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MIXTURES AND CUMULATIVE RISK ASSESSMENT: NEW APPROACHES USING THE LATEST SCIENCE AND THINKING ABOUT PATHWAYS

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SPEAKERS and PANELISTS/MODERATORS BIOS

SPEAKERS

Lesa L. Aylward, Ph.D., is a Principal at Summit Toxicology, LLP, located in Falls Church, Virginia, USA. She has 25 years of experience in chemical risk assessment and hazard communication and specializes in applying pharmacokinetic approaches to toxicology, exposure, and risk assessment, including the interpretation of biomonitoring data for assessing human health risks from a variety of chemicals. Dr. Aylward and her colleagues at Summit Toxicology have published on the development of tools for screening-level evaluation of population biomonitoring data for a wide range of chemical compounds in a risk assessment context. She has participated in studies of occupationally exposed workers, with a focus on the integration and use of pharmacokinetic modeling and biomonitoring data as tools to improve exposure estimation in epidemiological studies. Prior to her position at Summit Toxicology, Dr. Aylward provided consulting services at Exponent, Inc.; BBL, Inc.; and Karch & Associates. She received her B.S. and M.S. in engineering from the Massachusetts Institute of Technology and her Ph.D. in toxicology from the University of Utrecht.

Lyle Burgoon, Ph.D., is Deputy Program Director of the Advancing the Next Generation of Risk Assessment (NexGen) Program, and leads the translational and applied research program in systems biology, bioinformatics, and knowledge mining and management at the National Center for Environmental Assessment in the Office of Research and Development at the US Environmental Protection Agency. Dr. Burgoon's research focuses on making risk assessments better, faster, and cheaper by 1) leveraging new molecular biology, high throughput screening, and computational toxicology, 2) creating more effective informatics platforms that automatically screen the literature, identifying the most relevant studies, and 3) creating platforms that identify, capture, and manage knowledge from the literature and existing risk assessment and risk decision documents. Dr. Burgoon specializes in the application of graph, network, information and control theories to biological problems, Bayesian statistical modeling, and high performance general purpose graphical processing unit (GP-GPU) computing. Prior to joining the EPA, Dr. Burgoon was a Visiting Assistant Professor at Michigan State University, and was CEO of Toxicogenomic Informatics and Solutions, LLC, a toxicology and bioinformatics consulting company spin-out from Michigan State University. Dr. Burgoon currently has over 40 publications and book chapters.

Atul Butte, M.D., Ph.D., is Chief of the Division of Systems Medicine in the Department of Pediatrics, and an Associate Professor in Pediatrics, Medicine (Medical Informatics), and by courtesy, Computer Science, at Stanford University and the Lucile Packard Children's Hospital, and is a pediatric endocrinologist. Dr. Butte's lab at Stanford builds and applies tools that convert more than 300 billion points of molecular, clinical, and epidemiological data measured by researchers and clinicians over the past decade into diagnostics, therapeutics, and new insights into disease. Recent work on environment-wide association studies, evolution and disease, new taxonomies for diseases, and evaluations of patients presenting with personal genomes, were featured in the *New York Times*, *Wall Street Journal*, and many other newspapers. Dr. Butte received his undergraduate degree in Computer Science from Brown University, and previously worked as a software engineer at Apple Computer and Microsoft Corporation. He

graduated from the Brown University School of Medicine, during which he worked as a research fellow at NIDDK through the Howard Hughes/NIH Research Scholars Program. He completed his residency in Pediatrics and Fellowship in Pediatric Endocrinology, both at Children's Hospital, Boston. Dr. Butte received a Ph.D. in Health Sciences and Technology from the Medical Engineering / Medical Physics Program in the Division of Health Sciences and Technology, at Harvard Medical School and Massachusetts Institute of Technology.

