

An SIR Modeling with The Pathogen Population Dynamics of Disease Transmission

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We consider an SIR model of disease transmission through the environment around the host population, for example, by an aerial infection or by food contaminated by the pathogen. The pathogen population, which causes the disease of host, is taken into account. In our modeling, we explicitly introduce the pathogen density effect on the infection process. We can see that, even for the simplest SIR model, the detail of pathogen transmission dynamics would change the nature of temporal variation of the infective population size. Further the analysis of our model demonstrates that the basic reproduction number does not necessarily reflect the possibility of the outbreak occurrence in some epidemics even if it could be one of the useful indices to characterize the disease transmission.