

heterogeneous semi-Markov model was determined and then validated; the initial data set was randomly split into two groups: two thirds (450 patients) to build the model and one third (226 patients) to validate it. The model defined five states: ICU admission, first simple infection, first complicated infection, death, and discharge from the ICU. Transitions between these states determined nine different events. The global model of patient histories can be divided into nine survival models, each corresponding to one of these events. The possible events from a given state were considered to be competing. Since many risk factors induced nonproportional hazard functions, piecewise exponential models were used to model event occurrence. The effect of continuous covariates on hazard functions has been described with a nonparametric method that enables nonlinear relations to be shown.

Among other things, the model allows patients' post-admission histories to be predicted from data available at ICU admission. The bootstrap estimator of the attributable risk of death due to simple or complicated nosocomial infections is 44.2% (95% confidence interval, 26.0-61.6). They were also able to characterize the most highly exposed patients, those who comprise the high-risk group on whom prevention efforts must be focused.

FROM: Escolano S, Golmard JL, Korinek AM, Mallet A. A multi-state model for evolution of intensive care unit patients: prediction of nosocomial infections and deaths. *Stat Med* 2000;19:3465-3482.

Testing Disinfectant Efficiency on *Pseudomonas* Biofilm

Wirtanen and colleagues from VTT Biotechnology and Food Research, Espoo, Finland, conducted studies on the effect of disinfectants on biofilms. Biofilms of the gram-negative bacteria *Pseudomonas aeruginosa* and *Pseudomonas fragi* were grown on stainless steel surfaces (AISI 304, 2B) for 4 days in slime broth. These biofilms were treated with four commercial disinfectants. The disinfectants were alcohol-based, tenside-based, peroxide-based, and chlorine-based products, covering most disinfectant types used in the food industry. The effects of the disinfectants on the bacterial cells were first investigated in suspension using the permeabilization test, which is based on fluorescence assessment of hydrophobic 1-N-phenyl-naphthylamine. The surfaces covered with disinfectant-treated biofilms were investigated using conventional cultivation, impedimetry, and epifluorescence microscopy in

combination with image analysis of preparations stained with the DNA stain acridine orange and with the metabolic indicator system CTC-DAPI.

The results showed that the tenside-based and peroxide-based disinfectants permeabilized the cells in suspension. The overall biofilm results showed that, of the agents tested, the peroxide-based and chlorine-based disinfectants acted most effectively on cells in biofilms.

FROM: Wirtanen G, Salo S, Helander IM, Mattila-Sandholm T. Microbiological methods for testing disinfectant efficiency on *Pseudomonas* biofilm. *Colloids Surf B Biointerfaces* 2001;20:37-50.

New Oligosaccharide Antibiotic for Gram-Positive Nosocomial Pathogens

Gram-positive bacteria are increasingly found to be causative pathogens in nosocomial infections, and the occurrence of vancomycin resistance in enterococci, as well as staphylococci, has prompted Kropec and colleagues from the Institute of Environmental Medicine and Hospital Epidemiology, University Hospital Freiburg, to conduct an investigation of alternative antimicrobial agents active against these strains. Everninomycin, a new oligosaccharide antibiotic, has excellent in vitro activity against gram-positive bacteria, including those resistant to vancomycin. However, avilamycin, a related compound, has been used in Europe as a growth promoter in animal food for years, and concern has been raised that cross-resistance in clinical isolates may arise.

They studied a collection of 268 nosocomial gram-positive isolates from ICU patients with nosocomial pneumonia, urinary tract infection, and sepsis, using standard in vitro susceptibility testing. All species tested were sensitive to everninomycin. Furthermore, no difference could be observed between methicillin-resistant and methicillin-sensitive *Staphylococcus aureus* or between *Enterococcus faecium* and *Enterococcus faecalis*.

These results suggest that everninomycin is a promising antibiotic for the treatment of nosocomial infections in ICU patients and that the use of a related substance as an additive in animal food has not yet promoted resistance in clinical isolates.

FROM: Kropec A, Frank U, Jonas D, Thriene W, Schmidt-Eisenlohr E, Daschner FD. In vitro susceptibility to everninomycin of gram-positive nosocomial pathogens isolated from intensive care units in Germany. *Chemotherapy* 2001;47:15-18.