

Multi-Drug Resistant Organism (MDRO) Cheat Sheet for Infection Preventionists

Type of MDRO	Definition	Laboratory Evidence to Initiate Transmission-Based Precautions (TBP)	TBP	Duration of TBP	Nebraska Tier ¹⁴	NPHL Specimen Submission ¹⁰	
Carbapenemase-Producing Carbapenem Resistant Organisms Examples: •CP-CRAB: Carbapenemase-Producing Carbapenem-resistant <i>Acinetobacter baumannii</i> •CP-CRPA: Carbapenemase-Producing Carbapenem-resistant <i>Pseudomonas aeruginosa</i> •CP-CRE: Carbapenemase-Producing Carbapenem-resistant Enterobacterales	Any organism that produces a carbapenemase	Identification of a Carbapenemase Gene. Most Common Carbapenemase Genes: NDM, OXA, KPC, VIM, IMP NDM: New Delhi Metallo-β-Lactamase OXA-48 like: Oxacillinase KPC: <i>Klebsiella pneumoniae</i> carbapenemase VIM: Verona Integron Metallo- β-Lactamase IMP: Imipenemase	Contact Precautions Long-term Care Facilities (LTCF): Enhanced barrier precautions (EBP) recommended for colonized resident(s)** In general, CDC does not recommend screening individuals with a history of CPO colonization or infection to assess for decolonization to inform discontinuation of vertical infection control measures	Continue isolation indefinitely. In general, screening individuals with a history of colonization or infection with a targeted MDRO with the aim of discontinuing transmission-based precautions is not recommended.	Tier 2	Submit all isolates of in-house or reference laboratory confirmed carbapenemase-producing Enterobacterales (CPE) or <i>Pseudomonas aeruginosa</i> (CRPA) or <i>Acinetobacter baumannii</i> (CRAB)	
Carbapenem Resistant Enterobacterales (CRE) Organisms: <i>Escherichia</i> sp. (<i>E.coli</i>) <i>Klebsiella</i> sp. (<i>K. aerogenes</i> , <i>K. pneumoniae</i> , <i>K. variicola</i> , <i>K. oxytoca</i> , <i>K. ozaenae</i> , <i>K. ornitholytica</i> , etc.) <i>Enterobacter</i> sp. (<i>E. cloacae</i> , etc.) <i>Citrobacter</i> sp. (<i>C. freundii</i> , <i>C. koserii</i> , etc.) <i>Providencia</i> sp. (<i>P. rettgeri</i> , <i>P. stuartii</i> etc.) <i>Morganella</i> sp. (<i>M. morganii</i> , etc.) <i>Serratia</i> sp. (<i>S. marcescens</i> , etc.) <i>Proteus</i> sp. (<i>P. mirabilis</i> , <i>P. vulgaris</i> , <i>P. penneri</i> , etc.) Note: There are many more genera included within the family, but these are the most common CRE that you will see.	CRE are bacteria of the Enterobacterales order that are resistant to the carbapenem antibiotics such as meropenem, ertapenem or imipenem. Regarding bacteria that are intrinsically not susceptible to imipenem (e.g., <i>Proteus</i> spp., <i>Morganella</i> spp., <i>Providencia</i> spp.), resistance to at least one carbapenem other than imipenem is required	Any member of the bacterial family Enterobacterales with susceptibility results that indicate resistance (R) or Intermediate (I) to ertapenem, doripenem, imipenem, and/or meropenem. Regarding bacteria that are intrinsically not susceptible to imipenem (e.g., <i>Proteus</i> spp., <i>Morganella</i> spp., <i>Providencia</i> spp.), resistance to at least one carbapenem other than imipenem is required	Contact Precautions Long-term Care Facilities (LTCF): Enhanced barrier precautions (EBP) considered for colonized resident(s)**	Per facility policy and risk assessment Minimal consideration: duration of hospitalization where this organism was identified.	Tier 3	Enterobacterales: Ertapenem MIC ≥ 1 µg/ml or meropenem MIC ≥ 2 µg/ml or imipenem MIC ≥ 2 µg/ml or non-susceptible by disc diffusion method (See rare exceptions below) DO NOT submit the following isolates: <i>Proteus</i> species, <i>Providencia</i> species, and <i>Morganella morganii</i> non-susceptible only to imipenem but susceptible to meropenem and ertapenem	
Multidrug-Resistant (MDR) Acinetobacter	Gram-negative bacteria that are resistant to several types of antibiotics.	Any <i>Acinetobacter</i> spp. that has tested either Intermediate (I) or Resistant (R) to at least one drug in at least three of the following seven categories: 1. Extended-spectrum cephalosporin (cefepime, ceftazidime) 2. Fluoroquinolones (ciprofloxacin, levofloxacin) 3. Aminoglycosides (amikacin, gentamicin, tobramycin) 4. Carbapenems (imipenem, meropenem, doripenem) 5. Piperacillin/tazobactam 6. Ampicillin/sulbactam 7. Cefiderocol	Contact Precautions Long-term Care Facilities (LTCF): Enhanced barrier precautions (EBP) recommended for colonized resident(s)**	Per facility policy and risk assessment Minimal consideration: duration of hospitalization where this organism was identified.	Tier 3	<i>Acinetobacter baumannii</i> : Doripenem ≥ 4 µg/ml or Imipenem ≥ 4 µg/ml or Meropenem ≥ 4 µg/ml or non-susceptible by disc diffusion method and resistant to both cefepime and ceftazidime at MIC ≥ 16 µg/ml	
Resistant <i>Pseudomonas</i>	MDR <i>Pseudomonas aeruginosa</i>	<i>Pseudomonas aeruginosa</i> that has tested either Intermediate (I) or Resistant (R) to at least one drug in at least three of the following six categories: 1. Extended-spectrum cephalosporin (cefepime, ceftazidime, ceftazidime-avibactam, ceftolozane-tazobactam) 2. Fluoroquinolones (ciprofloxacin, levofloxacin) 3. Aminoglycosides (amikacin, tobramycin) 4. Carbapenems (imipenem, meropenem, doripenem, imipenem/relebactam) 5. Piperacillin/tazobactam 6. Cefiderocol	Contact Precautions Long-term Care Facilities (LTCF): Enhanced barrier precautions (EBP) considered for colonized resident(s)**	Per facility policy and risk assessment Minimal consideration: duration of hospitalization where this organism was identified.	Tier 3	<i>Pseudomonas aeruginosa</i> : Meropenem or imipenem MIC ≥ 4 µg/ml, or non-susceptible by disc diffusion method and non-susceptible to both Cefepime and Ceftazidime at MIC ≥ 16 µg/ml DO NOT submit the following isolates: <i>Pseudomonas aeruginosa</i> that are mucoid, from a cystic fibrosis patient or susceptible to cephalosporins.	
	XDR <i>Pseudomonas aeruginosa</i>	Not susceptible to at least one antibiotic in at least three antibiotic classes for which <i>P. aeruginosa</i> susceptibility is generally expected, plus susceptible to ≤ 2 classes of antibiotics: 1. Extended-spectrum cephalosporin (cefepime, ceftazidime, ceftazidime-avibactam, ceftolozane-tazobactam) 2. Fluoroquinolones (ciprofloxacin, levofloxacin) 3. Aminoglycosides (amikacin, tobramycin) 4. Carbapenems (imipenem, meropenem, doripenem, imipenem/relebactam) 5. Piperacillin/tazobactam 6. Cefiderocol				Tier 3	
	DTR (Difficult to Treat) <i>Pseudomonas aeruginosa</i>	DTR is defined as <i>P. aeruginosa</i> exhibiting non-susceptibility to all of the following: piperacillin-tazobactam, ceftazidime, cefepime, aztreonam, meropenem, imipenem-cilastatin, ciprofloxacin, and levofloxacin.				Tier 3	
	PDR (Pan Drug Resistant) <i>Pseudomonas aeruginosa</i>	Resistant to all antibiotic classes. Isolates tested against all agents in every category.		Contact Precautions Long-term Care Facilities (LTCF): Enhanced barrier precautions (EBP) recommended for colonized resident(s)**		Tier 2	

