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Forum on Microbial Threats

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SYSTEMATIZING THE ONE HEALTH APPROACH IN PREPAREDNESS AND RESPONSE EFFORTS FOR INFECTIOUS DISEASE OUTBREAKS

A VIRTUAL WORKSHOP

February 23-25, 2021

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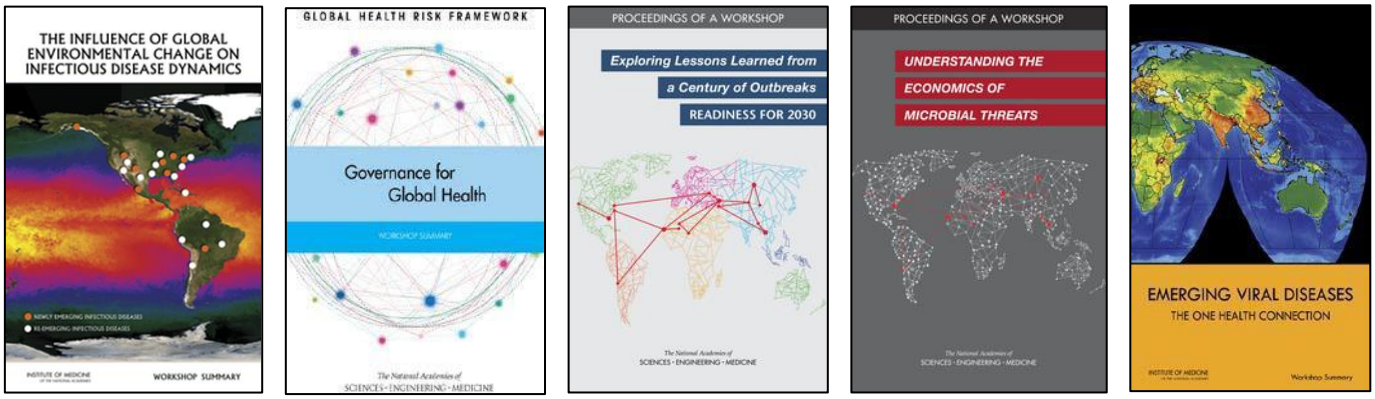
THE FORUM ON MICROBIALTHREATS

---- An Overview ----



ABOUT THE FORUM

The Forum on Microbial Threats of the National Academies of Sciences, Engineering, and Medicine (National Academies) was created in 1996 at the request of the Centers for Disease Control and Prevention and the National Institutes of Health to provide a structured opportunity for discussion and scrutiny of critical, and possibly contentious, scientific and policy issues related to research on and the prevention, detection, surveillance, and responses to emerging and reemerging infectious diseases in humans, plants and animals as well as the microbiome in health and disease. The Forum brings together leaders from government agencies, industry, academia, and nonprofit and philanthropic organizations to facilitate cross-sector dialogue and collaboration through public debate and private consultation to stimulate original thinking about the most pressing issues across the spectrum of microbial threats.

Despite decades of progress, the need for the Forum on Microbial Threats remains. Problems such as MERS, Ebola, Chikungunya, Zika, yellow fever, and antibiotic resistance demonstrate how the issue of emerging infections is global and unrelenting. The drivers are ever more pervasive, and the consequences—human, social, and economic—loom larger than ever.

The Forum convenes several times each year to identify and discuss key problems and strategies in the area of microbial threats. To supplement the perspectives and expertise of its members, the Forum also holds public workshops to engage a wide range of experts, members of the public, and the policy community. All workshops are summarized in high quality scholarly workshop proceedings that are available for free download from the National Academies Press.

The Forum on Microbial Threats is part of the National Academies' Board on Global Health. For more information about the Forum, please visit our website: www.nationalacademies.org/microbialthreats.

SPONSORS

Financial support for the Forum is derived from the following government agencies, industries, and nonprofit and philanthropic associations:

- American Society of Tropical Medicine and Hygiene
- Burroughs Wellcome Fund
- EcoHealth Alliance
- Infectious Diseases Society of America
- Johnson & Johnson
- Merck & Co., Inc.
- New Venture Fund
- Sanofi Pasteur
- U.S. Agency for International Development
- U.S. Centers for Disease Control and Prevention
- U.S. Department of Homeland Security
- U.S. Department of Veterans Affairs
- U.S. Food and Drug Administration
- U.S. National Institute of Allergy and Infectious Diseases
- Uniformed Services University of the Health Sciences

The Forum greatly appreciates our sponsors that make intellectual and financial contributions to the Forum's work.

HIGHLIGHTS OF RECENT WORKSHOP PROCEEDINGS

- Vaccine Access and Hesitancy: Part One of a Workshop Series: Proceedings of a Workshop—in Brief (2020)
- Exploring the Frontiers of Innovation to Tackle Microbial Threats: Proceedings of a Workshop (2020)
- The Convergence of Infectious Diseases and Noncommunicable Diseases: Proceedings of a Workshop (2019)
- Exploring Lessons Learned from a Century of Outbreaks: Readiness for 2030: Proceedings of a Workshop (2019)
- Understanding the Economics of Microbial Threats: Proceedings of a Workshop (2018)
- Urbanization and Slums: Infectious Diseases in the Built Environment: Proceedings of a Workshop (2018)
- Combating Antimicrobial Resistance: A One Health Approach to a Global Threat: Proceedings of a Workshop (2017)
- Building Communication Capacity to Counter Infectious Disease Threats: Proceedings of a Workshop (2017)
- Big Data and Analytics for Infectious Disease Research, Operations, and Policy: Proceedings of a Workshop (2016)
- The Ebola Epidemic in West Africa: Proceedings of a Workshop (2016)

FORUM'S ACTION COLLABORATIVE – ONE HEALTH

The Forum's One Health Action Collaborative (OHAC), led by Gail Hansen, D.V.M., is an ad hoc activity that engages a community of participants who are interested in contributing to ongoing exploration and information sharing related to One Health topics. OHAC is committed to accelerating the implementation of a One Health approach in the field to counter microbial threats. Members include a subset of Forum members and a diverse range of external stakeholders from multiple sectors and disciplines such as public health, animal health, plant pathology, agriculture, environment, biotechnology, and others. Drawing from the dynamic discussions over regular conference calls, OHAC advises on One Health efforts that are internal and external to the National Academies, through the publication of papers and the hosting of seminars. For more info, click here.

FORUM MEMBERSHIP

Membership in the Forum includes a diverse range of stakeholders from multiple sectors.

Peter Daszak, Ph.D. *(Chair)*
EcoHealth Alliance

Kent E. Kester, M.D. *(Vice Chair)*
Sanofi Pasteur

Rima F. Khabbaz, M.D. *(Vice Chair)*
U.S. Centers for Disease Control and Prevention

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National Institute of Allergy and Infectious Diseases

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U.S. Agency for International Development

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Bill and Melinda Gates Foundation

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University of California, Davis

Victoria McGovern, Ph.D.
Burroughts Wellcome Fund

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The Ohio State University

Suerie Moon, Ph.D., M.P.A.
The Graduate Institute, Geneva

Rafael Obregon, Ph.D., M.A.
United Nations Children's Fund

Kumanan Rasanathan, M.B.Ch.B., M.P.H
Health Systems Global

Gary A. Roselle, M.D.
U.S. Department of Veterans Affairs

Peter A. Sands, M.P.A.
The Global Fund to Fight AIDS, Tuberculosis & Malaria

Thomas W. Scott, Ph.D.
University of California, Davis

Matthew Zahn, M.D.
Orange County Health Care Agency

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The National Academies of
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Systematizing the One Health Approach in Preparedness and Response Efforts for Infectious Disease Outbreaks

Virtual Workshop
February 23 - 25, 2021

AGENDA

Objectives:

This virtual meeting will examine ways to systemize and integrate the One Health approach as part of outbreak prevention, detection, preparedness, and response efforts. The workshop will explore research opportunities, multisectoral, One Health collaboration mechanisms, community engagement strategies, educational opportunities, and policies that can effectively implement the core capacities and interventions of One Health principles to strengthen national health systems and enhance global health security.

Specifically, this workshop will feature invited presentations and discussions on the following topics:

- Strategies to systematize One Health in national prevention, detection, preparedness, and response efforts;
- A review of One Health programs integrated into national and global public health efforts to learn what programs are currently in effect:
- Integration of animal and human health surveillance systems for cross-reporting to better understand pathogens transmitted between animals and people;
- Feasibility of introducing and integrating One Health into existing coordination mechanisms, and into national action plans for health security based on the Joint External Evaluation;
- Strengthening the global health workforce with One Health capacities;
- Policies that underscore the interconnectedness of animal, plant, human, and environmental health;
- Implications of using a One Health approach to improve preparedness vs. a reactionary response that is required to create medical countermeasures after outbreak onset;
- Promising practices for engaging with communities and influencing behaviors that lower the risk of infectious disease infection through the One Health approach;
- The tension between public health needs, the private sector and data sharing within the One Health context in preparedness and response efforts; and
- Potential priority actions to unite organizations – public and private, domestic and international – in efforts to overcome newly discovered hurdles based on lessons learned from the COVID-19 pandemic.

Workshop speakers and discussants will contribute perspectives from government, academia, private, and nonprofit sectors.

DAY 1 – TUESDAY, 23 February 2021
10:00 am – 1:00pm

10:00 AM **Welcome Remarks, Workshop Overview and Goals**

Workshop Co-Chairs

CASEY BARTON BEHRAVESH
Director, One Health Office
U.S. Centers for Disease Control and Prevention

JONNA MAZET
Professor of Epidemiology and Disease Ecology
Founding Executive Director, One Health Institute
School of Veterinary Medicine
University of California, Davis

10:10 AM **Keynote Address**

"Rx One Health: a prescription for pandemic prevention"
ERIC GOOSBY
United Nations Special Envoy on Tuberculosis

10:40 AM **Q&A**

Session I: Defining the One Health State of Affairs

Session I objectives:

- Assess current One Health programs and efforts worldwide and their participation in the response to global public health crises
- Showcase how One Health practices have been integrated into existing programs to improve the current model for global public health responses**.**

KENT KESTER
Session Chair
Vice President
Head, Translational Science and Biomarkers
Sanofi Pasteur

11:00 AM **One Health in praxis**

Case presentations

"Operationalizing One Health at a local level"
DANA WILTZ-BECKHAM
Director, Office of Science, Surveillance and Technology
Harris County Public Health, Texas

"Multi-Sectoral Engagement in the COVID-19 Outbreak Response in Thailand"
SUPAPORN WACHARAPLUESADEE
Deputy Chief
Thai Red Cross Emerging Infectious Diseases Health Science Centre

"COVID-19 Response – Lessons learnt to reinforce the relevance of One Health principles"
THIERRY NYATANYI
Senior Advisor, COVID-19 Taskforce
Africa CDC

12:00 PM **Q&A**

12:45 PM **Observations from Day 1**
KENT KESTER

1:00 PM **Adjourn**

DAY 2 – WEDNESDAY, 24 February 2021
10:00 am – 1:00pm

Session II: What Can One Health Do Right Now?

