



# CONNECTICUT

## Public Health

### Laboratory Reporting for:

**Carbapenem-Resistant Enterobacterales (CRE)**

**Carbapenem-Resistant *Acinetobacter baumannii* (CRAB)**

**Carbapenem-Resistant *Pseudomonas aeruginosa* (CRPA)**

**Healthcare Associated Infections & Antimicrobial Resistance (HAI-AR) Program**

**Dr. Katherine A. Kelley State Public Health Laboratory**

**Connecticut Department of Public Health (DPH)**

Version	Authors	Date of Changes
1.0	N Piverger, V Leung, M Maloney	29-Nov-2019
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#### ABBREVIATIONS & ACRONYMS

CDC: Centers for Disease Control and Prevention

CLSI: Clinical and Laboratory Standards Institute

CP: Carbapenemase-producing

CRAB: Carbapenem-resistant *Acinetobacter baumannii*

CRE: Carbapenem-resistant Enterobacterales

CRO: Carbapenem-resistant organism

CRPA: Carbapenem Resistant *Pseudomonas aeruginosa*

DPH: Department of Public Health

HAI-AR: Healthcare-Associated Infection and Antimicrobial Resistance

mCIM: modified Carbapenem Inactivation Method

MIC: Minimum Inhibitory Concentration

PCR: Polymerase chain reaction

SPHL: State Public Health Laboratory

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## Carbapenem-Resistant Enterobacterales (CRE)

**CRE** (Carbapenem-resistant Enterobacterales) are an urgent threat to public health.<sup>1</sup> These bacteria are difficult to treat due to increased levels of antibiotic resistance and reduced treatment options for patients. CRE can carry mobile genetic elements, known as plasmids, that can move between bacteria and between patients. Based on data from the Antibiotic Resistance Laboratory Network (ARLN), in the United States, approximately one third of Enterobacterales that are resistant to a carbapenem can make an enzyme known as a carbapenemase that breaks down carbapenem antibiotics.<sup>2</sup> Strains of CRE that carry a gene for one of these carbapenemase enzymes are referred to as carbapenemase producing (CP). Identifying carbapenemase-producing organisms and containing their spread is an important strategy for protecting patients and preserving the power of antibiotics.<sup>3</sup> CT surveillance for CRE aligns with the case definition of the [National Notifiable Diseases Surveillance System \(NNDSS\)](#).<sup>4-6</sup>

**When to report CRE results:** Please send lab report ([by electronic file or OL-15C](#)) to DPH (fax completed forms to (860) 920-3131) and submit bacterial isolate to SPHL (accompanied by [OL-9B](#)) when an isolate is **identified with any MIC or zone criteria that indicates possible CRE**, even if this has not yet been confirmed by additional testing. Please include susceptibility testing results and results of any carbapenemase testing performed (e.g. CarbaR or Carba5) to DPH and the SPHL.

### **Clinical laboratory criteria for CRE reporting and submission of isolate for SPHL testing:**

1. **Enterobacterales species\***, collected from a normally sterile site\*\*, urine, or lower respiratory tract\*\*\*

#### **AND one or both of the following:**

2. **Isolate is resistant<sup>†</sup> to any carbapenem** (Doripenem<sup>‡</sup>, Imipenem, Meropenem, or Ertapenem)  
Please refer to Table 1.

**Note: Report based on MIC and Zone Diameter, not on interpretation alone.**

**Note: *Proteus* spp., *Providencia* spp., and *Morganella morganii* may have elevated Imipenem MICs by mechanisms other than production of carbapenemases; susceptibility results to Imipenem should not be considered for these genera.<sup>7</sup>**

3. **The organism displays production of carbapenemase** (e.g. KPC, NDM, VIM, IMP, and OXA-48) regardless of susceptibility results.

**\*Enterobacterales genera** (common carbapenem-resistant genera are bolded): ***Citrobacter***, ***Enterobacter***, ***Escherichia***, ***Hafnia***, ***Klebsiella***, ***Pantoea***, ***Proteus***, ***Providencia***, ***Morganella***, ***Raoultella***, ***Serratia***, *Alterococcus*, *Arsenophonus*, *Brenneria*, *Buchnera*, *Budvicia*, *Buttiauxella*, *Calymmatobacterium*, *Candidatus Phlomoacter*, *Cedecea*, *Edwardsiella*, *Erwinia*, *Ewingella*, *Kluyvera*, *Leclercia*, *Leminorella*, *Moellerella*, *Obesumbacterium*, *Pantoea*, *Pectobacterium*, *Photorhabdus*, *Plesiomonas*, *Pluralibacter*, *Pseudenterobacter*, *Pseudoescherichia*, *Pseudocitrobacter*,

<sup>1</sup> [Antibiotic Resistance Threats in the United States, 2019 \(cdc.gov\)](#)

<sup>2</sup> [Antibiotic Resistance | A.R. & Patient Safety Portal \(cdc.gov\)](#)

<sup>3</sup> [Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms \(MDROs\): Updated December 2022 \(cdc.gov\)](#)

<sup>4</sup> [Carbapenemase-Producing Organisms \(CPO\) 2023 Case Definition | CDC](#)

