

# Mother Nature is a Bioterrorist

A photograph showing three individuals wearing white full-body protective suits (hazmat suits) and respirators. They are standing in a line, looking forward. The background is slightly blurred, showing what appears to be an outdoor setting with some structures.

**Mike McEvoy, PhD, NRP, RN, CCRN**

**EMS Coordinator, Saratoga County, NY**

**EMS Editor - Fire Engineering magazine**

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**Power Point version of these slides  
available at [www.mikemcevoy.com](http://www.mikemcevoy.com)**

**(Click on “Open Bar” tab)**



# Mike McEvoy - Books:



AAOS

## Critical Care Transport

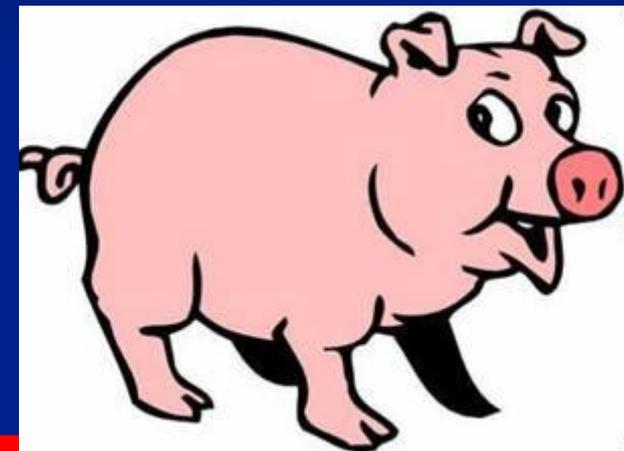


# Disclosures

- I am a pandemic advisor to the CDC and several major corporations including critical infrastructure providers.
  - I chair the emerging infectious diseases committee for the IAFC.
  - I am the EMS editor for Fire Engineering magazine.
  - I do not intend to discuss any unlabeled or unapproved uses of drugs or products.
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# Outline

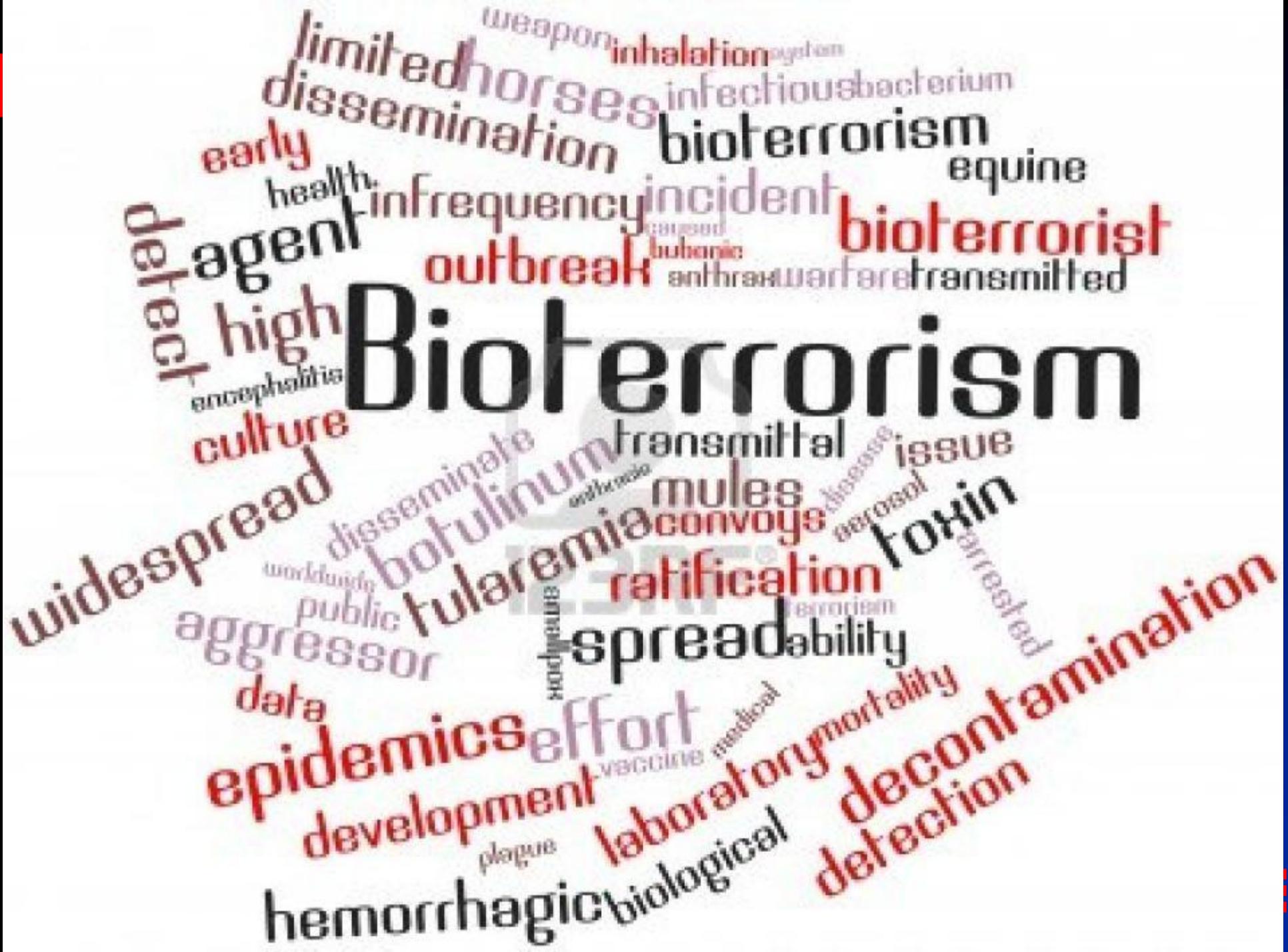
- **Bioterrorism**
  - Past experience
  - Why Mother Nature is the greatest bioterrorist of all time
- **What to worry about**
  - Measles, MERS, Ebola, Bird Flu
  - The hype about influenza
- **Public health response**
  - Past, present, future...
- **Actionable issues**



