Medical News

EDITED BY GINA PUGLIESE, RN, MS; MARTIN S. FAVERO, PHD

Antimicrobial Resistance Among *Staphylococcus* Bloodstream Infections

Marshall and co-investigators from the University of Iowa College of Medicine in Iowa City reported results from their national Surveillance Program, SCOPE (Surveillance and Control of Pathogens of Epidemiologic Importance). They found that coagulase-negative staphylococci (CNS) and *Staphylococcus aureus* were the first and second most common etiologic agents, respectively, causing nosocomial bloodstream infection in the United States. The frequency of oxacillin resistance was 68% among 1,553 strains of CNS and 26% among 787 strains of *S aureus* in this study. Extended susceptibility profiles were generated for a subset of 150 *S aureus* and 300 CNS against 16 antimicrobial agents. Oxacillin-susceptible strains of both CNS and *S aureus* were uniformly susceptible to β-lactam agents (with the exception of ampicillin and penicillin). Oxacillin-susceptible *S aureus* also were highly susceptible to the fluoroquinolones, aminoglycosides, and trimethoprim-sulfamethoxazole. The oxacillin-susceptible CNS were less susceptible to these agents, and only glycopeptides were reliably active against oxacillin-resistant strains.

Polymerase chain reaction detection of the *mec*A gene was used to scrutinize current National Committee for Clinical Laboratory Standards (NCCLS) interpretive breakpoint minimum inhibitory concentrations (MICs) for determining susceptibility or resistance to oxacillin. The authors found complete concordance between the presence or absence of *mec*A and the NCCLS oxacillin interpretive breakpoint categories for *S aureus.* In contrast, the NCCLS breakpoints for oxacillin significantly underestimate the degree of true oxacillin resistance among CNS. Using the presence of *mec*A as the reference standard, they detected 15.7% false susceptibility to oxacillin using an MIC susceptible breakpoint concentration of ≤2 μg/mL. Lowering the oxacillin MIC breakpoint to ≤0.25 μg/mL for CNS would improve the accuracy of the MIC test performance greatly. Both the current oxacillin disk test and the 30-μg ceftizoxime disk test functioned quite well in predicting those strains of CNS that contained *mec*A.

These studies have demonstrated both a high level of antimicrobial resistance among nosocomial bloodstream isolates of staphylococci, as well as substantial problems with the current NCCLS breakpoints for oxacillin when testing CNS.

FROM: Marshall SA, Wilke WW, Pfaller MA, Jones RN. *Staphylococcus aureus* and coagulase-negative staphylococci from bloodstream infections: frequency of occurrence, antimicrobial susceptibility, and molecular (*mec*A) characterization of oxacillin resistance in the SCOPE program. *Diagn Microbiol Infect Dis* 1998;30:205-214.

Effectiveness of Antibiotic Prophylaxis in Critically Ill Patients

Investigators from the Mario Negri Institute for Pharmacological Research in Milan, Italy, conducted a systematic review of randomized controlled trials to determine whether antibiotic prophylaxis reduces respiratory tract infections and overall mortality in unselected critically ill adult patients. A meta-analysis was conducted of aggregate data from trials involving 5,727 patients; confirmatory meta-analysis used data from another 4,343 individual patients. The main outcomes measured were respiratory tract infections and total mortality. Two categories of eligible trials were defined: topical plus systemic antibiotics versus no treatment, and topical preparation with or without a systemic antibiotic versus a systemic agent or placebo.

Estimates from aggregate data meta-analysis of 16 trials (3,361 patients) that tested combined treatment indicated a significant reduction in infection (odds ratio [OR], 0.35; 95% confidence interval [CI_{95}], 0.29-0.41) and total mortality (OR, 0.80; CI_{95}, 0.69-0.93). With this treatment, 5 and 23 patients would need to be treated to prevent 1 infection and 1 death, respectively. Similar analysis of 17 trials (2,366 patients) that tested only topical antibiotics indicated a significant reduction in infection (OR, 0.56; CI_{95}, 0.46-0.68) without a significant effect on total mortality (OR, 1.01; CI_{95}, 0.84-1.22). Analysis of data from individual patients yielded similar results. No significant differences in treatment effect by major subgroups of patients emerged from the analyses.