Candida auris	<i>Candida auris</i> is an emerging fungus that presents a serious global health threat. It is often multidrug-resistant, meaning that it is resistant to multiple antifungal drugs commonly used to treat <i>Candida</i> infections.	Some strains are resistant to all three available classes of antifungals. It is difficult to identify with standard laboratory methods, and it can be misidentified in labs without specific technology. Misidentification may lead to inappropriate management.	Contact Precautions <i>Long-term Care Facilities (LTCF):</i> Enhanced barrier precautions (EBP) recommended for colonized resident(s)** In general, CDC does not recommend screening individuals with a history of CPO colonization or infection to assess for decolonization to inform discontinuation of vertical infection control measures.	Continue isolation indefinitely.	Tier 2	Submit all isolates of in-house or reference laboratory confirmed <i>Candida Auris</i> . <i>Candida auris</i> is now reportable in Nebraska ¹⁵
VRSA/VISA Vancomycin-intermediate <i>S. aureus</i> (VISA) Vancomycin-resistant <i>S. aureus</i> (VRSA)	CDC definitions for classifying isolates of <i>S. aureus</i> with reduced susceptibility to vancomycin are based on the laboratory breakpoints established by the Clinical and Laboratory Standards Institute (CLSI). The CLSI breakpoints for <i>S. aureus</i> and vancomycin were last modified in 2009.	Vancomycin-susceptible <i>S. aureus</i> (VSSA) Vancomycin MIC ≤2 µg/ml Vancomycin-intermediate <i>S. aureus</i> (VISA) Vancomycin MIC =4-8 µg/ml. Vancomycin-resistant <i>S. aureus</i> (VRSA) Vancomycin MIC ≥16 µg/ml	Contact Precautions <i>Long-term Care Facilities (LTCF):</i> Enhanced barrier precautions (EBP) recommended for colonized resident(s)**	Continue isolation indefinitely.	Tier 2	Submit all isolates of in-house or reference laboratory confirmed VISA or VRSA
Extended Spectrum Beta-Lactamase Producers (ESBLs)	Extended-spectrum betalactamase (ESBL) is an enzyme (chemical tool) that allows bacteria to become resistant to a wide variety of antibiotics including penicillins and cephalosporins. Several types of Gram-negative bacteria can produce these enzymes and be classified as ESBLs.	Not all laboratory test results specifically confirm ESBL-positive specimens. The Clinical Laboratory Standards Institute (CLSI) has developed broth microdilution and disk diffusion ESBL screening and confirmation tests using selected antimicrobial agents. Contact your laboratory for details. Non-susceptibility to ceftriaxone (i.e., ceftriaxone minimum inhibitory concentrations [MICs] ≥2 µg/mL), is often used as a proxy for ESBL production. CTX-M-type enzymes of extended-spectrum β-lactamases (ESBLs) produced by Enterobacterales, from a bacterial colony, may show as a result for rapid diagnostic tests as CTX-M positive.	Contact Precautions <i>Long-term Care Facilities (LTCF):</i> Enhanced barrier precautions (EBP) considered for colonized resident(s)**	Per facility policy and risk assessment	Tier 3	