<sup>5</sup> [Council of State and Territorial Epidemiologists Position Statement 22-ID-04](#)

<sup>6</sup> [Council of State and Territorial Epidemiologists Position Statement 22-ID-04 Interim CPO Operational Guide](#)

<sup>7</sup> [CLSI M100-ED33:2023 Performance Standards for Antimicrobial Susceptibility Testing, 33rd Edition](#)

*Pragia, Rahnella, Saccharobacter, Salmonella, Shigella Sodalis, Tatumella, Tralbulsiella, Wigglesworthia, Xenorhabdus, Yersinia, Yokenella*

Microbial Taxonomy will continue to evolve please see the link below for reference:

[Taxonomy browser \(Enterobacterales\) \(nih.gov\)](#)

\*\*Normally sterile sites include: Blood, cerebrospinal fluid, pleural fluid, pericardial fluid, peritoneal fluid, joint/synovial fluid, bone, internal body site (lymph node, brain, heart, liver spleen, vitreous fluid, kidney, pancreas, or ovary), muscle, deep tissue or other normally sterile site.

\*\*\*Lower respiratory tract specimens include: Bronchoalveolar lavage, sputum, tracheal aspirate, or other lower respiratory site.

**Table 1.** MIC and Zone Diameter Interpretive Criteria for *Enterobacterales* species by antimicrobial, based on: [CLSI M100-ED33:2023 Performance Standards for Antimicrobial Susceptibility Testing, 33rd Edition](#)

Broth MIC Criteria (µg/mL)				Disk Diffusion Zone Diameter Criteria (nearest whole mm)			
Doripenem <sup>‡</sup>	Imipenem	Meropenem	Ertapenem	Doripenem <sup>‡</sup>	Imipenem	Meropenem	Ertapenem
≥4	≥4	≥4	≥2	≤19	≤19	≤19	≤18

**Note:** If breakpoints above are not in use at your facility, please contact DPH for individualized guidance.

<sup>‡</sup>Doripenem is no longer available in the United States but should be used to determine reporting criteria if currently tested at a reporting laboratory.

**Data Elements for Reporting:**

1. Patient (including address, DOB, phone number) and Provider information (name of provider and contact number)
2. CRE culture results
  - Genus and species of organism (e.g. *Klebsiella pneumoniae*)
  - Specimen source (e.g. urine, sputum, BAL, pleural fluid, blood, abscess, CSF, etc.)
  - Body site (e.g. peripheral blood, groin, left great toe, etc.)
  - Date of collection
3. Susceptibility results
  - For each drug: MIC value (when available), zone diameter (when available), and interpretation (S,I,R)
  - Methodology (e.g. Vitek, Phoenix, Microscan, Sensititre, Kirby-Bauer, E-test)
4. Results for carbapenemase testing (when available)
  - Positive carbapenemase findings
  - Negative results of carbapenemases tested
  - Methodology (e.g. CarbaR, Carba5)

**Submission of CRE isolates to SPHL**

Submit one isolate per specimen source per collection date. Refer to Table 2 for detailed submission requirements.

Table 2. Isolate Submission for CRE Testing at SPHL	
<u>Carbapenem Resistant Enterobacterales Testing</u>	
Revised: 10/4/2023	
<b>Test description</b>	Carbapenem Resistant Enterobacteriaceae (CRE) isolate submission for characterization, include identification confirmation, antimicrobial susceptibility testing, and carbapenemase phenotypic screening and PCR.
<b>Test use</b>	Characterization of CRE to aid in infection prevention measures.
<b>Test Department</b>	Bacteriology Phone: (860) 920-6596, FAX: (860) 920-6721
<b>Methodology</b>	Organism identification by MALDI-TOF or commercial kit (i.e. API 20E), antimicrobial susceptibility testing by broth microdilution and/or disk diffusion method, phenotypic testing by modified Carbapenem Inactivation Method (mCIM), and Real-Time PCR.
<b>Availability</b>	Monday-Friday. Fast Track: Saturday-Sunday ( <b>Epidemiology Approval Required</b> )
<b>Specimen Requirements</b>	Enterobacterales isolates with carbapenem resistance (MICs of $\geq 4$ $\mu\text{g/ml}$ against Imipenem or Meropenem, and/or $\geq 2$ mcg/ml against Ertapenem) identified in clinical isolates from sterile sites, sputum, or urine.
<b>Collection Kit/Container</b>	Not applicable
<b>Collection instructions</b>	Clinical CRE isolate(s) should be submitted on non-inhibitory/non-selective agar slant(s), 18-24 hour growth
<b>Specimen Handling &amp; Transport</b>	Transport to laboratory as soon as possible. Store and transport at room temperature (15°-25°C) or with ice pack.
<b>Unacceptable Conditions</b>	Unlabeled specimens. Specimens that have leaked or containers that have broken in transit. Specimens submitted on expired media. No clinical samples (i.e. blood, urine, etc.), <b>ONLY ISOLATES</b> are acceptable.
<b>Requisition Form</b>	<a href="#">Clinical Test Requisition OL-9B</a> Select: <b>Carbapenem Resistant Organism: CRE (indicate organism)</b>
<b>Required Information</b>	Name and address of submitter. Two patient identifiers (ie. name, DOB, Acc.#, MRN), town of residence (city, state, zip), specimen source/type of collection, date of collection and test requested. Please ensure information on the requisition matches the specimen
<b>Limitations</b>	Not applicable
<b>Additional Comments</b>	Carbapenem Resistant Enterobacterales (CRE) are reportable on the <a href="#">OL-15C</a> form and are required to be submitted to the State Laboratory for confirmation.