Session II Objectives:

- Assess the current status of developing a One Health workforce to identify gaps between education and training programs and employment needs
- Explore frameworks to establish cross-sector collaborations and community engagement to strengthen threat surveillance and detection
- Discuss challenges of and methods for introducing One Health ideology into existing systems for epidemiological surveillance (local, national, international levels)

10:00 AM **Welcome and Recap Day 1**

EVA HARRIS
Session Chair
Professor, Division of Infectious Diseases and Vaccinology
Director, Center for Global Public Health,
University of California, Berkeley

10:05 AM **Panel Discussions**

Panel I: What is Being Done Right Now?

Mark Smolinski (Ending Pandemics)
Moderator

DAVID GOLDMAN
JAMES HOSPEDALES
CARRIE S. MCNEIL
DAVID RIZZO
ESRON KARIMURIBO

10:35 AM **Q&A**

11:00 AM Panel II: What Could We Be Doing Better?

John Nkengasong (Africa Centres for Disease Control and Prevention)
Moderator

JOHN BALBUS
CHRISTOPHER BRADEN
CARLOS DAS NEVES
RICHARD HORTON
CRISTINA ROMANELLI

11:30 AM **Q&A**

11:55 PM **Break**

12:05 PM **Plenary Presentations**

I. The One Health Workforce

"One Health Workforce: Reconciling Competencies with Opportunities."
LONNIE KING
Dean Emeritus, College of Veterinary Medicine
The Ohio State University

II. Community engagement and frameworks for collaboration

"University Networks on the Front Lines for Community Engagement and One Health Innovation"
WOUTRINA A. SMITH
Professor, School of Veterinary Medicine
University of California, Davis

12:40 PM **Q&A**

12:55 PM **Observations from Day 2**
EVA HARRIS

1:00 PM **Adjourn**

DAY 3 – THURSDAY, 25 February 2021
10:00am – 1:00pm

Session III: Looking Forward – Lessons from the Past and the Future of One Health

Session III Objectives:

- Lessons that can be learned and extrapolated from COVID-19: Priority actions for policy, public-private partnerships, and industry resilience to build a broad, threat-agnostic global health system
- What comes next: Strategies to facilitate international cooperation and data sharing to establish forecasting capabilities for emerging health threats

10:00 AM **Welcome and Recap Day 2**
PETER DASZAK
Session Chair
President
EcoHealth Alliance

10:05 AM **Plenary Presentations**
Learning from the past and planning for the future – Collaboration opportunities and priority actions

I. What future capabilities can we build toward predicting the next outbreak?

"Precision Epidemiology, Human Behavior and the Future of One Health"

JONATHAN QUICK
Managing Director; Pandemic Response, Preparedness, and Prevention
Health Initiative, The Rockefeller Foundation

II. An example of existing frameworks that could be scaled up to improve public health systems in the U.S.

"A Collaborative Effort in Outbreak Preparedness: FDA's Approach to African Swine Fever"

DANIELLE SHOLLY
Animal Scientist, Center for Veterinary Medicine
U.S. Food and Drug Administration

III. What future policies can we develop to support forecasting emerging health threats?

"The Paradox of Global Policies for Pandemic Prediction and Prevention"

JOHN AMUASI
Executive Director
African Research Network for Neglected Tropical Diseases

IV. How can the public and private sectors collaborate to improve resilience against future global health threats?

"Taking Pandemic Threats Off the Table"

RAJEEV VENKAYYA
President, Global Vaccine Business Unit
Takeda Pharmaceuticals

11:05 AM **Q&A**

11:30 AM **Break**

11:40 PM **Breakout Room Discussions**

Key takeaways for building a better system for outbreak Response, Surveillance/Detection, and Forecasting

- In-depth discussions that will identify key, feasible goals and steps that can be taken toward improving outbreak preparedness efforts for the future
    - Identify 1-2 short-term goals
    - Identify 1-2 long-term goals
    - Identify key actions and relevant institutions involved in achieving these goals

Breakout 1: Response Capacities

- Moderator: Kent Kester, *Sanofi Pasteur*

- Kaylee Myhre Errecaborde, *University of Minnesota*
- Olga Jonas, *Harvard University*
- Catherine Machalaba, *EcoHealth Alliance*
- Peter Rabinowitz, *University of Washington*
- Michael Wilkes, *University of California, Davis*
- Victor del Rio Vilas, *World Health Organization*

Breakout 2: Surveillance and Detection Mechanisms

- Moderator*:* Maureen Lichtveld, *University of Pittsburgh*

- Charles (Ben) Beard, *U.S. Centers for Disease Control and Prevention*
- Julie Fischer, *Georgetown University*
- Tracey McNamara, *Western University of Health Sciences*
- Jonathan Sleeman, *U.S. Geological Survey*
- Irene Xagoraraki, *Michigan State University*
- TBD

Breakout 3: Forecasting and Predictive Innovations

- Moderator*:* Peter Daszak, *EcoHealth Alliance*

- Marc Allard, *U.S. Food and Drug Administration*
- Greg Glass, *University of Florida*
- Barbara Han, *Cary Institute of Ecosystem Studies*
- Laura Kahn, *Princeton University*
- Andrew Maccabe, *American Association of Veterinary Medical Colleges*
- Claire Standley, *Georgetown University*

12:10 PM **Breakout Room: Recap**

12:25 PM **Q&A**

12:55 PM **Closing Remarks**

Workshop Co-Chairs

CASEY BARTON BEHRAVESH

Director, One Health Office
U.S Centers for Disease Control and Prevention

JONNA MAZET
Professor of Epidemiology and Disease Ecology
Executive Director, One Health Institute
School of Veterinary Medicine
University of California, Davis

1:00 PM **Adjourn**

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A Workshop

PLANNING COMMITTEE ROSTER

Casey Barton Behravesh, M.S., D.V.M., Dr.P.H., DACVPM *(Co-Chair)*
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Atlanta, GA

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President
EcoHealth Alliance
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Eva Harris, Ph.D.
Member, Forum on Microbial Threats
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Director, Center for Global Public Health,
University of California, Berkeley
Berkeley, CA

Kent E. Kester, M.D.
Vice-Chair, Forum on Microbial Threats
Vice President and Head
Translational Science and Biomarkers
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Pittsburgh, PA

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University of California, San Francisco
San Francisco, CA

SYSTEMATIZING THE ONE HEALTH APPROACH IN PREPAREDNESS AND RESPONSE EFFORTS FOR INFECTIOUS DISEASE OUTBREAKS

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PLANNING COMMITTEE BIOGRAPHIES

Casey Barton Behravesh, M.S., D.V.M., Dr.P.H., DACVPM *(Co-Chair)* is the Director of CDC's One Health Office in the National Center for Emerging and Zoonotic Infectious Diseases and a Captain in the United States Public Health Service. Her role is to serve as the agency's lead for implementing a One Health approach to public health that connects human, animal, and environmental health, enabling CDC and partners to address emerging zoonotic and infectious diseases and other shared health threats at the human-animal-environment interface. Dr. Barton Behravesh is experienced in bringing together human, animal, and environmental health officials at the local, state, federal, and global level to bridge gaps related to emerging zoonotic and infectious diseases, including COVID-19. During her extensive career at CDC, Dr. Barton Behravesh has done everything from investigating outbreaks in the field to conducting epidemiologic research related to the prevention and control of zoonotic, foodborne, and vector-borne diseases. In her leadership role at CDC, she enjoys mentoring students and new staff to help them reach their career goals.

Jonna Mazet, D.V.M., M.P.V.M., Ph.D. *(Co-Chair)* earned her doctorate of veterinary medicine, master of preventative medicine, and her Ph.D. in epidemiology from the University of California, Davis. In addition to her faculty appointment in the Department of Medicine and Epidemiology in the UC Davis School of Veterinary Medicine, she serves as the Executive Director of the UC Davis One Health Institute (OHI). Dr. Mazet specializes in emerging infectious diseases and wildlife epidemiology, and as director of OHI, focuses on global health problem solving. In her role at UC Davis, she assists government agencies and the public with emerging health challenges, and is active in international One Health research programs such as tuberculosis in Africa, novel pathogen detection in less developed countries, and pathogen pollution of California coastal waters. Dr. Mazet founded California's Oiled Wildlife Care Network, the premier model wildlife emergency management system worldwide, and remains a consulting expert on wildlife emergency preparedness and response, serving on multiple government and nongovernment organization advisory panels. Dr. Mazet is the principal investigator and global director of the novel viral emergence early warning project, PREDICT, that has been developed with the USAID's Emerging Pandemic Threats Program. She leads a network of global NGOs and governmental agencies to build capacity within the PREDICT-engaged countries to develop surveillance systems and complete the necessary research to halt the next pandemic, like influenza, SARS, Ebola, and HIV that have preceded the program.

Kevin Anderson, Ph.D. serves as a senior program manager in the Department of Homeland Security's (DHS's) Science and Technology Directorate, providing oversight and requirements for biodetection and biodiagnostics systems development for government-wide customers and stakeholders. Since joining DHS in 2003, Dr. Anderson has provided leadership for science program development, laboratory design, and strategic planning; served as a subject matter expert and advisor to the Bioterrorism Risk Assessment and Biological Threat Characterization programs; and has participated in interagency working groups and assessments which provide guidance to medical countermeasure development, a key component of the nation's biodefense strategy. Prior to joining DHS, Dr. Anderson was a principal investigator at the U.S. Army Medical Research Institute of Infectious Diseases, leading research focused on understanding basic mechanisms of viral diseases causing hemorrhagic fever and development of medical countermeasures. He received postdoctoral training in molecular virology at the University of Alabama at Birmingham and the University of North Carolina at Chapel Hill, performing basic research on human respiratory syncytial viruses, and earned Ph.D. and B.S. degrees in microbiology from Montana State University and the University of Maryland, College Park, respectively.

