THE ROLE OF ACTIVE SURVEILLANCE AND PRE-MOVEMENT BIOSECURITY IN THE MANAGED MOVEMENT OF BROILERS FROM MONITORED FLOCKS DURING A HIGHLY PATHOGENIC AVIAN INFLUENZA OUTBREAK

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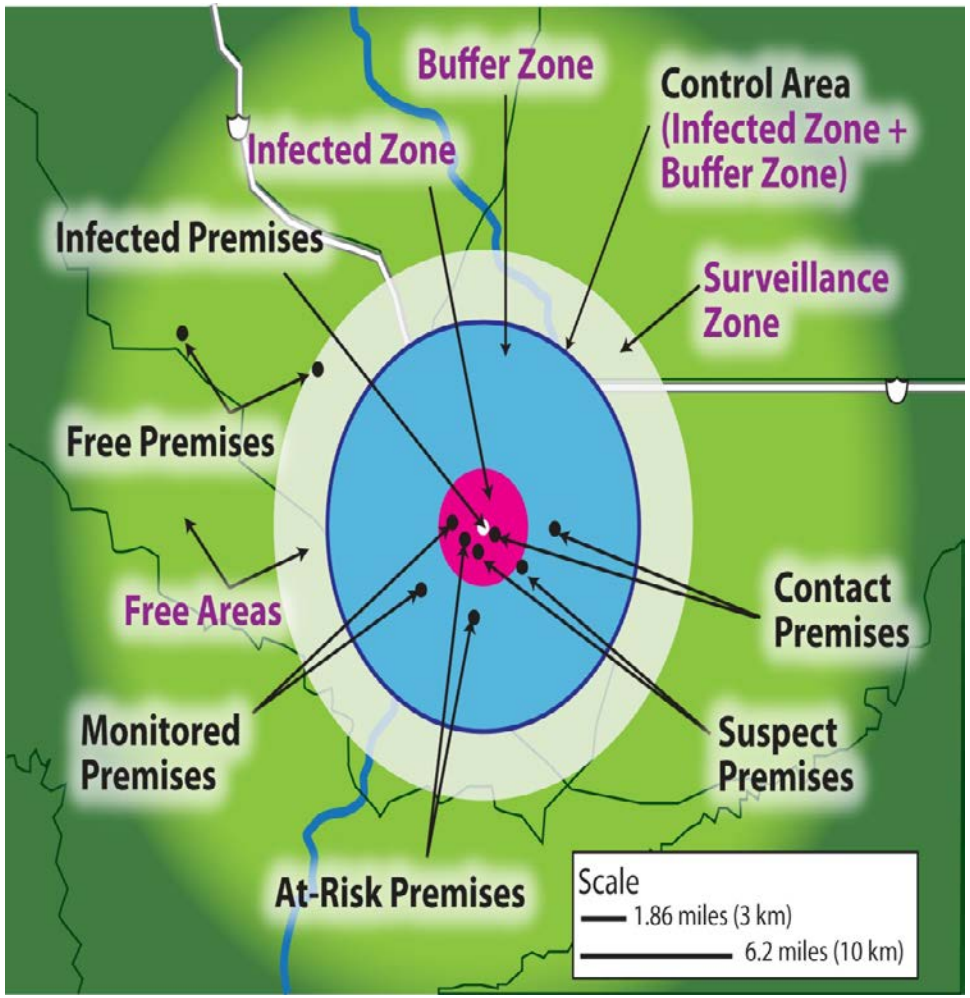
MANAGED MOVEMENT OF BROILERS TO SLAUGHTER DURING A HPAI OUTBREAK



Emergency Response in the Control Area (CA):

- Stamping out
- Quarantine
- Movement control

Managed movement from premises testing negative and without clinical signs:

- Continuity of business
- Reducing susceptible population
- Possibility of premises being infected and undetected

THE SECURE BROILER SUPPLY (SBS) PLAN SCIENCE AND RISK BASED GUIDELINES

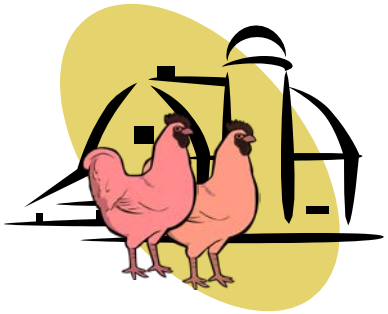
Collaborative initiative:

