Food Security Implications with an Animal Disease Incident

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Food Security

“…Access by all people at all times to enough food for an active, healthy life.”
- USDA, ERS

Three Pillars:
- Food availability (consistent quantities)
- Food access (sufficient resources)
- Food use (knowledge of nutrition/sanitation)
- World Health Organization
“Animal Disease Incident”

- Animal disease outbreak
- Food safety event
  - Vertical transmission or contamination
- Zoonosis
  - Contact with animals or unprocessed products
Outline

- Perspective from a primary breeding company
- Transboundary diseases
- Zoonotic diseases
- Genetic modification of breeding stock
- Food safety
- Case study – USA HPAI outbreak
There will soon be seven billion humans on Earth, but how does that number compare to other species on the planet? We are certainly outnumbered by ants. Harvard biologist and ant expert Edward O. Wilson has estimated that there are a thousand trillion to ten thousand trillion ants at any one time.* That would be about a million ants for every one of us. And doesn’t it seem like that when they invade our kitchens?

Estimating animal populations, especially wild ones, is hard, but here’s a look at one category of animals we can count: the ones we eat. —Nigel Holmes

*And they’re edible. Ants are a good source of protein and are considered a delicacy in many parts of the world.

Number of animals killed for food
Worldwide, 2009

- 1.7 million camels
- 24 million water buffalo
- 293 million cows
- 390 million goats
- 518 million sheep
- 633 million turkeys
- 1.1 billion rabbits
- 1.3 billion pigs
- 2.6 billion ducks
- 52 billion chickens
Sources of Poultry Genetics

- Specialized industries
  - Chicken Meat
  - Eggs
  - Turkeys
  - Ducks

- Consolidated centers of breeding
  - USA, UK, France, Germany, Canada, Netherlands
Relevance of Primary Breeders
(Chicken World Production - nearly 52 billion chickens)

Account for over 95% of world's production

Others 4%

1ry Breeders - direct impact from the USA

About 60% of the world's production is accounted for by product (all genetic pipeline) originated in the USA
Hy-Line International

- Only USA based egg layer breeding program
- 80th anniversary
- Products in >120 countries
  - ~42% of world egg layers
  - ~70% USA market share
- Committed ownership
  - EW Group
Committed Ownership

World leader in poultry breeding, biotechnology

Significant re-investments

Committed to long term genetic progress
Pedigree Farm
Transboundary Diseases
Transboundary Diseases

Control vs. eradication
- Government/industry provided indemnity
- Reporting
- Surveillance capabilities

Vaccination

Biosecurity
- Global trade of feed ingredients and PEDv
Transboundary Diseases

Examples:
- Highly Pathogenic Avian Influenza
- Foot and Mouth Disease

What do they mean for trade?
- Non-tariff trade barriers
- Risk assessments by trading partners to assess situation
- Negotiations!
Transboundary Diseases

Models to Protect Trade:

- **Regionalization**
  - Geographic separation from affected premise(s)

- **Compartmentalization**
  - Specific, defined sub-populations with distinct biosecurity and surveillance

- Require pre-negotiation and trust
Compartmentalization

NPIP - Poultry Primary Breeder Avian Influenza Clean Program
Zoonotic Diseases
Zoonotic Diseases

- Interface of humans and animals
  - Intimate contact
  - Multiple species intermingled on farms
  - Interface with wildlife

- Commensal bacteria
  - Salmonella
  - Campylobacter
Zoonotic Diseases

- **Use of antibiotics**
  - Residues?
  - Resistant bacteria?

- **Zoonotic potential increases disease incident status**
  - Consumer confidence
  - Governmental agency involvement
Genetic Modification of Breeding Stock
Genetic Modification:

- Traditional population breeding
- Genomic selection
- Gene deletion
- Transgenic capabilities (GMO?)

Consumer acceptance?
Do consumers (want to) understand?
By MICHAEL CASEY / CBS NEWS / September 8, 2015, 5:57 PM

Genetically modified chickens could beat bird flu

A baby chick, genetically modified to block transmission of bird flu, glows under an ultraviolet light, next to a chick that has not been modified, in this undated handout photo provided by Norrie Russell of The Roslin Institute, University of Edinburgh. Researchers insert a green fluorescent protein into the GMO birds to easily identify them during experiments to potentially reduce deadly bird-flu infections. / REUTERS

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Centers For Genomic Research

- Private industry labs
- Government
  - USDA, ARS
- Collaborative centers
  - Iowa State, UC Davis
  - Roslin Institute, Edinburgh
Animal Disease Resistance

- Hy-Line Marek’s challenge
- Field testing
- Good quality vaccines, proper application
- Few drugs for treatment
Food Safety
Food Safety

- Food chain is extremely vertically integrated
- Impact of few breeding companies
- Consumer assumption food should aseptic?
Food Safety

- Animals involved in a major disease incident not included in food chain
  - A luxury some countries don’t have:
    - Ex. HPAI in Egypt
- Implications of consumer education
- Proper food handling and cold chain
Food Safety

Animal medications regulated

- 2017 VFD
- Residues prevented with veterinary oversight
- Implications on animal welfare...
USA HPAI 2014-2016

- Wild waterfowl virus
- Breaches in industry biosecurity
  - Rapid/expansive lateral spread
- Domestic consumer confidence remained intact
- Fear of zoonosis
- Export markets drastically affected
Figure 9. HPAI Detections by Subtype in All Birds, As of June 11, 2015 PM (as reported on www.aphis.usda.gov) *one or more detections may have occurred in county
Global Supply of Breeding Stock

Entire markets unable to receive new breeding stock

- China
- Thailand

Strategic moves to protect large markets

- $$$ investments, time, no guarantee
Global Supply of Breeding Stock

- Ongoing negotiation with USDA → Trading partners
- Dynamic situation
- Foreign delegation visits to USA
- Easier to follow predetermined protocols (peacetime vs wartime)
Genomic Selection?

- Samples from HPAI survivor birds
  - Mexico H7N3
  - USA H5N2
  - Markers for resistance? Reason they survived?
  - Gene editing potential?
  - Basic science research to be shared and published
Future Considerations

- Moving breeding stock to alternative states, countries, or continents
  - Protect genetic lines
  - Protect customers and distribution
- Biosecurity infrastructure and training
- Global trade negotiation
- Looking around the corner…