Medical News

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Nosocomial Neonatal Outbreak of *Serratia marcescens*: Analysis of Pathogens by Pulsed-Field Gel Electrophoresis and Polymerase Chain Reaction

Steppberger and colleagues investigated an outbreak of *Serratia marcescens* in the neonatal intensive care unit (NICU) and the pediatric intensive care unit (PICU) of the University Children's Hospital Leipzig, Germany. From September to November 1998, 15 patients were infected or colonized by *S. marcescens*. During the outbreak, swabs were taken from the eyes, blood, throat, and nose of every patient hospitalized in the ICUs.

In 15 cases (14 from the NICU and 1 from the PICU), the cultures yielded *S. marcescens*. All strains were investigated by pulsed-field gel electrophoresis (PFGE) as well as by polymerase chain reaction (PCR) fingerprinting. The two molecular typing methods revealed corresponding fingerprint patterns in all 15 isolates. Typing results of the outbreak-related isolates demonstrated that two epidemic strains of distinct genotypes were associated with cross-infections of a group of 5 and a group of 10 patients, respectively. The 3 invasive and 7 of the colonizing isolates were related genotypically.

This survey showed that PCR and PFGE are comparable regarding discrimination and reproducibility for epidemiologic studies of *S. marcescens* strains in nosocomial outbreaks. Genotypic fingerprinting of bacterial isolates is useful and important to limit nosocomial infections. Fingerprinting sources of nosocomial infections can be traced by both PFGE and PCR. All patients infected recovered completely and the nosocomial outbreak could be stopped rapidly.

FROM: Steppberger K, Walter S, Claros MC, et al. Nosocomial neonatal outbreak of *Serratia marcescens*: analysis of pathogens by pulsed field gel electrophoresis and polymerase chain reaction. *Infection* 2002;30:277-281.

Nosocomial Primary Bloodstream Infection in Patients in the Pediatric Intensive Care Unit

Yogaraj and co-investigators from Washington University School of Medicine, St. Louis, Missouri, conducted a study to determine the rate, risk factors, and outcomes of nosocomial primary bloodstream infection in patients in the pediatric intensive care unit (PICU). It was a prospective cohort study performed at St. Louis Children's Hospital, a 235-bed, academic, tertiary-care center with a combined 22-bed medical and surgical PICU. Subjects were patients admitted to the PICU between September 1, 1999, and May 31, 2000. Patients were monitored for the development of nosocomial bloodstream infections from the day of admission to the PICU until 48 hours after discharge from the PICU.

Of 911 patients, 526 (58%) were male and 674 (74%) were white. Congenital heart disease (29%), lung disease (25%), and genetic syndrome (18%) were common. There were 65 episodes of primary bloodstream infection in 57 patients; 5 were polymicrobial and 7 patients had multiple bloodstream infections. Coagulase-negative *Staphylococcus* was the leading cause of bloodstream infection (n = 28), followed by *Enterobacter cloacae* (n = 8). The rate of bloodstream infection was 13.8 per 1,000 central venous catheter days. In a multiple logistic regression analysis, patients with bloodstream infection were more likely to have multiple central venous catheters, arterial catheters, and invasive procedures performed in the PICU and to be transported out of the PICU to the radiology or operating room suites.

Severity of illness as measured by admission pediatric risk of mortality score, underlying illnesses, and medications were not associated with an increased risk of nosocomial bloodstream infection.

The authors concluded that this study identified a high rate of bloodstream infection among patients in the PICU of St. Louis Children's Hospital. Risk factors for bloodstream infection were related more to the process of care than to the severity of illness. Additional research is needed to develop interventions to reduce nosocomial bloodstream infections in children.

FROM: Yogaraj JS, Elward AM, Fraser VJ. Rate, risk factors, and outcomes of nosocomial primary bloodstream infection in pediatric intensive care unit patients. *Pediatrics* 2002;110:481-485.

