ISSUE
11
May
2017

BULLETIN OF
the California Emerging
Infections Program

CEIP Sentinel

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Electron micrograph of a *Listeria* bacterium in tissue.

This issue:

PulseNet Builds on Success of *Listeria* Whole Genome Sequencing Project

The *Listeria* Initiative is a national enhanced surveillance system that collects detailed information on laboratory-confirmed cases of listeriosis in the United States. *Listeria* infections are rare but serious, and are the third leading cause of death from foodborne illness in the United States. As a component of FoodNet, CEIP surveillance staff interview patients diagnosed with listeriosis using the standardized *Listeria* Initiative questionnaire, which asks detailed questions about foods eaten in the 30 days before illness onset. This information on food history can then be paired with molecular subtyping data from food, environmental and clinical isolates to help identify sources of infection and solve outbreaks. These outbreaks are detected primarily via PulseNet, a national laboratory network that finds clusters of foodborne illness through the comparison of DNA fingerprints of several bacterial pathogens. Historically, PulseNet used molecular fingerprinting information drawn from pulse-field gel electrophoresis (PFGE) analysis to identify isolates with matching patterns. In 2013, the *Listeria* Whole Genome Sequencing (WGS) pilot project was launched, beginning the practice of using WGS techniques on all *Listeria* isolates to address this deadly foodborne pathogen.

WGS provides a more detailed and precise method than PFGE to compare bacterial isolates, making it possible to detect an outbreak when as few as two people have the same *Listeria* strain. It is a fast and affordable way to obtain high-level information about an isolate using a single test. Coupled with high-quality epidemiologic data from *Listeria* initiative interviews, WGS data have been used by public health officials to solve more *Listeria* outbreaks and reduce the number of cases per outbreak. With the success of the *Listeria* WGS project, PulseNet is now expanding the use of WGS to other foodborne pathogens, including *E. coli* O157, other Shiga toxin-producing *E. coli* and *Salmonella*. Ultimately, the increased use of WGS data will improve PulseNet's ability to detect foodborne outbreaks.

Concurrent with this transitionfrom PFGE to WGS, PulseNet is also challenged by the increased use of culture-independent diagnostic tests (CIDTs) by clinical laboratories. Instead of growing bacteria on a

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HPV-Impact Pilots Texting Effort to Improve Survey Response

Over 90% of the U.S. population owns a mobile phone, and 97% of these mobile phone owners use a text messaging feature on their phone[1]. Recent public health investigations have been paving the way for the use of texting, as phone surveys are becoming less and less effective in reaching people. When CEIP needed to ask about human papillomavirus (HPV) vaccine history for an ongoing surveillance effort, texting was discussed as a viable means of reaching young adults.

HPV-Impact is tasked with evaluating whether HPV vaccines are reducing cervical disease in the population at five sentinel EIP sites around the U.S. To monitor HPV vaccine impact in Alameda County, California, CEIP is tracking rates of cervical pre-cancer, HPV vaccine uptake, and the HPV types present in cervical pre-cancer lesions. Obtaining vaccine history is challenging, as it is often not available in medical records or in the statewide immunization registry.

In order to obtain this missing vaccine history and to evaluate the effectiveness of texting, CEIP conducted a pilot trial comparing texting and calling. All young adult women contacted for a vaccine history had been diagnosed with HPV-related cervical pre-cancer. Cases were randomized to receive up to three texts and three calls, or to receive no texts and up to six calls. Cases in the texting group were more likely to answer their phone and complete the interview, and they declined participation less often than those in the calling group. Respondents in the texting group also demonstrated high acceptability of texting, with 84% of them viewing text messaging as a good way to contact people for survey participation. In conclusion, texting was an acceptable method of contact for the cases interviewed and may help overcome challenges and barriers to telephone surveys.

1. Pew Research Center [Internet]. Washington, DC: Pew Research Center; c2004-2017. U.S. Smartphone Use in 2015; 2015 Apr 1 [cited 2017 Mar 15]. Available from: http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/

Contributed by Deanna Fink and Erin Whitney, MPH

PulseNet (continued)

plate, this type of testing detects bacterial DNA directly from patient samples, tending to be cheaper and faster for laboratories. However, without a bacterial isolate, DNA fingerprints cannot be obtained by either PFGE or WGS and public health is unable to detect patterns and clusters. To address this problem, PulseNet is exploring a variety of new testing methods that work directly on patient samples, without the need for a bacterial isolate. These methods include metagenomics approaches and other strategies using next generation sequencing (NGS) technology.

