

**SUBJECT: Use of Surgical N95 Respirators Should be a Part of Every Surgical Plume Protection Plan in the OR**

**ORIGIN:** Moldex Technical Services Department

**ORIGINAL DATE:** June 2008

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**OVERVIEW**

Over 500,000 workers are exposed annually to the hazards found in surgical plume (smoke) according to Occupational Safety and Health Administration (OSHA)<sup>1</sup>. Surgical smoke can contain toxic gases (particles) and live viruses<sup>2</sup>, such as human papilloma virus (HPV). In addition to an N95 or N100 respirators, the CDC recommends the use of central wall suction units with in-line filters to evacuate minimal laser plumes, and a mechanical smoke evacuation system with a high-efficiency filter to manage the generation of large amounts of laser plume, when ablating tissue infected with human papilloma virus (HPV) or performing procedures on a patient with extrapulmonary TB<sup>3</sup>.

The particles found in surgical smoke are often times too small to be effectively filtered by surgical masks<sup>1</sup>. Surgical masks are a relatively effective filter for exhaled air but are very ineffective filters for inhaled air<sup>4</sup>.

Surgical N95 respirators are designed to protect the wearer from both airborne particulates as well as to help prevent contamination from the wearer to the patient, medical equipment, sterile field, or work environment. They have specially designed filters to prevent even very small particles from entering the wearer's respiratory system and have fluid resistance attributes (they prevent fluid that lands on the mask from touching the wearer's nose, skin, or lips). However, filter and fluid resistance is only part of the equation. The disposable surgical N95 respirator is also designed to fit and seal against the face of the wearer. A proper fit ensures that the inhaled air is drawn through the filter media of the disposable respirator.

(See reverse side for publication excerpts)

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<sup>1</sup> Occupational Safety & Health Administration; [www.osha.gov/SLTC/laserelectrosurgeryplume/index.html](http://www.osha.gov/SLTC/laserelectrosurgeryplume/index.html) (2005, July 21)

<sup>2</sup> Schulster LM, et al. Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC), Chicago IL; American Society for Healthcare Engineering/American Hospital Association; 2004.

<sup>3</sup> Centers for Disease Control and Prevention. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC); MMWR 2003; 52 (No. RR-10): 1-48.

<sup>4</sup> FDA Masks & N95 Respirators: <http://www.fda.gov/cdrh/ppe/masksrespirators.html>

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WARNING: The information contained in this Tech Brief is dated and was accurate to the best of Moldex's knowledge, on the date above. It is not meant to be comprehensive, nor is it intended to be used in place of the warning/use instructions that accompany Moldex respirators.

## **Excerpts from Publications that reference the hazards found in Surgical Plume and the CDC Protection Recommendations**

*Centers for Disease Control and Prevention. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR 2003; 52 (No. RR-10): p 14*

### **VI. Other Potential Infectious Aerosol Hazards in Health-Care Facilities**

- A. In settings where surgical lasers are used, wear appropriate personal protective equipment (PPE), including N95 or N100 respirators, to minimize exposure to laser plumes. Category IC (OSHA; 29 CFR 1910.134,139)
- B. Use central wall suction units with in-line filters to evacuate minimal laser plumes. Category II
- C. Use a mechanical smoke evacuation system with a high-efficiency filter to manage the generation of large amounts of laser plume, when ablating tissue infected with human papilloma virus (HPV) or performing procedures on a patient with extrapulmonary TB. Category II

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Sehulster LM, et al. *Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC)*. Chicago IL; American Society for Healthcare Engineering/American Hospital Association; 2004. p. 40

### **6. Other Aerosol Hazards in Health-Care Facilities**

In addition to infectious bioaerosols, ...

Laser plumes and surgical smoke represent another potential risk for health-care workers. Lasers transfer electromagnetic energy into tissues, resulting in the release of a heated plume that includes particles, gases, tissue debris, and offensive smells. One concern is that aerosolized infectious material in the laser plume might reach the nasal mucosa of surgeons and adjacent personnel. Although some viruses (i.e., varicella-zoster virus, pseudorabies virus, and herpes simplex virus) do not aerosolize efficiently other viruses and bacteria (e.g., human papilloma virus [HPV], HIV, coagulase-negative *Staphylococcus*, *Corynebacterium* spp., and *Neisseria* spp.) have been detected in laser plumes. The presence of an infectious agent in a laser plume may not, however, be sufficient to cause disease from airborne exposure, especially if the normal mode of transmission for the agent is not airborne. No evidence indicated that HIV or hepatitis B virus (HBV) has been transmitted via aerosolization and inhalation.

Although continuing studies are needed to fully evaluate the risk of laser plumes to surgical personnel, the prevention measures in these other guidelines should be followed: a) NIOSH recommendations, b) the *Recommended Practices for Laser Safety in Practice Settings* developed by the Association of periOperative Registered Nurses [AORN], c) the assessments of ECRI and d) the ANSI standard. These guidelines recommend the use of a) respirators (N95 or N100) or full face shields and masks, b) central wall-suction units with in-line filters to collect particulate matter from minimal plumes, and c) dedicated mechanical smoke exhaust systems with a high-efficiency filter to remove large amounts of laser plume. Although transmission of TB has occurred as a result of abscess management practices that lacked airborne particulate control measures and respiratory protection, use of a smoke evacuator or needle aspirator and a high degree of clinical awareness can help protect healthcare workers when excising and draining an extrapulmonary TB abscess.