

Is your “Sterile Zone” Really Sterile?

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The literature is full of studies demonstrating the presence of thousands of microscopic particles in the air, with ten percent of them carrying microorganisms.

For years, we have discussed the merits of sterilization of surgical instruments, the appropriate cleaning and disinfection of working surfaces, the importance of performing proper hand hygiene and using personal protective equipment within the surgical field. Only occasionally has the subject of airborne contamination been addressed, even though we know that about one third of surgical site infections are caused by air-borne transmission of particles drifting within the “sterile zone.”

Whyte and colleagues put it succinctly: “Everything which is to come into contact with the wound has been made sterile, except the air, which is in contact with everything.”¹

Bacteria depend on transport via airborne suspended microscopic particles, including dust, sloughed skin cells, wet respiratory droplets, and a variety of other particulates.

In an attempt to reduce airborne particulates in the operating room, some hospitals have used expensive vertical filtered, laminar-flow devices installed in the ceiling. With few exceptions, these ceiling filters are installed in the hospital operating rooms only. Although these filtering units do have value, questions remain regarding the thousands of airborne particulates that are produced within the operating room during the procedure. Many of these airborne particulates slough off from the skin of personnel after they have entered the room and during the procedure itself. The more people in the room, the greater the number of particulates produced: we each shed up to ten thousand skin cells per minute. Forcing air currents in a downward direction from the ceiling can move floating airborne particulates directly into the “sterile zone,” into the surgical wound, and directly onto the surfaces of “sterile” instruments, resulting in instrument contamination prior to their point of use. In other words, instruments and implants are likely contaminated from direct exposure to the air as soon as the pack is opened.

In their 2004 study published in the *Journal of Infection Control and Hospital Epidemiology*, conducted at the Karolinska University Hospital in Stockholm, Persson and van der Linden stated, “An ultra-clean airflow from the ceiling downward may convey airborne particles from the surgical team into the wound, thus increasing the risk of infection. To protect a surgical wound against direct airborne contamination, air should be directed away from the wound rather than toward it.”² The same holds true for the surgical instruments themselves.

Two devices recently cleared by the United States Food and Drug Administration (FDA), the Operio® Mobile Unit from Sweden and the SurgiCube® Stationary Unit from the Netherlands: both have shown to significantly reduce surgical site infections in European hospitals by eliminating airborne particulates within the “sterile zone.” The Operio® unit is a mobile device that is easily transported directly to the patient’s bedside for use during invasive procedures, aseptic bandage changes, and other high-risk procedures. The SurgiCube® unit is assembled and fixed into an existing room, thereby converting a regular room into a procedure or minimal surgical room. Impressed by the performance of the unit developed in Sweden, the leader of a meeting held recently with the infection control staff at a large university hospital group said that “there should be an Operio® unit on the floor of every one of our hospitals.”

With the recent FDA clearance of both of these devices, it seems prudent for all facilities, including hospitals, ambulatory surgical centers, medical and dental offices, cardiac catheterization labs and immediate care treatment facilities, to consider the use of this technology in providing an “aseptic zone” in their immediate procedure areas. Information can be obtained from the U.S. importer and distributor, Aseptic Air Control, Rolling Meadows, Illinois. To learn more, go to www.aseptic-air.com or call 1-800-448-0131.

¹ Whyte W, Shaw BH, Barnes R: A bacteriological evaluation of laminar-flow systems for orthopedic surgery. *J. Hyg Camb* 1973;71:559

² Persson M, van der Linden J: Wound ventilation with ultraclean air for prevention of direct airborne contamination during surgery. *Journal of Infection Control and Hospital Epidemiology* 2004;25(4):297-301.