George P. Daston, Ph.D., has been employed at Procter & Gamble Company since 1985, where he is Victor Mills Society Research Fellow. Dr. Daston has spent his entire career in research to understand the effects of exogenous chemicals on biological systems, especially the developing embryo, fetus and child. His research interests include teratogenic mechanisms, in vitro methodologies, and risk assessment. He has published over 100 peer-reviewed articles, reviews and book chapters, and has edited three books. Dr. Daston's professional activities include serving as Councilor of the Society of Toxicology (2001-03); President (1999-2000) of the Teratology Society; member of the National Academy of Sciences Board on Environmental Studies and Toxicology (1995-98); member of the EPA Board of Scientific Counselors (2002-08); member of the U.S. National Toxicology Program Board of Scientific Counselors (2003-06, Chair in 2006); member of the National Children's Study Advisory Committee (2003-06); and member of EPA's Endocrine Disrupter Screening and Testing Advisory Committee (EDSTAC). He has served on several NRC committees, including the Committee on Developmental Toxicology, Committee on Research Opportunities and Priorities for EPA, and the Subcommittee on Arsenic in Drinking Water. Dr. Daston has served on the organizing committees for numerous government and private sector-organized workshops on reproductive toxicity, risk assessment, and non-animal alternatives. He chaired NIEHS/ICCVAM working groups evaluating the state of validation of the Frog Embryo Teratogenesis Assay - Xenopus (FETAX) assay for teratogen screening and receptor binding and transcriptional activation assays for estrogens and androgens. Dr. Daston is Editor-in-Chief of Birth Defects Research: Developmental and Reproductive Toxicology. Dr. Daston is an Adjunct Professor in the Department of Pediatrics and Developmental Biology Program at the University of Cincinnati and Children's Hospital Research Foundation. Dr. Daston received his Ph.D. from the University of Miami and post-doctoral training at the U.S. EPA's laboratories in Research Triangle Park, North Carolina.

Susan Y. Euling, Ph.D. is Biologist at the National Center for Environmental Assessment at US-EPA. Dr. Euling studied genes that control the timing of development in *C. elegans* during her Ph.D. research at Harvard University and postdoctoral research at the University of Minnesota. As an American Association for the Advancement of Science (AAAS) Fellow at EPA from 1997 – 1999, Dr. Euling investigated the use of mode of action and developmental stage information in risk assessment and supported EPA's Endocrine Disruptor Screening Program. From 1999-2001, she was a scientist with the Wildlife and Contaminants Program at World Wildlife Fund focusing on developmental outcomes after endocrine disruptor exposure. Returning to EPA in 2001, she has worked on a number of children's health risk assessment projects including the role of environmental factors in puberty timing, mammary gland development and carcinogenesis, as well as mechanism of action projects including a cross-species mode of action information case study of bisphenol A. Currently, her work focuses on developing approaches to use toxicogenomic data in risk assessment, improving the use of susceptibility information in risk assessment, and the Integrated Risk Information System (IRIS) individual and cumulative phthalate assessments.

Chris Gennings, Ph.D., is Professor of Biostatistics at the Virginia Commonwealth University and the Director of the Research Incubator for the Center for Clinical and Translational Research. Dr. Gennings received her PhD in Biostatistics from the Medical College of Virginia, Virginia Commonwealth University in 1986. Her research interests focus on design and analysis methodologies for studies of chemical mixtures. This has included methods for both toxicology studies and epidemiology/clinical studies. She is the founding Director of a T32 training grant from the NIEHS focused on the integration of mixtures toxicology and statistical methods. Her research has been supported by the NIEHS, U.S. EPA, WHO, NICHD, and the Health Effects Institute. Recent work includes methods for testing for sufficient similarity in chemical mixtures, combining exposure data with toxicology data. She is currently serving on the

Chronic Hazard Advisory Panel for the U.S. Consumer Product Safety Commission focusing on mixtures of phthalates.

L. Earl Gray, Ph.D. is Research Biologist at the Reproductive Toxicology Branch at the National Health and Environmental Effects Research Laboratory. Dr. Gray received his B.S. in Biological Science from Cornell University in 1967. He also received his Ph.D. in Zoology from North Carolina State University in 1976 and competed his Post Doctoral at Duke University/EPA-IPA from 1976-1979. He is currently Team Leader of "Cellular and molecular mechanisms of abnormal reproductive development produced by Endocrine Disrupting Chemicals (EDCs) administered during Critical Developmental Periods", Endocrinology Branch, Reproductive Toxicology Division, NHEERL, USEPA. His research is focused on how individual toxicants and mixtures induce alterations of mammalian reproductive development.

