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Benefits and drivers of swine influenza virus (SIV) surveillance

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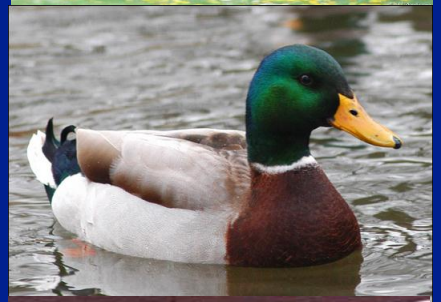
History of (animal) influenza virus surveillance

WHO influenza programme established in 1952

Formal surveillance programme since 1995



Several surveillance plans

(Interest in) surveillance spurred since 2000

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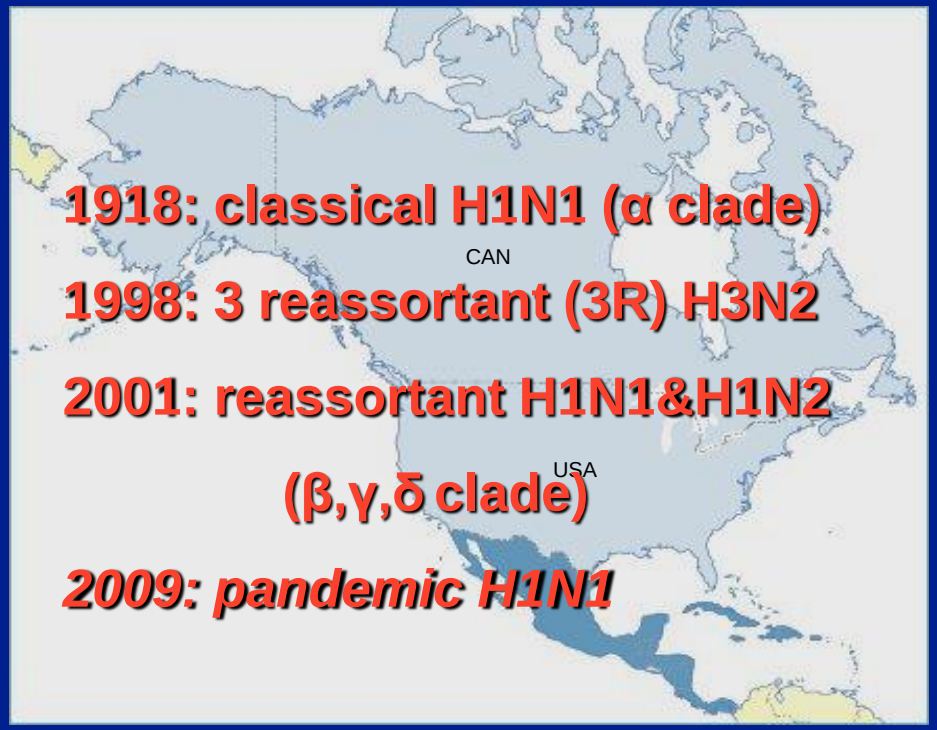
The complicated epidemiology of SIVs

North America



Europe

- Co-circulation of multiple subtypes / lineages
- Prevailing lineages differ in different regions

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The density of the swine population and pig farming practices differ in different regions

cf. Lina Awada

The basics about SI

- enzootic, non-notifiable
- self-limiting disease, rarely fatal, most infections subclinical
- vaccine update/demand low in some regions, most SIV vaccine used in sows
- adjuvanted vaccines, no standardization

Surveillance

- Collect and analyze SIVs (or serological data)
- Interpretation of data
- Timely dissemination of results to users of information

NO CRYSTAL BALL!!

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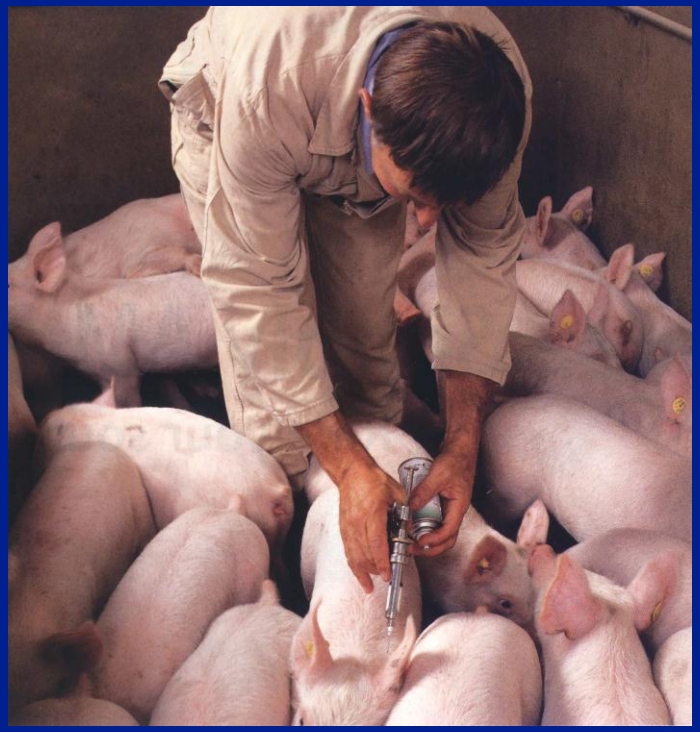
Example: Surveillance alone cannot tell us which SIV strains must be included in vaccines



