REFLECTIONS ON INFLUENZA PREVENTION AND CONTROL

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THERE IS A NEED TO REASSESS PREVENTION, CONTROL AND ERADICATION

Is the plan working?

30 years ago

At the second International Symposium on Avian Influenza, Ken Shortridge told us that domestic ducks were central to avian influenza epidemiology.

The internet was being invented
A new singer Madonna's album was number 1
The FDA began screening blood in blood banks for HIV
Civil war was at its peak in El Salvador

19 years ago

- Henry Wan isolated goose/Guangdong/1996, the progenitor of the H5 lineage viruses currently spreading around the globe.

18 years ago

- In Hong Kong, we discovered that avian influenza was not just for birds. 18 human cases of H5N1 HPAI, six people died.

The Taliban create a new state in Afghanistan
BSE emerges in the UK
Deng Xiaoping dies
Harry Potter is published

12 years ago

- The H5 lineage viruses spread throughout SE Asia in 2003.

10 years ago

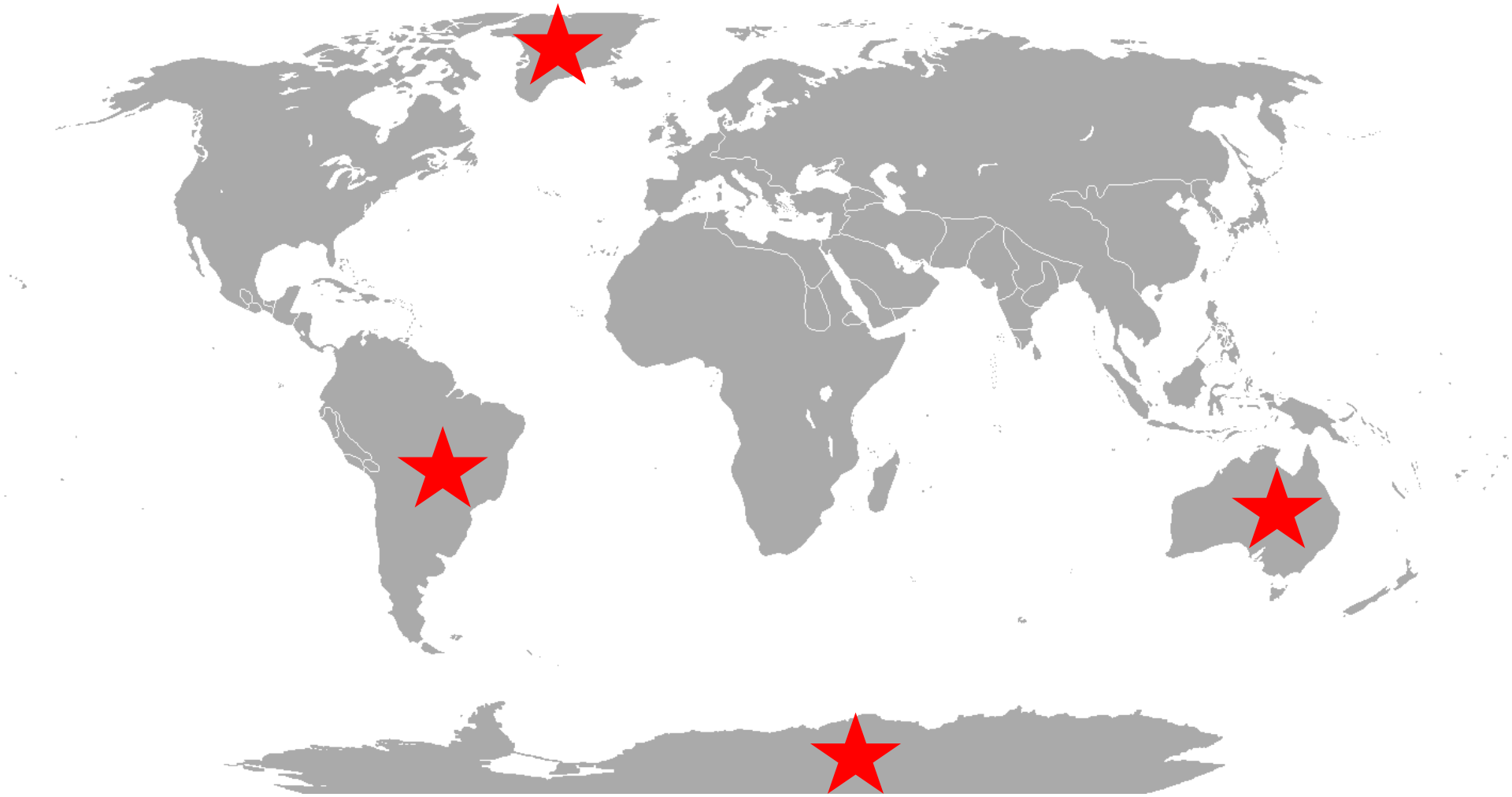
- We learned that these viruses could move long distances in wild birds. In 2005, H5 viruses moved from SE Asia through Russia, South Asia, Mid East, Europe and Africa
- Some countries were successful and some were not in eradicating

US attacks Iraq
Hurricane Katrina hits the Gulf coast

Where are we today?