Sean Hays, Ph.D., is President and founder of Summit Toxicology, a toxicology and risk assessment consulting firm headquartered in Colorado. Sean received a B.S. in biomedical engineering from Texas A&M University, an M.S. in Physiology from the University of Vermont, an M.S. in chemical engineering from Colorado State University, and a Ph.D. in Toxicology from the University of Utrecht. Sean has been a consultant since 1995, where he specializes in conducting exposure assessments, deriving acceptable exposure limits (i.e., reference doses and reference concentrations, cancer slope factors, permissible exposure limits, and minimal risk levels), and developing pharmacokinetic (PK), physiologically based pharmacokinetic (PBPK), and pharmacodynamic (PD) models for drugs and chemicals. Sean has been an invited speaker at numerous venues on the topic of interpreting human biomonitoring data and is the originator of the concept of the Biomonitoring Equivalent (BE), a screening tool that allows for interpretation of biomonitoring data in a public health risk context.

Thomas B. Knudsen, Ph.D., is Developmental Systems Biologist at the US Environmental Protection Agency's National Center for Computational Toxicology (NCCT). He trained at Thomas Jefferson University, Children's Hospital Research Foundation in Cincinnati, and Emory University. He held academic appointments at E Tennessee State University, Jefferson Medical College, and University of Louisville. Dr. Knudsen is a Past-President of the Teratology Society and since 2003 has served as Editor in Chief of Reproductive Toxicology. His research on prenatal developmental toxicity, mitochondrial and systems biology has led to over 90 scientific papers and book chapters. Dr. Knudsen has an adjunct faculty appointment at University of Louisville. At EPA, he is a member of the ToxCast research team and PI of NCCT's Virtual Embryo Project.

Ed Perkins, Ph.D., is Senior Research Scientist (ST) in Environmental Networks and Genetic Toxicology in the US Army ERDC, Environmental Laboratory. Dr. Perkins received his PhD in Genetics and Cell Biology from Washington State University in 1987 studying the biodegradation of the herbicide 2, 4-D. Prior to joining ERDC, Dr Perkins worked in development of transgenic plants for phytoremediation and molecular measures of soil quality. Dr. Perkins joined the ERDC Environmental Laboratory in 1996 where he established a genetics research lab. His research focuses on using biological networks to understand how chemicals cause harmful effects in ecologically important organisms using toxicogenomics, the use of gene expression to monitor adverse environmental impacts, the use of environmental DNA to monitor invasive species, and using a wide range of alternative animals (daphnia, fish, earthworms, avian species, and rats) to assess toxicity of chemicals in the environment.

Christopher J. Portier, Ph.D., joined CDC in 2010 as the Director of the National Center for Environmental Health and Agency for Toxic Substances and Disease Registry. Dr. Portier came to CDC from the National Institute of Environmental Health Sciences (NIEHS), where he was the Senior Advisor to the Director and a Principal Investigator in environmental systems biology. Formerly, Dr. Portier was Associate Director of NIEHS, Director of the Environmental Toxicology Program at the NIEHS, and Associate Director of the National Toxicology Program. Dr. Portier is an internationally recognized expert in the design, analysis, and interpretation of environmental health data. His research efforts and interests include such diverse topics as cancer biology, risk assessment, climate change, bioinformatics, immunology, neurodevelopment, genetically modified foods, and genomics. From 2000 to 2006, he managed the NTP and developed a strategic initiative that is internationally recognized for its innovation.

He has contributed to the development of cancer risk assessment guidelines for national and international agencies and has either directed or contributed significantly to numerous risk assessments. He led the U.S. evaluation of electromagnetic fields by national and international scientists, which was the first comprehensive review in this field. Dr. Portier directed efforts of the U.S. government to develop a collaborative research agenda with Vietnam on the health effects of Agent Orange in that country. He has just directed a multiagency review of research needs for the health effects of climate change for the entire U.S. government. He has served as an advisor to the Finnish Academy of Sciences on the Centers of Excellence Research Program, as a member of World Health Organization/International Agency for Research on Cancer scientific committees, and as a reviewer for grants for the United States, the European Union, and many other grant-sponsoring organizations. Dr. Portier received his BSc degree (1977) in mathematics (summa cum laude) and his MS (1979) and PhD (1981) degrees in biostatistics. He has authored more than 150 peer-reviewed publications, 30 book chapters, and 40 technical reports. In the past 5 years, he has given more than 70 invited lectures, many of them at international meetings. He has received numerous awards including the prestigious Spiegelman Award from the American Public Health Association and the Outstanding Practitioner of the Year Award from the International Society for Risk Analysis. He is a Fellow of the International Statistics Institute, the World Innovation Foundation, and the American Statistical Association.

