Exponent®
Engineering & Scientific Consulting

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Professional Profile

Dr. Whiting has over 45 years of experience in food science and technology research with extensive knowledge of microbial food safety issues from production to retail, food service, and consumers. At Exponent, he has qualitatively and quantitatively evaluated the safety of food processes via hazard analyses, risk profiles, and risk assessments to identify microbial contamination routes, deficient food processing practices and appropriate mitigation steps.

Dr. Whiting has designed experimental procedures to demonstrate process safety, evaluated HACCP/management systems and microbial sampling plans intended to assure safety, performed root cause analyses to determine the likely cause of product failures, and assisted clients with regulatory issues. Dr. Whiting advises clients on issues in food science and technology, microbiological modeling and risk assessment, and consumer product safety.

Dr. Whiting is internationally recognized for his research and applications in mathematical modeling of food borne microorganisms to estimate the growth, survival, or inactivation of harmful and spoilage bacteria in foods. He has used these to determine the level of risk that a food has and the reduction in risk that different processing steps could achieve. Dr. Whiting's contributions have been applied by linking this innovative science to individual food processing steps and to entire manufacturing processes to estimate the final quality and safety of foods. He has made major contributions to the development of the Food Safety Objective concept, which links food processing interventions to public health goals, and the use of microbial risk assessments to serve as the science base for the design of Hazard Analysis Critical Control Point (HACCP) systems to ensure food safety.

Prior to joining Exponent, Dr. Whiting was a Senior Scientist with the Food and Drug Administration, Center for Food Safety and Applied Nutrition (FDA, CFSAN). At FDA, he was a technical leader, advising senior managers and shaping the design of microbial risk assessments, including the Listeria monocytogenes risk assessment in ready-to-eat foods (2003). In addition, he contributed to developing harmonized international standards for food safety. He was an expert consultant to the Codex Committee for Food Hygiene, Working Group on Standards for L. monocytogenes and a member of team that conducted the Codex risk assessment on L. monocytogenes (2004). At FDA he also conducted research on microbial modeling and led a research group on microbial threat agents in foods. From 1977 to 1998, Dr. Whiting was a research food technologist at the USDA, Agricultural Research Service, Eastern Regional Research Laboratory. There he conducted research on muscle biochemistry and meat quality and safety, including the functionality and microbial safety of reduced-salt meat products. Shifting to research to microbial pathogens, he advanced the conceptual approaches for modeling growth of foodborne pathogens that became the USDA's Pathogen Modeling Program, including L. monocytogenes, Salmonella, and Escherichia coli O157:H7, and directed research that led to the creation

of survival models for Salmonella and E. coli O157:H7 and probability-of-growth models for Clostridium botulinum. He began his research career as a fellow in the Department of Food Science at the University of British Columbia in Vancouver, Canada.

Dr. Whiting has published over 155 research papers, book chapters, risk assessments and other scientific works. He has lectured extensively in the U.S. and internationally on predictive microbiology and microbial risk assessments, and has participated in numerous workshops/training programs in this area. He has served on the Editorial Boards for Journal of Food Protection, International Journal of Food Microbiology and as an Associate Editor for the Journal of Food Science. In recognition of his contributions to food science and food microbiology, Dr. Whiting was presented with the Food Safety Award by the National Center for Food Science and Technology and was elected a Fellow of the Institute of Food Technologists in 2006. He was recognized as a Certified Food Scientist in 2013.