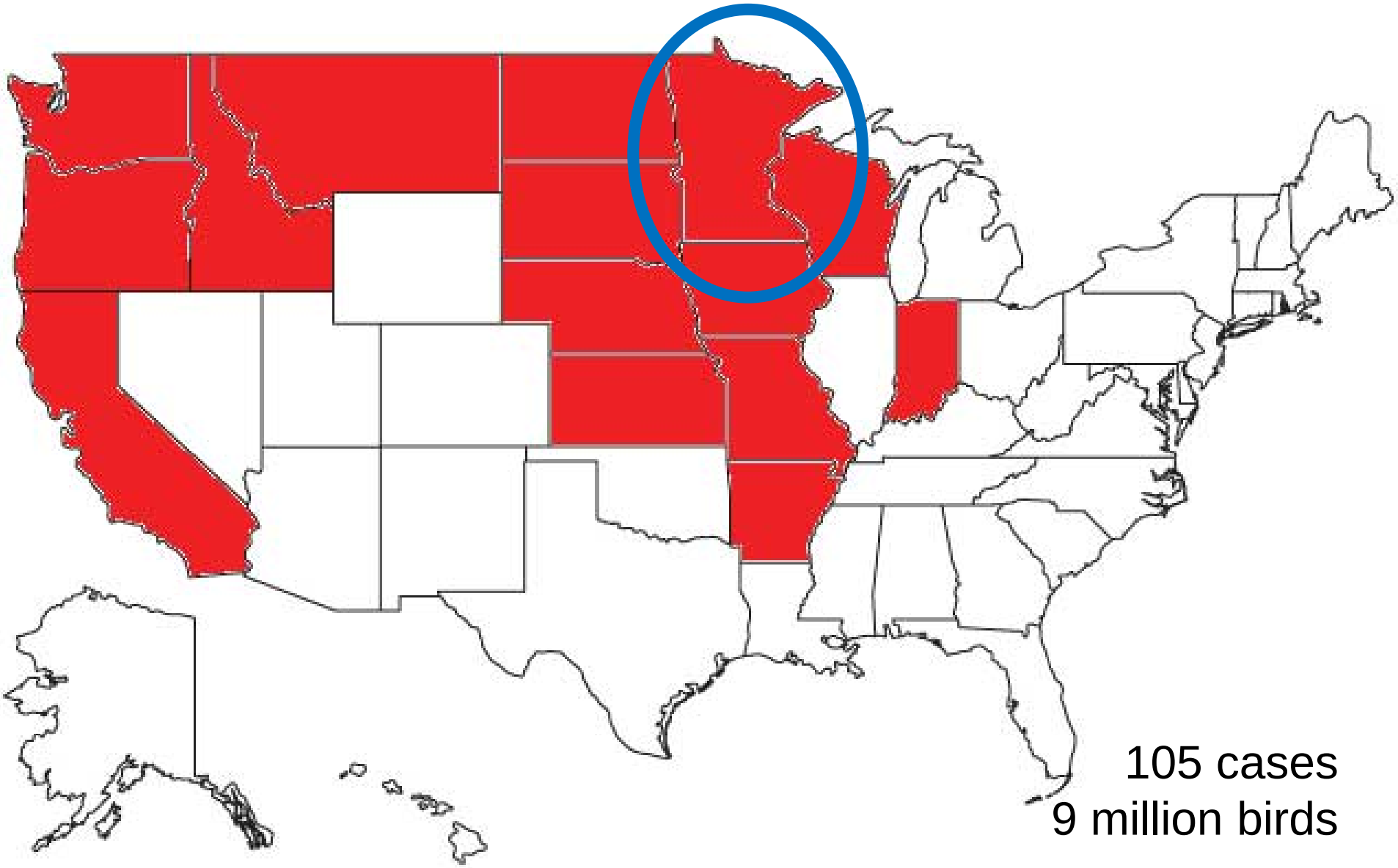
- The internet has been successful in transforming our everyday lives
- Blood transfusions are safe today
- The Taliban are out of Afghanistan
- BSE in humans is a thing of the past