Andrew Clements, Ph.D. is a Senior Scientific Advisor for the Emerging Threats Division in the U.S. Agency for International Development's Bureau for Global Health. He received his Ph.D. in Anaerobic Microbiology from Virginia Tech and completed his post-doctoral training in biochemistry at the National Institutes of Health. Between 1997 and 2005, he served as an infectious disease advisor at USAID focusing on the development, management, and monitoring of

international programs to address malaria, tuberculosis, antimicrobial resistance, and infectious disease surveillance. Since 2005, he has managed a number of projects (PREDICT, PREVENT) and partnerships with the Food and Agriculture Organization of the UN and the World Health Organization that support prevention, detection, and response to emerging zoonotic threats in developing countries. He also analyzes trends for emerging zoonotic threats and has participated in USAID's responses to new diseases, including H5N1 and H7N9 avian influenza, H1N1 pandemic influenza, MERS-CoV, and Ebola.

Peter Daszak, Ph.D. is president of EcoHealth Alliance, a U.S.-based organization that conducts research and outreach programs on global health, conservation, and international development. Dr. Daszak's research has been instrumental in identifying and predicting the impact of emerging diseases across the globe. His achievements include identifying the bat origin of SARS, identifying the underlying drivers of Nipah and Hendra virus emergence, producing the first ever global emerging disease 'hotspots' map, developing a strategy to find out how many unknown viruses exist that could threaten to become pandemic, identifying the first case of a species extinction due to disease, and discovering the disease chytridiomycosis as the cause global amphibian declines. Dr. Daszak is a member and chair-elect of the National Academy of Sciences, Engineering and Medicine's Forum on Microbial Threats. He is a member of the National Research Council (NRC) Advisory Committee to the U.S. Global Change Research Program, the Supervisory Board of the One Health Platform, the One Health Commission Council of Advisors, the Center of Excellence for Emerging and Zoonotic Animal Diseases External Advisory Board, the Cosmos Club, and the Advisory Council of the Bridge Collaborative; he has served on the Institute of Medicine committee on global surveillance for emerging zoonoses, the NRC committee on the future of veterinary research, the International Standing Advisory Board of the Australian Biosecurity Cooperative Research Centres, and has advised the Director for Medical Preparedness Policy on the White House National Security Staff on global health issues. Dr. Daszak is a regular advisor to the World Health Organization (WHO), World Organisation for Animal Heatlh, and the Food and Agriculture Organization of the United Nations, and is actively involved in the WHO Expert group on Public Health Emergency Disease Prioritization. Dr. Daszak won the 2000 Commonwealth Scientific and Industrial Research Organisation medal for collaborative research on the discovery of amphibian chytridiomycosis, is the EHA institutional lead for USAID-EPT-PREDICT, is on the editorial boards of *Conservation Biology*, *One Health*, and *Transactions of the Royal Society of Tropical Medicine & Hygiene*, and is editor-in-chief of the journal *EcoHealth*. He has authored over 300 scientific papers, and his work has been the focus of extensive media coverage, ranging from popular press articles to television appearances.

Eva Harris, Ph.D. is a professor in the Division of Infectious Diseases in the School of Public Health and Director of the Center for Global Public Health at the University of California, Berkeley. She has developed a multidisciplinary approach to study the molecular virology, pathogenesis, immunology, epidemiology, clinical aspects, and control of dengue, Zika, and chikungunya, the most prevalent mosquito-borne viral diseases in humans. Specifically, her work addresses immune correlates of protection and pathogenesis, viral and host factors that modulate disease severity, and virus replication and evolution, using in vitro approaches, animal models, and research involving human populations. This has been possible through a close collaboration with the Ministry of Health in Nicaragua for over 28 years. Her international work focuses on laboratory-based and epidemiological studies of dengue, chikungunya, Zika, and influenza in endemic Latin American countries, particularly in Nicaragua, where ongoing projects include clinical and biological studies of severe dengue, a pediatric cohort study of dengue, Zika, chikungunya, and influenza transmission in Managua, a household transmission study of Zika, and a recently concluded cluster-randomized controlled trial of evidence-based, community-derived interventions for prevention of dengue via control of its mosquito vector. She is also directing a study of Zika in infants and pregnancy in Nicaragua and evaluating a number of Zika diagnostic tests with her team in Nicaragua. In 1997, she received a MacArthur Award for work over the previous 10 years developing programs to build scientific capacity in developing countries to address public health and infectious disease issues. This enabled her to found a nonprofit organization in 1998, Sustainable Sciences Institute (SSI; www.sustainablesciences.org), with offices in San Francisco, Nicaragua, and Egypt, to continue and expand this work. Dr. Harris was named a Pew Scholar for her work on dengue pathogenesis. She received a national recognition award from the Minister of Health of Nicaragua for her contribution to scientific development and was selected as a "Global Leader for Tomorrow" by the World Economic Forum. In 2012, she was elected Councilor of the American Society of Tropical Medicine and Hygiene and received a Global Citizen Award from the United Nations Association. She has published over 200 peer-reviewed articles, as well as a book on her international scientific work.

Kent E. Kester, M.D. is currently vice president and head of Translational Science and Biomarkers at Sanofi Pasteur. During a 24-year career in the U.S. Army, he worked extensively in clinical vaccine development and led multiple research platforms at the Walter Reed Army Institute of Research, the U.S. Department of Defense's largest and most diverse biomedical research laboratory—an institution he later led as its commander/director. His final military assignment was as the associate dean for clinical research in the School of Medicine at the Uniformed Services University of the Health Sciences (USUHS). Dr. Kester holds an undergraduate degree from Bucknell University and an M.D. from Jefferson Medical College. He completed his internship and residency in internal medicine at the University of Maryland and a fellowship in infectious diseases at the Walter Reed Army Medical Center. A malaria vaccine researcher with over 70 scientific manuscripts and book chapters, Dr. Kester has played a major role in the development of the malaria vaccine candidate known as RTS,S. Currently a member of the U.S. Government Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria, he previously chaired the Steering Committee of the National Institute of Allergy and Infectious Diseases (NIAID)-USUHS Infectious Disease Clinical Research Program, and has served as a member of the Food and Drug Administration's Vaccines and Related Biologics Products Advisory Committee, the NIAID Advisory Council, and the U.S. Centers for Disease Control's Office of Infectious Diseases Board of Scientific Counselors. Board certified in both internal medicine and infectious diseases, he holds faculty appointments at USUHS and the University of Maryland; and is a fellow of the American College of Physicians, the Infectious Diseases Society of America, and the American Society of Tropical Medicine and Hygiene.

Maureen Lichtveld, M.D., M.P.H. is a member of the National Academy of Medicine with over 35 years of experience in environmental public health. She is the Dean of the Graduate School of Public Health, the Jonas Salk Chair in Population Health, and Professor of Environmental and Occupational Health at the University of Pittsburgh. Dr. Lichtveld previously served as Chair, Professor, and Freeport McMoran Chair in Environmental Policy, Department of Global Environmental Health Sciences, Tulane University, School of Public Health and Tropical Medicine. Her research focuses on environmentally-induced disease, health disparities, climate and health, environmental health policy, disaster preparedness, public health systems, and community resilience. Lichtveld's track record in community-based participatory research includes the impact of chemical and non-chemical stressors on communities facing environmental health threats, disasters, climate vulnerability, and health disparities. As Director, Center for Gulf Coast Environmental Health Research, Leadership, and Strategic Initiatives, she is the PI of several Gulf Coast-associated environmental health research projects. Dr. Lichtveld is a member of the NAS Board on Global Health, the One Health Action Collaborative, NAM's planning committee on Climate and Health, NAS Committee on Best Practices for Assessing Mortality and Significant Morbidity Following Large-Scale Disasters, and the Advisory Committee for the NASEM-wide Climate Communications Initiative. She serves on the Board of the Consortium of Universities for Global Health and co-chairs the Caribbean Expert Panel on Climate and Health. Dr. Lichtveld received her MD degree from the University of Suriname and an MPH in environmental Health Sciences from Johns Hopkins University, School of Public Health. Honors include: Johns Hopkins' Society of Scholars and CDC's environmental health scientist of the year.

Sally A. Miller, Ph.D. is a professor of plant pathology and state extension specialist for vegetable pathology at The Ohio State University, Ohio Agricultural Research and Development Center in Wooster, Ohio. She received her B. Sc. in biology from The Ohio State University (OSU), and M.S. and Ph.D. degrees in plant pathology from the University of Wisconsin-Madison. Prior to joining The Ohio State University faculty in 1991, she was a research manager at Agri-Diagnostics Associates in Cinnaminson, New Jersey, an early developer of plant disease diagnostic assays. Dr. Miller's research is focused on the development of sustainable disease management strategies for conventional and organic vegetable crops, in open field and protected (greenhouse and high tunnel) production systems. This includes diagnosis and management of diseases caused by viruses, bacteria, fungi, oomycetes (water molds), and nematodes. Her lab diagnoses more than 300 vegetable samples from growers and home gardeners each year, at no cost to Ohio residents. Areas of research emphasis are bacterial disease management in processing, fresh market and hydroponic tomatoes, downy mildew and bacterial wilt in cucurbits, soilborne diseases in all vegetable crops, and food safety. Outreach efforts are directed primarily to vegetable growers and extension educators, and in addition to diagnostics include providing management advice through presentations, fact sheets and other printed information, and social media (websites, blogs, and Twitter). Dr. Miller has been active in long-term international agricultural development projects on integrated pest management (IPM) and plant diagnostics in South and Southeast Asia, Ukraine, West and East Africa, and Central America, primarily under the auspices of the U.S. Agency for International Development (USAID). Current USAID-funded IPM programs are underway in East

Africa (Tanzania, Kenya, and Ethiopia) and South/Southeast Asia (Bangladesh, Nepal, and Cambodia). Dr. Miller has been active in the leadership of the American Phytopathological Society, serving as president in 2015-2016. She has recently been appointed to a Food and Agriculture Organization of the United Nations expert panel on antimicrobial resistance, and serves on the executive committee and two working groups for OSU's Global One Health Initiative.

