Avian Influenza on Dairy Farms in the U.S.- The Human Impact in a Challenging Working Environment

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Food Security is National Security

A nation's security is inextricably linked to its ability to feed and defend its people

A nation that is unable to grow enough food to feed its people is a nation at risk

President George W. Bush, July 27, 2001

Situation

March 25, 2024

H5N1 first confirmed in Texas

April 24, 2024

USDA issues Federal Order on interstate movement

April 30, 2024

9 states 36 herds

July 19, 2024

CDC-TAMU contract begins

December 16, 2024

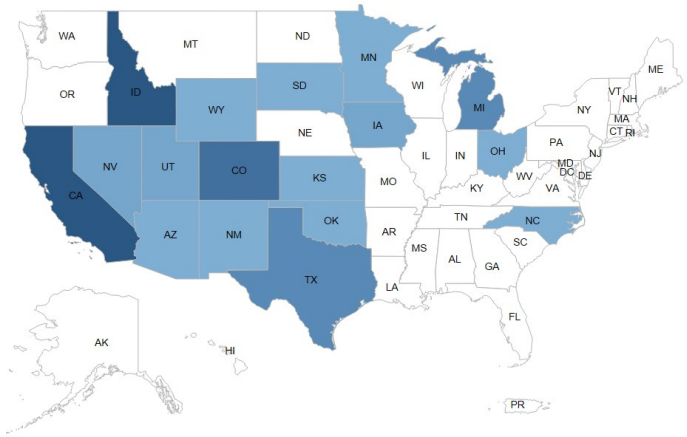
National Milk Testing Strategy Begins

December 16, 2024

On-farm data collection begins

December 31, 2024

spread to 17 states



August 29, 2025

1,076 herds across 17 states

70 confirmed human cases across 10 states/1 death

41 cases from dairy cattle exposure

1 new confirmed herd in 1 state in last 30 days

Farm-Industry Impact

- Cow health
- Early response to cull herd
  - Initial farms up to 20-30%
- Reduction of milk production roughly 20%
- Producer estimated combined mortality + herd removal cost: $1 million/farm
  - $950 per cow
- Expressed producer perspectives
  - cow and financial issue
  - worker impact minimal
  - guidance from federal and state authorities limited-slow response

H5N1 on Dairy-Why the public health concern?

- Influenza A(H5N1) infects numerous avian and mammalian species
- **First time spillover from avian influenza into cattle**
- Global spread may constitute a pandemic threat
- Fear of avian influenza mutation to enable human to human transmission

H5N1 on Dairy-Why the public health concern?

- Human cases have been rarely reported, to date
- Between 2003 and February 2025, the World Health Organization has recorded 972 cases of confirmed H5N1 influenza, leading to 468 deaths
  - **~50% mortality (previous strains)**

The current situation is not only a public health challenge.

It is also an **occupational health challenge** that introduces a key stakeholder in its management.

Response

- Researchers at Texas A&M University, School of Public Health responded to a request for immediate assistance from the Centers for Disease Control
- TAMU SPH researchers conducted an epidemiologic assessment to document the prevalence and risk factors for infectious disease (H5N1) exposures among U.S. dairy farm workers
- Collecting information from workers about potential exposures, along with respiratory and blood specimens facilitated the estimation of exposure prevalence and risk of animal-to-human transmission.

Specific Aims

Aim 1: Design and execute a study of influenza infection risks among individuals with workplace exposures to influenza A (H5N1) viruses.

Aim 2: Conduct laboratory studies to characterize susceptibility and infection history.

Industry Engagement & Farm Recruitment

- Research team members met with executive directors of state dairy associations (TX, NM, ID, CA)
  - directors informed of region of data collection to prevent unnecessary or incorrect spread of information in industry
- Dairy owners were approached for possible participation
  - on- and off-farm locations
  - farm shows
  - dairy conferences
- Logistical considerations discussed
  - on- or off-farm data collection
  - engagement with employees

Farm Data

- Between December 16, 2024 and May 29, 2025, a total of 26 dairy farms agreed to participate in the study.
- Of those, 22 dairy farm owners provided farm level data.

