



# Milken Institute School of Public Health

THE GEORGE WASHINGTON UNIVERSITY

## BACKGROUND

### Pioneering Ebola Response

A model for local leadership to address emerging  
infectious disease

Challenges and opportunities for future detection of  
pandemic threats

Tuesday, May 24, 2022 – 10:00-11:30 (EDT)

#### Contents

Event Overview .....	1
Symposium Speaker Biographies .....	3
USAID Infectious Disease Detection and Surveillance Program (IDDS).....	9
About the National Institute of Biomedical Research (INRB).....	9
Rodolphe Mérieux Laboratory INRB Goma .....	10
About the Milken Institute School of Public Health at the George Washington University.....	11
About the Mérieux Foundation .....	11
Additional Background on Ebola and DRC .....	13

## Event Overview

At a time when the Democratic Republic of Congo (DRC) is experiencing its 14<sup>th</sup> Ebola outbreak since the discovery of the virus, the Milken Institute School of Public Health and the Mériex Foundation USA are bringing together top experts in global health security, epidemiology, and international health to honor the groundbreaking work of Professor Jean-Jacques Muyembe Tamfum, the first scientist to investigate the first Ebola outbreak in 1976.

One of Time Magazine's most influential people of 2020 and Nature's ten people who mattered in science in 2019, Jean-Jacques Muyembe has also been recognized by numerous international awards, including the 2015 Christophe Mériex Prize, the 2015 Royal Society Africa Prize and the government of Japan's Hideyo Noguchi Africa Prize for 2019.

A professor of Microbiology at the University of Kinshasa Medical School, Director of the National Institute of Biomedical Research ([INRB](#)) and a scientific advisor to the WHO, Prof. Muyembe has devoted his career to transforming the management and treatment of Ebola virus disease. In the process, he has forged a successful model for local innovation and shown the world what investing in laboratory capacity and partnering with researchers in low- and middle-income countries can achieve.

Jean-Jacques Muyembe has advocated throughout his career for the place of scientists from the global South in international research, turning the tide on "scientific colonialism". He has worked to bring topflight laboratory infrastructure and develop local subject matter experts in the DRC so that future generations of Congolese are able to perform research in their own country.

In 1976, there was no place in the Democratic Republic of Congo where Prof. Muyembe could analyze the blood specimen he collected from that first deadly outbreak. For decades, the discovery of Ebola was only attributed to his colleagues in Belgium, England and the United States who had the laboratory capacity and resources to study the novel pathogen.

The symposium will highlight the strong international partnerships which have benefitted both public health and science in DRC and worldwide.

Professor Muyembe will share the story of an experiment which paved the way for the development of novel treatments for not only Ebola but also COVID-19. In 1995, during an Ebola outbreak in the southwestern Congolese city of Kikwit, he experimented with treating Ebola patients with a blood transfusion from a survivor. Out of eight treated, seven survived. A decade later, in 2006, he began partnering with a team of scientists from the NIH's National Institute of Allergy and Infectious Diseases (NIAID) Vaccine Research Center, led by symposium panelist, Dr. Nancy Sullivan, to develop and test a human monoclonal antibody (mAb114) derived from the blood of a survivor from that 1995 outbreak. The novel treatment, licensed under the name EBANGA, received approval from the U.S. Food and Drug Administration in December of 2020.

Another important partnership is with USAID and the Mériex Foundation, which joined forces to establish the Rodolphe Mériex Laboratory at INRB Goma and address a critical lack of testing and surveillance capacity in eastern DRC in the midst of the Ebola outbreak of 2018-2020. The goal was to provide a permanent reference laboratory for Ebola and other viral hemorrhagic fevers, a secure biobank for samples collected during outbreaks, and an operations center for INRB outbreak response teams to enable rapid investigation of future outbreaks. With the arrival of the COVID-19 pandemic, the laboratory became the main testing center for eastern DRC and the base for outbreak control in the region. Dr.

Dorothy Peprah, Global Health Security Advisor at USAID, will discuss the agency's work to continue to strengthen global health security and the laboratory system in eastern DRC through the Infectious Disease Detection and Surveillance (IDDS) project.

