

Risk of a Poultry Flock Becoming Infected with HPAI-virus due to Garbage Management

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Food system solutions through risk based science

Secure Poultry Supply Plans



Goals of the Secure Food Supply Projects

- Avoid interruptions in animal and animal product movement from premises with no evidence of FAD infection
 - [Interruptions of movement can have unintended consequences]
- Provide a continuous supply of [safe and] wholesome food to consumers; and
- Maintain **business continuity** for producers, transporters, and food processors through response planning



Foreign Animal Disease (FAD) Response Ready Reference Guide—
Overview of Continuity of Business and the Secure Food Supply (SFS) Plans (Dec 2016)

https://www.aphis.usda.gov/animal_health/emergency_management/downloads/fad_prep_rrg_sfs_cob.pdf



Interesting finding - 2015 HPAI outbreak

- 2015 case-control study (Garber et al, 2016)
- Infected layer flocks in Nebraska and Iowa
- “Garbage trucks coming near barns”
 - OR= 14.7 (p<0.001)
- Frequency of garbage truck visits not reported

AVIAN DISEASES 60:460–466, 2016

Factors Associated with Highly Pathogenic Avian Influenza H5N2 Infection on Table-Egg Layer Farms in the Midwestern United States, 2015

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Table 5. Results of multivariable logistic regression of farm-level analysis.

Characteristic ^A	% Case farms	% Control farms	Odds ratio	P-value	Average attributable fraction
In an existing control zone	50	10	32.0	0.002	31.7%
Rendering trucks near barns	29	3	22.3	<0.001	14.0%
Garbage trucks near barns	61	23	14.7	<0.001	28.1%
Visitors change clothes	77	93	0.08/12.6 ^B	0.01	7.6% ^B
Company service person visit in past 14 days	50	19	5.0	<0.001	15.0%

^AReference level = absence of factor.

^BDo not change clothes.



Other studies

- Risk factors for repeated presence of LPAI H5 and H7 viruses in live bird markets (Garber et al, 2007)
 - Disposed of dead birds and offal in the trash - OR: 2.4 (95% CI, 1.8-3.4)
- Risk factors associated with H5N1 in backyard poultry in Egypt (Sheta et al, 2014)
 - Disposing mortality and poultry feces in garbage piles outside was highly correlated in the regression model (F=15.7; p <0.0001)
- No previous work on commercial poultry farms in US

