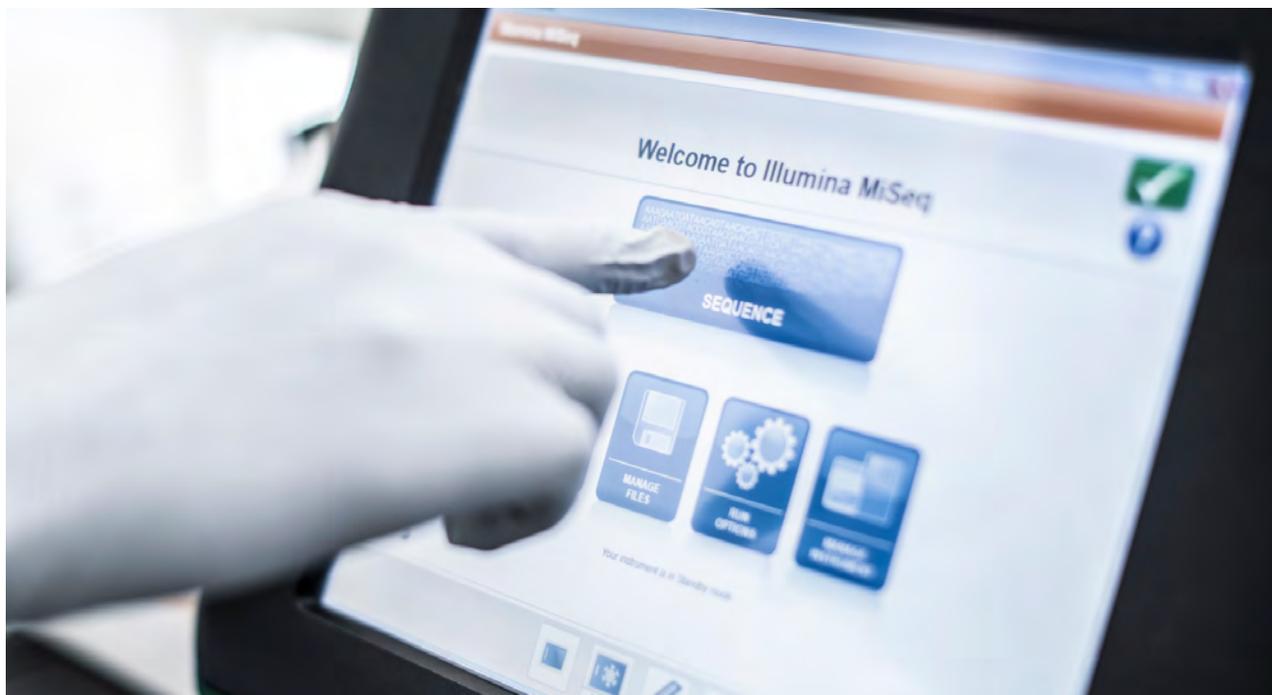


## COVID-19: hunting down the variants

Based on the pasteurian values they all share, the Pasteur Network members are still engaged with many countries and their population worldwide. In this issue, we present some examples of the COVID-19 activities implemented within the projects MediLabSecure, AFROSCREEN, REPAIR and «Support to Instituts Pasteur in SubSaharan Africa».



### SPOTLIGHT

The Institut Pasteur de Guinée: a young institute in the midst of the COVID-19 crisis

Page 2

### ZOOM ON

The study of immunity in infected and recovered COVID-19 patients in Guinea

Page 3

### CONVERSATION

Diagnostics during outbreaks: the case of MediLabSecure

Page 4

### SPOTLIGHT

A mobile laboratory enabling close surveillance of outbreaks

Page 6

SPOTLIGHT



## The Institut Pasteur de Guinée: a young institute in the midst of the COVID-19 crisis

**The decision to set up an Institut Pasteur in Guinea was made in 2014 in response to the Ebola crisis. It reflects the joint determination of France and Guinea to tackle emerging outbreaks on a long-term basis for the welfare of the population. When the COVID-19 pandemic struck, how was this young institute able to fulfill its remit as a front-line laboratory?**

**W**hen the first case of COVID-19 was confirmed in Guinea on March 13, 2020, the health authorities swiftly set up the «Stop COVID-19» task force, through which 7 laboratories including the Institut Pasteur de Guinée performed COVID diagnostic testing in response to the outbreak in the country.

