Wisconsin builds cutting-edge molecular testing infrastructure to respond to infectious diseases

CSTE Stories FROM THE Field

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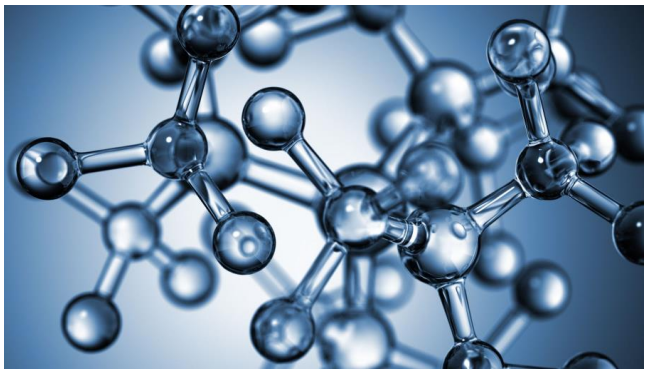
CATEGORY: **Epidemiology and Laboratory Capacity (ELC)**

CATEGORY: **Laboratory Data Exchange**

To remove manual, error-prone processes, Wisconsin State Laboratory of Hygiene utilized funds to invest in more automated instruments and a new laboratory information system. With these changes, dataflows have increased in efficiency and accuracy which allows public health to quickly receive these data and initiate their response.

Next-generation sequencing (NGS) is a transformational technology for public health. NGS allows for the whole-genome sequencing of any pathogen, for a deep dive into its genome. This has many applications, including identifying nationwide outbreaks of Salmonella and Escherichia coli (E.coli), performing genomic surveillance for SARS-CoV-2 and influenza, and helping to guide outbreak response of any pathogen.



The "What"

Prior to COVID-19, the Wisconsin State Laboratory of Hygiene (WSLH) was performing some NGS, but it was a manual process and not very high-throughput. Using Epidemiology and Laboratory Capacity for the Prevention and Control of Emerging Infectious Diseases (ELC) COVID-19 funding, WSLH purchased more automated and high-throughput instruments: namely, a Tecan liquid handler robot to perform the preparations prior to sequencing and two NextSeq high-throughput sequencers. The laboratory also purchased and implemented ClarityLIMS, an electronic system to track samples through this process. These instruments and tracking system have been critical to the WSLH effort to perform SARS-CoV-2 surveillance; they have also started using the instruments to sequence other pathogens, including enteroviruses and tuberculosis.

The "So What"

The streamlined workflow that these instruments and tracking system allow means that sequencing is automated, which leads to less microbiologist hands-on time and fewer errors. This workflow is also the lab's go-to workflow for the future. They plan to transition most, if not all, NGS testing to the Tecan+NextSeq workflow and use ClarityLIMS to track everything. This includes many pathogens, including but not limited to SARS-CoV-2, influenza, respiratory syncytial virus, salmonella, E. coli, listeria, gram-negative antibiotic resistant bacteria, Streptococcus pneumoniae, Candida auris, hepatitis C virus, Cryptosporidium, and Cyclospora. They perform NGS on these pathogens for many reasons:

- To track circulating strains to ensure the vaccines target correct strains.
- To track pathogen mutations to ensure that our PCR tests remain accurate.
- To identify and respond to outbreaks.
- To guide antimicrobial and antiviral treatment.

The "Now What"

The instrumentation and tracking system purchased using ELC funding is now the bedrock of WSLH's entire infectious disease NGS testing approach and allows for rapid data-driven public health action. The instruments are new and should last for many years, but the maintenance agreements to keep them in working order must be paid each year, and the ClarityLIMS tracking system is an annual subscription. Therefore, to maintain this automated system, sustained funding beyond ELC COVID-19 funding is required.

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