CAPT Brianna Skinner, D.V.M., M.P.H is assigned to the Office of Counterterrorism and Emerging Threats (OCET) at the U.S. Food and Drug Administration (FDA) with a focus on regulatory science, animal welfare, and public health. She is as a Senior Regulatory Veterinarian and subject matter expert for OCET serving as a One Health and animal model expert for the administration of policies to facilitate the availability of safe and effective medical countermeasures against chemical, biological, radiological, nuclear agents and emerging threats. In February of 2019, FDA's Chief Scientist sought Dr. Skinner's assistance to establish an agency-wide One Health Initiative and she was one of the leading experts to pioneer this development, which came to fruition in July 2019. For over 11 years and prior to transferring to the FDA, Dr. Skinner worked at the Centers for Disease Control and Prevention supporting infectious disease research and consulting with principal investigators on animal care and use in compliance with federal laws and regulations. She is a Commissioned Corps Officer in the U.S. Public Health Service (USPHS) with prior service in the United States Army Veterinary Corps. As a uniformed service officer, she has both national and international work experience and duties that include disaster and humanitarian response missions. She earned her Doctor of Veterinary Medicine degree from Tuskegee University and is a diplomate in the American College of Laboratory Animal Medicine. She also has a Masters of Public Health from Benedictine University. Dr. Skinner is associated with another activity in National Academies of Sciences, Engineering and Medicine where she serves as a roundtable member for Institute of Laboratory Animal Research.

Mark S. Smolinski, M.D., M.P.H. is the president of Ending Pandemics. He brings 25 years of experience in applying innovative solutions to improve disease prevention, response, and control across the globe. Mark is leading a well-knit team—bringing together technologists; human, animal, and environmental health experts; and key community stakeholders to co-create tools for early detection, advanced warning, and prevention of pandemic threats. Community health workers, village volunteers, farmers, and interested public citizens in Albania, Brazil, Cambodia, Europe, Laos, Myanmar, Tanzania, Thailand, and the United States are among those using their own solutions to address pressing local needs. Since 2009, Mark has served as the Chief Medical Officer and Director of Global Health at the Skoll Global Threats Fund (SGTF), where he developed the Ending Pandemics in Our Lifetime Initiative in 2012. His work at SGTF created a solid foundation for the work of Ending Pandemics, which branched out as an independent entity on January 1, 2018. Prior to SGTF, Mark developed the Predict and Prevent Initiative at Google.org, as part of the starting team at Google's philanthropic arm. Working with a team of engineers, Google Flu Trends (a project that had tremendous impact on the use of big data for disease surveillance) was created in partnership with the U.S. Centers for Disease Control. Mark has served as Vice President for Biological Programs at the Nuclear Threat Initiative, a public charity directed by CNN founder Ted Turner and former U.S. Senator Sam Nunn. Before NTI, he led an 18-member expert committee of the National Academy of Medicine on the 2003 landmark report "Microbial Threats to Health: Emergence, Detection, and Response." Mark served as the sixth Luther Terry Fellow in Washington, D.C., in the Office of the U.S. Surgeon General and as an Epidemic Intelligence Officer with the U.S. Centers for Disease Control and Prevention. Mark received his BS in Biology and MD from the University of Michigan in Ann Arbor. He is board-certified in preventive medicine and public health and holds an M.P.H. from the University of Arizona, where he was recognized as the 2016 Alumnus of the Year. Mark was on the investigation team that discovered hantavirus, a newly identified pathogen, in 1993. His passion for helping all peoples of the world save lives and improve livelihoods motivates partners on five continents.

Mary E. Wilson, M.D. is Clinical Professor of Epidemiology and Biostatistics, University of California, San Francisco and Adjunct Professor of Global Health and Population, Harvard T.H. Chan School of Public Health. Her academic interests include antibiotic resistance, the ecology of infections and emergence of microbial threats, travel medicine, tuberculosis, and vaccines. She received an M.D. from the University of Wisconsin and completed an internal medicine residency and infectious diseases fellowship at Beth Israel Hospital in Boston. She is a fellow in the Infectious Diseases Society of America, the American College of Physicians, the American Society of Tropical Medicine and Hygiene, and the International Society of Travel Medicine. She has served on the Advisory Committee on Immunization Practices (ACIP) of the CDC, the Academic Advisory Committee for the National Institute of Public Health in Mexico, and on five committees for the National Academies of Sciences, Engineering, and Medicine, where she was Vice-Chair of the Forum on Microbial

Threats through 2019 and is a member of the One Health Action Collaborative. She was a member of the Pew National Commission on Industrial Farm Animal Production, whose report, *Putting Meat on the Table: Industrial Farm Animal Production in America,* was released in 2008 and is author of *Antibiotics: What Everyone Needs to Know* (Oxford University Press, 2019). She served on the Board of Trustees for icddr,b in Bangladesh for 6 years, is a member of the Advisory Board for the Fogarty International Center at NIH, and on the Board of Directors for the Center for Disease Dynamics, Economics, and Policy.

SYSTEMATIZING THE ONE HEALTH APPROACH IN PREPAREDNESS AND RESPONSE EFFORTS FOR INFECTIOUS DISEASE OUTBREAKS

A Workshop

SPEAKER BIOGRAPHIES

Marc Allard, Ph.D., received his doctorate in biology in 1990 from Harvard University. Dr. Allard was the Louis Weintraub Associate Professor of Biology (and Genetics) at George Washington University (Washington, DC) for 14 years from 1994 to 2008. He has had appointments to the Visiting Scientists Program both at the Federal Bureau of Investigation's Counterterrorism and Forensic Science Research Unit (CTFSRU) and in the Chem.-Bio. Sciences Unit (CBSU) for approximately 8 years, where he assisted in the anthrax investigations as well as in human genetics data-basing. Dr. Allard joined the Food and Drug Administration, Office of Regulatory Science, Division of Microbiology in November 2008. He assisted in building FDA's GenomeTrakr Whole Genome Sequencing network for source tracking of foodborne pathogens to rapidly identify outbreaks and the root cause of contamination events for Salmonella, E. coli, and Listeria.

John H. Amuasi, Ph.D., M.P.H., lectures at the Kwame Nkrumah University of Science and Technology (KNUST), where he is based at the Global Health Department of the School of Public Health and is head of the Department of Community Health at the School of Medicine and Dentistry. Dr. Amuasi is also Group Leader of the Global Health and Infectious Diseases Research Group at the Kumasi Center for Collaborative Research in Tropical Medicine (KCCR), which hosts the Secretariat of the African Research Network for Neglected Tropical Diseases (ARNTD) of which he is the Executive Director. Dr. Amuasi trained as a physician at the KNUST School of Medical Sciences, and later graduated from the University of Minnesota School of Public Health, USA, with post-graduate degrees terminating in a PhD in Health Research and Policy. He also served as head of the R&D Unit at the 1,200-bed Komfo Anokye teaching Hospital in Kumasi, Ghana for 3 years from 2007-2010. Dr. Amuasi has consulted for several international organizations and is passionate about research that focuses on improving health systems, services and outcomes, including policy analyses using both primary and secondary data in low and middle-income countries. His research currently involves field epidemiologic studies on malaria, snakebite and other neglected tropical diseases. Dr. Amuasi serves as an Executive Committee member of the African Coalition for Epidemic Research, Response and Training (ALERRT). Through ALERRT at KCCR, Dr. Amuasi is coordinating the setup of research on the clinical characterization of COVID-19 in Africa and is the PI for a number of studies on COVID-19 in Ghana, including a phase III clinical trial. Dr. Amuasi also co-chairs the Lancet One Health Commission and is at the forefront of global efforts towards addressing emerging and re-emerging infectious diseases using a One Health approach.

John Balbus, M.D., M.P.H., serves as a senior advisor and directs the NIEHS-WHO Collaborating Centre for Environmental Health Sciences. He also leads NIEHS efforts on climate change and human health. In this capacity he serves as HHS principal to the U.S. Global Change Research Program, for which he also co-chairs the Interagency Cross-Cutting Group on Climate Change and Human Health. Dr. Balbus' background combines training and experience in clinical medicine with expertise in epidemiology, toxicology, and risk sciences.

Before joining the NIEHS, Dr. Balbus was Chief Health Scientist for the non-governmental organization Environmental Defense Fund. He served on the faculty of The George Washington University, where he was founding Director of the Center for Risk Science and Public Health, founding co-Director of the Mid-Atlantic Center for Children's Health and the Environment, and Acting Chairman of the Department of Environmental and Occupational Health. He maintains an adjunct faculty appointment at the Milken Institute School of Public Health at the George Washington University. Dr. Balbus received his A.B. degree in Biochemistry from Harvard University, his M.D. from the University of Pennsylvania, and his M.P.H. from the Johns Hopkins School of Public Health.

Charles (Ben) Beard, M.S., Ph.D., earned a B.S. in 1980 at Auburn University, a M.S. in 1983 at the Louisiana State University School of Medicine, and a Ph.D. in 1987 at the University of Florida. He was a post-doctoral fellow and associate research scientist at the Yale University School of Medicine from 1987 to 1991. In 1991, he joined CDC's Division of Parasitic Diseases, where he served as Chief of the Vector Genetics Section from 1999 to 2003. In 2003 he moved to CDC's Division of Vector-Borne Diseases in Fort Collins, CO to become Chief of the Bacterial Diseases Branch. In this capacity, he coordinated CDC's programs on Lyme borreliosis, tick-borne relapsing fever, Bartonella, plague, and tularemia. During his tenure at CDC, Ben has worked in the prevention of vector-borne diseases, both in the domestic and global arenas. In addition to his work as Chief of the Bacterial Diseases Branch, from 2011 until 2017 Dr. Beard served as the Associate Director for Climate Change in CDC's National Center for Emerging and Zoonotic Infectious Diseases, where he coordinated CDC's efforts to mitigate the potential impact of climate variability and disruption on infectious diseases in humans. In this capacity he participated in the U.S. Global Change Research Program Climate Change and Human Health Group and was an editor and lead author on the 2016 report, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. In 2017, he was appointed as the Deputy Director of CDC's Division of Vector-Borne Diseases. He has published over 140 scientific papers, books, and book chapters collectively, and has served on a variety of committees and panels both inside and outside of CDC, including working groups or advisory panels for the World Health Organization, the Bill & Melinda Gates Foundation, and the American Meteorological Society. He is an Associate Editor for Emerging Infectious Diseases and past president of the Society for Vector Ecology and served as Deputy Incident Manager for CDC's Zika virus outbreak response. He also served as Associate Director for Science for task forces in CDC's 2014 Ebola Response and currently in CDC's COVID-19 Response. Beard has served as CDC's representative to the U.S. Department of Health and Human Services Tick-Borne Disease Working Group federal advisory committee since its establishment in 2017.

Christopher Braden, M.D., serves as the Deputy Director, National Center for Emerging and Zoonotic Infectious Diseases at the CDC. Prior to 2016, he was the Director of the Division of Foodborne, Waterborne and Environmental Diseases. Previously, he served and the Associate Director for Science in the Division of Parasitic Diseases, and chief of outbreak response and surveillance in the Division of Foodborne, Bacterial and Mycotic Diseases. Dr. Braden has served on incident management teams for multiple national and international CDC responses.

