 20 percent; for the new Unicode to be released in 1991, 0 percent, in 1990)

Baseline data source: Center for Food Safety and Applied Nutrition, FDA.

A primary concern of this objective is to extend protective standards and regular monitoring to food services that may tend to be missed. Such food services include health care facilities, congregate feeding programs for older adults, day care and Head Start programs, meal programs for the homeless, and other food services that are not usually covered by programs on retail or commercial enterprises.

Health and sanitation inspections directed to restaurants, cafeterias, congregate feeding programs, and food stores are a basic part of the public health protection system in this country. They are authorized by codes adopted at the State level. In all, 56 States and territories and the District of Columbia have authority to set standards and monitor adherence on the part of food service providers. In the past, separate codes have generally been promulgated for restaurants and cafeteria operations and for food stores principally marketing packaged foods and fresh produce.[1,4,5] The variety of possible settings for food services that involve food handling and preparation for immediate consumption and the expansion of food preparation services in settings that previously offered only packaged foods and fresh produce have blurred the distinctions between the separate inspection code systems. From the perspective of protecting the health of the public, the requirements for ensuring safe food are not essentially different, regardless of the nature of the retailer or food service. Neither does it appear appropriate to hold one type of food service provider to a set of standards that are more or less demanding than those applied to another provider of the same kind of food. The new FDA Unicode scheduled for publication in 1991 will hold all food operations to the same standard.

12.5 Increase to at least 75 percent the proportion of pharmacies and other dispensers of prescription medications that use linked systems to provide alerts to potential adverse drug reactions among medications dispensed by different sources to individual patients. (Baseline data available in 1993)

Medical treatment today frequently involves the use of multiple concurrent medications, including both prescription and over-the-counter drugs. Medications, while beneficial, can also cause adverse drug reactions, and patients taking several medications simultaneously are at higher risk of suffering these effects. Since many patients see more than one primary care provider, there is an ever-increasing possibility that they may be concurrently taking several drugs from the same class of therapeutic agents, prescribed independently by different primary providers. This can result in needless suffering or loss of therapeutic benefit in specific clinical conditions.

Information services provided by pharmacists and medical clinics that dispense prescription medications can improve patient outcomes and reduce costs of care. Computerized technology is increasingly being used by pharmacists to detect, resolve, and prevent drug-related problems that can lead to suffering and death. An estimated 85 percent of all pharmacies in this country now use computers to some degree in their operations.[9]

The first line of defense the pharmacist can employ against adverse drug reactions is a computerized review of new prescriptions for potential interactions. At the most basic level, the review may screen for missing or improper dosage information. On a more sophisticated level, the review may include whatever information the pharmacist has collected on the patient's drug history. An automated review uses computer software that can be programmed to screen for therapeutic duplication in a patient's drug regimen. More sophisticated computer software allows screening for a wide range of drug interactions, including drug-drug, drug-allergy, and drug-disease interactions.

As patients obtain prescriptions from multiple community pharmacies, hospital pharmacies, mail order pharmacies, and directly from physicians, information systems to link prescription records are essential. Many possible mechanisms permit such linkage. For example, "smart" credit card systems can enable patients to carry their own prescription medicine records and share those records with pharmacists and physicians. Alternatively, centralized data bases can be used to share records among authorized users. Developing and testing such systems will assure patients access to multiple medication distribution mechanisms while at the same time permitting health professionals with the necessary equipment to review the patient's prescription history and screen for preventable adverse drug interactions.

Consumers may not be aware that pharmacists are highly knowledgeable sources of information about appropriate drug administration, interactions, and potential side effects. In a 1984 survey of 300 elderly patients only 1 in 6 patients mentioned the pharmacist as someone they would ask about prescription drugs.[12] There is some evidence, however, that patient demand for more and better information about drug therapy is increasing.[8] Augmenting this overall heightened interest in health care, consumer groups and non-profit organizations such as the National Council on Patient Information and Education (NCPIE) have conducted public education campaigns to alert consumers to drug-related risks and to encourage them to seek more and better information from health professionals.

For this objective to be fully realized, consumers must be informed about the value of computerized pharmacies and they must be willing to provide the pharmacist with the specific information needed for the drug safety information system. The Food and Drug Administration will collaborate with private professional associations to develop baseline data and to track this objective.

12.6 Increase to at least 75 percent the proportion of primary care providers who routinely review with their patients aged 65 and older all prescribed and over-the-counter medicines taken by their patients each time a new medication is prescribed. (Baseline data available in 1992)

Older adults, who have higher rates of chronic disease and use more health services than the total population, also take more prescription and nonprescription medicines than younger people. Adults aged 65 and older comprise approximately 12 percent of the population but receive 30 percent of all prescription medications.[10] As their proportion of the population rises in the coming decade, it is expected that the proportion of prescription medications used will rise also. About 95 percent of older adults live outside of institutions and are responsible for their own medications.[7] According to one study 25 percent of older patients discharged from hospitals were using 6 or more prescription medications.[11]

One of the major problems associated with polypharmacy use—the use of multiple medications—is adverse drug reactions. Patients who use multiple physicians and pharmacies run the risk of receiving drugs that are therapeutic duplicates and drugs that interact, since the health care professional they see may not be fully informed about other prescriptions. In addition, the more prescriptions an individual is given, the greater the risk of medication errors and noncompliance. A 1986 report indicated that those over age 60 accounted for one-third of all hospitalizations for adverse drug reactions.[3]

Although all medications have some side effects, the physiologic changes associated with increasing age and particular diseases and conditions may alter the effects of drugs. Adverse drug reactions are more likely to cause significant illness and/or death among older adults compared to younger people. Other problems associated with geriatric drug therapy include compliance, costs, access, and attitudes. Health promotion interventions targeted to these problems need to take into account the interdependency of these issues. Patients need to be better informed about the medications they are taking and encouraged to ask questions when given a new prescription. Physicians and other primary health care providers need to closely monitor the multitude of drugs being prescribed for their patients.

The Office of Disease Prevention and Health Promotion will initiate a survey of primary health care providers that will provide baseline data and track this objective beginning in 1992.

Personnel Needs

Priorities for ensuring an adequate supply of trained personnel to achieve the food and drug safety objectives include the following:

- Establish the number of food and drug inspection professionals who are needed to accomplish the regulatory and monitoring aspects of food and drug safety requirements; establish the appropriate levels of auxiliary professionals in research and communication aspects of these objectives; establish an adequate epidemiologic work force to identify foodborne hazards, quantify risks, and increase the efficacy of intervention strategies; and establish appropriate levels of training for inspection personnel, managers of food preparation operations, and others with roles in assuring food and drug safety.
- Provide information on food and drug safety to schools and programs preparing students for careers in public health, agriculture, pharmacy, medicine, nursing, dietetics, restaurant and hotel management, and related occupations.
- Increase the provision of continuing education on food and drug safety by national professional associations whose members have roles in ensuring food and drug safety.

Surveillance Needs

Availability of Future Data

Annual data from existing surveys are available to track Objectives 12.1, 12.2, and 12.4.

Periodic surveys and/or supplements to existing surveys can help to track Objective 12.3.

New surveillance systems are needed to track Objectives 12.5 and 12.6.

High Priority Needs

- Continue to develop postmarketing surveillance programs to assess the occurrence of adverse drug reactions in all populations with special attention being given to the elderly.
- Improve surveillance of adverse drug reactions and track adverse drug reactions related to products recently switched from prescription to over-the-counter status.
- Create a system to investigate epidemiologic and laboratory characteristics of foodborne pathogens and evaluate the effectiveness of educational and control methods. Although current foodborne disease surveillance efforts have been adequate to effectively identify many foodborne hazards, data are currently inadequate to quantify risk associated with specific vehicles or specific pathogens. Accurate projections can be obtained, however, from sentinel surveillance systems such as that now being used to study the incidence of listeriosis. Sentinel surveillance systems of this type should be expanded to cover all major foodborne pathogens and be combined with case control studies to determine food vehicles and, with pathogen surveillance of foods, to estimate the population's risk of exposure.

