Wisconsin State
Laboratory of Hygiene
UNIVERSITY OF WISCONSIN–MADISON

WE'RE MOVING!

Important Update!

The WSLH Communicable Disease Division will be moving to the Sta
Agriculture Drive, Madison, effective Monday, **October, 10, 2016**.

On and after October 10, 2016, please send clinical specimens as follows:

WSLH Unit	Address
• **Communicable Diseases (surveillance, emergency response, outbreak, etc.)** • Rabies • Cytology	**2601 Agriculture Drive, P.O. Box 7904 Madison, WI 53718** (For directions, see map below. Please deliver to loading dock off Vondron Road.)

WSLH Contact Information

- Email addresses will remain the same.
- CDD Customer Service #
  - 800-862-1013
- Phone & FAX numbers are changing

WSLH will communicate new key contact phone #'s when they become available

Influenza and other Respiratory Viruses Update--2016

Pete Shult, PhD
CDD Director & Emergency Laboratory Response

and

Erik Reisdorf, MPH, M(ASCP)^{CM}
Surveillance and Virology Lab-Team Lead

Learning Objectives

- Moving Day!
- Review of the 2015-201 influenza season.
- Vaccine strain selection and efficacy.
- Influenza “variant” virus update.
- Non-influenza respiratory pathogens.
- Technology update.
- Discuss surveillance strategy for 2016-2017

Influenza

The latest information

www.cdc.gov/flu/index.htm

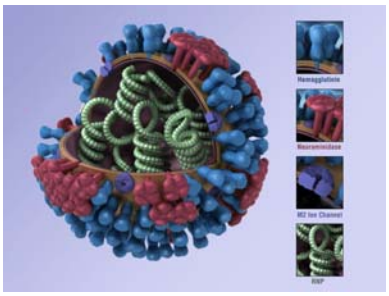
What We've Been Dealing With: 2016

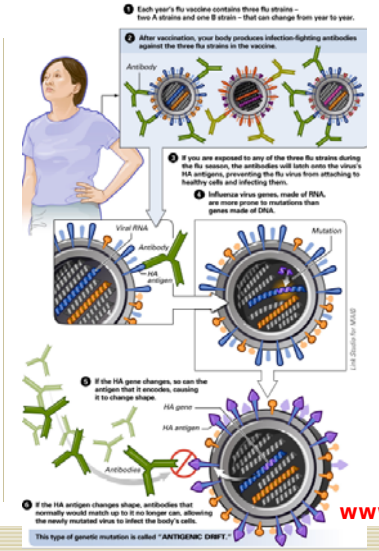
- Zika virus
- Dengue fever
- Chikungunya
- Elizabethkingia spp.
- Measles, mumps, pertussis
- Food-borne illnesses

… So what's the big deal with influenza?

The Changeability of Influenza

Antigenic Drift → Seasonal Influenza

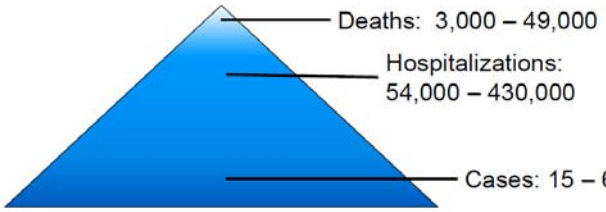




Antigenic Drift
Manifests in HA and NA as a result of continuous and gradual accumulation of point mutations in the HA and NA genes

www.flu.gov

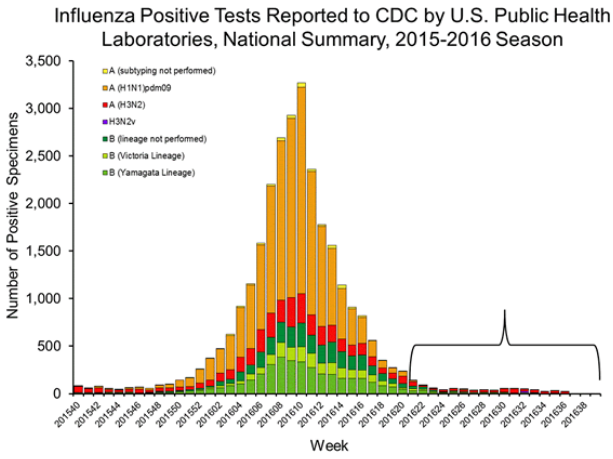
Estimated Annual Burden of Seasonal Influenza in the United States