- Broiler production veterinarians
- University of Minnesota, Center for Animal Health and Food Safety
- USDA:APHIS:VS:STAS: Center for Epidemiology and Animal Health
- State animal health officials

Risk assessments supporting movement permitting decisions for broiler industry products:

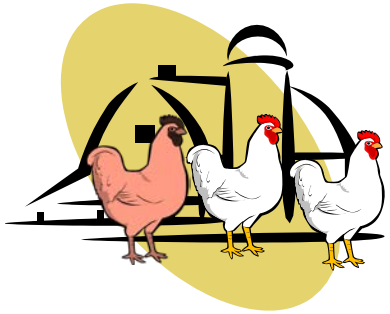
- Broiler hatching eggs
- Day old chicks
- Live broilers to slaughter

RELEASE PATHWAY STEPS FOR THE POTENTIAL MOVEMENT OF HPAI INFECTED BIRDS



Step 1: Premises in Control Area becomes infected

Vehicles, people,
i.e. local area spread

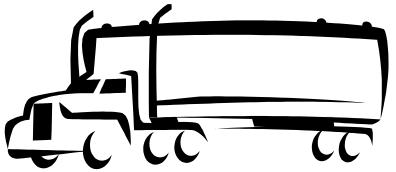


Mitigation for Step 1:
Biosecurity and distance

Mitigation for Step 2:
Active surveillance

Step 2: HPAI infection is **not** detected by movement

Possible movement of HPAI infected birds



PRE-MOVEMENT ISOLATION PERIOD (PMIP) TARGETED BIOSECURITY

Implementation of extreme biosecurity for a few days before scheduled movement.

- Non-critical visits to the farm would be restricted during PMIP (i.e., by scheduling visits)

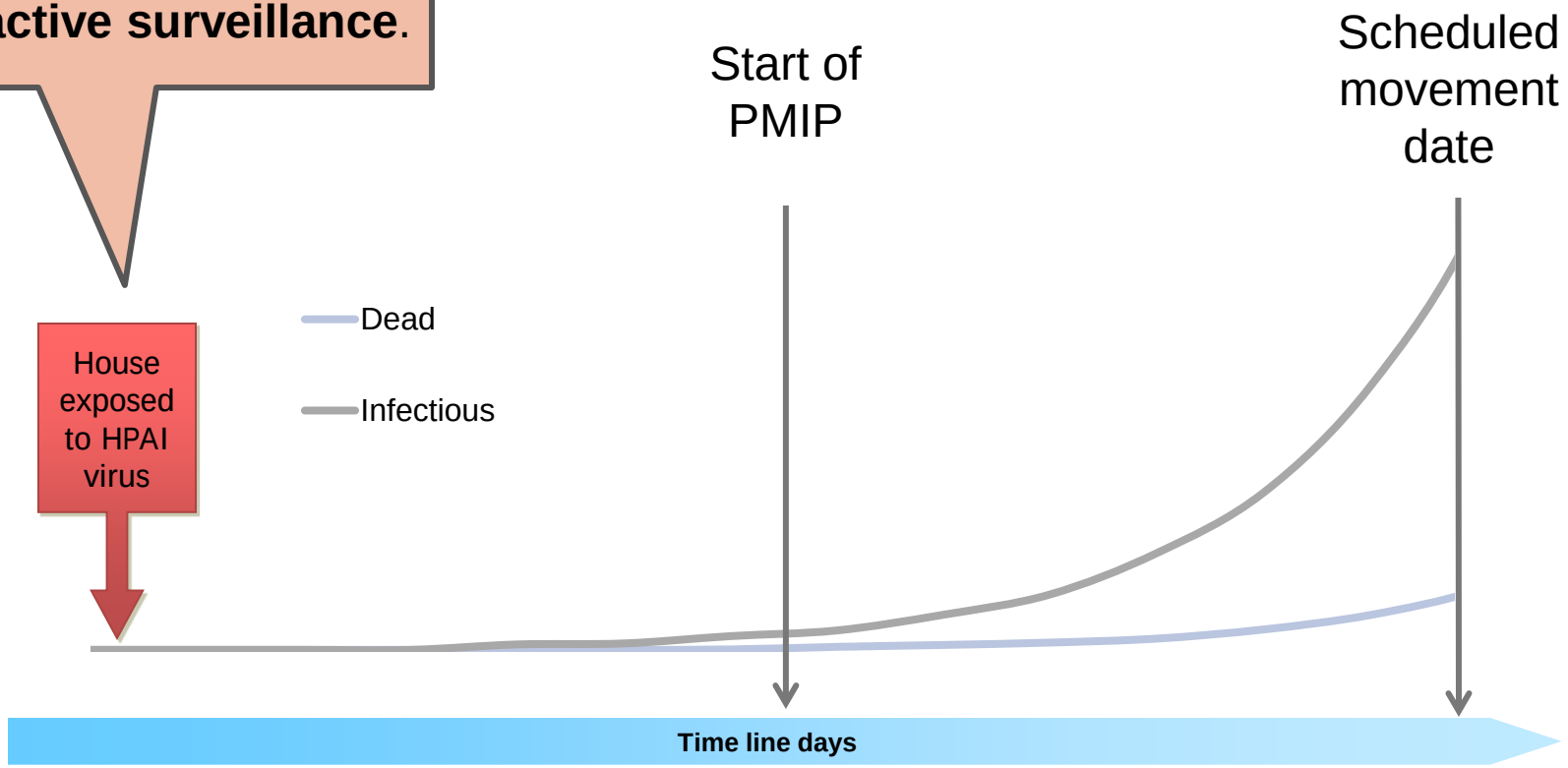
- Critical visits such as feed delivery continue with strict biosecurity

