

# The Q-Net™ Monthly

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## What's News

● In the September 2007 issue of *Materials Management in Health Care*, I provide responses to three instrument reprocessing questions. I respond to three additional reprocessing questions, for a total of six, in the November 2007 issue of this same magazine.

● An article I wrote entitled "Prevention of disease transmission during flexible laryngoscopy" was published in the October 2007 issue of APIC's *American Journal of Infection Control*.

## Editor-in-Chief

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

## What is 'Q-Net'?

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

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

## Serratia infections, Part 2

### THIS ARTICLE:

- **is the final in a series of two articles that discusses the epidemiology of Serratia;**
- **reviews reports of the transmission of Serratia during flexible and rigid endoscopy;**
- **complements the first article in this series published in the July-August 2007 issue of this newsletter; and**
- **provides additional recommendations to control and prevent the transmission of Serratia in NICUs, with focus on instrument reprocessing.**

and mortality, were reviewed to evaluate effective measures for the prevention of transmission of *Serratia* in neonatal intensive care units (NICUs).<sup>1-4,7,9-25,27,31-38</sup> Some recommendations for the control and prevention of the transmission of *Serratia* in a NICU were developed and provided in the first article in this series.

In particular, the details of a recent infection, colonization and potential outbreak of *Serratia* identified last May (2007) in the NICU of a medical facility in Toronto (Canada) were studied.<sup>1-4</sup> Many aspects of this case remain unknown, such as the source and mode of transmission of the *Serratia*, and whether the species of *Serratia* responsible for this infection was *S. marcescens*.

Discussed in the first article in this series, investigations of infections and outbreaks of *Serratia* in NICUs routinely focus on neonatal patients and their intestines as the likely source of the disease. This strategy is warranted, because *Serratia*, which is ubiquitous in the envi-

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**Background:** The first article in this series, published last month in the *July-August 2007 issue* of this newsletter, emphasized that improper reprocessing of reusable medical instruments is a risk factor for the transmission of *Serratia*—a genus of gram-negative (non-spore-forming) bacilli that has been linked to disease transmission during flexible and rigid endoscopy.<sup>8-14,31-37</sup> This series of two articles provides a response to a question about *Contact Precautions* and the epidemiology of *Serratia*.

Several reports of healthcare-acquired infections (HAIs) and outbreaks of *Serratia*, with associated morbidity

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ronment, has been identified in the intestinal flora of neonates.<sup>1-4,6,20,24</sup> Moreover, reports have described infected or colonized neonates as sources of *Serratia* infections and outbreaks in NICUs.<sup>16,17,19-22,24</sup>

The hand washing practices of healthcare staff members treating neonates in a NICU are also typically scrutinized, to determine whether these caretakers' hands are transiently colonized with the outbreak's strain of *Serratia* and, therefore, most likely responsible for disease transmission. This too is a valid strategy, because reports have linked poor hand hygiene of healthcare staff members to outbreaks of *Serratia*.<sup>16,17,19-22,24</sup>

Indeed, it is essential to investigate the intestines of neonates and the hands of healthcare staff members as the possible source and mode of transmission, respectively, of an infection or outbreak of *Serratia* in a NICU. It is equally important, however, also to investigate the potential contribution of other sources to disease transmission, including contaminated rigid laryngoscopes, incubators, sinks, tap water, water faucets, and other wet environmental surfaces.

These reusable medical instruments, inanimate and environmental surfaces, and water sources have been linked to infections and outbreaks of *Serratia* (and other types of gram-negative bacilli) in NICUs.<sup>7-14,20,23,30,45</sup> Therefore, failure during an outbreak investigation to consider each as a potential source and/or vehicle for transmission of *Serratia* could prevent implementation of infection-control measures crucial to the control and prevention of disease transmission.

