Labstract – October 2011

Carbapenemase activity in *Enterobacteriaceae*:
Implementation of a multiplex detection assay

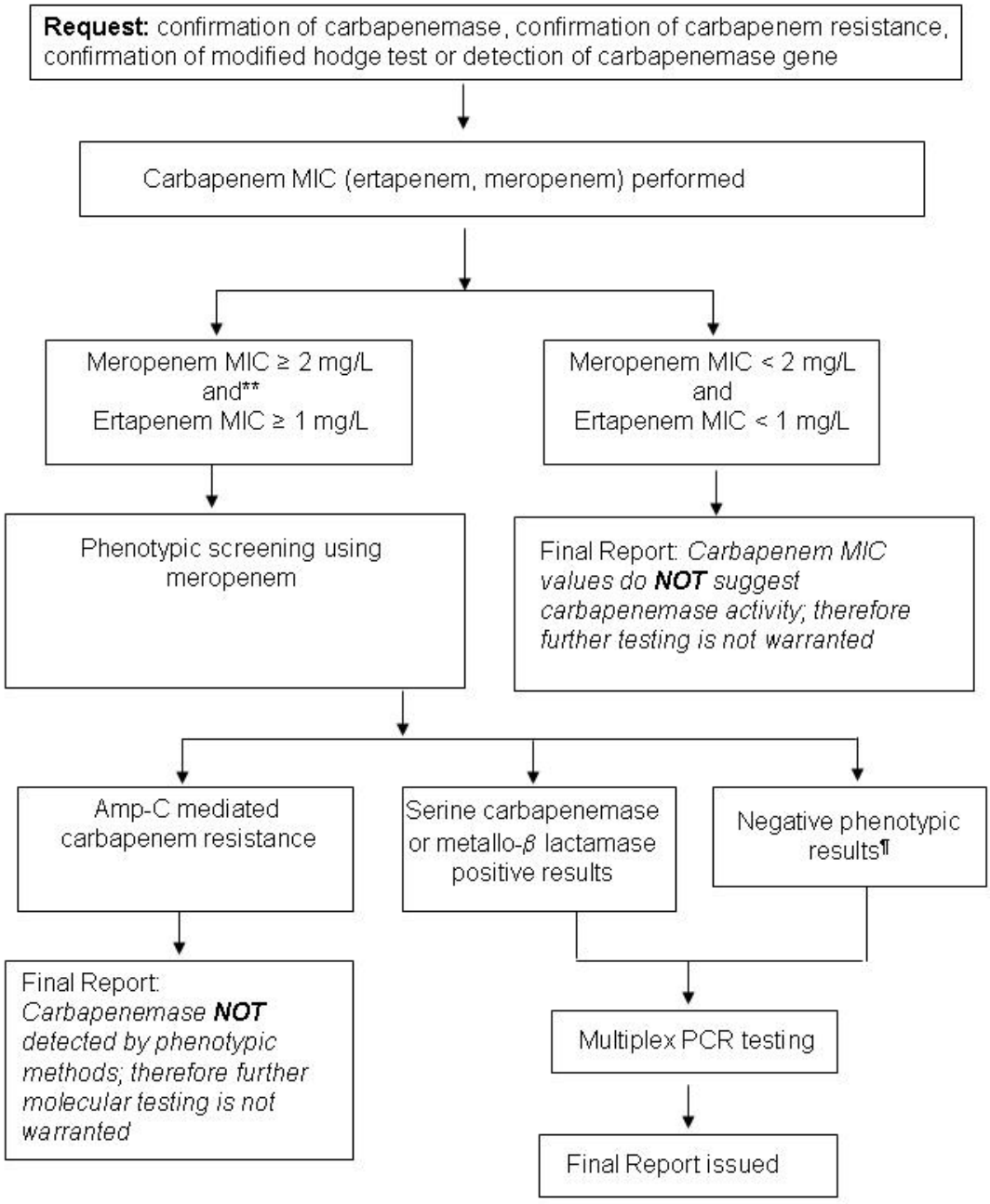
To Health Care Providers

Effective immediately, Public Health Laboratories, Public Health Ontario (PHO), will be introducing a new algorithm consisting of a phenotypic assay and a multiplex molecular assay for the detection of carbapenemase activity in the *Enterobacteriaceae* recovered from clinical specimens.