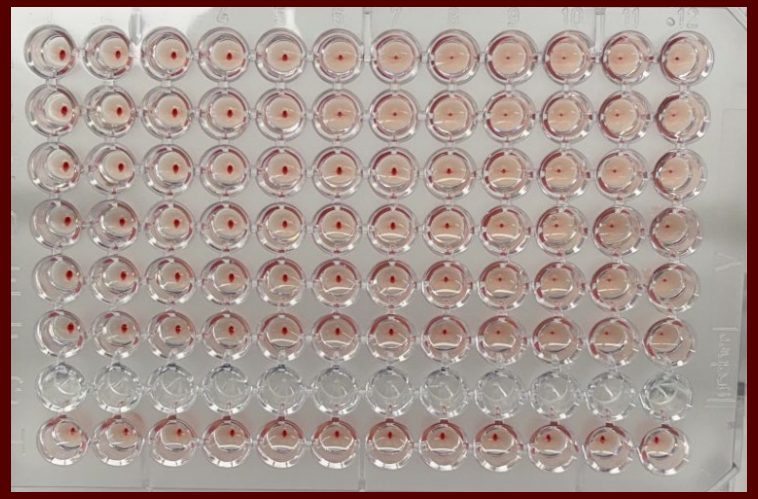
Farm Level Characteristics	Mean (SD) or n (%)
Herd size (Range 450 – 9,000)	3,661.4 (2,397.1)
Ill cattle (Range 1 – 30)	12.5 (6.1)
Other dead animals on the farm during outbreak	8 (36.4)
On going outbreak at the time of collection	4 (18.2)
Parallel milking configuration	12 (60.0)
Mechanized milking	22 (100.0)
Closed farm	8 (36.4)
Dirt soil bedding	16 (72.7)
Open housing	22 (100.0)
Open pasture	8 (36.4)

Tasso+

- Objective: Confirm influenza antibody detection in *capillary blood* collected via the Tasso+ blood collection device

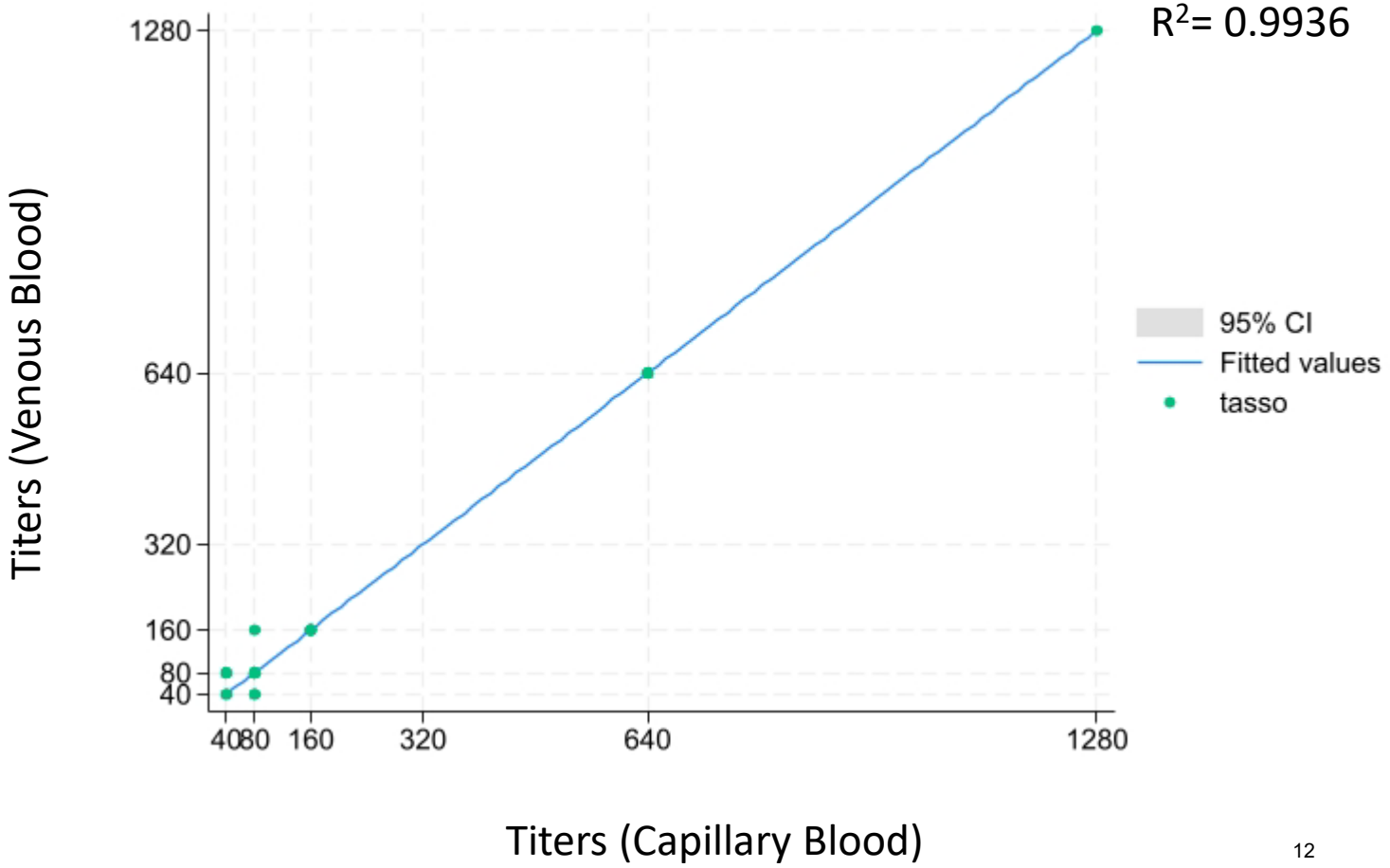
- Collection
  - specimens in order: nasal, nasopharyngeal, conjunctival, and blood
  - Process POC Influenza and SARS-CoV-2 on nasopharyngeal swabs after collection of specimens was completed and then add RNA shield