Additional information on isolate submission can be found at:

[Katherine A Kelley State Public Health Laboratory \(ct.gov\)](#)

## Carbapenem-Resistant *Acinetobacter baumannii* (CRAB)

**CRAB** (Carbapenem-resistant *Acinetobacter baumannii*) are an urgent threat to public health.<sup>1</sup> These bacteria are typically resistant to many antibiotics, resistance to carbapenems further limits treatment options for patients. Similar to CRE, CRAB can carry mobile genetic elements, known as plasmids, that can move between bacteria and between patients. Based on data from the Antibiotic Resistance Laboratory Network (ARLN), in the Northeastern United States, approximately 66% of *Acinetobacter* that are resistant to a carbapenem can make an enzyme known as a carbapenemase that breaks down carbapenem antibiotics.<sup>2</sup> Strains of CRAB that carry the gene that makes one of these carbapenemase enzymes are referred to as carbapenemase producing (CP). Additionally, CRAB is an important pathogen in healthcare facilities because *Acinetobacter* can survive for prolonged periods on environmental surfaces. Identifying carbapenemase-producing organisms and containing their spread is an important strategy for protecting patients and preserving the power of antibiotics.<sup>3</sup> CT surveillance for CRPA aligns with the case definition of the [National Notifiable Diseases Surveillance System \(NNDSS\)](#).<sup>4-6</sup>

**When to report CRAB results:** Please send lab report ([by electronic file or OL15C](#)) to DPH (fax completed forms to (860) 920-3131) and submit bacterial isolate to SPHL (accompanied by [OL-9B](#)) when an isolate is **first identified with any MIC or zone criteria that indicates possible CRAB**, even if this has not yet been confirmed by additional testing. Please include susceptibility testing results and results of any carbapenemase testing performed (e.g. CarbaR or Carba5) to DPH and the SPHL.

### **Clinical laboratory criteria for CRAB reporting and submission of isolate for SPHL testing:**

1. ***Acinetobacter* species\*** collected from a normally sterile site\*\*, urine, lower respiratory tract\*\*\*, or a wound.

#### **AND one or both of the following:**

2. **Isolate is resistant<sup>†</sup> to any carbapenem except Ertapenem** (Doripenem<sup>‡</sup>, Imipenem, and Meropenem).

**Note: Please refer to Table 3. Report based on MIC and Zone Diameter, not on interpretation alone.**

**Note: Ertapenem has little intrinsic activity against *Acinetobacter*, so *Acinetobacter* resistant to ertapenem only does not require reporting.**

3. **The organism displays production of carbapenemase** (e.g. KPC, NDM, VIM, IMP, and OXA-48) by PCR regardless of susceptibility results.

**\*Include *A. baumannii*, *A. baumannii* complex, *A. calcoaceticus-baumannii* complex, and all subspecies** (e.g. *Acinetobacter pittii*, *Acinetobacter nosocomialis*, *Acinetobacter calcoaceticus*)

<sup>1</sup> [Antibiotic Resistance Threats in the United States, 2019 \(cdc.gov\)](#)

<sup>2</sup> [Carbapenem-resistant \*Acinetobacter baumannii\* \(CRAB\): An urgent public health threat in United States healthcare facilities | A.R. & Patient Safety Portal \(cdc.gov\)](#)

<sup>3</sup> [Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms \(MDROs\): Updated December 2022 \(cdc.gov\)](#)

<sup>4</sup> [Carbapenemase-Producing Organisms \(CPO\) 2023 Case Definition | CDC](#)

<sup>5</sup> [Council of State and Territorial Epidemiologists Position Statement 22-ID-04](#)

<sup>6</sup> [Council of State and Territorial Epidemiologists Position Statement 22-ID-04 Interim CPO Operational Guide](#)

\*\* Normally sterile sites include: Blood, cerebrospinal fluid, pleural fluid, pericardial fluid, peritoneal fluid, joint/synovial fluid, bone, internal body site (lymph node, brain, heart, liver spleen, vitreous fluid, kidney, pancreas, or ovary), muscle, deep tissue or other normally sterile site.

\*\*\* Lower respiratory tract specimens include: Bronchoalveolar lavage, sputum, tracheal aspirate, or other lower respiratory site.

