

Building Whole Genome Sequencing and Bioinformatics Capacity in Central and South America

As it did throughout much of the world, the COVID-19 pandemic highlighted the need to build public health sequencing capacity in Central and South America.

When SARS-CoV-2 began to spread in 2020, some places had little to no whole genome sequencing capacity in place. In Honduras, for example, all samples initially had to be sent out of country, resulting in a two-month turnaround time that did not allow for public health decision making.

As the pandemic continued, many countries received donations of laboratory equipment, but local laboratories often did not have the experience or training needed to implement protocols and analyze the data.

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— *Soany Avilez, Honduras National Virology Laboratory*

“There was a lack of training in next generation sequencing (NGS), as well as in how to integrate its use into a sustainable model for public health surveillance,” says Adolfo Lara, a global health NGS and bioinformatics specialist with the Association of Public Health Laboratories (APHL).

For several months, APHL has been helping countries fill these gaps. Building off foundations laid during the pandemic, they aim to establish NGS as a core laboratory capacity in the Central and South American regions, with a focus on expanding beyond single-pathogen sequencing and developing bioinformatics expertise. In collaboration with the Pan American Health Organization (PAHO), US Centers for Disease Control and Prevention and local ministries of health, APHL is also working to establish local and regional networks to help in-country teams incorporate sequencing data and informatics into broader public health efforts.

“APHL’s goal in these countries is first to ensure NGS and bioinformatics technical training are in place, but then to move beyond that to integrate this knowledge into longer-term goal-setting and decision making, to incorporate it into a sustainable model that can become part of a public health surveillance system,” says Julia Pringle, lead specialist in global health NGS and bioinformatics at APHL.

In-country Support

One of the first steps for APHL has been to lead conversations with in-country staff and help them set goals for their teams. Then, trainings tailored to their identified needs can help them build the technical and informatics capacity to achieve these goals.

Laboratories in Colombia and Paraguay, for example, had established expertise in sequencing multiple pathogens but identified bioinformatics as an area where they needed additional support. For the past year, APHL has focused on providing education on best practices in bioinformatics to improve the long-term quality and sustainability of the NGS programs in these countries.



Bacteriologists from Paraguay’s Laboratorio Central de Salud Publica prepare an ONT sequencing library for foodborne pathogen samples including *Salmonella* and *E. coli*. This was the first time the Bacteriology laboratory staff received training in and performed ONT sequencing.

In Honduras, however, NGS became a new priority during the pandemic, with the microbiology team restructuring the laboratory to prioritize sequencing efforts. Their initial work focused on SARS-CoV-2, but they have quickly moved to onboard several additional pathogens.

APHL has supported multiple trainings in Honduras to expand these efforts to bacterial pathogens and to add a second sequencing platform. An in-person laboratory training session in May 2024 enabled many notable “firsts”: the country’s first bacterial sequencing, first training in Honduras on the ONT platform, first MinION sequencing run, and first sequencing training for agricultural, veterinary and bacteriology laboratories.

“We went from not even sequencing, to state-of-the-art technology. It is beautiful,” said Soany Avilez, a microbiologist at the National Virology Laboratory in Honduras. “Sequencing in our country has generated a considerable impact on public health.”

APHL provided training in wet-lab NGS protocols for bacterial sequencing for Honduran scientists from National Virology, Bacteriology, Agricultural and Veterinary laboratories and the National University.



Sustainable Knowledge Networks

Another accomplishment was a bioinformatics workshop to teach laboratory staff—who often have backgrounds in microbiology rather than informatics or computer science—critical bioinformatics skills to be able to analyze sequencing data.

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These advances mark an important turning point for Honduras. “We are noticing the progress,” said Karla Romero, another microbiologist in the Honduras laboratory. “In the long term, we can not only sequence bacteria and other microorganisms, we can also implement metagenomics protocols—it is very significant for us and for the country.”

Many of these trainings focus on providing in-country laboratory staff with the knowledge and experience to deliver their own sessions for other local personnel. Avilez has found this “train the trainer” approach especially useful. “The fact that we can transmit the knowledge to other people strengthens our knowledge, too,” she says.

The next step is to get genomic information out of the laboratory so it can be used to guide broader public health efforts. Early in 2024, APHL started facilitating connections between laboratory and epidemiology teams in Honduras to explore how their complementary perspectives, expertise and information can improve data-driven decision making.

Also in May, a regional bioinformatics training brought together scientists from throughout Central America—Guatemala, Costa Rica, El Salvador and Panama—and Argentina. “Getting all those folks in one room together was really valuable, a step together building a community of practice in the region,” says Pringle.

“Thanks to the support of APHL colleagues, genomic sequencing capabilities in Honduras have been significantly strengthened. We are now able to manage and analyze genomic data more efficiently, enabling a faster and more accurate response to disease outbreaks,” says Gabriela Rodríguez Segura, an infectious disease consultant in the Honduras PAHO office. “In addition, knowledge sharing and collaboration between institutions have strengthened our national genomic surveillance network, following the One Health approach.”

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