

Aerosolized Microbes May Pose a Hazard in OR

BY JEFF EVANS
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TUCSON, ARIZ. — Nasopharyngeal shedding of aerosolized microbes may be a vector for perioperative contamination in the operating room, Charles E. Edmiston Jr., Ph.D., reported at the annual meeting of the Central Surgical Association.

Barriers to contamination, such as surgical masks, may not adequately contain microbial aerosols, especially when they are worn for long durations, added Dr. Edmiston of the Medical College of Wisconsin, Milwaukee.

"Ten to fifteen years ago we would have never talked about this, because you primarily looked upon infections that occurred during the perioperative or even postoperative period as being mediated merely by contact," he said.

Over an 18-month period, Dr. Edmiston and his collaborators matched cultures obtained from air in the operating room with nasal cultures taken from an 11-member vascular surgery team during 70 vascular reconstruction procedures. An air-sampling device used a 0.45- μ m filter to collect the air at four points located within 0.5-1 m or 4-5.5 m from the surgical wound.

The investigators recovered strains of coagulase-negative staphylococci, such as *Staphylococcus aureus*, during 60 (86%) of the 70 procedures; these strains were collected 0.5-1 m away from the wound in 36 of the procedures. Another third of the isolates were *S. epidermis*.

Gram-negative bacteria grew in cultures after the perioperative sampling period in 23 (33%) of the 70 procedures. Three of the isolates—*Stenotrophomonas maltophilia*, *Burkholderia cepacia*, and *Aeromonas* species—entered the operating room as an aerosol when surgical team members turned on the faucet of a utility sink. Most of the recovered strains showed patterns of resistance to multi-

ple drug groups, such as the aminoglycosides, β -lactams, and fluoroquinolones.

In several selected cultures, Dr. Edmiston and his colleagues used pulsed-field gel electrophoresis, a tool commonly employed by molecular epidemiologists to investigate infectious disease outbreaks. They discovered that isolates derived from air samples were often from the same clonal family of isolates obtained from the nasal cultures of the surgical team.

In one instance, Dr. Edmiston found that *S. aureus* isolates taken from a senior member of the surgical team matched those from air samples taken within 1 m of the wound during an operation in which the senior member was present.

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DR. EDMISTON

In three separate procedures, the investigators found that a vascular fellow had spread the same strain of *S. aureus* from his anterior nostril to within 1 m of a wound.

"It became obvious that the shedding phenomenon was occurring during the intraoperative period," Dr. Edmiston said.

Although none of the 70 patients developed surgical-site or prosthetic-device infections after their procedures, the microbes recovered from the operating room air and nasal cultures are the same kinds commonly implicated in such infections, which can occur even months to years after the surgery, Dr. Edmiston said.

Four other reports in the literature have used molecular techniques to link the operative team with postoperative surgical-site infections, he noted.

To determine the effect of standard tie-back surgical masks on nasopharyngeal shedding, the researchers measured the air at four points in a room with conditions identical to those in an operating room. The 22 healthy volunteers and 8 volunteers with rhinorrhea sat in the room for 90 or 180 minutes and alternately read out loud or silently for 15 minutes at a time with or without the masks on.

At 90 minutes, the masks significantly reduced the amount of microbial nasopharyngeal shedding in healthy volunteers from 12.5 colony-forming units per cubic meter in those who did not wear a mask to 5.6 cfu/m³ in those who did wear one. In the volunteers with rhinorrhea, shedding declined significantly from 24.3 cfu/m³ in those without masks to 11.3 cfu/m³ in individuals who wore masks.

Masks were ineffective at significantly reducing the amount of nasopharyngeal shedding at 180 minutes. In healthy volunteers, nonmasked individuals had more shedding (21.8 cfu/m³) than did masked individuals (12.3 cfu/m³), but the difference was not significant. No difference in microbial shedding occurred in volunteers with rhinorrhea according to whether they wore a mask (37.8 cfu/m³) or not (53.8 cfu/m³).

"In essence, what's occurring is you have this venting phenomenon over the top of the mask and around the sides of the mask," Dr. Edmiston explained.

Dr. Edmiston said he doubted that U.S. surgeons with colds or symptoms of rhinorrhea would give up operating until they had recovered. Instead, improvement in surgical mask design, antiseptic-impregnated devices, or prevention of microbial adherence to device surfaces may make more of an impact than anything else.

Dr. Edmiston may only have proved that the airflow system in operating rooms works, since no patient became infected, noted Mark Malangoni, M.D., who was designated to comment on the paper. Airflow comes into the operating room over the patient, pushing air away from him or her to the sides of the room and toward the floor where return air systems exist. Dr. Malangoni, outgoing president of the association, added that he would have been more convinced if Dr. Edmiston had a way to sample the air directly over the patient.