### **Symposium Program**

The symposium will cover Jean-Jacques Muyembe's legacy and unique contribution to science and medicine worldwide, as well as explore today's most pressing challenges for emerging infectious disease response and models for success:

- Welcome and introduction by **Dr. Jon Andrus**, Adjunct Professor, Milken Institute School of Public Health
- Presentation by **Prof. Jean-Jacques Muyembe Tamfum** on 'Lessons from the discovery of Ebola and outbreak response in Democratic Republic of Congo'
- Panel discussion moderated by **Dr. David Heymann**, Chairman of the Mériex Foundation USA and Chair of WHO's Strategic and Technical Advisory Group on Infectious Hazards (STAG-IH). While at CDC in sub-Saharan Africa, Dr. Heymann investigated the first Ebola outbreak discovered by Prof. Muyembe. The panel discussion on 'Challenges and opportunities for future detection of pandemic threats' will feature:
  - **Dr. Tom Inglesby**, Director, Center for Health Security, Johns Hopkins Bloomberg School of Public Health
  - **Dr. Rebecca Katz**, Director, Center for Global Health Science and Security, Georgetown
  - **Dr. Christopher N. Mores**, Professor, Department of Global Health, Director, BSL-3 Containment Facility, Milken Institute School of Public Health, George Washington University
  - **Dr. Nancy Sullivan**, Senior Investigator, Acting Chief, Viral Pathogenesis Laboratory, Chief, Biodefense Research Section, NIAID
  - **Dr. Daniel Mukadi**, Regional Director, National Institute of Biomedical Research (INRB), Director of the Rodolphe Mériex Laboratory INRB Goma
- Q&A
- Closing remarks by **Dr. Dorothy Peprah**, Senior Global Health Security Agenda Advisor, USAID

## Symposium Speaker Biographies

### Dr. Jon Andrus, MD

Dr. Andrus is Adjoint Professor and Director of the Division of Vaccines and Immunization of the University of Colorado's Center for Global Health. He is also Adjunct Professor for Global Health at George Washington University. Dr. Andrus leads efforts to advocate for the evidence-based use of vaccines in developing countries. Over his >35-year global health career Dr. Andrus has served as Deputy Director of the Pan American Health Organization (PAHO); Director and Lead Senior Technical Advisor for PAHO's immunization program providing oversight for PAHO's measles-rubella elimination and other immunization initiatives; and the Regional Advisor for polio eradication in WHO's Southeast Asia Region from 1993-2000. He has also held positions as Head of the Vaccinology and Immunization Program at the Institute for Global Health at the Universities of California at San Francisco and Berkeley; and Professor and Director of the Global Health MPH Program at George Washington University.



Dr. Andrus began his global health career as a Peace Corps volunteer, serving as the District Medical Officer in Mchinji, Malawi. Currently, Dr. Andrus serves on several global health advisory groups, including: Chair of PAHO's Regional Commission for Re-Verification and Monitoring Measles Rubella Elimination in the Americas, Member of PAHO's Technical Advisory Group for Vaccine Preventable Diseases, Member of WHO's Southeast Asia's Regional Verification Commission for Measles and Rubella Elimination. Dr. Andrus has published more than 120 scientific peer-reviewed papers. He has received numerous awards for his leadership in the eradication of polio, measles, rubella and congenital rubella syndrome, as well as for the introduction of new vaccines in developing countries.

### Dr. Jean-Jacques Muyembe Tamfum, MD, PhD

Dr. Muyembe has been the Director General of the National Institute of Biomedical Research (INRB) since 1998, where his main scientific interest is in Ebola hemorrhagic fever. He is a Professor of Microbiology at the Faculty of Medicine of the University of Kinshasa and scientific advisor to the WHO.

Dr. Muyembe has been recognized for his pioneering work by distinguished rewards including: The National Gold Medal for his scientific contribution, Laureate of J. Vandepitte prize (Katholieke Universiteit te Leuven, Belgium), Lifetime Achievement Award, 2015 for Excellent in Filovirus Research (7th International Symposium on Filoviruses, Washington, March 25-28, 2015), Winner of the Royal Society Pfizer Advanced Award for his seminal work on Ebola Hemorrhagic Fever in Africa, and Honorary International Fellow of ASTMH for his eminent contribution to Ebola Virus Disease studies in Africa. He is the author and co-author of more than 100 scientific papers in peer reviewed journals.