Dr. Braden received his Bachelor of Science from Cornell University, and his MD at the University of New Mexico School of Medicine. He completed his internship and residency in internal medicine then fellowship in infectious diseases at Tufts New England Medical Center in Boston, MA. He is Board certified in infectious diseases. He joined CDC as an EIS Officer in 1993. He is a retired commissioned officer in the US Public Health Service, and a member of the Infectious Diseases Society of America.

He has authored over 70 peer reviewed publications and textbook chapters. His major areas of interest include molecular epidemiology of infectious diseases, infectious diseases surveillance and outbreak investigation and national programs in food safety.

Carlos das Neves D.V.M., Ph.D., Dipl.ECZM graduated in Veterinary Medicine, from the Technical University of Lisbon in 2004, and obtained his doctorate (PhD) in veterinary science, specialty Virology in 2009 from the Norwegian School of Veterinary Sciences. With scientific papers published in international scientific journals and extensive experience of scientific project coordination Dr. das Neves is currently the Director of Research and Internationalization at the Norwegian Veterinary Institute in Oslo, responsible for coordination of research staff of more than 150 researchers working in more than 20 different disciplines. He served previously for 3 years as Head of Virology and 2 years as Head of Food Safety & Emerging Threats at the Norwegian Veterinary Institute. He holds a joint position at the Faculty of Medical Sciences at the University of Tromsø, and has been promoted to research professor in 2018. Dr. das Neves has developed his scientific research in the field of virology in wildlife species and accumulated over these years extensive experience of fieldwork across the Arctic region. He works mostly today with topics related to One Health and emerging threats, especially viral zoonosis and antimicrobial resistance, also with a focus on LMICs. In 2013 he obtained the diploma of specialist of the European College of Zoological Medicine in the area of Wildlife Population Health and was appointed by the Norwegian Government in 2014 as an expert in animal welfare and health of the National Food Safety Committee. He is currently the

President of the Wildlife Disease Association, the Wildlife Population Health specialty chair for the European College of Zoological Medicine, and Member of the IUCN Species Survival Commission - Wildlife Health Specialist Group. In 2020, Dr. das Neves was also appointed by Norway to join the group of international experts at IPBES working on the relation between biodiversity and pandemics. He is also a Commissioner at the Lancet One Health Commission, and a member of the Lancet Covid19 Commission Task Force.

Victor del Rio Vilas, D.V.M., M.Sc., M.B.A., Ph.D., is currently at the World Health Organization (WHO), South East Asia Regional Office in New Delhi, India, where he coordinates the Global Outbreak Alert and Response Network (GOARN) in the region. He was previously at the Dept of Epidemiology, School of Veterinary Medicine, University of Surrey (UK), and at the Centre on Global Health Security at Chatham House, London. Until January 2018 he worked at the World Health Organization (WHO-Geneva) on the development of WHO's epidemic vulnerability evaluation framework. Until November 2016, Dr Del Rio was a consultant with the Pan American Health Organization (PAHO/WHO), based in Rio de Janeiro (Brazil). In that capacity, Dr Del Rio advised Ministries/Departments of Health across PAHO region on epidemiology, surveillance and control measures for a number of diseases such as rabies, leishmaniasis, echinococcosis, yellow fever and on zoonoses programmatic issues. He also contributed to WHO's global response to the Ebola Virus Disease outbreak in Liberia in 2015; previously worked in Uzbekistan implementing the Biological Threat Reduction Program (Defence Threat Reduction Agency, US DoD), and as veterinary advisor and epidemiologist for UK´s Department for Environment, Food and Rural Affairs (Defra) and the Veterinary Laboratories Agency.

Kaylee Myhre Errecaborde, D.V.M., Ph.D., is a policy researcher and a veterinarian. Kaylee supports health workers to situate their technical work within the context of international policies and frameworks. As a Technical Consultant at World Health Organization headquarters in Geneva, Switzerland, she works on the Human and Animal Interface Team, supporting member countries to build capacity for collaborative, One Health preparedness and response for zoonotic disease. As faculty at the University of Minnesota, her research focuses on global approaches to health workforce development, collaborative governance, policy, and international trade capacity. She previously worked for the US Congress on global health, border health, international trade, and food security issues with both the US House Foreign Affairs Committee and later on the US Senate Homeland Security Committee.

Julie Fischer, Ph.D., is a Senior Technical Advisor for Global Health at CRDF Global, where she is the primary investigator on several projects that aim to strengthen capacities to prevent, detect, and respond to emerging disease threats in South and Southeast Asia, Central Asia, and the Middle East and North Africa. Prior to joining CRDF, she served as an Associate Research Professor in the Department of Microbiology and Immunology and Director of the Elizabeth R. Griffin Program at Georgetown University, where she led a multidisciplinary team to promote evidence-based biosafety and biosecurity practices, and to help partner nations strengthen their capacities to detect and characterize disease threats rapidly, reliably, accurately, and safely. Before she joined Georgetown, Dr. Fischer held leadership positions at George Washington University's Milken Institute School of Public Health and the Global Health Security Program at the Stimson Center. Dr. Fischer received a B.A. from Hollins University, a Ph.D. in Microbiology and Immunology from Vanderbilt University, and completed post-doctoral training in viral pathogenesis at the University of Washington and Seattle Biomedical Research Institute.

Greg Glass, PhD., is a Professor in the Department of Geography and the Emerging Pathogens Institute at the University of Florida, Gainesville. He received his PhD in Population Biology/Quantitative Methods at the University of Kansas and his post-doctoral fellowship in the Department of Immunology & Infectious Diseases at the Johns Hopkins School of Public Health, where he worked on characterizing the transmission systems and health consequences of hantaviruses. The group was responsible for establishing the tight associations of reservoir species and viruses, as well as developing diagnostic methods and performing human population surveys of viral spillover. He remained at JHU with faculty appointments in the departments of Molecular Microbiology & Immunology and Epidemiology studying vector borne and zoonotic agents for 30 years, before moving to UF. There, he has continued developing applications for detailed characterizations of space-time dynamics of these disease systems in the environment. He has served on numerous national and international

committees for NASA, NIH, NAS, WHO and CDC. During the past decade much of his effort has focused in Eastern Europe and South Asia providing training on pathogen detection and surveillance.

RADM David Goldman, M.D., M.P.H., joined FDA's Office of Food Policy and Response as Chief Medical Officer effective January 15, 2019.

Dr. Goldman provides medical and scientific leadership to the foods program and provides strategic guidance on medical and public health issues associated with food, dietary supplements, cosmetic products and the nutritional composition of food. He is a clinical expert on issues related to food safety and a key leader in helping the agency respond to food safety outbreak and recall events.

As Chief Medical Officer for the foods program, Dr. Goldman plays a pivotal role in continuing to advance the agency's work to improve our recall efforts by co-chairing the Strategic Coordinated Oversight of Recall Execution (SCORE) team. Dr. Goldman's work also includes the full portfolio of work previously led by the Center for Food Safety and Applied Nutrition's (CFSAN) Chief Medical Officer. This includes providing leadership to foods program medical officers and chairing CFSAN's Health Hazard Evaluation Board, which evaluates the human health effects of physical, microbiological, chemical, or radiological contamination of food and cosmetic products. Dr. Goldman also serves as a spokesperson on human health issues associated with food products, involving food safety, nutrition, and cosmetics. In addition, he serves as liaison to USDA in foodborne outbreak situations.

Dr. Goldman has considerable experience in issues directly relevant to these important roles. He most recently served as the Chief Medical Officer of the Food Safety and Inspection Service (FSIS), which is part of the USDA. In this role, he was responsible for occupational health issues related to chemical and biological exposures, as well as providing medical expertise on emerging food safety issues. He was Assistant Administrator for FSIS's Office of Public Health Science from November 2004 through May 2018, leading a staff of 300 that provided the scientific foundation for FSIS policies, conducted microbial risk assessments, and executed a national sampling program of meat and poultry products. In addition, at the appointment of the U.S. Surgeon General, Dr. Goldman served as the U.S. Public Health Service (USPHS) Chief Professional Officer for physicians from 2013 to 2017.

Dr. Goldman is a board-certified family medicine and preventive medicine/public health physician, and a member of the Commissioned Corps of the U.S. Public Health Service since February 2002. He spent 10 years in the U.S. Army Medical Corps, practicing both family medicine and preventive medicine. He then spent 3 ½ years at the Virginia Department of Health, first as a District Health Director, then briefly as the Deputy State Epidemiologist, before joining the USPHS and FSIS. Dr. Goldman received his Bachelor of Arts from the University of Virginia, his Doctor of Medicine from the University of Virginia. He holds a Master of Public Health in Epidemiology from the University of Washington.

Eric Goosby, M.D., is an internationally recognized expert on infectious diseases, with a specialty in HIV/AIDS clinical care, research, and policy. During the Clinton Administration, Dr. Goosby was the founding director of the Ryan White CARE Act, the largest federally funded HIV/AIDS program in the U.S. He went on to become the interim director of the White House's Office of National AIDS Policy. In the Obama Administration, Dr. Goosby was appointed Ambassador-at-Large and implemented the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), which significantly expanded under his tenure life-saving HIV treatment to millions in Sub Saharan Africa, SE Asia, and Eastern Europe.

After serving as the U.S. Global AIDS Coordinator, he was appointed by the UN Secretary-General as the Special Envoy for TB, where he focused on the first-ever UN High-Level Meeting on TB in 2019. He is currently a Professor of Medicine at the UCSF School of Medicine and leading the Center for Global Health Delivery, Diplomacy and Economics, Institute for Global Health Sciences. A member of the Biden Covid-19 Advisory Board, a member of the Western States Scientific Safety Review Workgroup, and serves on the San Francisco Dept. of Public Health, Policy Group for the COVID-19 Response.

Barbara Han, Ph.D., is a disease ecologist at the Cary Institute of Ecosystem Studies. Her research program builds predictive capacity for zoonotic diseases that aim to better target upstream surveillance and management activities to preempt spillover transmission to humans. She has pioneered the application of machine learning and ecoinformatics approaches to predict zoonotic animal hosts and insect vectors, with recent work incorporating these approaches with mathematical modeling and structural modeling to quantify spillover risks posed by multiple animals species to humans (e.g., SARS-CoV-2). This work continues to inform the creation of new research and policy initiatives at the intersection of artificial intelligence, disease ecology, biodefense, biomedical science, and global health. She currently serves as the PI or Co-PI on multi-institution and multinational grants funded by NSF, NIH, and DARPA.