- Participants
  - n=200
  - Samples from faculty, staff, and student at TAMU
  - Vaccinated for Seasonal Influenza OR tested positive for Influenza within the last year



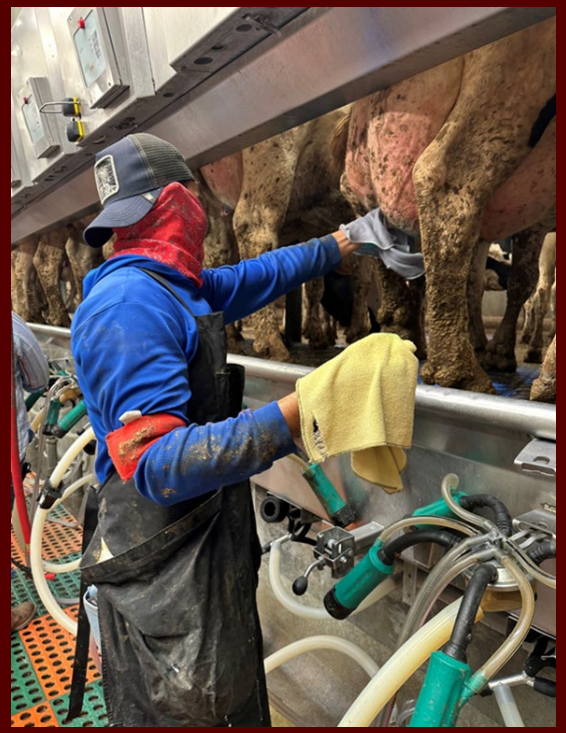
Tasso+

Good concordance between Venous and Capillary HI Titers



Survey Instrument: Overview

1. **Occupational characteristics, work schedule, work history, specific job tasks**
2. **Direct contact with ill cows after bird flu was detected on farm**
3. **Symptoms (fever, feverishness, cough, fatigue, sore throat, runny/stuffy nose, sneezing, nausea/vomiting, diarrhea, headache, rash, muscle/body aches, red/draining or itching eyes, shortness of breath, seizures, other):**
   - Around the time cows were sick (follow-up testing question)
   - Day of data collection ('Today, do you feel …')
1. **Exposure to other animals**
2. **PPE use, access, and training**
3. **Bird flu awareness and knowledge**
4. **Health information sources**
5. **Vaccination history and willingness to receive a “bird flu vaccine” if provided free of charge**



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Participant Demographics

- 36.9 (SD 12.5) Range 18 – 77
- Male (79.2%)
- Hispanic (95.5%)
- Primary language – Spanish (75.5%), K'iche' (8.5%)
- House/trailer (68.3%); employer housing (22.8%)
- Household size 3.9 (SD 1.7) Range 1 – 11
- 39.2% live with other dairy farm workers
- 7.2% diabetes, 12.9% hypertension, 8.3% hypercholesterolemia

1. Occupational Characteristics

Characteristic	N = 625[1]
Occupation	
Breeder	28 (4.5%)
Calf caretaker	35 (5.6%)
Farm cleaning	13 (2.1%)
Feeder	45 (7.2%)
Hoof trimmer	4 (0.6%)
Maintenance	29 (4.6%)
Maternity pens	40 (6.4%)
Mechanic	10 (1.6%)
Milker	127 (20%)
Multiple	91 (15%)
Office staff	12 (1.9%)
Other	43 (6.9%)
Other herd health	5 (0.8%)
Owner	5 (0.8%)
Parlor shift lead	4 (0.6%)
Pusher	18 (2.9%)
Ranch/crop production	16 (2.6%)
Sick pens	36 (5.8%)
Supervisor	25 (4.0%)
Tractor driver	38 (6.1%)
Vet or vet tech	1 (0.2%)
Estimated time working on farms (years)	4 (2, 10)
Unknown	86
Days worked per week, mode (%)	6 (77%)
Hours worked per day, median (IQR)	10 (8, 11)

[1] n (%); Median (IQR)