**Table 3.** MIC and Zone Diameter Interpretive Criteria for *Acinetobacter baumannii* species by antimicrobial, based on:

[CLSI M100-ED33:2023 Performance Standards for Antimicrobial Susceptibility Testing, 33rd Edition](#)

Broth MIC Criteria (µg/mL)				Disk Diffusion Zone Diameter Criteria (nearest whole mm)			
Doripenem <sup>‡</sup>	Imipenem	Meropenem	Ertapenem	Doripenem <sup>‡</sup>	Imipenem	Meropenem	Ertapenem
≥8	≥8	≥8	N/A	≤14	≤18	≤14	N/A

**Note:** If breakpoints above are not in use at your facility, please contact DPH for individualized guidance.

<sup>‡</sup>Doripenem is no longer available in the United States but should be used to determine reporting criteria if currently in use at a reporting laboratory

**Data Elements for Reporting:**

1. Patient (including address, DOB, phone number) and Provider information (name of provider and contact number)
2. CRAB culture results
  - Genus and species of organism (e.g. *Acinetobacter baumannii*)
  - Specimen source (e.g. urine, sputum, wound, BAL, pleural fluid, blood, abscess, CSF, etc.)
  - Body site (e.g. peripheral blood, groin, left great toe, etc.)
  - Date of collection
3. Susceptibility results
  - For each drug: MIC value (when available), zone diameter (when available), interpretation (S,I,R)
  - Methodology (e.g. Phoenix, Microscan, Vitek, Kirby-Bauer, E-test)
4. Results for carbapenemase testing (when available)
  - Positive carbapenemase findings
  - Negative results of carbapenemases tested
  - Methodology (e.g. CarbaR, Carba5)

**Submission of CRAB isolates to SPHL**

Submit one isolate per specimen source per collection date. Refer to Table 4 for detailed submission requirements.

Table 4. Isolate Submission for CRAB Testing at SPHL <u>Carbapenem Resistant <i>Acinetobacter baumannii</i> (CRAB) Testing</u> Revised 10-4-2023	
<b>Test description</b>	Carbapenem Resistant <i>Acinetobacter baumannii</i> (CRAB) isolate submission for characterization, include identification confirmation, antimicrobial susceptibility testing, and carbapenemase PCR.
<b>Test use</b>	Characterization of CRAB to aid in infection prevention measures.
<b>Test Department</b>	Bacteriology Phone: (860) 920-6596, FAX: (860) 920-6721
<b>Methodology</b>	Organism identification by MALDI-TOF or commercial kit (i.e. API 20E), antimicrobial susceptibility testing by broth microdilution and/or disk diffusion method, and Real-Time PCR.
<b>Availability</b>	Monday-Friday. Fast Track: Saturday-Sunday ( <b>Epidemiology Approval Required</b> )
<b>Specimen Requirements</b>	<i>Acinetobacter baumannii</i> isolates with carbapenem resistance (MICs of ≥8 µg/ml against Imipenem or Meropenem) identified in clinical isolates from sterile sites, sputum, or urine.
<b>Collection Kit/Container</b>	Not applicable
<b>Collection instructions</b>	Clinical CRAB isolate(s) should be submitted on non-inhibitory/non-selective agar slant(s), 18-24 hour growth
<b>Specimen Handling &amp; Transport</b>	Transport to laboratory as soon as possible. Store and transport at room temperature (15°-25°C) or with ice pack.
<b>Unacceptable Conditions</b>	Unlabeled specimens. Specimens that have leaked or containers that have broken in transit. Specimens submitted on expired media. No clinical samples (i.e. blood, urine, etc.), <b>ONLY ISOLATES</b> are acceptable.
<b>Requisition Form</b>	<a href="#">Clinical Test Requisition OL-9B</a> Select: <b>Carbapenem Resistant Organism: CRAB</b>
<b>Required Information</b>	Name and address of submitter. Two patient identifiers (ie. name, DOB, Acc.#, MRN), town of residence (city, state, zip), specimen source/type of collection, date of collection and test requested. Please ensure information on the requisition matches the specimen.
<b>Limitations</b>	Not applicable
<b>Additional Comments</b>	Carbapenem Resistant <i>Acinetobacter baumannii</i> (CRAB) are reportable on the <a href="#">OL-15C</a> form and are required to be submitted to the State Laboratory for confirmation.

Additional information on isolate submission can be found at:

[Katherine A Kelley State Public Health Laboratory \(ct.gov\)](#)

## Carbapenem-Resistant *Pseudomonas aeruginosa* (CRPA)

**CRPA** (Carbapenem Resistant *Pseudomonas aeruginosa*) are a serious threat to public health.<sup>1</sup> These bacteria are typically resistant to many antibiotics, resistance to carbapenems further limits treatment options for patients. CRPA can carry mobile genetic elements, known as plasmids, that can move between bacteria and between patients. Approximately 2-3% of *Pseudomonas* that are resistant to a carbapenem can make an enzyme known as a carbapenemase that breaks down carbapenem antibiotics. Strains of CRPA that carry the gene that makes one of these carbapenemase enzymes are referred to as carbapenemase producing organisms (CPO). CRPA isolates can be resistant to most if not all antibiotics and can cause significant clinical disease, resulting in worsened patient morbidity and mortality. Identifying carbapenemase-producing organisms and containing their spread is an important strategy for protecting patients and preserving the power of antibiotics.<sup>2</sup> CT surveillance for CRPA aligns with the case definition of the [National Notifiable Diseases Surveillance System \(NNDSS\)](#).

