



Systematic risk assessment comparing seven emerging vector-borne animal diseases

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Background

- Preparedness for vector-borne animal diseases warranted after recent incursions in the Netherlands
- Risk = *probability* of introduction AND *impact* of disease
- Structured approach for risk assessment
 - Comparison of diseases
 - Identification of targets for risk management



Seven vector-borne animal diseases

- African horse sickness (AHSV)
- Bovine babesiosis (*Babesia divergens*)
- Crimean-Congo haemorrhagic fever (CCHFV)
- Epizootic haemorrhagic disease (EHDV-6)
- Rift Valley fever (RVFV)
- Tularaemia (*Francisella tularensis* subs. *holarctica*)
- West Nile (WNV)

Results

Introduction

- Combined probability of entry and establishment
- Trade in animals contributes most, either by infected animals or carriage of infected vectors (Table 1)
- Establishment most likely when entry occurs
 - In the vector season
 - In a region where host and vector populations overlap
- Establishment of CCHFV is inhibited by absence of its tick vector

Table 1. Pathways contributing to the probability of introduction with the top ranking pathway or pathways indicated by a darker fill colour

INTRODUCTION PATHWAY	BAB	EHD	AHS	CCHF	RVF	TUL	WN
Infected host animals							
Legal trade in livestock	X			X	X		
Illegal trade in livestock	X	X	X	X	X		X
Trade in exotic animals							
Trade in pet animals							
Migration of wildlife						X	
Migratory birds							X
Infected vectors (eggs, larvae, nymphs, adults)							
Active flight							
Passive flight (wind, air currents)							
Transport vehicles (aircraft, ship, road transport)		X	X		X		X
Containers on aircraft or ship					X		X
Imported products (plant material, tires)					X		
Traded animals (livestock, pets)	X	X	X	X		X	
Migration of wildlife	X					X	
Migratory birds	X			X		X	
Contaminated products							
Products for consumption (meat, milk, eggs)		X					
Genetic material (semen, ova, embryos)			X				
Biological material (serum, plasma)							
Vaccines	X		X				

Conclusions

- Overall risk scores can be similar despite different risk profiles
- Risk profiles provide useful information for risk management
- AHS, EHD, and RVF have a low probability of introduction, but high to very high impact
- WN, tularaemia and bovine babesiosis have a high probability of introduction, but low to moderate impact
- The risk of CCHF is very low as long as its tick vector is not present in the Netherlands
- Improved knowledge on (illegal) trade volumes, vectorial capacity and overwintering opportunities will narrow the uncertainty intervals of the estimated risk

Objective

- Risk assessment of seven vector-borne diseases for the Netherlands
- To prioritize diseases for preparedness
 - To identify common parameters contributing most to the risk

Material and methods

MINTRISK¹ is a calculation tool for risk assessment of animal diseases in Microsoft Excel and VBA

1. Input via questions
 - Qualitative answer categories with underlying quantitative explanation
 - Indication of uncertainty
2. Monte Carlo simulation
3. Output: Semi-quantitative risk scores with uncertainty interval

Impact

- Depends on extent of spread and likelihood of persistence
 - No large outbreaks expected in the first year after entry for all evaluated diseases
 - Overwintering is a critical point for persistence and fraught with uncertainty for AHS, EHD, RVF and WN
- Includes economic, socio-ethical and environmental impact
 - Economic losses due to trade restrictions are an important component of the impact of AHS, EHD and RVF
 - Socio-ethical impact is high for RVF and WN because of potential severe human cases, and for AHS because of high morbidity and mortality in horses
 - Environmental impact is low to negligible for all evaluated diseases

Overall risk score

- Combined outcome of introduction and impact
- Moderate to high for all evaluated diseases but CCHF
- Not informative for prioritization in contrast to risk profiles (Fig. 1)

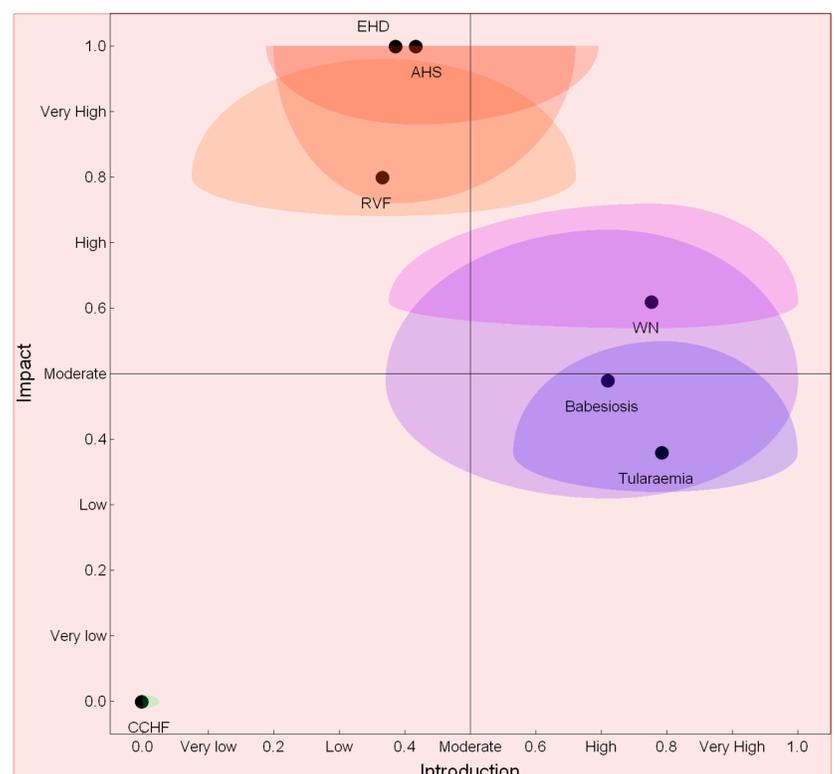


Figure 1. Risk profile of seven vector-borne animal diseases for the Netherlands

¹ De Koeijer et al., 8th Annual Meeting EPIZONE, September 2014, Copenhagen, Denmark



Acknowledgements

We would like to thank Dr Rijks, Dr Holzhauer, Dr Van Maanen, Mr Stroo, Dr Van Rijn, Dr Van der Giessen, Dr Nodelijk and Mrs Koene for their input into the risk assessment. This project was commissioned and financed by the Dutch Ministry of Economic Affairs (BO-20-009-026).