20% milkers, 15% multiple farm duties, 13.3% feeders/tractor drivers

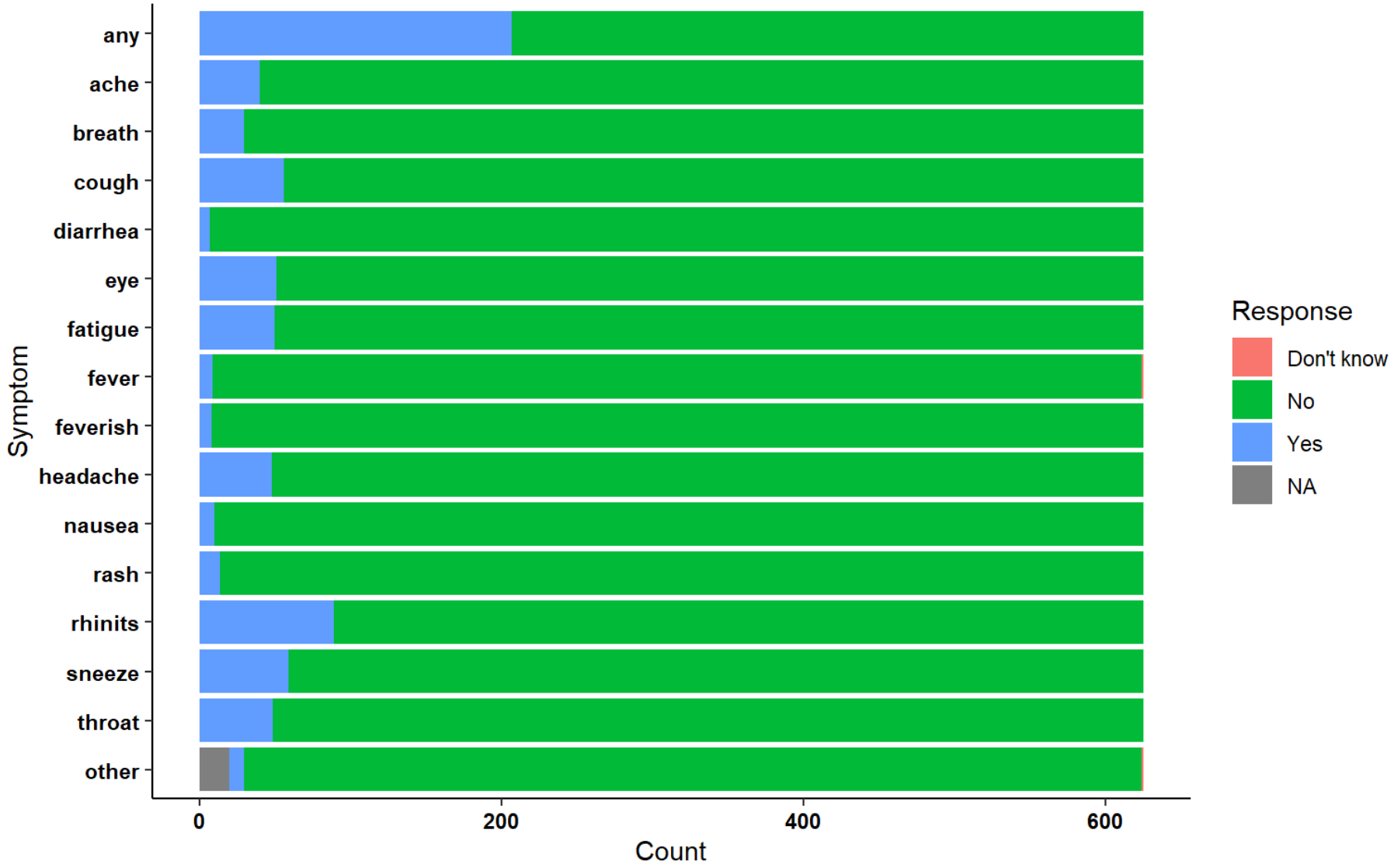
2. Direct contact with sick cows after bird flu was identified on farms

During the time the farm was experiencing bird flu (or the week before), [insert dates]

