

Analysis of spread dynamics of infectious diseases on trade networks

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This study investigates the spread of pathogens on food productions chain. Concerning the introduction and the dissemination of livestock infectious diseases, the trade of animals is an important risk factor [1]. In more detail the objectives of this study are:

The trade network is set up using data taken from the national "Herkunftssicherungs- und Informationssystem für Tiere (HIT)" database for pigs. In this database movement data of pigs are documented and can be use for buildings the network. In addition to the information about the trade pattern, the dates when animals are traded are recorded. With this information at hand, "waiting times" (time period between consecutive dates of trade) can be calculated. In order to model the disease spread within the farms and between neighboring farms (small scale), the model given by *Backer et al. (2007)* [2] is used. The trade net enables to simulate large scale spread of the disease.

It is important to investigate the dynamics of a disease on a trade net, when the information about the waiting times is available. In our analysis we hypothesize that waiting times pose a significant influence on the disease dynamics. This hypothesis is tested using the calculated networks statistics and parameters useful to characterize the dynamics and the ultimate outcome of the disease spread, i.e. R_0 and the final size of an outbreak. Furthermore, it is investigated whether high risk farms are indentified correctly.