

National Surveillance for Swine Influenza Virus in Swine



Invasive Species Management
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Overview

- Background
- Current Situation
- Future of SIV surveillance in US



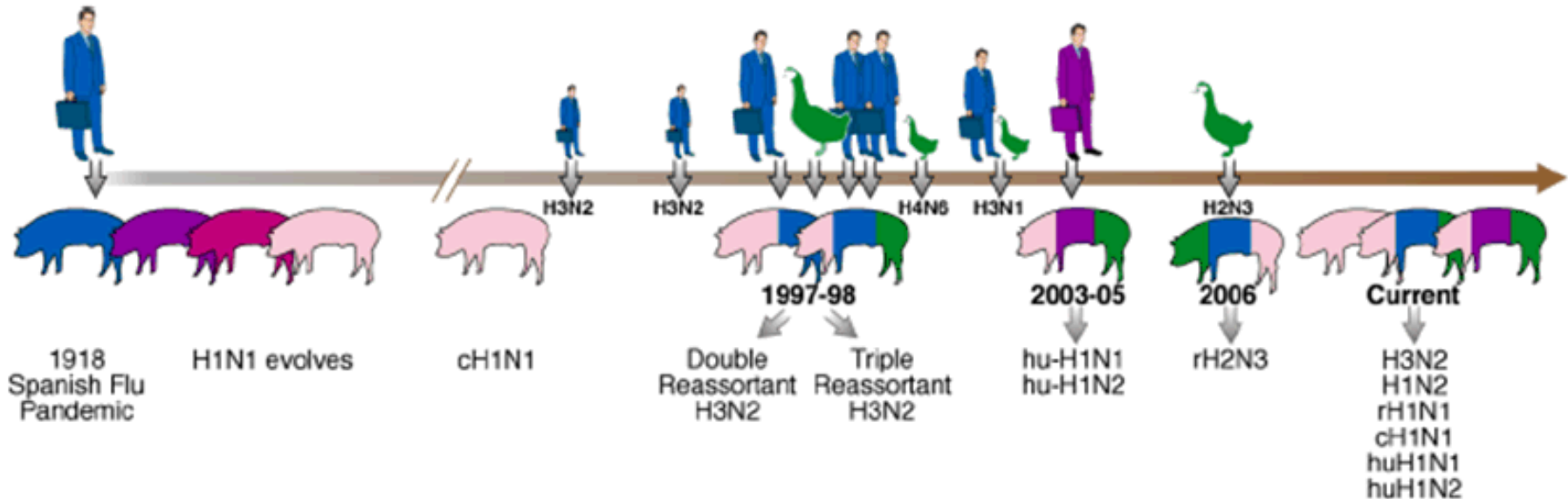
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Influenza in Swine

- **Endemic**
 - Is not a regulated disease in the United States
 - Is not a notifiable disease to the OIE
- **SIV Research and Surveillance**
 - Industry
 - Academia
 - USDA-Agriculture Research Service

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Swine Influenza in the U.S.



From: Vincent AL, Ma W, Lager KM, Janke BH, Richt JA. Swine influenza viruses a North American perspective. *Adv Virus Res.* 2008;72:127-54.

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Influenza picture in U.S. swine

- U.S. production systems
 - Large number of small producers (10% swine)
 - Small number of large producers (90% swine)
 - Predominant all-in-all-out production systems
- Control by biosecurity and vaccination
 - Commercial vaccines approved
 - Autogenous vaccine use common

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Animal health perspective*

- Serious swine health problem for many operations
 - Not a stable, single infectious agent
 - Need for:
 - improved vaccines
 - updated diagnostic reagents
 - national SIV data and isolates
- Began planning for SIV surveillance

*Pre-2009 pandemic H1N1

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Public health perspective*

- Pandemic preparedness
 - Novel influenza A virus infection of humans (including SIV) became a Nationally Notifiable Disease (June 2007)
 - Isolates for vaccine development
 - Diagnostic reagent updates
 - Ecology / Epidemiology of SIV in swine
- Began collaboration in SIV surveillance

*Pre- 2009 pandemic H1N1

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Early 2008- Interagency agreement between USDA and CDC*

- Collaboration with CDC on a proposal to initiate SIV surveillance and virus characterization
- Short term project (2 years) funding via Interagency Agreement (IAA)
 - USDA Veterinary Services
 - USDA Agriculture Research Service

