

Transmission dynamics of H9N2 Avian Influenza virus in a live-bird market in Chattogram, Bangladesh



Francesco Pinotti^{1*}, Lisa Kohnle², José Lourenço³, Sunetra Gupta¹, Md. Ahasanul Hoque⁴, Rashed Mahmud⁴, Paritosh Biswas⁴, Dirk Pfeiffer^{2,5}, Guillaume Fournié^{5,6,7}

¹University of Oxford, Oxford, UK; ²City University of Hong Kong, Hong Kong SAR, Hong Kong; ³Biomedical Research Centre, Universidade Católica Portuguesa, Oeiras, Portugal; ⁴Chattogram Veterinary and Animal Sciences University, Chittagong, Bangladesh; ⁵Royal Veterinary College, London, UK; ⁶INRAE, VetAgro Sup, UMR EPIA, Université de Lyon, Marcy l'Etoile, France; ⁷INRAE, VetAgro Sup, UMR EPIA, Université Clermont Auvergne, Saint Genes Champanell, France
*francesco.pinotti@biology.ox.ac.uk

Introduction

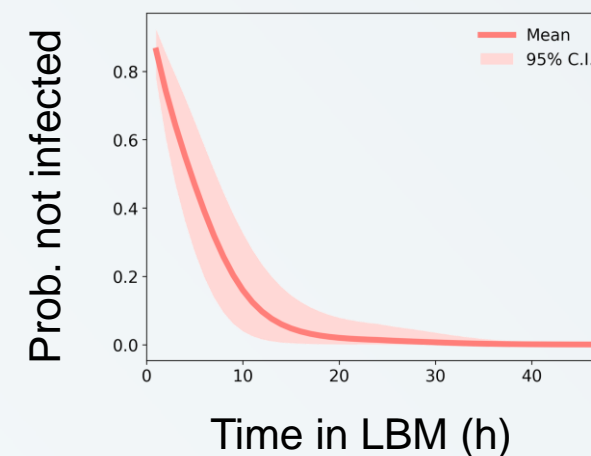
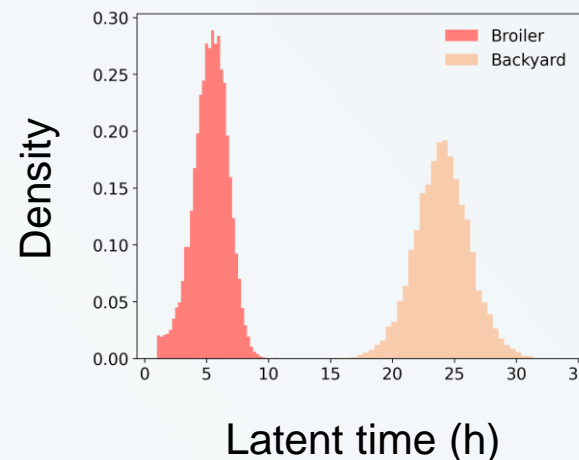
- H9N2 Avian Influenza virus (AIV) is endemic in Bangladeshi poultry
 - Infection impairs chicken growth and causes economic damage
 - It is highly prevalent in live-bird markets (LBMs)
 - It is zoonotic and is involved in the generation of highly pathogenic AIVs
- We aim to characterize H9N2 AIV epidemiology in an LBM
 - Estimate epidemiological parameters (e.g. latent period)
 - Measure H9N2 AIV transmission potential
 - Assess the role of external introductions
 - Assess the effectiveness of interventions

Hypothesis

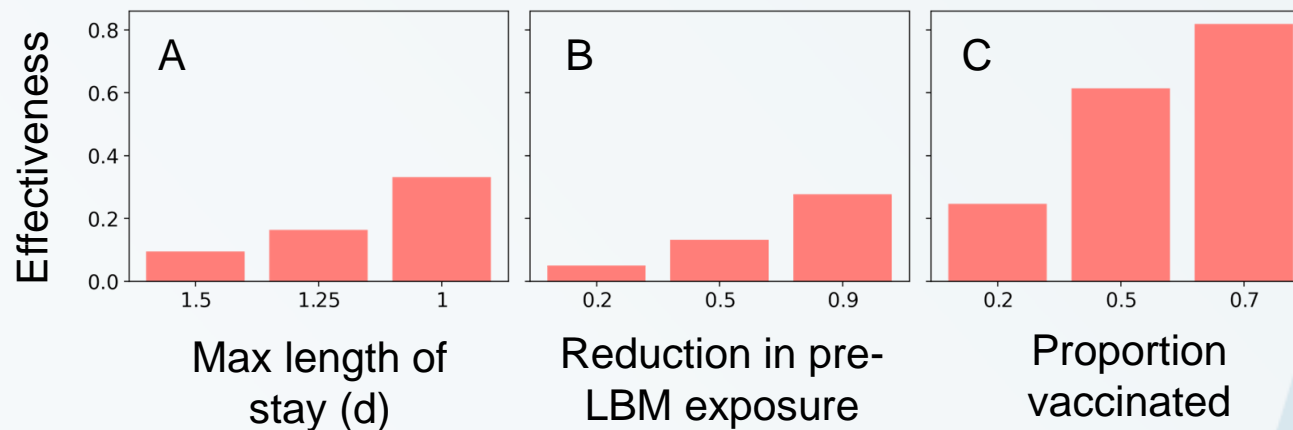
H9N2 AIV spreads rapidly among marketed poultry and is able to persist in LBMs.

Methods and results

- Methods
 - Fitted a transmission model
 - Used infection data from the field
 - Accounted for LBM dynamics
 - Simulated interventions
- Results
 - Short latent times in broilers
 - High transmission potential
 - >80% probability of infection after 24h within LBM
 - High frequency of viral introductions
 - Heterogenous effectiveness of interventions:
 - (A) Shorter length of stay
 - (B) Reduced pre-LBM exposure
 - (C) Vaccinations



Effectiveness = reduction in prevalence



Discussion

- LBMs provide a suitable environment for H9N2 AIV transmission
 - Short latent times allow onward transmission despite rapid sales
 - Rapid turnover provides a continuous supply of susceptible chickens..
 - ..and introduces infected chickens
 - Interventions differ in terms of effectiveness
- Curbing H9N2 AIV spread requires a multi-pronged approach
 - Combine multiple interventions in LBMs: shorter length of stay, improving biosecurity, ...
 - Important to intervene upstream as well (farms, middlemen)
 - Introduce widespread vaccination
 - Important to monitor AIV circulation in LBMs