Academic Credentials & Professional Honors

Ph.D., Food Science, Oregon State University, 1974

M.S., Food Science, University of British Columbia, 1970

B.S., Agriculture, Dairy, and Food Industries, University of Wisconsin, Madison, 1968

Certified Food Scientist, awarded 2013, renewed 2018

Food Safety Award by the National Center for Food Science and Technology, 2007

Fellow of the Institute of Food Technologists, 2006

HHS Secretary's Award for Distinguished Service as a member of the FDA Counter / Bioterrorism Preparedness Team, 2003

FDA Group Recognition Award as a member of the Listeria monocytogenes Risk Assessment, 2001

USDA Superior Service Award for efforts on the Microbial Food Safety team that developed the microbial pathogen models, 1993

USDA, ARS Edminster Award, for Outstanding Research Associate Proposal in ARS, 1989

Alpha Zeta, Agriculture Honors Fraternity, U. Wisconsin, 1966

Prior Experience

Senior Scientist, U.S. Food and Drug Administration, 1998-2008

Research Food Technologist, U.S. Department of Agriculture, 1977-1998 Research Fellow, Food Science Department, University of British Columbia, 1974-1977

Graduate Student, Food Science Department, Oregon State University, 1970-1974

Graduate Student, Food Science Department, University of British Columbia, 1969-1970

Plant Quality Control Manager, Oconomowoc Canning Co., 1967, 1968

Professional Affiliations

Institute of Food Technologists, 1969-present

- Philadelphia Section: Section newsletter editor, 1983-1987; elected to National Council, 1985-1989; elected Secretary, 1987, 1988; elected Section Chairman, 1993-1994
- National: Elected Muscle Food Division Director, 1992-1994; Nomination Committee for Food Microbiology Division, 1992; Research Committee, 1998; Associate Editor for Reviews and New Concepts, J Food Science, 2000-present; Elected Fellow, 2006

International Association for Food Protection (formerly IAMFES), 1997-present

Editorial Board for J. Food Protection (former)

Chair, Risk Analysis Professional Development Group, 2002-2004

Society for Risk Analysis, 1998

Patents

U.S. Patent Number 5,171,591: Control or elimination of undesirable bacteria using parasitic *Bdellovibrio* bacteria, December 15, 1992 (Serial # 07/694,602).

Publications

Kataoka, A., Wang, H., Elliott, P.H., Whiting, R.C. and Hayman, M.M. 2017. Growth of Listeria monocytogenes in thawed frozen foods. J. Food Protection 80(3):447-453.

Buchanan, R.L., Gorris, L.G.M., Hayman, M.M., Jackson, T.C. and Whiting, R.C. 2017. A review of Listeria monocytogenes: An update on outbreaks, virulence, dose-response, ecology, and risk assessments. Food Control 75: 1-13.

Singh, A., Datta, S., Sachdeva, A., Maslanka, S.E., Dykes, J., Skinner, G.E., Burr, D.H., Whiting, R.C. and Sharma, S. 2015. Evaluation of an Enzyme-Linked Immunosorbent Assay (ELISA) Kit for the detection of Botulinum neurotoxins A, B, E, and F in selected food matrices. Health Security 13(1): 37-44.

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Whiting, R.C. and Buchanan, R.L., 2014. Food Safety Objective. In: Batt, C.A., Tortorello, M.L. (Eds.), Encyclopedia of Food Microbiology, vol 1. Elsevier Ltd, Academic Press, pp. 959–963.

Anderson, N.M., Larkin, J.W., Cole, M.B., Skinner, G.E., Whiting, R.C., Gorris, L.G.M., Rodriguez, A., Buchanan, R., Stewart, C.M., Hanlin, J.H., Keener, L., Hall, P.A. 2011. Food Safety Objective approach for controlling Clostridium botulinum growth and toxin production in commercially sterile foods. J. Food Protection 74(11): 1956-1989.

ICMSF (International commission on Microbiological Specifications for Foods). 2011. Microorganisms in

Foods. Use of data for assessing process control and product acceptance. Vol 8. Springer, NY. (Co-author with M. Zwietering and C. Steward of Chapter 2. Validation of control measurers).

Van Stelten, A., Simpson, J.M. Chen, Y., Scott, V.N., Whiting, R.C., Ross, W.H. and Nightingale, K.K. 2011. Significant shift in median guinea pig infectious dose shown by an outbreak-associated Listeria monocytogenes epidemic clone strain and a strain carrying a premature stop codon mutation in inlA. Appl. Environ. Microbiol. 77(7): 2479-2487.

