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

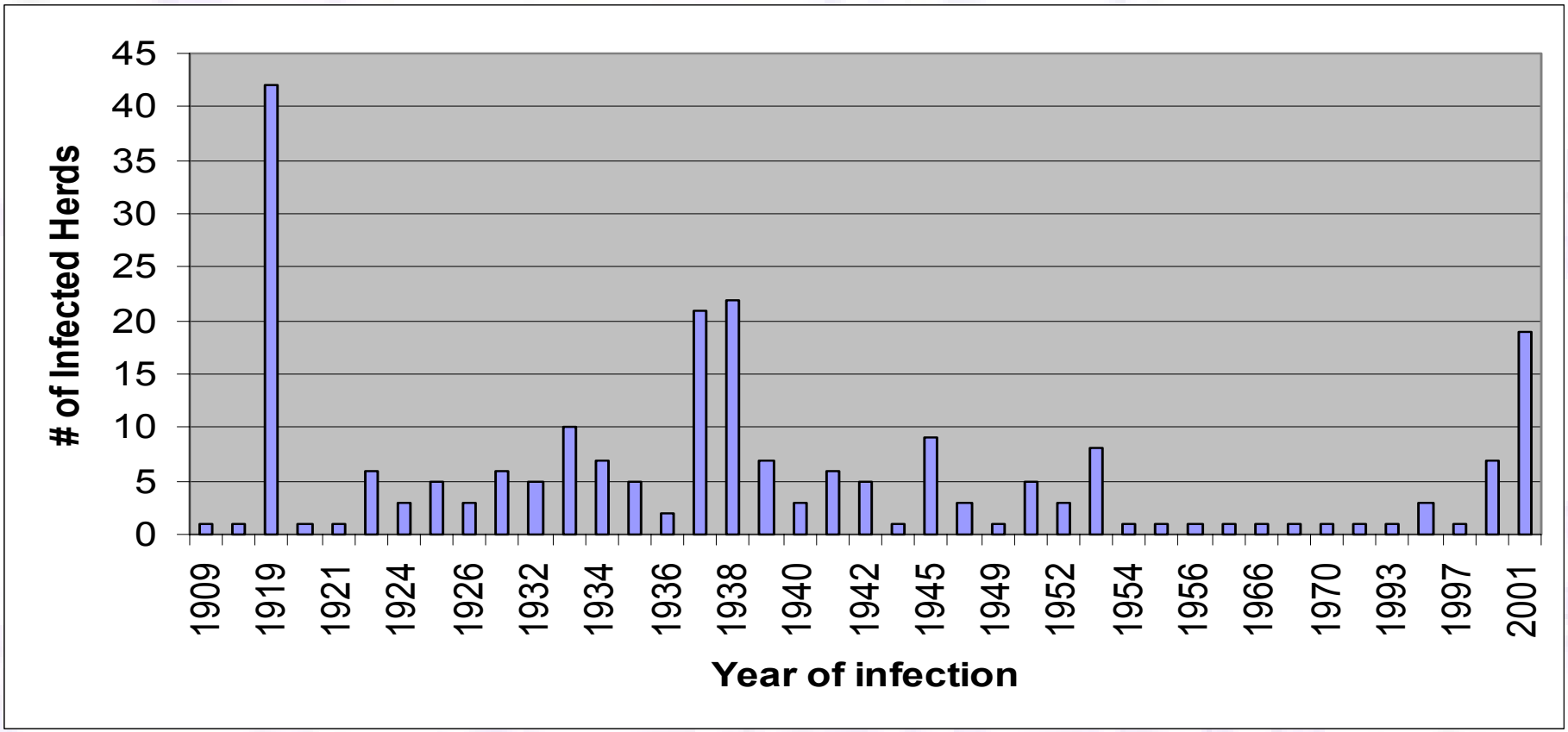
Bacterial:

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

- **Viral:** **Viral encephalitides**
- **Toxin:** *Clostridium botulinium* **(Botulism)**