Research Needs

A research priority of food and drug safety is pharmacoepidemiologic studies using linked data bases for finite populations. Data for special populations could be collected from Medicaid, HMOs, outpatient clinics, and Veterans hospitals and clinics. Research is also needed to determine the following:

- The nature and prevalence of consumer attitudes toward chemical contaminants, microbiologic contaminants, and other food safety issues in order to develop appropriate strategies for assisting consumers in understanding the true impact of each of these on public health.
- The ecology of foodborne pathogens from farm to table, the effects of various agricultural practices, and processes that can decrease or eliminate pathogens from food without affecting food quality. Rapid, sensitive, and reliable methods are needed to detect specific microorganisms and to discriminate nonpathogenic from pathogenic strains. Epidemiologic studies should identify high risk foods, processes, and behaviors, and define those subpopulations at greatest risk of infection and serious outcomes. These studies should also determine how pathogens enter the home and other food preparation settings, how they spread within the kitchen environment, and how they contaminate foods ready for consumption and ultimately infect humans.

Related Objectives From Other Priority Areas

Alcohol and Other Drugs

4.4 Drug abuse-related emergency room visits

4.11 Anabolic steroid use

Educational and Community-Based Programs

8.7 Health promotion activities for hourly workers

8.11 Programs for racial/ethnic minority groups

Unintentional Injuries

9.8 Nonfatal poisoning

9.21 Injury prevention counseling by clinicians

Occupational Safety and Health

10.12 Worksite health and safety programs

Environmental Health

11.7 Toxic agent releases

Clinical Preventive Services

21.2 Receipt of recommended services

21.4 Financial barriers to receipt of services

21.6 Provision of recommended services by clinicians

Surveillance and Data Systems

22.3 Comparable data collection procedures

Baseline Data Source References

Center for Infectious Diseases, Centers for Disease Control, Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Food and Drug Administration, Public Health Service, U.S. Department of Health and Human Services, Washington, DC.

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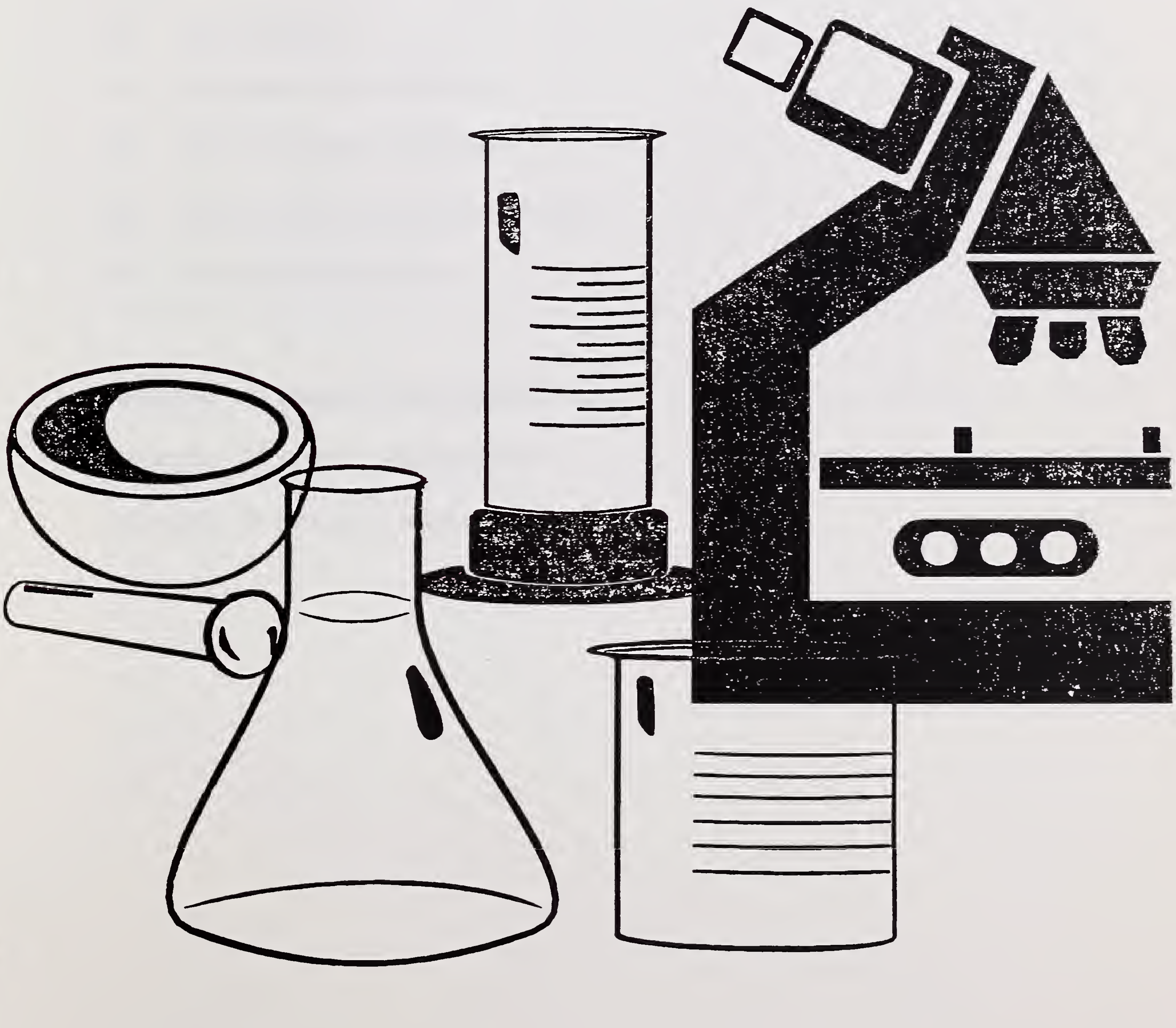
Food Safety and Inspection Service

Pathogen Reduction Program

The War on Pathogens



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PATHOGEN REDUCTION PROGRAM: OVERVIEW

The USDA's FSIS is taking immediate steps to strengthen public health protection by squarely facing the risks posed by microbial pathogens in the food supply. These actions will be coordinated in a program that will in effect be a "war on pathogens."

The control of pathogenic microorganisms is and always has been an implicit goal of the Federal meat and poultry inspection program. The program has worked to achieve this goal through such activities as continuous organoleptic inspection in slaughterhouses, the daily monitoring of operations in further processing plants, laboratory analyses and scientific research, and consumer education.

In recent years, USDA's FSIS has been laying the groundwork for a future inspection system that will:

— be based on the most up-to-date scientific knowledge and methods;

— employ criteria derived from quantitative risk assessments and epidemiological and microbiological surveys;

— focus on enhanced public health protection at critical points from the farm to the dinner table HACCP;

— incorporate the latest rapid detection and screening methodologies;

— use animal identification and traceback methods to determine the sources of potential or actual infections.

An integral feature of the future inspection system will be a Pathogen Reduction Program to reduce the likelihood that harmful microorganisms--such as Salmonella, Listeria monocytogenes, or E. coli O157:H7--will enter the food supply at key points in the production, distribution, and consumption chain. The plan the Department is now adopting is based on HACCP principles and incorporates the essential elements of a pathogen reduction approach. This includes critical "pre-harvest" production activities, research on rapid detection methods, "post-harvest" research, in slaughter and processing plants, food service and retail activities, and even more aggressive consumer education than has been undertaken in the past.

Additional actions will include such innovations as pre-evisceration organic-acid carcass sprays and rapid inplant detection methods or microbiological monitoring. Meat and poultry inspectors can and will eventually be equipped with microbiological swab kits or other tools to enhance the work they already perform to ensure that facilities and equipment are sanitary. Meanwhile, FSIS will carry out microbiological monitoring using existing methods.

In pursuing its new strategy, USDA will be making a decisive break with the past. In the future, the Department will not wait for the pathogens to become a problem. Nor will it be satisfied with holding the line against contamination;. USDA will strive to reduce contamination at the source. Department personnel will not just stand at their positions inside official establishments or within the bounds of bureaucratic turf. They will be going out into the fields among the herds and flocks to find the places where pathogens lodge so as to be better prepared to enumerate and eliminate them.