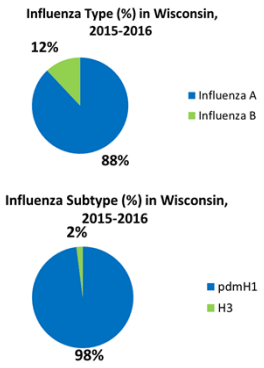
Direct medical costs: $10.4 billion

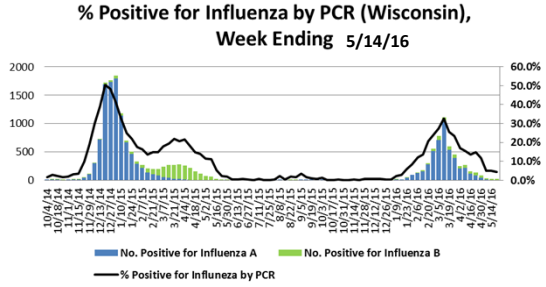
CDC

Influenza in the U.S. 2015-16



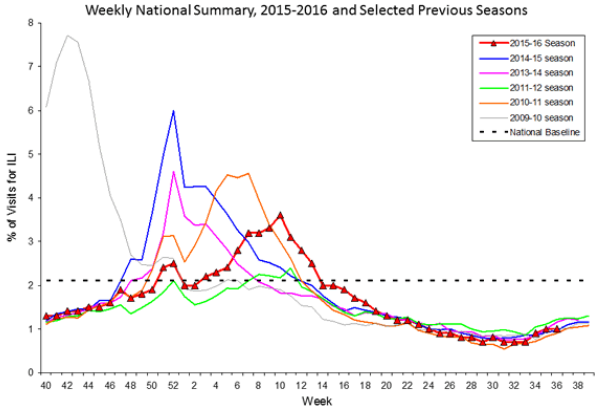
Influenza in WI, 2015-2016





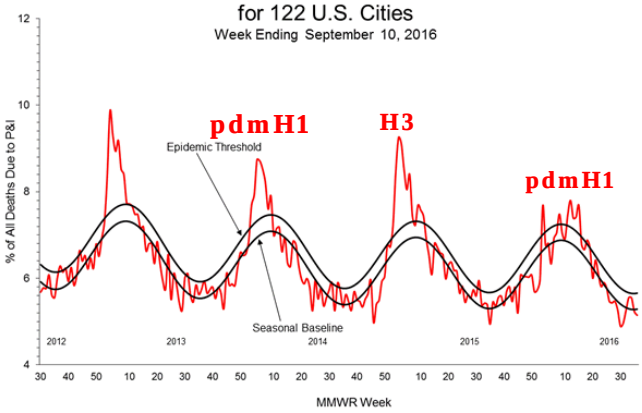
Influenza in the U.S. 2015-16

Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Weekly National Summary, 2015-2016 and Selected Previous Seasons



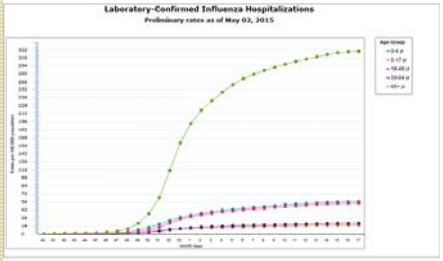
Influenza in the U.S. 2015-16

Pneumonia and Influenza Mortality for 122 U.S. Cities
Week Ending September 10, 2016

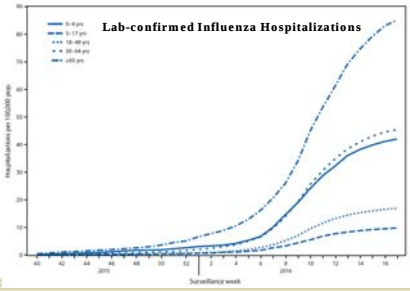


Influenza Hospitalizations

2014-15



In contrast, 2015-16



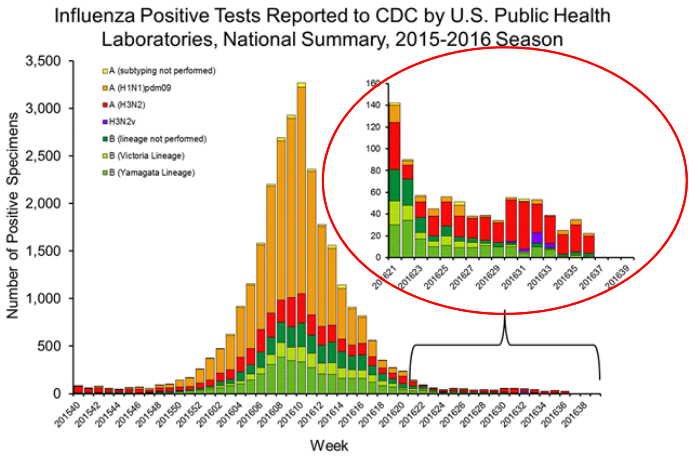
Influenza 2015-16

What was expected…

- A/Switzerland/9715293/2013(H3N2)
- A/California/7/2009
- B/Phuket/3073/2013 (B/Yamagata-lineage)
- B/Brisbane/60/2008 (B/Victoria-lineage

… and that's what we got☺

Influenza in the U.S. Early in 2016-17

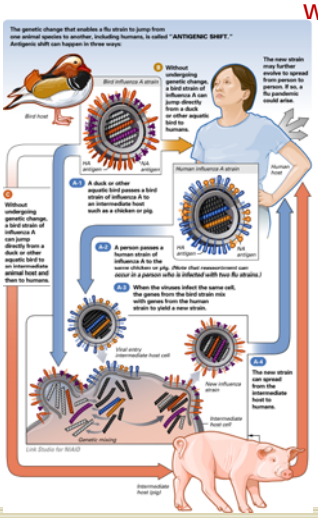


Early 2016-2017 Season....

