

Scientific Milestones for the Development of a Gene-Sequence-Based Classification System for Oversight of Select Agents

Committee

James W. LeDuc

Chair

James LeDuc directs the Program on Global Health within the Institute for Human Infections and Immunity at the University of Texas Medical Branch. He also serves as Deputy Director of the Galveston National Laboratory. Previously he served as the Coordinator for Influenza for the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia and was the Director, Division of Viral and Rickettsial Diseases in the National Center for Infectious Diseases (NCID), CDC. His professional career began as a field biologist working with the Smithsonian Institution's African Mammal Project in West Africa. Following that he served for 23 years as an Officer with the United States Army Medical Research and Development Command. He joined CDC in 1992 and was assigned to the World Health Organization as a Medical Officer, later becoming the Associate Director for Global Health at NCID. His research interests include the epidemiology of arboviruses and viral hemorrhagic fevers, and global health. He has participated in a number of NRC studies.

Ralph Baric

Member

Dr. Ralph Baric received his BS degree from North Carolina State University in 1977. He obtained his PhD from the Department of Microbiology at North Carolina State University in 1982, studying alphavirus-host interaction and pathogenesis under the direction of Dr. Robert E. Johnston. He continued his postdoctoral training on coronavirus replication and pathogenesis under the direction of Dr. Michael M.C. Lai at the University of Southern California. In 1986, Dr. Baric was hired as an assistant professor in the Department of Parasitology and Laboratory Practice and is currently a professor in the Departments of Epidemiology, and Microbiology and Immunology at the University of North Carolina at Chapel Hill. During his early training, Dr. Baric was a Harvey Weaver Scholar for the National Multiple Sclerosis Society and an Established Investigator for the American Heart Association, awards associated with his studies focusing on coronavirus replication, cross species transmission, persistence, evolution and pathogenesis. He is currently a member of the editorial board of Journal of Virology and a senior editor for Plos Pathogens, is an NIH study section permanent member (VirB), has been a consultant for WHO, CDC and NIH, and has served on various institutional recombinant DNA review committees. Dr. Baric has published over 130 peer-reviewed manuscripts including some in high profile journals like Science, Proceedings for the National Academy of Science and Nature Medicine and his research efforts are supported by several research grants from the National Institutes of Health. His expertise is primarily in coronavirus reverse genetics, synthetic genome reconstructions, pathogenesis, vaccine design and cross species transmission of viruses, oftentimes using the SARS coronavirus or noroviruses as models.

Roger G. Breeze

Member

Roger G. Breeze, Ph.D., received his veterinary degree in 1968 and his Ph.D. in veterinary pathology in 1973, both from the University of Glasgow, Scotland. He was engaged in teaching, diagnostic pathology, and research on respiratory and cardiovascular diseases at the University of Glasgow Veterinary School from 1968 to 1977 and at Washington State University College of Veterinary Medicine from 1977 to 1987, where he was professor and chair of the Department of Microbiology and Pathology. From 1984 to 1987 he was deputy director of the Washington Technology Center, the state's high-technology sciences initiative, based in the College of Engineering at the University of Washington. In 1987, he was appointed director of the U.S. Department of Agriculture's (USDA's) Plum Island Animal Disease Center, a Biosafety Level 3 facility for research and diagnosis of the world's most dangerous livestock diseases. In that role he initiated research into the genomic and functional genomic basis of disease pathogenesis, diagnosis, and control of livestock RNA and DNA virus infections. This work became the basis of U.S. defense against natural and deliberate infection with these agents and led to his involvement in the early 1990s in biological weapons defense and proliferation prevention. From 1995 to 1998, he directed research programs in 20 laboratories in the Southeast for the USDA Agricultural Research Service before going to Washington, DC, to establish biological weapons defense research programs for USDA. He received the Distinguished Executive Award from President Clinton in 1998 for his work at Plum Island and in biodefense. Since 2004 he has been chief executive officer of Centaur Science Group, which provides consulting services in biodefense. His main commitment is to the Defense Threat Reduction Agency's Biological Weapons Proliferation Prevention Program in Europe, the Caucasus, and Central Asia.