…and it is now easier to show where H5s are not



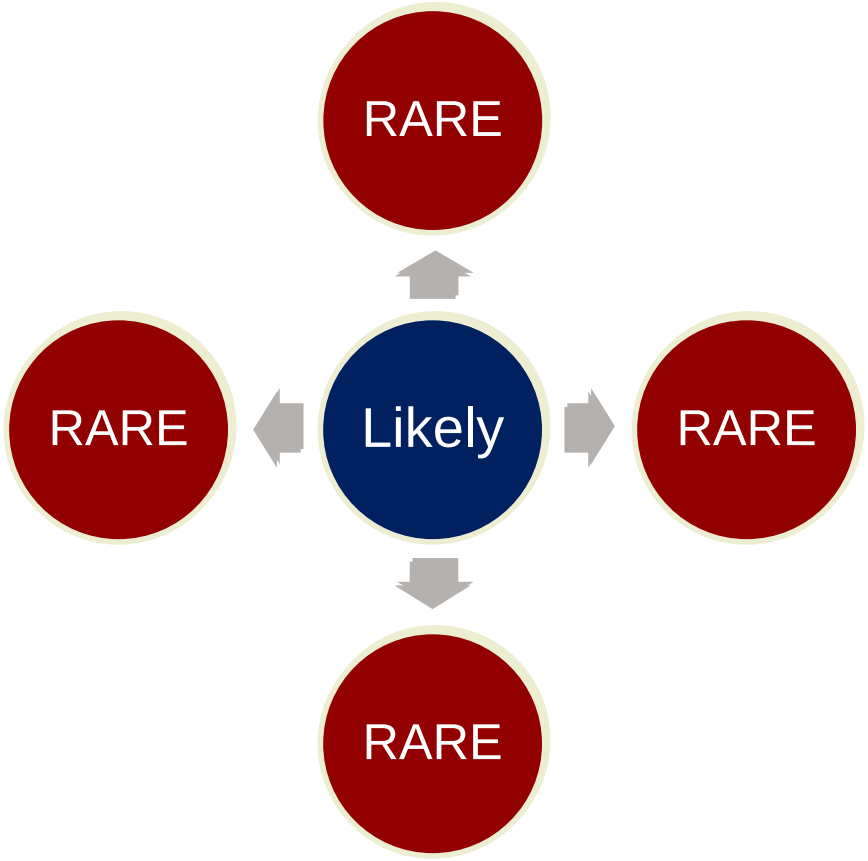
DISEASE PREVENTION

Taking another look


105 cases
9 million birds

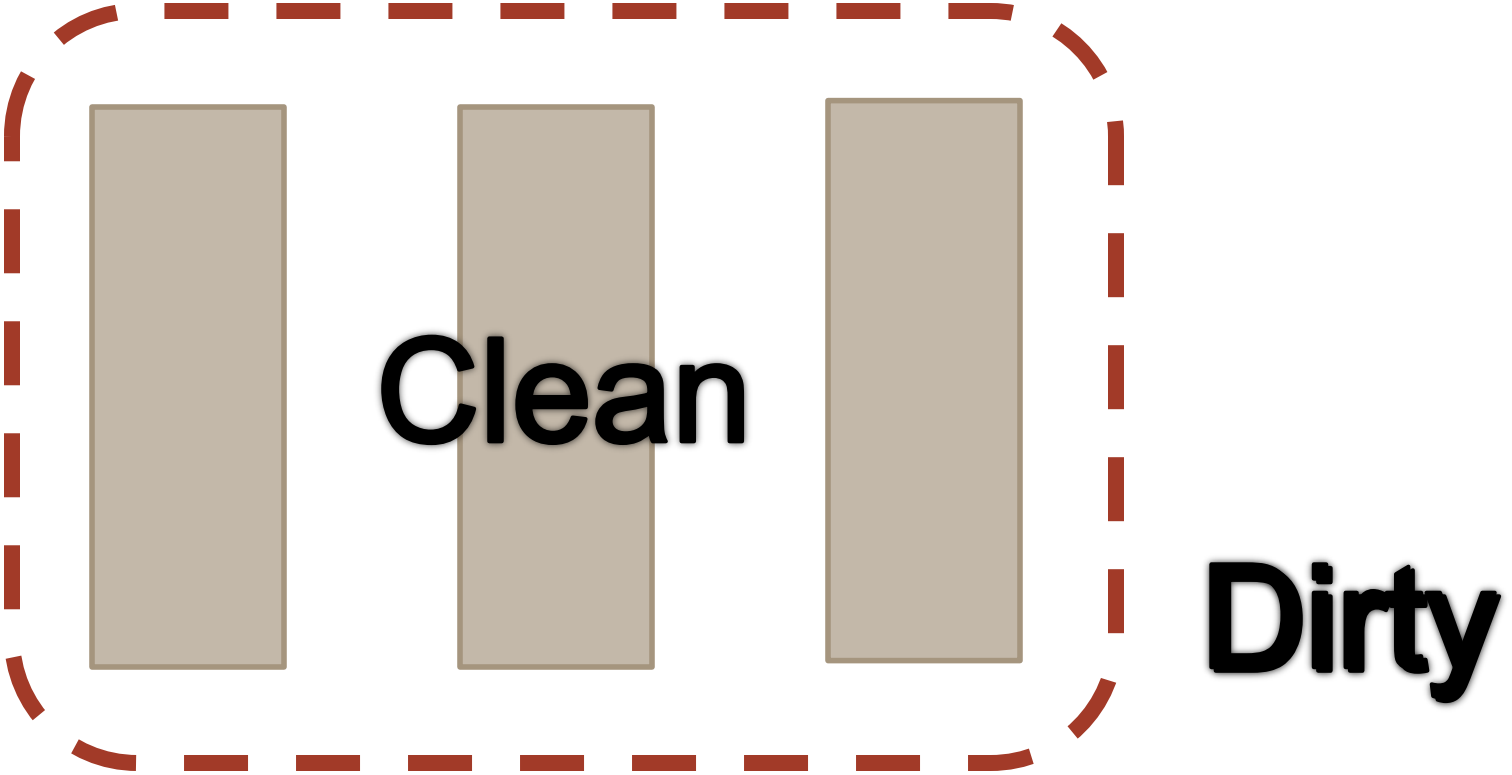
What have we seen in Minnesota?