Richard Horton is Editor-in-Chief of The Lancet. He qualified in physiology and medicine with honours from the University of Birmingham in 1986. He joined The Lancet in 1990, moving to New York as North American Editor in 1993. In 2016, he chaired the Expert Group for the High Level Commission on Health Employment and Economic Growth, convened by Presidents Hollande of France and Zuma of South Africa. From 2011 to 2015, he was co-chair of the UN's independent Expert Review Group on Information and Accountability for Women's and Children's Health. In 2011, he was elected a Foreign Associate of the US Institute of Medicine and, in 2015, he received the Friendship Award from the Government of China. In 2019 he was awarded the WHO Director-General's Health Leaders Award for outstanding leadership in global health and the Roux Prize in recognition of innovation in the application of global health evidence. He now works to develop the idea of planetary health – the health of human civilizations and the ecosystems on which they depend. In 2020, he published The COVID-19 Catastrophe: What's Gone Wrong and How to Stop It Happening Again. A revised, updated, and expanded second edition was published in 2021.

James Hospedales, M.D., M.Sc. is Founder of the EarthMedic and EarthNurse Foundation for Planetary Health, which aims to mobilise health professionals concerned about the climate and health crisis to take action to improve health of self, society, and planet. Dr H also serves as Chair of the Defeat-NCD Partnership, aiming to address Noncommunicable diseases in LMCs. He served as inaugural Executive Director, Caribbean Public Health Agency (CARPHA), 2013-2019, serving 23 countries, in which role he chaired an Expert Panel on Climate change and health in the Caribbean. Previously, Dr. Hospedales was Senior Advisor and Coordinator, Prevention and Control of Chronic Diseases, Pan American Health Organization/World Health Organization. From 1998–2006, Dr. Hospedales was Director of the Caribbean Epidemiology Centre, serving 21 countries. He played a key role in developing partnerships for HIV/AIDS prevention, and for improving health, safety and environment conditions in the Caribbean travel and tourism industry. Dr. Hospedales was a member of the Caribbean Commission on Health and Development, which made policy recommendations to the Heads of Government and named chronic diseases as a super-priority for the Region. This work helped stimulate the UN High Level Meetings on NCDs in 2011, 2014 and 2018. Dr. Hospedales' career has included service as an Epidemic Intelligence Service Officer with the US Centers for Disease Control, as an epidemiologist at CAREC, and several years working in public health for the UK National Health Service. Dr. Hospedales graduated with honors in medicine from UWI in 1980. He has a M.Sc. in Community medicine from the London School of Hygiene and Tropical Medicine, is a Fellow of UK Faculty of Public Health, and an accredited partnership broker with the Partnering Institute (TPI). He has published more than 100 papers and reports. He is married to a Veterinarian and is keen on the outdoors, woodworking and gardening.

Kate Huebner, V.M.D., M.S., is a Veterinary Medical Officer within the Office of Surveillance and Compliance at FDA's Center for Veterinary Medicine. Dr. Huebner obtained her veterinary degree from the University of Pennsylvania and went on to complete an internship in livestock medicine and surgery at Colorado State University. She also obtained her master's in clinical sciences at CSU researching the effects of a feed additive on feedlot cattle liver abscess prevalence, fecal microbiomes and antimicrobial resistance. Kate enjoys working on regulatory and policy matters related to innovative science and technologies impacting human, animal, and environmental health. Outside of her work at CVM, Kate enjoys practicing veterinary medicine on the weekends and spending time outdoors with her family, friends, and pets.

Olga B. Jonas is an economist and a Senior Fellow at the Harvard Global Health Institute, after serving as an economist at the World Bank in 1983-2016. She coordinated the World Bank's operational responses to avian flu and pandemics in

2005-2013 and implementation of reforms of emergency response financing policies. Jointly with UN System Influenza Coordinator, David Nabarro, she was the lead World Bank author of five global monitoring reports on country and global programs in 2005-10 that saw increased use of One Health approaches for prevention and preparedness in nearly 100 developing countries, helped by $3.9 billion of external financing.

She was also lead author of the World Bank's 2016 report on antimicrobial resistance, the parts on pandemics in the World Bank's 2014 World Development Report on Risks to Development, and the economic analysis in the 2012 Economics of One Health report; she co-authored International Cooperative Responses to Pandemic Threats: A Critical Analysis (2015).

Earlier she worked as a macroeconomist for policy-reform programs in Africa and Asia and then as financing and development policy adviser for two replenishments of IDA (the World Bank's fund for the poorest countries), small states task force, fragile states, and responses to major disasters.

She now focuses on pandemic and epidemic risks through understanding of links to economic development, governance to increase the adequacy and effectiveness of financing of prevention, preparedness and responses to microbial threats, policies to contain antimicrobial resistance, and the role of One Health approaches.

Laura Kahn, M.D., M.P.H., is a physician and research scholar with the Program on Science and Global Security at the Princeton University School of Public and International Affairs. In 2006, she published Confronting Zoonoses, Linking Human and Veterinary Medicine in the CDC journal Emerging Infectious Diseases that helped launch the One Health Initiative (http://www.onehealthinitiative.com) which is a global effort to promote the One Health concept that human, animal, and environmental/ecosystem health are linked. She is the author of two books: Who's in Charge? Leadership During Epidemics, Bioterror Attacks, and Other Public Health Crises (2nd edition published in 2020 by Praeger Security International) and One Health and the Politics of Antimicrobial Resistance published in 2016 by Johns Hopkins University Press. In June 2020, she launched her Coursera course: Bats, Ducks, and Pandemics: An Introduction to One Health Policy, which has over 4000 students enrolled from around the world. In 2014, she received a Presidential Award for Meritorious Service from the American Association of Public Health Physicians, and in 2016, the American Veterinary Epidemiology Society (AVES) awarded her with their highest honor for her work in One Health: the K.F. Meyer-James H. Steele Gold Head Cane Award.

Esron Karimuribo, B.V.M., M.V.M., Ph.D., is a One Health Epidemiology Professor and Director of Postgraduate Studies and Research at Sokoine University of Agriculture (SUA) based in Morogoro, Tanzania. He also works with the Southern African Centre for Infectious Disease Surveillance (SACIDS) Foundation for One Health; a regional disease surveillance network which is headquartered at SUA. Esron holds BVM and MVM degrees of SUA and PhD of University of Reading in UK.

In 2009, Esron joined SACIDS as a postdoctoral research fellow working on resource mapping and application of mobile technologies in infectious disease surveillance. Through the financial support from the Skoll Global Threats Fund/Ending Pandemics, Esron led a team which designed and developed an app called 'AfyaData' which has been rolled out to support disease surveillance in human and animal health sectors in East and southern African countries. On 1st July, 2019, the AfyaData team was awarded Prize by the Fondation Pierre Fabre. Esron has published more 100 articles in peer reviewed international journals. He is a member of different professional associations and communities within and outside Tanzania.

Lonnie King, D.V.M., M.S., M.P.A., A.C.V.P.M., has served as dean for 3 colleges over 17 years. Most recently, he was the interim dean of the College of Food, Agricultural and Environmental Sciences at The Ohio State University and was also the VP for Agriculture. He was also dean of the College of Veterinary Medicine at The Ohio State University from 2009 – 2015. At Ohio State, Dr. King held the Ruth Stanton Endowed Chair and served as the Executive Dean for the 7 health science colleges at the university. Before becoming dean at OSU, he was the first Director of the National Center for Zoonotic, Vector-Borne, and Enteric Diseases at the Centers for Disease Control and Prevention. Dr. King led the Center's activities for surveillance, diagnostics, disease investigations, epidemiology, research, public education, policy

development, and disease prevention and public health concerns. Before serving as director, he was the first chief of the agency's Office of Strategy and Innovation.

Dr. King served as dean of the College of Veterinary Medicine, Michigan State University, from 1996 to 2006. He led the college's academic programs, research, the teaching hospital, diagnostic center for population and animal health, basic and clinical science departments, and the outreach and continuing education programs. He was also professor of large animal clinical sciences and a distinguished university professor.

In 1992, Dr. King was appointed administrator for the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, in Washington, DC. In this role, he provided 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. Dr. King also served as the country's chief veterinary officer for five years and worked extensively in global trade and closely with the World Animal Health Association (OIE). He also served as the deputy administrator for Veterinary Services of APHIS, USDA where he led national efforts in disease eradication, imports and exports, diagnostic labs and animal welfare.

As a native of Wooster, Ohio, Dr. King received his BS and DVM degrees from The Ohio State University. He earned his MS in epidemiology from the University of Minnesota and received his master's degree in public administration from the American University. 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 was elected as a member of the National Academy of Medicine of the National Academies of Science in 2004. He is a past Vice-Chair of the National Academy of Medicine's Forum on Microbial Threats to Health and has been awarded both the Global One Health Award presented in 2013 by the World Small Animal Veterinary Medical Association and the OIE Meritorious Award for his distinguished global career in animal and public health in 2019. His interests and expertise are in emerging zoonoses, antimicrobial resistance, global health, One Health and leadership development. He currently is the Vice-Chair for the President's Advisory Council Combating Antibiotic Resistant Bacteria and is serving on the boards or in advisory roles for 10 organizations and companies.

Andrew Maccabe, D.V.M., M.P.H., J.D., is the Chief Executive Officer of the Association of American Veterinary Medical Colleges (AAVMC). He received his Bachelor of Science and Doctor of Veterinary Medicine degrees from The Ohio State University in 1981 and 1985, respectively. Dr. Maccabe began his professional career in Jefferson, Ohio where he worked in a mixed animal practice with primary emphasis on dairy herd health.

In 1988, he was commissioned as a Public Health Officer in the U.S. Air Force where he managed the preventive medicine activities of several Air Force installations and directed programs in occupational health, communicable disease control, and health promotion.

Dr. Maccabe completed his Master of Public Health degree at Harvard University in 1995. That same year he became Chief of the Health Risk Assessment Branch of the U.S. Air Force where he directed the health risk assessment program for environmental restoration activities throughout the Air Force.

Dr. Maccabe completed his Juris Doctor degree, Magna Cum Laude, at the University of Arizona in 2002. He subsequently became the Associate Executive Director at the Association of American Veterinary Medical Colleges where he led programs to advance veterinary medical education. In 2007, he was appointed as CDC's Liaison to the U.S. Food and Drug Administration where he coordinated policies and programs between the two agencies before returning to AAVMC in 2012 as the CEO.