Thus, under the rubric of "pre-harvest production activities," FSIS, working with Animal and Plant Health Inspection Service (APHIS) and other Government agencies, will carry out on-farm investigations and epidemiological studies of foodborne enteric pathogens. Although USDA intends eventually to deal with all serious pathogens through detection and eradication, it is beginning this effort -- appropriately--with a study of E. coli O157:H7 characteristics and risk factors in cattle herds. The Department is also seeking legislative changes to mandate animal identification and traceback in order to determine the herds of origin of infected animals arriving at the slaughterhouse. Further, to be truly proactive, USDA will be developing pathogen prevention programs to help producers keep their livestock from becoming carriers of dangerous bacteria. The resources of Government agencies and professional associations will be marshalled in this effort.

USDA agencies will speed the development of new methods—especially rugged, reliable tests that can yield results quickly—and make them available to inplant inspectors. Efforts are now underway to apply new advances in molecular biology, bioluminescence, and biosensors that are capable of detecting low numbers of disease-causing bacteria on food products. Even in highly technical areas it will not be business as usual. FSIS intends to seek authority to conduct and fund its applied research, especially in the areas of rapid tests and post-harvest pathogen control.

In the slaughter plant environment, FSIS still lacks the quantitative data that would permit it to measure such reduction. However, already underway is a microbiological baseline study that covers steers and heifers—the chief sources of the steaks and roasts familiar to consumers. The baseline study will be expanded to include cows, chickens, and pigs.

More must be learned about the health of cows coming to slaughter, including information on the public health significance of stressed or disabled cows compared with that of normal or healthy cows. Questions about the relative prevalence of disease-causing bacteria in these cattle populations must also be answered.

In the area of further processing, FSIS will seek to establish stricter requirements for boneless beef reinspection by establishments and for the conditions under which hamburger patties are processed commercially. The agency will also move to publish a final regulation establishing time and temperature minimums for the processing of partially cooked hamburger patties to prevent the recurrence of E. coli O157:H7 and other outbreaks in which such products have been implicated. USDA and FDA will strongly encourage preventive actions across the whole range of processed foods, and will recommend and support industry initiatives to establish certified HACCP programs. Inplant microbiological monitoring would be a key feature of such programs.

Finally, USDA is taking the initiative in strengthening protection at food service establishments and in the homes of consumers. For example, the Department is preparing to mandate the use of safe-handling labels on raw meat products sold at the food service and retail level, and the use of safe-handling inserts to accompany shipments of meat products used in such purchase programs as the National School Lunch program. USDA will also increase cooperative efforts with FDA and other agencies and organizations that share roles as food safety educators. Bold action can now be expected to convey food safety information to the general public.

The Pathogen Reduction Program incorporates actions that can be taken immediately at key points along the route from the farm to the table. Other preventive activities, such as those based on epidemiological information from the Centers for Disease Control and Prevention, will be integrated into the program as the need for them is identified.

Some improvements will be difficult and will have costs that exceed those of the current inspection program. But USDA believes that the people of this country want and deserve an up-to-date inspection system that is focused on protection from foodborne disease. The time is ripe for a comprehensive, cooperative effort engaging the Department, Congress, consumers, the scientific community, and the meat and poultry industry.

I. PRE-HARVEST PRODUCTION ACTIVITIES

Pathogens that get into the food supply and make people sick may originate in the animals from which food is made. In the case of the recent epidemic in several Western states, it is possible that certain cattle brought to slaughter carried the E. coli O157:H7 organism in their bodies. Unfortunately scientists do not know with certainty which animals are most likely to be harboring the organism or why they may be affected: it could be because of certain husbandry practices of the farmer; it could be because of the geographic location of the farm or its proximity to wild animal populations; it could be because the animals are old or stressed, or many other factors. Because scientists cannot tell us with precision where and why the organism appears, it has not been possible to design on-farm programs which will assist producers in making sure that their animals are not the source of these dangerous bacteria.

The pre-harvest production activities which are part of the Pathogen Reduction Program are designed to obtain answers to the underlying scientific questions, and use those answers in conjunction with basic animal identification information to build a better pathogen prevention system for animals destined for food.

A. *On-farm investigations: Conduct on-farm epidemiologic studies of food borne enteric bacterial pathogens, using E. coli O157:H7 as a model to determine the characteristics and risk factors associated with infected animals.*

B. *Animal ID and traceback: Design programs, secure necessary authority and put in place mandatory requirements for animal identification so that meat-borne problems can be traced back to their on-farm origins. Such requirements are the basis for effective pathogen controls and are also the foundation of prevention programs which are beneficial to both producers and their customers.*

C. *Pathogen prevention programs: Develop a program designed to assist producers to eradicate or control disease organisms of public health concern. Models will be developed based on experience of other countries such as Sweden and Denmark as well as outcomes of US on-farm investigations combined with resources from producer groups and assistance providers like APHIS, Extension Service (ES), AVMA, and Universities.*

II. RAPID METHODS DEVELOPMENT

Reducing pathogens that may get into the food supply depends on being able to detect their presence at various points in the food production process-we need methods to find these microorganisms in live animals, on carcasses of animals in the slaughtering plant, on machinery or tables in the processing plant, in raw materials being used to make meat food products, and on the hands and clothing of workers and in finished products. Identifying these organisms requires sophisticated analytic methods to be used in differing and difficult circumstances, often by persons without extensive training. The methods development research part of this program is designed to accelerate the provision of these critically important tools.

Emphasis will be placed on new technologies (especially new advances in the fields of molecular biology, bioluminescence, and biosensing) to detect and enumerate the low numbers of human pathogens found in and on food products, the development of more rapid tests with shortened turn-around-times, and the development of simple to use, in-plant tests. New methods are needed by inspectors to detect temperature abused products, to estimate microbial bioburden at various stages of processing, and to determine microbial pathogen contamination at selected Critical Control Points (CCP).

A. *Methods development research: Develop and evaluate methods for the detection and enumeration of microorganisms of public health concern in raw and ready-to-eat meat and poultry products and for implementation at Critical Control Points to monitor process control.*

III. POST-HARVEST ACTIVITIES

During the time that animals are being slaughtered and processed, pathogens originating in the animal or from the environment may be transferred into the food. Under certain time and temperature conditions which are typical of food processing, bacteria may attach themselves to products and grow. Post-harvest activities are designed to investigate what happens to bacteria during all phases of food processing and design, and test interventions which break up the chain of bacterial contamination. HACCP programs for meat and poultry slaughter plants will be designed and pilot tested.

A. *Slaughter and processing pathogen research: Identify critical issues and expand existing research programs in FSIS, ARS, CSRS, industry, and academic consortia to elicit further knowledge about the presence and persistence of foodborne pathogens during meat and poultry production and potential interventions aimed at reducing contamination.*

B. *Irradiation research: Give immediate priority to research to support a petition to extend FDA approval for irradiation of fresh and frozen poultry to include red meat.*

IV. RISK ANALYSIS

Once data and information are gathered on pathogens in meat and poultry and proposed interventions are promoted to help reduce their prevalence, a sound scientific process is needed to assess the inherent riskiness of the current procedures in terms of the potential for foodborne illness, and the value, in these same terms, of any interventions. Quantitative Risk Assessment (QRA) provides the tools to improve the soundness of agency decisions in protecting the public health by allowing for a logical, orderly assessment of risks and numerically estimating the potential for foodborne illness in old and new systems.

A. Quantitative Risk Assessment: Adapt the science of quantitative risk assessment to foodborne hazards, especially of microbial origin, and to FSIS inspection activities, thereby improving Agency decisionmaking.

V. SLAUGHTER PLANT ACTIVITIES

Even though all critical research questions have not yet been answered, FSIS recognizes and accepts its obligation to proceed with activities that are likely to succeed based on current theories about pathogen control. The agency also has the opportunity to introduce useful microbial detection technologies into the present inspection program as they become available, not waiting for the fully developed new system.

The Pathogen Reduction Program (PRP) includes several activities which are based on present knowledge, especially that which suggests that pathogen presence on carcasses is likely associated with fecal contamination; that careful sanitation can reduce potential for cross-contamination; that HACCP principles have high potential for benefits; and that more information about microbiological profiles of species and classes of animals brought to slaughter will provide better opportunities for fine-tuning interventions.

The PRP also includes quickly using microbial monitoring techniques in the present inspection system, thereby empowering inspectors with significantly better tools to do their jobs.