The pace picked up very quickly, so that the Institut Pasteur de Guinée team, composed of two technicians and one post-doctoral fellow in charge of the laboratory, soon found themselves processing 180 diagnostic tests a day, seven days a week. Thanks to emergency funding from

the Agence française de Développement (AFD), the institute was able to acquire reagents, protective and diagnostic equipment to meet rising demand for testing. The team was also expanded, enabling the staff to work in shifts and to deliver PCR-type COVID diagnostics training to almost a dozen individuals.

«This emergency support enabled the institute to secure long-term diagnostic capabilities and hence to control the first wave of the outbreak in Guinea» explains Dr. Solène Grayo, post-doctoral fellow and specialist in viral hemorrhagic fevers and COVID-19 at the Institut Pasteur de Guinée.

Throughout 2020, the institute worked with three sites: Donka referral hospital, the military hospital at Camp Alpha Yaya, and the French Embassy's medical center. Case numbers gradually fell, leading to less frequent sampling. However, two full-time staff members are still exclusively assigned to testing in a bid to improve control of the outbreak.

Until December 2020, COVID-19 cases were caused by the primary viral strain. However, the team witnessed increasing levels of virulence at a time when variants were already circulating in Europe.

«We sensed that variants were present in Guinea as the PCR amplification patterns were different to those observed thus far,» comments Dr. Grayo. «We did not have the sequencing tools to identify variants. Through the Pasteur Network, we were able to send a panel of samples to the Institut Pasteur de Dakar, which confirmed to us that variants were indeed present, although not in the majority of samples.»

Given the potentially serious impact of the COVID-19 pandemic on African countries, the ten African Pasteur Network member institutes joined forces through the REPAIR project. Funded by the French Ministry of Europe and Foreign Affairs, its aim is to conduct an applied research program to understand the circulation of SARS-CoV-2 on the African continent. Joining this project and particularly its diagnostics, sequencing, and epidemiological research components, has enabled the Institut Pasteur de Guinée to benefit from other partners' expertise in these three areas.



*This emergency support enabled the Institut Pasteur de Guinée to secure long-term diagnostic capabilities and hence to control the first wave of the outbreak in Guinea*



**DEVELOPING EXPERTISE TO PARTICIPATE IN MAJOR COVID-19 PROJECTS**

## SEQUENCING: A VITAL TOOL FOR EARLY DETECTION OF VARIANT SPREAD

The Alpha variant arrived in Guinea in early 2021, spreading quickly until late March 2021 and co-circulating with the Eta variant, also known as the «Nigerian variant», until April 2021. The Delta variant emerged in Guinea in May. Given the permanent and increasing co-circulation of these variants, the ability to perform sequencing independently is becoming an essential factor.

«Sequencing is a crucial technique for monitoring the circulation of variants in this country and examining genome evolution,» adds Dr. Grayo. «We received initial training from the Institut Pasteur Laboratory for Urgent Response to Biological Threats (CIBU), which familiarized us with sequencing tools such as MinION. Through the REPAIR project, we acquired the appropriate reagents and consumables for this equipment. We are currently engaged in a development phase in which we continue to draw on Institut Pasteur de Dakar expertise and are therefore dependent on airfreight. We have a delayed view of variant circu-

lation, which is not ideal for monitoring the outbreak.»

To meet this increased demand for sequencing, the Institut Pasteur de Guinée joined AFROSCREEN, a major new project officially launched in July 2021. Funded by the AFD and run by the ANRS-MIE, IRD, and the Institut Pasteur, this two-year project aims at boosting the sequencing capabilities of laboratories in 13 Sub-Saharan African countries with a view to monitoring the evolution of SARS-CoV-2 variants and other emerging pathogens. The project will provide the team put in place with financial support, training, sequencing equipment, reagents, and consumables. Project partners will share their data through the GISAID open-access database, which will enable monitoring and improved understanding of circulation in the region.