Dr. Maccabe holds memberships in many professional organizations including the American Veterinary Medical Association, the District of Columbia Veterinary Medical Association, and the Pride Veterinary Medical Community. He is a member of the State Bar of Arizona, the Bar of the District of Columbia, and a Licensed Patent Attorney. After 24 years of service in the U.S. Air Force, he retired as a Colonel in 2017.

Catherine Machalaba, Ph.D., serves as senior policy advisor and a senior scientist at EcoHealth Alliance, a scientific non-profit organization working at the nexus of conservation, global health, and capacity strengthening. Her work focuses on assessing and optimizing One Health strategies, including the use of economic analyses to identify cost-effective options to reduce the threat and impact of emerging infectious diseases. She was a lead author of the World Bank Operational Framework for Strengthening Human, Animal and Environmental Public Health Systems at their Interface ("One Health Operational Framework") published in 2018 to assist countries and donor institutions in implementing One Health approaches. Catherine is the programme officer for the International Union for the Conservation of Nature Species Survival Commission's Wildlife Health Specialist Group, and previously served as Chair of the American Public Health Association (APHA) Veterinary Public Health group, where she led development of APHA's One Health policy statement. She holds degrees in Biology and Public Health and a PhD in Environmental and Planetary Health Sciences.

Tracey McNamara, D.V.M., Diplomate, A.C.V.P., is a veterinary pathologist and a Professor of Pathology at Western University of Health Sciences College of Veterinary Medicine in Pomona, CA. Dr. McNamara specializes in the recognition and understanding of the diseases of captive and free-ranging wildlife and is best known for her work on the discovery of the West Nile virus in 1999. In 2004 she worked on DTRA's "Integrated Biosurveillance for Zoonotic Threats" program in Uzbekistan, Kazakhstan and Georgia. She served as lead on a project with Russian colleagues on the "Human-Animal Interface: Improving Biological Threat Detection and Surveillance in Russia" by the Nuclear Threat Initiative's Global Health and Biosecurity program in Wash. DC. Dr McNamara served as a consultant to the National Biosurveillance Advisory Subcommittee (NBAS) from 2008-2009 and continues to be actively involved in the development of the Nation's biosurveillance strategy.. She recently gave a TEDxUCLA talk entitled "Canaries in the Coalmine" about continued gaps in biosurveillance for for emerging biological threats. Dr. McNamara is a founding member of the Global Health Security Alliance (GloHSA) working with German/US military, the United Nations, medical intelligence and security sectors. She chaired a panel on "Disease X" at the World Health Summit, Berlin, 2018. She helped organize a meeting at the Salzburg Global Seminar on One Health Metrics in November 2019 and is a Salzburg Fellow. She is actively involved in the One Health movement and advocates for a species neutral approach to the detection of pandemic threats. Most recently, she was asked to be a member of the "Red Dawn Breaking Team" on COVID-19, a group of experts advising the Asst Secretary for Preparedness and Response (ASPR) of the United States.

Carrie S. McNeil, D.V.M., M.P.H., is a veterinary epidemiologist at Sandia National Laboratories with a background in public policy and emergency management who has designed numerous strategic and operational-level exercises and drills to evaluate One Health preparedness in North Africa, the Middle East, South and Southeast Asia. She coauthored Portal for Readiness Exercises and Planning (PREP™), a no-cost, web-based platform tracking multiplayer, role-based, participant-led exercises and planning workshops. On behalf of Ending Pandemics, Dr. McNeil and her team have designed and are implementing a series of During Action Reviews for COVID-19 at national and subnational level internationally. She has led multiyear One Health Biothreat Readiness Leadership trainings globally using PREP.™ She is principle investigator on a One Health-focused assessment of domestic Food-Agriculture-Veterinary readiness on behalf of the US Department of Homeland Security and on research leveraging remote technologies and machine learning for early outbreak detection. Prior to coming to Sandia, she served as an Epidemic Intelligence Service Officer for the USCDC and as an emergency response planner with the CDC. She received MPH with honors in Global Environmental Health at Rollins School of Public Health where she conducted a participatory-based community health assessment in one of the country's most rural and impoverished counties. As a former committee consultant with the California State Legislature and director of a water-quality nonprofit, she worked to ensure science was incorporated in developing health, environment and preparedness policies. After completing her DVM at University of California Davis in 2004 and internship in 2006, Dr. McNeil practiced in small animal emergency medicine and became a Veterinary Medical Officer with the National Veterinary Response Team.

John Nkengasong, M.Sc, Ph.D., currently serves as Director of the Africa Centres for Disease Control and Prevention, a specialized technical institution of the African Union.

In early 2020, he was appointed as one of the WHO Director-General's Special Envoys on COVID-19 Preparedness and

Response. In addition, Dr Nkengasong was most recently awarded the Bill and Melinda Gates Foundation's 2020 Global Goalkeeper Award for his contributions to the continental response in fighting the COVID-19 pandemic in Africa.

Prior to his current position, he served as Acting Deputy Principal Director of the Center for Global Health and Chief of the International Laboratory Branch, Division of Global HIV and TB for the US Centers for Disease Control and Prevention (CDC).

Dr Nkengasong holds a master's degree in tropical biomedical science from the Institute of Tropical Medicine in Antwerp, Belgium, and a doctorate in medical sciences (virology), from the University of Brussels, Belgium.

Dr Nkengasong has received numerous awards for his work including Sheppard Award, the William Watson Medal of Excellence, the highest recognition awarded by the US CDC. He is also recipient of the Knight of Honour Medal by the Government of Cote d'Ivoire, was knighted in 2017 as the Officer of Loin by the President of Senegal, H.E. Macky Sall, and Knighted in November 2018 by the government of Cameroon for his significant contributions to public health. He is an adjunct professor at the Emory School of Public Health, Emory University, Atlanta, GA.

He serves on several international advisory boards including the Coalition for Epidemic Preparedness Initiative (CEPIT) and the International AIDS Vaccine Initiative (IAVI), among others. He has authored over 250 peer-review articles in international journals and published several book chapters.

Thierry Nyatanyi, M.D., M.P.H., M.M.Sc., is a physician by training and global health specialist. Previously, Nyatanyi worked with the Ministry of Health in Rwanda, and with the University of Minnesota in the United States. In Rwanda, he served as the director of the epidemiology department, and head of division for epidemic surveillance and response at the Ministry of Health. In that capacity, he was responsible for developing and implementing programs meant to prevent, and rapidly respond to emerging and re-emerging infectious diseases threats. In the United States, he has worked with the University of Minnesota as the regional technical lead for Africa, under the USAID funded One Health Workforce Project that supported higher institutions of learning (public health and veterinary medicine) to develop of a public health workforce with the technical skills and cross-sectoral capacity to readily adapt and respond to emerging infectious disease threats in eight African countries. He has also worked as an international consultant with the UN Food and Agriculture Organization (FAO), to assess One Health operationalization gaps in the Africa region. He also served as the senior advisor on COVID-19 response with the Africa CDC, supporting the Ministry of Health in Rwanda. Currently, he is working with the USAID mission in Ivory Coast as the GHSA Senior Consultant. He is fluent in English and French. He received an MD/M.P.H from the University of Rwanda, and a MMSc-GHD from Harvard Medical School.

Jonathan ("Jono") D. Quick, M.D., M.P.H., is an internationally known global health leader and the author of The End of Epidemics: The Looming Threat to Humanity and How to Stop It (www.endofepidemics.com 2018, 2020). Drawing lessons from the last 100 years on how to prevent epidemics from spreading worldwide, Dr. Quick has been interviewed media about the COVID-19 pandemic by North American, European, and Asian. A family physician and health management specialist, Dr. Quick is Managing Director for Pandemic Response, Preparedness, and Prevention at The Rockefeller Foundation and adjunct Professor of Global Health, Duke Global Health Institute. He has served as President and Chief Executive Officer of the global health nonprofit Management Sciences for Health; director of essential medicines at the World Health Organization; resident advisor for health system development and financing programs in Afghanistan and Kenya. Dr. Quick has carried out assignments to improve the health and lives of people in over 70 countries in Africa, Asia, Latin America, and the Middle East. He also holds faculty appointments at Harvard Medical School and the University of Boston School of Public Health; is a past Fellow of the Royal Society of Medicine; has a first degree from Harvard University and an MD, with distinction in research, and masters of public health from the University of Rochester.

Peter Rabinowitz, M.D., M.P.H., is a board certified physician and a Professor at the University of Washington (UW), jointly appointed in Environmental and Occupational Health Sciences, Global Health, and Family Medicine, with adjunct appointments in the Department of Medicine Division of Allergy and Infectious Disease as well as the Department of Epidemiology. I have over 20 years of research experience with a current focus on zoonotic diseases, and more than 100

publications and 20 book chapters on zoonotic and emerging infectious diseases, One Health, and occupational medicine. I am the Director of the Center for One Health Research at UW that focuses on zoonotic diseases and other health connections between humans, animals, and environments. I have a particular interest in increasing the involvement of human health professionals in One Health research and practice related to zoonotic diseases.

David Rizzo, Ph.D., received his doctorate in plant pathology from the University of Minnesota and subsequently joined the faculty of the University of California, Davis, Department of Plant Pathology and the Graduate Group in Ecology in 1995. In 2013, Dr. Rizzo became chair of the Department of Plant Pathology. Research in his lab focuses on the ecology and management of tree diseases, including diseases caused by both native and introduced pathogens. Research in the lab takes a multi-scale approach ranging from experimental studies on the basic biology of organisms to field studies across landscapes. In addition to research, Dr. Rizzo teaches a number of courses in One Health and mycology. He is director of the One Health-focused undergraduate major, Global Disease Biology. The major is a collaboration between the Department of Plant Pathology in the College of Agricultural and Environmental Sciences, the School of Veterinary Medicine, and the School of Medicine at UC Davis. Since 2004, he has also been director of the Science and Society program in the College of Agricultural and Environmental Sciences. Science and Society is an academic program designed to offer students the opportunity to discover the interdisciplinary connections that link the biological, physical and social sciences with societal issues and cultural discourses.

