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Dairy goat demography and Q-fever infection dynamics

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What caused the Abortion Storms in Goat Herds?

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Two plausible causes

1) Host-pathogen interaction



versus



2) Population dynamics and farm structure
→ intensified husbandry system





Research question

Can the Q fever abortion storms in goats be explained by the way the goats are kept?





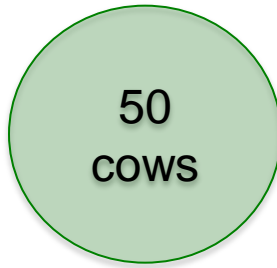
Methods

- French mathematical model for within herd Q fever transmission in dairy cattle (Courcoul *et al.* 2011)
- Adapted to represent Dutch dairy goat herd demographics
 - Population size
 - Seasonal kidding pattern
 - Other characteristics related to population dynamics



Model simulations

“Original”
French
cow
model



- COWS
- herd size 50
- calving non-seasonal

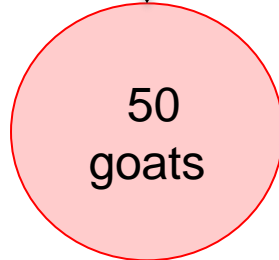
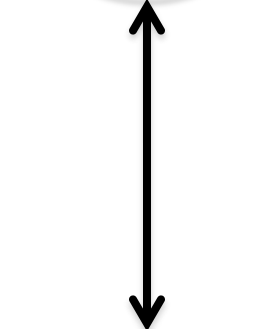
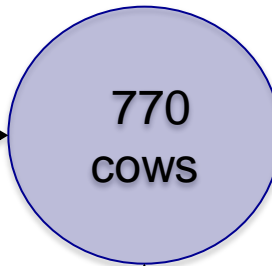
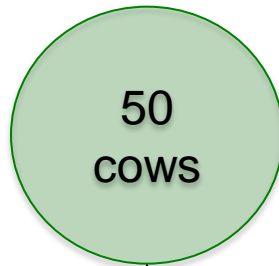


“Default”
Dutch
goat
model

- goats
- herd size 770
- kidding seasonal

Model simulations

“Original”
French
cow
model



Seasonal kidding
and other goat
characteristics

Herd size

“Default”
Dutch
goat
model

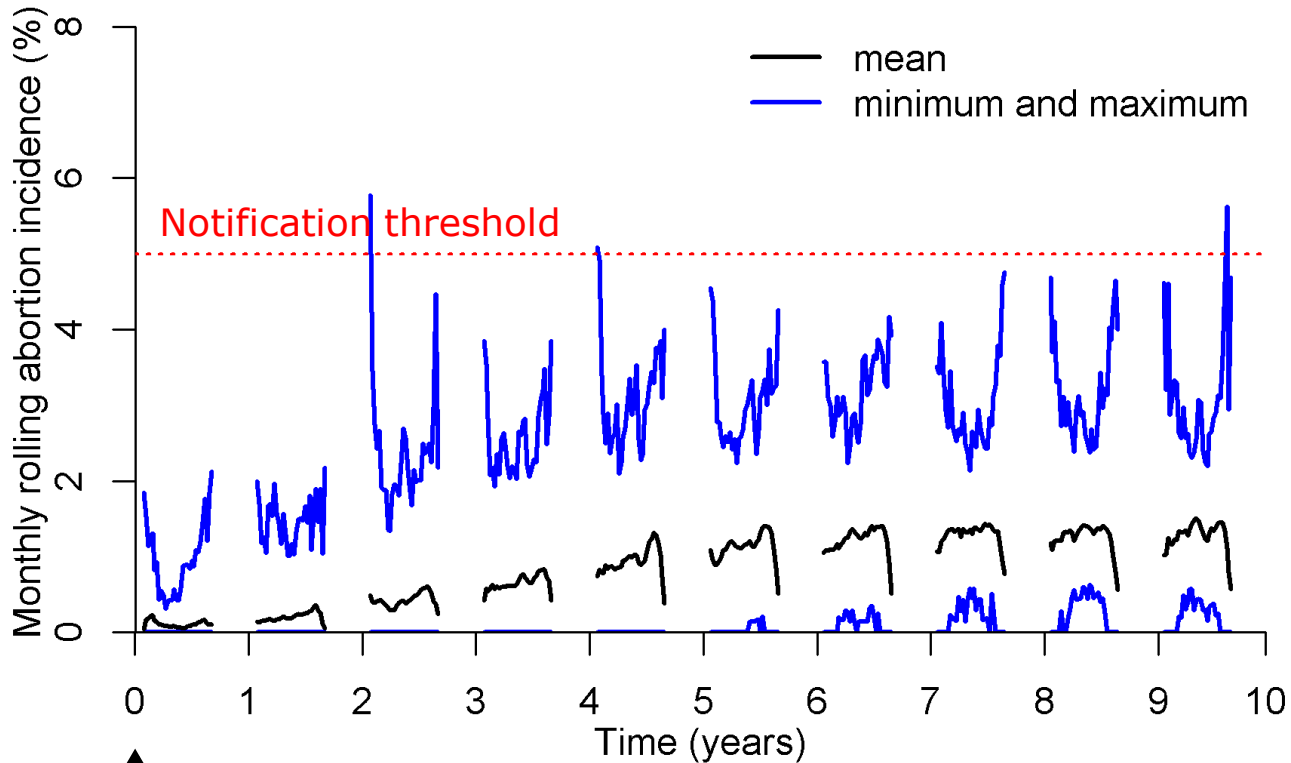
- Simulation period 10 years
- Starts with introduction of 1 infected animal in susceptible herd
- Each model is run 100 times