Linda K. Teuschler, Ph.D., has been a Mathematical Statistician with United States Environmental Protection Agency's (EPA) Office of Research and Development, National Center for Environmental Assessment (NCEA) since 1989. She received a M.S. in Mathematics from the University of Cincinnati in 1987. She is currently serving as the lead for NCEA's Cumulative Risk Assessment Program. Her specific area of expertise is the development of chemical mixtures health risk assessment methodologies, the technical transfer of these risk assessment methods through the development of guidance documents and publications, and the application of such methods to the risk assessment of complex mixtures such as drinking water disinfection by-products, polycylic aromatic hydrocarbons, dioxins, phthalates, and total petroleum hydrocarbons. More recently, her mixtures research has expanded to incorporate cumulative risk assessment issues, leading to co-authorship of the 2007 EPA publication, *Concepts, Methods and Data Sources for Cumulative Health Risk Assessment of Multiple Chemicals, Exposures and Effects: A Resource Document*. She served on EPA's Risk Assessment Forum (RAF) Technical Panel that authored and published the 2000 *Supplementary Guidance for the Health Risk Assessment of Chemical Mixtures* and is currently a Co-chair for the RAF Cumulative Risk Assessment Technical Panel. She is a member of the Society for Risk Analysis.

PANELISTS/MODERATORS

David Balshaw, Ph.D., received training in Pharmacology and Biophysics from the University of Cincinnati and University of North Carolina at Chapel Hill. He is a Program Director in the Center for Risk and Integrated Sciences, part of the Division of Extramural Research and Training at the National Institute of Environmental Health Sciences, one of the US National Institutes of Health. He is the primary scientist responsible for emerging technologies with particular emphasis on developing innovative approaches to improving exposure and risk assessment and enabling high data-content techniques to define the response to environmental exposures. Dr. Balshaw is responsible for planning, directing and administration of NIEHS-funded translational research programs in (1) bioengineering, integrated systems and computational methods to understand complex systems; (2) development of novel sensor technologies for comprehensive environmental exposure assessment; (3) validation of emerging biomarkers of exposure, susceptibility and effect including development of databases; and (4) application of innovative "omics" research for reducing risk of exposure and disease. His activities include leadership roles in the NIH Genes, Environment, and Health Initiative Exposure Biology Program, the NIEHS DISCOVER Program as well as several aspects of NIH Roadmap.

Ila Cote, Ph.D. is Senior Science Advisor for the U.S. Enviornmental Protection Agency's (EPA) National Center for Environmental Assessment (NCEA). NCEA develops assessments that support decision-making for the Agency's air, water and Superfund programs. She also leads the "*Advancing the Next Generation of Risk Assessment"* Program. This program is a multi-agency effort to incorporate recent

advances in molecular biology into risk assessment. Dr. Cote's expertise is in environmental risk assessment, and the interface of science and public policy. She is a board certified toxicologist. Her former positions include director of NCEA's Research Triangle Park Division; associate professor at the University of Colorado's Department of Public Policy, associate director of EPA's National Center for Health and Environmental Effects Research; risk assessor in several regulatory offices; and assistant professor at New York University Medical Center's Department of Environmental Medicine. She has also been an advisor to the Environmental Ministries of several foreign governments to develop their environmental policies and programs.

Michael J. DeVito, Ph.D., leads the pharmacokinetic modeling efforts of the National Toxicology Program at the National Institute of Environmental Health Sciences. Prior to that (1995-2009). Mike was a principle investigator in the Pharmacokinetics Branch of the National Health and Environmental Effects Research Laboratory at the US Environmental Protection Agency. From 2002-2009 he was Chief of the Pharmacokinetic Branch. Mike was one of the lead health effects researchers on the US EPA's Dioxin Reassessment from 1991-2009. In 2009 Mike joined the National Toxicology Program at NIEHS as the discipline leader for pharmacokinetic modeling. His research interests include developing quantitative model to understand the relationships between exposure to environmental chemicals, tissue dose and toxicity for use in risk assessments. He has a number of publications focusing on mixtures and cumulative risk for dioxins, endocrine disruptors and pyrethroid pesticides. Mike received a Ph.D. (1992) in Toxicology from the Joint Graduate Program in Toxicology from Rutgers, the State University of New Jersey.