Anthrax in Minnesota

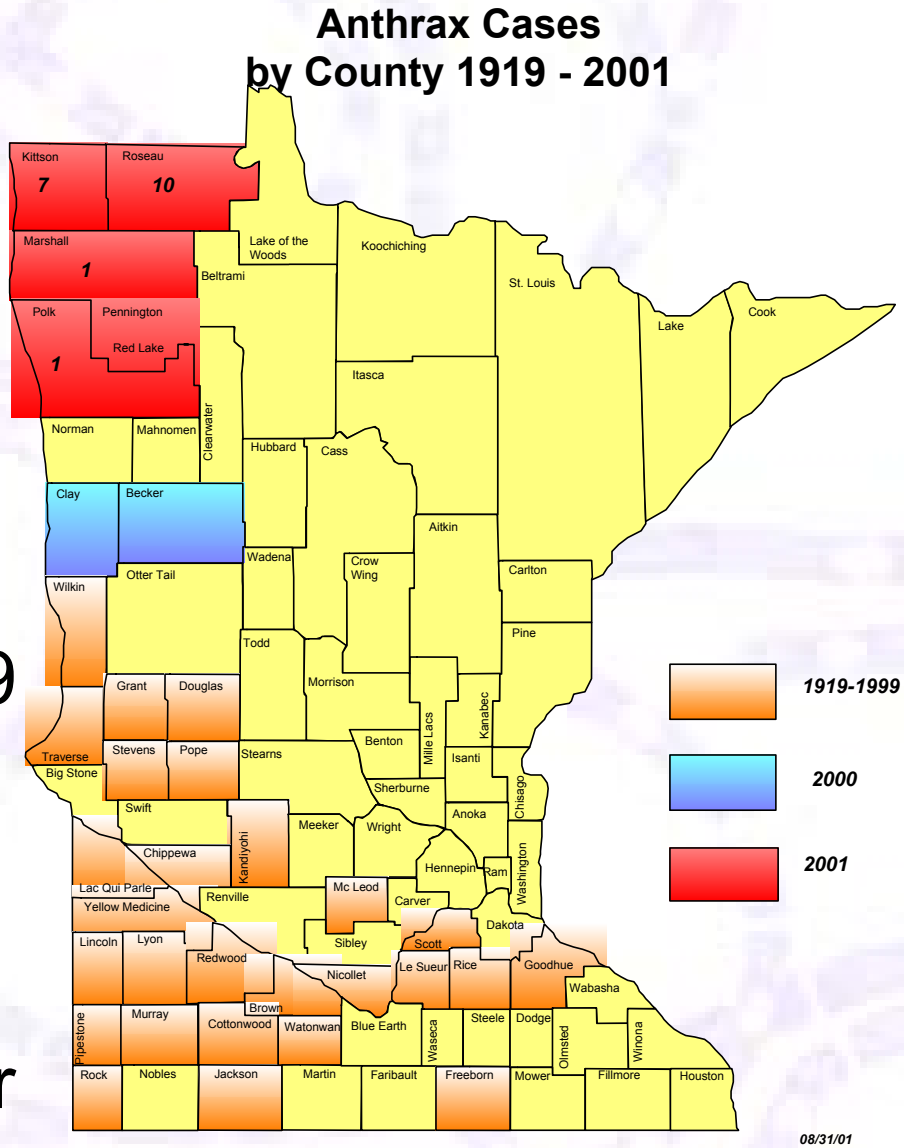
Anthrax in Minnesota



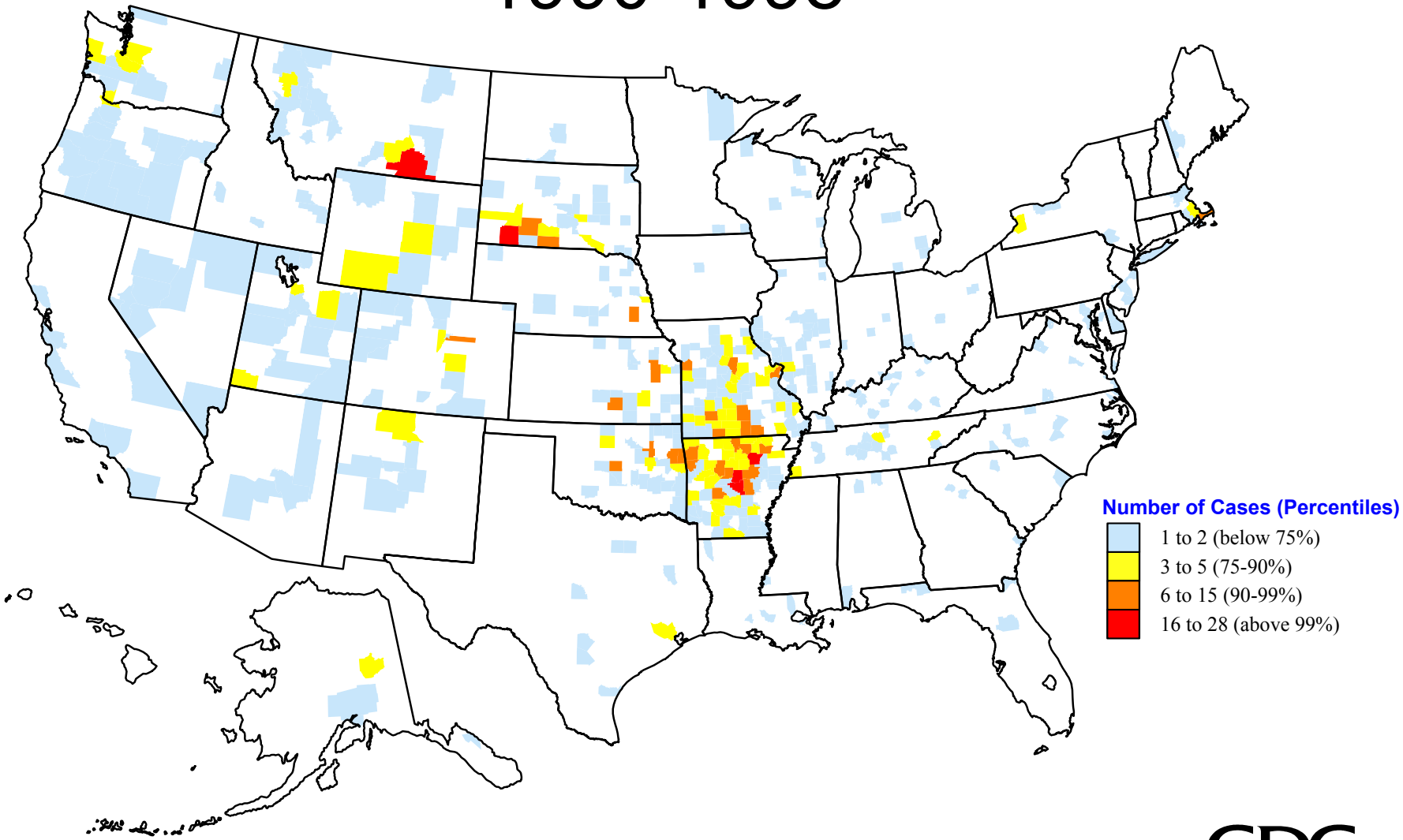
Anthrax

2001

- First death, June 19
- 19 Premises
- Approx 80 animals
- Cattle, horses, deer



Reported Cases of Human Tularemia 1990-1998



CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

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

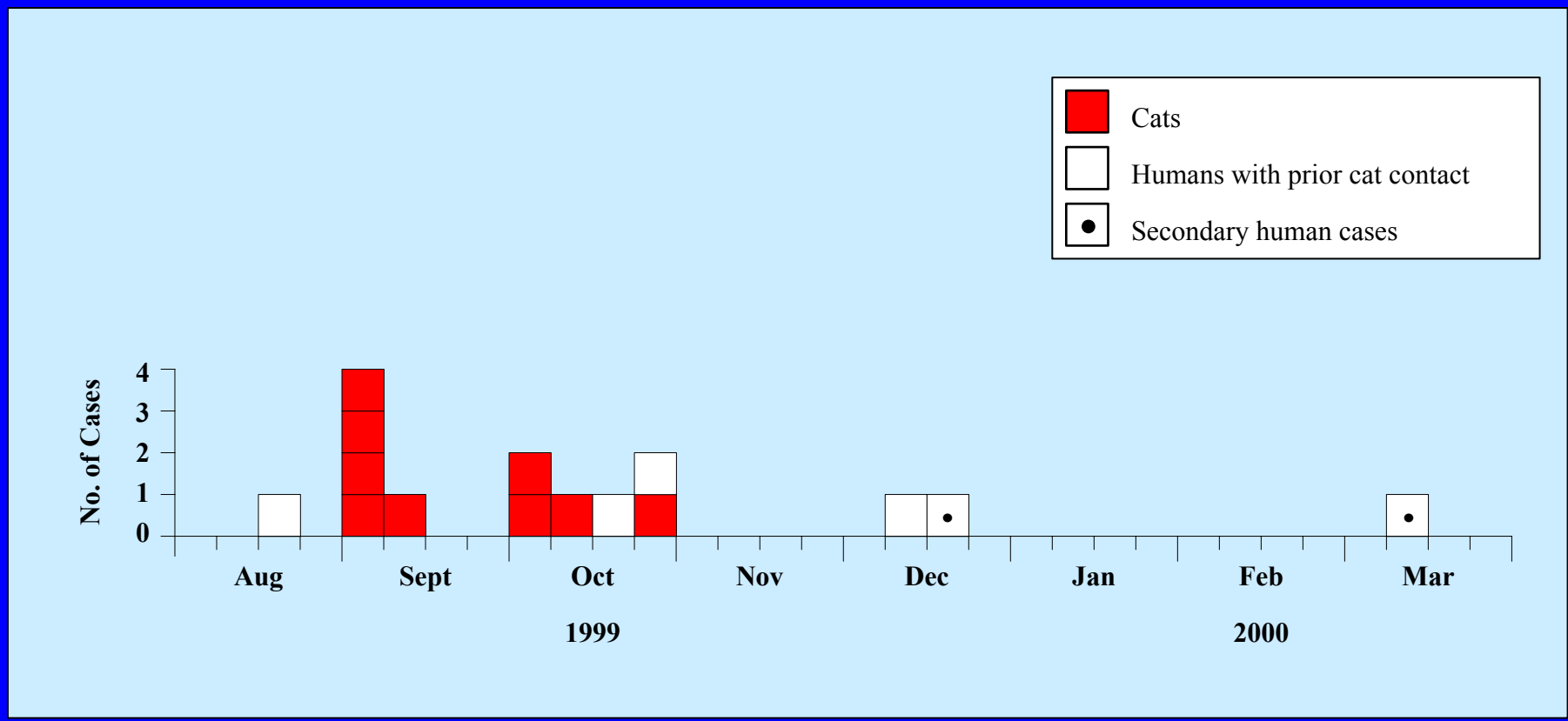
Opportunities

- 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



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