**When to report CRPA results:** Please send the lab report ([by electronic file or OL15C](#)) to DPH and submit bacterial isolate to SPHL (accompanied by [OL-9B](#)) **when an isolate is first identified with any MIC or zone criteria that indicates resistance to a carbapenem antibiotic, doripenem, imipenem or meropenem.** Please include susceptibility testing results and results of any carbapenemase testing performed (e.g. CarbaR or Carba5) to DPH and the SPHL.

### **Clinical laboratory criteria for CRPA reporting and submission of isolate for SPHL testing:**

1. ***Pseudomonas aeruginosa*** collected from a normally sterile site\*, urine, lower respiratory tract\*\*, or a wound.

#### **AND one or both of the following:**

2. **Isolate is resistant† to doripenem‡, imipenem or meropenem**

**Note: Please refer to Table 5. Report based on MIC and Zone Diameter, not on interpretation alone.**

**Note: Ertapenem has little intrinsic activity against *Pseudomonas*, so *Pseudomonas* resistant to ertapenem only does not require reporting.**

3. **The organism displays production of carbapenemase** (e.g. KPC, NDM, VIM, IMP, and OXA-48) by PCR regardless of susceptibility results.

\*Normally sterile sites include: Blood, cerebrospinal fluid, pleural fluid, pericardial fluid, peritoneal fluid, joint/synovial fluid, bone, internal body site (lymph node, brain, heart, liver spleen, vitreous fluid, kidney, pancreas, or ovary), muscle, deep tissue or other normally sterile site

\*\*Lower respiratory tract specimens include: Bronchoalveolar lavage, sputum, tracheal aspirate, or other lower respiratory site

<sup>1</sup> [Antibiotic Resistance Threats in the United States, 2019 \(cdc.gov\)](#)

<sup>2</sup> [Carbapenem-resistant Acinetobacter baumannii \(CRAB\): An urgent public health threat in United States healthcare facilities | A.R. & Patient Safety Portal \(cdc.gov\)](#)

<sup>3</sup> [Interim Guidance for a Public Health Response to Contain Novel or Targeted Multidrug-resistant Organisms \(MDROs\): Updated December 2022 \(cdc.gov\)](#)

<sup>4</sup> [Carbapenemase-Producing Organisms \(CPO\) 2023 Case Definition | CDC](#)

<sup>5</sup> [Council of State and Territorial Epidemiologists Position Statement 22-ID-04](#)

<sup>6</sup> [Council of State and Territorial Epidemiologists Position Statement 22-ID-04 Interim CPO Operational Guide](#)

**†Table 5.** MIC and Zone Diameter Interpretive Criteria for *Pseudomonas aeruginosa* species by antimicrobial, based on:  
[CLSI M100-ED33:2023 Performance Standards for Antimicrobial Susceptibility Testing, 33rd Edition](#)

Broth MIC Criteria (µg/mL)				Disk Diffusion Zone Diameter Criteria (nearest whole mm)			
Doripenem	Imipenem	Meropenem	Ertapenem	Doripenem	Imipenem	Meropenem	Ertapenem
≥8	≥8	≥8	N/A	≤15	≤15	≤15	N/A

**Note:** If breakpoints above are not in use at your facility, please contact DPH for individualized

‡Doripenem is no longer available in the United States but should be used to determine reporting criteria if currently in use at a reporting laboratory

**Data Elements for Reporting:**

1. Patient (including address, DOB, phone number) and Provider information (name of provider and contact number)
2. CRPA culture results
  - Specimen source (as listed above under laboratory criteria)
  - Body site (e.g., peripheral blood, groin, left great toe, etc.)
  - Date of collection
3. Susceptibility results
  - For each drug: MIC value (when available), zone diameter (when available), interpretation (S,I,R)
  - Methodology (e.g., Phoenix, Microscan, Vitek, Kirby-Bauer, E-test)
4. Results for carbapenemase testing (when available)
  - Positive carbapenemase findings
  - Negative results of carbapenemases tested
  - Methodology (e.g. CarbaR, Carba5)

**Submission of CRPA isolates to SPHL**

Submit one isolate per specimen source per collection date. Refer to Tables 6 and 7 for detailed submission requirements.

**Testing of CRPA isolates at SPHL**

CARBA 5 testing will be performed on all Carbapenem Resistant *Pseudomonas aeruginosa* (CRPA) isolates to screen for the expression of a carbapenemase gene (KPC, OXA-48 like, VIM, IMP and NDM) using the NG-Test CARBA 5 immunochromatographic assay. If a carbapenemase is detected on the CARBA 5, reflex testing will be performed including organism identification confirmation, antimicrobial susceptibility testing, and carbapenemase phenotypic screening via mCIM and PCR. Clinical teams (i.e., laboratory or antimicrobial stewardship team) may request full isolate characterization including antimicrobial susceptibility testing upon submission (bypassing initial CARBA 5 screening). This testing may be requested even in the absence of carbapenemase markers and may be of particular value when there are limited therapeutic options identified on testing at the clinical laboratory.