Pseudomonas aeruginosa Outbreak in a Hematology–Oncology Unit Associated With Contaminated Surface Cleaning Equipment

Engelhart and co-investigators from the Institute of Hygiene and Public Health, University of Bonn, Bonn, Germany, conducted an outbreak investigation of six cases of hospital-acquired *Pseudomonas aeruginosa* infections (pneumonia, two cases; septicemia, two cases; skin or wound infection, two cases) occurring between August and September 2000 in an adult hematology–oncology unit at a

tertiary-care center. During the outbreak, the incidence density rate for hospital-acquired infection rose from 29.4 to 62.3 ($P < .05$) infections per 1,000 days at risk (ie, neutropenic days). Multiple samples from the patients' environment were tested for the presence of *P. aeruginosa*. A total of 4.5% of the samples from sanitary equipment and 20.0% of the samples from surface cleaning equipment were found to be contaminated with *P. aeruginosa*. Genotypic analysis by pulsed-field gel electrophoresis showed different patterns for all (N = 6) of the patient isolates; however, two of the patient isolates were identical in comparison with environmental isolates from cleaning equipment (four samples) and sanitary equipment (one sample).

This investigation revealed that the cleaning staff had used cleaning solution instead of disinfectants for decontamination of the patients' environment. The outbreak was terminated after re-adoption of surface disinfection, application of sterile filters on taps and shower heads, chemical disinfection of the washbasin drains, and appointment of a hospital hygiene nurse to a previously unfilled position. After institution of the control measures, incidence densities for hospital-acquired infection decreased to the level before the outbreak. This investigation emphasizes the need to carefully evaluate cleaning and disinfection practices for patient care, particularly regarding neutropenic patients.

FROM: Engelhart S, Krizek L, Glasmacher A, Fischnaller E, Marklein G, Exner M. *Pseudomonas aeruginosa* outbreak in a haematology-oncology unit associated with contaminated surface cleaning equipment. *J Hosp Infect* 2002;52:93-98.

Development of Viral Disinfectant Assays for Duck Hepatitis B Virus Using Cell Culture/Polymerase Chain Reaction

Human hepatitis B virus (HBV) is a worldwide public health problem with chronic carriers at risk for developing cirrhosis and hepatocellular carcinoma. Nosocomial infections can occur from exposure to inadequately disinfected equipment or the blood and body fluids of infected patients. However, disinfectants to inactivate HBV must be validated. Duck hepatitis B virus is accepted as a surrogate for HBV, due to their similar sensitivities to disinfectants and its safety. Ducklings are used for disinfectant efficacy assays; however, the same virus titer is obtained using duck embryonic hepatocytes. Viral titration in disinfectant efficacy assay is conducted using Southern hybridization of infected duck serum. However, this test requires radioisotopes.

Wang and co-investigators from the Department of Poultry Science, Auburn University, Auburn, Alabama, developed disinfectant assessment protocols using duck embryonic hepatocytes with polymerase chain reaction (PCR) or nested PCR. Its ease of handling, lower cost, and enhanced sensitivity make PCR desirable. Chicken embryonic hepatocytes were applied to duck HBV disinfectant efficacy assay. Results were consistent and could be used under certain conditions. The virucidal activities of two quaternary ammonium chloride disinfectants, n-alkyl dimethyl benzyl ammonium chloride and alkyl dimethyl benzyl ammonium chloride (10C-12C), were compared and effective concentrations were 1,200 and 1,800 ppm, respectively. The efficacies of these disinfectants were validated using real-time quantitative PCR.

Results confirmed that the efficacy of n-alkyl dimethyl benzyl ammonium chloride was higher than that of alkyl dimethyl benzyl ammonium chloride (10C-12C). This assay was useful for rapid discrimination of killing potentials of disinfectants.

The authors point out that these assays can be applied to other viruses that are unable to cause CPE in cell cultures and broadened the utility of duck HBV as an animal model for HBV.

FROM: Wang CY, Giambrone JJ, Smith BF. Development of viral disinfectant assays for duck hepatitis B virus using cell culture/PCR. *J Virol Methods* 2002;106:39-50.