# Current Concerns: Today

- Measles
- Bird flu
- MERS-CoV
  - Middle East Respiratory Syndrome (Coronavirus)
- Ebola
- Seasonal influenza
- Resistance





# Potential Bioterrorism Agents

- **Bacterial Agents**
  - Anthrax
  - Brucellosis
  - Cholera
  - Plague, Pneumonic
  - Tularemia
  - Q Fever
- **Viruses**
  - Smallpox
  - VEE
  - VHF
- **Biological Toxins**
  - Botulinum
  - Staph Entero-B
  - Ricin
  - T-2 Mycotoxins

Source: U.S. A.M.R.I.I.D.

9-11-01



10-9-01

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BUILDING  
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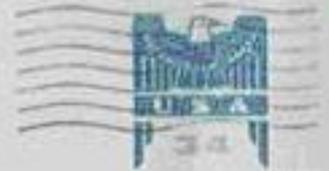
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(WWW.FBI.GOV)



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THIS IS NEXT  
TAKE PENACILIN NOW  
DEATH TO AMERICA  
DLATH TO ISRAEL  
ALLAH IS GREAT

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# Potential Bioterrorism Agents

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- Cholera
- Plague, Pneumonic
- Tularemia
- Q Fever

- **Viruses**

- Smallpox
- VEE
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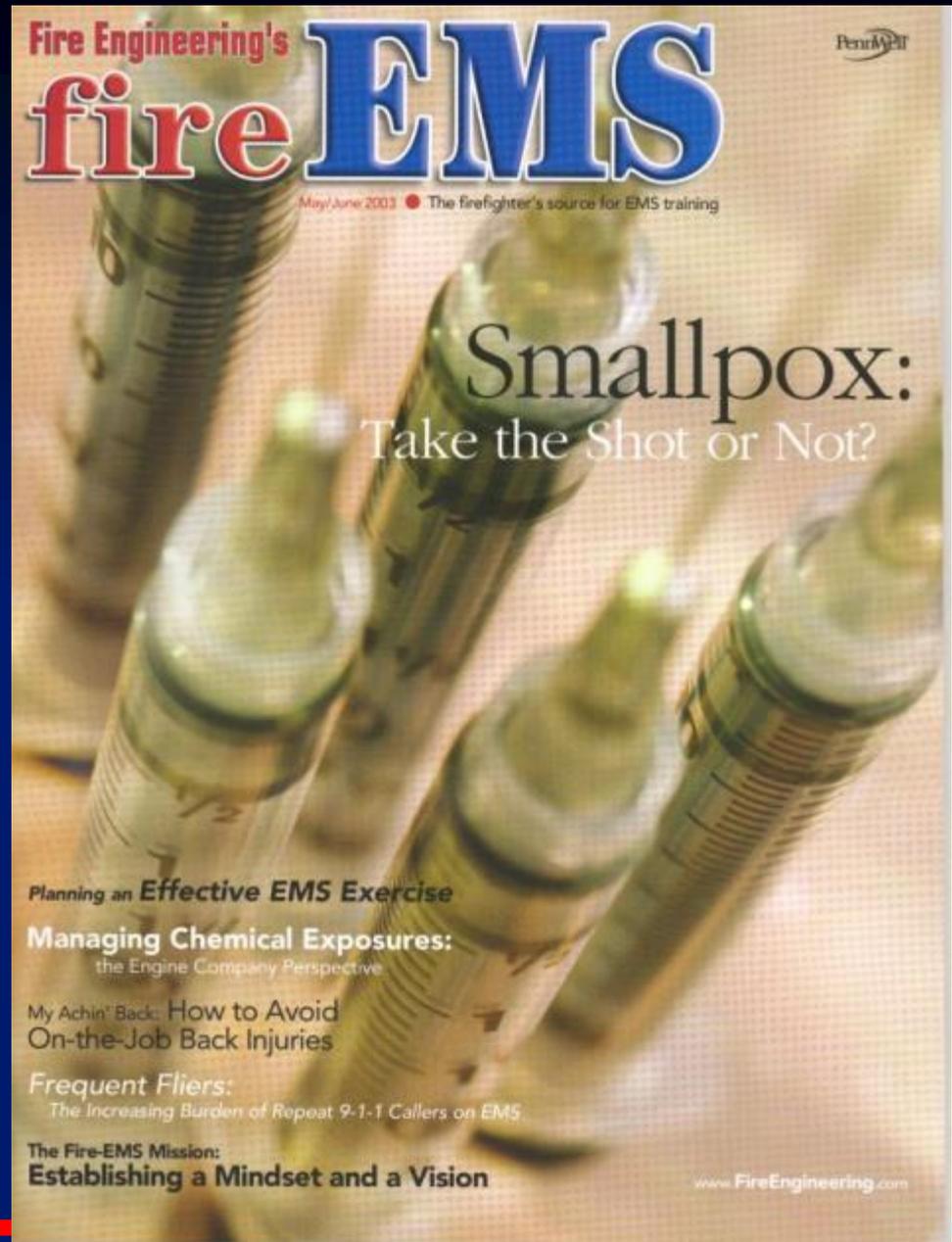
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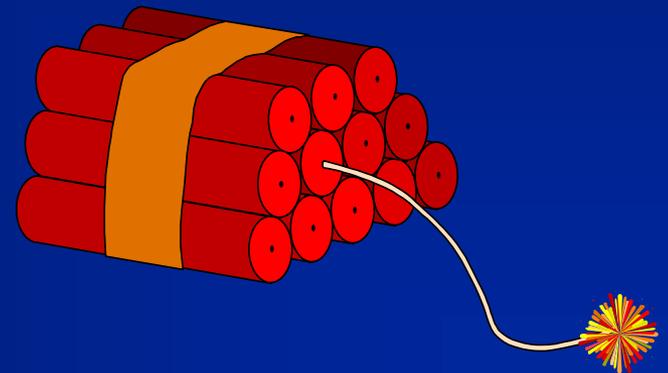
# Fire Engineering's fireEMS May/June 2003



