

# The Q-Net™ Monthly

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## What's News

This double issue is one of a series that discusses “positive” respiratory specimens. One of the goals of this series is to provide a set of all-inclusive recommendations that prevent contamination of respiratory specimens, whether due to a true or pseudo outbreak. This double issue provides a set of recommendations to prevent **true outbreaks**, while next month's issue will provide a set of recommendations to prevent **pseudo outbreaks**.

## Editor-in-Chief

All of the articles published in this newsletter are written by: **Lawrence F Muscarella, PhD, Chief, Infection Control at Custom Ultrasonics, Inc.** Ivyland, PA

## What is 'Q-Net'?

**Q-Net** is a technology-assessment network of questions and answers. Its newsletter is *The Q-Net™ Monthly*.

The mail goal of **Q-Net** is to encourage the infection control, endoscopy, and OR communities to not only ask good questions but to also demand well referenced responses.

**Q-Net** addresses the needs of both the health care provider whose goal is to provide the best care possible and the patient who deserves affordable quality health care.

## Recommendations to prevent 'positive' respiratory specimens

### ~ Third in a series ~

*This article is the third in a series of reports that discusses respiratory specimens contaminated with atypical mycobacteria and M. tuberculosis, whether due to a true or pseudo outbreak.*



**Background:** This article is the third in a series that responds to a hospital's question about the clinical significance of “positive” respiratory specimens. This hospital identified a significant increase in the number of respiratory specimens contaminated with mycobacteria. These patient specimens were collected during bronchoalveolar lavage (BAL) using bronchoscopes reprocessed by an automated machine.

As discussed in the two previous articles of this series, positive respiratory specimens are clinically significant and can indicate a true outbreak, a pseudo outbreak, or both. Whereas a true outbreak is associated with patients

displaying clinical symptoms of disease, contaminated respiratory specimens in the absence of clinical disease typically indicates a pseudo (or false) outbreak.

In addition to explaining the difference between a true and pseudo outbreak, the first article in this series (available at: [www.myendosite.com/htmlsite/2005/pseudo\\_infection05.pdf](http://www.myendosite.com/htmlsite/2005/pseudo_infection05.pdf)) discusses the characteristics of, and differences between, the two types of mycobacteria—atypical mycobacteria and mycobacteria that cause tuberculosis. The second article in this series (available at: [www.myendosite.com/htmlsite/2005/factors05.pdf](http://www.myendosite.com/htmlsite/2005/factors05.pdf)) focuses on factors linked to the contamination of respiratory specimens, due to a true outbreak, a pseudo outbreak, or both. And, this article, which is the third in this series, provides recommendations to prevent contamination of respiratory specimens.

*Mycobacterium avium-intracellulare* (MAI) and other species of atypical mycobacteria are opportunistic, generally not contagious, and often grow on environmental surfaces.<sup>26,28,35</sup> In general, respiratory specimens contaminated with this type of mycobacteria suggest a

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**FOCAL POINT:** ● Many of the recommendations provided in this issue apply to the prevention of outbreaks not only during **bronchoscopy**, but also during **cystoscopy**, **hysteroscopy**, **flexible laryngoscopy**, **gastrointestinal (GI) endoscopy**, and other types of flexible endoscopy.

Important factors linked to the contamination of respiratory specimens	True outbreaks		Pseudo outbreaks	
	MAI	TB	MAI	TB
• Contaminated water used to rinse bronchoscopes <sup>9,25,26,28,31-35</sup>	NO*	NO	YES	NO
• Improper disinfection, “sterilization” of bronchoscopes <sup>5,8,13,14,21</sup>	NO	YES	NO	YES
• Inadequate drying of the bronchoscope <sup>5,25,26,33,35,59</sup>	YES	YES	YES	YES
• A damaged, torn sheath of the bronchoscope’s suction channel <sup>15,16</sup>	YES	YES	NO*	NO*
• Contaminated tap water (unrelated to bronchoscopy) <sup>27,28,36,39,41-46</sup>	YES	NO	YES	NO
• Improper collection, processing of respiratory specimens <sup>7,10-12,17,20,36-38</sup>	NO	NO	YES	YES
• Improper reprocessing of respiratory therapy equipment <sup>65</sup>	NO	YES	NO	NO*
• Improper reprocessing of lidocaine sprayers, atomizers <sup>19,27</sup>	NO*	YES	YES	NO*

**Table 1.** Important factors, and their associated references, linked to the contamination of respiratory specimens with *M. avium-intracellulare* (MAI) (and other types of atypical mycobacteria), *M. tuberculosis* (denoted “TB”), or both, due to a true outbreak, a pseudo outbreak, or both.