Outcome 1

770
goats

Abortion patterns

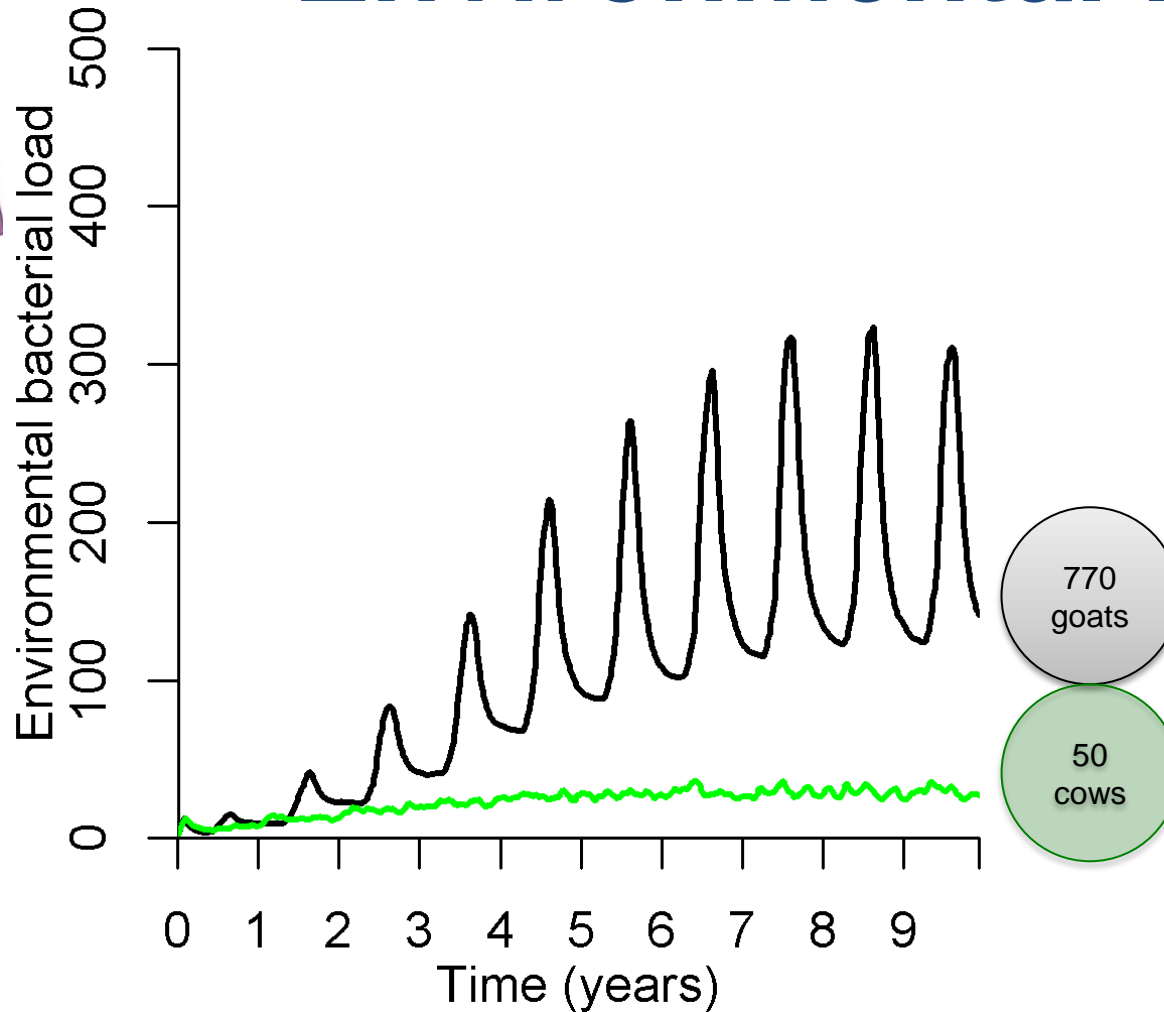


↑
Introduction of
1 infected animal



Outcome 2

Environmental load



Higher in *large* herds

Seasonal peaks in *goat* herds

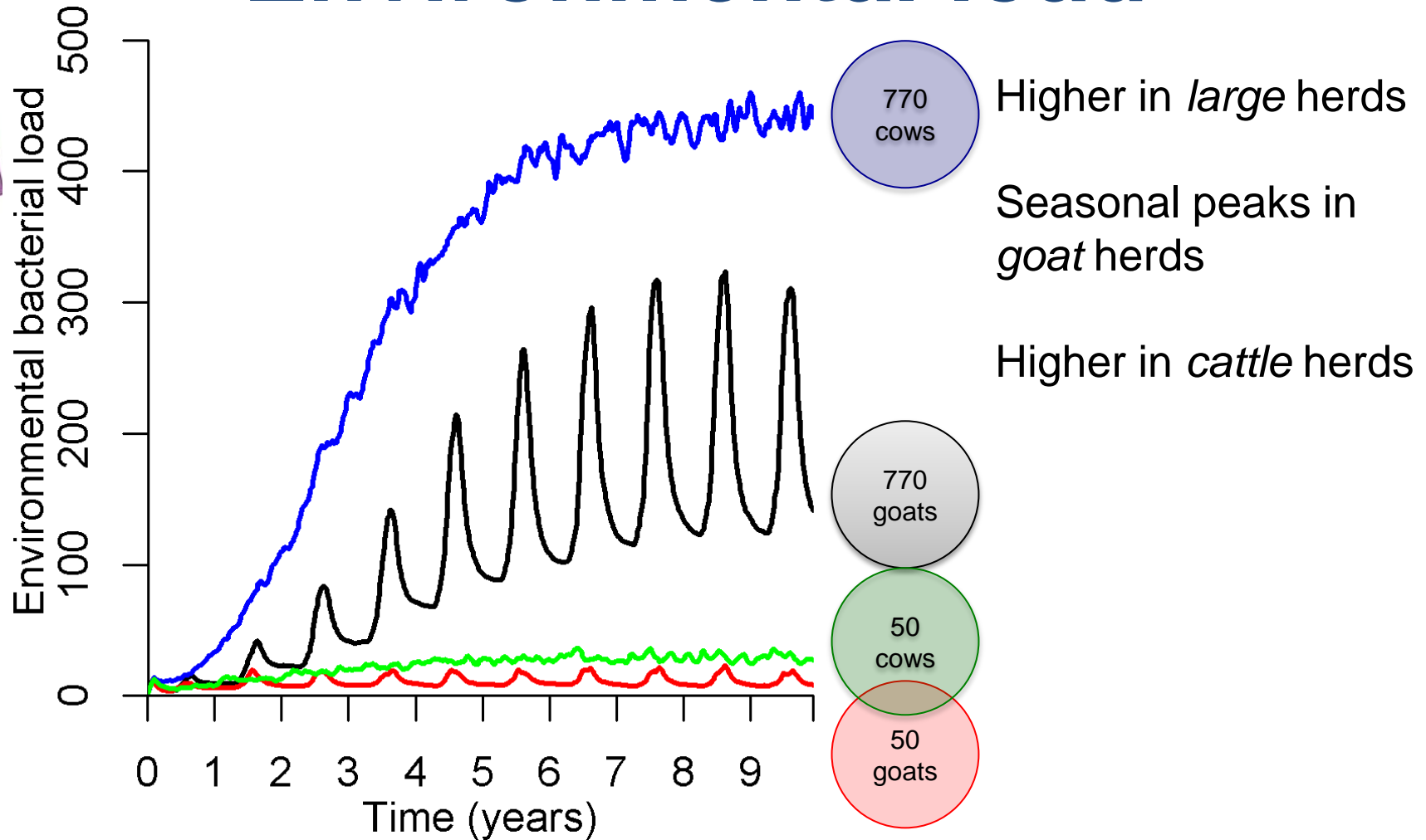
770
goats

50
cows



Outcome 2