PH Region	Date Received	Influenza type
?	7/14/2016	Flu A (H3)
?	7/28/2016	Flu A (H3)
Travel (AK)	8/10/2016	Flu A (H3)
Travel (India)	8/30/2016	Flu A (H3), FluB
?	9/15/2016	Flu A (H3)
?	9/21/2016	Flu A (H3)
Monroe Co.	June 2016	Flu A H1N2v

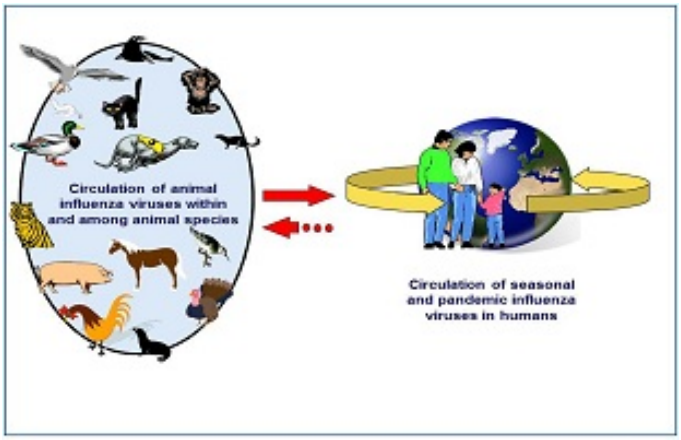
The Changeability of Influenza
Antigenic Shift

www.flu.gov



Antigenic Shift
When a new subtype (a novel HA and/or NA) of influenza A emerges in the host (humans)

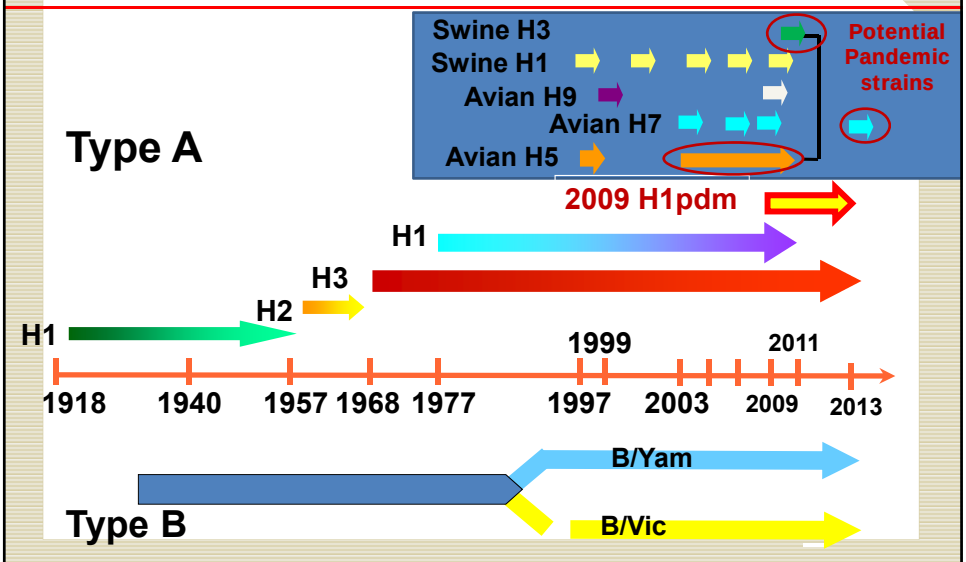
Infectious Diseases at the Human-Animal Interface
Influenza as an Example



Influenza at the Human-Animal Interface

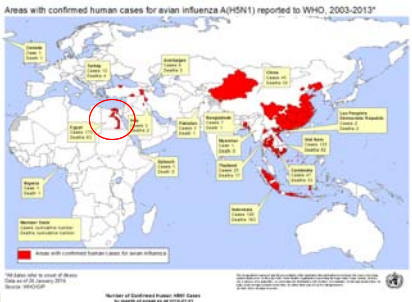
Influenza A
- H1 - H17
- N1 – N10

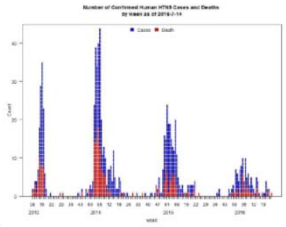
Timeline of Influenza Viruses in Humans

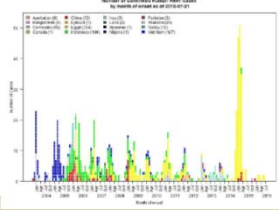


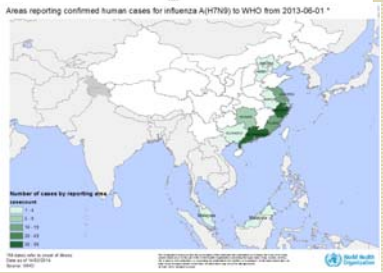
Global Influenza Concerns:
A(H5N1) and A(H7N9)

http://www.who.int/csr/disease/avian_influenza/en/





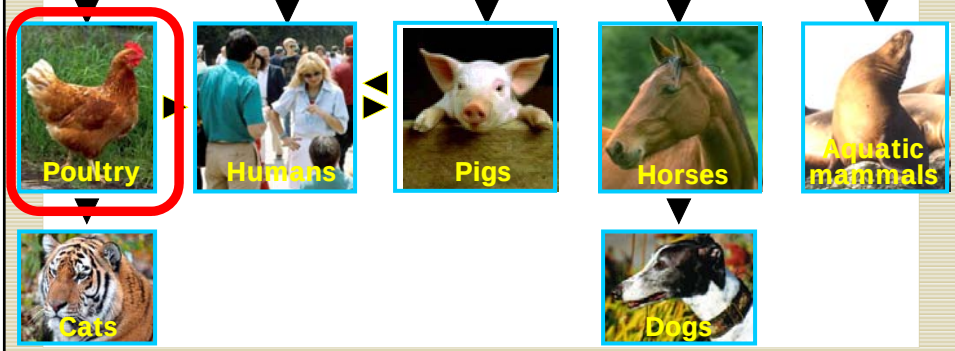




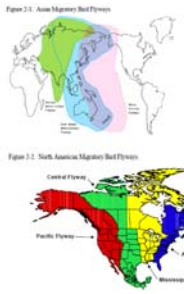
Influenza: Emergence of Novel Flu A Subtypes