<b>Table 6. Isolate Submission for CRPA to SPHL</b> <u>CARBA 5 Testing for Carbapenem Resistant <i>Pseudomonas aeruginosa</i></u> Revised: 10/4/2023	
<b>Test description</b>	CARBA 5 testing will be performed on all Carbapenem Resistant Pseudomonas aeruginosa (CRPA) isolates to screen for the presence of KPC, OXA-48 like, VIM, IMP and NDM. If a carbapenemase is detected, identification confirmation, antimicrobial susceptibility testing, carbapenemase phenotypic screening and PCR will be performed.
<b>Test use</b>	Characterization of CRPA to aid in infection prevention measures.
<b>Test Department</b>	Bacteriology Phone: (860) 920-6596, FAX: (860) 920-6721
<b>Methodology</b>	Organism screening of carbapenemase enzymes by NG-Test CARBA 5.
<b>Availability</b>	Monday-Friday. Fast Track: Saturday-Sunday ( <b>Epidemiology Approval Required</b> )
<b>Specimen Requirements</b>	<i>Pseudomonas aeruginosa</i> isolates with carbapenem resistance (MICs of $\geq 8 \mu\text{g/ml}$ against Imipenem, Meropenem) identified in clinical isolates from sterile sites, sputum, or urine.
<b>Collection Kit/Container</b>	Not applicable
<b>Collection instructions</b>	Clinical CRPA isolate(s) should be submitted on non-inhibitory/non-selective agar slant(s), 18-24 hour growth.
<b>Specimen Handling &amp; Transport</b>	Transport to laboratory as soon as possible. Store and transport at room temperature (15°-25°C) or with ice pack.
<b>Unacceptable Conditions</b>	Unlabeled specimens. Specimens that have leaked or containers that have broken in transit. Specimens submitted on expired media. No clinical samples (i.e. blood, urine, etc.) <b>ONLY</b> isolates.
<b>Requisition Form</b>	<a href="#">Clinical Test Requisition OL-9B</a> Select: <b>Carbapenem Resistant Organism: CRPA, Fast Track</b> (if approved)
<b>Required Information</b>	Name and address of submitter. Two patient identifiers (ie. name, DOB Acc. #, MRN), town of residence (city, state, zip), specimen source/type of collection, date of collection and test requested. Please ensure information on the requisition matches the specimen.
<b>Limitations</b>	Not applicable
<b>Additional Comments</b>	Carbapenem Resistant Pseudomonas aeruginosa (CRPA) are reportable on the <a href="#">OL-15C</a> form and are required to be submitted to the state laboratory for confirmation. Complete AST work-up may be requested (despite the absence of carbapenemase markers), by indicating on the OL-9B form in Comments section

Additional information on isolate submission please see:  
[Katherine A Kelley State Public Health Laboratory \(ct.gov\)](#)

<b>Table 7. Reflex testing for CRPA that test positive for carbapenemase production on CARBA 5</b> <u>Carbapenem Resistant <i>Pseudomonas aeruginosa</i> Testing</u> Revised: 10/4/2023	
<b>Test description</b>	Carbapenem Resistant <i>Pseudomonas aeruginosa</i> (CRPA) isolate submission will include, screening for presence of KPC, OXA-48 like, VIM, IMP and NDM, identification confirmation, antimicrobial susceptibility testing, carbapenemase phenotypic screening and PCR.
<b>Test use</b>	Characterization of CRPA to aid in infection prevention measures.
<b>Test Department</b>	Bacteriology Phone: (860) 920-6596, FAX: (860) 920-6721
<b>Methodology</b>	Organism screening of carbapenemase enzymes by NG-Test CARBA 5, identification by MALDI-TOF or commercial kit (i.e. API 20E), antimicrobial susceptibility testing by broth microdilution and/or disk diffusion method, phenotypic testing by modified Carbapenem Inactivation Method (mCIM), and Real-Time PCR.
<b>Availability</b>	Monday-Friday. Fast Track: Saturday-Sunday ( <b>Epidemiology Approval Required</b> )
<b>Specimen Requirements</b>	<i>Pseudomonas aeruginosa</i> isolates with carbapenem resistance (MICs of $\geq 8$ $\mu\text{g/ml}$ against Imipenem, Meropenem) identified in clinical isolates from sterile sites, sputum, or urine.
<b>Collection Kit/Container</b>	Not applicable
<b>Collection instructions</b>	Clinical CRPA isolate(s) should be submitted on non-inhibitory/non-selective agar slant(s), 18-24 hour growth.
<b>Specimen Handling &amp; Transport</b>	Transport to laboratory as soon as possible. Store and transport at room temperature (15°-25°C) or with ice pack.
<b>Unacceptable Conditions</b>	Unlabeled specimens. Specimens that have leaked or containers that have broken in transit. Specimens submitted on expired media. No clinical samples (i.e. blood, urine, etc.), <b>ONLY ISOLATES</b> are acceptable.
<b>Requisition Form</b>	<a href="#">Clinical Test Requisition OL-9B</a> Select: <b>Carbapenem Resistant Organism: CRPA, Fast Track</b> (if approved)
<b>Required Information</b>	Name and address of submitter. Two patient identifiers (ie. name, DOB Acc. #, MRN), town of residence (city, state, zip), specimen source/type of collection, date of collection and test requested. Please ensure information on the requisition matches the specimen.
<b>Limitations</b>	Not applicable
<b>Additional Comments</b>	Carbapenem Resistant <i>Pseudomonas aeruginosa</i> (CRPA) are reportable on the <a href="#">OL-15C</a> form and are required to be submitted to the State Laboratory for confirmation. Complete AST work-up may be requested (despite the absence of carbapenemase markers), by indicating on the OL-9B form in Comments section.