- With 30 years of influenza experience, we did not expect to have >100 cases of HPAI



- Our understanding of influenza was challenged.
- The greatest risks were not addressed.

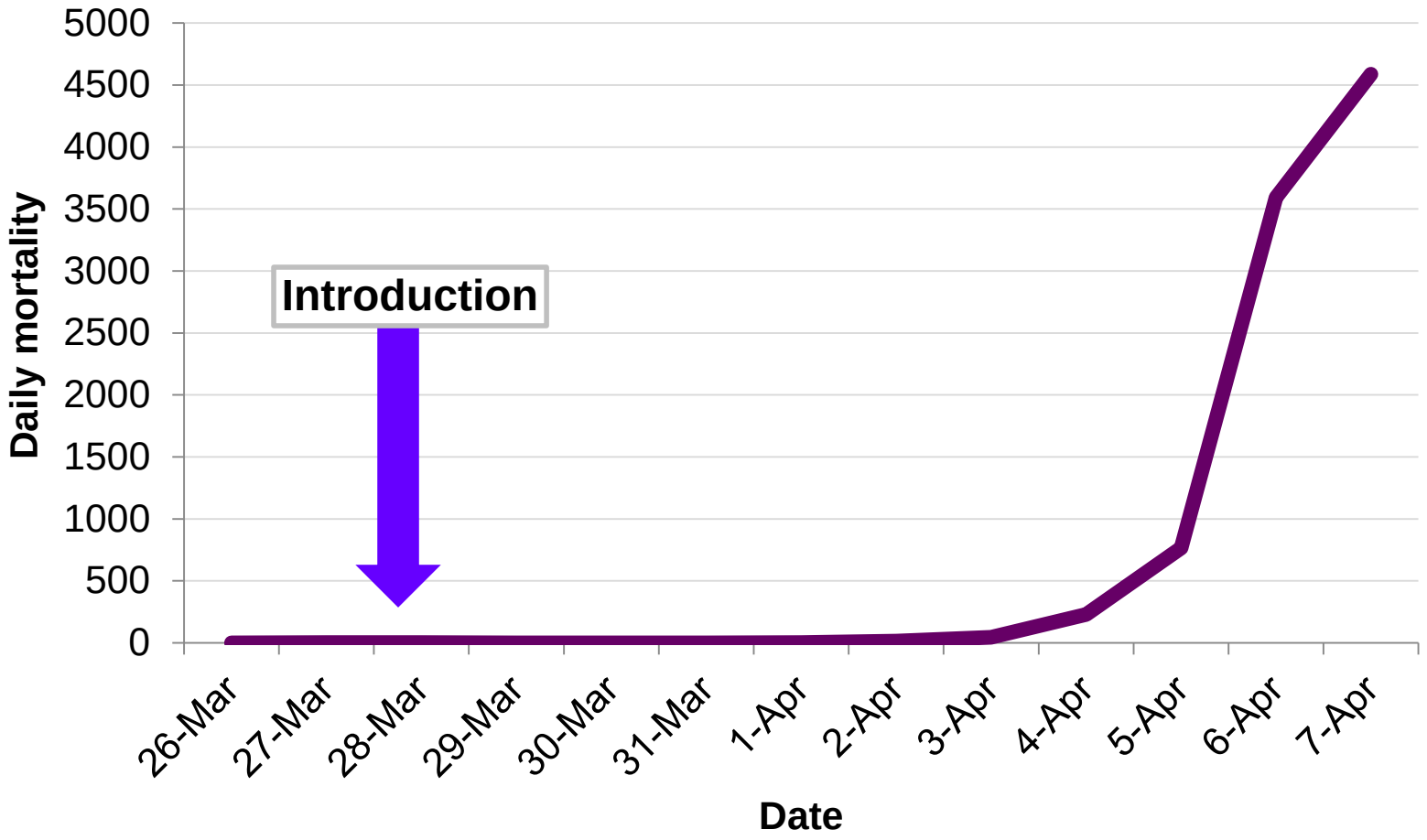
Biosecurity systems

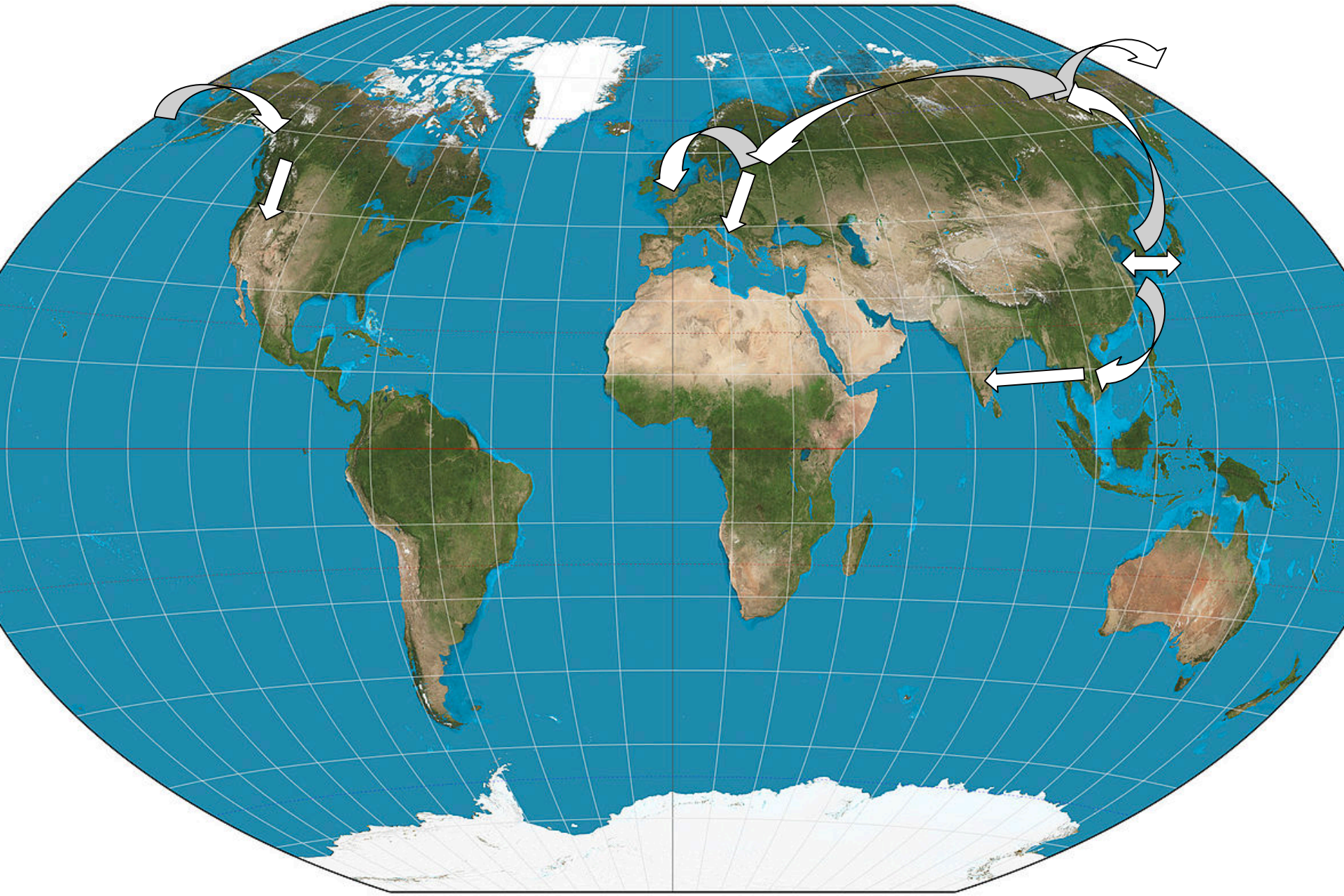


Your greatest threat is your neighbor.