A sufficiently long and effective PMIP increases confidence that there is no undetected HPAI infection at the time of movement.

LIKELIHOOD OF MOVING HPAI INFECTED AND UNDETECTED POULTRY

If the house is infected before PMIP it would likely be detected via **active surveillance**.

Ensure low probability of HPAI exposure during PMIP with **biosecurity and distance**



BASELINE PMIP MEASURES

- During PMIP:
  - Non-critical operational visits are prohibited
  - Critical operational visits continue with strict biosecurity

- Critical operational visit biosecurity (e.g., feed delivery):
  - Vehicle C&D (infected zone)
  - Dedicated vehicles (infected zone)
  - Routing to minimize proximity and contact with poultry
  - Driver does not enter the poultry house
  - Driver wears PPE and follows hand hygiene protocol

OTHER PMIP BIOSECURITY MEASURES

- Grower biosecurity:
  - Clothing and shoes dedicated to the farm
  - No visits to other farm premises
  - Communication

- Farm premises biosecurity:
  - On premises disposal or holding of mortality
  - No equipment sharing between farms
  - No litter removal, introduction or removal of live poultry
  - No live poultry will be brought onto the farm or removed from the farm

- Procedures for surveillance crew

PRE-MOVEMENT ACTIVE SURVEILLANCE RRT-PCR TESTING PROTOCOLS

Primary diagnostic test:

- Targeted matrix gene real-time reverse transcriptase polymerase chain reaction (rRT-PCR).
- Targeted active surveillance swab samples taken from dead birds from each house (flock)
- Submitted to NAHLN laboratory