# Let's get real...

- Chemical
- Biological
- Radiological
- **Explosive/Incendiary**
- Cyberspace
- Unimagined...

70%



# Boston Marathon...



# The Greatest Bioterrorist



**Mother  
Nature**

## Rap Sheet:

- **Smallpox**  
**1/2 billion**
- **Influenza**  
**1/4 million/year**
- **Plague**  
**137 million**
- **AIDS**  
**39 million**
- **SARS...**  
**916**

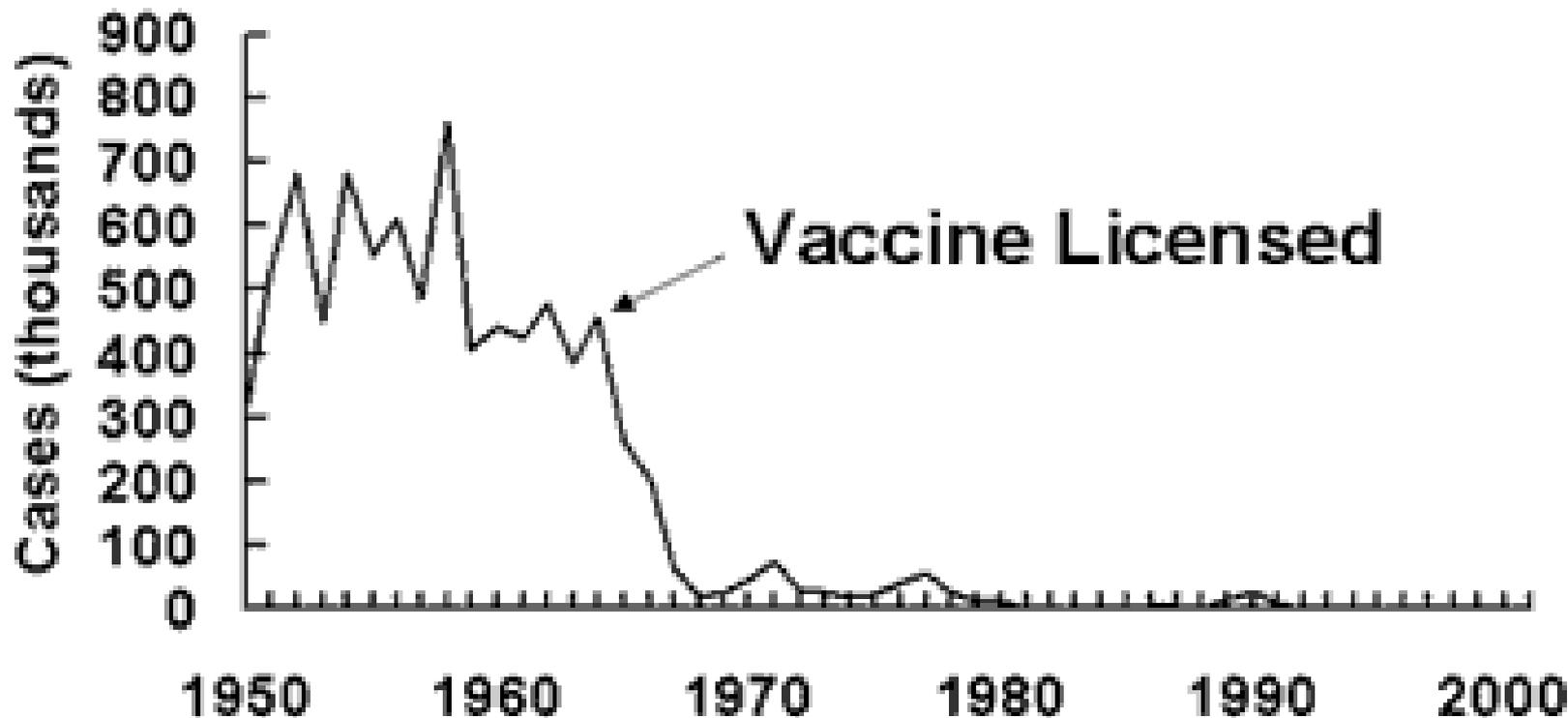
# Measles

- **Highly contagious virus**
- **Spread by respiratory secretions**
  - Including coughing and sneezing
- **Lives for up to 2 hours on surfaces/air**
  - Can infect others after carrier leaves
  - 9 of 10 unvaccinated people will be infected