A. *Expand microbiological baseline: Design national monitoring programs for cows, poultry, and swine. This program will provide a microbiological profile of these classes of animals; it will survey for bacteria of public health concern, i.e., E. coli O157:H7, Salmonella, Listeria monocytogenes, Clostridium perfringens, Campylobacter jejuni/coli, and staphylococcus aureus. Data generated by the baseline studies will show an "average microbial profile" for the class of animal studied. Plants which consistently produce products outside of this average can be identified and their slaughter operations reviewed.*

A baseline study will be designed and implemented to determine a microbial profile of ground beef. Three thousand samples will be collected and analyzed for indicator organisms and selected pathogens, including E. coli O157:H7.

B. *Test "disabled" cows: Determine prevalence of fecal carriage of disabled cows compared to normal cows to assess the effects of stress on the shedding of bacteria causing foodborne human illness, i.e., E. coli O157:H7, Salmonella, and Campylobacter jejuni/coli. The study will determine if disabled cows constitute a greater public health risk than normal cows. This case control study has been designed to initially evaluate 500 disabled cows and 500 control animals.*

C. *Improve current slaughter procedures: Review and modify current methods to maximize reduction of carcass contamination and prevent bacteria proliferation.*

D. *Enhance veterinary coverage: Enhance effective use of Veterinary Medical Officers (VMO) in plants that slaughter high risk animals.*

E. *Mandate record-keeping: Strengthen requirements for maintaining records of purchase and sale transactions, and in processing plants requirements for product formulation records. The focus would be on* *records that would facilitate identification and traceback.*

F. *HACCP micro monitoring: Based on current knowledge and work of the National Advisory Committee Microbiological Criteria for Foods (NACMCF) develop, a microbiologic monitoring program for beef slaughter; pilot test in five representative beef slaughter plants to target CCP's that have been identified as microbiologically important. This will lead to the implementation of HACCP sampling in targeted beef slaughter plants.*

VI. PROCESSING PLANT ACTIVITIES

Processing plant environments also offer opportunities for intervening at critical control points to reduce pathogen presence. Again, the present Pathogen Reduction Plan will take advantage of best available thinking and technology to minimize the chance of contamination reaching consumers of meat and poultry products. HACCP programs for meat and poultry processing plants need to be designed and implemented. Wherever current measurement technology permits microbial monitoring of critical control points, FSIS will build such techniques into its existing inspection framework. This will permit the immediate use of technical advancements by USDA inspectors, and will encourage such use by the regulated industry.

A. *Control bacterial proliferation: Impose time and temperature controls on various stages of processing, especially of ground meat products.*

B. *Improve current processing procedures: Strengthen existing procedures designed to control bacterial proliferation.*

C. *Finalize "patty" docket and controls on similar products: Publish regulations to specify cooking requirements for patties and like products.*

D. *Mandate safe-handling labels: Mandate safe handling instructions for labels on all raw meat and poultry products: issue interim instructions for approving voluntary use of such statements on labels. Provide for safe handling inserts and prominent cooking instructions on labels of school commodity products and National School Lunch Program purchases.*

E. *HACCP micro monitoring: Based on current knowledge and work of NACMCF and FSIS ground Beef Workshop, develop a microbiologic monitoring program. Pilot test in five representative ground beef processing plants to target CCP's that have been identified as microbiologically important. This will lead to the implementation of HACCP sampling in beef processing plants.*

VII. FOOD SERVICE AND RETAIL ACTIVITIES

While pathogen reduction is the central goal of this effort, it is unlikely that it can assure pathogen-free raw meat and poultry products in the near future. This means that those who further prepare and serve food will need to remain critically attentive and expertly equipped to perform their important preparation and handling functions. The Pathogen Reduction Program includes food service and retail activities which encourage the provision to these workers of scientifically up-to-date information and guidance, clear consistent instructions about how to do their jobs well and recognition that communication and coordination among federal, state and local regulators is essential to an effective system.

A. Sponsor teleconference: Provide state and local public health authorities with current information on food safety requirements and methods of enforcement.

B. Assist state enforcement programs: Provide technical and resource assistance to states to carry out their enforcement efforts in food service and retail establishments. Cooperate in developing and supporting model food codes to provide uniform technical guidance for cooking and handling.

C. Educate food handlers: Work with cooperators such as the Extension Service and trade and professional organizations to identify the level of knowledge of food service workers in safe food handling practices and to identify existing food safety education materials and vehicles. Determine which needs are not being met, and develop and integrated and targeted education program for food service employees including day care centers, nursing homes, hospitals, restaurants and similar institutions to teach proper cooking and handling of food.

D. Educate fast food chain employees: Call upon corporate leaders of restaurants to ensure that their food service employees are instructed in safe food handling practices. Prepare a joint HHS/USDA initiative to educate all restaurant managers and staff.

VIII. CONSUMER AWARENESS

As long as meat and poultry products are prepared by consumers, those consumers remain critical in terms of ensuring their own safety. Proper handling, storage and preparation of these perishable products is less widely known than it once was in contemporary households and less time and attention are often devoted to these matters. The Pathogen Reduction Program includes activities which continue the agency's traditional recognition of the important role of consumer education and awareness in protecting public health.

A. *Intensify consumer awareness campaign: Develop a national consumer awareness campaign to improve understanding of the risks of unsafe food handling practices, using ground beef safety as key. Positively influence consumer food buying and food handling behavior. Evaluate effectiveness of campaign, using traditional and innovative measures.*

B. *Expand food safety education: Increase cooperative efforts with agencies and organizations who share roles as food safety educators.*

Appendix A.—Program Management Plan

Pathogen Reduction Program Management Plan

The Food Safety and Inspection Service has proposed a Pathogen Reduction Plan that targets its efforts, and calls on related public and private stakeholders for critical assistance. Using a matrix management approach, a senior manager and five senior activity leaders will plan and oversee implementation of a broad-based program to reduce pathogens in the US meat and poultry supply. The management team consists of Pat Stolfa general manager, plus activity leaders Jeanne Axtell, Rich Carnevale, Pat Clerkin, Bill Havlik, and Karen Stuck. Each team member is an experienced manager and most have carried out varied assignments for this and other federal agencies over the past 20 years. They will relinquish their normal duties to the extent necessary to ensure success of the pathogen reduction program.

Each activity leader will be responsible for a series of related projects which have been identified as having good potential for meeting the overall goals of the program. Activity leaders will identify teams to assist in implementation.

In addition to this overall management team, a number of staff experts have been designated to work with both the general manager and the individual teams. The list of staff experts includes:

Budget	Michael Zimmerer
Personnel	Karen Bridge
Regulations and Directives	Nancy Goodwin Chuck Williams
Technical Writing	Chuck Williams
Training	Robert Tynan
Constituent Communications	Wayne Baggett
Labor Management Relations	Ron Hicks
Office of General Counsel	Hal Reuben

Appendix B.—Activity Assignments

Activity		Leader
I.	**Pre-Harvest Production Activities**	
	A. On-farm investigations	Carnevale
	B. Animal ID and traceback	Havlik
	C. Pathogen prevention programs	Havlik
II.	**Rapid Methods Development**	Carnevale
	A. Methods development research	
III.	**Post Harvest Activities**	Carnevale
	A. Slaughter and processing pathogen research	Carnevale
	B. Irradiation research	Carnevale
IV.	**Risk Analysis**	Carnevale
	A. Quantitative risk assessment	Carnevale
V.	**Slaughter Plant Activities**	
	A. Expand microbiological baseline	Carnevale
	B. Test "disabled" cows	Carnevale
	C. Improve current slaughter procedures	Axtell
	-Clean meat stations -Slaughter dressing procedures -New pre-op sanitation program -Standardize operational sanitation	
	D. Enhance veterinary coverage	Axtell
	E. Mandate record-keeping	Clerkin
	F. HACCP micro monitoring	Axtell
VI.	**Processing Plant Activities**	

A. Control bacterial proliferation . . . . Havlik
B. Improve current processing procedures . . . . Axtell
C. Finalize "patty" docket and controls on similar products . . . . . Havlik
D. Mandate safe-handling labels . . . . Clerkin
E. HACCP micro monitoring . . . . Axtell

VII. Food Service and Retail Activities

A. Sponsor teleconference . . . . Stuck
B. Assist state enforcement programs . . . . Clerkin
C. Educate food handlers . . . . Stuck
D. Educate fast food chain employees . . . . Stuck

VIII. Consumer Awareness

A. Intensify consumer awareness campaign . . . . Stuck
B. Expand food safety education . . . . Stuck

Appendix C.—Research Issues

The pace at which the Pathogen Reduction Plan can be expected to produce results is directly related to emergence of knowledge about pathogens themselves and their presence throughout the food production process. At critical stages in every aspect of the plan, new or better scientific information is critical to the success of the effort. FSIS expects that this important information will be generated by researchers from various organizations and institutions. Listed below are the research questions to be addressed.