Elizabeth (Beth) Doyle, Ph.D., is Chief of Human Health Risk Assessment Branch, Health and Ecological Criteria Division Office of Science and Technology, Office of Water, at the U.S. Environmental Protection Agency. Dr. Doyle has more than 20 years experience in human health risk assessment. She began her career at the Consumer Product Safety Commission where she evaluated the toxicity of fire emissions. She came to EPA in 1989 where she spent 14 years conducting risk assessments on pesticides. During her tenure in the Office of Pesticide Programs, she worked on introduction of cumulative risk assessment into risk assessment practice. She also lead the introduction of distributional exposure assessment into common use. Since then, she has lead risk assessment activities in the Office of Water. Current activities include implementation of PBPK modeling and cumulative risk into OW assessments.

William H. Farland*,* Ph.D., is Senior Vice President for Research and Engagement at Colorado State University in Fort Collins, CO. He is also a Professor in the Department of Environmental and Radiological Health Sciences, School of Veterinary Medicine and Biomedical Sciences at that institution. In 2006, Dr Farland was appointed Deputy Assistant Administrator for Science in the US Environmental Protection Agency's (EPA) Office of Research and Development (ORD). He had served as the Acting Deputy Assistant Administrator since 2001. In 2003, Dr. Farland was also appointed Chief Scientist in the Office of the Agency Science Advisor. He served as EPA's Acting Science Advisor throughout 2005. Formerly, he was the Director of the ORD's National Center for Environmental Assessment (NCEA) which had major responsibility for the conduct of chemical-specific risk assessments in support of EPA regulatory programs, the development of Agency- wide guidance on risk assessment, and the conduct of research to improve risk assessment. Dr. Farland's 27 year federal career was characterized by a commitment to the development of national and international approaches to the testing and assessment of the fate and effects of environmental agents. Dr. Farland holds a Ph.D. (1976) from UCLA in Cell Biology and Biochemistry. Dr. Farland served on a number of executive- level committees and advisory boards within the Federal government. In 2005-2006, he chaired the Executive Committee of the National Toxicology Program (NTP). He is also a member of the Scientific Advisory Council of the Risk Sciences and Public Policy Institute, Johns Hopkins University School of Hygiene and Public Health, a public member of the American Chemistry Council's Strategic Science Team for its Long Term Research Initiative (ACC/LRI) and a member of the Programme Advisory Committee for the WHO's International Programme on Chemical Safety. In 2002, Dr. Farland was recognized by the Society for Risk Analysis with the "Outstanding Risk Practitioner Award," and in 2005 was appointed as a Fellow of the Society. In 2006, he received a Presidential Rank Award for his service as a federal senior executive. In 2007, he

was elected as a Fellow, Academy of Toxicological Sciences. He continues to teach and publish and has been a member of the Editorial Board for *Risk Analysis*, *Environmental Health Perspectives* and *Chemosphere*.

Jeffrey Fisher, Ph.D. is Research Toxicologist with the U.S. Food and Drug Administration, National Center for Toxicological Research. He was formerly a Professor in the Department of Environmental Health Science, College of Public Health at the University of Georgia (UGA). He joined the University of Georgia in 2000 and served as Department Head of the Department of Environmental Health Sciences from 2000 to 2006 and Director of the Interdisciplinary Toxicology Program at UGA from 2006-2010. He spent most of his career at the Toxicology Laboratory, Wright Patterson AFB, where he was Principal Investigator and Senior Scientist in the Toxics Hazards Division and Technical Advisor for the Operational Toxicology Branch. Dr. Fisher's research interests are in the development and application of biologically based mathematical models to ascertain health risks from environmental and occupational chemical exposures. Dr. Fisher's modeling experience includes working with chlorinated and non-chlorinated solvents, fuels, pesticides, perchlorate and bisphenol A. He has developed PBPK models for use in cancer risk assessment, estimating lactational transfer of solvents, understanding in utero and neonatal dosimetry, quantifying metabolism of solvent mixtures and developing biologically motivated models for the hypothalamic-pituitary-thyroid axis in rodents and humans. Dr. Fisher has 20 years of experience in physiological modeling and has trained several graduate students and postdoctoral fellows on the concepts and application of physiological models. He was a Visiting Scientist at the Chemical Industry Institute of Toxicology in 1996 and at the NIOSH Taft Laboratory in 1999. During this time, he also served as Adjunct Professor in the Department of Pharmacology and Toxicology at Wright State University. Dr. Fisher has published over 120 papers on pharmacokinetics and PBPK modeling in laboratory animals and humans. He has served on several national panels and advisory boards for the DoD, ATSDR, USEPA and non-profit organizations. He was a U.S. delegate for the North Atlantic Treaty Organization. Dr. Fisher served on the International Life Sciences Institute Steering Committee, which evaluated chloroform and dichloroacetic acid using EPA-proposed Carcinogen Risk Guidelines. He is Past President of the Biological Modeling Specialty Section of the Society of Toxicology, reviewer for several toxicology journals, and was Co-Principal Investigator on a National Institutes of Health (NIH)-supported workshop on Mathematical Modeling at the University of Georgia in the fall of 2003. He was a member of the National Academy of Sciences subcommittee on Acute Exposure Guideline Levels (AEGLs) from 2004-2010 and Science Advisory Board for the US EPA (2007-2010). He is an ad hoc member of the SAB for dioxin. He is a fellow of the Academy of Toxicological Sciences and an associate editor for Toxicological Sciences. Dr. Fisher has a B.S. degree in biology from the University of Nebraska at Kearney, a M.S. degree in biology from Wright State University, and a Ph.D. in Zoology/Toxicology from Miami University.