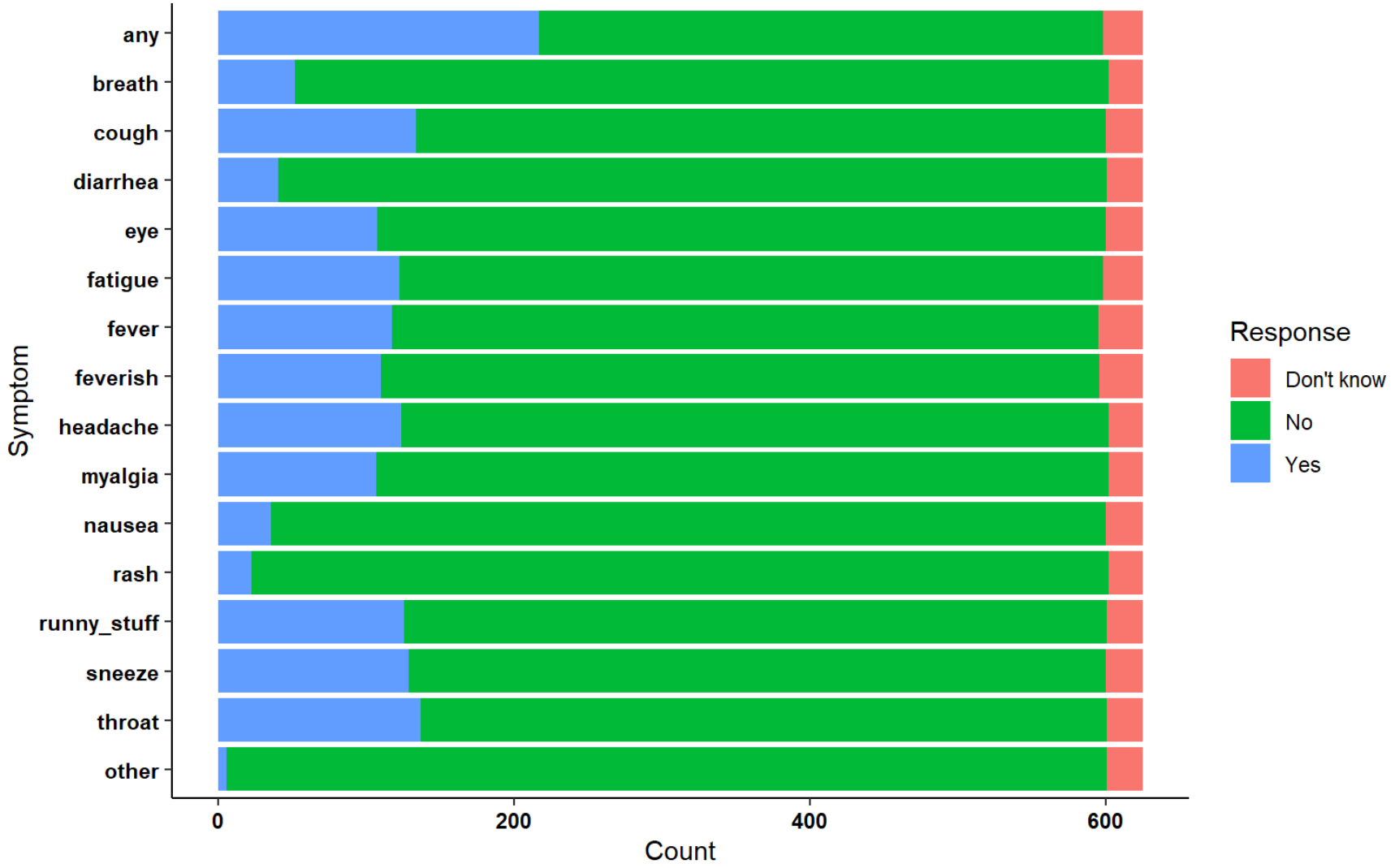
Characteristic	N = 625[1]
…did you work with any sick cows?	
No	318 (51%)
Yes	**252 (40%)**
Don't know/don't remember	55 (8.8%)
…did you handle or care for any sick cows or calves?	
No	394 (63%)
Yes	**192 (31%)**
Don't know/don't remember	39 (6.2%)

[1] n (%)

