Data Sources Needed to Assess Animal Health Risk: The US National Animal Health Surveillance and Monitoring Systems

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The United States’ National Animal Health Surveillance System (NAHSS) is a Veterinary Services’ initiative to integrate existing and future animal health monitoring and surveillance systems. The NAHSS is a comprehensive and coordinated system intended to systematically collect, collate, and analyze animal health data and to promptly disseminate the information to those for the purpose of taking action. The four major goals of the NAHSS are: 1) early detection and global risk assessment of foreign animal diseases; 2) early detection and global risk assessment of emerging animal diseases; 3) enhance surveillance for official disease programs; and 4) monitoring and surveillance for diseases with a major impact on marketing and production. The NAHSS is a network of partners--Federal and State governmental agencies, veterinary diagnostic laboratories, public health, wildlife, universities, industry and producers groups. The NAHSS operates under several major concepts including: national, standardized, objective-driven, risk-based, and comprehensive and integrated.

There are many elements that combine to comprise a surveillance system, these include: the design, collection, standardized laboratory testing and quality control, data collation and management, surveillance analysis, and communication of results under a coordinating entity. Veterinary Services’ National Surveillance Unit (NSU) is responsible for the overall coordination of the NAHSS and the specific tasks of surveillance design, evaluation, data management, analysis and communication. Surveillance design begins with a process of prioritization. Veterinary Services and OIE surveillance standards are considered in conjunction with disease epidemiology and risk of disease occurrence. Sampling schemes are designed around points of collection of surveillance information (surveillance streams), targeting populations with the greatest probability of disease whenever possible. Surveillance streams include: on-farm, veterinary diagnostic laboratories, slaughter establishments/abattoirs, livestock auction markets, and from feral animals. Accredited veterinarians, wildlife biologists, port/border inspectors, and producers collect observational and biological samples.

Much of the laboratory surveillance testing occurs in the 58 National Animal Health Laboratory Network (NAHLN) laboratories. The objectives of the NAHLN are surveillance for routine animal disease diagnosis and support for emergency diagnosis, including bioterrorism events. Personnel in the NAHLN laboratories are trained and proficiency tested using standardized diagnostic protocols for quality assurance. Many laboratories have the capability to electronically transmit sample testing data into a centralized database for collation and management. Surveillance data are analyzed to estimate or determine: a threshold of disease detection; disease occurrence (prevalence/incidence); disease freedom; time to disease detection; spatial distribution of disease; and/or zoning and compartmentalization. The NSU develops and
modifies methodology for surveillance design and analysis, for example: targeted surveillance methodology, estimation of value of surveillance, epidemiologic modeling, and methods using expert opinion to quantify risk. Regular summary and analytical surveillance reports are distributed to decision-makers, program managers, field operations, laboratory personnel, and other stakeholders. The National Animal Health Reporting System (NAHRS) is one example of communication and coordination of surveillance results.

The following are examples of specific systems in the overall NAHSS. The National Animal Health Monitoring System (NAHMS) conducts national commodity-based studies to assess industry demographics and management practices. Foreign animal and emerging disease surveillance systems use trained domestic and international veterinarians, inspectors as well as open-source scanning for prevention and rapid detection. Examples of disease-specific surveillance systems are bovine brucellosis, BSE, scrapie, swine influenza virus, equine arboviruses, and viral hemorrhagic septicemia. Objectives for these programs vary from rapid detection, eradication, spatial distribution, prevalence estimation, to proof of disease freedom. Relevant analyses are performed regularly to support these objectives. Finally, a comprehensive and integrated swine surveillance system is being used as a model for other species for its integration of disease-specific surveillance programs, integration of surveillance streams and comprehensive single sample testing to maximize resources and efficiency.
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Joint AESAN/EFSA Workshop

*Science Supporting Risk Surveillance of Imports*

Seville, Spain
February 10, 2010

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Safeguarding Animal Health
National Animal Health Surveillance System (NAHSS)

• NAHSS is a comprehensive and coordinated system to:
  - systematically collect, collate and analyze animal health data; and
  - promptly disseminate vital information to those who might take action.

• VS initiative to integrate existing animal health monitoring programs and surveillance activities

Safeguarding Animal Health
NAHSS Strategic Goals

Goal: Early detection and global risk assessment of foreign animal diseases

Goal: Early detection and global risk assessment of emerging animal diseases

Goal: Enhance surveillance for current “program” diseases

Goal: Monitoring and surveillance for diseases of major impact on production and marketing

Safeguarding Animal Health
Key NAHSS Partners

- **Network of partners:**
  - Veterinary Services units
  - Veterinary Diagnostic Laboratories
  - Food Safety Inspection Services
  - Wildlife and public health agencies
  - Department of Homeland Security
  - Other Federal agencies
  - State agencies
  - Private veterinarians
  - Industry groups
  - Producers
  - Universities
Major Concepts Integral to the NAHSS