Dr. Muyembe is also the winner of the 2015 Christophe Mérioux Prize for his research on Ebola hemorrhagic fever in the Congo basin. This prize, worth 500,000 euros, is awarded each year by Fondation Christophe et Rodolphe Mérioux of Institut de France to a researcher or a research team, studying infectious diseases in developing countries.

### **Dr. David Heymann, MD, DTM&H**

Dr. Heymann is currently professor of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, head of the Centre on Global Health Security at Chatham House, London. During the COVID-19 pandemic, Dr. Heymann has been the chair of the WHO Strategic and Technical Advisory Group on Infectious Hazards (STAG-IH) that has gained oversight of pandemic responses worldwide and provided strategic technical pandemic guidance to the WHO emergencies programme



Previously he was the World Health Organization's assistant director-general for Health Security and Environment, and representative of the director-general for polio eradication. From 2012 to March 2017, he was chairman of Public Health England, UK. From 1998 to 2003 he was Executive Director of the WHO Communicable Diseases Cluster, during which he headed the global response to SARS, and prior to that was director for the WHO programme on Emerging and other Communicable Diseases.

Earlier experiences at WHO include chief of research activities in the WHO global programme on AIDS. Before joining WHO, he worked for 13 years as a medical epidemiologist in sub-Saharan Africa, on assignment from the US Centers for Disease Control and Prevention (CDC), where he participated in the first and second outbreaks of Ebola hemorrhagic fever, and supported ministries of health in research aimed at better control of malaria, measles, tuberculosis and other infectious diseases.

Prior to joining CDC, he worked in India for two years as a medical epidemiologist in the WHO smallpox eradication programme. He is an elected fellow of the Institute of Medicine of the National Academies (US) and the Academy of Medical Sciences (UK) and has been awarded several public health awards that have provided funding for the establishment of an on-going mentorship program at the International Association of Public Health Institutes (IANPHI). In 2009, he was appointed an honorary Commander of the Most Excellent Order of the British Empire (CBE) for service to global public health.

David Heymann is a member of the Board of Directors of the Mérioux Foundation and Chairman of the Mérioux Foundation USA. He also contributes regularly to the development of the foundation's programs and courses and is, among others, on the Scientific Advisory Board of the Advanced Course on Diagnostics (ACDx), organized each year by the Mérioux Foundation and the London School of Hygiene & Tropical Medicine at Les Pensières Center for Global Health.

### **Dr. Thomas Inglesby, MD**

Dr. Inglesby is the Director of the Johns Hopkins Center for Health Security at the Bloomberg School of Public Health, dedicated to protecting people's health from the consequences of epidemics and disasters. Dr. Inglesby is also a Professor in the Department of Environmental Health and Engineering in the Johns Hopkins Bloomberg School of Public Health, with a Joint Appointment in the Johns Hopkins School of Medicine.



During the COVID-19 pandemic, Dr. Inglesby has provided technical guidance to response efforts at the global, federal, state, and local level. Dr. Inglesby served as Senior Advisor on the White House COVID-19 Response Team. In 2020, he served on the Biden-Harris transition team reviewing HHS and advising on COVID-19 policy. In 2021, Dr. Inglesby served as Senior Policy Advisor for the COVID-19 response in the Office of the U.S. Health and Human Services Secretary.

Dr. Inglesby's work is internationally recognized in the fields of public health preparedness, pandemic and emerging infectious disease, and prevention of and response to biological threats. He was Chair of the Board of Scientific Counselors for the Center for Preparedness and Response at the US Centers for Disease Control and Prevention (CDC) from 2010 to 2019. He was Chair of the National Advisory Council of the Robert Wood Johnson Foundation's National Health Security Preparedness Index. He was also a member of the CDC Director's External Laboratory Safety Workgroup, which examined biosafety practices of the CDC, the National Institutes of Health, and the Food and Drug Administration following high-profile laboratory incidents in federal agencies. He has served as advisor to US Department of Health and Human Services (HHS), US Department of Defense, and US Department of Homeland Security on preparedness and response issues, and he has testified before Congress on many occasions. He has served on a range of committees and panels of the National Academies of Sciences, Engineering, and Medicine.