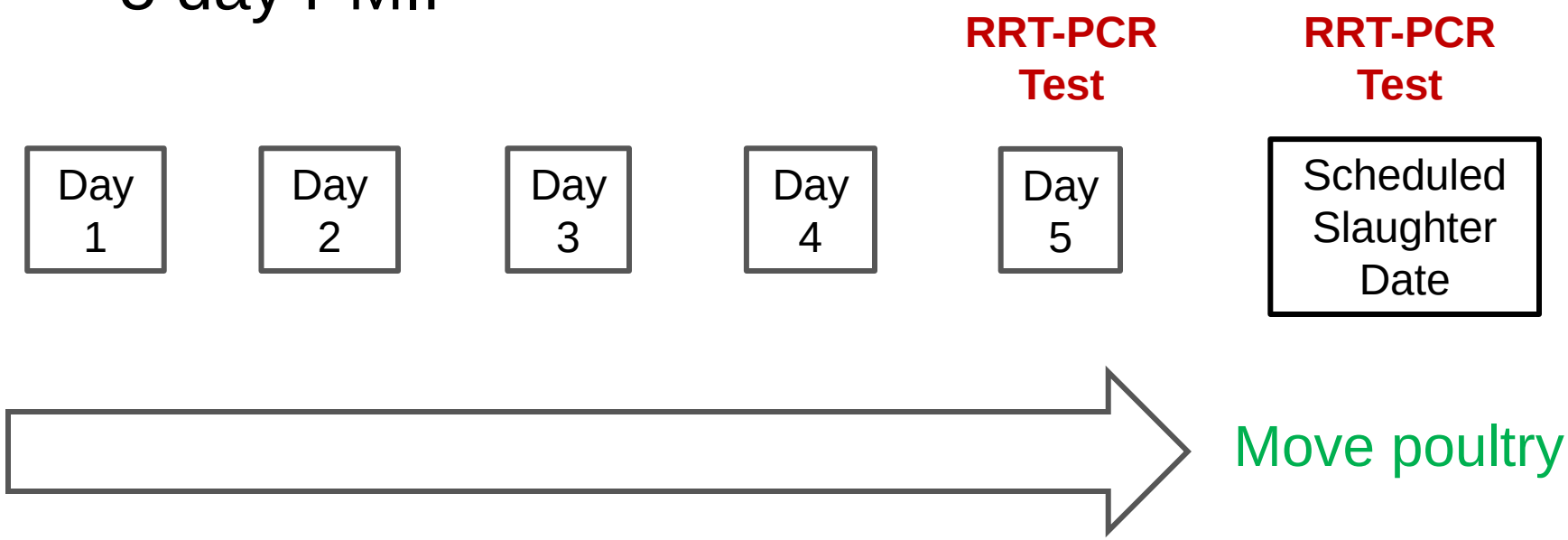
Sampling options for RRT-PCR testing:

- Two pooled samples collected the morning of:
  - The day prior to movement
  - The day of movement
- Pool sizes of 5 or 11 birds considered in the analysis

PRE-MOVEMENT ISOLATION PERIOD EXAMPLE

Move broilers on their scheduled day after:

- 2 negative RRT-PCR tests
- 5 day PMIP



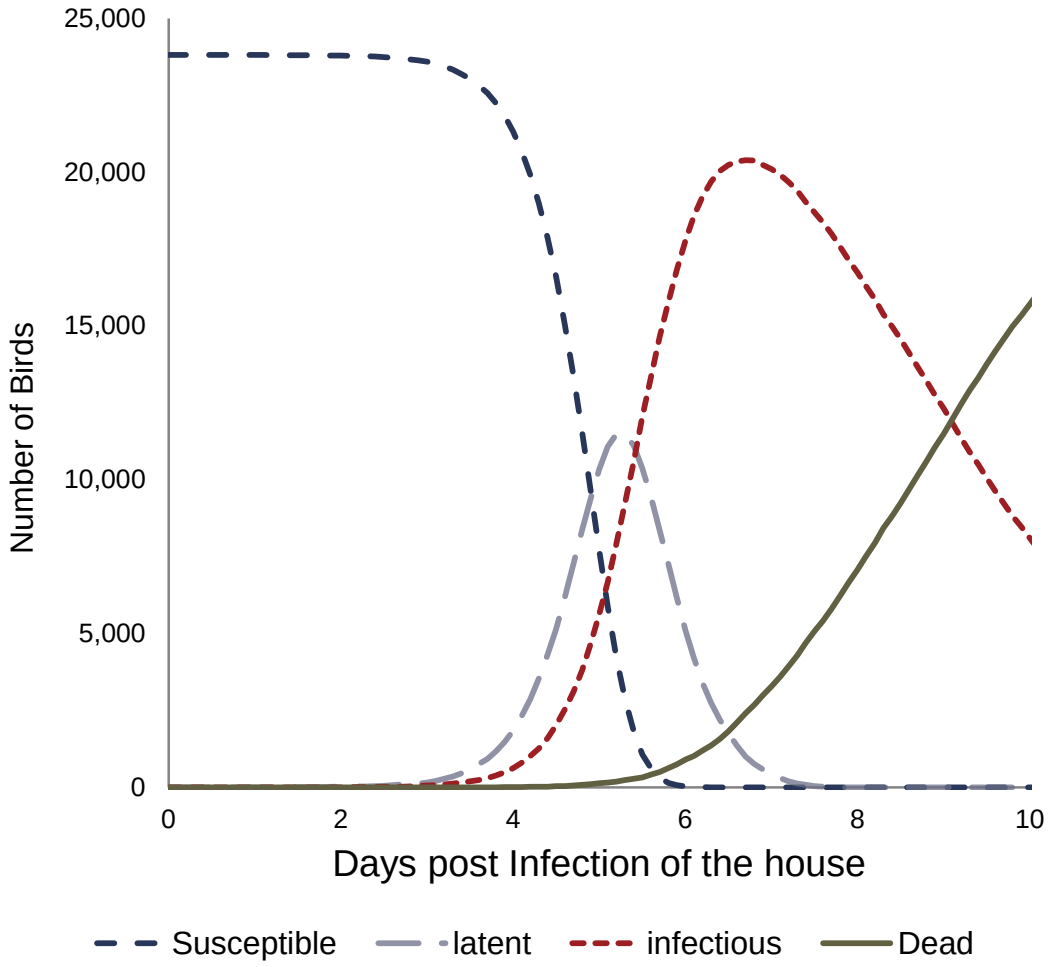
METHODOLOGY TO PREDICT THE PROBABILITY OF HPAI DETECTION IN A HOUSE (FLOCK)