**Standard Precautions, Transmission-Based Precautions:** Also discussed in the first article of this series, *Standard Precautions* are the first and most important level of precautions, or practices, to prevent disease transmission. These precautions apply to *all* patients, regardless of their illnesses, the status of their immune systems, or the healthcare setting. For most types of infectious agents, such as HIV and the hepatitis B and C viruses, *Standard Precautions* are ordinarily sufficient to prevent disease transmission. But, for some other types of infectious agents, *Standard Precautions* are inadequate, requiring the additional implementation of *Transmission-Based Precautions*—the second level of isolation precautions.

*Contact Precautions*, *Droplet Precautions*, and *Airborne Infection Isolation Precautions*—the three types of *Transmission-Based Precautions*—are intended only for the care of patients known or suspected to be infected or colonized with certain epidemiologically important, or targeted, infectious agents. These targeted agents are, in general, readily transmissible, associated with significant morbidity and mortality, and sometimes antibiotic-resistant.

Whether implementation of any one or more of these

**Poor hand hygiene of healthcare staff members has been linked to outbreaks of *Serratia*.**<sup>16,17,19-22,24</sup>

**Contaminated rigid laryngoscopes, incubators, and wet environment surfaces have been linked to the transmission of *Serratia* and other gram-negative bacilli in NICUs.**<sup>7-14,20,23,30,45</sup>

three types of transmission-based precautions is required to control and prevent disease transmission depends on the targeted infectious agent and its mode of transmission. *Contact Precautions* (in addition to *Standard Precautions*) are typically indicated to control and prevent nosocomial transmission of infectious agents, like *Serratia*, that are transmitted by direct or indirect (physical) contact. (Review **Box A** on p. 14 of the first article in this series for more information.)

**Recommendations:** Several important (although incomplete) recommendations for the control and prevention of transmission of *Serratia* in NICUs were provided in the previous issue of this newsletter. The following additional recommendations, which complete this previously published set, focus on water quality and instrument reprocessing. Rigid laryngoscopes, bronchoscopes and gastrointestinal (GI) endoscopes have been linked to outbreaks (and pseudo-outbreaks) of *Serratia*.<sup>31-37</sup> Although generally specific to NICUs and *Serratia*, these recommendations can be also applied to other healthcare settings, such as adult ICUs, and to other epidemiologically important infectious agents, like *Clostridium difficile* or “*MRSA*,” that are transmitted by direct or indirect contact.

#### 4. **Quality Assurance, Part 2 (continued):**

**A. Review** the recommendations provided in *Section 1*—Quality Assurance, Part 1—on p. 16 of this series' first article.

**B.** Develop and implement a comprehensive quality assurance program that **supervises and monitors healthcare staff members** to ensure their strict compliance with *Standard Precautions* and, as warranted, *Contact Precautions*.

**a. Require healthcare staff to attend as often as possible educational programs** that discuss *Standard Precautions*, *Contact Precautions*, *Serratia*, and the principles of disease transmission. (Refer to *Section 3* on p. 16S of this series' first article.)

**C.** Use this quality assurance program to **supervise and monitor staff members responsible for cleaning and disinfecting** (or sterilizing) **rigid laryngoscopes, bronchoscopes, gastrointestinal (GI) endoscopes** and other types of reusable instruments, as well as incubators and environmental surfaces, to ensure strict compliance with published guidelines and manufacturers' instructions. (Refer to *Section 5*, below.)

**D. Monitor the number of neonates and healthcare staff members in the NICU, and the number of medical instruments and equipment in inventory to ensure the NICU:**

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- ✓ is not **understaffed**. An adequate number of healthcare staff members is required to provide quality care;
- ✓ is not **overcrowded** with neonatal patients, which, along with understaffing, has been linked to an increased risk of disease transmission;<sup>1-4,13,19,41,43</sup> and
- ✓ has in inventory a sufficient number of reusable medical instruments—including rigid laryngoscope blades and handles—to permit ample time for each to be thoroughly reprocessed between uses. An inadequate inventory of available instruments has been linked to outbreaks of *Serratia* and other types of microorganisms.<sup>8,9,13,14</sup> *The purchase of additional reusable medical instruments may be necessary.* (Refer to the article about *flash sterilization* on p. 19 of this newsletter).

