Challenge M124-2

February 2013

Nares swab: methicillin-resistant *Staphylococcus aureus* (MRSA)

HISTORY

The challenge was sent to category A and B laboratories. The sample was a simulated nares swab obtained as a MRSA admission screen from a 58 year old patient .

Participants were expected to isolate and report MRSA and notify Infection Control (IC).

CMPT QA

Internal quality control testing at CMPT yielded a pure growth of methicillin-resistant *S. aureus* (MRSA), viable for 18 days.

This strain has a documented MIC for oxacillin of >256mg/L.

SURVEY RESULTS

Reference Labs: 15/15 labs reported methicillin-resistant *Staphylococcus aureus* (MRSA). 15/15 labs reported that they would notify Infection Control (IC) or Public Health (PH). Consensus was reached for both components and were graded.

Participants

Identification (Table 1): 83/84 (99%) of laboratories processing the sample, reported the isolate as MRSA and were given a grade of 4. One participant reported the isolate as *Staphylococcus aureus* but did not indicate that it was a MRSA and was graded 0.

Isolation Precaution Notification (Table 2): 81/84 (96%) of the laboratories that processed the sample indicated that they would notify Infection Control (IC) or Public Health (PH) and received a grade of 4. Two participants did not indicate that they would notify Infection Control (IC) or Public Health (PH) and thus, were graded 0.

MAIN EDUCATIONAL POINTS from M124-2

1. Approximately 1% of MRSA are being misclassified as methicillin-susceptible *S. aureus* (MSSA) based on routinely used phenotypic tests.
2. Heteroresistance is proposed as the reason for the difference between phenotype and genotype for oxacillin-susceptible MRSA (OS-MRSA).
3. *S. aureus* isolates that are positive on any chromogenic MRSA ID plate, but are negative for cefoxitin screening and are oxacillin-susceptible, should be investigated further to determine if they are OS-MRSA.

COMMENTS ON RESULTS

In order to receive a full grade on each component, laboratories had to report the organism as a MRSA (full grade of 4), and indicate notification to IC/PH (full grade of 4). Failure to report the organism as MRSA or indicate notification to IC/PH resulted in a grade of 0 for each component.

For Screening Sites, Screening Methods, and Clinical Relevance please refer to Critique M103-3

ISOLATION PRECAUTION NOTIFICATION

In facilities that do not have specific infection control staff, the laboratory should notify the ward staff about the MRSA isolate and the report should include a comment code indicating isolation precautions are required.

Recognizing that not all facilities have a designated Infection Control practitioner, CMPT uses the phrase "Isolation Precaution Notification."

Grading

Maximum grade: 8

Reporting MRSA was graded 4.

Reporting *S. aureus* was graded 0.

Reporting to IC was graded 4.

Not reporting a MRSA to IC was graded 0.

Table 1. Identification results

Reported results	A labs	B labs	Grade
methicillin-resistant *Staphylococcus aureus* (MRSA)	75	8	4
Staphylococcus aureus		1	0
sample not normally processed, refer	6	2	ungraded
Total	**81**	**11**	

Table 2. Notification to Infection Control / Public Health

Reported results	A labs	B labs	Grade
yes	73	8	4
no report	1	1	0
sample not normally processed / refer	7	2	ungraded
Total	**81**	**11**	

OXACILLIN-SUSCEPTIBLE MRSA

Although this isolate was oxacillin resistant, clinical isolates of oxacillin-susceptible, *mec*A-positive *S. aureus* are increasingly being reported worldwide. [1-4]

Detection of these isolates could represent a major challenge for the clinical microbiology laboratory. MRSA isolates that are extremely hetero-resistant and phenotypically oxacillin-susceptible *mec*A-positive *S. aureus* (OS-MRSA) are likely to be missed by the oxacillin/cefoxitin DDT (disk diffusion test) or oxacillin agar screening methods. Several studies by Sharff et al. (2012)[4] have shown that approximately 1% of MRSA isolates were oxacillin-susceptible and misclassified as MSSA.

Detection of the *mec*A gene is the reference method for methicillin susceptibility testing. However, this detection method is likely not available in most clinical laboratories.

PBP2a detection by latex agglutination was the only phenotypic test able to predict β-lactam resistance in an OS-MRSA isolate reported by Curiolo et al (2011).[2] However, the availability of the commercial kit in developing countries may present a problem.

There have been several reports of growth of OS-MRSA on at least two different commercially available chromogenic MRSA ID plates [3,4] but not all OS-MRSA isolates will grow on each of these different plates. *S. aureus* isolates that are positive on chromogenic MRSA ID plates, but are negative by cefoxitin screening method and susceptible to oxacillin, should be investigated further for the presence of PBP2a by latex agglutination or for the *mecA* gene by PCR.[3]

Additionally, MSSA isolates from patients who have had a therapeutic failure following treatment with a β-lactam antibiotic should be further tested to determine if the isolate is an OS-MRSA. Laboratories may want to consider the inclusion of either the PBP2a latex test or *mec*A PCR as part of a routine work-up of any *S. aureus* isolates from invasive sites.[4]

Studies have shown that these heteroresistant/ oxacillin-susceptible isolates do contain the *mec*A gene and express the PBP2a, and are functionally oxacillin resistant.

Because treatment with a β-lactam antibiotic is likely to be used for infections with MSSA, this could result in treatment failure. Therefore, it is important for these isolates be reported to the clinician as MRSA so that appropriate treatment and isolation precautions can be initiated.[1,4]

REFERENCES

1. Hososaka Y, Hanaki H, Endo H, et al. Characterization of oxacillin-susceptible mecA-positive *Staphylococcus aureus*: a new type of MRSA. *J Infect Chemother*. 2007;13:79-86.

2. Cuirolo A, Canigia LF, Gardella N, et al. Oxacillin- and cefoxitin-susceptible meticillin-resistant *Staphylococcus aureus* (MRSA). *Int J Antimicrob Agents*. 2011;37:178-179.

3. Kumar VA, Steffy K, Chatterjee M, et al. Detection of Oxacillin-Susceptible mecA-Positive *Staphylococcus aureus* Isolates by Use of Chromogenic Medium MRSA ID. *Journal of Clinical Microbiology*. 2013;51:318-319.

4. Sharff KA, Monecke S, Slaughter S, et al. Genotypic Resistance Testing Creates new Treatment Challenges: Two Cases of Oxacillin-Susceptible Methicillin-Resistant *Staphylococcus aureus*. Journal of Clinical Microbiology. 2013; 50:4151-4153.