I. Pre-harvest Research

A. Incidence/Prevalence of Pathogens

1. What are the regional differences in prevalence of E. coli O157:H7 and other pathogens in livestock and poultry production units?

2. By comparing special-fed veal calves with replacement calves, raised under traditional methods, what is the incidence/prevalence of E. coli O157:H7 and other bacterial pathogen infections?

B. Risk Factors to Identify Potentially Affected Farms

1. What are the ecological risk factors (i.e., sources for drinking water, soil, variation, bedding, management systems) between farms with and without E. coli O157:H7 and other bacterial pathogen infections in arid/semi-arid West/Southwest, sub-tropical, humid and temperate upper Midwest?

2. What is the relationship between on-farm labor, pets, and wildlife to bacterial pathogens on farms of varying size in temperate, arid, and subtropical climates?

3. What is the correlation between load of bacterial pathogens in livestock and poultry treated with growth promotants, antibiotics, or other additive practices and untreated animals?

4. Is there a correlation between character of ration, source of feed, and loads of bacterial pathogens for medium and large production

units in the temperate Midwest, subtropical, humid or arid/semi-arid West?

5. Do transportation and marketing methods used in different parts of the country (i.e., arid/semi-arid West/Southwest, temperate upper Midwest, and subtropical, humid Southeast) affect the load of bacterial pathogens between the farm and the slaughter facility?

6. What age groups of livestock and poultry are most susceptible and develop the largest infection rates of bacterial pathogens in temperate, arid, and subtropical climates?

7. What factors favor the survival of bacterial pathogens in subtropical/humid, temperate, and arid production units?

8. What are the seasonal and climatic factors that predispose bacterial pathogen infections in subtropical/humid or arid West/Southwest regions and temperate upper Midwest regions?

C. Control Factors

1. What critical control points in pre-harvest HACCP-based practices can be identified to control or eliminate bacterial pathogens?

2. What is the efficacy of current or developing coliform vaccines for reducing E. coli loads in subtropical/humid, temperate, and semi-arid/arid production units?

3. What is the role of competitive exclusion in preventing the colonization of livestock and poultry with bacterial pathogens?

4. What other types of interventional strategies are economical and effective to control E. coli O157:H7 and other bacterial pathogens in large and medium-sized production units located in Southeastern, Midwestern, and Western states?

D. Clinical Characteristics

1. Do E. coli O157:H7 and other bacterial pathogens become systemic in infected livestock and poultry? If so, how long do viable bacteria persist in the tissues?

2. Do the bacteria remain confined to the gastrointestinal tract?

3. How long do infected animals shed the bacteria in their feces?

4. Are the bacteria shed in the milk? Are the bacteria shed in the urine?

5. How long do animals remain as carriers?

6. Are infected carrier animals always culture positive, or must they be stressed before they shed pathogenic bacteria in the feces?

E. Rapid Method Research

1. What are the most effective, rapid, sensitive, and specific diagnostic tests that can be recommended for use in varied pre-harvest management systems?

2. What on-farm samples (milk, feces, blood) could be used to rapidly identify infected herds or flocks?

II. Post-harvest Research

A. Slaughter and Processing

1. Risk Factors

a. How do current dressing procedures (employee hygiene, equipment sanitation, contamination of product with rumen or intestinal contents) contribute to bacterial contamination of meat and poultry products?

b. What is the risk of cross contamination from diseased/suspect animals being slaughtered concurrently with healthy animals?

c. Does the processing of by-products on the kill floor increase bacterial pathogens on carcasses?

d. Is there a correlation between visual contamination and the presence of bacterial pathogens on carcasses?

e. What is the effect of internal temperatures of meat products (hot vs. chilled processing) on the proliferation of bacterial pathogens in raw meat/ poultry?

f. What is the effect of processing storage room temperature on bacterial pathogen growth in raw product (carcasses, cuts, trimmings)?

2. Critical Control Points

a. Do infected animals exhibit evidence of disease that can be detected organoleptically using routine or expanded inspection procedures?

b. Based on identification of risk factors, what other CCP's can be defined for incorporation into a HACCP system?

3. Interventions

a. What effect does spray-chilling have on microbial profiles of carcasses?

b. What are the relative merits of air vs. water chilling on bacterial pathogen levels?

c. What interventions in facilities design, slaughter operations, or processing of products can be utilized to reduce cross-contamination?

d. What is the effect of bacterial inhibitors (chemicals, bacteriocins) on the control of bacterial pathogens in processed products?

e. What is the effect of moisture content of products on bacterial growth?

f. What effect does packaging in various types of atmosphere have on pathogen control in the wholesale/retail chain?

B. Bacterial Attachment

1. What are the mechanisms of attachment for human, foodborne pathogens to various animal tissues?

2. How can these mechanisms be exploited to remove pathogens from animal tissues? (chemicals, biocides, pH, etc.)

3. What is the timeframe for attachment of bacterial pathogens to animal or environmental surfaces? How does this relate to application of interventions, such as detergents, sanitizers, and disinfectants?

4. Do stressed bacterial pathogen cells react differently to biocides, disinfectants, and other compounds?

5. What protective effect do biofilms have on the destruction of bacterial pathogens?

6. What level of bacterial contamination remains after intervention?

7. Can competitive inhibition of bacterial pathogens by non-pathogenic bacteria be used to reduce pathogenic bacterial on carcasses?

C. Irradiation

1. Chemical Research

a. Are there differences/similarities in compositional changes in irradiated meat and poultry that reflect the major radiation chemical reaction pathways involving proteins and lipids?

b. Are the radiolytic yields of hydrocarbons from fats in irradiated meat and poultry predictable? How do the radiolytic yields of red meats compare to those in poultry?

2. Microbiological Research

a. How does destruction of bacterial pathogens in model meat and poultry systems irradiated under similar conditions compare?

b. Are there differences/similarities in microbial death kinetics in irradiated meat and poultry due to differences such as product temperature or fat content?

The Annual Report of the Food Safety Consortium

Fiscal Year 1 July 1992 – 30 June 1993

University of Arkansas • Iowa State University • Kansas State University

Contents

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A Message from the Steering Committee Chairman

As the Food Safety Consortium completes its fifth year, many new and exciting accomplishments have been made. Since its inception in 1988, the Consortium has focused on many of the facets of food safety. With this passing year the Consortium has increased its focus on technology transfer. This year's report is indicative of the increased emphasis in this area.

The maturity of the Consortium is evidenced by the type of discoveries and accomplishments that have been made. Some of the highlights for this year are:

<u>Intervention Points:</u>

- Studies in Arkansas revealed that counter current scalding is microbiologically justified and should be used in combination with other hygienically improved modifications.
- From research at Iowa State University it was shown that lactic acid sprays produced less off-odor in pork chops as compared to other treatments.
- Kansas State University scientists showed that Critical Control Points in the meat production process must be identified and carefully monitored. They concluded that calculation of heat values may be more appropriate than internal meat temperature to describe the heating process.

<u>Rapid Identification:</u>

- Kansas State researchers have found that the enzyme Oxyrase may be an effective aid in reducing the time required to detect food-borne pathogens in ground beef.
- Research at the University of Arkansas has shown that the addition of an electrolyte to processing water significantly enhances the removal of microbes from this water at a flow rate of five liters per minute.

<u>Risk Monitoring:</u>

- University of Arkansas researchers found that the use of surfactants, especially quaternary ammonium compounds, effectively detached or prevented attachment of bacteria to poultry skin. This process could minimize cross contamination in processing plants.
- Kansas State scientists have perfected a method of maintaining the identity of beef cattle from the range through the processing plant.

<u>Statistical Framework:</u>

- Iowa State researchers have found that any additive or genetic alteration of animal food products will work only if consumers in general are confident that the newer products are safe and wholesome. In fact, consumers will pay more if this confidence has been assured.

