

# Carbapenem-Resistant *Acinetobacter baumannii*

## Surveillance Protocol

### **Background** <sup>(2)</sup>

Carbapenem-Resistant *Acinetobacter baumannii* (CRAB) are gram-negative bacteria that are resistant to the broad-spectrum, “last resort” carbapenem class of antibiotics. Certain CRAB are resistant because they produce carbapenemase enzymes (e.g., KPC, NDM, OXA, VIM, IMP) that make carbapenems ineffective. Carbapenemase genes can be transferred between different kinds of bacteria and lead to the spread of antibiotic resistance.

Carbapenemase-producing organisms (CPO) are increasingly more common throughout West Virginia healthcare settings, making surveillance of CRAB an important aspect of prevention and control efforts.

### **Public Health Significance** <sup>(2,3,4,6)</sup>

*Acinetobacter* is historically resistant to many antibiotics. *A. baumannii*’s capacity to develop antibiotic resistance mechanisms allows the organism to thrive in healthcare settings, facilitating the spread of multidrug-resistant strains. Resistance to carbapenems further reduces patient treatment options.

According to the Centers for Disease Control and Prevention (CDC) 2019 Antimicrobial Resistant Report, overall rates of CRAB cases have decreased in the United States. However, CRAB can produce carbapenemases, which can spread to other bacteria and amplify the problem of resistance through mobile resistance elements (e.g., DNA), which appear to be increasing. This increase in carbapenemase production threatens to reverse decreases in CRAB cases. In January 2023, the Council of State and Territorial Epidemiologists (CSTE) expanded the case definition for carbapenemase-producing organism (CPO) to include *A. baumannii*. In 2022, the incidence of CRAB in West Virginia was 2.3 cases per 100,000 population.

### **Provider Responsibilities**

1. Ensure that your laboratory is immediately reporting carbapenem-resistant test results to you and that your office staff notify you of CRAB results immediately.
2. When you are notified by your laboratory that your patient has CRAB:
  - a. Follow CDC recommendations:  
[www.cdc.gov/hai/organisms/cre/cre-clinicians.html](https://www.cdc.gov/hai/organisms/cre/cre-clinicians.html)
  - b. Notify the Infection Preventionist at the facility where the patient is hospitalized; and/or
  - c. Ensure that the Infection Preventionist and other providers are notified before a patient is admitted or transferred so that they can also follow CDC guidelines.
3. Immediately notify the local health department (LHD) of CRAB outbreaks in your facility.

### **Laboratory Responsibilities**

1. Report CRAB immediately to healthcare facilities. Highlight carbapenem resistance on the report so resistance is readily apparent to healthcare providers.

### **Office of Epidemiology and Preventions Services**

#### **Division of Infectious Disease Epidemiology**

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: 304-558-5358 • Fax: 304-558-6335

# CRAB

## Surveillance Protocol

2. Report all positive CRAB tests to the LHD within one week of the result. Report the result by electronic messaging when feasible.
3. Follow current guidelines from the CDC/Clinical and Laboratory Standards Institute (CLSI) for testing for carbapenem resistance.
4. Follow the guidance provided by the West Virginia Department of Health and Human Resources (DHHR), Bureau for Public Health's (BPH) Office of Laboratory Services (OLS) for sending CRAB specimens to OLS for further characterization.

### LHD Responsibilities

Complete the CRO Case Report Form by contacting the provider and/or facility listed on the lab report, as well as the patient and/or their family, as needed.

