WASHOE COUNTY HEALTH DISTRICT
ENHANCING QUALITY OF LIFE

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EPI-NEWS

Public Health

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CONTAINING "NIGHTMARE BACTERIA"

- What Have We Done in Washoe County?

Introduction

On April 6, 2018, the Centers for Disease Control and Prevention (CDC) released its Vital Signs report entitled "Containment of Novel Multidrug-Resistant Organisms and Resistance Mechanisms – United States, 2006-2017"[1]. In this report, authors analyzed infection data from the National Healthcare Safety Network from 2006-2015 to calculate changes in the annual proportion of selected pathogens that were nonsusceptible to extended-spectrum cephalosporins (ESBL phenotype) or resistant to carbapenems (carbapenem-resistant Enterobacteriaceae [CRE]). They also reported testing results for CRE and carbapenem-resistant Pseudomonas aeruginosa (CRPA) from January to September 2017. Three major findings can be summarized from this report as follows:

- **221**. New nationwide testing in 2017 (January-September) uncovered 221 instances of unusual resistance genes in "nightmare bacteria".
- **1 in 10**. 11% of screening tests, in people with no symptoms, found a hard-to-treat germ that spreads easily.
- **1st.** The Containment Strategy keeps new threats from spreading. Launch at the first sign of unusual resistance.

This issue of Epi-News will address how the Washoe County Health District (WCHD) has been containing these "Nightmare bacteria".

Superbugs vs. Nightmare bacteria

Both superbugs and nightmare bacteria are colloquial terms used primarily by media or the general public. There are no official definitions published by CDC. "Superbugs" is a term generally used to describe strains of bacteria that are resistant to the majority of antibiotics commonly used today. "Nightmare" bacteria refer to those resistant bacteria containing unusual resistance genes which can be easily spread. The World Health Organization (WHO) released a priority pathogens list [2] of 12 bacteria in February 2017. The top 3 critical superbugs are:

- *Acinetobacter baumannii*, carbapenem-resistant (CRAB)
- *Pseudomonas aeruginosa*, carbapenem-resistant (CRPA)
- *Enterobacteriaceae*, carbapenem-resistant (CRE), ESBL-producing

In the United States, CDC published a report outlining the top 18 drug-resistant threats to the United States in 2013[3]. These threats were categorized based on level of concern: urgent, serious, and concerning. The pathogens included in the CDC's list are similar to the WHO's list although priorities were different. The top 3 superbugs with urgent threats published by CDC are:

- Clostridium difficile (CDIFF)
- Carbapenem-Resistant Enterobacteriaceae (CRE)
- Neisseria gonorrhoeae

No doubt, CRE is a superbug. Several resistance mechanisms make antibiotics ineffective against bacteria. Such resistance mechanisms include: 1) Restrict access of the antibiotic; 2) Get rid of the antibiotic by producing pumps; 3) Destroy the antibiotic; 4) Change the antibiotic; 5) Bypass the effects of the antibiotic; 6) Change the targets for the antibiotic.

A primary mechanism of carbapenem resistance in Gram-negative bacteria is acquired carbapenemases, enzymes that hydrolyze these antibiotics to make them ineffective (resistance mechanism #3). There are five major carbapenemases which pose the largest public health risks. They are:

- Klebsiella pneumoniae carbapenemase (KPC);
- New Deli Metallo-β–lactamase (NDM);
- OXA-48 like enzymes;
- Verona Integron-encoded Metallo-β-lactamase (VIM);
- Imipenem Metallo-β-lactamase (IMP).

This means resistance genes that code for carbapenemases can be exchanged between different Gram-negative bacteria via genetic packets called plasmids. Resistance can then be spread between different bacteria among patients. Nightmare bacteria refer to those resistant bacteria carrying non-KPC genes.

Local Approach in Washoe County to Combat Nightmare Bacteria

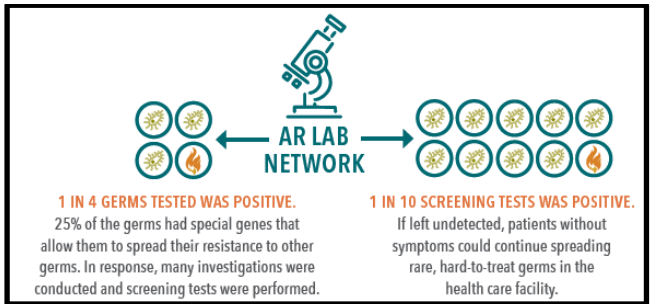
Since 2003, WCHD has been working with local clinical laboratories to compile a community-wide antibiogram. This work has been ongoing for 15 years. The antibiogram has been well received by the local medical community helping to make them aware of local antibiotic resistance (AR) data. Since 2010, WCHD has been partnering with local hospitals and the Nevada State Public Health Laboratory (NSPHL) to conduct lab-based surveillance for