## 5. Reprocessing Endoscopes, Incubators:

### A. Properly clean and disinfect rigid laryngoscopes,

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## ~ Flash sterilization ~ A Q-Net position statement

Also known as “flashing,” flash sterilization is a rapid, thermally-based sterilization process originally used only for *emergency situations* as instructed by *The Joint Commission on Accreditation of Healthcare Organizations* (JCAHO) and others<sup>46-54</sup>—for example, to quickly *re-sterilize* an instrument that accidentally dropped on the operating room floor prior to use.<sup>46-49</sup> Primarily because of the significantly shorter time of its cycle, however, flash sterilization has evolved for many applications and healthcare facilities from a rare, controlled practice into a replacement for traditional, or conventional, steam sterilization. Flash sterilization is now routinely used, or arguably misused, to sterilize instruments, not only for emergency situations, but also for immediate use.<sup>49,50</sup> The popularity of flashing has grown in many medical fields, including orthopedic surgery and ophthalmology.<sup>46,47,51-54</sup>

The time savings and convenience associated with flashing can be significant. Whereas a traditional steam sterilization cycle may require as long as 30 minutes at 121° C to process pre-washed, wrapped instruments followed by time for instrument drying and cooling, a flash sterilization cycle may require only 3 minutes at 134° C, with no drying time. And, with shorter cycle times typically comes lower costs. Deciding whether to flash instruments may be reduced to the following choice: contraindicate its routine use and purchase additional expensive instrument sets to meet patient demand and accommodate the longer cycle times associated with traditional steam sterilization processes; or, expand the applica-

tions of flash sterilization and limit purchase of additional instrument sets, reducing costs and patient turnaround times.

Like with several other aspects of medicine, however, potential risks may accompany such types of shortcuts, and flash sterilization is no exception. Although it is bactericidal, flash sterilization requires close monitoring and is associated with an inherently narrower margin of safety compared to traditional steam sterilization. Although its methodology has some limitations, one study found a statistically significant higher incidence of nosocomial infection associated with flash sterilization.<sup>46</sup>

Flash sterilization is also associated with several additional potential shortcomings that may call into doubt the quality of care it provides. First, unlike cleaned instruments processed by a traditional steam sterilizer, flashed instruments are unwrapped, typically have not been first washed or inspected, and often are wet when transported to and handled in the operating room, posing an increased risk of re-contamination and nosocomial infection.<sup>55</sup> Second, whereas traditional steam sterilization is typically performed by experienced reprocessing staff members in a dedicated centralized department, flash sterilization is instead performed near (or in) the operating room by staff whose primary focus is patient care—not instrument sterilization.<sup>46</sup>

Third, wet, unwrapped flashed instruments may be used more frequently during one time of the day (e.g., morning) than dry, wrapped instruments processed by a traditional steam sterilizer, raising additional concerns about whether flashing introduces two different standards of patient care.

Fourth, the documentation and records associated with flashed instruments—unlike instruments processed using traditional steam sterilization cycles—are typically incomplete, if not entirely lacking, preventing adequate tracking of flashed instruments. Flashing may also encourage the preoperative administration of prophylactic antibiotics.<sup>46</sup>

Finally, some manufacturers of surgical instruments (and implants) contraindicate flash sterilization.<sup>56</sup> The rapid heating and cooling of its rapid, high-temperature cycle can cause chipping, flaking, and other types of damage to some types of surgical instruments.<sup>57</sup> Whether flash sterilization might be damaging ophthalmic instruments causing pieces of the instrument’s surface to be introduced into the eye during cataract surgery, increasing the risk for toxic anterior segment syndrome (TASS), is unclear. (Refer to this newsletter’s *January-February 2007 issue for a discussion of TASS.*)

**Position statement:** Q-Net recommends that flash sterilization be performed *only* in emergency situations. Admittedly, compliance with this recommendation may require a healthcare facility to purchase additional instrument sets to ensure an adequate inventory of instruments and accommodate the longer reprocessing times associated with traditional steam sterilization cycles. But, doing so will establish one safe standard of patient care, minimize potential legal exposure, and demonstrate that reducing costs at the potential expense of patient safety is not acceptable. *The End* ● LFM