# Measles in the U.S.

## Measles—United States, 1950-2001



# **Measles prior to 1970...**

- **3 to 4 million cases every year**
  - Recovery did convey immunity
- **48,000 hospitalizations per year**
- **500 deaths per year**
- **4,000 measles encephalitis cases per year**

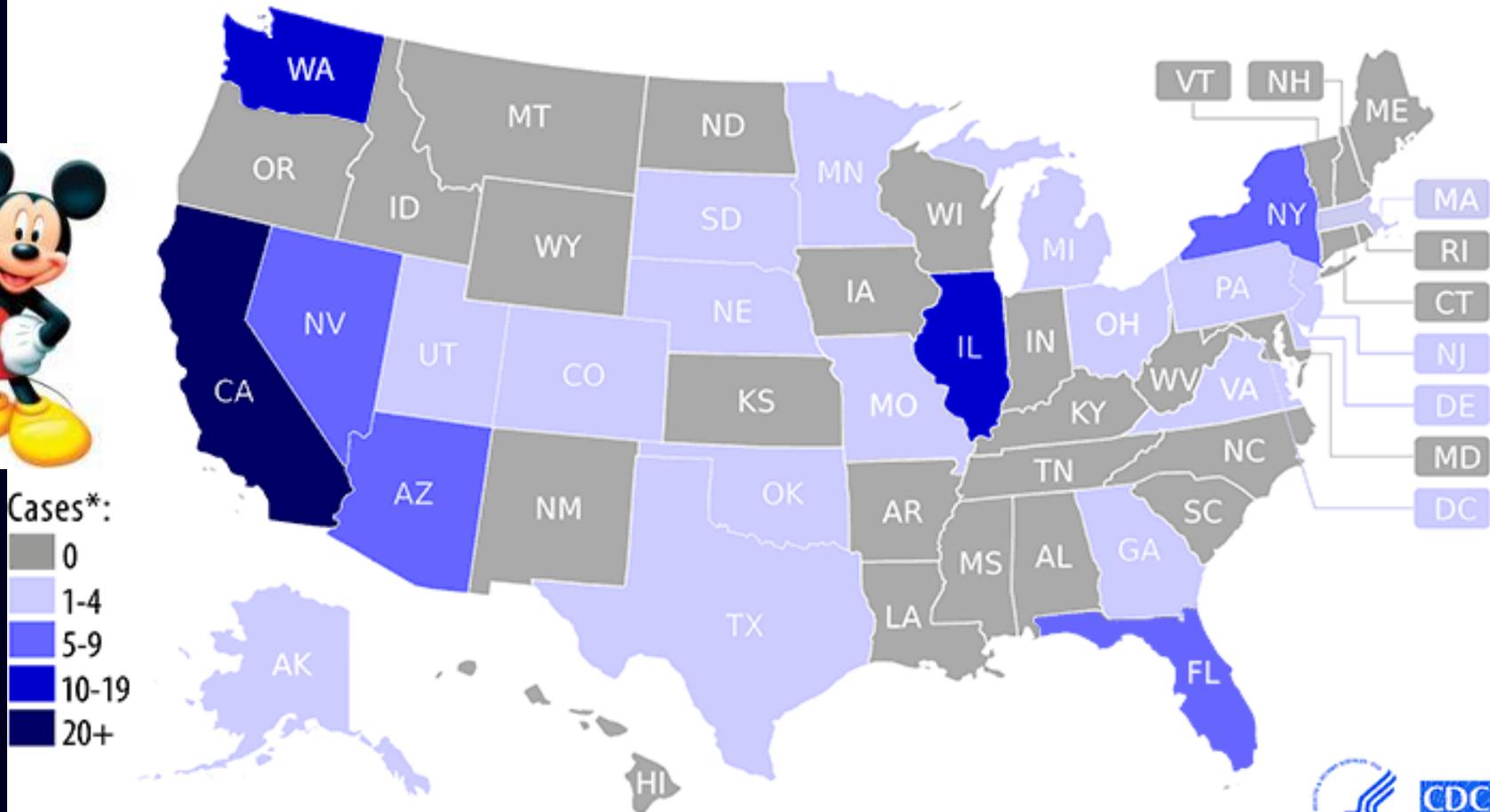
# **Measles lately...**

- **Unvaccinated people are greatest threat to measles spread in US**
- **20 million cases/yr in Europe, Asia, Pacific and Africa (146,000 deaths)**
- **International travel fuels outbreaks**
- **2004 = 37 cases, 2014 = 644 (highest)  
all centered in areas w/ low vaccination compliance**