Chickens* and *turkeys* take center stage *in 2015

Influenza A
- **H1 - H17**
- **N1 – N10**



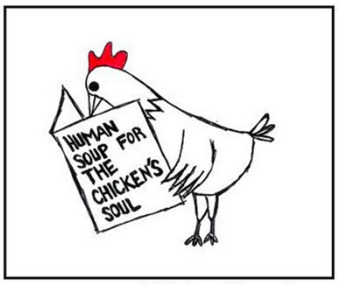
Emergence of Avian Flu (H5Nx) in U.S.



- Avian Influenza (H5Nx) emerged in North America (November 2014).
- Many flocks in the area were infected by December including those in the US.

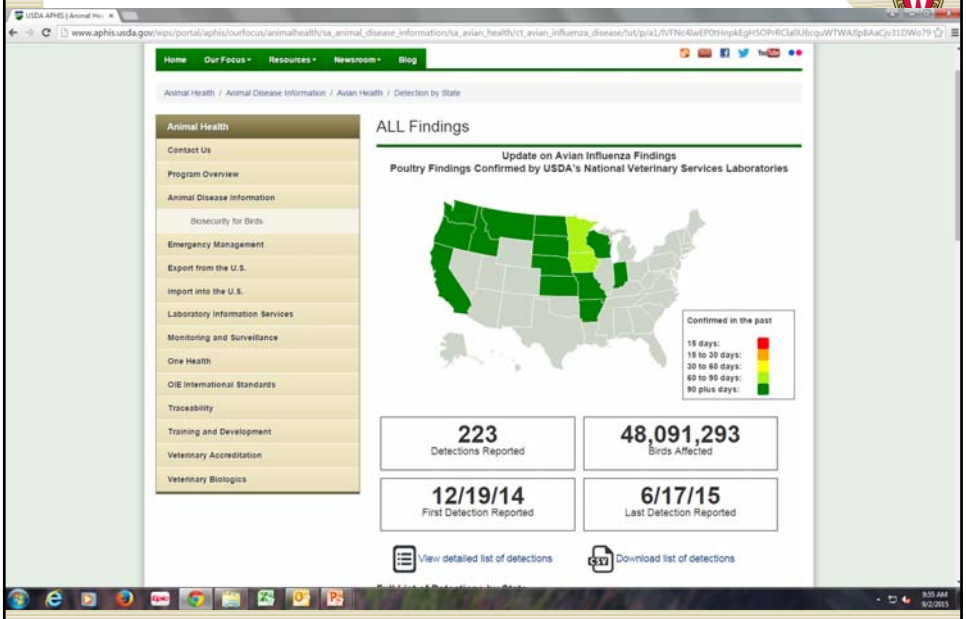
Avian Influenza Terminology

- **H**ighly **P**athogenic **A**vian **I**nfluenza
- Bird flu
- Pathogenicity refers to avian NOT human
- **H5N1, H5N2** and **H5N8** are collectively referred to as **H5Nx**
- **H5N2** and **H5N8** have both been detected in the US in 2015.



dcfeliciano.blogspot.com

Current Situation



The question going into the 2015-16 influenza season?

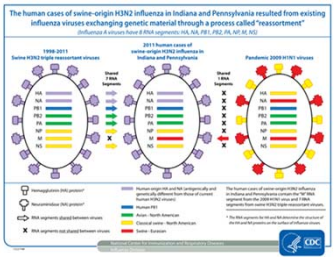
Influenza: Emergence of Novel Flu A Subtypes

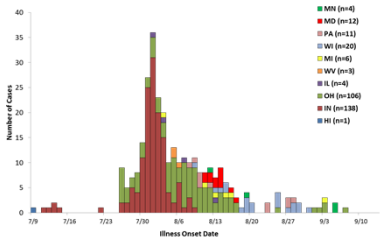
Don't forget about the little piggies

Influenza A
- H1 - H17
- N1 – N10

Influenza A H3N2v: July-Sept, 2012

Novel Flu A events happen in the U.S. too!

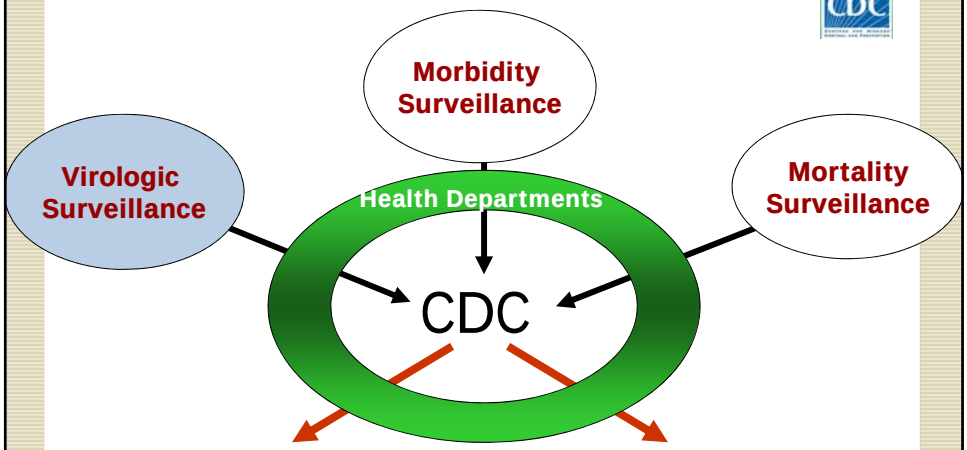




H3N2v Cases –September 14, 2012
(*n*=20*)