Background
Recent studies have shown that carbapenem resistance among the *Enterobacteriaceae* is being reported worldwide. Distinguishing between different mechanisms of carbapenem resistance in Enterobacteriaceae is needed to support infection prevention efforts to reduce the spread of these isolates among hospitalized patients. In addition, surveillance of carbapenem resistance is essential at the population level to assess trends in incidence of these organisms, evaluate the success of prevention efforts, and clinical recommendations for the treatment of infections.

The following algorithm will be used to detect or confirm carbapenemase activity in the *Enterobacteriaceae*. Isolates from screening specimens from hospital programs and outbreak investigations will also be accepted for confirmation of carbapenemase activity. Isolates must be submitted with the susceptibility profile including carbapenems, and the organism identification.

Carbapenemase activity in *Enterobacteriaceae*: Implementation of a multiplex detection assay (Continued)



Note:
**, *E. coli* and *Klebsiella Spp*. isolates resistant only to ertapenem will also be tested using phenotypic screening testing.
¶, Multiplex PCR will be performed only on *E. coli* and *Klebsiella* Spp. isolates with negative phenotypic results

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Please note that modified hodge test (MHT) will no longer be performed at PHL as studies have shown that MHT does not reliably detect metallo-β-lactamase (i.e NDM-1) producing organisms. Instead of MHT, more specific phenotypic testing will be done to confirm carbapenemase activity.

How to submit samples to PHL

- Submit pure viable subculture of organism on media
- Ship in conditions to ensure viability on receipt
- Complete a PHL General Test Requisition
    - Record Meropenem and Ertapenem MIC results, and organism identification in the "Clinical Information" section. The patient information must match the label on the subculture
    - If your hospital is performing a phenotypic testing, please include the results of phenotypic testing to ensure faster Turnaround Time with genotypic testing.

The following reports may be generated depending on results

- Carbapenem MIC values do NOT suggest carbapenemase activity; therefore further testing is not performed.
- Carbapenemase NOT detected by phenotypic methods; therefore further molecular testing is not performed. (Current phenotypic testing does not identify class D carbapenemase such as OXA-48).
- AmpC mediated β-lactamase detected by phenotypic methods

NOTE: It is important to remember that other resistance mechanisms can play a role in inducing carbapenem resistance in isolates that are negative for phenotypic testing and/or molecular testing.

Results based on multiplex testing:

- Carbapenemase genes not detected by molecular methods
  (PHL-Toronto is currently testing for the detection of KPC, NDM-1, GES, OXA-48 like, VIM, and IMP genes)
- KPC gene detected by molecular methods
- NDM-1 gene detected by molecular methods
- GES gene detected by molecular methods
- OXA-48 like gene detected by molecular methods
- VIM gene detected by molecular methods
- IMP gene detected by molecular methods

Comment:
For epidemiological and infection control purposes only.
For Research use only.

For further information:

- PHO Customer Service Centre toll free at **1-877-604-4567** or **416-235-6556**
- For the PHO Specimen Collection Guide and previous Labstracts, refer to http://www.oahpp.ca/publichealthlaboratories.php
- To subscribe to future PHO Labstracts, please e-mail labstracts@oahpp.ca

Reference

1. Seah C, Low DE, Patel SN and Melano RG. Detection of carbapenemase activity in *Enterobacteriaceae*: comparative evaluation of a chromogenic agar media, the modified Hodge test and a battery of meropenem-inhibitors disks. 2010. **Journal of Clinical Microbiology**; 49(5): 1965-1969.

2. Grundmann H, Livermore DM, Giske CG, Canton, Rossolini GM, Campos J, Vatopoulos A, Gniadkowski M, Toth A, Pfeifer Y Jarlier V, Carmeli Y, the CNSE working group. Carbapenemase-non-susceptible *Enterobacteriaceae* in Europe: conclusions from a meeting of national experts.2010. **Eurosurveillance**; 15(46)