*Pre-2009 pandemic H1N1

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Pilot Project Objectives*

1. Rapidly detect changes in swine influenza virus to increase the knowledge of the impact of SIV changes on swine health;
2. Provide diagnostic, epidemiologic, and experimental data to develop new diagnostic reagents, provide material for vaccine updates, and improve biosecurity practices.
3. Cooperation with CDC to meet public health mandate (share isolates and data)

*Pre-2009 pandemic H1N1

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Agency Roles / Responsibilities

Veterinary Services

- Develop and implement the surveillance plan
- Provide education / guidance to Industry, veterinarians and State animal health officials
- Provide epidemiologic analysis and reports

Agriculture Research Service

- Characterize selected emerging isolates identified through the surveillance project
- *In vivo* challenge and transmission studies
- Antigenic characterization with in-house reference sera
- Molecular analysis as necessary

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Agency Roles / Responsibilities

Centers for Disease Control and Prevention

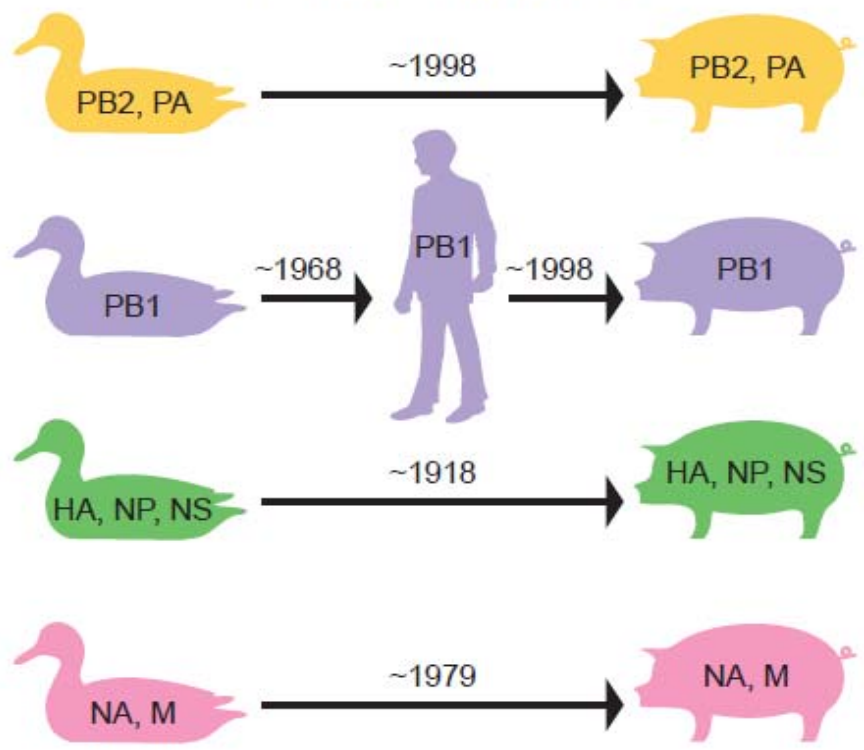
- Communication on confirmed human SIV cases with potential epidemiologic links to swine
- Share human data, tissues, antigens and isolates with VS and ARS
- Provide updates on new variants of human seasonal influenza A viruses as they emerge

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2009 Pandemic H1N1

R.J. Garten, Davis, Russell, Shu et al. Antigenic and Genetic Characteristics of Swine-Origin 2009 A (H1N1) Influenza Viruses Circulating in Humans, in *Scienceexpress* 12 May 2009; accepted 22 May 2009 Published online 22 May 2009; 10.1126/science.1176225 www.sciencexpress.org

Gene Segments, Hosts, and Years of Introduction



Triple Reassortant

Classical Swine

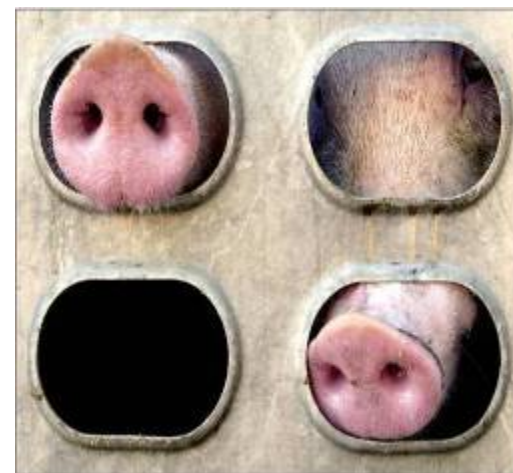
Eurasian Swine



2009 A(H1N1)

2009 Pandemic H1N1 Influenza in Swine

- Endemic SIV is still NOT reportable BUT 2009 pH1N1 is reportable to OIE as an emerging disease.
- Vaccines:
 - Some cross reactivity with commercial and autogenous vaccines
 - 2009 pH1N1 seedstock available to vaccine manufacturers –November Release projected



