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To: North Carolina Clinicians and Laboratories
From: Zack Moore, MD, MPH, State Epidemiologist
Scott Zimmerman, DrPH, MPH, HCLD (ABB), Director, NC State Laboratory of Public Health

Subject: Carbapenem Resistant Enterobacteriaceae in North Carolina

This memo is intended to provide updated information to North Carolina healthcare providers and laboratories regarding multi-drug resistant organisms (MDROs), specifically, carbapenem-resistant *Enterobacteriaceae* (CRE) and to reinforce important prevention, detection and response measures for responding to MDROs. Clinicians and laboratories should consider this information when evaluating laboratory results indicating an organism that demonstrates resistance to carbapenem antibiotics.

Background:
Enterobacteriaceae are a normal part of the gastrointestinal flora and include *Klebsiella* species, *Enterobacter* species, *Escherichia coli,* among other types of bacteria. Infections caused by CRE are difficult to treat because CRE have high levels of resistance to antibiotics, including carbapenems, a class of last-line antibiotics. Some CRE produce enzymes called carbapenemases which break down carbapenem antibiotics. The genes that produce these carbapenemases can be easily transferred to other bacteria. Carbapenemases include: *Klebsiella pneumoniae* carbapenemase (KPC), New Delhi metallo-β-lactamase (NDM), Verona integron encoded metallo-β-lactamase (VIM), imipenemase metallo-β-lactamase (IMP), and oxacillinase-48 (OXA-48). Because of their ability to transfer resistance, carbapenemase-producing CRE (CP-CRE) are of particular public health concern; early detection and aggressive implementation of infection prevention are necessary to prevent further spread.

Recommendations:
In light of the increase in CRE nationally and globally and a recent increase in reporting of CP-CRE producing OXA-48 in North Carolina, the NC Division of Public Health's Communicable Disease Branch and State Laboratory of Public Health (SLPH) asks that clinicians and laboratories consider the following recommendations.

Surveillance and Notification

- **If you or your facility identifies a cluster of patients with CRE infection or colonization OR if you suspect an unusual mechanism of resistance, please notify your local health department and save the isolate. NC SLPH can assist with mechanism testing of isolates to inform public health response. When an unusual mechanism of resistance is identified, NC DPH is available to provide recommendations and resources related to infection prevention and colonization screening.**
- Communicate with your laboratory to ensure use of appropriate methods for CRE identification (including adoption of

the most recent Clinical Laboratory Standard Institute (CLSI) breakpoints for carbapenem susceptibility testing) and to assess their capacity to test for production of carbapenemase. If your laboratory does not have the capacity to perform carbapenemase testing, consider identifying an alternate laboratory to perform additional testing when needed.

- Acute care healthcare facilities should:
  - Perform periodic reviews of laboratory data to quantify incidence of CRE and detect changes in overall trends.
  - Consider performing rectal screening cultures to detect CRE colonization when admitting patients who have been hospitalized outside the U.S. within the past 6 months.

Prevention Recommendations for Healthcare Facilities

- Implement a system to facilitate timely notification of infection prevention staff when CRE are identified.
- Place patients colonized or infected with MDROs, including CRE, on Contact Precautions when appropriate.
- Minimize the use of invasive devices.
- Educate healthcare personnel on prevention of CRE transmission.
- Notify transferring agencies and facilities if an individual is infected or colonized with CRE or another MDRO.
- Adopt a policy on Antimicrobial Stewardship, to include CDC's seven core elements of stewardship. Detailed description of these core elements for acute care, small and critical access hospitals, and long-term care settings is available at https://www.cdc.gov/antibiotic-use/healthcare/implementation.html, and https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html.

Additional information on CRE and infection prevention of MDROs can be found at:
https://www.cdc.gov/hai/outbreaks/docs/Health-Response-Contain-MDRO.pdf

If you have questions, please call the NC DPH epidemiologist on call at 919-733-3419.