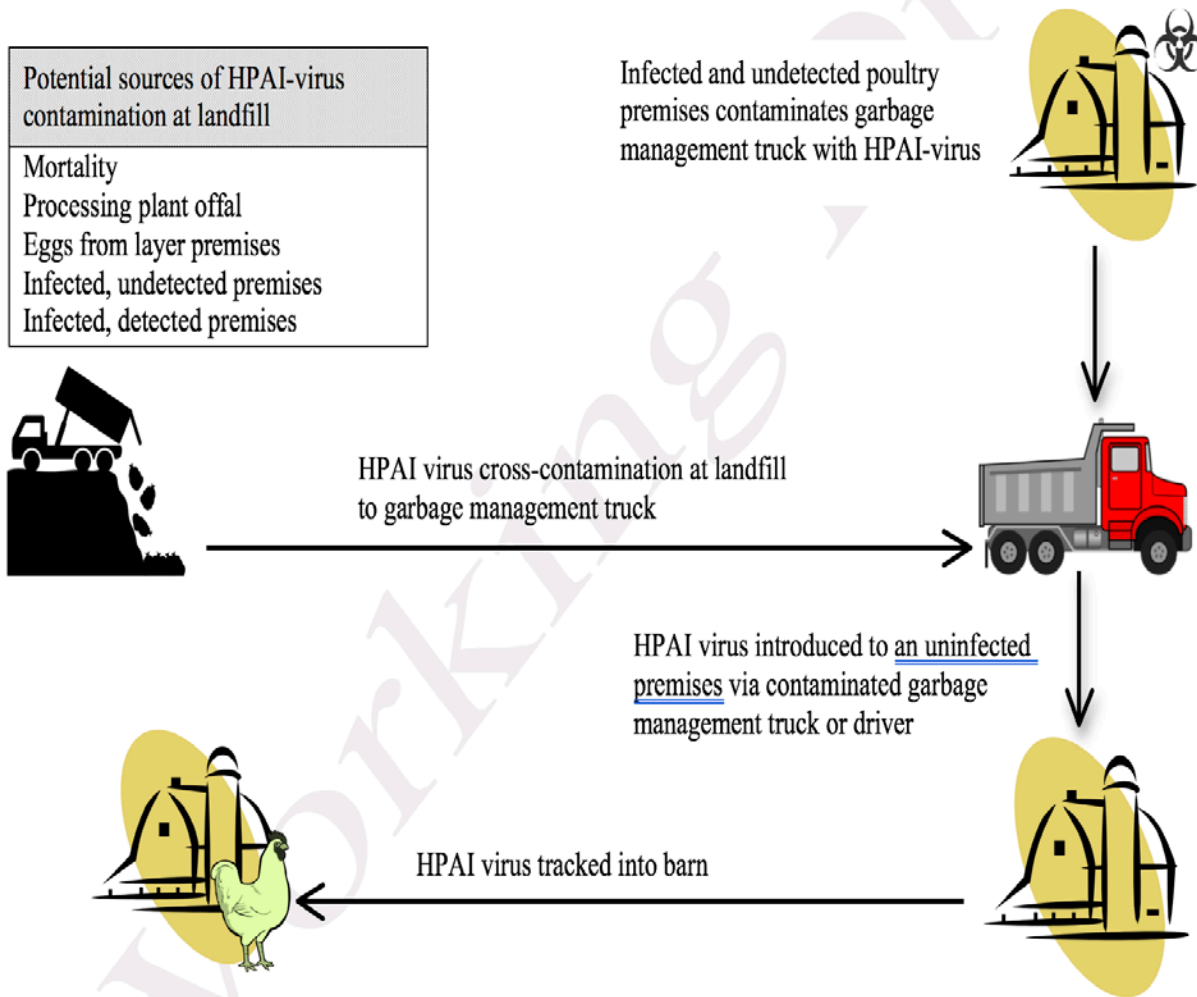
HPAI survival studies

- HPAI virus in chicken and turkey secretions, feces, feathers:
 - 10^3 to 10^7 EID₅₀ per gram or per milliliter
 - Assuming a low infectious dose of 10^2 viral particles, 1.5 ounces carcass fluid contains enough viral particles to infect **thousands of birds**
- Virus persistence is generally longer at cooler temperatures and in more humid conditions
- Virus survival on materials that may be disposed of in the garbage
 - Poultry carcasses, feathers, egg shells, egg trays, wood, steel, glass, and PPE: days to weeks at ambient environmental conditions

HPAI-virus present in the garbage + Ability to survive environmental conditions = Sufficient to infect a bird exposed to that material



Hypothesized risk pathway(s)



Gathering more details...

- Online survey (Qualtrics software), administered June-August 2016
- Convenience sample of veterinarians and other managers in the poultry industry
- Option to decline to answer any question within the survey

• Results:

Industry sector	Number surveys completed
Turkey	15
Broiler	8
Layer	40
Total	63



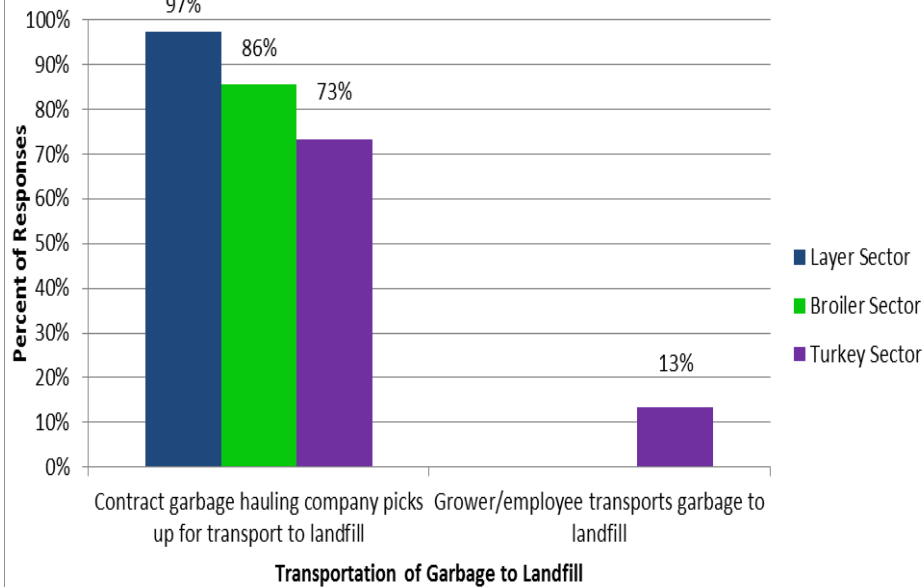
Results - Garbage Contents

Item	Broiler Sector (n=8 respondents)	Turkey Sector (n=15 respondents)	Layer Sector (n=39 respondents)
Dead wildlife/wild birds	Yes (1/8)	Yes (5/15)	Yes (1/39)
Rodents	Yes (3/8)	Yes (5/15)	Yes (10/39)
Mortality or poultry carcasses	No (0/8)	Yes (1/15)	Yes (9/39)
Eggs or egg products ²	Yes (1/8)	Yes (1/15)	Yes (8/39)
Manure	No (0/8)	No (0/15)	Yes (1/39)
Spilled feed	Yes (2/8)	Yes (8/15)	Yes (7/39)
Disposable chick transport boxes ²	Yes (4/8)	Yes (4/15)	Yes (24/39)
Used needles/syringes/diagnostic supplies that have contacted birds ²	Yes (1/8)	Yes (5/15)	Yes (14/39)
PPE (boot covers, gloves, coveralls, etc.)	Yes (8/8)	Yes (14/15)	Yes (36/39)
Feathers	No (0/8)	Yes (2/15)	Yes (4/39)
Offal	No (0/8)	No (0/15)	No (0/39)
Equipment or supplies from inside barns ³	Yes	Yes	Yes (22/39)
Household garbage from farm manager or any other residence ³	--	Yes	Yes (20/39)
Trash associated with waterfowl hunting ³	--	--	No (0/39)
Garbage from processing operation ³	--	--	Yes (23/39)
Lunch room and restroom garbage ³	--	--	Yes (37/39)

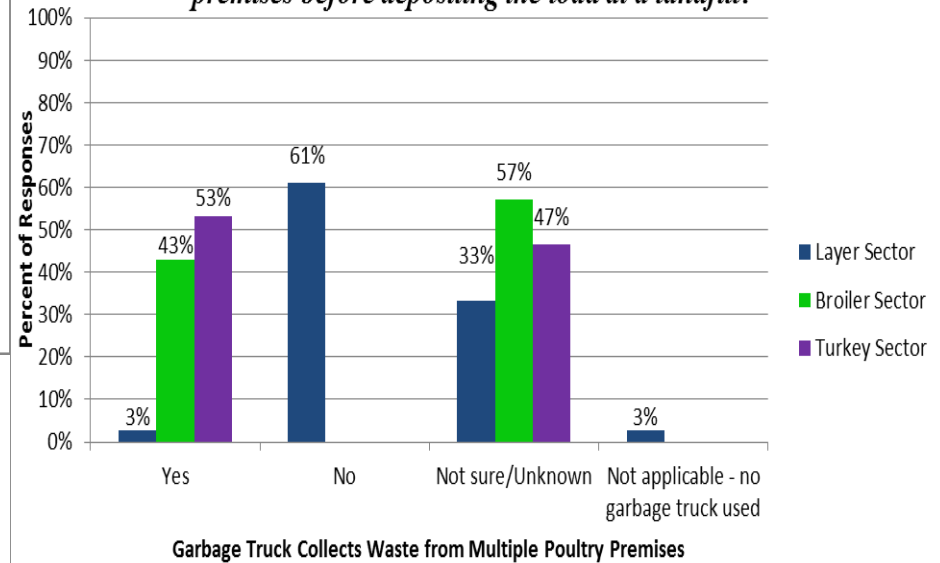


Results - Garbage truck routing

How is garbage transported to landfill?

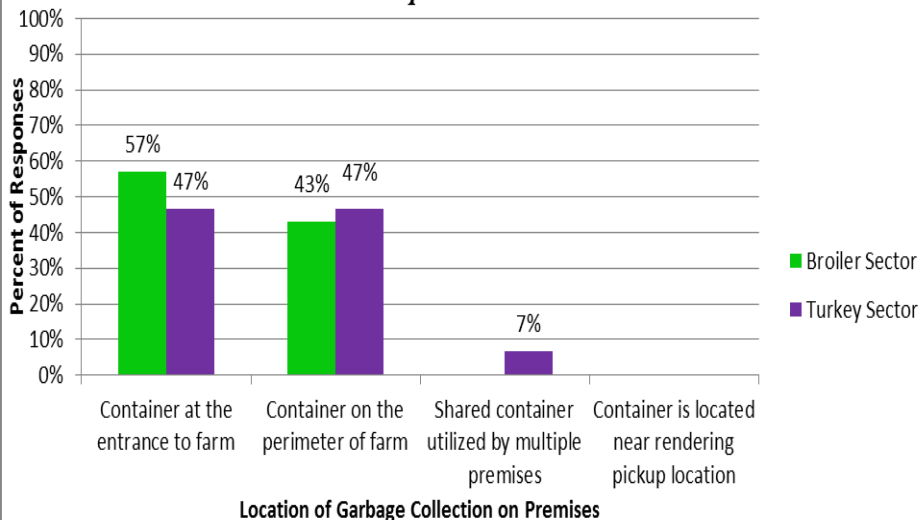


Does the garbage truck collect waste from multiple poultry premises before depositing the load at a landfill?