U.S. Influenza Surveillance

www.cdc.gov/flu/weekly

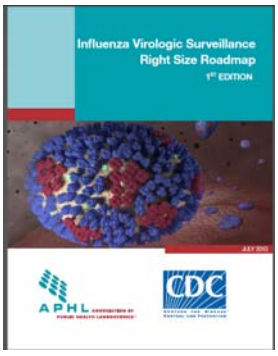


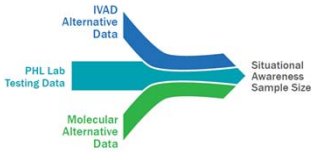
FLUVIEW
A Weekly Influenza Surveillance Report Prepared by the Influenza Division

State-level data to state surveillance coordinators

"Right-Sizing" Influenza Virologic Surveillance

The Importance of "Alternative Data"

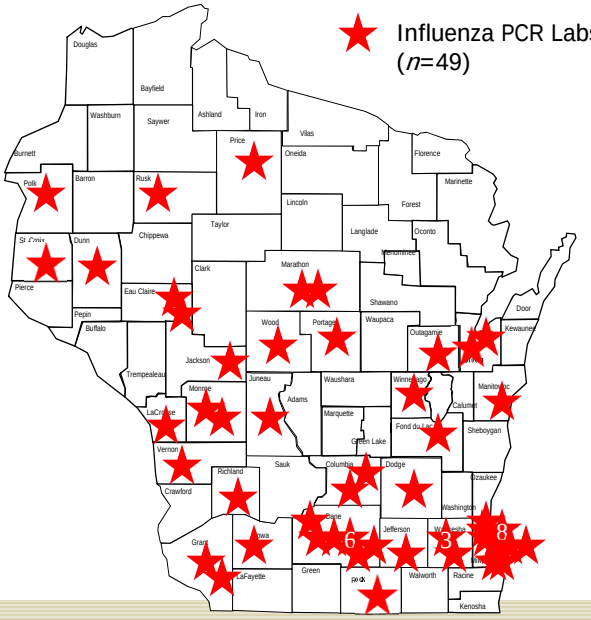




Alternative data is existing virologic data from non-PHL sources that can be used to supplement PHL data for improved situational awareness

Right Size Roadmap
http://www.aphl.org/aphlprograms/infectious/influenza/Pages/Influenza-Virologic-Surveillance-Right-Size-Roadmap.aspx

Wisconsin Labs with Flu PCR Capacity, September 2016



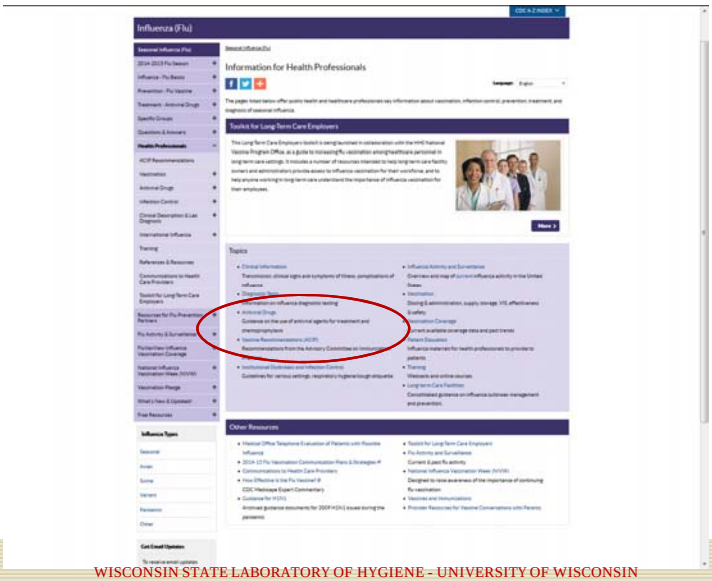
Influenza Virologic Surveillance

Increasing Role for the Clinical Lab

- Provide situational awareness
  - **Clinical lab testing data** → (Via WSLH or directly) **CDC**
- Detect novel or reassortant viruses
  Inform vaccine strain selection
  Detect and monitor antiviral resistance
  - **Specimens / isolates from clinical labs** → **WSLH** → **CDC**

Influenza – Prevention and Treatment

http://www.cdc.gov/flu/professionals/index.htm



Seasonal Influenza Vaccines
How effective in 2015-16?

http://www.cdc.gov/flu/professionals/vaccination/effectivenessqa.htm

http://www.cdc.gov/flu/professionals/vaccination/

Table. Adjusted vaccine effectiveness estimates for influenza seasons from 2005-2016

Influenza Season	Reference	Study Site(s)	No. of Patients	Adjusted Overall VE (%)	95% CI
2004-05	Belongia 2009	WI	782	10	-36, 40
2005-06	Belongia 2009	WI	346	21	-52, 59
2006-07	Belongia 2009	WI	871	32	12, 70
2007-08	Belongia 2011	WI	1914	37	12, 49
2009-10	Griffin 2011	WI, MI, NY, TN	6737	38	23, 73
2010-11	Treanor 2011	WI, MI, NY, TN	4757	60	53, 66
2011-12	Ohmit 2014	WI, MI, PA, TX, WA	4771	47	38, 56
2012-13	McLean 2014	WI, MI, PA, TX, WA	6452	49	43, 55
2013-14	Unpublished	WI, MI, PA, TX, WA	5990	51	43, 58
2014-15	ACIP presentation, Flannery	WI, MI, PA, TX, WA	9329	23	14, 31
2015-16*	ACIP presentation, Flannery	WI, MI, PA, TX, WA	[illegible]	47*	38, 55*

*Estimate from Nov 1, 2015–April 16, 2016.