# 189 cases total (113 CA)

## 2015 Measles Cases in the U.S.

January 1 to September 18, 2015

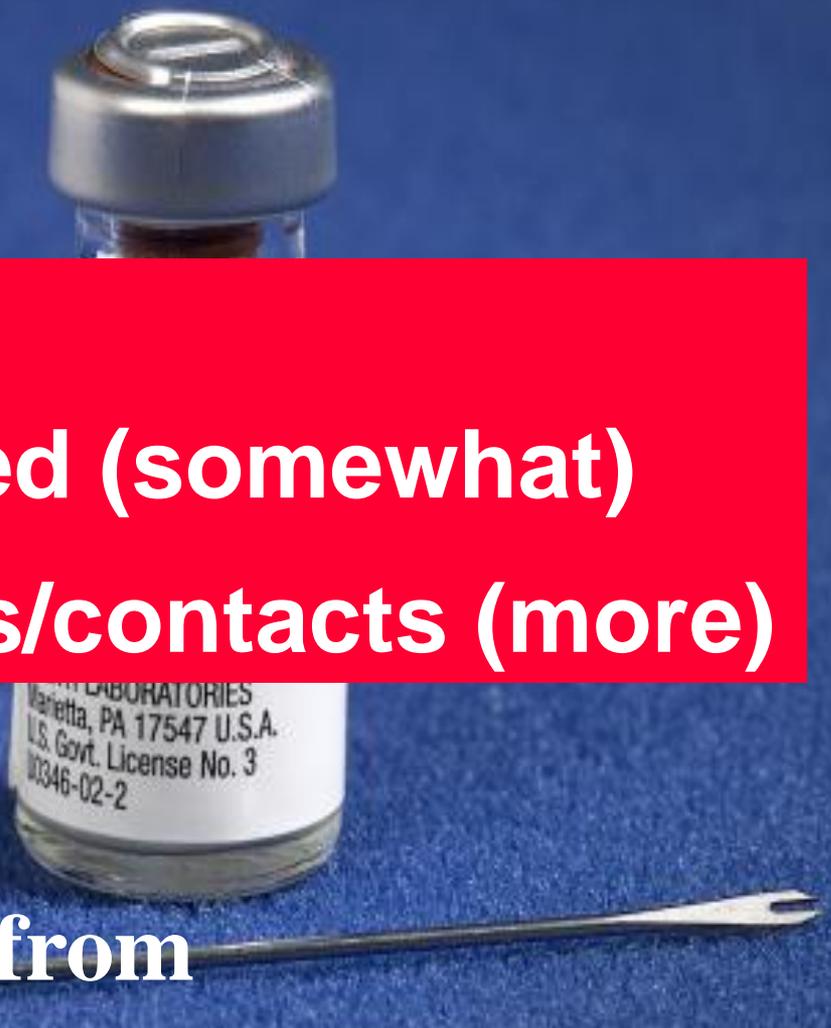


Cases\*:  
0  
1-4  
5-9  
10-19  
20+

\*Provisional data reported to CDC's National Center for Immunization and Respiratory Diseases



# Vaccines



**Protect people:**

- **Those vaccinated (somewhat)**
- **Family members/contacts (more)**

• **22 diseases (US)**

• **>60,000 die annually from preventable diseases**

# The Proof is in the Pudding

**JAMA**<sup>®</sup>

Effect of Influenza Vaccination of Children  
on Infection Rates in Hutterite Communities  
A Randomized Trial

**Conclusion: Immunizing children and adolescents with inactivated influenza vaccine significantly protected unimmunized residents of rural communities against influenza.**

Incidence and mortality, resulting in an estimated 200 000 hospitalizations and 36 000 deaths annually in the United States alone.<sup>1-4</sup> During pandemics, the burden of influenza illness increases substantially.<sup>5</sup> Current vaccine policy focuses on immunizing those at high risk of complications of influenza.<sup>6</sup> As a component of a broader policy to prevent the spread of influenza and reduce its complications, using immunization to interrupt community-

in the influenza vaccine colonies and 80 of 1055 (7.6%) in the hepatitis A vaccine colonies had influenza illness confirmed by RT-PCR, for a protective effectiveness of 61% (95% confidence interval [CI], 8%-83%;  $P = .03$ ). Among all study participants (those who were and those who were not vaccinated), 80 of 1773 (4.5%) in the influenza vaccine colonies and 159 of 1500 (10.6%) in the hepatitis A vaccine colonies had influenza illness confirmed by RT-PCR for an overall protective effectiveness of 59% (95% CI, 5%-82%;  $P = .04$ ). No serious vaccine adverse events were observed.

**Conclusion** Immunizing children and adolescents with inactivated influenza vaccine significantly protected unimmunized residents of rural communities against influenza.