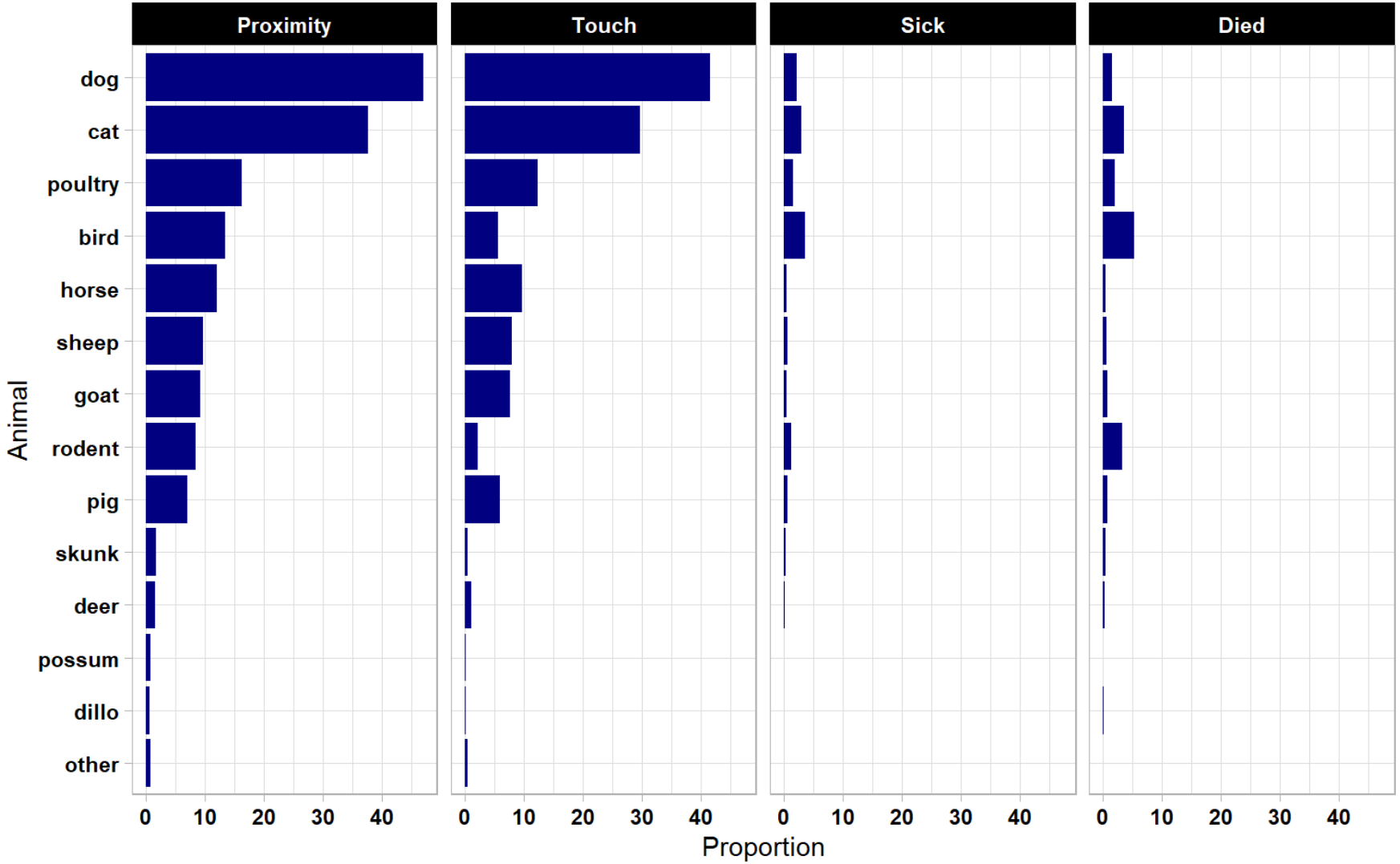
3. Symptoms: At the time of testing



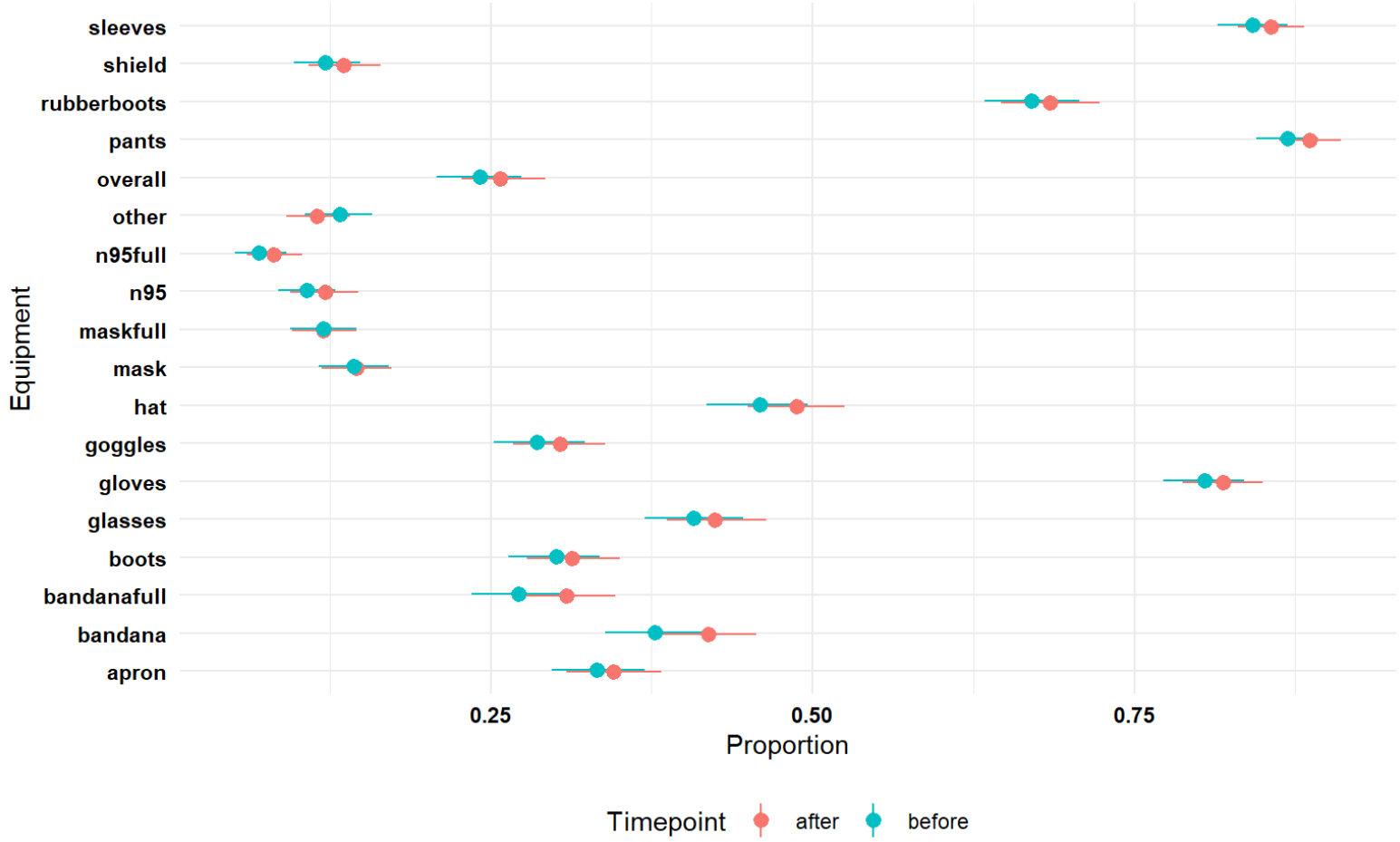
3. Symptoms: During early exposure



4. Exposure to other animals



5. PPE use and access



Overall use of **any PPE** during outbreak (25.9%)

Where do you get PPE?
Bought it myself (93.8%);
Given to me by farm (51.4%)

64.6% reported NOT changing out of work clothes

6. Bird flu awareness

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	N = 625[1]
Heard of bird flu?	420 (67%)
Know what bird flu is?	235 (38%)
Concerned about being **infected**?	375/621 (60%)
Know how it's **transmitted**?	204 (33%)
Know how to **protect** yourself?	211 (34%)
Know the **symptoms in people**?	163/623 (26%)
Know the **symptoms in cows**?	141 (23%)
Has this farm provided you **training**?	173/583 (35%)
[1] n (%)	

	N = 625[1]
Do sometimes/ever drink unpasteurized milk or cheese?	
Yes	**126 (20%)**
No	495 (79%)
Don't know	4 (0.6%)
Do you take milk home from the farm?	
Yes	**39 (6.2%)**
No	586 (94%)
[1] n (%)	

7. Health information sources

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Characteristic	N = 625[1]
What is your primary source of your health information?	
Social media	**212 (34%)**
Radio	9 (1.4%)
TV	64 (10%)
Internet searches	**108 (17%)**