\* Outbreaks linked to the specified type of mycobacteria have not been reported, but they would seem possible.

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*pseudo* outbreak, due to environmental contamination (or, to transient colonization of patients).<sup>15,40-46</sup> *M. tuberculosis* and other species of mycobacteria that cause tuberculosis, however, are contagious, do not ordinarily grow in the environment, and are transmitted from *patient-to-patient*. Respiratory specimens contaminated with this type of mycobacteria often indicate a *true outbreak*.<sup>5,7,8,10-13,17,21</sup>

Table 1 displays important factors that have been linked to the contamination of respiratory specimens with one or both types of mycobacteria, due to a true outbreak, a pseudo outbreak, or both. Improper disinfection (or “sterilization”) of bronchoscopes, for example, has been linked to both true and pseudo outbreaks of *M. tuberculosis*.<sup>5,8,13,14,21</sup> (but not of atypical mycobacteria) (Table 1). Similarly, improper collection, handling, processing, and analysis of respiratory specimens is a factor that has been linked to *pseudo* outbreaks of both types of mycobacteria (but not to *true* outbreaks of either type of mycobacteria) (Table 1).<sup>7,10-12,17,20,36-38</sup>

## Recommendations

The following is a set of recommendations that prevent the contamination of respiratory specimens with mycobacteria, due to a true outbreak (as a result of disease transmission) or a pseudo outbreak. This set of recommendations is divided

into two sections—the first addresses true outbreaks, and the second, to be published in next month’s issue of this newsletter, addresses pseudo outbreaks. *Although written about bronchoscopy, many of these recommendations also prevent both true and pseudo outbreaks during cystoscopy, hysteroscopy, flexible laryngoscopy, gastrointestinal (GI) endoscopy, and other types of flexible endoscopy.* (Refer to this newsletter’s July, 2003, issue for recommendations to prevent disease transmission during GI endoscopy. This article can be read at: [www.myendosite.com/htmlsite/2003/july03.pdf](http://www.myendosite.com/htmlsite/2003/july03.pdf)).<sup>†</sup>

### I. TRUE OUTBREAKS OF MYCOBACTERIA:

*Some of the recommendations in this section, which is divided into two sub-sections—bronchoscope reprocessing and quality assurance (QA)—may also prevent pseudo outbreaks. Most of these recommendations apply whether reprocessing bronchoscopes manually or using an automated endoscope reprocessor (AER).*

#### 1. Bronchoscope reprocessing:

**A. Leak-test the bronchoscope** in accordance with its manufacturer’s instructions.<sup>5,16</sup> This initial step can detect endoscope damage, which has been linked to disease transmission (Table 1).<sup>5,15,16</sup> Promptly remove from service a bronchoscope that fails this test. Contact the manufacturer and return the bronchoscope as instructed. **Note:** *Damage to the bronchoscope’s suction channel has been reported to transmit*

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<sup>†</sup> A review and understanding of the recommendations provided in this newsletter’s July, 2003, issue might have prevented the incident that occurred earlier this year in Pittsburgh, PA, and was discussed by ASGE and SGNA at: <http://www.sgna.org/message.htm>

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disease despite ethylene oxide (EtO) gas sterilization.<sup>15</sup> This important finding would appear to call into question the validity and effectiveness of any low-temperature process that claims to “sterilize” flexible endoscopes.

**B. Clean the bronchoscope, including its suction channel and valve, using a detergent and brush.**<sup>5,14,21,54,55</sup> Develop and implement a written step-by-step procedure for reprocessing bronchoscopes after each use. **Note:** Proper reprocessing is essential to prevent true and pseudo outbreaks. Because formal and endorsed guidelines for reprocessing bronchoscopes have not been published,<sup>29,39,66</sup> it is recommended that, in addition to the reprocessing instructions provided by the bronchoscope’s manufacturer, published guidelines for reprocessing GI endoscopes be used to develop the medical facility’s procedure for reprocessing bronchoscopes.

