Mathematical Modeling of Delayed Pulse Vaccination of Infectious Diseases

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ABSTRACT

This study concerns the theoretical determination of a mathematical model of delayed pulse vaccination of infectious diseases that affects children. In this study, a delayed SEIR epidemic model with impulsive effect and the global dynamic behaviors of the model is analyzed. Using the discrete dynamical systems developed, it's shown that there exists an 'infection-free' periodic solution which is globally attractive when the period of impulsive effect is less than some critical value. The sufficient condition for the permanence of the epidemic model with pulse vaccination is given, which means the epidemic disease is to spread around. The study has concluded that time delay and pulse vaccination brings great effects of shortening 'infection period' on the dynamics of the model. The main feature of the study is to introduce time delay together with pulse into epidemic model, and investigate their effects on the dynamics of model. The results indicate that a large vaccination rate or a short period of pulsing leads to the eradication of the disease. Numerical simulation has been used together with the analytical results. The results are presented in tabular and graphical form.

Keywords: Mathematical modeling, Basic reproduction ratio-R_o Compartmental model Infectious diseases

Disease-Free Equilibrium Endemic Equilibrium Pulse vaccination