Surveillance of Livestock for Zoonotic Diseases and Veterinary Bio-Threat Agents

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Sharing human-animal agents

- Agents don’t distinguish between humans and domestic animals
- Agents regularly cycle between animals and humans through
  - Direct contact
  - The human food, animal feed system
  - Other animal products
  - The environment (air, water, soil)
Agent sharing is dynamic and big news stories!

Sharing involves both natural spread of disease and human intervention

- Anthrax bioterrorism in US
- Foot and mouth epidemic in UK
- Salmonella and E coli recalls in US
- Spread of West Nile virus across US
- Rabies epizootic in US
Exotic diseases have high visibility

Foot and Mouth Disease virus
Classic Swine Fever virus
African Swine Fever virus
Rinderpest virus
Rift Valley Fever virus
Avian Influenza virus
Newcastle disease virus
Venezuelan Equine Encephalitis

List based on economic trade impact and ease of transmission
Many zoonoses and bio-threat agents are endemic

**Bacterial:**
- *Bacillus anthracis* (Anthrax)
- *Yersinia pestis* (Plague)
- *Francisella tularensis* (Tularemia)
- *Coxiella burnetii* (Q Fever)
- Salmonella
- Shigella
- *Cryptosporidium parvum*

**Viral:**
- Viral encephalitides

**Toxin:**
- *Clostridium botulinum* (Botulism)
Anthrax in Minnesota
Anthrax in Minnesota

Year of infection

# of Infected Herds
Anthrax

2001

- First death, June 19
- 19 Premises
- Approx 80 animals
- Cattle, horses, deer
Reported Cases of Human Tularemia
1990-1998

Number of Cases (Percentiles)
1 to 2 (below 75%)
3 to 5 (75-90%)
6 to 15 (90-99%)
16 to 28 (above 99%)

Map showing the distribution of reported cases of human tularemia across the United States from 1990 to 1998.
Veterinary diagnostic laboratory role: individual animals

- Diagnostic work-up for ill animals
  - Individual case work-up to establish diagnosis, support treatment
  - Outbreak investigation to rule out exotic agent (foreign animal disease)

Note: limited government subsidy and no third party payer except suspected foreign animal disease

Document disease status of animals to support trade
Veterinary diagnostic laboratory role: populations

- Support targeted disease control and eradication programs
  - Federal: Bovine tuberculosis, brucellosis
  - State or individual: Leucosis, paratuberculosis
- Public health and food quality programs
  - Milk and meat samples
- Disease surveys, ad hoc and NAHMS
- Herd or area testing to document status
National Animal Health Monitoring System

- Periodic national surveys based on statistical sampling of herds and animals
- Collects data on risk factors (husbandry, housing, feeding, demographics)
- Implements collection of biological samples from subsets to characterize national prevalence
Vision for the future

• Integrated and coordinated animal health/public health surveillance
• Build linkages between animal health, wildlife, food surveillance and public health
• How do we get there from where we are now?
Critical Assessment: Strengths

- Diagnostic laboratories in every state
- National reference laboratories for domestic and exotic diseases
- Dedicated cadre of diagnosticians with extensive experience
- National system for baseline prevalence information (NAHMS)
Weaknesses

• Lack of epidemiologic capacity within veterinary diagnostic labs
• Sampling by convenience
• Resources vary widely between states
• Little uniform reporting or diagnostics
• Little sharing of data for regional or national summaries
• Limited collaboration with public health
Threats to successful integration

• Failure to recognize link between livestock surveillance and public health
• Conflict of paradigms
• No new resources committed to system
• Continued deterioration of livestock surveillance infrastructure
• Additional polarization between animal health and public health
Opportunities

- Recent events (FMD and anthrax) heightened recognition of importance
- Willingness and commitment to strengthening the system
- Proven examples of coordinated surveillance enhancement (PulseNet)
- Homeland security initiative offers resources to encourage enhancements
Salmonella Surveillance

- Salmonellosis is reportable in Minnesota and all *Salmonella* isolates are sent to the MDH for confirmation
- Beginning in 1996, VDL isolates sent and subtyped by MDH
- Human cases were interviewed with a standard questionnaire regarding possible sources of infection.
Date of Death among Cats and Illness Onset among Human Cases Minnesota, 1999

- Cats
- Humans with prior cat contact
- Secondary human cases

No. of Cases

Aug 1999

Sept 1999

Oct

Nov

Dec

Jan 2000

Feb

Mar
Other MN examples

- Anthrax
- Arboviruses (WNV and EEE)
- Other bioterrorism agents
- Drug resistant salmonella
- Chronic Wasting Disease
Benefits of integrated animal-public health surveillance

- Better understanding of endemic disease dynamics
- Monitoring of agent/disease spread
- Early detection of emerging diseases
- Rapid response to bio-threats
- Further characterization of risk
The Minnesota Integrated Surveillance Team

- The University
  - Jim Collins, VDL
  - Craig Hedberg, SPH
  - Dick Isaacson, CVM
  - Scott Wells, CVM
  - Tim Schacker, COM
- Board of Animal Health
  - Bill Hartmann
  - Kris Petrini
- Dept of Health
  - John Besser
  - Heidi Kassenborg
  - Joni Scheftel
  - Kirk Smith
- Dept of Agriculture
  - Bill Krueger
  - Kevin Elfering
- Dept Nat Resources
  - Joe Marcino
From Farm to Table: Safety & Biosecurity in Food Production Systems

University of Minnesota
Courses

• Surveillance of Foodborne Diseases in Humans
• Surveillance of Foodborne Diseases in Animals and Plants
• Public and Environmental Health Problem Solving: The Changing Food Industry
• Food System Biosecurity: Threats
• Food System Biosecurity: Preparedness/Response
• Applications of Microbiology to Food Monitoring
Global Food System
Field Trips

To build better understanding of the complexity of the food system....

- Pork
- Dairy
- Fresh Produce

- Information
  - WWW.CPHEO.UMN.EDU/INSTITUTE
  - 612.626.4515