Stochastic chain binomial HPAI disease transmission model:

- Predicts susceptible, dead, infectious birds over time.

Simulation models of HPAI detection via active surveillance protocols:

- Diagnostic test sensitivity (86.5%)
- Variability in normal and HPAI disease mortality



PROBABILITY OF DETECTING HPAI UNDER VARIOUS PMIP DURATIONS

Simulation results if the flock (house) became exposed to HPAI virus **before** implementing PMIP biosecurity (HPAI H5N2 scenario)

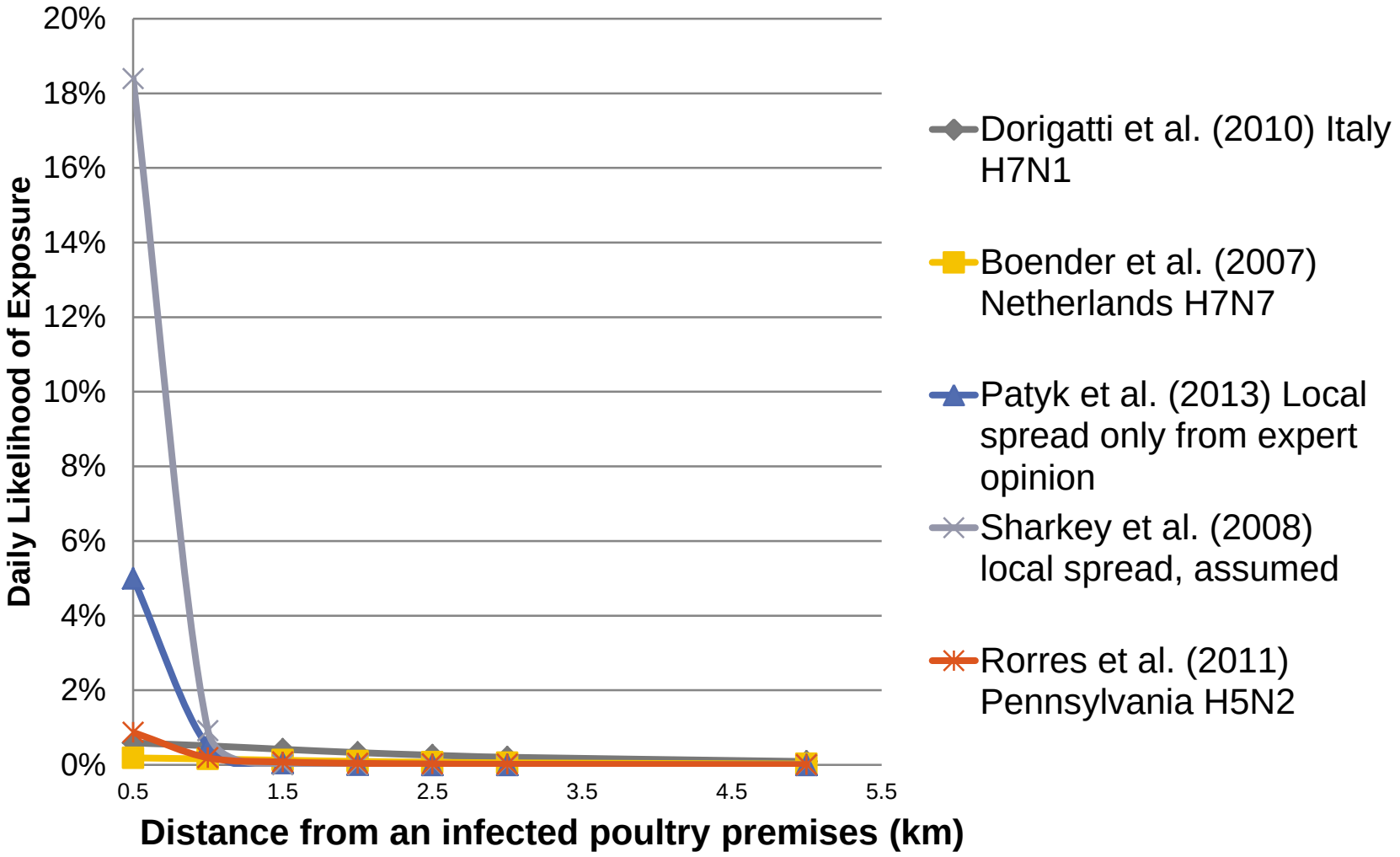
	Predicted detection probability under various PMIPs			
Active surveillance option (dead bird testing)	3 Days	4 Days	5 days	6 days
rRT-PCR testing of a pooled sample of **5 swabs** each on two consecutive days	92.7%	96.4%	98.3%	99.0%
rRT-PCR testing of a pooled sample of **11 swabs** each on two consecutive days	95.8%	98.4%	98.8%	99.5%

