Estimating the impact of **low temperature** on **African Swine Fever Virus** transmission through contaminated environment

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Objectives

- A **stochastic environmental transmission model** was used to estimate epidemic parameters based on experimental data
- Nonlinear modelling was employed to fit the **decay rate parameter** with **temperature** variations.
- We constructed **16 scenarios** for different temperature (**at 20 °C, 10 °C, 0 °C, or −10 °C**) and duration of empty periods (**1, 3, 5, or 7 days**) after the environment had been contaminated.

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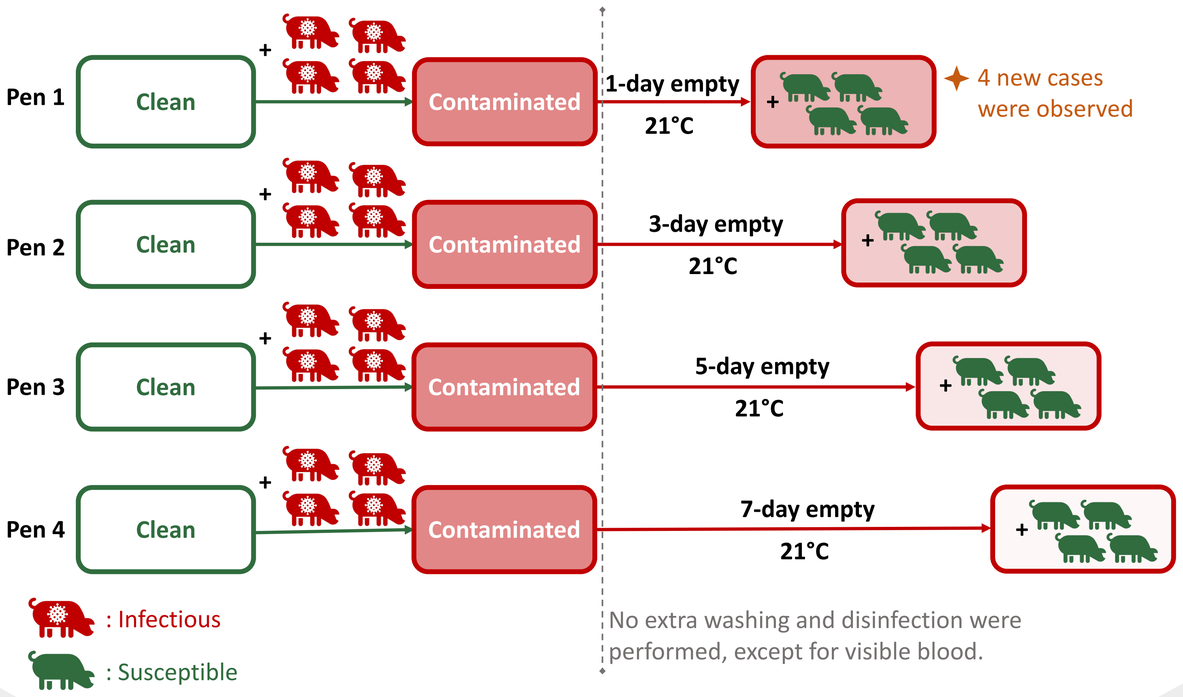
Exposure data

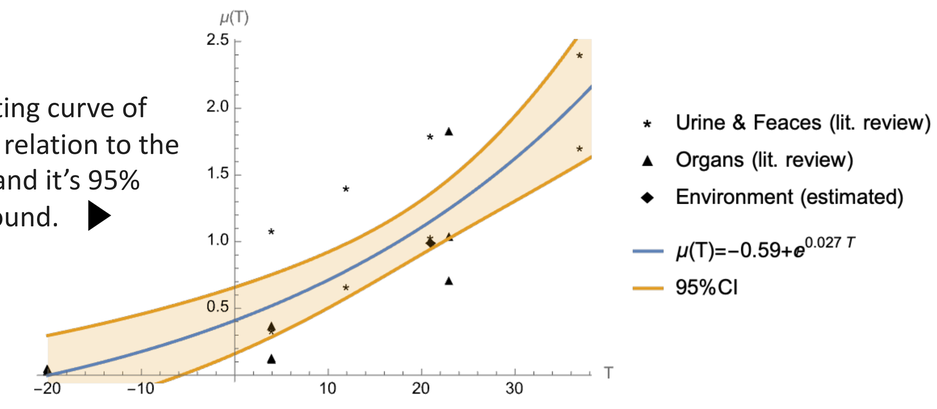
Epidemic parameters were calculated from the environmental transmission experiments conducted by Olesen et al., (2018; 2017)



