

## **Importance of nested models in modeling infectious diseases**

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### **Abstract**

Mathematical models are believed to achieve good results in prediction of disease prevalence's. The progression of an infection within a host determines the capacity of a pathogen to spread to new hosts and to sustain itself in the population. Whereas a wide link between the infection dynamics within-host and between hosts, transmission dynamics of pathogens is broadly recognized, an inclusive and quantitative understanding that would allow complete integration of the two scales is yet to be realized. This paper aims at explaining the importance of nested models and giving an example of the within-host and between-dynamics of bacterial pneumonia (pneumococcal). To that end, deterministic differential and integro-differential equations are used to investigate the interaction between the target cell and streptococcus pneumoniae. Analysis on this model, with a focus of streptococcus fitness /threshold dynamics is done. Mathematics Subject Classification (2010).