These are but a handful of the accomplishments that have been made during this past year. Within this report, projects are listed that are currently under way and will lead to meaningful breakthroughs in food safety. Also, an impressive list of scientific publications for this past year is presented.

Lastly, I want to express the appreciation of the Consortium to the members of the Steering Committee. It is through the special efforts of these people that the focus of the Consortium is maintained. We want to especially thank those members who for personal/professional reasons had to resign.

Our deepest gratitude goes to Dr. Bill Dubbert, FSIS, and Dr. Otto Loewer, University of Florida (previously, University of Arkansas) for their service on the Steering Committee and their untiring efforts on behalf of the Consortium.

For professional reasons, I have resigned my administrative position at the University of Arkansas to return to research and teaching. For this reason I have resigned as Chair of the Consortium. I have enjoyed seeing the Consortium develop and mature. The Consortium can indeed be pleased with the coordinated research efforts that have been put forth on poultry, beef and swine. It has been and will continue to be very successful. With all the talented people involved at the three universities, I expect that many significant and immensely important breakthroughs in food safety research are on the horizon.

Gerald J. Musick
University of Arkansas

A Message from the Consortium Cordinator

1992-1993 has been a busy and productive year. The Food Safety Consortium has increased its technology transfer role and liaison with an increasing number of organizations and trade associations. The highlights and publications described and listed later in this report are indicative of the activity of the Consortium scientists. The Consortium has matured as a group of interacting scientists.

Dr. Donald Derr replaced Dr. Bill Dubbert on the FSC Steering Committee, and he serves as chairman of the FSIS Research Steering Committee, which helps the Consortium plan research to respond to real needs. Consortium members have participated in the annual FSIS-ARS planning meeting in December and in the development of the pathogen-reduction program.

Consortium scientists were able to immediately respond to the request of the USDA-FSIS for assistance in investigating the food-borne illness caused by *E. coli* 0157:H7 in the western United States because of work that was already under way at Kansas State and Iowa State.

Consortium members presented testimony at two of the public hearings held by USDA-FSIS in the early summer of 1993. In both cases the scientific approach to the pathogen reduction program and inspection system modification were supported.

Food Safety Consortium scientists participated in the workshop, "FAIR 95" (Food Animal Integrated Research 1995) sponsored by the Federation of American Societies of Food Animal Sciences (FASFAS) held in Kansas City October 18-20, 1992. The strongly supported goal of the workshop was to "Improve Food Quality Control in Terms of Safety, Desirability and Nutritional Composition."

The coordinator had the opportunity to speak to the Animal Protein Producers Industry (APPI) annual meeting in Chicago in December. In addition to describing the Consortium and requesting their cooperation in our research efforts, he presented a paper "Risk: Reality vs Perception." Public perception of food safety and the risks involved with are of major concern. Even good science does little to reduce these perceptions of risk.

The Consortium was represented at the Extension Conference "Food Safety: Who is Responsible?" in Washington in September 1992. The answer from the conference was "everyone." Consumer advocacy groups were invited, but few attended. Representative Stenholm of Texas was the keynote speaker. Some food safety problems identified included antibiotic and drug residues, microbiological pathogens, pesticides and food additives.

The Consortium was invited to present highlights of its research activities at a meeting of the American Association of Food Hygiene Veterinarians in Louisville in December. The presentations were well received, and we have been invited to do a repeat in Las Vegas in November 1994.

Through the Iowa State group, The Food Safety Consortium has been able to become part of the World Health Organization. Food safety is an international issue and will become more so as the European Common Community Market and the North American Free Trade Agreement are put in place.

The Food Safety Consortium is listed in the Animal Health Institute 1993 Food Safety Network Catalog. This will increase the Consortium's visibility in the institute, which represents manufacturers of animal health products.

George Beran, professor in charge of Iowa State's food safety research program, was elected to the council on Public Health of the American Veterinary Medical Association. His liaison will assist in networking with the AVMA.

Continued financing for the Consortium was included in the 1993 FY budget through a special grant from CSRS. This was the fourth year of support, and we appreciate the efforts of Senator Dale Bumpers. Over $6.5 million from federal sources has been matched by more than $7 million from the states. At this writing, funding for FY 1994 has been approved.

Richard H. Forsythe
University of Arkansas

Research Highlights from 1992-93 by Area of Investigation

The Food Safety Consortium was established by the U.S. Congress through a Cooperative Research Service Grant in 1988 to conduct scientific investigation in four areas of immediate concern to consumers, growers and processors:

- To determine the most effective intervention points to control microbiological or chemical hazards.
- To develop technology for rapid identification of infectious agents and toxins.
- To develop risk-monitoring techniques to detect hazards in the distribution chain.
- To develop a statistical framework to evaluate the health risks posed by contamination of the food chain by infectious agents and toxins.

Following are some highlights of research being conducted. A complete list of research projects by university and principal investigator is included on page 9.

Effective Intervention Points

A study was conducted in a commercial broiler processing plant to investigate the microbiological effects of single-phase counter current scalding. During a two-week period, microbiological samples were collected at four sampling locations on a processing line with conventional scalding and on a similar line with counter current scalding (this line also had a postscald rinse). At the postscald location, total aerobic organisms, coliforms and *E. coli* were significantly lower in samples collected from birds exiting the counter scalder. At this location, incidence of salmonella was also significantly reduced by counter current scalding. However, at the postevisceration and postchill sampling locations, microbiological counts on carcasses from the two scald lines were not significantly different. Counter current scalding is microbiologically justified and should be used in combination with other hygienically improved modifications to improve the microbiological condition of raw processed poultry. Amy Waldroup. **Benefits of Counter Current Scalding.** University of Arkansas. 501-575-4409.

Pork carcasses were sprayed with 1.5% acetic, citric or lactic acid. Loins were vacuum packed and stored at 0-2^{0}C for up to 42 days. Chops were cut from loins on sampling days and stored at 2-4^{0}C until they spoiled. Acetic and citric acids decreased ($P<0.05$) aerobic plate counts (APC) and total coliform counts during 14 days storage. No salmonella and few *Yersinia* and *Campylobacter* spp., were found. *Listeria* spp., which existed in 69% of fresh loins, were decreased in spoiled chops. Lactic acid resulted in less off-odor of chops at day 14, but the APC and coliform counts were higher than in chops from carcasses treated with other acids. A. H. Fu, J.G. Sebranek and E.A. Murano. **Microbial and Other Characteristics of Acid-Rinsed Pork Carcasses.** Iowa State University. 515-294-9485.

Research Highlights from 1992-93 by Area of Investigation, Continued.

Effective Intervention Points, Continued.

The *Escherichia coli* bacteria that normally inhabit the upper digestive tracts (ileum and cecum) in healthy swine were found to have greater resistance to multiple antibiotics than those in the lower digestive tract (colon and rectum). When swine were subjected to heat or cold stress, or experimentally when intestinal motility was drug induced, the more antibiotic-resistant *E. coli* of the upper tract poured down into the lower tract. When swine that had been stressed for 24 hours were butchered, the *E. coli* that contaminated their carcasses from rectal contents showed levels of multiple antibiotic resistance twice as high as those that contaminated carcasses of swine not stressed before butchering. The handling of swine should minimize pre-slaughter stress. Manuel Moro and George Beran. **Effects of Environmental Stress on Bacteria of the Digestive Tract of Healthy Swine**. Iowa State University. 515-294-8308.

The application of the Hazard Analysis and Critical Control Point program requires determination of Critical Control Points (CCPs) in the meat production process and then continuous monitoring of these CCPs. Precooked, vacuum-packaged, non-cured beef products have become increasingly popular in U.S. markets because these foods provide a great convenience for the consumer. However, normal production could yield microbiologically unsafe products if adequate thermal processing, handling and storage procedures are not followed. Heat treatment is a CCP for *L. monocytogenes* control in restructured meat products. Specification of an internal temperature, normally 160° F, to describe adequate thermal processing may not be sufficient because evidence suggests that organisms become more heat resistant when the product is heated slowly, as practiced in a commercial process. Calculation of heat values as applied in the canning industry may be more appropriate than an internal temperature criterion since these values more accurately describe the overall thermal process. Dan Fung, Curtis Kastner, Bret Kenney and Harshavardhan Thippareddi. **Thermal Destruction of *L. monocytogenes* in a Restructured Meat Product**. Kansas State University. 913-532-6533.