- National
- Standardized
- Objective driven
- Risk-based
- Comprehensive and Integrated

Safeguarding Animal Health
NAHSS—Elements of a surveillance system

- **Design**—Standardized, risk and objective-based
- **Collection**—Field force of accredited veterinarians, producers, wildlife biologists, and border inspection agents who collect observational and biological samples
- **Laboratory testing/standardization/QA/QC**—National Animal Health Laboratory Network

Safeguarding Animal Health
NAHSS—Elements of a Surveillance System

- **Data Collation and Storage**—Integrated information management systems
- **Surveillance Analysis**—Statistics, epidemiological and spatial models, adaptation and development of new methods
- **Communication of results**—Frequent reports to decision-makers, program managers, field operations, laboratories, other stakeholders
- **Coordinating entity**—National Surveillance Unit

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NAHSS-- Design Elements and Process

- Surveillance prioritization
- OIE and Veterinary Services surveillance standards
- Risk-based surveillance
- Surveillance stream based
- Targeted surveillance

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NAHSS-- Points of data collection

**Surveillance Streams**
- On-farm
- Veterinary diagnostic laboratories
- Slaughter/abbatoirs
- Livestock auction markets
- Renderers
- Feral/wild species
- Ports/borders

**Observational and biological samples**

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National Animal Health Laboratory Network—Laboratory standardization

- Network of animal diagnostic laboratories
- 58 participating labs
- Endemic and foreign animal disease testing
- Standardization--Proficiency tested and trained, quality assurance
- Electronic messaging of results

**Objectives—surveillance for routine animal disease diagnosis and support for emergency diagnosis, including bioterrorism events**

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National Surveillance Data Analysis

**Determination/estimation of:**
- Threshold of disease detection
- Occurrence (prevalence/incidence) of disease
- Spatial distribution of disease
- Disease freedom
- Time to detection of disease
- Establishment of zoning and compartmentalization (within and outside the compartments)

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National Surveillance Methods Development

- Surveillance Prioritization
- Expert opinion to determine risk-factor methodology
- Value of surveillance
- Targeted surveillance methodology
- Epidemiologic modeling for:
  - Time to disease detection
  - Herd prevalence
  - Predictive models for test and removal strategy

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Communication of Results– Surveillance reports

- Weekly, monthly, quarterly, annual reports
- Summary and analytical reports
- Audience varies– decision-makers, program managers, laboratory personnel, field personnel and other stakeholders including public

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Communication of Results--
National Animal Health Reporting System

• State reporting of disease occurrence
• Allows US to fulfill OIE reporting obligations
• Standardized case definitions for reporting

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NAHSS Coordinating Entity

Veterinary Services, National Surveillance Unit
• Unit solely dedicated to surveillance
• Mission:
  ➢ Design
  ➢ Evaluation
  ➢ Analysis
  ➢ Integration
  ➢ Coordination
  ➢ Prioritization
  ➢ Communication

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NAHSS—Combination of the elements into National Surveillance System

→ All elements combine into national surveillance systems

Surveillance ≠ Sampling

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National Animal Health Monitoring System

- National commodity studies on rotating annual basis
- Surveys to collect information on industry demographics and management practices
- Follow-up biologic sampling to assess disease occurrence
NAHSS—Examples of National Surveillance Systems

Foreign Animal Disease and Emerging Disease Surveillance

- Customs and Border inspection agents
- Import testing requirements
- State, Federal and Private accredited veterinarians
- International Services
- Open-source scanning
- Specific programs (CSF, HPAI, SIV)

**Objectives: prevention, rapid identification or proof of disease freedom**

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NAHSS– Examples of National Surveillance Systems

National Disease Surveillance Programs

• Bovine– BSE, brucellosis, tuberculosis
• Equine– arboviruses, EIA
• Avian– avian influenza
• Aquaculture– SVC, VHS

** Objectives– rapid identification, eradication, occurrence and distribution estimates, vaccine and reagent development
NAHSS– Examples of National Surveillance Systems

**Comprehensive Swine Surveillance**
- Integration of disease programs:
  - CSF, Psuedorabies, brucellosis, trichinae
- Integration of multiple surveillance streams
- Comprehensive testing of single sample for multiple disease
- Maximize efficiency and resources

**Model for integration of future surveillance systems**

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NAHSS Results-- Analysis and Conclusions

• Examples
  ➢ BSE
    • BSurvE and OIE points systems
    • Estimated prevalence
  ➢ Bovine brucellosis
    • Threshold detection of 1 in 1 M infected animals
    • Disease free status
  ➢ Scrapie
    • Spatial distribution
    • Eradication targets
Available Sources for U.S. surveillance data and information

- NAHSS website
- US Animal Health and Productivity Surveillance Inventory
- NAHMS Reports
- Emerging Animal Disease Notices
- US Animal Health Report

http://www.aphis.usda.gov/vs/nahss/

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Thank you for the invitation and your attention
Questions and discussion welcome