[1] https://www.cdc.gov/mmwr/volumes/67/wr/mm6713e1.htm
[2] http://www.who.int/mediacentre/news/releases/2017/bacteria-antibiotics-needed/en/
[3] https://www.cdc.gov/drugresistance/biggest_threats.html

multi-drug resistant organisms. In 2016, a local resident acquired a "Nightmare bacteria" infection during multiple hospitalizations in a foreign country. This patient had a pan-resistant NDM-CRE infection and had a fatal outcome[4]. In 2017, WCHD made carbapenem resistant organisms (CRO) reportable for laboratories serving healthcare facilities in Washoe County. This was an effort to have early detection of nightmare bacteria. All CRO isolates must be forwarded to NSPHL for carbapenemase screening. If the screening test for carbapenemase production is positive, this organism is classified as a carbapenemase producing organism (CPO). An additional PCR test is performed to identify which carbapenemase this organism produces. WCHD will investigate all CPO cases, identify the likely sources of infection, trace the epi-linked contacts, and provide screening tests through collaboration with clinicians. This is done to prevent further spread. From January 1 2017 through March 31, 2018, a total of 11 CPO cases have been investigated. Five of the 11 had nightmare bacterial infections (2) or nightmare bacterial colonization (3). Two infections were detected by routine surveillance and three were detected by active surveillance by hospital or epidemiological screening by public health (e.g., screening epi-linked patients or Point Prevalence Survey). A total of 79 contacts were identified for screening. The case to contact ratio is 15.8. As of December 2016, because of long-term community-wide efforts in Washoe County, the overall CRE rate remained very low at 0.32% (22/6791) base on laboratory data. The 2017 CRE rate will be published by October 2018.

Collaboration with External Agencies

CDC funded a network of 56 state and local antimicrobial resistance (AR) labs, i.e., Antimicrobial Resistance Lab Network (ARLN). The NSPHL is one of them and thus, is capable of performing carbapenemase screening by mCIM and identification of carbapenemase by PCR. CDC also funded 7 ARLN Regional Labs. Washington State Public Health Laboratory (WSPHL) is a resource for Nevada. WSPHL can perform AR related tests which cannot be performed by NSPHL. For example, one local hospital was recruited as a sentinel site in northern Nevada for mobile colistin resistance (*mcr*) and *candida auris* surveillance by working with WSPHL.

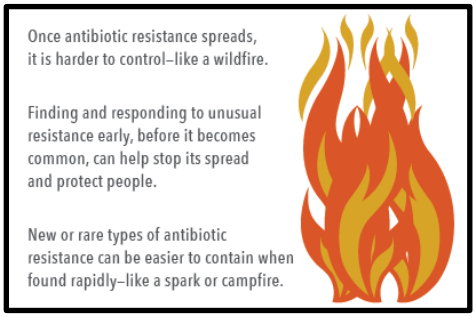


Past volumes of Epi-News can be found here:
www.tinyURL.com/WashoeEpiNews

[4] https://www.cdc.gov/mmwr/volumes/66/wr/mm6601a7.htm

Recommendations for Healthcare Providers

Antibiotic-resistant germs can spread like wild fire. Successful containment of unusual resistance i.e., Nightmare Bacteria, relies heavily on an early detection. Although the transmission of CPO is primarily in healthcare facilities, the WSPHL has noted that the novel carbapenemase-producing organisms are being identified with increasing frequency in patients without a travel history. This suggests that there has been in-state transmission occurring in the Western region. [5]



One NDM-CRE case identified in 2017 in our area did not have a travel history but was epidemiologically linked to a case that did have a travel history. However, two cases were not linked to the NDM-CRE case reported in 2016. WCHD strongly recommends that all healthcare providers (HCPs) in Washoe County take the following actions to assist in combating AR organisms:[6]

1. Know your local AR data. Stay aware of facility specific antibiogram. Also stay aware of the community-wide antibiogram by reading WCHD's annual antibiogram at www.tinyurl.com/WashoeAntibiogram.
2. Ask if a patient has received medical care somewhere else, including in another country within the past six months.
3. Place patients currently or previously colonized or infected with CPO on Contact Precautions. Whenever possible, dedicate rooms, equipment, and staff to CPO patients. In Washoe County, all CPO cases are asked to carry a "wallet card" with them for at least one year.
4. Wear a gown and gloves when caring for patients with CPO.
5. Perform hand hygiene – use alcohol-based hand rub or wash hands with soap and water before and after contact with the patient or their environment.
6. Alert the receiving facility when you transfer a CPO patient, and find out when a patient with CPO transfers into your facility.
7. Make sure labs immediately alert clinical and infection prevention staff when CPO are identified.
8. Prescribe and use antibiotics wisely.
9. Discontinue devices like urinary catheters as soon as no longer necessary.
10. Please always report CPO cases to WCHD at 775-328-2447 or fax to 775-328-3764.

Acknowledgement

We are grateful to all hospitals, infection control practitioners and laboratory staff for their reporting and collaboration to make this surveillance work possible.

[5] CDC ARLN: West Regional Health Advisory. April 2018.

[6] https://www.cdc.gov/hai/organisms/cre/cre-clinicians.html