Moiz Mumtaz, Ph.D., is Science Advisor, Division of Toxicology and Environmental Medicine, Agency for Toxic Substances and Disease Registry (ATSDR), Centers for Disease Control and Prevention (CDC) and an adjunct associate professor at the Department of Environmental and Occupational Health, School of Public Health, Emory University, Atlanta, GA. He is a member of the Society of Toxicology (SOT), and the past- president of the SOT Mixtures Specialty Section. He has extensively published his research findings in peer-reviewed journals over the past two decades. In 2010, he edited a book entitled "Principles and Practice of Mixtures Toxicology". His research has focused on methods development for the human health risk assessment of environmental chemicals mixtures and stressors. His involvement in several agency-wide activities at ATSDR has led to a) the establishment of a mixtures research program for determining significant human exposures to environmental chemicals, and b) the foundation of a computational toxicology laboratory. He is the principal representative of ATSDR on the Department of Health and Human Services (DHHS) Interagency Coordinating committee on the validation of alternative methods (ICCVAM).

Resha M. Putzrath, Ph.D., DABT, is a toxicologist and risk assessor for the Navy and Marine Corps Public Health Center, and serves as a technical expert to the Office of the Secretary of Defense for the Emerging Chemicals Program; the Bureau of Naval Medicine and Surgery; and the Chief of Naval Operations for the Assistant Secretary of the Navy, for Navy and Marine Corps facilities inside and

outside the continental United States. She also teaches “Principles of Risk Assessment and Management” at the Whiting School of Engineering of Johns Hopkins University. From 2003 to 2009, she was the Health Science Coordinator for the Risk Assessment Forum in the Office of the Science Advisor at EPA. She has served as a panel member for EPA’s Expert Peer Consultations and has served as an Expert Peer Reviewer for EPA and the Agency for Toxic Substances and Disease Registry. Her primary research is improving risk assessment methods for combining data, including the evaluation of complex mixtures. Dr. Putzrath earned her M.S. and Ph.D. in biophysics from the University of Rochester, School of Medicine and Dentistry, and her A.B. in physics from Smith College. Dr. Putzrath is a Fellow of the Society for Risk Analysis.

Ivan Rusyn, Ph.D. is Professor with tenure in the Department of Environmental Sciences and Engineering in the School of Public Health at the University of North Carolina at Chapel Hill. He directs the Laboratory of Environmental Genomics and the Carolina Center for Computational Toxicology in the Gillings School of Global Public Health at UNC. He also serves as Associate Director of the Curriculum in Toxicology and is a member of the Lineberger Comprehensive Cancer Center, Center for Environmental Health and Susceptibility, Bowles Center for Alcohol Studies, and the Carolina Center for Genome Sciences. Dr. Rusyn served on several working groups convened by the National Research Council and the WHO/IARC. Dr. Rusyn's laboratory has an active research portfolio funded by the National Institutes of Health and the US EPA with a focus on the mechanisms of action of environmental toxicants and the genetic determinants of the susceptibility to toxicant- induced injury. The Rusyn lab applies molecular, biochemical, genetic and genomics approaches to understanding the mechanisms of environmental agent-related disease. His studies on health effects of environmental agents resulted in more than 75 peer-reviewed publications. Dr. Rusyn received his M.D. (with honors) from Ukrainian State Medical University in Kiev and his Ph.D. in Toxicology from UNC-Chapel Hill. He also trained at the University of Dusseldorf in Germany and at the Massachusetts Institute of Technology.

