Drinker Biofilm Testing in Turkeys

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Water is part of the influenza cycle.
Why test the water from poultry houses?

• The turkey industry checks birds for influenza antibody 21 days prior to market
• If they are antibody positive, what decisions need to be made?
  • Delay moving them?
  • Change the route by which they are moved?
• Are they even still shedding virus?
• Can virus then be found in the drinking water?
• Perhaps presence of flu virus in the water can help inform decisions of when and/or how to market
How can we check the water?

• Antigen capture (FluDetect strips)
  • Advantage: very quick assay
  • Disadvantage: May just be residual, non-infectious protein coats
  • Not very sensitive ($10^3$ to $10^4$ EID$_{50}$)
  • Disadvantage: May pick up false positives just due to water chemistry

• qRT-PCR of AI matrix
  • Advantage: stronger evidence that influenza is in the poultry house
  • Advantage: better sensitivity (? $10^1$ EID$_{50}$)
  • Disadvantage: Can detect non-viable virus

• Isolation from eggs
  • Advantage: Best sensitivity for presence of live virus
  • Disadvantage: time and cost of eggs
  • Disadvantage?: maybe too sensitive? Detects down to far below infectious dose?
What kind of water?

• Virus persistence studies have been done in HEPES buffered dH₂O (Lebarbenchon 2011, 2012)

• “Artificial Pond Water” can be prepared as a consistent water that is closer to an environmental sample

• Tap water is what the birds drink, but each farm would have its own well. There is wide variation in the pH and ion content of well water.
Survival of H7N9 in H2O

Percent virus survival

Days post inoculation

31-Dec  3-Jan  7-Jan  10-Jan  15-Jan  18-Jan  22-Jan

0  3  7  10  15  18  22
RNA vs. live virus

The graph shows the comparison of RNA vs. live virus over time. The x-axis represents time in days (0, 3, 7, 10, 15, 18, 22, 29, 36), and the y-axis represents the percentage of RNA or live virus. The graph includes lines for Tap (35-Ct), Pond (35-Ct), Clean (35-Ct), and Dirty (35-Ct) for both RNA and live virus. The graph highlights the decline in both RNA and live virus levels over time, with Tap (35-Ct) showing the least decline and Dirty (35-Ct) showing the most.
Figure 1. Detection of viral RNA by RTPCR in water samples and associated debris.
Drinker biofilm sampling

- Now a test at MCROC
- Part of active surveillance
  - 2 samples per barn taken 24-36 hrs pre-movement
- Used in HPAI outbreaks
A comparison of drinker biofilm and oropharyngeal swab RTPCR results in HPAI infected flocks.
Influenza monitoring is not the only thing!

- Metapneumovirus
- Newcastle Disease
- Egg Drop Diagnostic

Metapneumovirus spiked samples
Some Caveats

• Regulatory environment

• This is an environmental test not a direct bird test

• Diagnostic lab certification

• Only applicable with open water systems
Questions?