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Title
Evolution of FMD Epidemic on a Weighted Contact network and Control Strategies

Abstract
Introduction:
Epidemic models can be extremely useful in characterizing the spatial and temporal evolution of Foot and Mouth Disease. We present a parameterized compartmental S-I-R model to map the evolution of FMD over a weighted contact network and its comparison with un-weighted baseline models. Specificity and sensitivity analysis further provides a clear demarcation between the pre-outbreak and the outbreak period of the epidemic.

Methods:
FMD has been widely analyzed so far as a windborne disease which spreads over great distances with movement of infected or contaminated animals and people. The novelty of our model lies in the fact that it considers a weighted contact network which considers wind and movement as weights of a contact network which can model the spread of the FMD effectively and dynamically. The World Organization for Animal Health (OIE) Incidence reports from the FMD Bioportal provides the basis for validation of our predictive model.

Results, Discussion:
The spread of the FMD in Turkey from January 2005 to December 2006 has been studied. Our model separates the period under study into pre-outbreak and outbreak periods according to the level of incidence reports. Our predictive model shows a high Negative Prediction value with specificity (70.74%) and a 95% confidence interval with respect to baseline models in the pre-outbreak period thus proving that a negative test for infection, which is provided by our model, is efficient in providing good predicted results. In the outbreak period, the model shows a high Positive Prediction value with a high sensitivity (96.5%) and a 98%confidence interval, showing that a positive test for infection is efficient. We have tested that control strategies involving isolation of an average of 6% nodes based on highest node degree, closeness centrality and betweenness of the infected network leads to a 40% reduction in the overall infected population.