Dr. Inglesby has authored or coauthored more than 170 publications, including peer-reviewed research, reports, and commentaries on issues related to health security, preparedness for epidemics, biological threats, and COVID-19. He is Editor-in-Chief of the peer-reviewed journal *Health Security*, which he helped establish in 2003.

### **Dr. Rebecca Katz, PhD, MPH**

Dr. Katz is a Professor and Director of the Center for Global Health Science and Security and holds joint appointments in Georgetown University Medical Center and the School of Foreign Service. She teaches courses on global health diplomacy, global health security, and emerging infectious diseases in the Science, Technology and International Affairs, Security Studies, and Global Infectious Disease Programs.



Before 2016, she spent ten years at The George Washington University as faculty in the Milken Institute School of Public Health. Since 2007, much of her work has been on the domestic and global implementation of the International Health Regulations as well as global governance of public

health emergencies. She has authored over 100 peer reviewed manuscripts, and five books in addition to numerous op eds, blogs, white papers and book chapters.

From 2004 to 2019, Dr. Katz was a consultant to the Department of State, working on issues related to the Biological Weapons Convention, pandemic influenza and disease surveillance. She returned to the Department of State in January 2021 as a senior advisor on the global COVID-19 response and global health security. In 2019, Dr. Katz co-convened the first international scientific conference on global health security, bringing together over 900 participants from around the world to form a community of practice.

### **Dr. Christopher Mores, ScD, SM**

Dr. Mores is an arbovirologist and epidemiologist, who studies emerging infectious diseases and their impacts. Dr. Mores is a Professor in the Department of Global Health at the Milken Institute School of Public Health, George Washington University, where he is Director of a high containment research laboratory, from which he led numerous SARS-CoV-2 studies in response to the pandemic.

He holds a Master of Science in Tropical Public Health and Doctor of Science in Immunology and Infectious Diseases from Harvard University. Dr. Mores completed postdoctoral training in vector-borne and viral hemorrhagic fever viruses as a National Research Council Fellow at the United States Army Medical Research Institute for Infectious Diseases (USAMRIID). He has held professorships at the University of Florida and Louisiana State University where he investigated numerous outbreaks and led laboratories researching pathogen emergence. Dr. Mores responded to the West Africa ebolavirus outbreak in 2014-15 with the Irish NGO GOAL as an infection prevention and control specialist and surveillance lead. He was previously the head of the Virology and Emerging Infections Department at the US Naval Research Unit No. 6 in Peru, during which he investigated the initial Zika virus outbreak in the Americas and many other viral diseases. With the US CDC, he has been engaged in Ebola outbreak response activities and investigations in the Democratic Republic of the Congo since 2020. He continues to work closely with the US government and industry on countermeasures to emerging disease threats and enhancements to health system resiliency.



### **Dr. Nancy Sullivan, ScD**

Dr. Sullivan is a tenured Senior Investigator and Chief of the Biodefense Research Section at the Vaccine Research Center, a division of the National Institute of Allergy and Infectious Diseases (NIAID) at the NIH. She conducted her doctoral thesis in the laboratory of Dr. Joe Sodroski, where her work demonstrated that primary HIV isolates exhibit resistance to antibody neutralization due to occlusion of the coreceptor binding site on gp120. Following her work on HIV, Dr. Sullivan pursued postdoctoral training under the guidance of Dr. Gary Nabel, studying the mechanisms of Ebola virus pathogenesis and immune protection.



Dr. Sullivan's current research is on the immunologic correlates and mechanisms of protection against infection by emerging viruses, including Ebola virus which causes a highly lethal disease for which there

are currently no effective therapeutic or preventive treatments. Dr. Sullivan is a leader in the field and has personally conducted many of the most critical experiments. Her work on filovirus immunology and vaccine development is widely considered as one of the very best in the field despite the difficulties of conducting research under highly specialized BSL-4 containment conditions. Dr. Sullivan's innovative and specialized work on filovirus immunology is recognized worldwide and has consistently been the source of novel observations that have contributed to critical advancements in the field.

