The battle against resistance: Carbapenemase-producing organisms in BC

Carbapenemase-producing organisms (CPOs) continue to be a public-health and infection-prevention and control problem globally. CPOs refer to gram-negative bacteria, normally found in the gut, that have acquired resistance to the broad spectrum carbapenem class of antibiotics. In addition to carbapenem resistance, these bacteria also tend to be multidrug resistant, greatly reducing treatment options.

The three most common types of CPOs include the New Delhi metallo-beta-lactamase, OXA-48, and *Klebsiella pneumoniae* carbapenemase. The first two arose from India in 2008 and are now considered endemic in South Asia, with outbreaks and sporadic cases reported worldwide. *Klebsiella pneumoniae* carbapenemase originated from North Carolina in 1996, is endemic throughout the United States, and outbreaks have been reported in many parts of the world. The genetic material that confers resistance in these bacteria resides in their plasmids, and plasmids are easily transferable between and across bacterial species, making resistance highly transmissible with significant infection control implications.

BC saw its first case of CPOs in 2008. Since then, approximately 700 cases have been identified across the province, mostly through active screening by acute care facilities. Risk factors for colonization and, potentially, infection include travel to endemic countries with exposure to health care settings where these multidrug-resistant organisms are highly concentrated. In 2014 the Ministry of Health mandated surveillance of CPO cases across all acute care facilities in BC. All patients presenting to an acute care facility are asked whether they have traveled outside Canada and whether they have had any exposure to a health care facility while abroad. If the answer is yes, the patient will be screened for CPOs by rectal swab. Cases of CPOs are also detected through routine microbiological workup for infections. This allows identified patients to receive appropriate infection and prevention measures to minimize transmission within health care facilities, but more importantly, appropriate antibiotics are initiated when these patients develop infections. This surveillance, coordinated through the BC Provincial Infection Control Network, has recently expanded to include community-identified cases of CPOs to capture potential cases of infection in the community setting. All cases of CPOs are followed up with whole genome sequencing at the BCCDC Public Health Laboratory. The genomic characterization identifies potential transmissions and outbreaks occurring in acute care or community-based care facilities.

Transmissions of CPOs in acute and community-based care facilities can occur through contaminated health care equipment, poor hand hygiene, and contaminated fomites such as sinks.

Front-line health care professionals can support the prevention of multidrug resistant spread by:

- Using antibiotics judiciously. Inappropriate and unnecessary antibiotic use drives antibiotic pressures that can lead to selection for CPOs.
- Reinforcing the importance of hand hygiene and minimizing the sharing of personal toiletry items.
- Ensuring appropriate use of contact precautions, which is important in preventing spread of CPOs as well as other communicable diseases.
- Ensuring information about a patient's CPO status is shared with all health care providers so that appropriate infection control and isolation precautions are put in place and appropriate antibiotic treatment is provided in the event of an infection.
- Advising patients to avoid unnecessary exposure to health care settings in CPO-endemic countries, but noting that if exposure does occur, they should inform their health care professionals.

For more information about CPOs, visit www.bccdc.ca/resource-gallery/Documents/Educational%20Materials/Epid/Other/CPOBacteriainBC_factsheet_feb7_2014.pdf.

Additional details about BC's provincial CPO program are available from the Provincial Infection Control Network of BC (www.picnet.ca/surveillance/cpo).

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