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Surveillance Challenges

- Voluntary surveillance
- Not regulated → not reportable
- Not a stable, single infectious agent
- Largest sample source (D-lab system) is not a part of regulatory medicine
- (+) 2009 pH1N1 swine → economic ramifications??



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Surveillance Goals

1. Determine if the 2009 Pandemic H1N1 virus currently exists in U.S. Swine
2. Detect new influenza virus strains in swine in a timely manner
3. Determine virus distribution of new influenza virus strains (if present) in swine
4. Determine the genetic characteristics of viruses as necessary for vaccine and diagnostics development

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SIV Surveillance Objectives

1. Detect the presence and distribution of viruses that are, or may be of public health concern (including 2009 pH1N1) to protect public health and swine markets.
2. Identify genomic sequences of viruses that may be relevant for vaccine or diagnostic reagent development
3. Collect geographical and temporal data related to SIV in the United States swine population

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Broader Surveillance Objectives

- Detect changes in the SIV genome of isolates from sick pig cases submitted to NAHLN-associated diagnostic laboratories from producers and swine veterinarians. Isolates will be shared with CDC per IAA.
- Provide accessible geographical and temporal data related to genomic sequences of interest to animal and public health officials.

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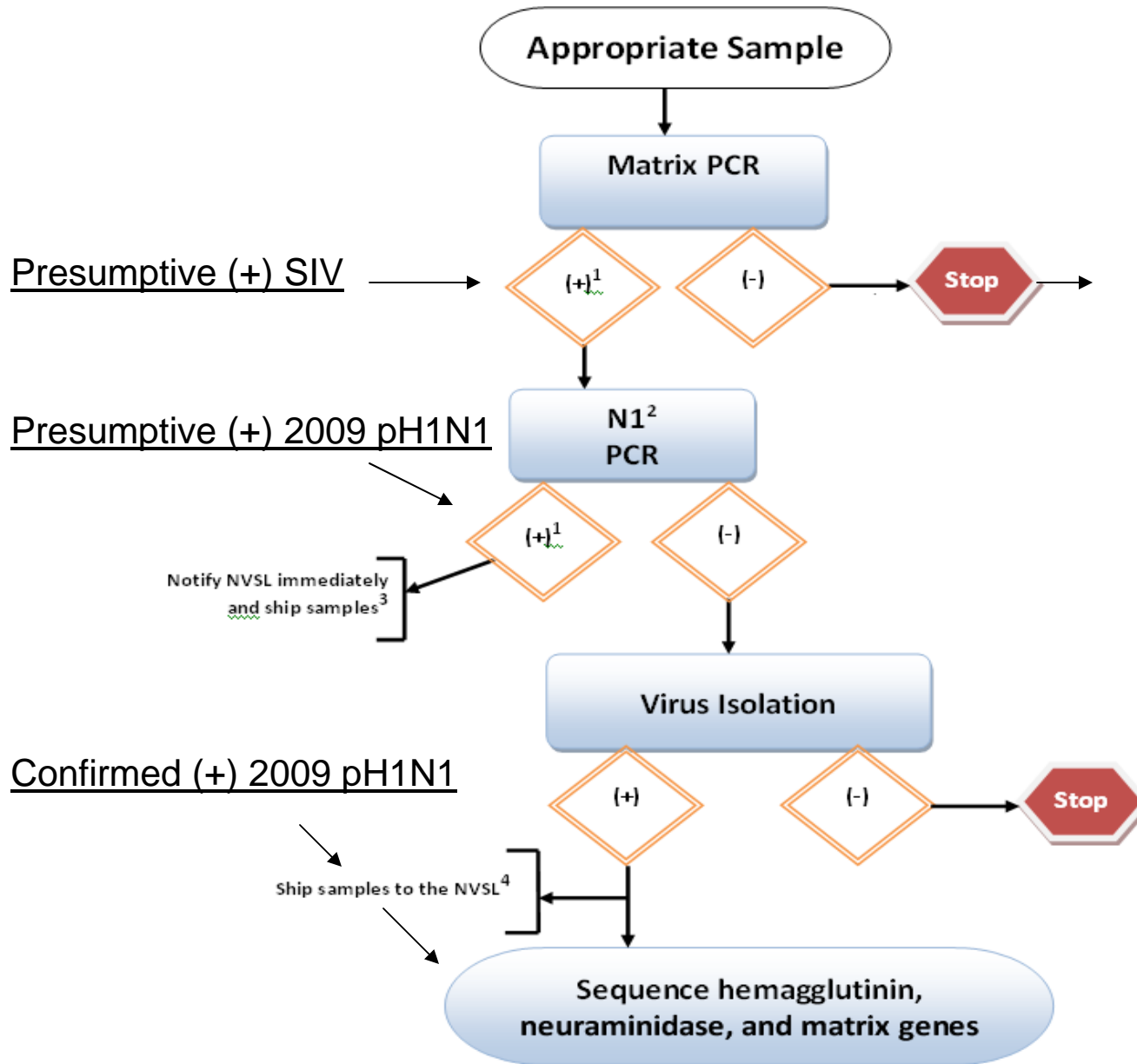