Your greatest threat is outside your barn door.

The incubation is period is long…





Global spread is not the only challenge

The spread to new species is just another symptom of the failure to control.

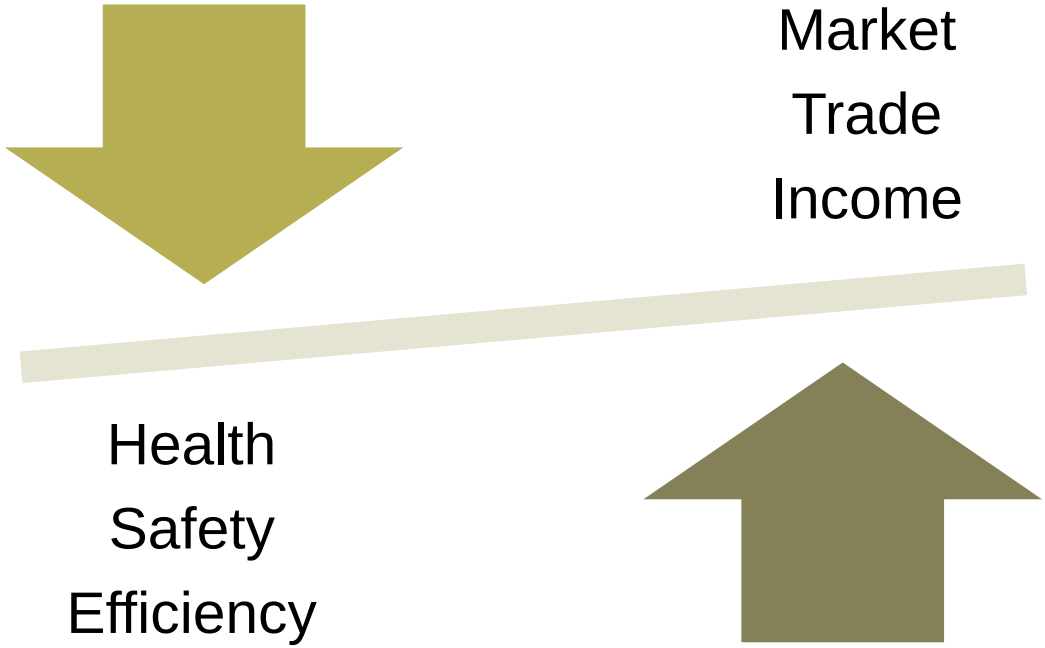
The ubiquitous nature of the cassette of internal protein-genes from H9N2 continue to fuel the emergence of zoonotic viruses.

H7N9, H10N8 are just the most recent examples.

What is next?

Prevention starts with detection

- When the cost of detection exceeds the benefit of control, detection will no longer happen
- Without detection, prevention and control are impossible.