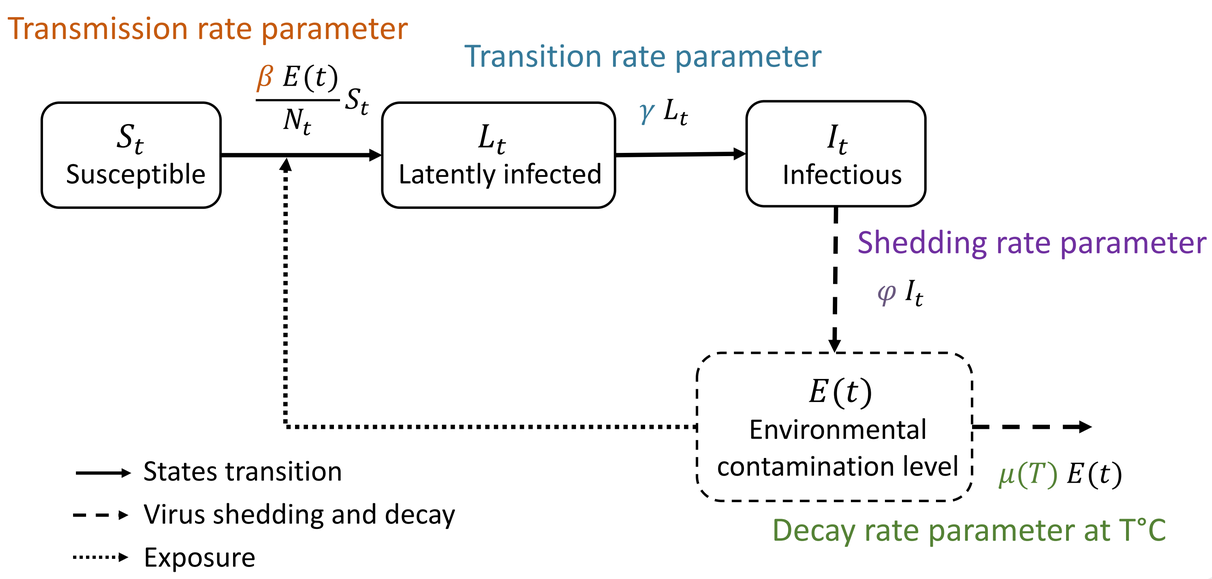
Result ii. Decay rate as a function of temperature

Decay rate parameters calculated from published half-life values and the non-linear model fit. We were then able to extrapolate the decay rate parameters at 20 °C, 10 °C, 0 °C, −10 °C to be 1.11, 0.71, 0.40, 0.18 day^{-1}, respectively.

Non-linear fitting curve of $\mu(T)$ values in relation to the temperature and it's 95% confidence bound.



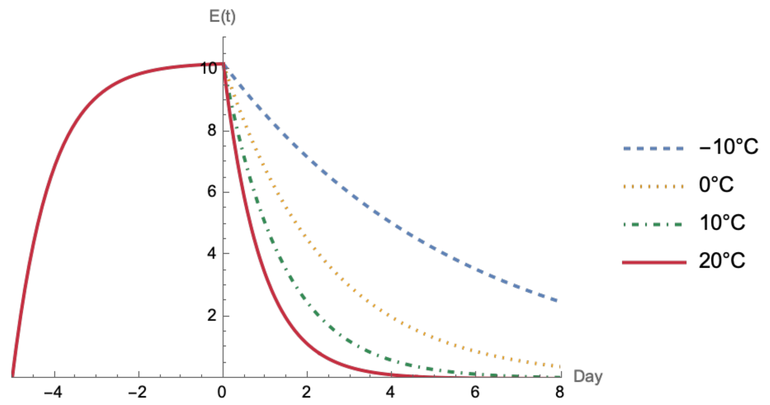
Model construction



Result iii. Scenario study

Without washing and disinfecting, the environment required 9, 14, 24, 54 days to reach a low probability of causing at least one new case (<0.005) at 20 °C, 10 °C, 0 °C, −10 °C, respectively.

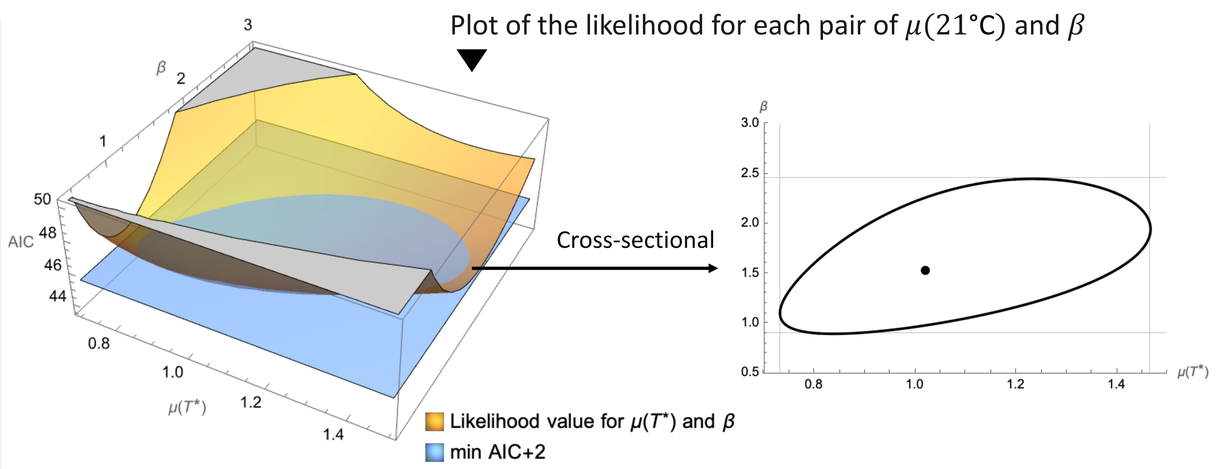
Overview of the change of $E(t)$ with time under 20°C before Day 0, and -10°C, 0°C, 10°C and 20°C after Day 0.



Result i. Parameter estimation

The transmission rate parameter (β) was estimated to be 1.53 (0.90, 2.45) day^{-1}, the decay rate parameter at room temperature (μ(21°C)) to be 1.02 (0.73, 1.47) day^{-1}, and the shedding rate parameter (φ) to be 2.70 (2.51, 3.02) day^{-1}.

Plot of the likelihood for each pair of $\mu(21°C)$ and β



The predicted probability of one new case under 16 sub-scenarios

Temperature / Empty days	-10°C	0°C	10°C	20°C
1	100%	100%	100%	100%
3	100%	99.65%	93.16%	64.22%
5	99.91%	91.71%	47.51%	10.59%
7	99.30%	66.64%	14.35%	1.21%

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