R. M. Buller

Member

R. Mark Buller, PhD, is widely recognized as a leader in the field of viral pathogenesis. His current research focuses on the interplay between the genetic expression of orthopoxviruses such as monkeypox, ectromelia, and vaccinia, and the hosts' response to infection. Dr. Buller applies this work to the development of animal models for the evaluation of anti-virals and vaccines for smallpox. He currently serves as a Professor at Saint Louis University, Missouri, in the Department of Molecular Microbiology and Immunology. Dr. Buller is also Director of the Aerosol Biology Core of the multi-institutional Midwest Regional Center for Excellence in Biodefense and Emerging Infectious Diseases Research. Before joining Saint Louis University, he was head of the Poxvirus Pathogenesis Group at the National Institute of Allergy and Infectious Disease at the National Institutes of Health. Dr. Buller holds a PhD in Virology from the Institute of Virology in Glasgow. He has published over 130 peer-reviewed scientific articles, reviews or book chapters, and is a member of the editorial review boards of major scientific publications. Dr. Buller has also served as an invited reviewer, committee member or speaker on the topic of bioterrorism and biomedical research.

Sean Eddy

Member

Sean Eddy is a group leader at the Howard Hughes Medical Institute's Janelia Farm Research Campus outside Washington, DC. His research interests are in the development of computational algorithms for genome sequence analysis. He is the author of several widely used software tools for biological sequence analysis including a software package called HMMER; a coauthor of the Pfam database of protein domains; and a coauthor of the book *Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids* (Cambridge University Press, 1998). He received a bachelors degree from the California Institute of Technology, a Ph.D. from the University of Colorado at Boulder, and was a postdoctoral fellow at NeXagen Pharmaceuticals and at the MRC Laboratory of Molecular Biology. He was a faculty member in the Department of Genetics at the Washington University School of Medicine for eleven years before moving to Janelia Farm.

Stanley Falkow

Member

Stanley Falkow, PhD, is the Robert W. and Vivian K. Cahill Professor of Microbiology and Immunology at Stanford University School of Medicine. He formulated molecular Koch's postulates, which have guided the study of the microbial determinants of infectious diseases since the late 1980s. Dr. Falkow received his B.S. degree from the University of Maine and went on to earn his Ph.D. from Brown University. He discovered that infectious microbes employ genes that are activated only inside host cells. Dr. Falkow has published numerous articles, and has served on the editorial boards of several professional publications. In addition, he has received numerous awards for his achievements in science. Some of these include the Bristol-Myers Squibb Award for Distinguished Achievement in Infectious Disease Research, the Altemeier Medal from the Surgical Infectious Diseases Society of America, the Howard Taylor Ricketts Award Lecture at the University of Chicago, and the Paul Ehrlich-Ludwig Darmstaedter Prize. In 2003, he received the Abbott Lifetime Achievement Award from the American Society for Microbiology and the Selman A. Waksman Award in Microbiology from the National Academy of Sciences. He received the Robert Koch Award in 2000. Dr. Falkow was elected President of the American Society for Microbiology and served from July 1997 through June 1998. He was elected to the Institute of Medicine in 1997 and received the Maxwell-Finland Award from the National Foundation of Infectious Diseases in 1999. He also received in 1999 an Honorary Doctor of Science, University of Guelph, Guelph, Canada and the University of Maine Alumni Career Award. He has received honorary doctorates in Europe and the U.S. Dr. Falkow is an elected member of the Institute of Medicine, the National Academy of Sciences, and the National Academy of Arts and Sciences. He is also an elected Fellow of the American Association for the Advancement of Science. He was also elected into the UK's Royal Society as a Foreign Member. Dr. Falkow was also nominated twice for a Nobel prize in the category "Medicine". In September, 2008, Dr. Falkow was awarded the prestigious Lasker Award for medical research.

Rachel E. Levinson

Member

A twenty five-year veteran of science policy at the national level, Rachel Levinson is the director of Arizona State University's Washington office and is responsible for Special Projects and Research Initiatives within the Office of the Vice President for Research and Economic Affairs. She came to ASU in 2005 as the director of the Government and Industry Liaison Office, Biodesign Institute at Arizona State University. Rachel Levinson heads an office responsible for facilitating mutually-beneficial relationships between University researchers and Federal funding agencies as well as private sector entities. Most recently, she was with the Office of Science and Technology Policy in the Executive Office of the President of the United States, where she was assistant director of life sciences. Rachel Levinson began her career as a biologist for the National Cancer Institute within the National Institutes of Health (NIH). She advanced to positions including deputy director of the NIH Office of Recombinant DNA and senior policy advisor in the Office of Technology Transfer. Rachel Levinson earned her B.S in Zoology from the University of Maryland at College Park, and her M.A in Science, Technology and Public Policy from George Washington University, School of Public and International Affairs.

John Mulligan

Member

Dr. Mulligan founded Blue Heron Biotechnology in 1999 after a decade of genomics research experience including establishment and management of one of the two Human Genome Centers at Stanford University and directing genomics research at Darwin Molecular. Blue Heron Biotechnology is pioneer and leader of the gene synthesis market.