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**bronchoscopes, GI endoscopes, incubators, humidifiers, nebulizers,** and other reusable medical instruments and equipment as recommended by their respective manufacturer's instructions and published guidelines.<sup>8-15,20,28-37,42</sup>

- a. *Semi-critical* and *critical* reusable medical instruments used on isolated patients do not require any additional reprocessing steps other than those dictated by their labeling and by *Standard Precautions* (i.e., cleaning followed by high-level disinfection or sterilization).
- b. Clean and disinfect *non-critical* items and frequently touched and potentially contaminated environmental surfaces in patient-care areas. In general, no additional measures other than those prescribed by *Standard Precautions* are required for isolated patients.<sup>28,29</sup> (Refer to *Section 2.A.e* on p. 16S of this series' first article.)

**B.** Visit the "**How to reprocess ...**" page at the website: [www.myendosite.com](http://www.myendosite.com) for instructions about reprocessing rigid and flexible laryngoscopes, bronchoscopes, GI endoscopes, and other types of reusable medical instruments.

**Visit:** [http://www.myendosite.com/how\\_to\\_reprocess.htm](http://www.myendosite.com/how_to_reprocess.htm)

#### 6. Water Quality, Other Recommendations:

**A. Wash neonates in the NICU using sterile water.**<sup>7,45</sup> If tap water is used, ensure that the main water supply, as well as other environmental surfaces including the faucets and sinks, have been adequately disinfected and are not colonized with *Serratia* or another type of potentially pathogenic microorganism. (Refer to *Section 5.A.b*, above.)

- a. To prevent bacterial colonization of the tap water, it may be necessary, among other measures, to periodically replace the faucets in the NICU, microbiologically monitor the tap water, and use point-of-use water filters.<sup>7</sup>

**B.** For humidification, **use only the quality of water indicated by the incubator's manufacturer** (e.g., sterile distilled water).<sup>42</sup>

**C.** While bacteria-free filtered water is preferred, tap water may be used for rinsing reusable *semi-critical* instruments including GI endoscopes after chemical immersion, provided the instrument is rinsed with 70% isopropyl alcohol followed by forced air drying after reprocessing and also before storage. (Refer to *Section 5.A*, above.)

**D. Use sterile water in nebulizers and humidifiers** used in NICUs to treat neonates.<sup>58</sup>

**E.** Ensure that the water used by neonates for drinking and to consume oral medications does not contain any opportunistic

gram-negative bacteria (i.e., use bottled or sterile water).<sup>58</sup>

**F. Consider stopping new admissions to the NICU, or temporarily closing the unit,** until the outbreak of *Serratia* is under control, if not terminated.<sup>2-4,15,21,38,40</sup> This action may be necessary to prevent additional infections of *Serratia*.

**G.** Depending on the strain of *Serratia*, **more judicious use of antibiotics** may be indicated to control and prevent disease transmission.

- a. Review antibiotic ordering patterns and consult with infectious disease staff to determine whether a change in policy—namely, to restrict or modify antibiotic usage (e.g., automatic stop orders)—might be necessary to control and prevent disease transmission.<sup>29,40</sup>

**H.** The design of a medical facility's NICU should feature:

- ✓ A sufficient number of sinks in convenient locations to encourage more frequent hand washing;
- ✓ sufficient space to prevent overcrowding, including private rooms with single beds for isolated patients; and
- ✓ sufficient space between incubators (e.g., 10 feet apart) to minimize the risk of disease transmission.<sup>2</sup> ● LFM

The REFERENCES for this series of articles about the epidemiology of **SERRATIA** and **FLASH STERILIZATION** are available for downloading at:

[www.myendosite.com/refs070807.pdf](http://www.myendosite.com/refs070807.pdf)

Thank you for your interest in this newsletter. *I have addressed each issue and topic to the best of my ability. Respectfully,* *Lawrence F. Muscarella, Ph.D.*  
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