Jane Ellen Simmons, Ph.D., is Chief of the Pharmacokinetics Branch of the Integrated Systems Toxicology Division of the National Health and Environmental Effects Research Laboratory of the U.S. EPA. She received a M.S.P.H. in Environmental Management and Protection and a Ph.D. in toxicology from the Department of Environmental Sciences and Engineering in the School of Public Health at the University of North Carolina at Chapel Hill. Dr Simmons has authored more than 80 peer-reviewed journal articles and 15 book chapters and conference reports. The focus of her research efforts in mixtures has been development of models and methods for defined mixtures and development of methods and approaches for evaluation of environmentally realistic complex mixtures with integration of chemistry and toxicology. She is a Diplomate of the American Board of Toxicology and a Fellow of the Academy of Toxicological Sciences. She has served as President of the Mixtures Specialty Section of the Society of Toxicology (2009-2010) and on the Society of Toxicology Mixtures Task Force (2004-2006). Currently, Dr. Simmons is Project Lead of the 4Lab Integrated Disinfection Byproducts Mixtures Research Program, serves on the HiWate Science Advisory Board, and is Advisor of the EPA RTP Chapter of the National Training Leadership Organization for post-doctoral fellows, graduate students and undergraduate trainees.

Elizabeth (Betsy) Southerland, Ph.D., is Director at the Assessment and Remediation Division Office of Superfund Remediation & Technology Innovation, U.S. EPA. Dr. Southerland has over 30 years of experience in the field of regulatory environmental management. Her work experience includes state government, federal government and private consulting. Dr. Southerland has been solicit to lead, educate and participate on national committees regarding her expertise in environmental management. Dr. Southerland received her Ph.D. from Virginia Polytechnic Institute and State University.

José-Manuel Zaldívar, Ph.D. is Senior Scientist working for the European Commission Joint Research Centre at the Institute of Health and Consumer Protection on the development of modelling approaches for their incorporation on integrated testing strategies aiming at reducing animal toxicity tests. He has been carrying out research on modelling and on the integration of hydrodynamic, fate, bioaccumulation and toxic effects models. José-Manuel holds a PhD on Chemical Engineering from Twente University (Enschede, NL) and a MSc on Organic Chemistry from Institut Quimic de Sarria (Barcelona, ES). He is

the author of more than 100 peer review publications, 2 patents and 5 software copyrights. José-Manuel has been involved in the model-based chemical prioritization exercise for the EU Water Framework Directive as well as on the assessment of toxicodynamics aspects for animal replacement for the EU cosmetics Directive.

Lauren Zeise, Ph.D. is Chief of the Reproductive and Cancer Hazard Assessment Branch of the California Environmental Protection Agency. She oversees or is involved in a variety of California's risk assessment activities, including cancer and reproductive toxicant assessments; development of frameworks and methodologies for assessing cumulative impact, nanotechnology, green chemistry/safer alternatives, and susceptible populations; the California Environmental Contaminant Biomonitoring Program; and health risk characterizations for environmental media, food, fuels and consumer products. Dr. Zeise's research focuses on human interindividual variability and risk. She has served on advisory boards of the Environmental Protection Agency (EPA), Office of Technology Assessment, World Health Organization, and National Institute of Environmental Health Sciences. She has also served on several NRC and IOM committees, including the Board on Environmental Studies and Toxicology's Committee on Evaluation of the Presumptive Disability Decision-Making Process for Veterans, the Committee on Toxicity Testing and Assessment of Environmental Agents (which produced *Toxicity Testing in the 21st Century*), the Committee on Improving Risk Analysis Approaches used by the U.S. EPA, the Board on Population Health and Public Health Practice, the Committee on Risk Characterization, the Committee on Comparative Toxicology of Naturally Occurring Carcinogens, and the Committee to Review EPA's Research Grants Program. Dr. Zeise is currently serving as a member of the NRC's Committee on Improving Risk Analysis Approaches Used by the U.S. EPA. Dr. Zeise received her Ph.D. from Harvard University.