Vaccine usage and effectiveness 2015-16

All is not sunshine and roses

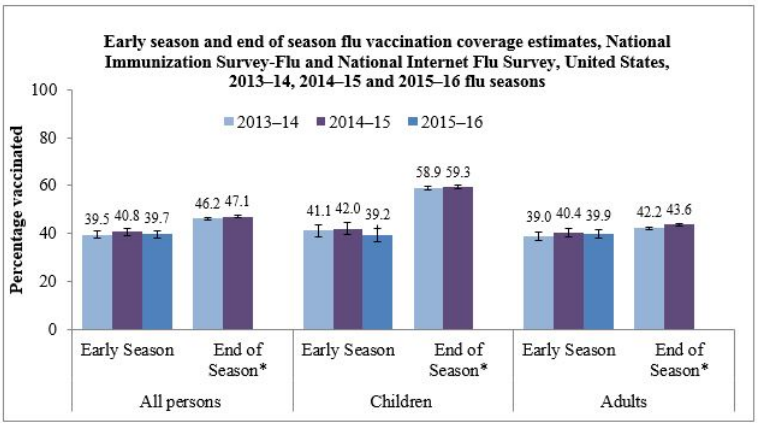
ACIP: Don't Use LAIV During 2016-17 Flu Season

-AAFP News, June 23, 2016-

Vaccination Rates---2013-14, 2014-15, 2015-16

General Population

http://www.cdc.gov/flu/professionals/vaccination/



Influenza Surveillance in Wisconsin

Multi-element approach

1. Rapid Influenza Diagnostic Testing (RIDT) Sites
   - >50% of Influenza testing in WI.
   - Confirmatory testing during periods of low prevalence!

WSLH can provide confirmatory testing for out-of-season positives and the first two positive influenza A and influenza B specimens.

Influenza Surveillance in Wisconsin

Multi-element approach

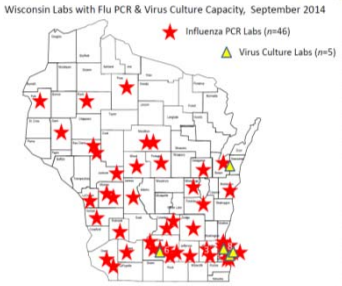
2. Enrolled Surveillance Sites
   - 17 labs in 5 public health regions.
   - Provide randomized specimens weekly.

Request to continue to submit the first 3 specimens per week with influenza test requests to WSLH.

Influenza Surveillance in Wisconsin

Multi-element approach

3. PCR Labs
   - "Gold Standard" testing.
   - Provide weekly testing data summary reports.
   - 48 WI PCR labs!



Request to report both the *number positive* and the *number tested* weekly.
**Send Flu A unsubtypable specimens when subtyping for both 2009 H1N1 and seasonal H3 were attempted (Ct<35).

Laboratory-based Surveillance

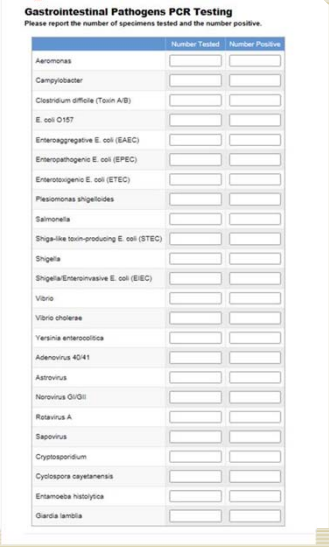
All Clinical Laboratories performing influenza diagnostic testing

All Labs:
- Send those with international travel histories
- *Sampling* of influenza-related hospitalizations
- Unusual presentations/results
- Contact with swine/ sick or dead poultry
- Antiviral treatment failure

Other Pathogens of Public Health Importance to Report

- B. *pertussis*/ *parapertussis*
- RSV
- Non-influenza respiratory viruses
- Grp A Strep
- VZV
- Rotavirus

NEW! Gastropathogen PCR



Gastrointestinal Pathogens PCR Testing

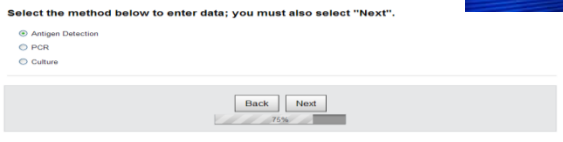
Please report the number of specimens tested and the number positive.

	Number Tested	Number Positive
Aeromonas		
Campylobacter		
Clostridium difficile (Toxin A/B)		
E. coli O157		
Enteroaggregative E. coli (EAEC)		
Enteropathogenic E. coli (EPEC)		
Enterotoxigenic E. coli (ETEC)		
Plesiomonas shigelloides		
Salmonella		
Shiga-like toxin-producing E. coli (STEC)		
Shigella		
Shigella/Enteroinvasive E. coli (EIEC)		
Vibrio		
Vibrio cholerae		
Yersinia enterocolitica		
Adenovirus 40/41		
Astrovirus		
Norovirus GI/GII		
Rotavirus A		
Sapovirus		
Cryptosporidium		
Cyclospora cayetanensis		
Entamoeba histolytica		
Giardia lamblia		

Reporting Lab Results

There are two options.....