**C. Steam sterilize the bronchoscope’s suction valve.**<sup>8,14,21,32,34</sup> Purchase additional valves, as required, to accommodate this practice.<sup>21</sup> Reprocessing the suction valve using a liquid chemical sterilant (LCS) may be acceptable, but this practice may require use of a specially designed adapter, or holder, to retract and hold in place the valve’s spring as required for complete exposure of the valve’s internal stem to the LCS.<sup>32</sup> Alternatively, the use of single-use, disposable suction valves may be used.<sup>14,33</sup> **Note:** Some AERs or “systems” contraindicate the processing of these valves.

**D. Steam sterilize all reusable critical endoscopic accessories, such as biopsy forceps.**<sup>14</sup> Maintain their sterility prior to reuse. **Note:** Do not reprocess biopsy forceps using a LCS or EtO gas. “Flashing” biopsy forceps is contraindicated.<sup>14</sup>

**E. Reprocess all other types of reusable endoscopic instruments** in accordance with their respective operator’s instructions and/or published guidelines. Improperly reprocessed **respiratory equipment and lidocaine sprayers, atomizers, and nebulizers**, for example, have been linked to the contamination of respiratory specimens.<sup>19,27,30,65</sup> Use single-use, disposable instruments whenever feasible and available.

**F. Completely immerse the bronchoscope in the LCS to achieve high-level disinfection** (or “liquid sterilization”).<sup>5,16,33</sup> Flush the entire suction channel with the LCS, to remove air bubbles.<sup>5</sup> Only use a LCS cleared by the FDA for reprocessing flexible endoscopes (refer to: [www.fda.gov/cdrh/ode/germlab.html](http://www.fda.gov/cdrh/ode/germlab.html)).

**G. Rinse the bronchoscope after chemical immersion with bacteria-free (or sterile) water**, to prevent re-contamination of the bronchoscope with atypical mycobacteria (and gram-negative bacteria).<sup>36,68</sup>

**H. Dry the bronchoscope** by rinsing its suction channel (and valve) with 70% alcohol to facilitate drying, followed by

TYPE	MAI	TB
True outbreak	15 (rare)	5, 14, 16, 21
Pseudo outbreak	9, 25, 26, 28, 31-35	5, 8, 13, 21

**Table 2. References** of reports of bronchoscopes linked to true, pseudo outbreaks of MAI (and other types of atypical mycobacteria) and *M. tuberculosis*, denoted “TB,” above.

forced or compressed air.<sup>5,14,24-26,32,33,35,49</sup> Perform this drying step after each completed reprocessing cycle, whether rinsing with tap water, bacteria-free water, bottled sterile water, or “sterile” filtered water. Drying the bronchoscope is crucial not only to prevent true outbreaks of mycobacteria, but also to prevent costly pseudo infections, the misdiagnosis of respiratory tuberculosis, and the administration of unnecessary, aggressive, and expensive antibiotics to “un-infected” patients.<sup>27</sup>

**I. Store the bronchoscope** in a dry, clean well-ventilated area hanging freely and vertically with its valve and biopsy cap removed.<sup>5</sup> Do not store the bronchoscope coiled or in a carrying case, bag, or pillow case, or on a cart in the hallway. Handle the bronchoscope with care, to prevent re-contamination before reuse. Reprocess again before reuse bronchoscopes that were mishandled or improperly stored.

**2. Quality assurance (QA):**

**A. Develop and implement a quality control program** that monitors reprocessing staff members, to ensure their practices are in compliance with the medical facility’s written step-by-step procedure for reprocessing bronchoscopes (see: sub-section 1, item “B”). **Note:** Use this same procedure to reprocess all bronchoscopes immediately after use, whether used: (a) on a healthy or immuno-compromised patient; (b) in the endoscopy suite on the first or last scheduled patient; or (c) at the patient’s bedside or in the operating room or emergency room during an unscheduled emergency procedure.

**B. Ensure all reprocessing staff members**, among other considerations: (a) are trained, supervised, and understand the basic concepts of endoscope reprocessing, the principles of infection-control, and the modes of disease transmission; (b) have available all of the necessary reprocessing equipment for each endoscope in inventory (e.g., channel adapters, brushes, detergents, sponges); and, (c) have reviewed the reprocessing instructions and the internal design, diagrams, and schematics of every endoscope model in inventory. Different bronchoscope models may require the use of unique and model-specific reprocessing channel adapters or “kits,” as well as connectors, fittings, and caps. The use of untrained staff members to reprocess bronchoscopes increases the risk of disease transmission and, therefore, is contraindicated.

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**C. Periodically conduct competency tests**, to evaluate staff members' knowledge of the specific reprocessing steps required for, and nuances and differences between, every endoscope model in inventory. Additional reprocessing training and testing may be indicated whenever a new bronchoscope model is introduced into use.