**Trial Registration** [clinicaltrials.gov](https://clinicaltrials.gov) Identifier: NCT00877396

JAMA. 2010;303(10):943-950

[www.jama.com](http://www.jama.com)

# Meningococcal Infection 7 mos



"Charlotte Cleverley-Bisman" by Pam Cleverley, Perry Bisman, <http://babycharlotte.co.nz> - Trimmed from [http://www.babycharlotte.co.nz/image/mediaimage/Charlotte\\_214.jpg](http://www.babycharlotte.co.nz/image/mediaimage/Charlotte_214.jpg). Licensed under CC BY-SA 3.0 via Commons - [https://commons.wikimedia.org/wiki/File:Charlotte\\_Cleverley-Bisman.jpg#/media/File:Charlotte\\_Cleverley-Bisman.jpg](https://commons.wikimedia.org/wiki/File:Charlotte_Cleverley-Bisman.jpg#/media/File:Charlotte_Cleverley-Bisman.jpg)

# AVIAN INFLUENZA



# 2003-4 Outbreak of Highly Pathogenic Avian (HPAI) Influenza A in Asia

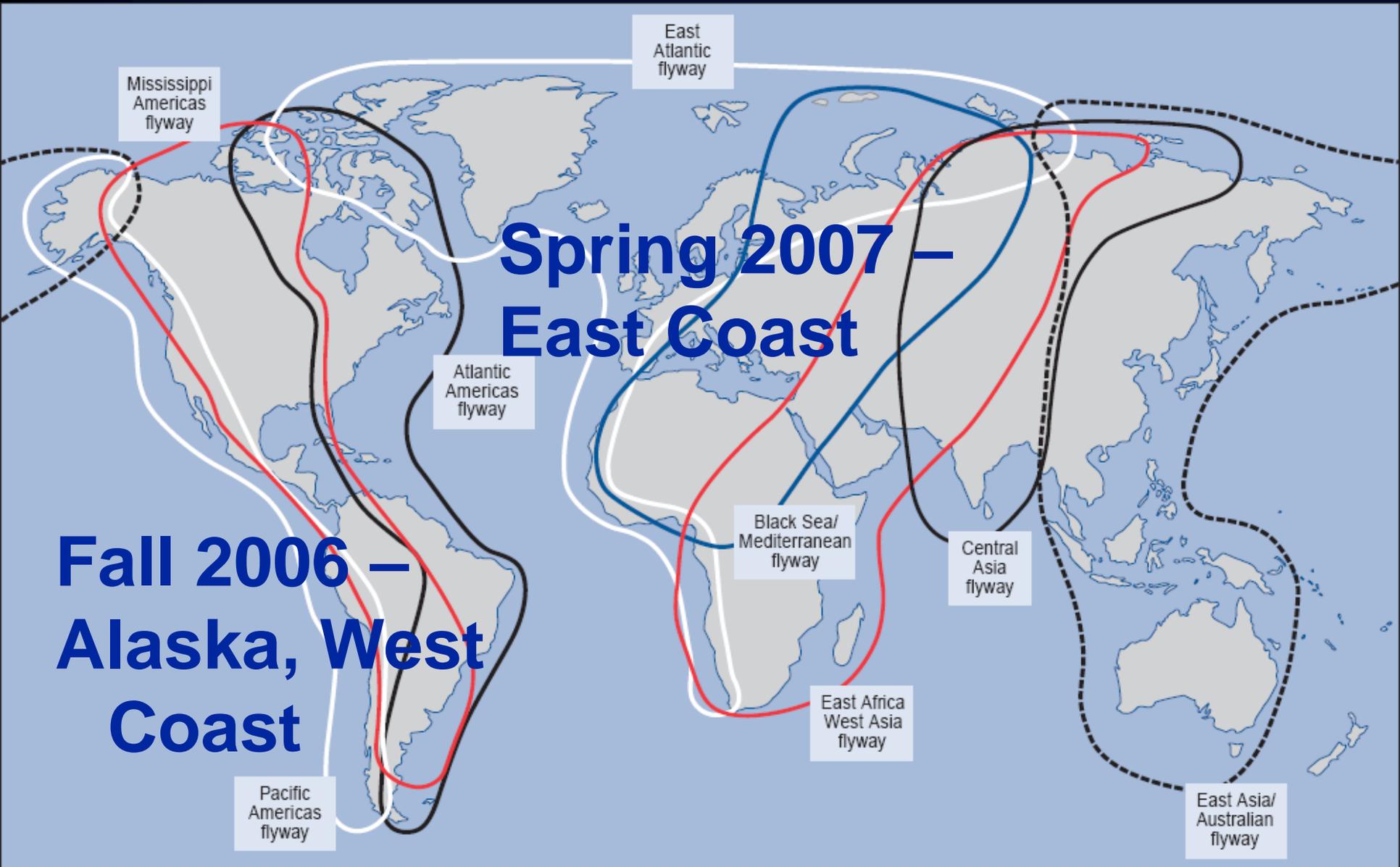


## **W.H.O. Official Says Deadly Pandemic Is Likely if the Asian Bird Flu Spreads Among People**

By KEITH BRADSHER and LAWRENCE K. ALTMAN

HONG KONG, Nov. 29 - A pandemic of human influenza could kill up to 100 million people around the world in a worst case, a World Health Organization official said Monday, significantly raising the agency's earlier estimates of the potential number of deaths in such a catastrophe.

