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A Nosocomial Epidemic Model with Room Contamination

Nosocomial infections, i.e. hospital-acquired infections, are a major public health concern, especially in light of the spread of antibiotic-resistant bacteria. In this talk, I present a model of epidemic bacterial infections in hospitals which incorporates the infection of patients and contamination of healthcare workers due to environmental causes. The basic reproduction number, \mathcal{R}_0 , is defined and asymptotic dynamics are analyzed. Under certain conditions, it is proved that the disease-free equilibrium is globally stable when $\mathcal{R}_0 < 1$. However, in general the disease-free equilibrium is only locally stable when $\mathcal{R}_0 < 1$ and there can be multiple positive steady states in this case. Numerical simulations are conducted and the model is interpreted to provide insight for controlling nosocomial epidemics. Furthermore, the problem of antibiotic resistance, along with potential intervention strategies, are discussed.