The authors concluded that this meta-analysis of 15 years of clinical research suggests that antibiotic prophylaxis with a combination of topical and systemic drugs can reduce respiratory tract infections and overall mortality in critically ill patients. This effect is significant and worthwhile, and it should be considered when practice guidelines are defined.

FROM: D'Amico R, Pifferi S, Leonetti C, Torri V, Tinazzi A, Liberati A. Effectiveness of antibiotic prophylaxis in critically ill adult patients: systematic review of randomised controlled trials. *BMJ* 1998;316:1275-1285.

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TB of Thumb Following Needlestick

A laboratory technician sustained a needlestick injury while processing a cervical lymph node for culture obtained from an HIV-positive, severely immunocompromised (CD4+ lymphocyte count, 40/mm^3) patient. The needle and syringe contained a broth specimen from the lymph node (strongly positive for acid fast bacilli [AFB]) and was being used to inoculate a new bottle for further testing. The injury occurred as the technician was inserting the needle through the membrane of the bottle, and the needle went deeply into the tip of the thumb, touching the bone. A bolus of liquid was accidentally injected into the finger. The technician disinfected the wound immediately with povidone iodine.

Despite the relatively low risk of contamination with HIV (the lymph node had been decontaminated previously, and it had been incubated for >10 days after removal), the technician was given prophylactic treatment with zidovudine. Tests for antibodies to HIV were negative at 0, 3, and 6 months.

Ten days after the injury, the technician felt numbness at the site of the wound and noted a pinhead-sized pustule. Numerous AFB were observed from a specimen of pustule, and cultures yielded *Mycobacterium tuberculosis.*

The authors note that cutaneous tissue can be affected by TB in different ways. Straight inoculations, as described in this report are rare. Infections due to close contact, such as fistulating TB adenitis, are more frequent. Hematogenous dissemination during the course of miliary TB also can give rise to skin lesions, which usually present as papular forms showing central crusts. Infection by direct injection is rare, and only one other case has been reported that involved a needlestick injury.

FROM: Genee D, Siegret HH. Tuberculosis of the thumb following a needlestick injury. *Clin Infect Dis* 1998;26:210.

Levels of Microbial Contamination on Surgical Instruments

Rutala and co-investigators from the University of North Carolina School of Medicine at Chapel Hill point out that sterilization systems in the United States are validated using highly conservative criteria. The FDA requires manufacturers of low-temperature sterilization systems to employ a high degree of conservatism in designing sterilization cycles, such as assuming that the bioburden is 10^6 on a device and using bacterial spores most resistant to the process; in challenge tests, placing of spores in the least accessible locations in the device; using spores contained in "soil"; simulating use conditions and documenting 6 logs of kill at half cycle; and documenting that a cycle produces 6 logs of kill with a 10^{-6} probability that one spore survives.

Rutala and colleagues conducted studies to ascertain the microbial load and type of organisms on used surgical instruments following standard cleaning, which consisted of the use of a washer sterilizer followed by sonic cleaning. In this prospective experimental study, used surgical instruments were immersed in Peptamen Tween broth, the broth agitated, and then filtered through a 0.45-μm filter. Quantitative cultures were performed, and all microorganisms were identified by using standard techniques. The study was conducted at a 660-bed university hospital.

The microbial load remaining on used surgical instruments after cleaning was as follows: 36 (72%) instruments 0 to 10 colony-forming units (CFU); 7 (14%) instruments, 11 to 100 CFU; and 7 (14%) instruments, more than 100 CFU. Microorganisms contaminating the instruments included coagulase-negative *Staphylococcus* (56%), *Bacillus* (22%) and diphtheroids (14%). No other microorganisms were isolated from more than 4% of the instruments. The authors concluded that most used nonlumened surgical instruments contain less than 100 CFU of relatively nonpathogenic microorganisms after cleaning. These data suggest that new low-temperature sterilization technologies are likely to be highly effective in preventing cross-transmission of infection via nonlumened medical instruments.

FROM: Rutala WA, Gergen MF, Jones JF, Weber DJ. Levels of microbial contamination on surgical instruments. *Am J Infect Control* 1998;26:143-145.

Additional news items in this issue: Effect of Granulocyte Colony-Stimulating Factor on Nosocomial Infections, page 503; Hydrogen Peroxide Gas-Plasma Sterilization Studies on Viruses and Oocysts, page 520; HIV-Related Laws, page 498; Directly Observed Therapy for TB, page 529.

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