Local health clinic or your health provider	118 (19%)
Family/friends	41 (6.6%)
Work	34 (5.5%)
Other	4 (0.6%)
None	31 (5.0%)
Unknown	4

[1] n (%)

Characteristic	N = 625[1]
What social media?	
Facebook	**144 (68%)**
WhatsApp	17 (8.0%)
TikTok	32 (15%)
Instagram	5 (2.4%)
Snapchat	0 (0%)
YouTube	12 (5.7%)
Other	2 (0.9%)
Unknown	413

[1] n (%)

Combined, **online sources of information** (51%)

8. Vaccination

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Vaccination Target	Vaccination - ever	Vaccination – past 12 months
Flu	**316 (51%)**	**98 (16%)**
COVID-19	**391 (63%)**	**68 (11%)**
RSV	36 (5.8%)	5 (0.8%)
TDAP	387 (62%)	37 (5.9%)
Measles	367 (59%)	4 (0.6%)
TB	286 (46%)	
Yellow fever	144 (23%)	
None	71 (11%)	452 (72%)
Don’t know	96 (15%)	

59.3% reported interest in an H5 vaccine if provided free

OR=5.8, (3.3,10.1) p<0.0001, those who are concerned about infection are more likely to be vaccinated

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On-Farm Specimen Collection & Analysis

- Collection
  - Collect specimens in order: nasal, nasopharyngeal, conjunctival, and blood
    - Process POC test as participant finishes collection and survey
- Sample Handling
  - Nasopharyngeal and conjunctival swabs in RNA shield were transferred to the molecular laboratory for confirmatory RT-PCR testing