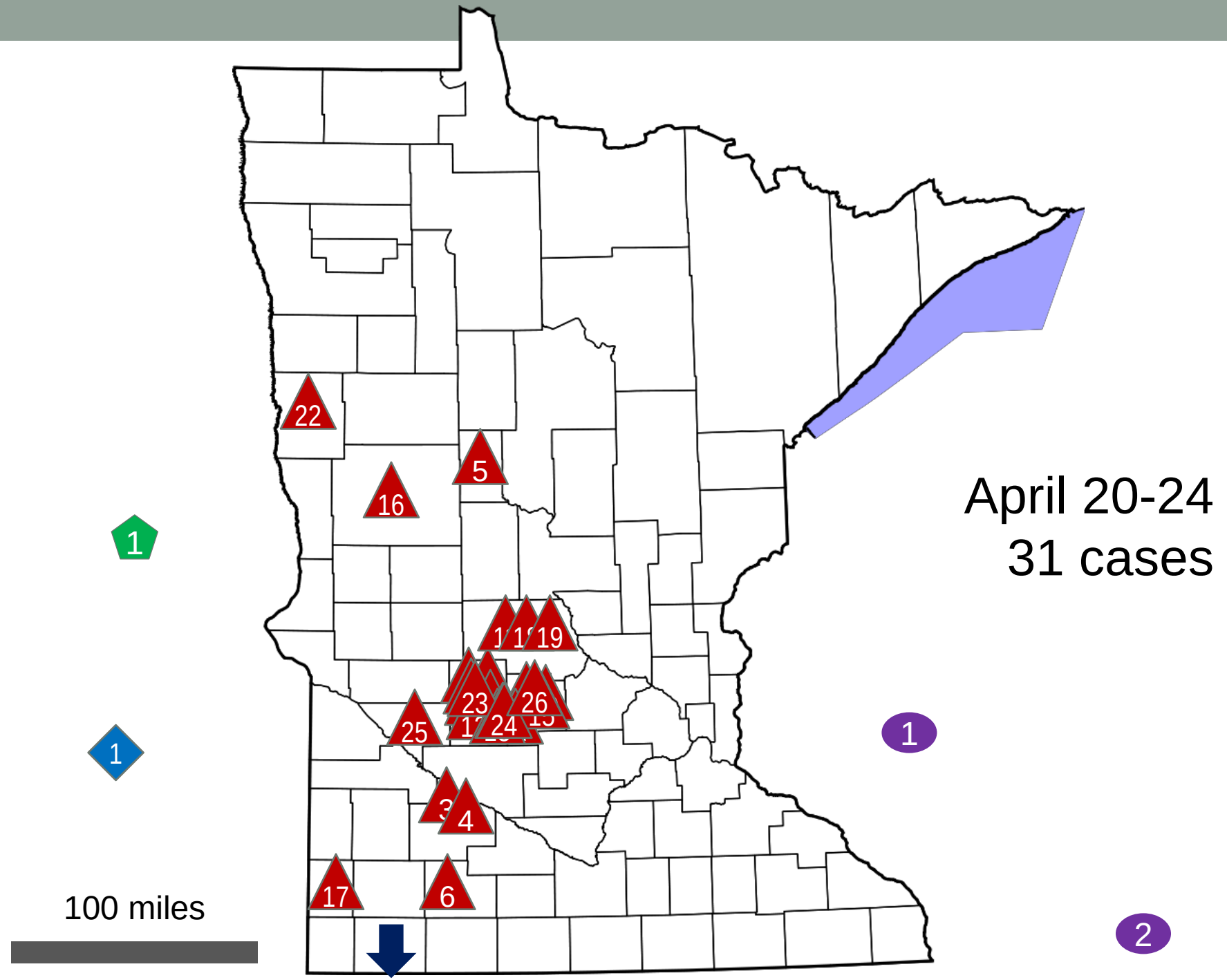
Preventing control, promoting spread

- The costs of control vary by location, culture, economy
  - The immediate loss of protein is a cost that has been exceeded, leading to the trade of dead and dying poultry.
  - The cost to political stability reduces the political will to solve the H5 issue using our current approaches
  - The cost to brand and markets is an unintended consequence and could be exceeded

- At a global level the costs of detection have not been balanced because there has been no control and thus no benefit.

CONTROL

A page from the Minnesota experience



April 20-24
31 cases

Control zone out of control

- We had 57 control zones in Minnesota alone on Apr 24
- Each zone is a 10 km circle, that's 314 km^2

Control workforce spread too thin

In that zone, every flock is visited, swabbed and tested. Lots of man hours.

Another look at control

- We can't do it the way we say we will because the virus will win

- A modern farm may house 5 million hens
- A typical flock size is 100,000 hens.
  - 30-40 people working 8 hours can depopulate a flock
- That would be:
  - 2 million = 20 days
  - 5 million = 50 days

In 50 days and after 5 million bird passages, what would the virus look like?