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tularensis from food matrices for subsequent detection by real-time PCR. J Food Protection 2009; 72:1156-1164.

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Buchanan RL, Whiting RC. Risk assessment: A means of linking HACCP and public health. J Food Protect 1998; 61:1531-1534.

Whiting R, Buchanan R. Risk assessment--Its role within HACCP. pp. 48-52. In: Proceedings, Beef Safety Symposium, National Cattlemen's Beef Association, Greenwood Village, CO, 1998.

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Kozempel MF, Annous B, Cook RD, Scullen OJ, Whiting RC. Inactivation of microorganisms with microwaves at reduced temperatures. J Food Protect 1998; 61:582-585.

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Buchanan RL, Whiting RC. Concepts in predictive microbiology. Proceedings, Reciprocal Meat Conf. Nat. Livestock Meat Bd. Chicago, IL, 1997.

Whiting RC, Buchanan RL. Development of a quantitative risk assessment model for Salmonella enteritidis in pastuerized liquid eggs. Int J Food Microbiol 1997; 36:111-125.

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Whiting RC, Buchanan RL. Predictive modeling. Chapter 40. pp. 728-739. In: Food Microbiology: Fundamentals and Frontiers, Doyle M, Beuchat LR, Montville TJ (eds). ASM Press, Washington, DC, 1997.

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Whiting RC. Data and modeling requirements for foodborne microbial risk assessments. AIChE Annual Meeting, San Francisco, CA, November 20, 2003.

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Whiting RC, Bagi L. Modeling the lag phase of Listeria monocytogenes. Third International Conference on Predictive Modeling, Leuven, Belgium, September 13, 2000.

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Whiting RC. Listeria monocytogenes risk assessment. American Dairy Science Association, Baltimore, MD, July 24, 2000.

Whiting RC. Microbial modeling/risk assessment. Food-Borne Pathogens 2000: Perspectives & Interventions, SIM, Crystal City, VA, April 16-19, 2000.

Whiting RC. Listeria monocytogenes risk assessment. American Frozen Foods Institute, Washington, DC, March 22, 2000.

Whiting RC. Listeria risk assessment. FDA Science Forum 2000, Washington, DC, February 15, 2000.

Project Experience

Co-lead for the USDA Food Safety and Inspection Service risk assessment on Salmonella Enteritidis in shell eggs. This was the first risk assessment on foodborne microbial pathogens. Among many objectives, it evaluated the relative importance of different storage temperatures on egg safety. Publically presented and defended the risk assessment.

Technical leader for the FDA risk assessment that estimated the relative importance of different ready-to-eat foods in leading to listeriosis. It clarified the importance of L. monocytogenes growth in the foods and evaluated the susceptibilities of different consumer populations. This risk assessment provided the scientific basis for the current FDA Compliance Policy Guide proposal. Presented risk assessment to Agency officials, industry representatives, and the public.

Served on Joint FAO/WHO Expert Committee on Microbial Risk Assessment. This committee planned, conducted, and published the FAO/WHO risk assessment on L. monoctyogenes that evaluated the consequences of whether a food that did or did not support growth and determined the numbers of the pathogen likely to lead to listeriosis.

Was a member of the U.S. Delegation to the Codex Committee on Food Hygiene. Focused on developing concepts in microbial risk assessment and regulation of L. monocytogenes.

Was the technical lead for FDA risk assessment on hot- and cold-smoked seafood that evaluated the impact of different processing steps and potential mitigations on the risk of listeriosis. To be released in 2009, this risk assessment modeled product pathways and estimated the improvement in the risk per serving to consumers that would result from various processing changes.

Developed the microbiological modeling for FDA risk assessment on soft cheeses (Brie, Camembert). This ongoing risk assessment is evaluating the impact that changes in the processing and storage would have on public health from L. monocytogenes.

Participated in the USDA/FSIS NACMCF Committee (National Advisory Committee for Microbiological Criteria for Foods) that evaluated the impact of date marking on microbiological safety.