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Effectiveness of risk-based testing of imported animals for bovine tuberculosis in the Netherlands

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Purpose
The Netherlands are officially free from bovine tuberculosis (bTB) since 1999. However, frequent reintroductions occurred in the past 15 years due to importation of infected cattle. Currently, cattle are not tested after importation into the Netherlands. Additional testing (AT) would, however, enhance the probability of detecting an imported bTB infection in an early stage. The goal of this study was to evaluate the effectiveness of risk-based AT for bTB in cattle imported into the Netherlands.
Methods
A generic stochastic import risk model was developed that simulates disease introduction by importation of live animals on an annual basis. Main output parameters are the number of infected animals that is imported (N_{inf}), the number of infected animals that is detected by testing (N_{det}), and the economic loss incurred by importing infected animals (*Loss*). The model was parameterized for bTB. Model calculations were optimized to either maximize N_{det} or to minimize *Loss*.
Results
Model results indicate that the risk of bTB introduction into the Netherlands is very high with N_{inf} = 99 (median) per annum. Random testing of 8% of all imported cattle results in N_{det} = 7 (median), while the median N_{det} = 75 if the sampling strategy for AT is optimized to maximize N_{det}. However, in this scenario, *Loss* is more than doubled if compared to the current situation without AT, because only calves are tested for which cost of detection is higher than the expected gain of preventing a possible outbreak. When optimizing the sampling strategy for AT to minimize *Loss*, only breeding and production cattle are selected for AT resulting in N_{det} = 1 (median). *Loss* is, however, reduced with 75% if compared to the current situation.
Conclusions
We conclude that the effectiveness of AT can greatly be improved by risk-based sampling. The optimal sampling strategy for risk-based AT for bTB depends on the objective of AT. To minimize *Loss*, AT should focus on breeding and production cattle.
Relevance
The model used in this study is a generic import risk model that can be used to evaluate the import risk and the optimal sampling strategy for AT for any livestock disease.