# Epidemiology Imprecise:



# December 2014 - HPAI

- 21 states report bird flu infections
- 48.1 million chickens, turkeys, other birds killed
- \$191 million lost (poultry farms)
- Egg prices ↑ 80%



# Should U Fear the Chicken?



# **Pope contracts Bird Flu...**

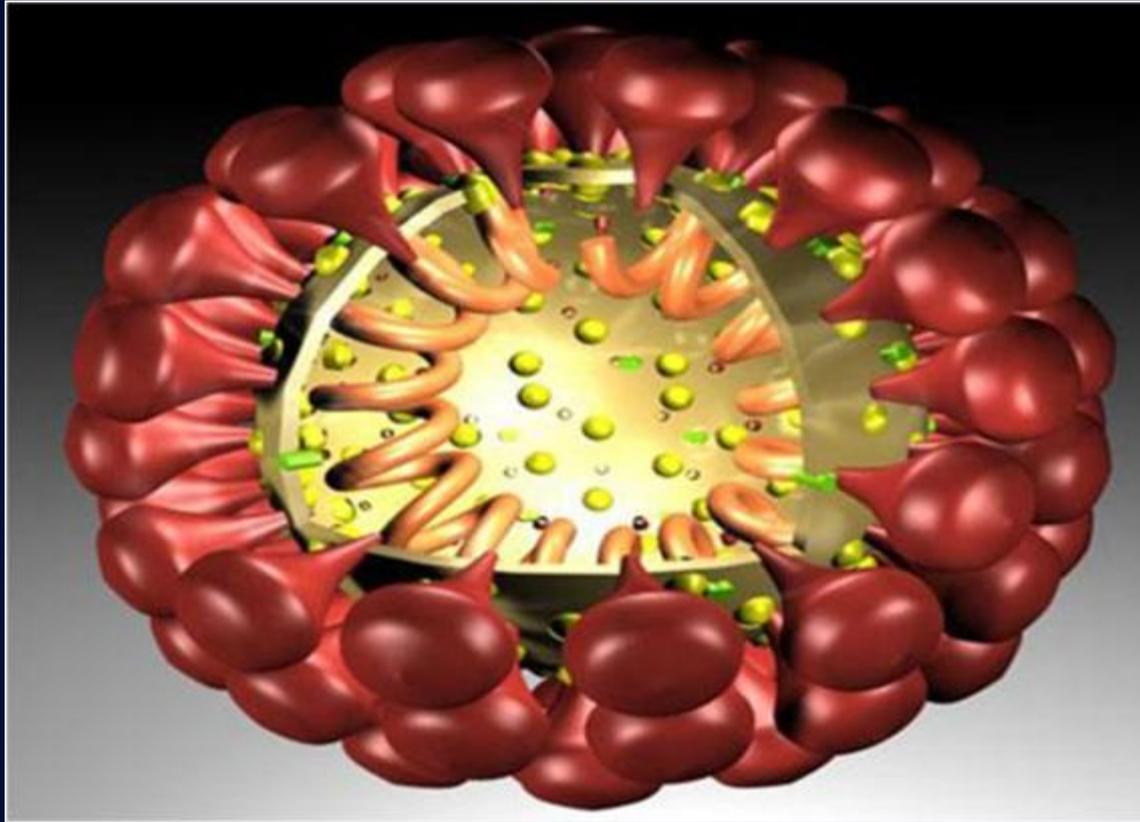


# From one of his Cardinals



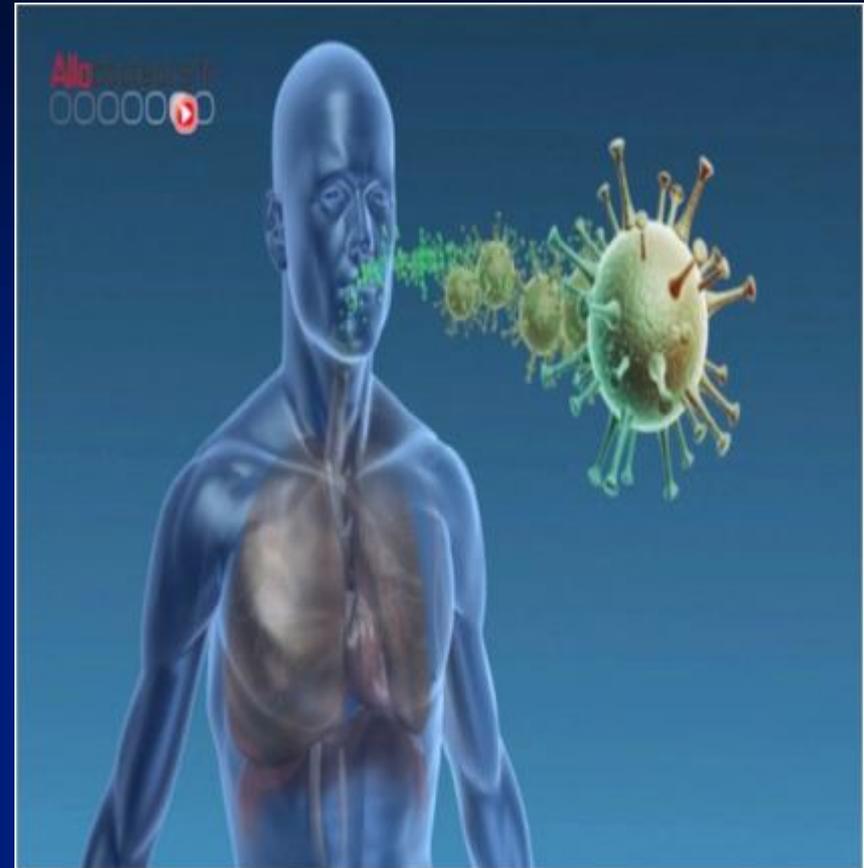
# Coronaviruses

- SARS, MERS



# Coronaviruses

- Named for crown-like spikes
- Believed responsible for common colds
- Typically URI in humans
- Also GI s/s in animals
- Discovered in 1960's
- SARS 11/02 – 4/04