Endemic MDRO's

Type of MDRO	Definition	Laboratory Evidence to Initiate Transmission-Based Precautions (TBP)	Isolation Precautions	Duration of Isolation	Tier	Notes
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)	Gram-positive bacteria that are resistant to several types of antibiotics.	Positive result for laboratory test for MRSA detection or culture of <i>S. aureus</i> with susceptibility results that indicate resistance (R) to oxacillin, ceftioxin, or methicillin. A rapid molecular test that detects mecA DNA is associated with prediction of antimicrobial resistance to methicillin and other applicable beta-lactam antibiotics in isolates of <i>Staphylococcus</i> species. Another rapid diagnostic test that can be used is a PBP2a test (Penicillin-Binding Protein (PBP2)/ Latex Agglutination Test). This test is a rapid latex agglutination assay, detecting PBP2(also called PBP2a)7, in isolates of <i>Staphylococcus</i> , as an aid in identifying MRSA and methicillin resistant coagulase-negative staphylococci.	Contact precautions per facility risk assessment <i>Long-term Care Facilities (LTCF):</i> Enhanced barrier precautions (EBP) considered for colonized resident(s)**	Per facility policy and risk assessment	Tier 4	
Vancomycin-resistant <i>Enterococci</i> (VRE)	<i>Enterococci</i> are Gram-positive bacteria that are normally present in the human gut and can sometimes cause infections. When enterococci become resistant to the drug vancomycin, they are called vancomycin-resistant <i>Enterococci</i> (VRE)	Positive result for laboratory test for VRE detection or culture of <i>Enterococcus faecalis</i> , <i>Enterococcus faecium</i> , or <i>Enterococcus species</i> unspecified with susceptibility results that indicate resistance (R) to vancomycin A lab test may show the presence of either vanA or vanB, which confer vancomycin resistance in <i>Enterococcus faecalis</i> and <i>Enterococcus faecium</i> (and occasionally other organisms).	Contact precautions per facility risk assessment <i>Long-term Care Facilities (LTCF):</i> Enhanced barrier precautions (EBP) considered for colonized resident(s)**	Per facility policy and risk assessment	Tier 4	

**Contact precautions for acute/active infections or uncontained drainage/secretions

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This document has been reviewed and approved by the MDRO subcommittee of the Nebraska DHHS HAI/AR Advisory Council. Updated 8/8/2024