

Modelling the effect of genotype (PRNP) linked to susceptibility, duration and level of prion shedding on chronic wasting disease dynamics of cervids

Magnus Nygård Osnes^{1#}; Atle Mysterud^{2,3#}; Katharine Dean¹; Michael Tranulis⁴; Stefan Widgren⁵; Hildegunn Viljugrein^{1,2}

Authors contributed equally. Contact: Magnus.Nygard.Osnes@vetinst.no

1. Norwegian Veterinary Institute, Ås, Norway 2. University of, Oslo, Norway. 3. Norwegian Institute for Nature Research (NINA), Trondheim, Norway 4. Norwegian University of Life Sciences, Norway. 5. Swedish Veterinary Agency, Uppsala, Sweden.

(S)

Background

Chronic wasting disease (CWD) was detected for the first time in Europe in Norway 2016.

Aim

Determine the effect of PRNP genotype in reindeer (*Rangifeer*) *tarandus*) on Chronic wasting disease epidemic dynamics.

- The PRNP gene in cervids influences CWD susceptility, disease
- Simulation models with mechanistic assumptions can be used to explore epidemic trajectories under various assumptions and scenarios.

progression and likely shedding.

Methods

We used a stochastic SEID model to simulate CWD transmission in reindeer. The model includes three infectious classes (I1, I2, I3), age, sex, and PRNP genotype, categorized as susceptible, intermediate, and robust. The model is implemented in SimInf along with population events for harvesting and extra calf mortality.



Force of infection (λ)

Symptomatic shedding multiplier

What we assumed

Shedding

• PRNP genotype (3 compartments) affects

susceptibility: β_a .

PRNP genotype affects disease progression

rates: σ_q , $\alpha 1_q$, $\alpha 2_q$,

but not the CWD induced mortality rate: m3.

• PRNP genotype affects shedding: κ_a .





Frequency dependent transmission rate Contact rate does not depend on population density

Susceptibility, shedding and disease duration have different effects on the epidemic!



• Funded by The Research Council of Norway (adaptCWD, project number 352554).

Funded by the European Union (WiLiMan-ID, grant agreement 101083833).

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or REA. Neither the European Union nor the granting authority can be held responsible for them.