Ground pork (80% lean) inoculated with five selected viruses that are representative of viruses causing disease in people and animals was treated with low dose (1kGy) gamma irradiation in three replicate trials. The viruses tested were influenza A, herpesvirus, encephalomyocarditis virus, Echovirus type 7 and Reovirus type 1. Cultures of the irradiated and nonirradiated inoculated ground pork showed no statistically measurable inactivation of the viruses studied. Further studies are in progress with higher irradiation doses and additional viruses. Terry Proescholdt, Eugene Pirtle and George Beran. **Survival of Viruses in Irradiated Ground Pork**. Iowa State University. 515-294-8308.

Effective Intervention Points, Continued.

Various food additive chemicals, including sodium chloride, sodium carbonate and trisodium phosphate, were studied as electrolytes for electrical stimulation to eliminate bacteria in poultry processing water and to reduce bacteria attached to chicken skin. It was found that sodium chloride was the most effective electrolyte for treatment of processing water and trisodium phosphate was the most effective for treatment of chicken skin. Bacteria studied include *Salmonella typhimurium, Escherichia coli* and *Campylobacter jejuni*. Scanning and transmission electron microscopy was used to investigate the effect of electrical stimulation on *S. typhimurium* attached to chicken skin and in processing water. The external and internal appearance of *S. typhimurium* cells treated with electrical stimulation was significantly different from that of normal cells or those treated with chemicals only.

A flow-through electrical stimulation system was designed and constructed for treatment of poultry processing water. When an electrolyte was added to scalding water or chiller water and electrical current was applied at one ampere, bacteria were eliminated from the processing water at a flow rate of five liters per minute. Electrolytes used include sodium chloride, sodium carbonate and trisodium phosphate. Carl Griffis, Mike Slavik, Joel Walker, Yanbin Li, Jeong-Weon Kim and Rodney Wolfe. **Determination of Bacteriocidal Potency of Chemicals and Chemical Combinations Against Salmonella and Other Bacteria Found on Chicken Carcasses.** University of Arkansas. 501-575-4387.

Rapid Identification

Development of HACCP programs for food processing plants relies on rapid identification of contaminants. For meat products, the need for more rapid techniques to detect microbial pathogens is obvious. Current methodologies for testing meat samples for the presence of pathogens normally incorporate an enrichment phase in which low levels of the organism of concern are provided the opportunity to multiply and often repair from injury before a selective detection state. Enrichment protocols normally add 12-48 hours to the overall detection period. Shortening enrichment periods for specific pathogens is crucial in developing effective HACCP programs for meat products.

Oxyrase is an enzyme preparation that has been demonstrated to enhance the growth of several food-borne pathogens, including *Listeria monocytogenes, Campylobacter jejuni*, and *Salmonella* spp. Currently, scientists are evaluating the effects of Oxyrase supplementation of enrichment media on detection of *Escherichia coli* 0157:H7 in meat products.

Results have been very promising and indicate that the use of the enzyme preparation substantially decreases the time needed for very low levels of *E. coli* 0157:H7 (<1 cell/g) to be increased to a detectable level as compared to non-supplemented

Rapid Identification, continued

systems. Current work has addressed the use of Oxyrase in culture media and enrichment of autoclaved ground beef. Future studies will address the enzyme's beneficial qualities for products containing competitive microflora and supplementation level. Randall Phebus, Harshavardhan Thippareddi, Karem Kone, Daniel Fung and Curtis Kastner. **Use of Oxyrase Enzyme in Enrichments to Enhance the Recovery of *Escherichia coli* 0157:H7 from Culture Media and Ground Beef**. Kansas State University. 913-532-1215.

Food processors, public health and federal regulatory agency laboratories have a need for more rapid and unequivocal tests to judge whether bacterial pathogen isolates from foods and food processing environments are virulent or harmful to man as compared to similar isolates from humans suffering f[illegible]od-borne illnesses. The FDA mode[illegible]rulence test for *Listeria monocytogenes* isolates uses immune-compromised mice and requires a minimum of three to five days for results. An in vitro tissue culture test has been developed that uses hybridoma cells that distinguish virulent *Listeria monocytogenes* from other non-virulent *Listeria* isolates in just four to six hours. The in vitro test results agree well with conventional FDA mouse test results, give the promise of considerable savings in assay costs and time and present the possibility of determining whether all *Listeria monocytogenes* isolates have the same or differing levels of pathogenicity. Mike Johnson, Ahrun Bhunia and Pamela Steele. **In Vitro Pathogenicity Screening Test for *Listeria monocytogenes* (Clinical vs. Food Isolates) on Murine Hybridoma Cells Lines and Mice**. University of Arkansas.

Risk Monitoring Techniques

Electrostatic attraction and formation of water surface film are among possible mechanisms responsible for attachment of salmonella to poultry skin. In this study, anionic, cationic and nonionic surfactants were tested for their ability to prevent attachment of salmonella to chicken skin or to detach salmonella already attached. Excised skins from processed chicken drumsticks were inoculated with *Salmonella typhimurium* and then washed with and without surfactants. The washes were then titered for salmonella. In addition, the number of salmonella colonies remaining on the skin was determined by a nitrocellulose lift technique.

Results indicated that none of the surfactants tested enhanced detachment of salmonella. Cationic surfactants, however, specifically cetyl pyridinium chloride and benzethonium chloride, appeared to have a significant effect in preventing attachment of salmonella to chicken skin. This was not observed with either anionic or nonionic surfactants. Cationic surfactants also were effective in killing salmonella attached to chicken skin. Studies are now in progress to

Risk Monitoring Techniques, continued

determine optimum conditions to achieve maximum killing effect of cetyl pyridinium chloride. Mike Slavik, Cristine Lobsinger and Darrel Foss. **Determination of Bacteriocidal Potency of Chemicals and Chemical Combinations Against Salmonella and Other Bacteria Found on Chicken Carcasses.** University of Arkansas. 501-575-4387.

In a related study, researchers have used surfactants to effectively detach and prevent attachment of bacteria to chicken skin. They found the quaternary ammonium compounds (QACs) to be more effective at preventing contamination of poultry tissues than at reversing pre-existing microbial contamination. Consequently, these compounds would be useful in poultry processing plants to prevent cross contamination. Also, preliminary studies using campylobacter indicate that the QACs may be more effective against this organism than against salmonella. Danny Lattin. **Chemical Studies Related to Food Safety.** University of Arkansas for Medical Sciences. 501-686-6495.

In order to assure food wholesomeness and maintain consumer confidence in beef products, a consistent and diligent effort must be put forth by all sectors of the beef cattle industry to assure that approved drugs and other animal products are used correctly and that strict adherence to established withdrawal periods is maintained. Additionally, modern cattle management systems require effective means to identify individual animals. In this light, researchers have been working in conjunction with FSIS and manufacturers of electronic identification systems to monitor their use for livestock.

Data were collected at a commercial slaughtering plant in which 24 electronic IDs were recovered. A report has been sent to FSIS based on the excellent success of the retrieval process.

Working in collaboration with a commercial ranch in which the cow-calf operation was located in Montana and the feedlots were located in Kansas, 138 calves were implanted at birth with electronic IDs. These calves were followed from birth to weaning and, at the time of weaning, transferred to the feedlot. Of the 138 calves implanted, 136 implants were identified at weaning time as being operable. Larry Corah, Marty Vanier and Mitch Blanding. **To Assess Cattle Identification Systems, Assist Producers in Their Drug Record Keeping Abilities and Identify Critical Control Points of Drug Usage in Their Operations; Electronic Identification Systems.** Kansas State University 913-532-6131.

Statistical Framework

Any additive or genetic alteration of animal food products will be effective only if consumers in general are confident the newer product is safe and wholesome. Researchers have devised techniques to accurately measure the public's willingness to pay for safer food products. The results show that:

Research Highlights from 1992-93 by Area of Investigation, Continued.

Statistical Framework, continued

1) The positive attributes of lean PST pork far outweigh any negative attributes associated with the use of a biotechnological compound.

2) Most consumers would pay more for irradiated pork that is free of trichinella.

3) Consumers in Arkansas and Massachusetts are willing to pay more for safer food than consumers in Iowa or California.