As laboratory methods and testing practices evolve, PulseNet is becoming a more efficient system for improving food safety. There will be the replacement of PFGE with WGS and, eventually, adaptations to the increased use of CIDTs with NGS. The future of PulseNet is a faster, cheaper, and more accurate system for detecting and solving foodborne disease outbreaks.

References:

https://www.cdc.gov/pulsenet/next-generation.html

https://www.cdc.gov/listeria/pdf/whole-genome-sequencing-and-listeria-508c.pdf

Contributed by Mimi Ton

Adult PCV13 Effectiveness Study: Progress and Updates

In December 2015, CEIP began enrollment for the study entitled "13-Valent Pneumococcal Conjugate Vaccine (PCV13) Effectiveness Evaluation Among Adults Age 65 Years and Older." The study was launched in the setting of a new recommendation issued by the Advisory Committee on Immunization Practices (ACIP) in August 2014, recommending one dose of PCV13 for all adults aged ≥65, followed by a dose of 23-valent polysaccharide vaccine (PPSV23). The purpose of the study is to measure the effectiveness of PCV13 against invasive pneumococcal disease (IPD) caused by PCV13 serotypes among adults ages 65 and older.

To-date, CEIP has enrolled 24 case patients and 72 matched controls from our three-county catchment area of Alameda, Contra Costa, and San Francisco Counties. Participants have been interviewed about their vaccination status, medical history, functional status, household characteristics, and demographic factors. Study staff have contacted participants' medical providers to obtain vaccination and medical histories. *Streptococcus pneumoniae* isolates from case patients have been sent to CDC, where they will undergo serotyping and whole genome sequencing (WGS). We would like to thank all of our local lab partners for submitting isolates, and encourage labs to continue prioritizing submission of these isolates, as they are a critical part of this important study.

Study enrollment is expected to continue through 2018. Study data from CEIP, combined with data from the nine other participating EIP sites throughout the country, are sent to the Centers for Disease Control and Prevention (CDC). CDC expects to have preliminary data analyses completed prior to the 2018 ACIP meeting to re-evaluate the adult pneumococcal vaccine recommendations.

Contributed by Jenny Broker, Tara Scheuer, Mirasol Apostol, MPH

FoodNet Fast Launched!

FoodNet has recently launched an interactive online tool, called FoodNet Fast, for getting information on cases of illness caused by nine pathogens transmitted commonly through food: *Campylobacter*, *Cryptosporidium*, *Cyclospora*, *Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* (STEC) O157 and non-O157, *Shigella*, *Vibrio*, and *Yersinia*. FoodNet Fast makes it easy for users to see how rates of illness caused by these pathogens have changed over the past 20 years. The interactive tool allows you to search by pathogen, year, age group, sex and race and also provides information on ethnicity, seasonality, hospitalizations, deaths, travel-associated cases and outbreak-associated cases. The program displays data on graphs, maps and tables and also allows you to download data.

https://wwwn.cdc.gov/foodnetfast/

Contributed by Kathryn Wymore, MPH

Summarizing an Epidemiological Comparison of two Recent H3N2 Influenza Seasons

During the 2016-2017 influenza season, the California Emerging Infections Program identified more than twice the number of influenza hospitalizations than in the previous season, with the predominant influenza virus being Influenza A H3N2. A recent presentation highlighted similarities and differences in two recent H3N2 seasons.

The poster presented at Options IX for the Control of Influenza[1] compared two H3N2 influenza predominant seasons (2012-2013 and 2014-2015) to investigate the difference in pathogenicity of the H3N2 viruses, because the 2014-2015 H3N2 influenza virus had changed from the 2012-2013 H3N2 strain, causing decreased influenza vaccine effectiveness for the 2014-2015 H3N2 season.