«Since Africa is behind in terms of its vaccination roll-out, we must monitor variants through sequencing. With pupils returning to school and increasing international trade due to the economic recovery, the risk of a new wave of the outbreak cannot be ruled out. We need

to be able to meet this demand for sequencing right now,» says Dr. Grayo.

In the long term, this increase in the institute's capacity and expertise will enable real-time control of outbreaks in Guinea and prevent other pandemics. With this early warning system for virus spread in place, the health authorities will be able to trigger effective ad hoc strategies for prevention, patient management, and occasional vaccination of certain populations.●



## Zoom on the study of immunity in infected and recovered COVID-19 patients

Dr Solène Grayo,  
Post-doctoral fellow and specialist in viral hemorrhagic fevers and COVID-19  
Institut Pasteur de Guinée

« Since March 2020, we have performed over 25,000 COVID-19 tests for which we have established a fully anonymized biobank. Through REPAIR, we decided to launch the IMAGE-COVID study with a view to understanding the relationship between levels of antibodies detected in recovered infected COVID-19 patients and the time taken for such individuals to test negative again (short COVID versus long COVID).

Following the national ethics committee's approval of the study protocol, individuals were retrospectively enrolled from mid-May 2021, with 200 individuals currently included.

After signing a consent form, each participant completed a questionnaire and provided a blood sample to determine their antibody levels.

This will enable us to cross-reference demographic and clinical information with individual immune response. The aim is to characterize virus circulation, gain an understanding of how the Guinean population has potentially been immunized in spatiotemporal terms, and translate these data into a more general overview at country level enabling a multi-center study with other REPAIR project partners. The results are currently being analyzed.»

## CONVERSATION



# Diagnostics during outbreaks: the case of MediLabSecure

**As leader of the human virology component of the European MediLabSecure project, the Institut Pasteur Laboratory for Urgent Response to Biological Threats (CIBU) has supported beneficiary countries' SARS-CoV-2 diagnostic capabilities. Project manager Guillain Mikaty reflects on an extraordinary 18 months.**

**T**he MediLabSecure project seeks to strengthen surveillance networks for emerging vector-borne diseases (transmitted by ticks and mosquitoes) in 22 beneficiary countries around the Mediterranean and extending to the Black Sea and Sahel regions. It combines several components as part of a One Health approach: human and animal virology, medical entomology, public health, veterinary services, and modeling of early warning systems incorporating environmental and climatic factors.

Since COVID-19 is a novel emerging zoonotic disease, the European Commission, which funds the project, approved emergency funding to help beneficiary countries manage the outbreak, and in particular, build their diagnostic capabilities.

**What were your first supportive activities on learning of this novel virus?**

**Guillain Mikaty (GM):** Given the CIBU's core activity, we were informed relatively early of this novel virus. We knew it had to be taken seriously, as it was a coronavirus like SARS and MERS, which both emerged in the past 20 years and showed significant infectious potential.

We attended the MediLabSecure Regional Meeting for Sahel countries held in Dakar (Senegal) in January 2020. We took the opportunity offered by this event to hold a meeting on coronaviruses and their impact. One week later, using the whole genome sequence for the virus, which had been shared by the Chinese team that first identified it, Dr. Leo Poon's team at the Hong Kong University-Pasteur Research Pole developed and shared a PCR protocol for diagnostics with members of the Pasteur Network. We in turn passed on this information to the MediLabSecure network.

We were faced with the initial challenge that no one had a positive control to verify the diagnostics and thus validate the results. We therefore produced positive controls based on the SARS virus, which is closely related to SARS-CoV-2, and shared them with the network. At that time, suspected cases were emerging veritably everywhere

in the world.

By late January 2020, we had all the necessary information for diagnostics: whole genome sequencing of the virus, protocols and primers, but we were not the only ones! Given the pressures on reagent producers' stock, we centralized all the MediLabSecure network's orders and sent shipments to the various countries.