1. Enter lab results and complete information from the CRE Disease Reporting Form into the West Virginia Electronic Disease Surveillance System (WVEDSS) in a timely manner.
2. Encourage labs to report electronically when feasible.
3. When a case of CRAB is identified in a long-term care facility in your county, assess the facility's knowledge about CRAB using the "Initial Assessment for Long-term Care Facility (LTCF) Reported Case of Carbapenem-Resistant Organisms (CRO) including Carbapenem-Resistant *Enterobacteriales* (CRE)", available at:  
[www.oeps.wv.gov/cre/documents/lhd/Initial\\_Assessment\\_for\\_LTCF\\_Reported\\_CRE.pdf](http://www.oeps.wv.gov/cre/documents/lhd/Initial_Assessment_for_LTCF_Reported_CRE.pdf)
  - a. Provide education/resources to the facility based on the assessment results, including the "CRO including CRE Infection Prevention and Control Guidance," available at:  
[www.oeps.wv.gov/cre/documents/hcp/CRE\\_Infection\\_Prevention\\_and\\_Control\\_Guidance.pdf](http://www.oeps.wv.gov/cre/documents/hcp/CRE_Infection_Prevention_and_Control_Guidance.pdf)
4. When a case of CRAB is identified in an outpatient setting or the case's LTCF residential status is "No" or "Unknown":
  - a. Contact the patient and/or their family, as appropriate, to verify LTCF residential status. Provide education/resources to the patient/family including "CRO including CRE Patient FAQ" and link to or provide copies of information from the CDC patient information page.  
[www.oeps.wv.gov/cre/documents/community/cre\\_patient\\_faq.pdf](http://www.oeps.wv.gov/cre/documents/community/cre_patient_faq.pdf)  
[www.cdc.gov/hai/organisms/cre/cre-patients.html](http://www.cdc.gov/hai/organisms/cre/cre-patients.html)

### **Office of Epidemiology and Preventions Services**

#### **Division of Infectious Disease Epidemiology**

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: 304-558-5358 • Fax: 304-558-6335

# CRAB

## Surveillance Protocol

- b. If you notice a rise in reported CRAB above your county endemic level or baseline, or you notice multiple cases for a healthcare provider(s), contact the provider(s) to supply education/resources including the link to the CDC clinician FAQ information page. Report these situations to the West Virginia Department of Health and Human Resources immediately.  
[www.cdc.gov/hai/organisms/cre/cre-clinicians.html](http://www.cdc.gov/hai/organisms/cre/cre-clinicians.html)
- c. For providers/facilities with multiple CRAB cases, consult with BPH's Healthcare-Associated Infections, Antimicrobial Resistance (HAI AR) program for assistance in determining if there is an outbreak. Email: [OEPSMDRO@wv.gov](mailto:OEPSMDRO@wv.gov) / Phone: 304-558-5358, ex.2.

### **BPH Responsibilities**

1. Maintain updated facility, patient, and healthcare worker education materials on the Office of Epidemiology and Prevention Services (OEPS) website.
2. Maintain awareness of new developments in medical literature and through ongoing surveillance.
3. Provide technical expertise and consultation regarding reporting, investigation, or control of cases or outbreaks of CRAB including direct support of outbreak investigation if needed.
4. Summarize surveillance data for new cases of CRAB on at least an annual basis.
5. Serve as liaison between clinical laboratories, LHD, and OLS for the shipping of CRAB isolates to OLS and/or CDC for further characterization.

### **Disease Control Objectives**

Prevent additional cases of CRAB through:

- Investigation of CRAB outbreaks and delivery of recommendations related to outbreak control/resolution.
- Education of patients and healthcare providers including LTCFs and outpatient providers, as appropriate, about CRAB prevention and control.

### **Disease Prevention Objectives**

Reduce the incidence of CRAB by:

- Providing education and resources related to preventing transmission of CRAB.

### **Surveillance Objectives**

- Determine the incidence and regional distribution of CRAB in West Virginia.
- Detect outbreaks of CRAB.

### **Office of Epidemiology and Preventions Services**

#### **Division of Infectious Disease Epidemiology**

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: 304-558-5358 • Fax: 304-558-6335

# CRAB

## Surveillance Protocol

- Describe demographic characteristics of persons with CRAB in West Virginia.

### **Clinical Description** <sup>(2,3,4)</sup>

CRAB can often cause bloodstream infections, ventilator-associated pneumonia, wound infections, intra-abdominal abscesses, and urinary tract infections in people who have a urinary catheter or have urinary retention.