- No criteria to justify replacement or addition of vaccine strains: cross-HI with post-infection ferret sera, genetic homology are poor indicators of vaccine strain performance
- Oil adjuvants broaden serological cross-reaction and cross-protection

Surveillance can assist with vaccine strain selection

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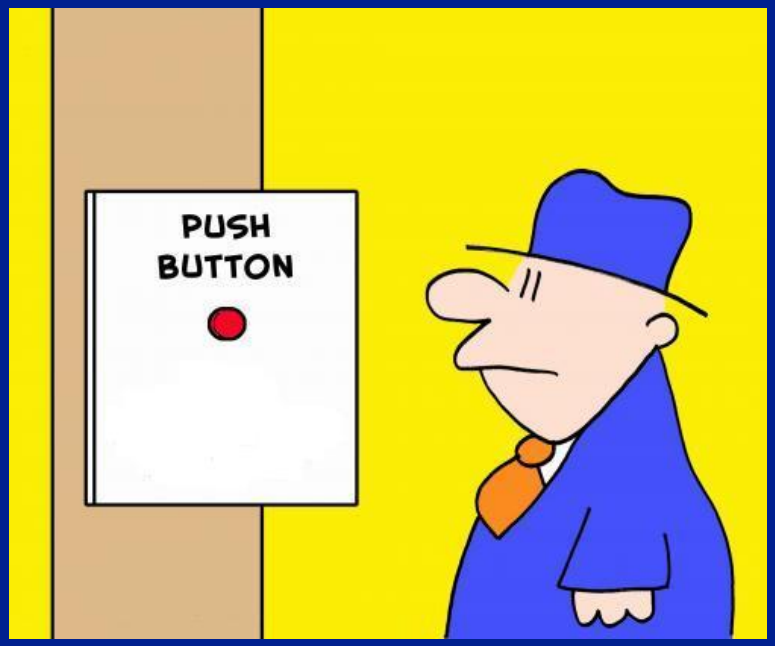
Example: surveillance cannot control future (swine -origin) influenza pandemics



Push button risk assessment???

We don't know what determines transmission of SIVs from pigs to humans or spread between humans!!!

Surveillance can detect changes in SIVs or novel viruses in pigs and provide material for research on host adaptation

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Benefits for swine health

1. Global picture of dominant SIV subtypes and lineages in different geographic regions

- Apply information to update diagnostic technologies
- Assistance with vaccine strain selection

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Benefits for swine health

2. Better understanding of the antigenic and genetic evolution of SIVs

Why slower antigenic drift with swine than with human viruses? Genetic changes outside antigenic domains? Which amino acids in the HA are most important? Differences in extent of drift between various subtypes/lineages? Extent of drift in NA as compared to HA?

Benefits for swine health

3. Indications as to determinants of virus adaptation to pigs and/or mechanisms of virulence

e.g. dominant SIVs in North America and Europe have single type of internal gene cassette (triple-reassortant, avian-like)

Pitfalls and limitations of surveillance

- Genetic analysis: how reliable? overinterpretation?
- Antigenic analysis: results highly variable, depending on reagents used
- Serology has become of limited use in regions where several SIV lineages are co-circulating, may be useful to answer specific questions

Benefits for swine health

4. Better understanding of the epidemiology of SIV in swine farms or separate facts from speculation

The Problem with Pigs: It's Not about Bacon

Gregory C. Gray and Whitney S. Baker

Emerging Pathogens Institute and Department of Environmental and Global Health, College of Public Health and Health Professions, University of Florida, Gainesville, Florida

"Mathematical models …… workers can serve as a bridging population to introduce the influenza A virus strains that are being amplified in the CAFOs to their surrounding human communities."

"Modern swine production techniques may have contributed to novel influenza virus generation."

Benefits for public health

1. Timely identification of novel influenza viruses in pigs or changes in SIVs
2. Trace immediate ancestors of putative swine origin pandemic viruses (should they occur)
3. Reliable data about the incidence of zoonotic SIV infection through targeted virologic surveillance

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Surveillance...

- is essential for insights in the epidemiology and evolution of SIVs, as an alert for new viruses, to improve diagnosis ....
- is a building stone for influenza research
- may assist in vaccine strain selection, implementation of control measures, and contribute to determine public health risk