Dr. Sullivan's long-term commitment to emerging virus research has resulted in the discovery of both vaccines and therapies. By using a novel gene-based prime boost vaccine, Dr. Sullivan and her team were the first to demonstrate vaccine protection against Ebola infection in primates. This was followed by her discovery of a single shot vaccine that provided more immediate protection, making it a practical vaccine that could be used in the face of an Ebola outbreak. As a result, this vaccination schedule is now standard in the field of Ebola vaccine research, where one of the lead Ebola vaccine candidates, ChAd3-EBOV, has been advanced to Phase I/II and III human clinical trials. More recently, Dr. Sullivan and her team collaborated with Prof. Jean-Jacques Muyembe and INRB scientists to discover from a human Ebola survivor a potentially protective monoclonal antibody, mAb114, that was shown in a randomized controlled trial to be effective in saving the lives of nearly 90% of Ebola patients who were treated soon after they were infected. The therapeutic, Ebanga, was developed in collaboration with INRB, the NIH Vaccine Research Center, and Ridgeback Biotherapeutics and is now FDA approved for the treatment of Ebola virus disease.

### **Dr. Daniel Mukadi-Bamuleka, MD**

Dr. Mukadi has been the Regional Director of the National Institute of Biomedical Research (INRB) branches in the east of DRC and Director of the BSL3/BSL2/BSL2 Rodolphe Mérieux INRB-Goma Laboratory since its opening in June 2020. He has also worked as a field activities supervisor, Head of Research Units, and lecturer in the Viral Hemorrhagic Fever Unit, Department of Virology, INRB-Kinshasa and in the Departments of Microbiology and of Medical Biology, University of Kinshasa, DRC.



Dr. Mukadi has extensive field and laboratory experience in the domain of Ebola virus disease (EVD) and other emerging diseases with deep knowledge of the deployment, management and coordination of field laboratories. As a lab practitioner, he has skills, training, and research experience in Molecular Biology, Genomic Sequencing, Serology, Bacteriology, Immunology and Clinical biology. In the last six years, Dr. Mukadi has been involved in seven EVD outbreaks in the DRC, serving as the Laboratory Coordinator for diagnosis, research, field activities, postmortem surveillance activities, and survivor follow-up laboratories across various provinces and regions of the country. He was the Laboratory Coordinator in "A Multicenter, Multi-Outbreak, Randomized, Controlled Safety and Efficacy Study of Investigational Therapeutics for the Treatment of Patients with Ebola Virus Disease" in partnership with National Institutes of Health (NIH) in the DRC, November 2018-December 2020.

At the start of the COVID-19 pandemic in DRC (June 2020), Dr. Mukadi was appointed as the Coordinator of COVID-19 laboratories in the eastern DRC. He set up and manages COVID-19 INRB field laboratories across 4 provinces in eastern DRC: North-Kivu (Goma, Beni & Butembo), South-Kivu (Bukavu), Ituri (Bunia) & Haut-Uele (Watsa & Isiro). He also set up a sequencing lab capacity in Goma in collaboration with Molecular Epidemiology Department at INRB-Kinshasa and was the Lab Coordinator in "International Study on COVID-19 Vaccine to assess immunogenicity, reactogenicity and efficacy" in



partnership with NIH-InVITE starting in August 2021. Dr. Mukadi is also the author and co-author of numerous scientific papers, covering Ebola, HIV, Hepatitis B, and monkeypox, most recently publishing: “Ebola virus: DRC field laboratories’ rapid response” in *Nature* in April 2022.

### **Dorothy Peprah, Ph.D., M.P.H.**

Dorothy Peprah is a Senior Global Health Security Advisor at USAID with over 15 years of global health experience focused on social and behavioral change interventions, vaccination, community-based prevention and response to infectious disease outbreaks and emerging infectious diseases, and health systems strengthening in contexts of political transition and fragile states.