Patients can be infected or colonized with CRAB. Colonization occurs when the organism lives and reproduces in or on a patient's body but does not cause symptoms or disease. The ability of CRAB to colonize and produce biofilm on surfaces contributes to chronic and persistent infections, antibiotic resistance, and survival in hospital environments. A colonized individual can still transmit the bacteria to others and can go on to develop an infection themselves. CRAB may acquire resistance mechanisms from living or dead drug-resistant bacteria, whether CPO or not.

### **Etiologic Agent** <sup>(1,2)</sup>

*Acinetobacter* is a group of bacteria commonly found in the environment, like in soil and water. While there are many types, the most common cause of infections in humans is *Acinetobacter baumannii*. *A. baumannii* has acquired, over the years, multiple mechanisms of resistance to a wide range of antimicrobials and the ability to survive in different environments. Some have become pan-resistant, or resistant to all or almost all antibiotics, including the carbapenem class of antibiotics.

For CRAB surveillance purposes, any CRAB species should be reported as noted on the WVEDSS CRO Report Form: [oepps.wv.gov/cre/documents/lhd/cre\\_report\\_form.pdf](https://oepps.wv.gov/cre/documents/lhd/cre_report_form.pdf).

### **Reservoir** <sup>(1,2)</sup>

The reservoir for CRAB infections in the United States is colonized and infected individuals, especially patients who have frequent contact with the healthcare system. *A. baumannii* is a water-loving organism and has the tendency to colonize body organs that contain fluid. This bacteria can survive on inanimate objects such as bed rails, counter tops, and on medical equipment such as catheter tubing and flexible endoscopes.

### **Mode of Transmission** <sup>(2)</sup>

CRAB is transmitted person-to-person through direct contact with infected bodily tissues or fluids. In healthcare settings, CRAB is spread mainly through the hands of healthcare workers and

**Office of Epidemiology and Preventions Services**

**Division of Infectious Disease Epidemiology**

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: 304-558-5358 • Fax: 304-558-6335

# CRAB

## Surveillance Protocol

by direct contact with contaminated environmental surfaces such as bed rails and computer keyboards.

### **Incubation Period** <sup>(2)</sup>

The incubation period is not well defined, particularly due to the ability of CRAB to colonize an individual for an extended period.

### **Infectious Period** <sup>(2)</sup>

CRAB can potentially be transmitted as long as the organisms are present in a person's bodily tissues or fluids. It is unknown how long CRAB can live on inanimate surfaces. These bacteria are capable of transmitting resistance mechanisms in the absence of living organisms.

### **Outbreak Recognition**

Outbreak recognition involves ongoing and systematic CRAB surveillance using a standardized case definition in each facility. CRAB surveillance will allow one to determine when an increase in cases above the baseline occurs and should trigger an investigation into the reason for the increase.

### **Case Definition** <sup>(4)</sup>

CRAB is defined as *A. baumannii* that is:

- Resistant to any carbapenem (minimum inhibitory concentrations of  $\geq 8$  mcg/ml for meropenem, imipenem, and doripenem).

**OR**

- Positive phenotypic test (e.g., Carba NP, Carbapenem inactivation method (CIM), Modified Hodge test, Metallo- $\beta$ -lactamase test) result for carbapenemase production, with or without identification of a specific carbapenemase gene (e.g., blaKPC, blaNDM, blaVIM, blaIMP, blaOXA-48, but other carbapenemase genes include but are not limited to: blaSIM, blaGIM, blaSPM, other OXA genes, etc.)

**OR**

- Positive molecular test (e.g., BD Max Check-Points CPO, FilmArray (BioFire), Nucleic acid amplification test (NAAT) (e.g., PCR), Whole-genome sequencing (WGS) result detecting a carbapenemase gene.

**OR**

- Detection of a carbapenemase gene by NGS

**OR**

**Office of Epidemiology and Preventions Services**

**Division of Infectious Disease Epidemiology**

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: 304-558-5358 • Fax: 304-558-6335

# CRAB

## Surveillance Protocol

- Specimen positive for a carbapenemase gene without bacterial species identification, (e.g., Xpert Carba-R rectal swabs, other CIDI)

### **Preventive Interventions** <sup>(2)</sup>

Prevention of CRAB transmission requires a coordinated effort involving a variety of stakeholders including healthcare providers, acute and long-term care facilities, and state and local public health departments. It requires an understanding of the local and regional prevalence of these organisms, rapid identification of colonized and infected patients in healthcare settings, and implementation of facility-specific and regional interventions to prevent transmission.