Our objective was clear: to provide all our beneficiary laboratories with a diagnostic tool for identifying suspected cases!

**How did you support project beneficiaries during the pandemic?**

**GM:** Between January and March 2020, we supported the MediLabSecure project beneficiary countries by centralizing orders and shipping reagents.

We also helped confirm the first positive cases in the MediLabSecure network with the National Reference Center (CNR) for Respiratory Infection Viruses at the Institut Pasteur in Paris. In fact, part of a reference center's remit is to confirm laboratories' initial diagnostics data in the event of novel emerging viruses. This was carried out within the MediLabSecure networks and, more broadly, within the Pasteur Network.

The ability to assess diagnostics is also

Dr. Guillain Mikaty, a microbiologist working at the Laboratory for Urgent Response to Biological Threats (CIBU) at the Institut Pasteur and project manager for the human virology component of MediLabSecure, reflects on the past 18 months.





## SPOTLIGHT

# A mobile laboratory enabling close surveillance of outbreaks

**In recent years, West Africa has faced several outbreaks whose impact on people, health, and the economy has been severe, as response has been slow and ineffective. To improve this situation, local authorities and international organizations have joined forces to implement agile surveillance and response measures to tackle the emergence of outbreaks in areas that are sometimes difficult to access.**

In order to monitor and respond to emerging diseases, laboratory equipment and qualified staff are needed. Effective surveillance of outbreaks is hampered by the existence of isolated areas and a lack of qualified staff, particularly for BSL-3 laboratories.

Given this situation, the Institut Pasteur de Dakar has developed a comprehensive outbreak surveillance, investigation, and containment strategy in collaboration with the Senegalese Ministry of Health and international institutions including WHO. This response to a public health emergency is based on deploying mobile laboratories staffed by qualified personnel, in order to quickly detecting and identifying outbreaks.

### THE EUWAMLAB MOBILE LABORATORY: A KEY ELEMENT IN THIS RAPID RESPONSE STRATEGY

The facilities deployed include a mobile laboratory truck funded by the European Union through its European West African Mobile Laboratory project (EUWAMLab), which is a prime example of steps taken in this field. This BSL-3 laboratory deployed in Guinea during the Ebola outbreak in 2015 was transferred to the Institut Pasteur de Dakar in 2018.

When the COVID-19 outbreak struck in 2020, the European Commission's Directorate-General for International Partnerships funded its refurbishment through the CBRN Centers of Excellence Initiative using the MediLabSecure emergency fund. This was completed in April 2020.

Throughout the outbreak, the EUWAMLab has enabled the Institut Pasteur de Dakar to adapt to the evolving situation. At the peak of the crisis, it accommodated an additional 10% of samples, enabling the Institut Pasteur de Dakar to test up to 2,000 samples daily.

### TRAINING: A KEY COMPONENT IN OUTBREAK SURVEILLANCE

Besides providing useful assistance during outbreaks, there are plans to make the EUWAMLab mobile laboratory truck a key training facility at Institut Pasteur de Dakar.

Indeed, skilled staff trained in diagnostics are essential for ensuring an effective response to outbreaks. This mobile BSL-3 laboratory will provide training and practice with performing laboratory techniques in a confined space.

The Institut Pasteur de Dakar will therefore not only have access to a suitable additional facility, but also trained skilled staff. Through its connection to training and professional networking, the laboratory will also provide the Institut Pasteur de Dakar with a team of local experts who can be deployed in the event of outbreaks. ●

How did the Institut Pasteur de Dakar use the EUWAMLab mobile laboratory in its response to COVID-19?

[Watch the video \(in French\)](#)



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Editorial: Alice Henry-Tessier - Design: Toma Block /Tom&Fred - Photo credits: Institut Pasteur de Guinée;  
Institut Pasteur de Dakar; Institut Pasteur/Guilain Mikaty

The Journal of Projects presents examples of Pasteur Network mobilization.  
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