FRIEDRICH-LOEFFLER-INSTITUT
FLI
Bundesforschungsinstitut für Tiergesundheit
Federal Research Institute for Animal Health

Vergleichende Bewertung der verschiedene Überwachungsstrategien zum Beweis der Abwesendheit Bovine Herpesvirus 1 in Milchviehbetriebe

Eine Fallstudie in RISKSUR project

Stendaler Symposium 2017

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The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement N° 310806.

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Comparative assessment of surveillance programs to prove freedom of bovine herpesvirus 1 in dairy herds in a disease-free and endemic situation

A case study within the RISKSUR project

A. Veldhuis[1], I. Santman[1], B. Schauer[2], F. Waldeck[1], J. Mars[1], C. Staubach[2], G. van Schaik[1,3]

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Introduction

- Surveillance design framework (SDF) was developed in RISKSUR, an EU project.
  - For the design, documentation and redesign of surveillance systems
  - available at https://surveillance-design-framework.wikispaces.com
- Apply SDF on surveillance systems to demonstrate freedom of disease
- Case study: Bovine herpesvirus 1 (BoHV1) causes Infectious Bovine Rhinotracheitis (IBR)
- EU Member States can obtain official BoHV1-free status
- there are differences in Europe in the approach of eradication.

Objective

Compare epidemiological performance of EU & alternative surveillance approaches using scenario-tree models and cost-effectiveness analysis

Surveillance designs

Design	Component	Action
CONVENTIONAL **(EU)**		
ALTERNATIVE		

Surveillance designs

Design	Component	Action
CONVENTIONAL (EU)	**Intake**	**Blood >9 months twice**
ALTERNATIVE		

Surveillance designs

Design	Component	Action
CONVENTIONAL (EU)	Intake	Blood >9 months twice
ALTERNATIVE	**Intake**	**Blood >12 months once + bulk milk testing**

Surveillance designs

Design	Component	Action
CONVENTIONAL	Intake	Blood >9 months twice
(EU)	**Monitoring**	**Yearly blood >24 months**
ALTERNATIVE	Intake	Blood >12 months once + bulk milk testing

Surveillance designs

Design	Component	Action
CONVENTIONAL	Intake	Blood >9 months twice
(EU)	Monitoring	Yearly blood >24 months
ALTERNATIVE	Intake	Blood >12 months once + bulk milk testing
	Monitoring	**Monthly bulk milk testing (≥9/year)**

Surveillance designs

Design	Component	Action
CONVENTIONAL	Intake	Blood >9 months twice
(EU)	Monitoring	Yearly blood >24 months
	Purchase	**No action**
ALTERNATIVE	Intake	Blood >12 months once + bulk milk testing
	Monitoring	Monthly bulk milk testing (≥9/year)

Surveillance designs

Design	Component	Action
CONVENTIONAL (EU)	Intake	Blood >9 months twice
	Monitoring	Yearly blood >24 months
	Purchase	NA
ALTERNATIVE	Intake	Blood >12 months once + bulk milk testing
	Monitoring	Monthly bulk milk testing (≥9/year)
	Purchase	**Blood + bulk milk testing**

Surveillance designs

Design	Component	Action
CONVENTIONAL	Intake	Blood >9 months twice
(EU)	Monitoring	Yearly blood >24 months
	Purchase	NA
ALTERNATIVE	Intake	Blood >12 months once + bulk milk testing
	Monitoring	Monthly bulk milk testing (≥9/year)
	Purchase	Blood + bulk milk testing
	clinical signs	**Nasal swabs PCR**

Scenario tree analysis (Martin et al., 2007)

Purpose:

1. Calculate sensitivity of each surveillance design to *detect* an infected herd (intake)

2. Calculate probability of freedom from infection in a herd during 1 year of *monitoring* a herd's free status in both designs

Scenario tree analysis (Martin et al., 2007)

Purpose:

1. Calculate sensitivity of each surveillance design (and components thereof) to *detect* an infected herd

2. **Calculate probability of freedom from infection during 1 year of *monitoring* a herd's free status in both designs**

Veldhuis et al, Preventive Veterinary Medicine 139 (2017) 105–114

Monitoring freedom in different situations

- BoHV1-free cattle holding:

CONV
ALT

A. without purchase of animals from non-free holdings, assuming BoHV1 is endemic at country level

CONV
ALT

B. without purchase of animals from non-free holdings, in a situation in which the country is free from BoHV1

ALT

C. that purchases animals that originate from non-free holdings, assuming BoHV1 is endemic at country level

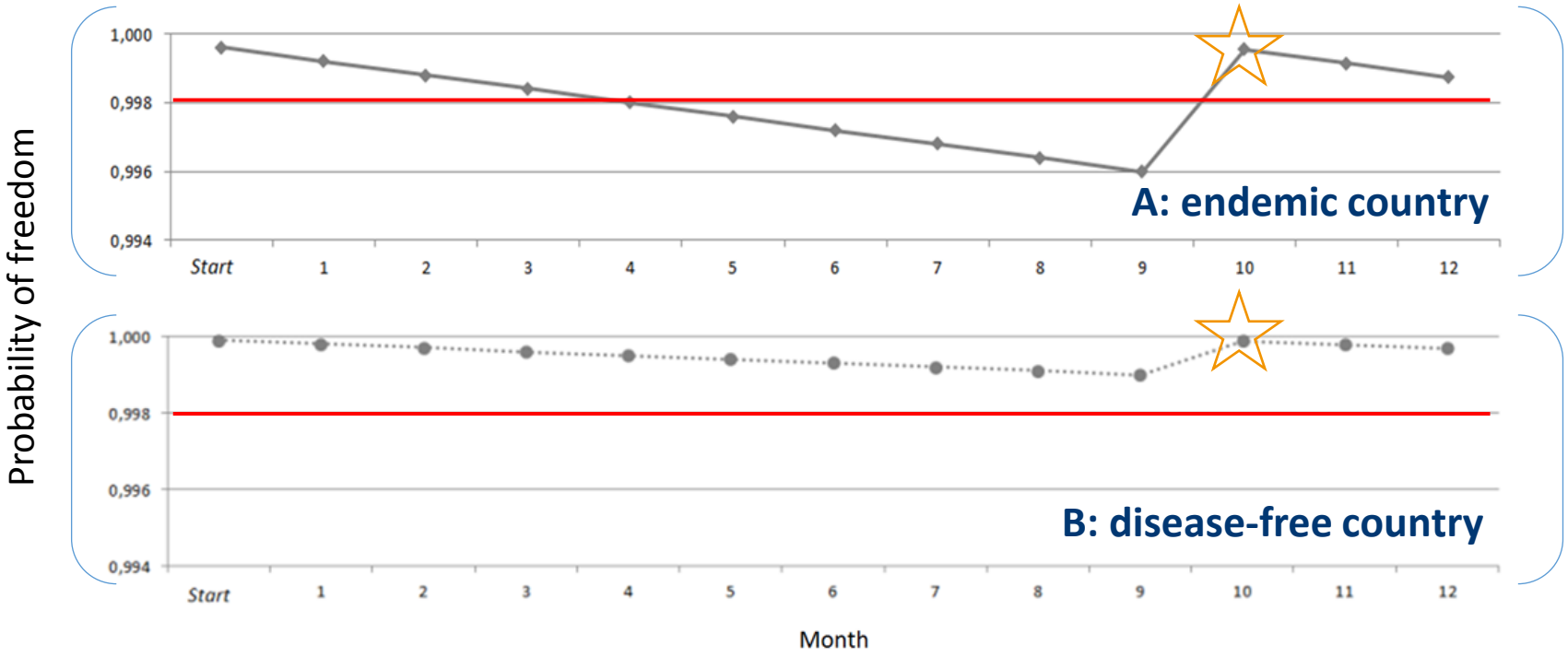
Important input parameters

- Within-herd design prevalence — 10%
- Chance of introduction of BoHV1 into a certified cattle holding
  - in an endemic country — 0.04% per month
  - in a disease-free country — 0.01% per month
- Hazard rate per purchased animal for introduction of BoHV1 into dairy farms — 1.10
- Test sensitivity (gE-ELISA) — 87% (serum); 98% (bulk milk[#])

[#]*provided that the animal level prevalence in the group of lactating cows is 10% or more*