4) BST milk will be acceptable in all regions except the northeast.

Dermot Hayes, James Kliebenstein and Jason Shogren. **Experimental Auctions to Determine Consumer Reacti[illegible] Food Safety**. Iowa State University. 515-294-6185.

A study of demographic data from 1989-1991 of 1335 human cases of salmonellosis reported to the Arkansas Department of Health found that most cases were not reported properly. Therefore, many epidemiological factors associated with human cases of the disease were based upon incomplete information. This year, telephone follow-up interviews were attempted with 326 patients (or their immediate relatives) reported to the Health Department for cases of human salmonellosis. Missing epidemiologic factors were updated, and data concerning poultry consumption and environmental contamination were gathered.

Among the findings were:

- Forty nine percent of patients were less than four years of age.
- Of 137 serotyped cases, *Salmonella typhimurium*, *S. newport*, *S. heidelberg* and *S. javiana* were the most common.
- Diarrhea (97%) was the most common complaint, followed by fever (84%), cramps (75%) and headache (41%).
- Sixty-one percent had antimicrobial agents prescribed.
- Fifty percent required hospitalization, and 90% of those over 65 years old required hospitalization.
- Fourteen percent stated that another member of their household was also sick at that time.
- Fifty-eight percent had consumed poultry two days prior to illness, 49% eggs, 17% raw eggs and 11% turkey.
- Twelve percent worked with poultry or had a family member who worked with poultry.

Gordon Schutze, Russell Kirby, Ellie Flick and John Lofgren. **Epidemiology of Salmonella in Arkansas 1992-1993.** Arkansas Children's Hospital. 501-320-1416.

Research Projects by University and Principal Investigators

University of Arkansas

- Chemical/physical means to reduce microorganisms in the processing plant. **A. Waldroup and R. Forsythe.**

- Reduction of salmonella at confirmed interdiction points. **A. Waldroup and P. Waldroup.**

- Intervention points in vertically integrated poultry industry. **A. Waldroup and P. Waldroup.**

- Enumeration of salmonella by membrane filtration and selective plating. **A. Waldroup.**

- Use of particle concentration immunoassay fluorescence to identify poultry pathogen. **M. Slavik, C. Lobsinger, S. Tsai and M. Johnson.**

- Development of a method to rapidly identify bacterial contaminants of chicken carcasses. **M. Slavik and S. Tsai.**

- Development of genetic probes against *Campylobacter jejuni*. **M. Slavik, R. Wang and W. Cao.**

- Determination of bacteriocidal potency of chemicals and chemical combinations against salmonella and other bacteria found on chicken carcasses. **M. Slavik, C. Lobsinger and D. Foss.**

- Development of modifications in the processing of poultry to reduce or eliminate contamination by salmonella and other micro-organisms. **J. Walker, C. Griffis and M. Slavik.**

- Specific monoclonal antibody microcolony immunoblot assay to detect and enumerate *Listeria monocytogenes* in foods in 24 hours. **M. Johnson and A. Bhunia.**

- In vitro pathogenicity screening tests for *Listeria monocytogenes* (clinical vs. food isolates) on murine hybridoma cell lines and mouse. **M. Johnson, A. Bhunia and P. Steele.**

- Risk assessments: Pathogenicity study of *Listeria monocytogenes* using a pregnant mouse model. **M. Johnson, P. Steele and A. Bhunia.**

- Differentiation of *Listeria monocytogenes* strains using DNA fingerprinting and peptide map analysis. **M. Johnson, A. Bhunia and B. Kurz.**

- Isolation of bacteriocin production *Pediococcus* species by monoclonal antibody probe. Characterization of bacteriocins and cloning of bacteriocin gene. **M. Johnson and A. Bhunia.**

- Development of nucleic acid probes and rapid methods for specific detection of *Listeria monocytogenes* in contaminated foods. **M. Johnson, W. Cao, B. Kurz and H. Wang.**

Research Projects by University and Principal Investigator, Continued.

- Control: Destruction of listeria cells in poultry products by physical and chemical treatments. **M. Johnson, A. Bhunia, R. Wang, J. Emerson and D. Scott.**

- Rapid detection of Bovine herpes virus (BHV-1) in contaminated food by polymerase chain reaction (PCR). **M. Johnson, R. Wang, H. Minocha, G. Beran and G. Pirthe.**

- A socio-economic analysis of Arkansas households' perceptions and willingness-to-pay for pathogen-free chicken products using contingent market valuation methodology and an experimental economic methodology. **W. Bailey and J. Redfern.**

- Development of genetic probes against *Campylobacter jeuni*. **M. Slavik, R. Wang, S. Tsai and W. Cao.**

University of Arkansas for Medical Sciences

- DNA probe-polymerase chain reaction (PCR) and fingerprint assays for various salmonella species. **M. Cave and K. Eisenach.**

- Studies of chemical agents in poultry. **D. Lattin, P. Breen, C. Compadre, E. Fifer and H. Salari.**

Children's Hospital, Little Rock

- Epidemiology of salmonella gastroenteritis in Arkansas. **G. Schutze, R. Jacobs, K. Kelleher and S. Pope.**

Iowa State University

- Scientific information and the public debate over food safety. **A. Maney and E. Plutzer.**

- Hazard analysis and critical control point determination in pork slaughtering and cutting operations. **G. Beran, L. Knipe and T. Proescholdt.**

- Assessment of food safety technologies and regulations. **D. Hayes, H. Jensen and J. Kliebenstein.**

- Economics of food safety research and regulations, **D. Hayes, H. Jensen and J. Shoegren.**

- Effect of heat and oxidative stress on survival of *Yersinia enterocolitica* and *Escherichia coli* 0157:H7 to heat and irradiation. **E. Murano.**

- The survival of viruses in pork. **E. Pirtle, T. Proescholdt, G. Beran and R. Rust.**

- Microbiological safety of pork products prepared in institutional operations. **N. Brown, E. Murano, G. Beran and L. Knipe.**

- Hog carcass survey for latent bone marrow infection with *Salmonella choleraesuis*. **T. Kramer.**

- Shelf-life extension of fresh, chilled pork. **L. Knipe, G. Beran, R. Rust and E. Murano.**

- Effect of sanitizer treatment of attachment and injury of *Listeria monocytogenes* in fresh pork. **E. Murano.**

- Effect of irradiation of *Listeria monocytogenes* in fresh pork. **E. Murano.**

- Inhibition of *Listeria monocytogenes* by bacteriocin produced *Pediococcus acidilactici* in fresh pork chops. **E. Murano.**

- Increasing the safety of fresh pork products for consumers by development of organic acid treatments as a potential HACCP process. **J. Sebranek and E. Murano.**

- Enhancement of the safety of pork products. **P. Hartman.**

Kansas State University

- Rapid motility enrichment U-tube system with Oxyrase enzyme for listeria and other pathogens. **D. Fung, F. Niroomand and R. Prasai.**

- Innovative dye-containing agar for yeast and mold isolation from meats. **D. Fung and R. Hart.**

- Intervention treatments for meat products to enhance microbiological safety: Fermentation, heat, ingredients and antioxidants. **D. Fung, K. Kong, H. Thippareddi and Y. Ogunrinola.**

- Foodborne viruses heat inactivation and inactivation marker. **D. Fung, H. Minocha, M. All-Dagal and C. Kastner.**

- Methods for destruction of microbial contaminants on meat contact surfaces. **D. Fung and I. Al-Sheddy.**

- Minimizing contamination of beef subprimals during fabrication of carcasses decontaminated with either lactic acid or chlorine. **C. Kastner, P. Kenney, R. Campbell and R. Prasai.**

- Multiple organophosphate metabolites in animal tissues. **J. Smith, B. Ioerger and K. Coulibaly.**

- Fusarium mycotoxins: Analytical study of the fumonisins. **J. Smith and R. Thakur.**

- Electronic implants as a method of permanent identification in beef cattle. **L. Corah and B. Larson.**

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University of Arkansas

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Steering Committee Members of the Food Safety Consortium

The steering committee is responsible for overseeing the food safety program of the three-state Consortium to insure that it is progressing in a satisfactory manner toward meeting its purpose as outlined in the congressional mandate. The committee meets at least once each year to review research progress and to recommend, if necessary, changes that may be required to accomplish the congressional mandate.

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