**D. Establish an active surveillance program that monitors respiratory specimens for contamination** and ensures appropriate staff members are promptly notified whenever a true or pseudo outbreak has been detected or is suspected.<sup>5,34</sup>

**E.** As part of this active surveillance program, consider **periodically sampling the bronchoscope's exterior, suction channel, and valve** for contamination, to ensure the effectiveness of the reprocessing procedure, whether manual or automated.<sup>25,32,34,68</sup> (In truth, some organizations recommend microbiological sampling of the bronchoscope and all relevant environmental surfaces only during an outbreak investigation.) Also, consider periodically monitoring the water used to rinse the bronchoscope, whether reprocessing manually or using an AER or "system," to ensure its microbial quality is as claimed and does not pose an infection risk.<sup>69</sup>

**F. Document all important reprocessing parameters**, including the date, the brand of the detergent and LCS, the LCS's immersion time and temperature, the patient's and physician's names, and the bronchoscope's identification or serial number.<sup>16</sup> Also, **monitor the LCS's concentration** (if reusable) several times a day using available tests, such as test strips or a titration kit, to ensure its effectiveness prior to use.<sup>5</sup> Record the results. Documentation of these parameters provides information that during an outbreak investigation is crucial to minimizing risk and to quickly identifying patients on whom a potentially contaminated bronchoscope was used.

**G. Whenever using an AER, ensure that reprocessing staff are trained**, supervised, and have demonstrated an understanding of its proper operation. Monitor reprocessing staff members to ensure the required channel adapters or "kits" (and connectors, fittings, and caps) are being used to properly connect to the AER every bronchoscope model in inventory.<sup>25</sup> Different bronchoscope models may use specific and unique reprocessing channel adapters. The use of improper reprocessing adapters has resulted in patient injury.<sup>9,50</sup> Resolve any conflicts or discrepancies between the reprocessing instructions provided by the AER and bronchoscope manufacturers.<sup>45</sup> In general, the reprocessing instructions provided by the AER's manufacturer—not the bronchoscope's manufacturer—take precedence during automated reprocessing. **Note:** *If there is any doubt about the success of a bronchoscope reprocessing cycle, or it is suspected that a reprocessing adapter was not properly connected to the bronchoscope during automated (or manual) reprocessing, then reprocess the bronchoscope again before its reuse.*

**H. Monitor and document the service and repair of each bronchoscope model in inventory.** Perform all necessary preventative maintenance steps as instructed by the bronchoscope's manufacturer.<sup>15,18</sup> Failure to properly service, repair, and maintain every bronchoscope model in inventory can result in disease transmission and nosocomial infection.<sup>16</sup>

**I. Consider purchasing models of bronchoscopes manufactured by the same company**, to avoid confusion, enhance familiarity with endoscope design, and minimize the risk of using improper reprocessing channel adapters, which has been linked to disease transmission, or otherwise inadequately reprocessing the bronchoscope.<sup>9,50</sup>

**J. Appoint a staff member** to frequently interact with the manufacturer of the bronchoscope, to learn quickly of any device recalls or alerts and to resolve any confusing or conflicting reprocessing instructions. Immediately remove any recalled bronchoscope model from service.<sup>18,25,26,34,35,48,62</sup>

**K. Limit unnecessary exposure of susceptible patients to tap water sources**, such as faucets, which may be contaminated. Hospital tap water has been linked to true (and pseudo) outbreaks of atypical mycobacteria.<sup>28,41,44,45</sup> © LFM

*To be continued ...*

*This discussion's second section, entitled "PSEUDO OUTBREAKS OF MYCOBACTERIA," will be published next month.*

## References

*The references are available at the following website:*  
<http://www.myendosite.com/refs010405.doc>

Thank you for your interest in this newsletter. *I have addressed each issue to the best of my ability. Respectfully, the Publisher: Lawrence F. Muscarella, Ph.D.* Please direct all correspondence to:

**Lawrence F. Muscarella, Ph.D.**  
*Editor-in-Chief, The Q-Net™ Monthly  
Director, Research and Development*



**Custom Ultrasonics, Inc.**  
144 Railroad Drive, Ivyland, PA 18974  
**Tele:** 215.364.8577; **Fax:** 215.364.7674  
**E-mail:** editor@myendosite.com  
**Internet:** http://www.myendosite.com



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