Medical News

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

Antimicrobials in Animal Feed

Antimicrobial agents have been given to food animals in North America and Europe for nearly a half century. These agents often are given in the absence of disease, for subtherapeutic purposes, to promote growth. It has been estimated that 50% of all antimicrobials produced in the United States are administered to animals, mostly for subtherapeutic uses. The implications for humans has been the subject of an ongoing debate.

Three articles in the October 18, 2001, issue of the *New England Journal of Medicine,* accompanied by an editorial, addressed the use of antimicrobials in animal feed. White found that 20% of samples of ground meat obtained in supermarkets were contaminated with *Salmonella* and that 84% of the isolates were resistant to at least one antimicrobial. The authors note that other studies have shown that *Campylobacter jejuni,* another important human pathogen, frequently is isolated from meat, particularly poultry, available in supermarkets, and the incidence of fluoroquinolone-resistant strains has increased with the introduction of the therapeutic use of these drugs in animals.

A second study by McDonald found that at least 17% of chickens obtained in supermarkets in four states had strains of *Enterococcus faecium* resistant to quinupristin-dalfopristin, suggesting that development of resistance to *E faecium* is related to the use of virginiamycin in chicken feed.

The third study, by Sorensen found that glycopeptide-resistant and streptogramin-resistant strains of *E faecium,* isolated from chicken parts obtained at a grocery store and from pigs after slaughter, were able to colonize transiently (up to 14 days) the intestinal tract of healthy volunteers. They attributed the emergence of glycopeptide-resistant strains to the earlier widespread use of avoparcin in animal feed in Europe, noting that in 1997 its use was banned by countries in the European Union.

Gorbach, in an accompanying editorial, commented that the use of antimicrobials in food animals selects for resistant strains and enhances their persistence in the environment. Another concern is the horizontal spread of the resistance genes from bacteria in food animals to commensal strains in the intestinal microflora of humans.

On the basis of discussions by an expert committee of the Alliance for the Prudent Use of Antibiotics, several recommendations were made, including (1) antimicrobials should be used only when indicated in individual infected animals for a targeted pathogen and prescribed by a veterinarian; (2) the use of certain drugs that have important uses in humans, such as fluoroquinolones and third-generation cephalosporins, should be prohibited in animals; and (3) the subtherapeutic use of these agents to promote growth and feeding efficiency should be banned—a move that would decrease the burden of antimicrobial resistance in the environment and provide health-related benefits to both humans and animals.

FROM: White DG, Zhao S, Sudler R, Ayers S, Friedman S, Chen S, et al. The isolation of antibiotic-resistant *Salmonella* from retail ground meats. *N Engl J Med* 2001;345:1147-1154.

McDonald LC, Rossiter S, Mackinson C, Wang YY, Johnson S, Sullivan M, et al. Quinupristin-dalfopristin–resistant *Enterococcus faecium* on chicken and in human stool specimens. *N Engl J Med* 2001;345:1155-1160.

Sorensen TL, Blom M, Monnet D, Frimodt-Moller M, Poulsen RL, Esperson F. Transient intestinal carriage after ingestion of antibiotic-resistant *Enterococcus faecium* from chicken and pork. *N Engl J Med* 2001;345:1161-1166.

Gorbach S. Antimicrobials in animal feed: time to stop. *N Engl J Med* 2001;345:1202-1203.

Effect of Vancomycin and Cephalosporins on VRE in ICUs

Patient-specific risk factors for acquisition of vancomycin-resistant enterococci (VRE) among hospitalized patients are becoming well-defined. However, few studies have reported data on the institutional risk factors, including rates of antimicrobial use that predict rates of VRE. Identifying modifiable institutional factors can advance quality-improvement efforts to minimize hospital-acquired infections with VRE. Fridkin and colleagues from the CDC's Division of Healthcare Quality Promotion, the Intensive Care Antimicrobial Resistance Epidemiology (ICARE) Project, and the National Nosocomial Infections Surveillance System hospitals conducted a study to determine the independent importance of any association between antimicrobial use and risk factors for nosocomial infection on rates of VRE in ICUs. The study was a prospective ecological study in 126 adult ICUs from 60 US hospitals from January 1996 through July 1999. Included were all patients admitted to participating ICUs. Monthly use of antimicrobial agents (defined daily doses/1,000 patient-days), nosocomial infection rates, and susceptibilities of all tested enterococci isolated from clinical cultures were determined.

Prevalence of VRE (median, 10%; range, 0% to 59%) varied by type of ICU, as well as by teaching status and hospital size. Prevalence of VRE was strongly associated with VRE prevalence among inpatient non-ICU areas and outpatient areas in the hospital, ventilator-days per 1,000 patient-days, and rate of parenteral vancomycin use. In a weighted linear-regression model controlling for type of ICU and rates of VRE among non-ICU inpatient areas, rates of vancomycin use ($P<.001$) and third-generation cephalosporin use ($P=.02$) were independently associated with VRE prevalence.

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The authors concluded that higher rates of vancomycin or third-generation cephalosporin use were associated with increased prevalence of VRE, independent of other ICU characteristics and the endemic VRE prevalence elsewhere in the hospital. Decreasing the use rates of these antimicrobial agents could reduce rates of VRE in ICUs.