She has worked with a variety of international organizations and academic institutions to deliver programs and conduct research to improve health outcomes in various communities in collaboration with local stakeholders and government. Her experience spans the range of humanitarian and development settings including Sierra Leone, South Sudan, Ghana, Ethiopia, Afghanistan and other countries for health promotion, women’s empowerment, and the advancement of global health security.



She is a member of the boards of the Institute of Women and Ethnic Studies (IWES) and the Board on Global Health at the National Academies of Sciences Engineering and Medicine (NASEM). Dr. Peprah received her Masters in Public Health from Boston University’s School of Public Health and her doctorate from the London School of Hygiene and Tropical Medicine.

## USAID Infectious Disease Detection and Surveillance Program (IDDS)

The USAID Infectious Disease Detection and Surveillance (IDDS) project operates in more than 20 countries in Africa and Asia where there are significant gaps in health systems' ability to detect, track, and rapidly respond to infectious diseases and drug-resistant infections that pose a major threat to public health and global health security. Since 2020, the Mériex Foundation and INRB have been part of the IDDS consortium led by ICF, supporting projects at the Rodolphe Mériex Laboratory in Goma such as mapping of sample management (collection, storage, transport) and referral systems in Eastern DRC and developing an operational plan for the Eastern regional public health laboratory network.

The [IDDS Fact Sheet](#) introduces the project. The [IDDS DRC Fact Sheet](#) summarizes project activities in the Democratic Republic of Congo, including Ebola virus disease outbreak response.

## About the National Institute of Biomedical Research (INRB)

The National Institute of Biomedical Research (INRB) in Kinshasa serves as the national biomedical research laboratory for the Ministry of Health of the Democratic Republic of Congo (DRC). It is one of five WHO reference laboratories for viral hemorrhagic fevers located in Africa. The INRB was inaugurated in 1984 with the aim of working in synergy with central departments and specialized disease control programs worldwide. It is a multidisciplinary institute that collectively has decades of experience in both the identification, treatment and prevention of disease in the DRC. Its foundations are the performance of medical and biological analyses, applied and translational research, the surveillance of communicable diseases and the promotion of professional growth and development.

The establishment is a modern research institute composed of six laboratories dedicated to Virology, Parasitology, Bacteriology, Medical Entomology, Clinical Biology and Pathology, including a Research Center on animals and a Data Centre. Each laboratory is staffed by a dedicated director and staff, including both students and international collaborators. INRB has a strong collaboration with other in-country institutions for which it serves as the referral laboratory, especially infectious diseases control programs (TB, Malaria, HIV, VHF, Monkeypox), Expanded Program of Immunization (ex: Measles, Rubella, Polio, Tetanus), Department of Epidemiological Surveillance, health and hygiene at the borders, Department of Laboratory Systems, and health district offices in the provinces. The INRB also manages the national network of laboratories throughout the country; the Public Health Laboratories are organized around the INRB.

Director of the INRB, Professor Jean-Jacques Muyembe, has dedicated his career to fighting Ebola. In 2016, Prof. Muyembe, in coordination with other researchers at the INRB and the American NIH Vaccine Research Center, led the research that resulted in mAb114, one of the most promising treatments for Ebola. In December 2020, the monoclonal antibody treatment was approved for medical use in the United States. INRB continues to play a crucial role in Ebola research and pandemic preparedness at the national, regional, and international levels.

## Rodolphe Mérieux Laboratory INRB Goma

The DRC's immense size coupled with its limited functional laboratory infrastructure necessitate the development of reference laboratory capabilities in other parts of the country, especially in eastern DRC, where there is minimal laboratory infrastructure and where more than half of Ebola outbreaks have occurred over the past 40 years.



The establishment of the Rodolphe Mérieux Laboratory in 2020, a branch of INRB in Goma, has brought critical capacities for surveillance, testing, training and research closer to the remote provinces; shortened the time and distance samples must travel before being analyzed; and empowered the provinces in the organization of surveillance, investigation and biological response to epidemics and diseases with epidemic potential.