1. Web-based reporting

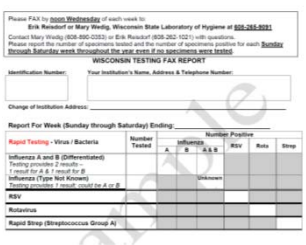


Select the method below to enter data; you must also select "Next".

- Antigen Detection
- PCR
- Culture

Back Next

2. FAX reporting



Please FAX by noon Wednesday of each week to:
Erik Reisdorf or Mary Wedig, Wisconsin State Laboratory of Hygiene at 608-265-8091
Contact Mary Wedig (608-890-0353) or Erik Reisdorf (608-262-1021) with questions.
Please report the number of specimens tested and the number of specimens positive for each Sunday through Saturday week throughout the year even if no specimens were tested.

WISCONSIN TESTING FAX REPORT

Identification Number: Your Institution's Name, Address & Telephone Number:

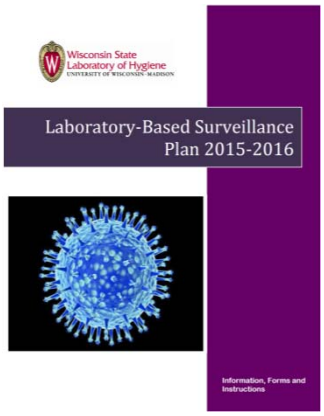
Change of Institution Address: _____

Report For Week (Sunday through Saturday) Ending: _____

Rapid Testing - Virus / Bacteria	Number Tested	Number Positive						
		Influenza				RSV	Roto	Strep
		A	B	A & B				
Influenza A and B (Differentiated) Testing provides 2 results – 1 result for A & 1 result for B								
Influenza (Type Not Known) Testing provides 1 result, could be A or B					Unknown			
RSV								
Rotavirus								
Rapid Strep (Streptococcus Group A)								

What is the WSLH able to provide to support participating labs?

- Specimen collection supplies.
- Specimen shippers & packaging supplies.
- NO cost specimen transport.
- Influenza confirmatory testing.
- Influenza PCR validation specimen panel.
- Weekly updated surveillance data (*B. pertussis*, *Influenza*, *RSV* & others).
- Laboratory Surveillance Reports



Influenza Surveillance Strategy

WSLH Surveillance Coordinators

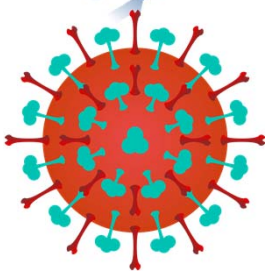
1. Erik Reisdorf
   Virology Lab-Team Lead
   erik.reisdorf@slh.wisc.edu

2. Mary Wedig
   Electronic Reporting Coordinator
   mary.wedig@slh.wisc.edu

Other Respiratory Pathogens of Public Health Importance.....

RSV

Metapneumovirus



Rhinovirus

Enterovirus

ADENOVIRUS

New viral pathogens discovered since 2001

- Human metapneumovirus (2001)
- SARS-coronavirus (2003)
- Coronavirus NL63 (2004)
- Coronavirus HKU1 (2005)
- Human bocavirus (2005)
- MERS- coronavirus (2012)

Other “not so new” ones impacting public health.....

- Enterovirus D68 (2014)

Rapid Molecular Platforms

GAS
Flu A/B
Flu A/B & RSV

Flu A/B
GAS

Coming Soon!

GAS

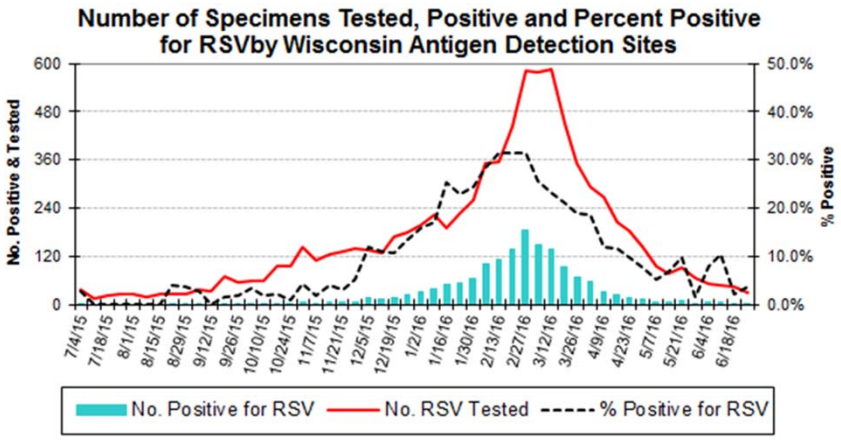
Benefits of NIRV Testing

- Establishes situational awareness
- Establishes etiology when influenza is not detected
- NIRV have similar clinical presentations
- Antibiotic stewardship
- Broaden capacity for outbreak investigations
- Define etiologies with severe acute respiratory illness (SARI)
- Understand burden of co-infections, emerging pathogens

The Major Players- **RSV**

- Types A and B
- Leading cause of severe disease in infants and young children
- Bronchiolitis, hospitalizations (1-2% infants)
- Burden on elderly
- Seasonality varies with geography
- Infections occur throughout life
- Prophylaxis for vulnerable population--$$
- Vaccines in development