WHO case definition for human infections with avian influenza A(H5) virus

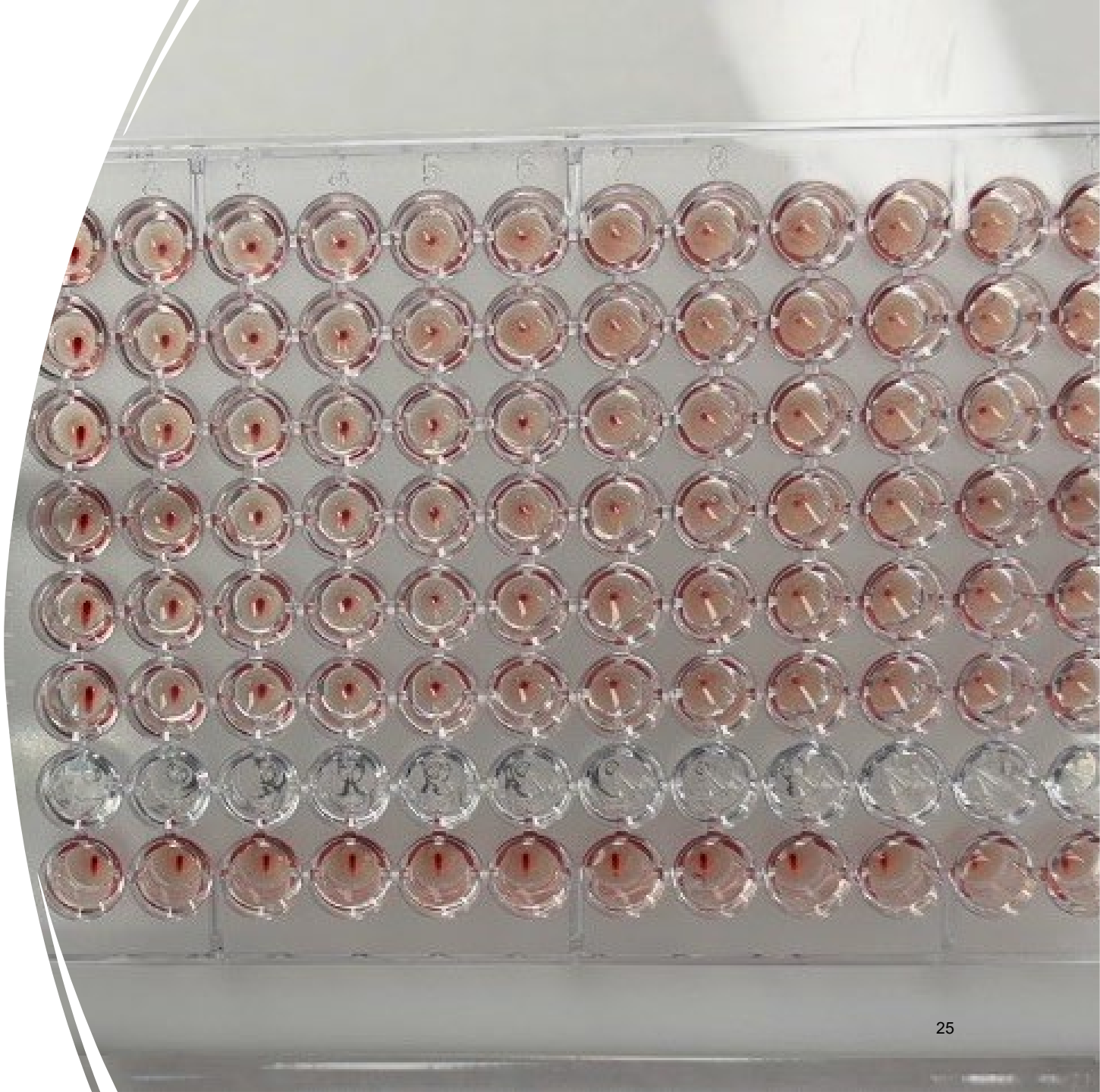
Specifically for a single convalescent serum (blood) sample

- Neutralizing antibody titre ≥ 1:40 on microneutralization test

AND

- Positive result using a different serologic (blood) test such as hemagglutination inhibition (antibody titre ≥ 1:40).

https://www.who.int/teams/global-influenza-programme/avian-influenza/case-definitions



Challenges, Observations, Limitations, & Opportunities

Owner & Farm Recruitment

- Producer reluctance
  - USDA National Milk Testing mandate
  - Post-COVID world
  - Media
  - Immigration enforcement activities
  - Logistics and location
  - External research efforts & approaches

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Challenges, Observations, Limitations, & Opportunities

Interview

- Fear of unknown, distrust
- Lack of private spaces
- No or low (misinformed) awareness of H5N1
- Recall bias (months from farm outbreak)
- Underlying conditions unknown; lack of health access
- Quantitative data collection misses part of the story (notes pages)

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Challenges, Observations, Limitations, & Opportunities

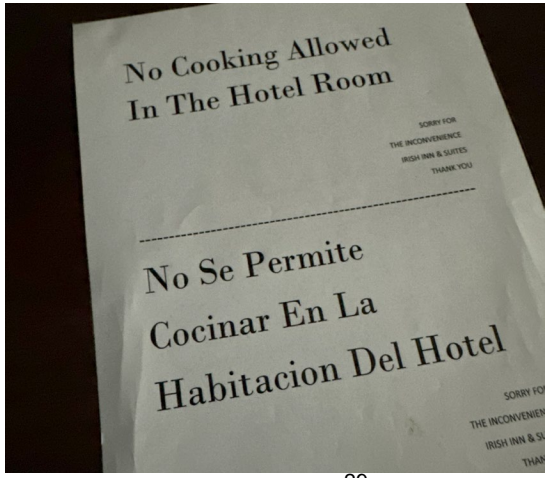
Specimen Collection

- Variable access to electricity
- Lack of consistent space, required flexibility with collection station configuration
- Access to different phlebotomists with varying state licensing requirements
- Sample management in the field and transfer to the lab

Challenges, Observations, Limitations, & Opportunities

Logistics

- Weather
- Remote locations
- Lodging
- Internet connectivity
- On-farm recruitment
- On-farm space
- Shift changes



Partnerships

- Trusted partnerships
- Proven track record
- Industry-Academia-Public Health

Thank you, to those who feed us.

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