### Origins

In August 2018, an Ebola virus disease (EVD) epidemic spread amongst populations in the North Kivu, South Kivu, and Ituri provinces of eastern DRC. By the following summer, it was starting to spread to Goma, which is a densely populated city that is highly connected to other major urban hubs in DRC, Uganda, and Rwanda, particularly at risk for EVD transmission due to their size, connectivity, population density, and dynamics. In July 2019, the Chairman of the Mérieux Foundation, Alain Mérieux, received an alert from Professor Jean-Jacques Muyembe, who was coordinating the national response to the Ebola epidemic. Professor Muyembe described the crucial need for a laboratory to improve diagnostic capacities in Goma.

The Mérieux Foundation responded rapidly and by October 2019, airlifted BSL2 and BSL3 biocontainment laboratories and a cold storage unit to Goma, transferring ownership to the local branch of the INRB. These “plug & play” container laboratories, manufactured by the Grenoble-based company IMeBIO, are particularly well-adapted to complex, challenging situations on the ground.

USAID joined forces with the Mérieux Foundation to co-fund the Rodolphe Mérieux Laboratory INRB Goma and establish a permanent reference laboratory for EVD or other viral hemorrhagic fevers, a secure biobank for samples collected in outbreaks, and an operations center for INRB outbreak response teams to enable rapid investigation.

### Activities

Since its start in June 2020, the Rodolphe Mérieux Laboratory INRB Goma has shifted its focus from the Ebola outbreak that receded in 2020 to the COVID-19 pandemic, becoming the main testing center for Eastern DRC. The areas of expertise include virology, molecular biology, bacteriology, immuno-serology, clinical biology, Next Generation Sequencing, and antimicrobial resistance, with emphasis on research and training for staff and biologists from other laboratories. In North Kivu, South Kivu, Ituri, and Haut-Uele provinces there is active surveillance of viral hemorrhagic fevers and respiratory diseases at the hospital, community, and environmental levels through networks and with support from local authority focused on pathogens including Ebola, Marburg, Rift Valley Fever, and COVID-19.

As of 2022, there are approximately 45 staff members, including 15 lab personnel - molecular biologists, virologists, and lab technicians - as well as administrative, logistics, and support staff. The staff is well trained with experience in the management of testing in outbreaks and a strong capacity for deployment in the field for emergency situations. It has become the center of a network with several other laboratories in the province, developing local capacity to provide critical services.

Major accomplishments at the Rodolphe Mérieux Laboratory INRB Goma have included:

- Organizing a COVID-19 response laboratory network in the eastern DRC with 7 laboratories across 4 provinces (North-Kivu, South-Kivu, Ituri and Haut-Uele).
- Managing the 10<sup>th</sup> DRC post Ebola outbreak period, the 12<sup>th</sup> (Butembo, North-Kivu, Feb-May 2021) and 13<sup>th</sup> (Beni, North-Kivu, Oct-Dec 2021) Ebola virus disease outbreaks.
- Establishing a Next Generation Sequencing platform for COVID, Ebola, polio and bacteria.
- Setting up a functional cold chain for reagents, samples, Ebola therapeutics and vaccines (-80°C, -20°C, 2-8°C)

### **A member of the Mérieux Foundation network**

The Rodolphe Mérieux Laboratory at the INRB in Goma is part of a larger scientific network. Nine other Rodolphe Mérieux Laboratories have been created in Mali, Cambodia, Haiti, Laos, Madagascar, Lebanon, Bangladesh, Brazil and Tunisia. Transferred to local public health authorities, hospitals or research centers, these labs help strengthen diagnostics, training and applied research activities in their host countries. The Rodolphe Mérieux Laboratory INRB Goma is part of the foundation's GABRIEL research network, which coordinates collaborative, multicenter research projects among its members, transfers technology for research and testing techniques, organizes workshops and training programs, and provides support and mentorship for quality assurance and biosafety. GABRIEL currently has 21 members in 16 countries, including most of the Rodolphe Mérieux Laboratories.

## **About the Milken Institute School of Public Health at the George Washington University**

Established in July 1997 as the School of Public Health and Health Services, [Milken Institute School of Public Health](#) is the only school of public health in the nation's capital. Today, students from all over the United States and the world pursue undergraduate, graduate and doctoral-level degrees in public health. The school also offers an online Master of Public Health, [MPH@GW](#), and an online Executive Master of Health Administration, [MHA@GW](#).