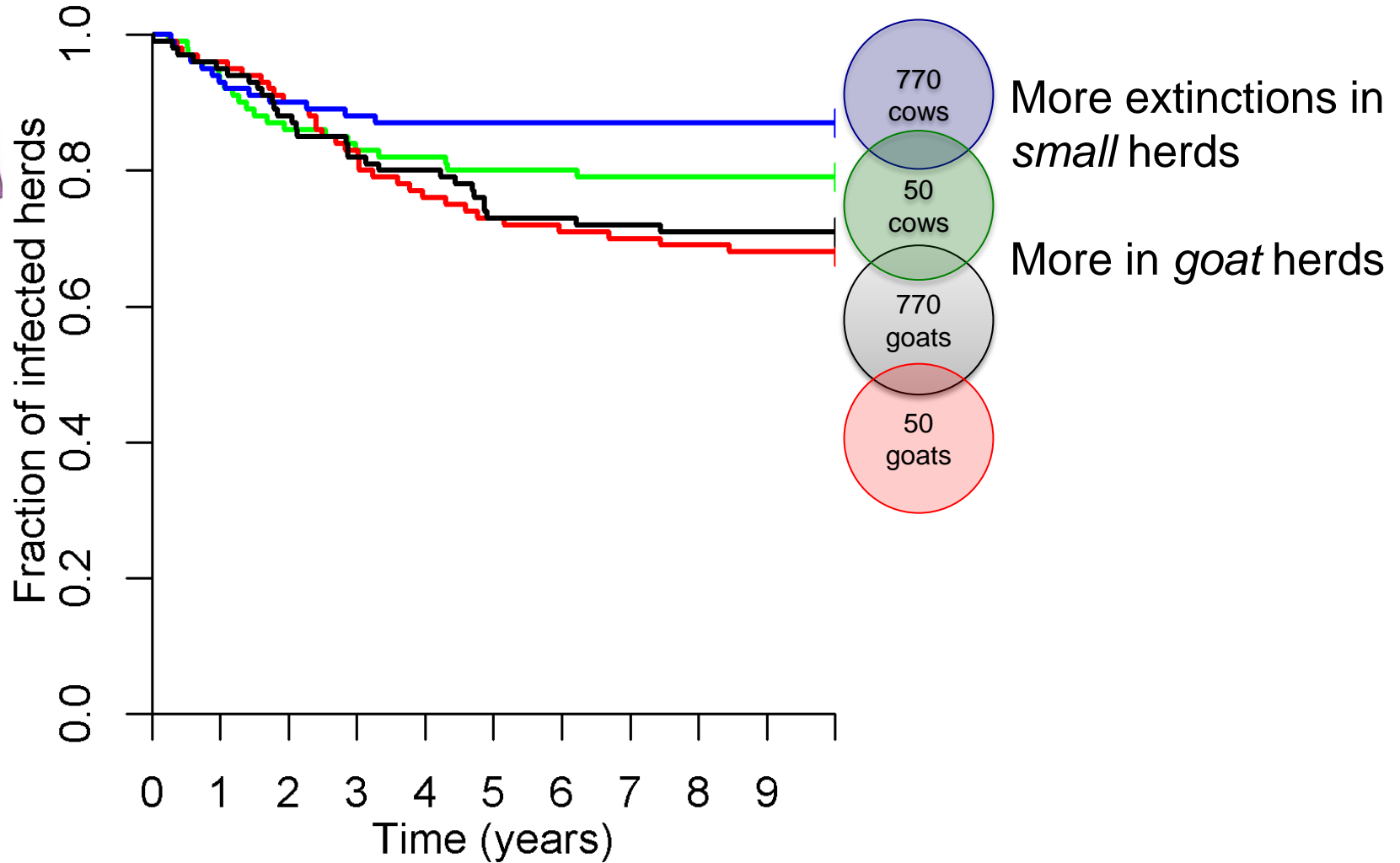
Environmental load



Outcome 3 Extinction



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Discussion

Abortion storms

- Caused partially by demographics
- Host-pathogen interaction probably different from cattle, but unknown whether due to
 - host (e.g. susceptibility, immunity)
 - pathogen (e.g. virulence)
 - or both

Large cattle herds

- Higher environmental load and less extinctions than large goat herds
- Endemic situation with high prevalence on large cattle farms?
- May be taken into account when enlarging cattle production systems



Thank you!