Its time to admit we have a problem

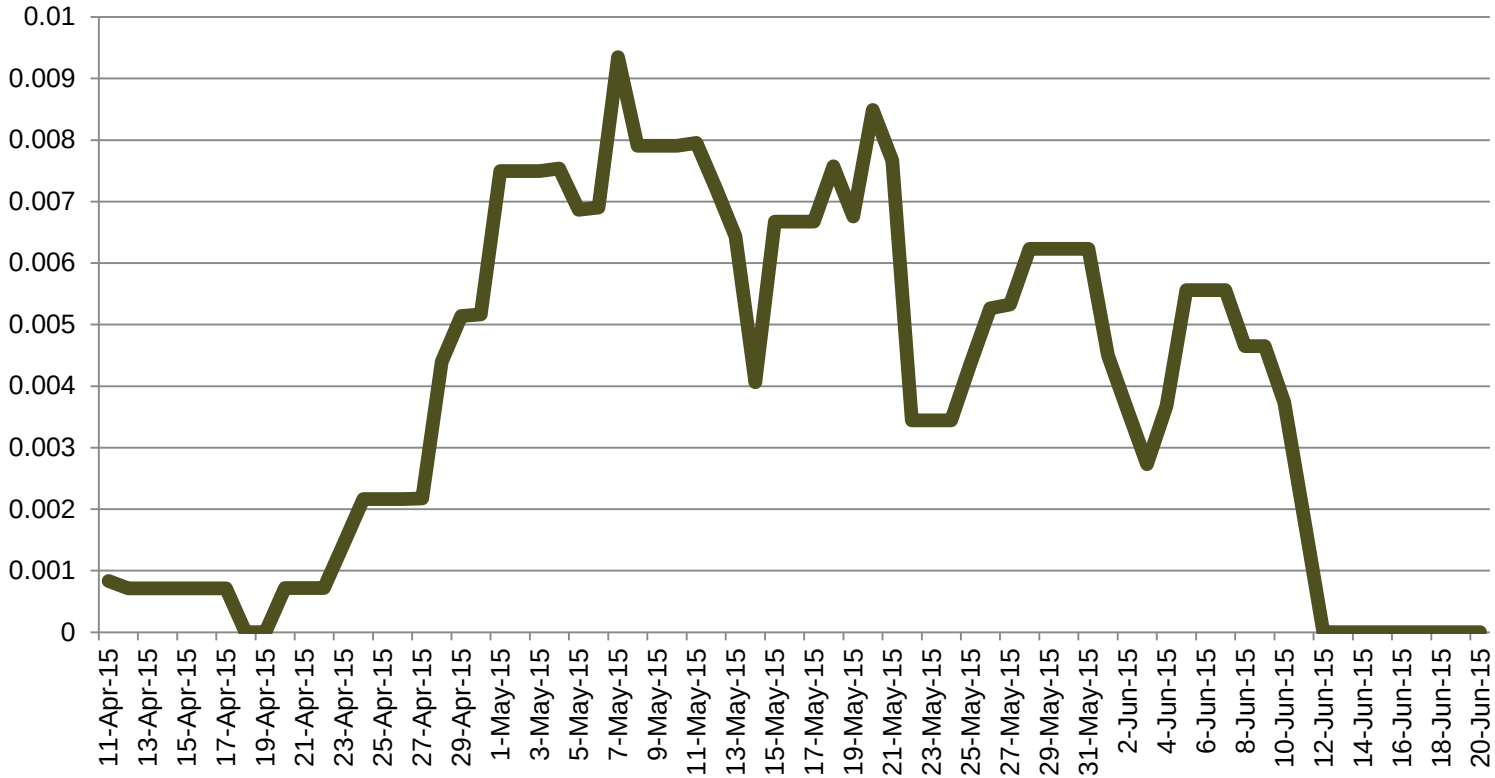
- Prevention strategies prevented by competing forces
- Endemic infections a world away providing new challenges
- Control strategies that have not evolved to meet a new reality.

We need a better way.

ERADICATION

…our progress in Minnesota

Minnesota's turkeys



Eradication misapplied

- Global emphasis has been on eradication of HPAI in gallinaceous poultry
  - And yet spread continues
  - And yet new viruses emerge

- The central role of domestic duck populations in the emergence and persistence of new influenza viruses has not been successfully addressed.

It is time to focus on the source.

Our existing dogma limits our ability to use the best science

- Prevention – *It is time to rethink biosecurity.*
- Surveillance – *It is time to remove the barriers.*
- Control – *It is time to evaluate the effectiveness of stamping out across a variety of scenarios.*
- Science – *It is time to use it.*

One example

- We don't use vaccines because we *know* that they will make things worse
  - For nearly 20 years, we have had a pathogen that
    1. Kills animals
    2. Kills humans
    3. Has spread across the globe
  - The world and technologies available today are way more advanced than where we were when we created that dogma.

Can it really get worse?

Time to see if it is true.

Turns out…

- We decided that vaccination was dangerous before:

1. DIVA strategies that differentiate infected from vaccinated animals were developed
2. We had recombinant, genetically engineered precision tools for vaccination.
3. Private industry had grown to unimaginable levels.
4. In fact, we are a lot different today than we were in 1996.

Advances since 1996

- We have diagnostic laboratory networks
  - In fact, our ability to test, has evolved beyond our regulations!
- Genomic sequence databases that unlock mysteries of transmission and give us great potential to move forward with new tools
- Rapid communication across the globe.
- Most importantly a new generation of poultry producers, regulatory officials and scientists ready to take on the challenge

How can we use these new capabilities to meet the challenge?

- What actions do we need to take?

- Isn’t it time to get our ducks in a row?