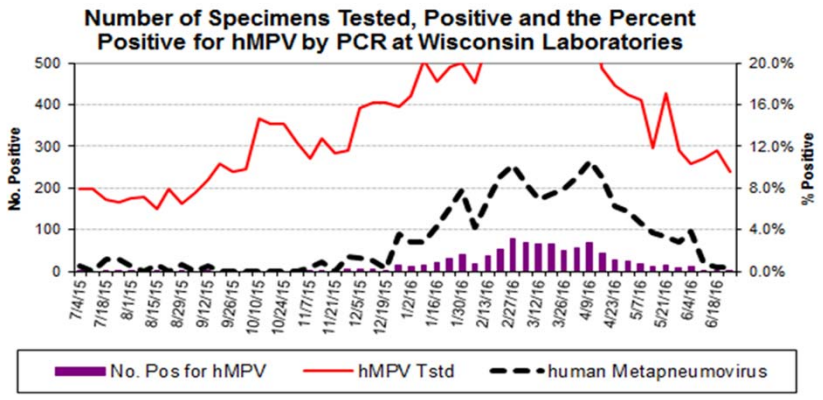
RSV Seasonality- Wisconsin



The Major Players- **Metapneumovirus**

- Burden primarily on children, elderly immunocompromised, COPD
- Occurs every year
- Symptoms indistinguishable with RSV
- No antivirals, treatments, or vaccines
- 51% hMPV patients prescribed antibiotics (Williams J et al. J Infect Dis 2006, 193: 387-95)

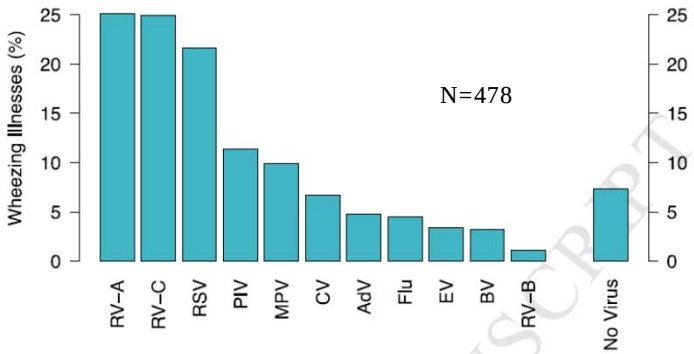
Human Metapneumovirus-Seasonality



The Major Players- **Rhino/Enterovirus**

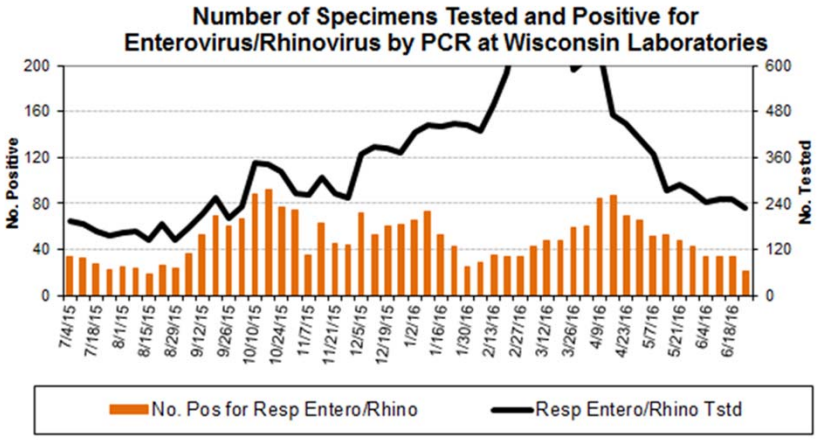
- "Common cold", URI sinusitis but.....LRI
- Exacerbations of asthma, wheezing
- Occurs every year, year-round
- Re-infections common
- Many types co-circulate, diversity
- Some types associated with more severe disease (e.g. paralysis, myocarditis, encephalitis); Others are mild

Rhinovirus and Wheezing



Anderson H, et al., (2016) Assessment of Wheezing Frequency and Viral Etiology on Child and Adolescent Asthma Risk. J Allergy and Clin Immun 26 July 2016

Rhinovirus/enterovirus-Seasonality



WI Pediatric SARI Patients (2016)

	Infants (n=51)	Toddlers (n=47)	School-Aged Children (n=37)
Bacterial growth	4 (8%)	3 (6%)	3 (8%)
Coinfection	11 (22%)	11 (23%)	5 (14%)
Virus Detected	45 (88%)	42 (89%)	27 (73%)
RSV	25 (62%)	6 (14%)	2 (7%)
Influenza	2 (4%)	1 (2%)	5 (19%)
Coronavirus	4 (9%)	4 (10%)	5 (19%)
Adenovirus	5 (11%)	7 (17%)	3 (11%)
Bocavirus	3 (7%)	3 (7%)	1 (4%)
Metapneumovirus	1 (2%)	5 (12%)	0 (0%)
Rhinovirus	14 (31%)	19 (45%)	10 (37%)
Parinfluenza	1 (2%)	3 (7%)	2 (7%)

Preliminary data courtesy of Lina Elbadawi, MD (CDC) and the WI Div. of Public Health (unpublished)

Thank you!

Your participation in the Wisconsin surveillance system is **vital** to monitor for emerging novel strains with pandemic potential and other pathogens that impact community health.