Healthcare Happenings:
Infection Prevention and Control Highlight

Carbapenem-Resistant *Pseudomonas aeruginosa* (CRPA)

WHAT IS IT?

Pseudomonas is a genus of gram-negative bacteria found in the environment in soil and water. *Pseudomonas* has a propensity to form biofilms, which are extremely difficult to eradicate from indwelling devices. Of the many *Pseudomonas* species, the most common cause of human infections is *Pseudomonas aeruginosa*, which can cause infections in the blood, urine, wounds, or lungs.

In 2020, carbapenem-resistant *P. aeruginosa* (CRPA) caused an estimated **28,800 infections** in hospitalized patients and **2,500 estimated deaths** in the United States.

The majority of CRPA is due to porin mutations. 2 to 3% of CRPA carry a mobile genetic element that produces a carbapenemase enzyme, which breaks down carbapenem antibiotics. These CRPA are of highest concern to public health due to their increased ability spread in healthcare settings.

What you need to know

- *P. aeruginosa* infections usually occur in people in the hospital or with weakened immune systems. It is particularly dangerous for patients with chronic lung diseases.
- Some types of multidrug-resistant *P. aeruginosa* are resistant to nearly all antibiotics, including carbapenems.

TRANSMISSION

CRPA can spread in healthcare settings from one person to another through contaminated hands, equipment, or surfaces. People at highest risk include hospitalized patients, especially those who:

- Are on ventilators
- Have invasive medical devices, such as catheters
- Have open wounds, such as from surgery or burns

TREATMENT

Unfortunately, many *P. aeruginosa* infections are highly resistant to antibiotics, including carbapenems, which makes them difficult to treat with available antibiotics.

Healthcare providers should base treatment decisions on the susceptibility profile of the organism and reevaluate empiric regimens as soon as susceptibility results are available. Patients colonized with CRPA who are not showing active signs of infection do not need to be treated.

Improper antibiotic use drives the development of resistance – judicious antibiotic use is essential to prevent further resistance!

Table 1. Percentage of carbapenem resistance among CRPA isolates by carbapenem drug, stratified by carbapenemase gene detection, 2018-2020 (CDC)*

	Carbapenem Drug	# of Isolates	Total % Not Susceptible
Carbapenemase gene **not** detected	Doripenem	5,314	75%
	Imipenem	8,248	93%
	Meropenem	6,370	79%
Carbepenemase gene[1] detected	Doripenem	404	97%
	Imipenem	571	98%
	Meropenem	583	98%

* These data are not intended to provide any information to assist with clinical decision making

[1] KPC, NDM, VIM, IMP, or OXA-48. Isolates positive for more than one carbapenemase gene were excluded from the analysis.

Table 2. CRPA Antibiotic Resistance Profiles in Philadelphia, 2020-2021

	Antibiogram for Confirmed CRPA Cases (n=197) [not all isolates were tested for all antibiotics]						
	Pip+Tazo	Cefepime	Meropenem	Ciprofloxacin	Levofloxacin	Gentamicin	Tobramycin
Isolates Tested	101	197	196	188	192	195	195
% Susceptible	35.6	45.2	8.7	38.3	33.9	63.6	87.2

REPORTING

Pan-drug resistant isolates of *Pseudomonas aeruginosa* that exhibit non-susceptibility to ALL antibacterial agents tested through routine antimicrobial susceptibility testing (AST) assays are reportable in the City of Philadelphia. All positive results should be reported to PDPH **within 24 hours**, either by using the PDRO reporting form and faxing it to 215-238-6947 or by calling 215-685-6748 during business hours.

IPC RECOMMENDATIONS

TRANSMISSION-BASED PRECAUTIONS:

- CRPA patients should be placed on **contact precautions** or **enhanced barrier precautions** (nursing homes/SNFs only) and in a **private room** for the duration of all current and future healthcare stays. Patients can be cohorted if they have the same organism and same resistance mechanism (if known).
- Patients may remain colonized for more than one year - **do not discontinue precautions when the infection has been treated.**
- Inter-facility transfer: Prior to patient transfer, the transferring facility should notify the receiving facility of CRPA colonization or infection using the PDPH inter-facility transfer form or another established method that captures the same information.

DISINFECTION GUIDANCE:

- Reusable equipment should be dedicated to the colonized or infected patient whenever possible
- Shared reusable medical equipment should be disinfected **immediately** after use
- Disinfect with products that are effective against CRPA
- Disinfect areas in close proximity to the patient, high-touch surfaces in the room, and surfaces around sinks and toilets daily
- Immediately clean and disinfect equipment or surfaces contaminated with blood, urine, feces, and other bodily fluids or infectious materials

References:

Multidrug-Resistant Pseudomonas Aeruginosa. https://www.cdc.gov/drugresistance/pdf/threats-report/pseudomonas-aeruginosa-508.pdf

Pseudomonas aeruginosa in Healthcare Settings. https://www.cdc.gov/hai/organisms/pseudomonas.html