Facility-specific prevention measures include:

- Onsite infection control assessments
  - Contact the HAI program to schedule an Infection Control Assessment and Response (ICAR) by email: [OEPSICAR@wv.gov](mailto:OEPSICAR@wv.gov).
- Educate all healthcare personnel (HCP) and environmental services (EVS) personnel about CRAB.
- Reinforce and follow hand hygiene practices.
- Use transmission-based precautions
  - Contact precautions including gown and gloves.
  - Enhanced barrier precautions for nursing home residents.
- Monitor adherence to infection control practices and provide feedback.
- Ensure adequate supplies are available.
- Ensure appropriate signage is on the patient's door to alert HCP and visitors of recommended precautions.
- Collaborate with laboratories regarding testing and notification.
- Implement antimicrobial stewardship.
- Consider screening for CRAB upon admission and colonization screening.
  - Information on colonization screening can be found here: [www.cdc.gov/hai/mdro-guides/index.html#coloniz](http://www.cdc.gov/hai/mdro-guides/index.html#coloniz)

### **Treatment** <sup>(2)</sup>

Treatment options for CRAB are extremely limited and may lead to adverse outcomes. Infectious disease consultation is recommended for treatment decisions.

**Office of Epidemiology and Preventions Services**

**Division of Infectious Disease Epidemiology**

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: 304-558-5358 • Fax: 304-558-6335

# CRAB

## Surveillance Protocol

### Surveillance Indicators

The purpose of CRAB surveillance indicators in West Virginia is to ensure sufficient performance of surveillance and case investigation and to identify areas of improvement. BPH's OEPS currently monitors the following indicators through WVEDSS on a regular basis and reports annually:

- The proportion of investigations with complete demographic information.
- The proportion of investigations with complete antimicrobial sensitivity information.
- The proportion of investigations with complete information on LTCF residence.
- The proportion of LTCFs that were provided education on CRAB.

### References

1. Brady MF, Jamal Z, Pervin N. *Acinetobacter*. [Updated 2022 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: [www.ncbi.nlm.nih.gov/books/NBK430784/](http://www.ncbi.nlm.nih.gov/books/NBK430784/)
2. CDC. *Acinetobacter* in Healthcare Settings. Retrieved from: [www.cdc.gov/hai/organisms/acinetobacter.html](http://www.cdc.gov/hai/organisms/acinetobacter.html)
3. CDC. 2019 antibiotic resistance threats report. November 23, 2021. Retrieved from: [www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf](http://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf)
4. Council of State and Territorial Epidemiologist (CSTE). *Carbapenemase-Producing Organisms (CPO) 2022 Case Definition*. Retrieved from: [www.cste.org/resource/resmgr/ps/ps2022/22-ID-04\\_CPO.pdf](http://www.cste.org/resource/resmgr/ps/ps2022/22-ID-04_CPO.pdf)
5. Gedefie A, Demsiz W, Ashagrie M, et al. *Acinetobacter baumannii* biofilm formation and its role in disease pathogenesis: A Review. Infection and drug resistance. September 10, 2021. Accessed August 22, 2023. [www.pubmed.ncbi.nlm.nih.gov/34531666/](http://www.pubmed.ncbi.nlm.nih.gov/34531666/).
6. Mandell GL, Bennett JE, Dolin R. *Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases, 7<sup>th</sup> edition*. Philadelphia: Churchill Livingstone Elsevier, 2010. Print.
7. Rodrigues DL, Morais-Rodrigues F, Hurtado R, et al. Pan-resistome insights into the multidrug resistance of *Acinetobacter baumannii*. *Antibiotics*. 2021;10(5):596. doi:10.3390/antibiotics10050596

**Office of Epidemiology and Preventions Services**

**Division of Infectious Disease Epidemiology**

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: 304-558-5358 • Fax: 304-558-6335