	Surveillance Components	Sample Locations	Populations
1	Swine epidemiologically linked to human cases of SIV	All locations	All swine populations
2	Swine accessions to veterinary DX laboratories	On-farm sick pigs	Commercial herds
3	First points of concentration / commingling events	Auctions, fairs, exhibitions, zoos	Small farms / backyard herds

NOTE: All testing is voluntary and only sick pigs are being sampled.

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Presumptive (+) SIV

Presumptive (+) 2009 pH1N1

Confirmed (+) 2009 pH1N1

• Ship all matrix negative samples associated with human illness to NVSL²

• Bank all matrix negative samples for future shipment to NVSL³

Bank virus isolation negative samples for future shipment to NVSL³

Notify NVSL immediately and ship samples³

Ship samples to the NVSL⁴

Response to (+) 2009 pH1N1

Developed in collaboration with animal health, food safety and public health:

- Series of notification protocols involving all partners
 - State management
- *Minimize disruptions while protecting animal and public health
- * Work to assure market acceptance of affected herds

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Guidelines for a pH1N1 detection

- Primary response goal → prevent additional spread of virus and limit human exposure
 - Increase protective measures that prevent the introduction of or slow the spread of the virus;
- Monitored movement → Recovered swine will be allowed to move
 - Monitor sick swine so that once they are recovered, only healthy swine are moved from farms
- Ensure public safety → information sharing
 - Share virus and information with public health officials at state, local and federal levels to ensure public safety

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Current Situation

- Mechanics for surveillance in swine are in place
- Ongoing extensive communications and collaboration with Federal / State animal health officials / public health officials/ industry



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SIV Surveillance Results (early October)

- A total of 36 NAHLN labs are participating in SIV surveillance testing
- 18 NAHLN labs have reported SIV testing
- Number of tests performed:
 - 163 Matrix PCR
 - 18 N1 PCR
 - 20 Virus Isolation
 - 0 Sequenced

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Positive Perspective

- Having the pilot project framework in place prior to the 2009 pH1N1 outbreak enabled a very rapid and effective response.
- Animal health and public health are still experiencing new relationships, new responsibilities, and uncharted legal areas.
- This collaborative effort clearly exemplifies the value and synergy possible from application of the “One Health” concept to animal and human health.

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Challenges for moving forward

- **Industry concerns**
 - Loss of markets (domestic and international)
 - Unsure of regulatory response
 - Liability from workers
- **Veterinary Practitioner concerns**
 - Liability / Violation of client privacy / Loss of clients
- **Laboratory concerns**
 - Liability
 - Loss of all swine caseload → fears of SIV test reporting

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Focus on Progress

Continue to work together to:

- Ensure domestic and international markets to alleviate Industry concerns
- Educate public on safety of pork
- Communicate research findings
- Educate producers on best prevention, detection and reporting practices
- Demonstrate the benefit for surveillance for novel swine influenza (not limited to pH1N1)

→ Increase sample submissions to move surveillance forward

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In Summary

Monitoring and studying influenza viruses in the swine population:

- Help us learn about the virus to protect animal and public health
- Develop better tools to diagnose
- Develop new and improved vaccines to protect U.S. swine herds

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QUESTIONS?

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