FROM: Fridkin SK, Edwards JR, Courval JM, Hill H, Tenover FC, Lawton R, et al. The effect of vancomycin and third-generation cephalosporins on prevalence of vancomycin-resistant enterococci in 126 U.S. adult intensive care units. *Ann Intern Med* 2001;135:175-183.

Risk Factors for Ventilator-Associated Pneumonia in a Community Hospital

Ibrahim and coinvestigators from Washington University School of Medicine, Barnes-Jewish Hospital, St Louis, Missouri, conducted a study to identify prospectively the occurrence of ventilator-associated pneumonia (VAP) in a community hospital and to determine the risk factors for VAP and the influence of VAP on patient outcomes in a nonteaching institution. The study was a prospective cohort study conducted in a medical ICU and a surgical ICU in a 500-bed private community nonteaching hospital. All patients receiving mechanical ventilation who were admitted to the ICU setting between March 1998 and December 1999 were prospectively evaluated.

During a 22-month period, 3,171 patients were admitted to the medical and surgical ICUs. Eight hundred eighty patients (27.8%) received mechanical ventilation. VAP developed in 132 patients (15.0%) receiving mechanical ventilation. Three hundred one patients (34.2%) who received mechanical ventilation died during hospitalization. Logistic-regression analysis demonstrated that tracheostomy (adjusted odds ratio [AOR], 6.71; 95% confidence interval [CI_{95}], 3.91-11.50; $P<.001$), multiple central venous-line insertions (AOR, 4.20; CI_{95}, 2.72-6.48; $P<.001$), reintubation (AOR, 2.88; CI_{95}, 1.78-4.66; $P<.001$), and the use of antacids (AOR, 2.81; CI_{95}, 1.19-6.64; $P=.019$) were independently associated with the development of VAP. The hospital mortality of patients with VAP was significantly greater than the mortality of patients without VAP (45.5% vs 32.2%, respectively; $P=.004$). The occurrence of bacteremia, compromised immune system, higher APACHE II scores, and older age were identified as independent predictors of hospital mortality.

The authors concluded that VAP is a common nosocomial infection in the community hospital setting. The risk factors for the development of VAP and risk factors for hospital mortality in a community hospital are similar to those identified from university-affiliated hospitals. These risk factors can potentially be employed to develop local strategies for the prevention of VAP. ICU clinicians should be aware of the risk factors associated with the development of VAP and the impact of VAP on clinical outcomes. More importantly, they should cooperate in the development of local multidisciplinary strategies aimed at the prevention of VAP and other nosocomial infections.

FROM: Ibrahim EH, Tracy L, Hill C, Fraser VJ, Kollef MH. The occurrence of ventilator-associated pneumonia in a community hospital: risk factors and clinical outcomes. *Chest* 2001;120:555-561.

Touch Contamination Levels During Anesthetic Procedures: Relation to Hand-Hygiene Procedures

Merry and colleagues from the University of Auckland, New Zealand, have reported on a study of microbial contamination levels during anesthetic procedures. After different methods of hand preparation, volunteers rolled segments of a sterile central venous catheter between their fingertips, and bacterial transfer was evaluated by standardized quantitative culture. The number of bacteria transferred differed between methods ($P<.001$). Comparisons were made with the control group (no preparation at all; median, third quartile and maximum count=6.5, 24, 55). Bacterial transfer was greatly increased with wet hands (1,227, 1,932, 3,254; $P<.001$). It was reduced with a new rapid method, based on thorough drying with a combination of 10 seconds using a cloth towel followed by either 10 or 20 seconds with a hot-air towel (0, 3, 7 and 0, 4, 30, respectively; $P=.007$ and .004, respectively).

When asked to follow their personal routines, 10 consultant anesthetists used a range of methods. Collectively, these were not significantly better than control (7.5, 15, 55; $P=.73$) and neither was an air towel alone (2.5, 15, 80; $P=.176$) nor the hospital's standard procedure (0, 1, 500; $P=.035$).

The authors concluded that, if hand preparation is needed, an adequate and validated method should be used, together with thorough hand drying.

FROM: Merry AF, Miller TE, Findon G, Webster CS, Neff SP. Touch contamination levels during anaesthetic procedures and their relationship to hand hygiene procedures: a clinical audit. *Br J Anaesth* 2001;87:291-294.

Evolution of MRSA

Crisostomo and colleagues have theorized that the key genetic component of methicillin resistance, the *mec*A determinant, is not native to *Staphylococcus aureus*. Thus, the evolution of methicillin-resistant *S aureus* (MRSA) must have begun with the acquisition of the *mec*A determinant from an unknown heterologous source some time before the first reported appearance of MRSA isolates in clinical specimens in the United Kingdom and Denmark (in the early 1960s). They compared the genetic backgrounds and phenotypes of a group of methicillin-susceptible *S aureus* (MSSA) isolates to the properties of MRSA strains isolated in Denmark and the United Kingdom during the same time period and to the genetic profiles of contemporary epidemic clones of MRSA.

All early MRSA isolates resembled a large group of the early MSSA blood isolates in phenotypic and genetic properties, including phage group, antibiotype (resistance to penicillin, streptomycin, and tetracycline), pulsed-field gel electrophoresis pattern, and *spa*A type and multilocus