Dr. Edmiston contended, however, that the movement of seven to eight people in the operating room—maybe five or six of whom are within a half meter of the surgical wound—creates a vortexing of aerosols that may spread out across the room despite specialized airflow. ■

CLINICAL CAPSULES

Necrotizing Fasciitis

Cases of necrotizing fasciitis that are caused by community-acquired methicillin-resistant *Staphylococcus aureus* are on the rise, Loren G. Miller, M.D., of Harbor-UCLA Medical Center, Los Angeles, and colleagues reported.

Of 843 patients whose wound cultures grew MRSA over a 15-month period in 2003-2004, 14 had necrotizing fasciitis, necrotizing myositis, or both (N. Engl. J. Med. 2005;352:1445-53).

None of the 14 patients died, but all had one or more serious complications. Combined surgical and medical treatment was provided; all MRSA isolates showed in vitro susceptibility to clindamycin, trimethoprim-sulfamethoxazole, vancomycin, gentamicin, and rifampin.

S. aureus has been a rare cause of necrotizing fasciitis, but cases caused by community-acquired MRSA represent an emerging clinical syndrome.

Empirical treatment in suspected cases, particularly where MRSA is endemic, is necessary regardless of the presence of clinical risk factors, and should include antibiotics active against the locally circulating strains, they said.

This represents a major departure from currently recommended treatment for necrotizing fasciitis, the investigators added.

HSV-2 Shedding Risk

Hormonal contraception and two common genital tract conditions appear to be among the risk factors for genital tract shedding of herpes simplex virus type 2 in women.

In a 12-month study of 330 women who were evaluated every 4 months, independent predictors of genital tract shedding of HSV-2 were HSV-2 seroconversion during the previous 4 months (adjusted odds ratio [OR] 3.0), bacterial vaginosis (adjusted OR 2.3), heavy colonization with group B streptococcus (adjusted OR 2.2), and use of hormonal contraceptives (adjusted OR 1.8), reported Thomas L. Chernes, M.D., and his colleagues at the University of Pittsburgh (Clin. Infect. Dis. 2005;40:1422-8).

Because use of hormonal contraception is widespread, and bacterial vaginosis and vaginal group B streptococcus colonization are two of the most common genital conditions in women of reproductive age, the associations between these variables and increased genital tract shedding of HSV-2 is of concern. The findings could have important implications for decreasing HSV-2 transmissions.

Multidrug-Resistant TB

Directly observed therapy, which has served as the primary strategy world-

wide for preventing drug-susceptible tuberculosis transmissions, also is effective for reducing the transmission and incidence of drug-resistant tuberculosis, a study suggests.

In the population-based prospective study of 436 patients undergoing directly observed therapy, short course (DOTS), three indicators of ongoing TB transmissions showed that transmission declined between 1995 and 2000.

During those years, the pulmonary TB incidence rate decreased from 42 to 19 per 100,000 population, the percentage of clustered pulmonary TB cases decreased from 22% to 8%, and the rate of primary drug resistance decreased from 9 to 2 per 100,000 population, according to Kathryn DeRiemer, Ph.D., of Stanford (Calif.) University and her colleagues (Lancet 2005;365:1239-44).

Multidrug-resistant (MDR) TB also decreased significantly, as did the number of treatment failures, from 13 (11%) in 1995 to 1 (2%) in 2000. But the case-fatality rate over the study period was 12% for MDR TB, compared with 7% for strains resistant to one or more drugs (not including MDR cases), and 3% for strains susceptible to multiple drugs.

DOTS remains a valuable tool for preventing TB transmission even in this age of emerging drug resistance, but further interventions will be required to avoid treatment failure and reduce multidrug-re-

sistant TB mortality rates, the investigators concluded.

Tomatoes and Salmonella

Roma tomatoes were implicated or suspected in three salmonella outbreaks involving more than 560 patients in 18 states and 1 Canadian province last year, according to the Centers for Disease Control and Prevention. No deaths were associated with the outbreaks, but 14%-30% of the patients were hospitalized.

In two of the outbreaks, case-control studies conducted by the CDC and state and local health departments showed associations between salmonella infection and Roma tomato consumption. For example, in the largest outbreak—involving 429 culture-confirmed cases in nine states—multivariate analysis showed that salmonella infection was strongly associated (adjusted odds ratio 7.1) with consumption of Roma tomatoes (MMWR 2005;54:325-8). In the third outbreak, no case-control study was conducted, but Roma tomatoes were the only common food exposure among patients.

Health officials investigating salmonella outbreaks should consider tomatoes as a potential vehicle, and future studies should focus on mechanisms of tomato contamination and methods of eradication of salmonella in fruit, according to the CDC.

—Sharon Worcester