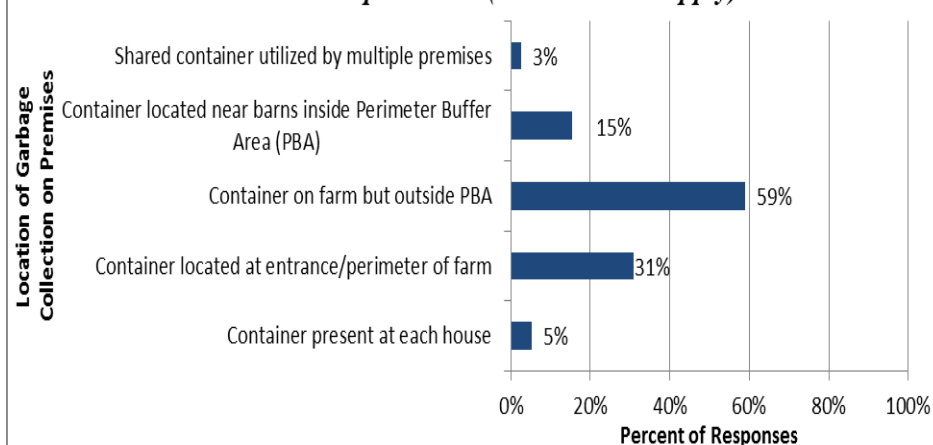


Results - Trash pickup location

Where is the dumpster or trash collection point located on the premises?

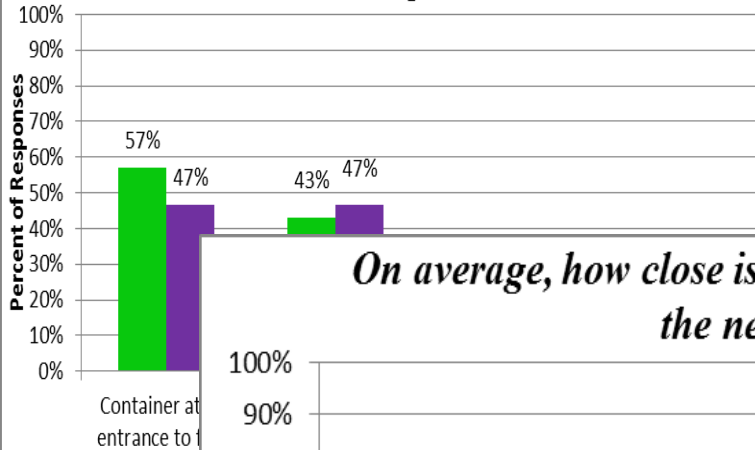


Layer Sector: Where is the dumpster or trash collection point located on the premises? (Check all that apply)?

