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Wind-supported transmission of HPAI virus to poultry farms via faecal particles from infected wild birds

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- Wild birds can be a source of HPAI virus to poultry farms by contaminating the environment around poultry farms with their faeces
- Despite obligatory indoor-housing of poultry in Dutch bird-flu season (preventing direct contact), poultry farms became infected
- What is the role of wind-supported transmission of faecal particles from infected wild birds?

Approach

Quantitative microbial risk assessment model

- *Exposure assessment*: Fig. 1
  - Number of wild birds (Anseriformes) close to poultry farm
  - HPAI prevalence in Anseriformes
  - Daily amount of faeces per bird
  - HPAI virus concentration in faeces
  - Aerosolization of faeces (weather-dependent)
  - Survival and dispersal of HPAI virus during aerosolization and wind-borne transport
  - Aerosolized faeces entering the poultry house
  - Inhalation by poultry
- *Hazard characterization*: bird infectious dose (BID_{50})
- *Risk characterization*: exponential dose-response model
- Quantification of parameters based on Dutch bird-flu season

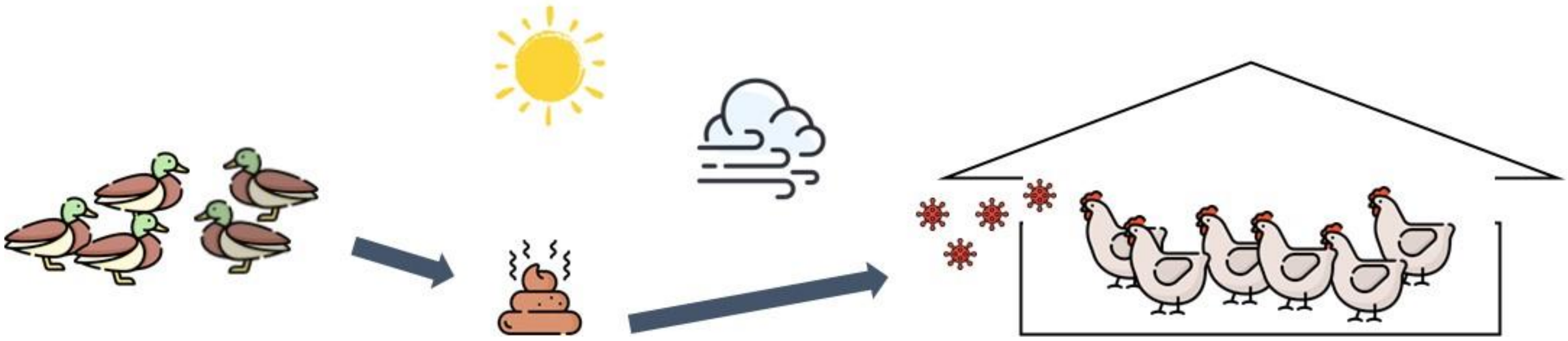
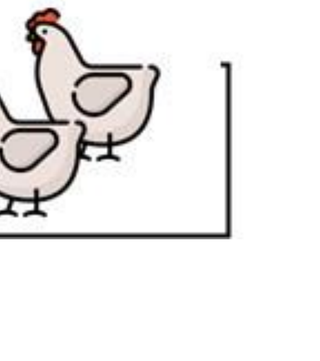


Figure 1. Outline of the exposure assessment of poultry farms to HPAI virus via wind-borne faecal particles from infected wild birds

Results

- Daily probability of infection of single poultry farm: median 4.1×10^{-8} (95% uncertainty interval: 1.7×10^{-9} to 8.2×10^{-7})
- Overall probability ≥ 1 infected poultry farm during Dutch bird-flu season: median 0.012 (95% uncertainty interval: 5.0×10^{-4} to 0.21)
- In other words: an HPAI outbreak in a poultry farm due to wind-supported transmission of HPAI virus via fecal particles from infected wild birds is expected approximately once every 85 years

- Probability that aerosolization of faecal droppings of wild birds results in infected poultry farm during Dutch bird-flu season is very low
- Removal of wild bird droppings from concrete or paved surfaces close to poultry house will further reduce this probability
- Other risk factors, e.g., failures in compliance to biosecurity likely to be more important for HPAI virus incursion on poultry farms



Discussion

- Result of risk model is overall estimate, averaged over different farm types, virus strains and wild bird species
- Results indicate that uncertainty is relatively high
- Most important uncertain input parameters: survival of HPAI virus during drying of feces, fraction of virus retained after dispersion of aerosols, concentration of HPAI virus in wild bird feces, bird infectious dose, and number of wild birds close to poultry house
- HPAI prevalence in wild birds is likely to have increased over recent years

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