ROLE OF DISTANCE IN THE LIKELIHOOD OF THE PREMISES BECOMING INFECTED

- Local area spread
  - Broad term for mechanisms where transmission is dependent on distance from infected premises.

- Enhanced biosecurity measures may not be effective for some local area spread components.
  - Flies
  - Bio-aerosols
  - Wildlife

LIKELIHOOD OF EXPOSURE OF A POULTRY PREMISES AS A FUNCTION OF DISTANCE FROM A KNOWN HPAI INFECTED PREMISES BASED ON SPATIAL TRANSMISSION MODELS



CONSERVATIVE ESTIMATES OF THE LIKELIHOOD OF A FLOCK (1) BECOMING INFECTED WITH HPAI VIRUS AND (2) MOVING INFECTIOUS BIRDS BEFORE DETECTION

Testing a pool of 11 birds via RRT-PCR for two consecutive days.

Distance from a HPAI infected premises (km)	Conservative: includes all spread mechanisms			Local spread components excluding vehicles (e.g., feed, live haul)	
	Dorigatti Italy HPAI H7N1	Boender Netherlands HPAI H7N7	Rorres Pennsylvania HPAI H5N2	Patyk Expert opinion	Sharkey Expert opinion
1.5	1.100%	0.337%	0.137%	0.017%	0.213%
2	0.878%	0.257%	0.014%	0.000%	0.113%
2.5	0.694%	0.196%	0.001%	0.000%	0.070%
3	0.551%	0.151%	0.000%	0.000%	0.047%
5	0.247%	0.063%	0.000%	0.000%	0.015%

QUALITATIVE METHODS FOR EVALUATING LOCAL AREA SPREAD COMPONENTS

Focus on local area spread components which may not be mitigated via PMIP biosecurity measures.

- (e.g., aerosols, flies, wildlife)

Qualitative approaches:

- Literature review on the role of local area spread in past HPAI outbreaks.
- Expert opinion: questionnaire to field veterinarians with experience managing poultry diseases.
- Local area spread component evaluation.

OVERALL CONCLUSIONS

A combination of:

- Active surveillance
- Pre-movement biosecurity
- Adequate distance from known infected premises

Can be considered as a basis for the managed movement of monitored poultry flocks with a higher level of confidence that they are not infected with HPAI virus.

Results will be used to evaluate the likelihood of exposure of other commercial poultry flocks through the movement of broilers to slaughter.