

## Labstract – November 2016

# *Mycobacterium chimaera* – Clinical Testing Guidelines for Symptomatic Persons with Potential Exposure to Contaminated Heater-Cooler Units During Open-Chest Heart Surgery

### Audience

Health Care Providers, Laboratory, and Health Unit Staff

### Overview

This document provides:

- information on an international cluster of invasive *Mycobacterium chimaera* infections following open-chest heart surgery with cases identified in Europe, the United States and Quebec that have been attributed to contamination of heater-cooler units (HCUs) used during the surgery.
- laboratory testing criteria
- specimen and testing recommendations (for detailed clinical testing guidance please see **Table 1**).

### Background

Public Health Ontario (PHO) is aware of an international cluster of invasive *M. chimaera* infections following open-chest heart surgery with cases identified in Europe, the United States and Quebec<sup>1,2,3,4</sup>. These cases have been attributed to contamination of HCUs used during the surgery<sup>5</sup>. Microbial transmission in this cluster is thought to occur through aerosols of contaminated water from the HCU<sup>6</sup>. Current reports suggest contamination of the HCU may have occurred at the manufacturing plant of a single device manufacturer<sup>7</sup>; however, it is unknown whether multiple manufacturers and devices may cause similar risks.

Cases identified to date have all been associated with patients who have undergone open-chest cardiac valve replacement or repair, or received a cardiac prosthetic device<sup>1,8,9</sup>. Current evidence suggests that individual risk of infection is very low (<1%), and that delaying surgery may pose a greater risk than the potential risk of acquiring an infection<sup>7,9</sup>. However, disease can be severe for those infected despite appropriate treatment, even in immunocompetent hosts.

Most patients present with *M. chimaera* infection between three months to five years (median 18 months) after the index surgery, with symptoms of recurrent or persistent fever (weeks to months), fatigue, shortness of breath, and unexplained weight loss<sup>1,3,7</sup>. Cardiac manifestations include prosthetic valve endocarditis, prosthetic vascular graft

infection, paravalvular abscess, and pseudo and mycotic aneurysms<sup>7,10</sup>. Extracardiac manifestations have also been reported, including bone infection (osteoarthritis, spondylodiscitis), sternotomy wound infection, mediastinitis, hepatitis, and bloodstream infection (BSI)<sup>3,7,10</sup>. Approximately 50% of patients have ocular manifestations due to emboli (panuveitis, multifocal chorioiditis, chorioretinitis)<sup>3</sup>. Other embolic and immunologic manifestations (arthritis, osteomyelitis, bone marrow involvement with cytopenia, cerebral vasculitis, pneumonitis, myocarditis, granulomatous nephritis) have also been described<sup>7,10</sup>. Splenomegaly is observed in approximately 80% of cases<sup>3</sup>.

## Laboratory Testing Criteria for *M. chimaera* Infection

1. Presence of cardiac and/or extracardiac (listed above) in patients who had open-chest surgery between 3 months and five years prior to symptoms.
2. Symptoms should be present for ≥ three weeks.
3. Common causes of symptoms (both infectious and not-infectious) should be ruled out prior to submitting samples for *M. chimaera*
4. Consultation with an infectious disease specialist for investigation possible NTM infections is recommended, if possible.

**Testing of asymptomatic individuals who have undergone open-chest surgery is not warranted.** These patients should be counseled regarding potential symptoms of invasive NTM (including *M. chimaera*) infection and to consult a healthcare provider should these develop.

## Specimen and Testing Recommendations

**Table 1. Clinical Testing for Identifying Potential Cases of NTM (including *Mycobacterium chimaera*) Following Cardiac Surgery**

Clinical symptoms/exposure	Specimen and testing recommendations	Where to submit testing
<ul style="list-style-type: none"> <li>• Open-chest surgery with implanted device between 3 months to 5 years*</li> </ul> <p style="text-align: center;"><b>AND</b></p> <ul style="list-style-type: none"> <li>• Constitutional: recurrent or prolonged fever, fatigue, shortness of breath, weight loss</li> <li>• Cardiac: prosthetic valve endocarditis and/or prosthetic vascular graft infection</li> <li>• Extracardiac: bone infarction, sternotomy surgical wound infection, mediastinitis, hepatitis, bloodstream infection</li> <li>• Immunologic/embolic: splenomegaly, ocular, cytopenia</li> <li>• Infants: febrile episodes and</li> </ul>	<ul style="list-style-type: none"> <li>• Routine investigation to identify common etiologic agent should first be performed</li> </ul> <p><b>Mycobacterial blood culture:</b></p> <ul style="list-style-type: none"> <li>• 3 sets over 24 hours, or 2 sets collected 12 hours apart. Collect blood in 10.0 ml SPS (yellow top tube) or 10.0 ml heparin (green top tube) or 10.0 ml isolator tube</li> </ul> <p><b>Cardiac tissue:</b></p> <ul style="list-style-type: none"> <li>• Aseptically collect and submit to PHOL in sterile container without fixative</li> </ul> <p><b>Extracardiac tissue and fluid (if local infection suspected):</b></p> <ul style="list-style-type: none"> <li>• Affected soft tissue, pus, fluid, bone, and/or bone marrow</li> </ul>	<ul style="list-style-type: none"> <li>• Routine blood culture, wound, and tissue culture should be performed at a hospital or commercial laboratory. Routine bacterial cultures are not available at PHO</li> </ul> <p><b>Blood for mycobacterial culture:</b></p> <ul style="list-style-type: none"> <li>• Submit to PHO laboratory (PHOL) requesting mycobacterial blood culture**</li> </ul> <p><b>Tissue, fluid, and/or bone:</b></p> <ul style="list-style-type: none"> <li>• Submit tissue, fluid and/or bone for mycobacterial culture,</li> </ul>

Clinical symptoms/exposure	Specimen and testing recommendations	Where to submit testing
failure to thrive		and acid fast staining to PHOL **

\*Risk of patients with NTM infection is still evolving. Contact microbiologist at PHOL to discuss testing for NTM in patients who do not meet this criteria.

\*\* All specimens sent to PHOL must be accompanied by a [PHO laboratory requisition with complete information.](#)

## Sources/ references

1. Sax, Hugo, et al. "Prolonged outbreak of Mycobacterium chimaera infection after open-chest heart surgery." *Clinical Infectious Diseases* 61(1) (2015): 67-75.
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4. Perkins, Kiran M. "Mycobacterium chimaera Contamination of Heater-Cooler Devices Used in Cardiac Surgery—United States." *MMWR. Morbidity and Mortality Weekly Report* 65(40) (2016): 1117-1118.
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7. Kohler, Philipp, et al. "Healthcare-associated prosthetic heart valve, aortic vascular graft, and disseminated Mycobacterium chimaera infections subsequent to open heart surgery." *European heart journal* 36(40) (2015): 2745-2753.
8. Achermann, Yvonne, et al. "Prosthetic valve endocarditis and bloodstream infection due to Mycobacterium chimaera." *Journal of clinical microbiology* 51(6) (2013): 1769-1773.
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10. EU protocol for case detection, laboratory diagnosis and environmental testing of Mycobacterium chimaera infections potentially associated with heater-cooler units: case definition and environmental testing methodology – August 2015.