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Spreading Disease with Transport-Related Infection

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ABSTRACT

Transport among regions is found as one of the main factors which affect the outbreak of diseases. It will change the disease dynamics and break infection out even if infectious diseases will go extinct in each city without transport-related infection. In this talk, a mathematical model is proposed to demonstrate the dynamics of such disease propagation between two regions (or cities) due to the population dispersal and infection on transports. Further, our analysis shows that transport-related infection intensifies the disease spread if infectious diseases break out to cause an endemic situation in each region, in the sense that both the absolute and relative size of patients increase. This suggests that it is very essential to strengthen restrictions of passengers once we know infectious diseases appeared.

Key Words: Transport-related infection, SI model, SARS

AMS Classification:34D20, 92D30

References

[1] Arino, J. and van den Driessche, P. 2003. A multi-city epidemic model. Mathematical Population Studies, 10,175-193.
[2] Sattenspiel, L. and Dietz, K. 1995. A structured epidemic model incorporating geographic mobility among regions. Math. Biosci. 128,71-91.
[3] Wang, W. and Zhao, X.-Q. 2004. An epidemic model in a patchy environment, Math. Biosci. 190, 97-112.