## **About the Mérieux Foundation**

The Mérieux Foundation, an independent family foundation with public interest status created in France in 1967, is committed to fighting against infectious diseases affecting low- and middle-income countries. The foundation's action is focused on diagnostics, an essential aspect of patient care and an indispensable tool for disease surveillance and control. In the field, the foundation works to improve the living conditions of vulnerable populations, especially mothers and children. Founded in 2012 in Washington, DC, the Mérieux Foundation USA engages American partners in Mérieux Foundation initiatives and opens opportunities for new collaborations and technological innovation to foster sustainable health systems around the world.

Working in 25 countries in Africa, Latin America, Asia and the Middle East, the Mérieux Foundation focuses on 4 objectives:

- Increasing vulnerable populations' access to diagnostics by strengthening clinical laboratories in national healthcare systems
- Enhancing local applied research capabilities by creating Rodolphe Mérieux Laboratories, transferred to local partners, training researchers and developing collaborative programs
- Encouraging knowledge-sharing and public health initiatives leveraging Les Pensières Center for Global Health
- Improving conditions for mothers and children taking a global health approach.

## Additional Background on Ebola and DRC

### Country Context

The Democratic Republic of Congo (DRC), located in the heart of the African continent, is the most populous French-speaking country (including France). With a surface area of 2,345,410 km<sup>2</sup>, it is the second largest country in Africa with an estimated population of approximately 100,000,000 inhabitants. It shares borders with many countries: Congo, Central African Republic, South Sudan, Uganda, Rwanda, Burundi, Tanzania, Zambia and Angola. Its central location increases the risk of transmission of the epidemic to other countries.

The DRC has a very diverse climate depending on the region and is crossed by several rivers including the Congo River and its many powerful tributaries. The DRC also has a rich and varied fauna and flora with the dense and humid forest representing three fifths of the national territory. Because of this rich ecosystem, the DRC is home to several epidemic infectious diseases (Ebola, Marburg, Cholera, etc.), endemic diseases (Human African Trypanosomiasis, Tuberculosis, Malaria, Schistosomiasis, etc.) and diseases with epidemic potential (Measles, Rubella, Yellow Fever, etc.). The areas most affected by the epidemic are difficult to access, due to their geographical isolation or complicated political situation. The progression of the disease transmission is aggravated by the geopolitical situation in the affected areas, which makes the response missions of health organizations very complicated.

The DRC faces several financial, technical and logistical challenges, particularly in the organization of disease surveillance, the distribution of drugs and medical equipment, the conduct of vaccination activities, the organization of the laboratory network and the sample referral system. These challenges are accentuated by factors such as the vastness of the territory, the delay in socio-economic development, the absence or dilapidation of health and communication infrastructures and the isolation of large portions of the country.

### Ebola Outbreaks in the DRC: Overview

In 1976, there was an outbreak in the Équateur province, with most cases occurring within 70 km of Yambuku village. This marked the first discovery of Ebola Virus Disease (EVD). 88% of the reported 318 cases were fatal.

Between 1976 and 2022, there have been fourteen Ebola outbreaks, with the fourteenth being declared in April 2022 after a case was confirmed in the northwestern Équateur province, also marking the third outbreak in the province since 2018.<sup>1</sup>

The Rodolphe Mérieux Laboratory INRB Goma managed the tenth DRC post-Ebola outbreak period (North Kivu, South Kivu, Ituri, 2018-2020), the twelfth (Butembo, North Kivu, Feb-May 2021) and thirteenth (Beni, North Kivu, Oct-Dec 2021) Ebola virus disease outbreaks.

In DRC, since 1977, there have been at least 4,706 laboratory confirmed cases and 3,180 deaths from Ebola virus.<sup>2</sup>

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<sup>1</sup> Source: <https://www.cdc.gov/vhf/ebola/history/chronology.html>

<sup>2</sup> Source: <https://www.cdc.gov/vhf/ebola/history/distribution-map.html>