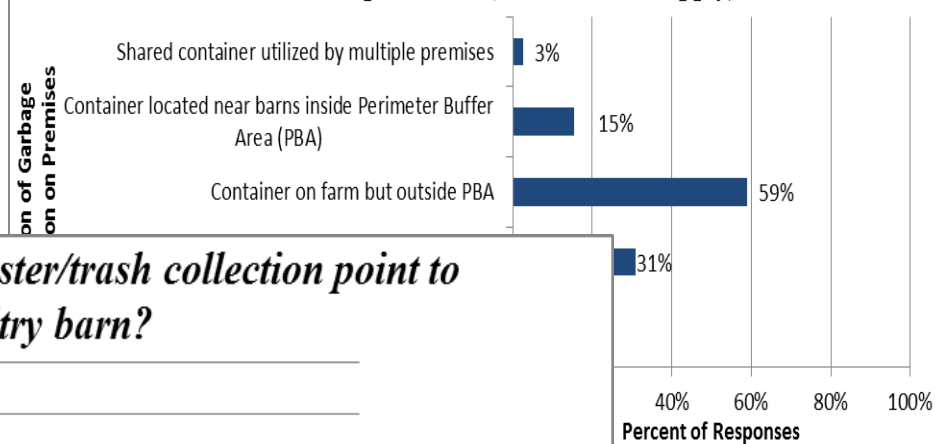


Results - Trash pickup location

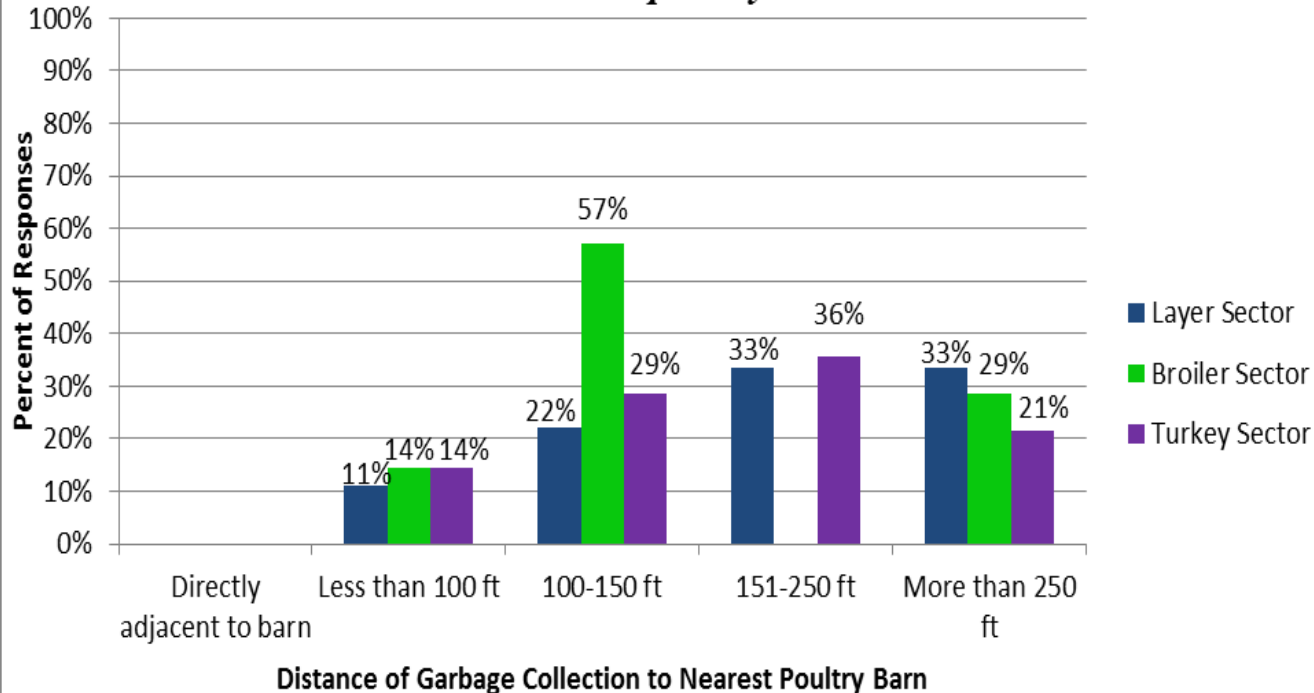
Where is the dumpster or trash collection point located on the premises?



Layer Sector: Where is the dumpster or trash collection point located on the premises? (Check all that apply)?



On average, how close is the dumpster/trash collection point to the nearest poultry barn?



Conclusions

- Potentially HPAI-contaminated or infectious material is in the garbage on poultry premises
 - i.e., dead wildlife, poultry carcasses, egg shells, and materials that have contacted poultry
- Garbage contractors used by some turkey and broiler premises may visit multiple poultry premises on one route before depositing a load at the landfill
 - HPAI virus-contaminated garbage from an infected (but undetected) premises may be present on the truck when it arrives at the next poultry farm
- Overwhelming majority of respondents indicated that they hire a contractor for some or all of their garbage transport needs
- Distance from nearest barn may be key in prevention (dumpster and garbage truck must be considered)



Limitations

- Exploratory survey:
 - Convenience sampling method
 - Small sample size
- Proportion of industry engaging in risk activity unknown
 - Highlights potential differences between sectors that may operate in the same geographic area
 - Absence of an affirmative response to a high risk activity does not definitively indicate it is not occurring
- Illustrates the variations in industry practice - ***What might my neighbor be doing?***



Impacts

- Preliminary survey identified items in garbage that may contain infectious virus, some which may carry high titers of virus
- Secure Poultry Supply Proactive Risk Assessments for movement of poultry and poultry products:
 - Broiler sector working group, Turkey Sector Working Group opt to suspend garbage collection during Pre-Movement Isolation Period before moving birds to slaughter
- Support to keep asking about garbage in future epi questionnaires

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