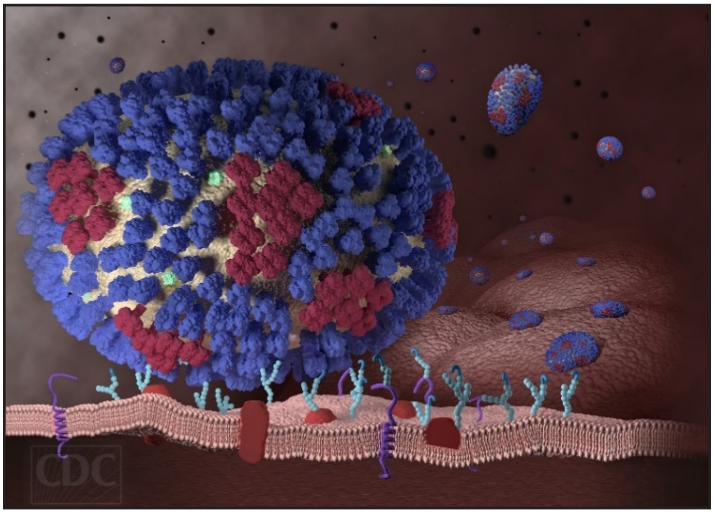

Figure 1: An Influenza Virus binds to a Respiratory Tract Cell - Centers for Disease Control and Prevention[2]

A thorough analysis conducted by Arriola, C S et al, utilized data from FluSurv-NET, a Centers for Disease Control and Prevention surveillance system, which included CEIP hospitalized influenza surveillance data.

The analysis found adjusted rates of influenza-associated hospitalizations were higher in 2014-15 vs 2012-13 (312 vs 198 per 100,000 population) especially among adults 65 years or older (1,665 vs 993 per 100,000 population).

Furthermore, a comparison of the age distributions of the 2014-2015 and the 2012-2013 season confirmed H3N2 occurred more frequently in adults 80 years and older (38% vs 31%), and less frequently in children 5 years and younger (5% vs 8%) in the 2014-2015 season. Antiviral treatment and vaccinations were received by a larger proportion of children and adults hospitalized with H3N2 influenza during the 2014-2015 season. Interestingly, the frequency of influenza complications including pneumonia, bronchiolitis, acute chest syndrome, and pulmonary collapse among children and adults was similar during both seasons. Moreover, the risk of severe outcomes in 2014-2015, including ICU admission, death, and mechanical ventilation due to the drifted H3N2 virus was similar to the risks from the 2012-2013 H3N2 virus.

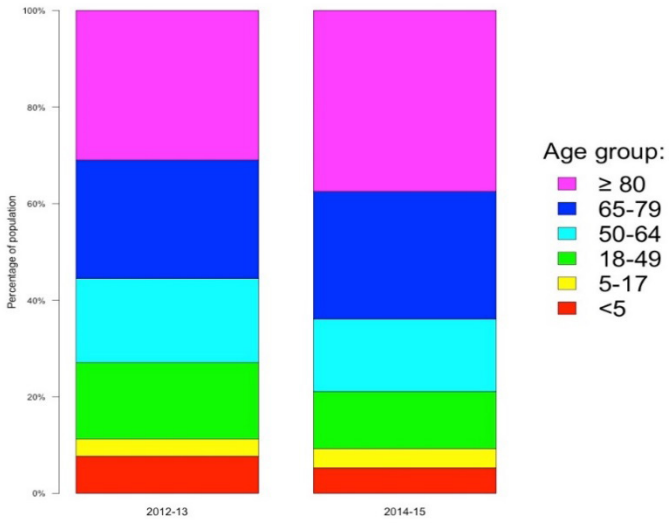

Figure 2: Age distribution of H3N2 influenza-associated hospitalizations among children and adults for the 2012-2013 and 2014-2015 seasons.

1. Carmen SA, Evan JA, Lisa M, et al. Epidemiological Comparison of Two Recent H3N2 Influenza Seasons. Poster presented at: Options IX for the Control of Influenza; 2016 August 24-28; Chicago, IL.
2. Centers for Disease Control and Prevention. An Influenza Virus Binds to a Respiratory Tract Cell. Available from: https://www.cdc.gov/flu/images/influenza-virus-fulltext.jpg.

Contributed by Nicole Del Castillo and Pamala Daily Kirley, MPH

The California Emerging Infections Program is a program of Public Health Foundation Enterprises Inc. and a collaboration with the California Department of Public Health.

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