Additional information on isolate submission can be found at:  
[Katherine A Kelley State Public Health Laboratory \(ct.gov\)](#)

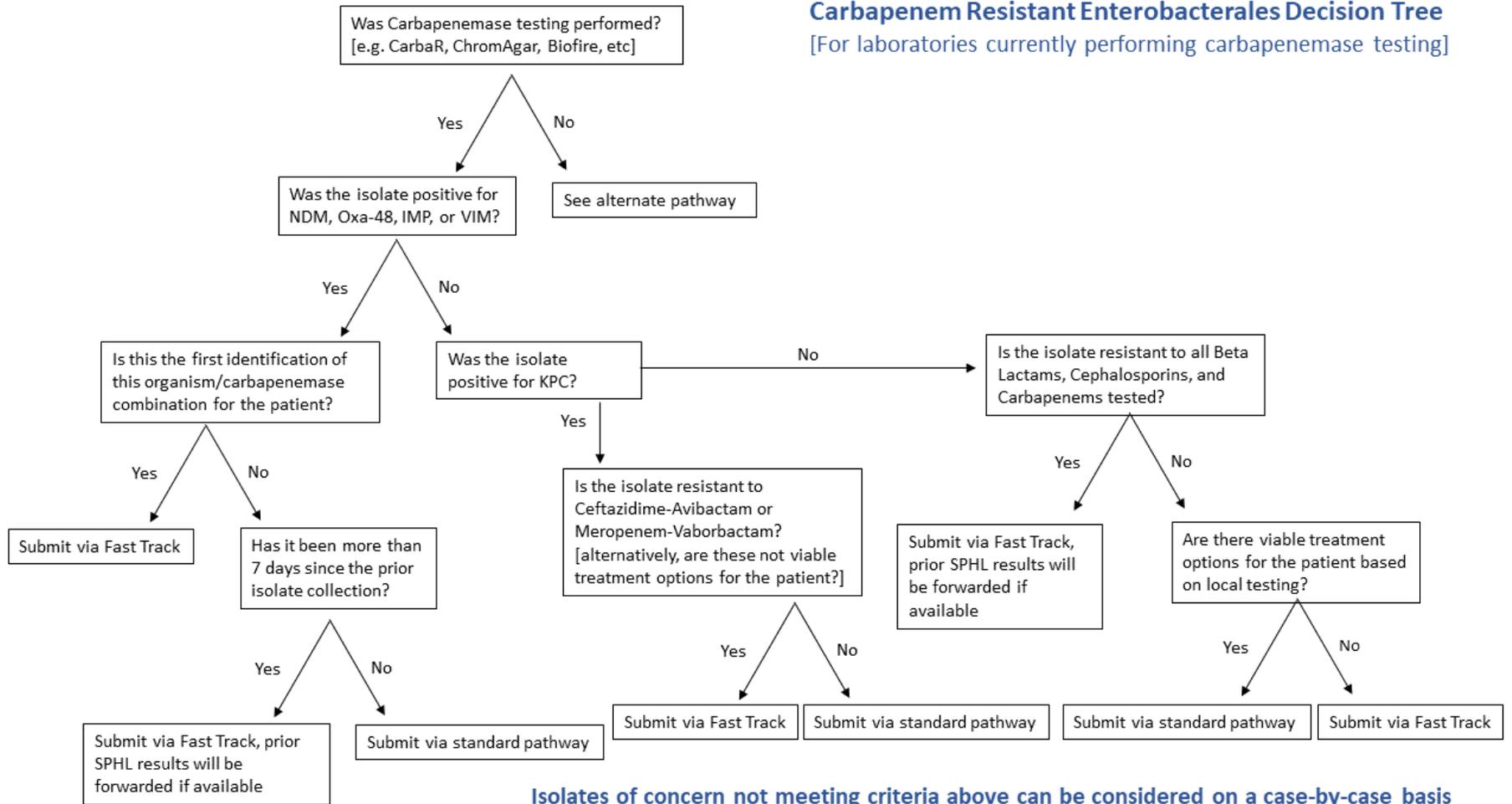
## SPHL Fast Track Testing Algorithm

Under the SPHL Fast Track Initiative for difficult-to-treat infections, all CRAB isolates, and reportable CRE isolates found to harbor a non-KPC carbapenemase (NDM, Oxa48, IMP or VIM) (or those CRE isolates that have strong clinical indicators that this is likely) will be eligible for on-demand testing services, including facilitation of on-demand courier services, seven (7) days per week. Isolates received prior to 12 noon as a pure isolate on a 24-hour agar plate will receive carbapenemase testing the day of receipt, followed by antimicrobial susceptibility testing the following day. Receipt of a >24 hour agar plate will delay testing. All isolates not eligible for Fast Track will be processed via the Standard Pathway with testing performed twice per week.