Cristina Romanelli, M.A., M.Sc. is the interagency liaison for the UN Biodiversity Convention under its joint work programme on biodiversity and health with the World Health Organization. She has over 17 years of experience as a sustainability professional working in policy evaluation and development, multi-stakeholder engagement, and interdisciplinary research with the United Nations, specialized agencies, the public and private sectors, and non-governmental organizations. She has provided high-level scientific and policy advice in research and regulatory-compliance settings, primarily in the areas of biodiversity and ecosystem management and conservation, global and public health, One Health, climate change, and regulatory energy policy. She also jointly organized and led capacity-building workshops convened by the UN Biodiversity Convention and WHO, bringing together Ministries of health and environment, experts and local community representatives across over 85 countries in Latin America, Africa, Europe and the ASEAN region. She was principal lead coordinating author of the WHO & CBD-led State of Knowledge Review, Connecting Global Priorities: Biodiversity and Human Health, and has contributed to several other UN reports, most recently leading the development of biodiversity-inclusive policy guidance on One Health adopted at the 2018 UN Biodiversity Conference (COP 14). Prior to joining the CBD in 2010, she worked as a senior sustainability consultant focusing on sustainable development policy, energy regulation, and climate change, contributing to over 35 energy regulatory proceedings across North America. She holds a Master of Science and a Master of Arts.

Danielle Sholly, Ph.D., M.S., is an Animal Scientist within the Office of New Animal Drug Evaluation at FDA's Center for Veterinary Medicine. Dr. Sholly obtained her Doctor of Philosophy and Master of Science degrees in swine nutrition from Purdue University. Her graduate research focused on the impact of dietary modifications on animal growth and nutrient excretion from growing-finishing pigs. Danielle joined CVM in 2009 and enjoys the pre-approval side of new animal drug approval; reviewing target animal safety and effectiveness data for food animal drugs. She also enjoys collaborating on projects and issues that encompass the three branches of a One Health Approach – human, animal, and environmental health. Outside of her work at CVM, Danielle enjoys spending time with family, friends, and pets, reconnecting with her love of ceramics, and traveling.

Jonathan Sleeman, ECFVG, is currently the Center Director for the USGS National Wildlife Health Center where he leads a team of scientists and support staff to investigate and research wildlife diseases that threaten wildlife populations, public health, and the economy. He received his master's degree in zoology and his veterinary degree from the University of Cambridge, and completed and internship and residency in zoological medicine at the University of Tennessee. He is a Diplomate of the American College of Zoological Medicine. He has published widely on topics related to wildlife anesthesia, emerging diseases of wildlife, wildlife epidemiology, risk assessment, One Health, and Ecohealth. He holds a

variety of leadership positions including a member of the OIE's Working Group on Wildlife and is a Board member for Ecohealth International. Current interests include development of national wildlife health programs in Asia and Africa, broad-scale wildlife disease risk assessments, and leadership skills in wildlife health.

Woutrina Smith, D.V.M., M.P.V.M., Ph.D., is a Professor of Infectious Disease Epidemiology in the School of Veterinary Medicine at the University of California, Davis, and co-leads the USAID One Health Workforce – Next Generation Project working with AFROHUN and SEAOHUN. She also co-leads the multi-campus Planetary Health Center of Expertise within the UC Global Health Institute, and is an Associate Director at the UC Davis One Health Institute. Dr. Smith has worked on One Health research projects across Africa, Asia, and in the Americas, where multidisciplinary teams innovate together to solve complex health problems. Dr. Smith has received funding from diverse sources including the National Institutes of Health, the US Agency for International Development, the US Department of Defense, and the Bill & Melinda Gates Foundation to support her research and training programs.

Claire Standley, M.Sc., Ph.D., is an Assistant Research Professor within Georgetown University's Center for Global Health Science and Security, with faculty appointments in the Department of Microbiology & Immunology and the Department of International Health. She is also affiliated with the Heidelberg Institute for Global Health in Heidelberg, Germany. Her research focuses on the analysis of health systems strengthening and international capacity building for public health, with an emphasis on multisectoral and integrated approaches for the prevention and control of infectious diseases, particularly in the context of public health emergency preparedness and response. Prior to joining Georgetown University, Dr. Standley was a Senior Research Scientist at The George Washington University Milken Institute of Public Health, and also served as an American Association for the Advancement of Science (AAAS) Science & Technology Policy Fellow at the Department of State, where she supported programs for laboratory capacity building, disease surveillance, and cooperative health security research.

Dr. Standley received a B.A. (Hons) in Natural Sciences from the University of Cambridge, an MSc in Biodiversity, Conservation, and Management from the University of Oxford, and a Ph.D. in Genetics (with a focus on Biomedical Parasitology) from the University of Nottingham, as part of a joint program with the Natural History Museum of London, and completed a postdoctoral fellowship in biodiversity and infectious diseases at Princeton University.

Rajeev Venkayya, M.D., is President of the Global Vaccine Business Unit at Takeda Pharmaceutical Company Ltd, where he leads a vertically-integrated business developing vaccines for dengue, norovirus and Zika. He also oversees partnerships with the Japanese Government to supply COVID-19 and pandemic influenza vaccines. He serves as an independent member of the board of the Coalition for Epidemic Preparedness Innovations (CEPI), which is funding and coordinating several vaccine development programs for SARS-CoV-2 (the virus that causes COVID-19). He is also on the board of the International AIDS Vaccine Initiative (IAVI) and is a life member of the Council on Foreign Relations.

Dr. Venkayya is currently co-leading Takeda's response to the COVID-19 outbreak, given his previous experience at the White House as Special Assistant to the President for Biodefense. In this role, he was the principal author of the National Strategy for Pandemic Influenza (2005), and his office led the development and execution of the companion Implementation Plan (2006). His team conceived the strategy of early, coordinated implementation of non-pharmaceutical interventions to slow the spread of a pandemic virus, now known as the "flattening the curve," that was described in the US Government's guidelines on community mitigation of pandemic influenza (2007). These guidelines were updated in 2017 to reflect the lessons of the 2009-H1N1 outbreak, and the concepts therein are being implemented or considered by governments around the world to slow the transmission of SARS-CoV-2.

Prior to joining Takeda, Dr. Venkayya served as Director of Vaccine Delivery at the Bill & Melinda Gates Foundation's Global Health Program, where he was responsible for the foundations top two priorities of polio eradication and the introduction of new vaccines into developing countries through Gavi, the Vaccine Alliance. He also served on the board of Gavi.

Dr. Venkayya trained in Pulmonary & Critical Care Medicine at the University of California, San Francisco, where he also served on the faculty. He was a resident and Chief Medical Resident in internal medicine at the University of Michigan. He received his B.S./M.D. from the Northeast Ohio Universities College of Medicine, where he was inducted into the Alpha Omega Alpha honorary medical society.

Dr. Venkayya lives in Boston with his wife Viktoria and their two sons. He is active on social media and can be found on Twitter: @rvenkayya

Supaporn Wacharapluesadee, Ph.D., is the Laboratory Head at the Thai Red Cross Emerging Infectious Diseases Health Science Centre (TRC-EID), King Chulalongkorn Memorial Hospital, Faculty of Medicine, Chulalongkorn University, a WHO Collaborating Centre for Research and Training on Viral Zoonoses. Her research interests include emerging infectious diseases in bats (including Nipah, Rabies, Coronavirus, and novel pathogens) as well as molecular diagnoses and sequencing of viruses. TRC-EID is responsible for molecular diagnoses services to the hospital, and is the reference laboratory for rabies virus, MERS-CoV, Ebola, Zika, and other infectious diseases diagnoses for Ministry of Public Health, Thailand. She has served and consulted on several WHO and Thai government committees. Dr. Wachaeapluesadee's team was the first to positively identify a human COVID-19 infection outside of China.

Michael Wilkes, M.D., M.P.H., Ph.D. is widely known for his efforts to introduce medical students to the humanistic side of being a physician, and for working tirelessly to include the public health and social sciences as part of training physicians. During his tenure as Vice Dean of the Medical School he lead the way toward enormous changes in medical education at UC Davis including the rural prime program, the college system of mentoring, and a dramatic shift away from lectures toward small group and interactive learning. Dr. Wilkes introduced UC's "Doctoring" curriculum, a series of classes and seminars for all four years of medical school. Topics within the curriculum include One Health, interprofessional education, leadership, doctor- patient communication, and clinical reasoning to name but a few. Dr. Wilkes has extensive experience in the development, management, and evaluation of eLearning technologies. In his current capacity as Director of Global Health he works locally with the UC Davis Vet and Nursing faculty and with medical and health sciences schools around the world helping to build capacity by creating environments to train the most capable health providers to address local health needs. He serves as a reviewer for many medical publications and is an award winning journalist currently with NPR. He is also an adolescent health physician.

Dana Wiltz-Beckham, D.V.M., M.P.H., M.B.A., is a native Houstonian. She earned her undergraduate degree from Prairie View A&M University, Doctor of Veterinary Medicine from Tuskegee University, and her MPH/MBA from Benedictine University. After veterinary medical school, Dr. Wiltz-Beckham worked in The Gambia, West Africa as a veterinarian and laboratory diagnostician for one year. Returning to the United States, she trained at University of Texas Southwestern Medical Center as a National Institute of Health (NIH) fellow in Comparative Medicine. Dr. Wiltz-Beckham has over 20 years of experience in the public health and research fields. Her professional background consist of jobs as a laboratory animal veterinarian consultant, director of Palo Alto College Veterinary Technology Program in San Antonio, TX, Regional Zoonosis Control Veterinarian for Texas Department of Health HSR 6/5S, director of Animal Services, chief epidemiologist, and Director of Community Health Services for Galveston County Health District. Currently, she serves as the director for the Office of Science, Surveillance, and Technology at Harris County Public Health. Additionally, she is a longstanding adjunct faculty member at University of Texas Medical Branch (UTMB). Dr. Wiltz-Beckham has worked extensively within the Southeast region of Texas on disease investigation, One Health initiatives, emergency management, education and surveillance. Dr. Wiltz-Beckham spends her time away from work with her family and enjoys giving back to the community that made her who she is today.

Irene Xagoraraki, Ph.D., is an Associate Professor of Environmental Engineering at Michigan State University. She earned her Ph.D. and MS degrees in Environmental Engineering from the University of Wisconsin-Madison and her BS degree in Environmental Science from the University of the Aegean in Greece. Her research is focused on water quality engineering emphasizing protection of public health and prevention of waterborne disease. She is interested in microbial contaminants

and their fate in water systems. Her current research focuses on viral outbreak identification and prediction using wastewater-based epidemiology. Her research projects have been funded by the National Science Foundation (NSF), the Michigan Department of Environment, Great Lakes and Energy (EGLE), the Great Lakes Water Authority (GLWA), the Environmental Protection Agency (EPA), the Department of Homeland Security (DHS), Water Research Foundation (WRF), Water Environmental Research Foundation (WERF) and other agencies.

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