Alison D. O'Brien

Member

Alison D. O'Brien is a professor and chair of the Department of Microbiology and Immunology at the Uniformed Services University of the Health Sciences. She is currently the president of the American Society for Microbiology. She received her Ph.D. from Ohio State University in 1976. The objective of the major program in her laboratory is to define the molecular mechanisms by which enterohemorrhagic *Escherichia coli* (EHEC) cause hemorrhagic colitis and the hemolytic uremic syndrome.

Francisco Ochoa-Corona

Member

Dr. Ochoa Corona, a forensic plant pathologist, specializes in delivering and developing reference diagnostics for exotic, naturalized, and indigenous plant viruses and other phytopathogens of relevance to agricultural biosecurity. His work is applicable to plant pathogens that can be intercepted at the border, or detected by general surveillance of field settings or within transitional facilities. Ochoa Corona's research in plant pathology contributes scientific input to regulatory officials regarding plant health emergencies. He joined Oklahoma State University in 2008 from the Investigation and Diagnostic Centre (IDC) at Biosecurity New Zealand (BNZ), Ministry of Agriculture and Forestry (MAF), where he was Principal Adviser in Virology.

Jane S. Richardson

Member

Jane S. Richardson earned a bachelor's degree from Swarthmore College and a master's degree from Harvard University in 1966. Since 1970 she has been at Duke University Medical Center, where she and her husband, David, work together investigating the 3-dimensional structure of proteins and RNA. They were early pioneers in protein crystallography, in molecular computer graphics, and in helping start the field of de novo protein design, proposing and then making novel amino-acid sequences designed to fold into specific 3D structures. Professor Richardson was the developer of ribbon drawings of protein structures, originally done by hand but since universally adopted in molecular graphics. She identified many well-known structural motifs such as the helix N-cap, and has recently concentrated on new methods for the validation and improvement of protein and RNA crystal structures. She became a MacArthur Fellow in 1985, a member of the National Academy of Sciences in 1991 and the Institute of Medicine in 2006, and an assessor for last year's CASP8 structure predictions.

Margaret A. Riley

Member

Dr. Riley is a Professor of Biology at the University of Massachusetts, Amherst. She received her Ph.D. in population genetics from Harvard University and performed postdoctoral research in microbial population genetics with a Sloan Postdoctoral Fellowship in Molecular Evolution. She joined the faculty at Yale in 1991 and recently moved to UMass Amherst. She has a broad set of research interests that range from studies of experimental evolution of microbes to developing novel antimicrobials and redefining the microbial species concept. Dr. Riley studies the evolution of microbial diversity, with a particular emphasis on the ecology and evolution of microbial toxins. Her recent work has revealed that the production of toxins is a primary force in the generation and maintenance of microbial diversity. These studies led to an interest in applying ecological and evolutionary theory to the design of novel antimicrobials for use in animal and human health. She is co-founder of Origin Antimicrobials, Inc., whose mission is to discover and refine novel antimicrobials to address the challenge of antibiotic resistance. Dr. Riley is the Director of the Organismic and Evolutionary Biology Program and the Director of the Museum of Natural History at UMass Amherst. From 1999-2002 she chaired the Gordon conference on molecular evolution and from 2003-2005 she chaired the Gordon conference on microbial population biology and evolution. She is a fellow of the American Academy of Microbiologists.

Tom Slezak

Member

Tom Slezak has been involved with bioinformatics at Lawrence Livermore National Laboratory (LLNL) for 30 years after receiving BS and MS degrees in Computer Science from the University of California, Davis. Tom is currently the Associate Program Leader for Informatics for the Global Security Program efforts at LLNL. He was involved with the Human Genome Program from 1987-2000, leading the informatics efforts at LLNL and then the DOE's Joint Genome Institute from 1997-2000. In 2000 he began to build a pathogen bioinformatics team at LLNL pioneering a novel whole-genome analysis approach to DNA signature design. His team developed signature targets for multiple human pathogens that were used at the 2002 Winter Olympic Games under the BASIS program and later adapted for use nationwide in the DHS BioWatch program. Under a close collaboration with the CDC, the LLNL team has been called on for computational help on smallpox, SARS, monkeypox, avian influenza, and numerous other pathogens. In addition to continuing work on human and agricultural pathogens, Tom's team is currently focusing on signatures of mechanisms of virulence, antibiotic-resistance, and evidence of genetic engineering. They have been focusing on detecting novel, engineered, and advanced biothreats for several years, leveraging high-risk ITIC and DHS funding. Tom has chaired or served on multiple advisory boards, including the rice genome project, mouse and maize genetics databases, spruce tree genome project (Canada), plant pathogens, and a NIAID sequencing center contract renewal.