Eligibility criteria for Fast Track are included below (Figures 1 and 2) based on whether the facility currently performs carbapenemase testing. Isolates that do not strictly meet criteria presented but may require additional testing to identify treatment options (including isolates testing pan non-susceptible at clinical laboratories) will be considered for Fast Track processing.

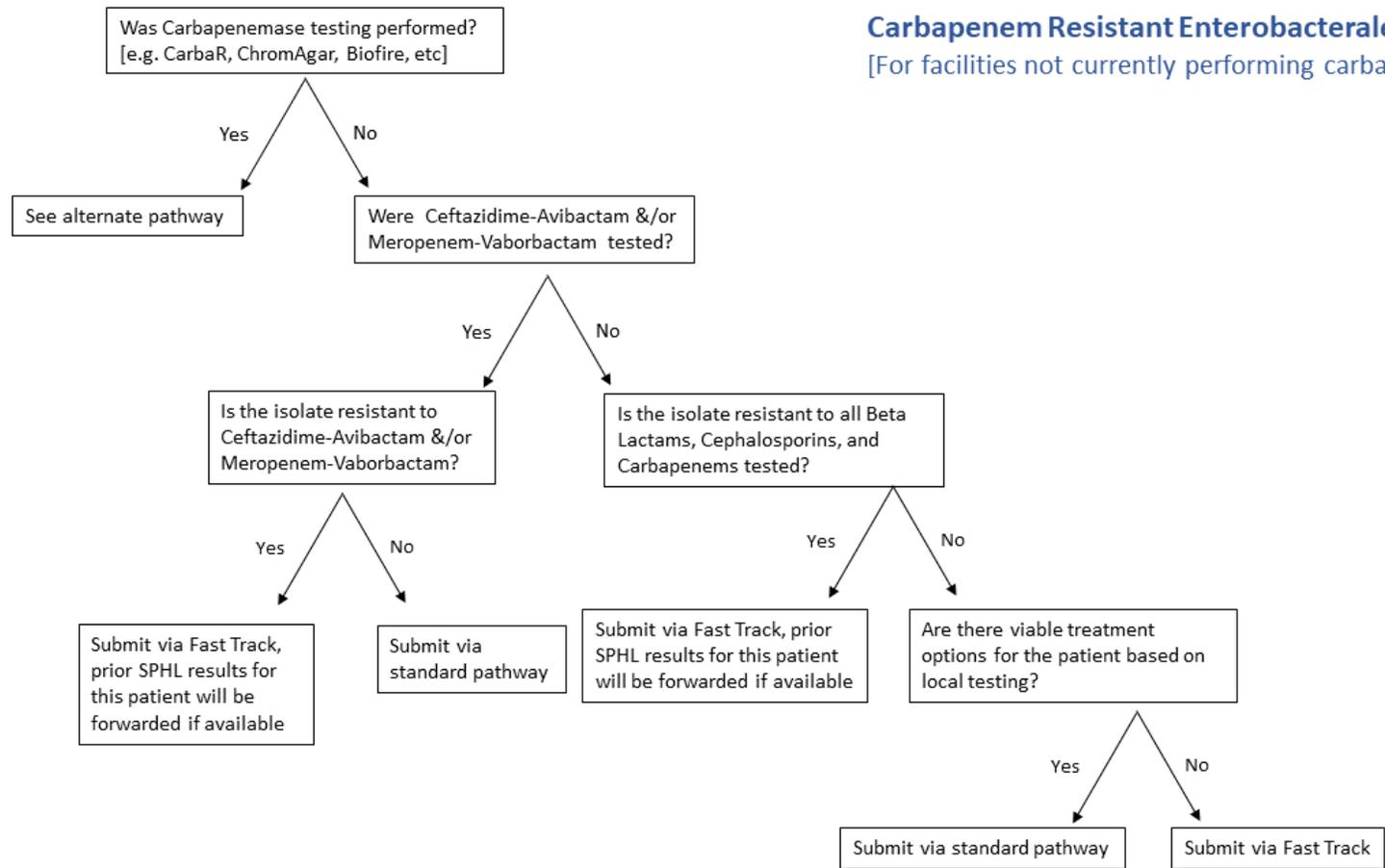
Please call the HAI-AR Program at (860) 509-7995 (Monday-Friday 8:30-4:30) or (860) 509-8000 (after hours) to coordinate all Fast Track Testing.

Figure 1. Fast Track Testing Decision Tree



Isolates of concern not meeting criteria above can be considered on a case-by-case basis

Figure 2. Fast Track Testing Decision Tree



**Carbapenem Resistant Enterobacterales Decision Tree**  
[For facilities not currently performing carbapenemase testing]

Isolates of concern not meeting criteria above can be considered on a case-by-case basis

## Contacts

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