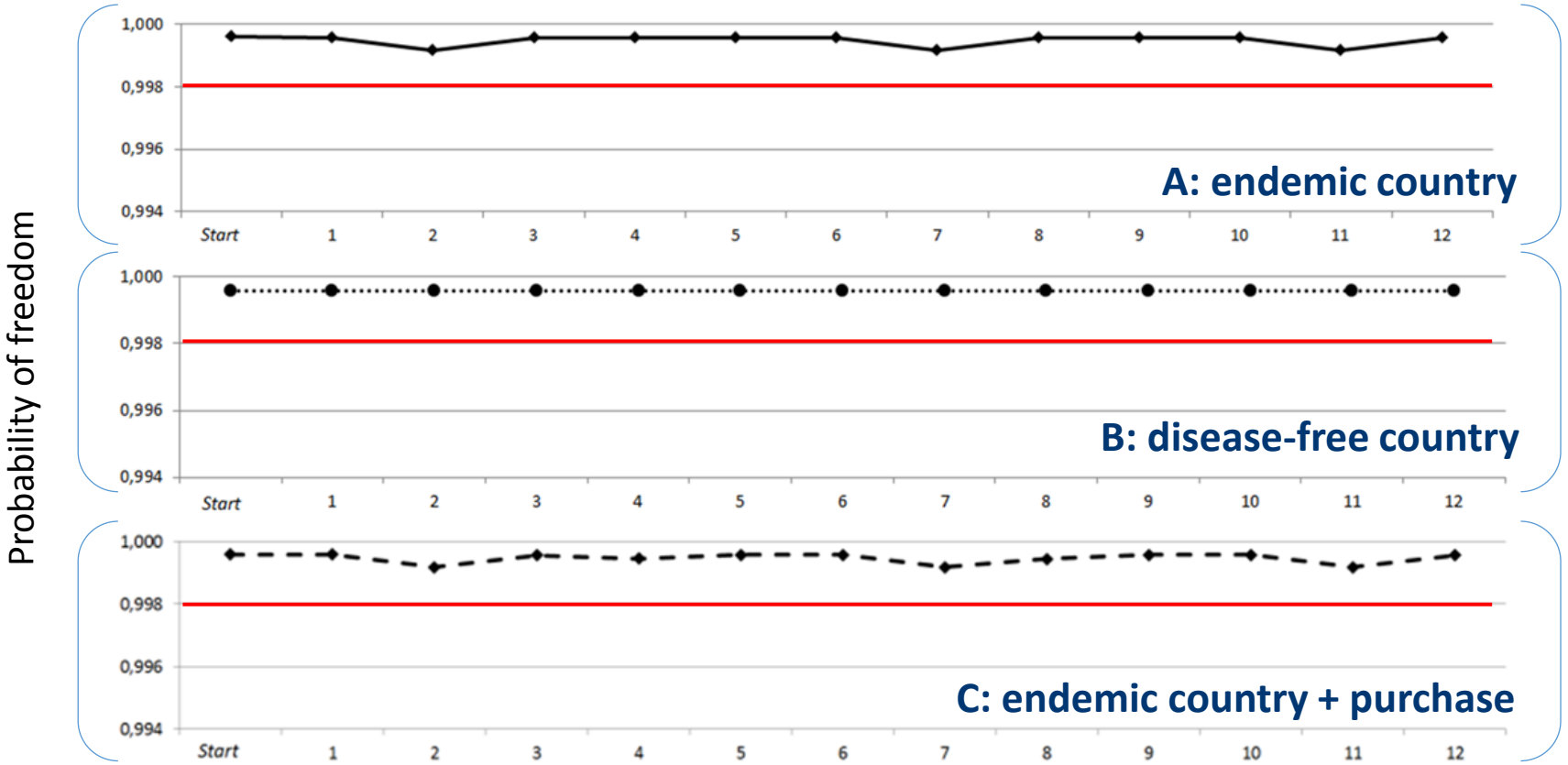
Monitoring of free status in *conventional* design

- Yearly serology on all lactating animals



Monitoring of free status in *alternative* design

- Monthly bulk milk testing



Probability of freedom and cost-effectiveness of surveillance systems

A: endemic country
B: disease-free country
C: endemic + purchase

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Probability of freedom and cost-effectiveness (monitoring)

Description	Mean probability of freedom per year (min-max)	Cost per holding per year (P5-P95) (€)
Conventional design		
Situation A	99.74 - 99.81	**979** (352-1,863)
Situation B	99.94 - 99.95	**979** (352-1,863)
Alternative design		
Situation A	99.95	**476** (432-513)
Situation B	99.99	**476** (432-513)
Situation C	99.89 - 99.95	**804** (714-962)

A: endemic
B: disease-free
C: endemic + purchase

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Conclusion & Discussion

- Monitoring free status:
  - Designs performed equally well in *disease-free* situation
    - Alternative approach most cost-effective
  - In *endemic* situation, the mean probability of freedom was lower in conventional design
    - Low frequency of testing might hamper timeliness of detection
  - Bulk milk test is 98% sensitive at within-herd prevalence of 10%
    - Performance of alternative design might be less effective compared to the conventional design at within-herd prevalence <10%

Take home message

- Assessment of various surveillance designs is useful towards optimizing animal health surveillance (eg. costs and sensitivity)

- for IBR: frequent bulk milk testing, in combination with clinical surveillance is a good and cost-effective alternative to yearly serology.

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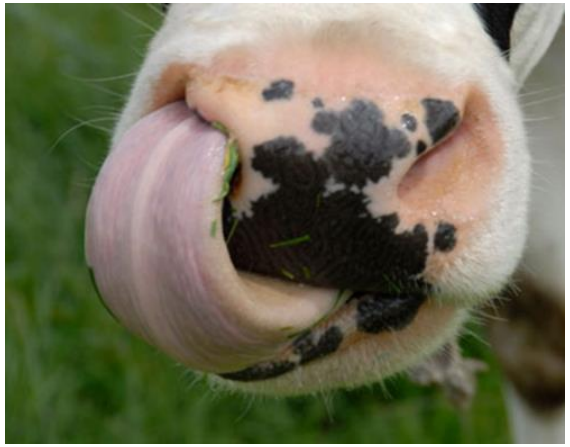
Thank you for your attention!

Questions?



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RISKSUR project ▸ www.fp7-risksur.eu

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