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Whole Genome Sequencing: Coming of Age at the County Public Health Lab

The County of San Luis Obispo Public Health Laboratory (SLOPHL) has been developing the capability to use whole genome sequencing (WGS) of microbe DNA. WGS offers an advancement over traditional culturing. In addition to accurately identifying the genus and species of bacterial isolates, the serotype of the pathogen can also be determined using only the DNA data. Finally, and perhaps most importantly from a public health perspective, is the potential to ascertain clonal relationships of multiple isolates of the same species and serotype—i.e., to detect outbreaks.

The lab team has made much progress on its WGS protocols, with SLOPHL scientists now able to take a group of isolates through DNA extraction, sequencing and bioinformatic analysis in the space of only four days. In the two most recent WGS runs, three bacteria isolates identified as *E. coli* O157 were conclusively shown to have zero mutations difference. The infected patients are now part of an epidemiologic investigation conducted by state and local public health experts as cases have appeared in several counties.

In the U.S., *E. coli* O157 has caused numerous outbreaks of gastrointestinal illness, often with the worrisome hemolytic uremic syndrome (HUS). The vehicles of transmission have included ground beef, steaks, spinach, lettuce, tomatoes, milk, fruit juices, cookie dough and even drinking water. Transmission has also occurred when people swam in contaminated fresh water, visited petting zoos or visited dairy farms.

Our epidemiology team further assist with outbreak investigations by interviewing people who are ill about their activities and exposures through a detailed questionnaire. Analysis of their answers is the heart of the detective story that allows investigators to identify a particular product or activity that facilitated transmission.

Since 1996, numerous outbreaks of GI illness have been detected by state and local public health laboratories performing pulsed-field gel electrophoretic analysis and now WGS analysis of bacterial isolates. The CDC-sponsored network that collects and shares this information is called PulseNet. With our recent proficiency in discovering an *E. coli* O157 outbreak, the SLOPHL has demonstrated that it has reached the level of expertise to join the national network, showing that actionable information can be obtained by county-level laboratories, two to three weeks before being discovered at the state laboratory.

New Pneumonia PCR Panel #6620

In October 2019, the Public Health Laboratory will initiate molecular amplification testing for multiple agents of lower respiratory tract illness.

The availability—to be announced shortly—of the Pneumonia PCR panel (PN for short) will allow SLO County providers to make a rapid specific diagnosis of pneumonia by submitting sputum or bronchoalveolar lavage specimens to the laboratory and receiving results the same day.

Among the 34 targets detected by sensitive polymerase chain reaction (PCR) chemistry of the PN panels are bacteria such as *Streptococcus pneumoniae*, *Legionella pneumophila*, *Moraxella catarrhalis* and *Klebsiella pneumoniae*; viruses such as influenza and RSV; fungi such as *Aspergillus* and *Cryptococcus* and numerous antibiotic resistance markers.

Questions?

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