# **MERS-CoV**

- **Middle East Respiratory Syndrome**
    - First reported 2012 in Saudi Arabia
    - Fever, cough, SOB, high case fatality rate
    - Middle East and Korea largest outbreaks
  - **1595 cases worldwide, 571 died**
    - 2 US cases in May 2014 (IN, FL)
    - HCW from Saudi Arabia
  - **Believed virus came from camels**
  - **Requires vigilance...**
- 
- 
-

# Saudi Arabia - Hajj

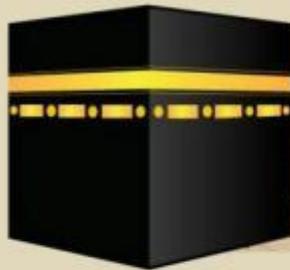
- Largest mass gathering in world
- Every able-bodied adult Muslim is required to make Hajj at least once
- Sept. 21-26, 2015 (2 million people)



# The Pilgrimage...

## THE SACRED JOURNEY

What it takes to complete the holy pilgrimage of Islam



The pilgrim enters Makkah and expresses the intention to perform Hajj.

5  
Mecca

It is then obligatory for the pilgrim to circle the Kaaba 7 times, whilst reciting prayers, in what is known as Tawaf.

The pilgrim will then pass between the hills of Safa and Marwah 7 times.

Pilgrims will then make their way back to Makkah where the Tawaf will be performed and prayers will be offered.

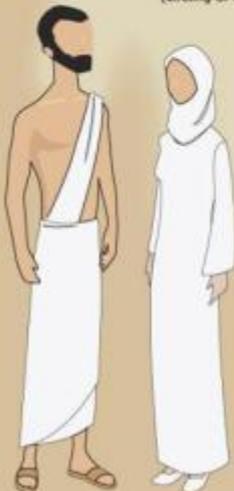
The crossing between the hilltops of Safa and Marwa is also completed 7 times.

Pilgrims also drink from the Zam-Zam well.

Having returned to Mina, Male pilgrims proceed to stone 3 pillars representing the devil.

Pilgrims usually stay in Mina to offer prayer for a few days.

Finally, Pilgrims can return to Makkah and the holy Masjid al-Haram to perform the farewell Tawaf (circling of the Kaaba).



### The required pilgrimage dress:

Men wear two white cloths, one of which covers the body from the waist down, and one that is gathered around the shoulder, this is known as an "Ihram"

Women usually wear a simple white dress and headscarf, or their own native dress. Any garment which covers her so she is dressed modestly.

The required pilgrimage dress is a symbol of **purity** and **equality**.

### The 5 stages of Hajj

1. Start of the main pilgrimage
2. Prayers at the Plain of Arafat
3. Pilgrims sleep at Muzdalifah
4. Jamaraat - stoning the pillars
5. Return to Mecca

1  
Mina

Pilgrims will then make their way to Mina, a short distance away, to perform 5 prayers starting with Zuhr in the afternoon and ending with Fajr in the early hours of the morning.

4

Here, male pilgrims will perform the stoning of the devil ceremony where pebbles are thrown at a stone pillar.

An animal sacrifice, whose meat is to be distributed to the poor, is also made.

3  
Muzdalifah

Here, pilgrims will collect pebbles needed for the "stoning" ceremony.

Before the sun rises, Pilgrims will set off back to Mina.

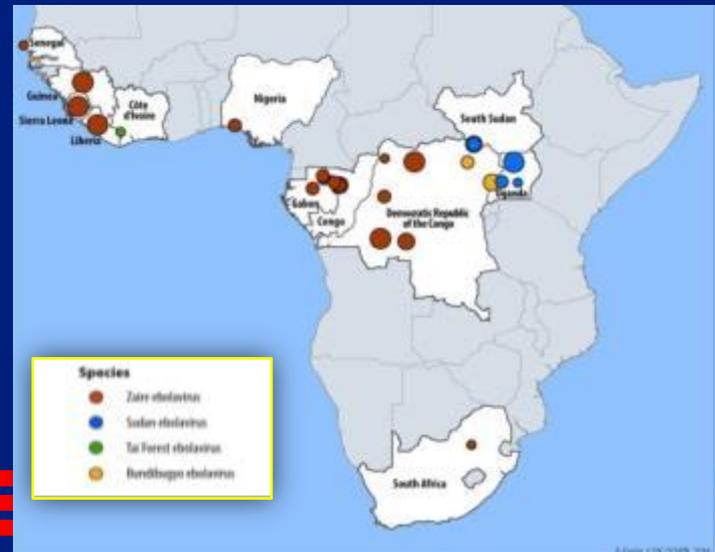
Pilgrims will make their way to Arafat and time will be devoted to prayer.

2  
Arafat

When the sun sets, pilgrims will leave Arafat for Muzdalifah.

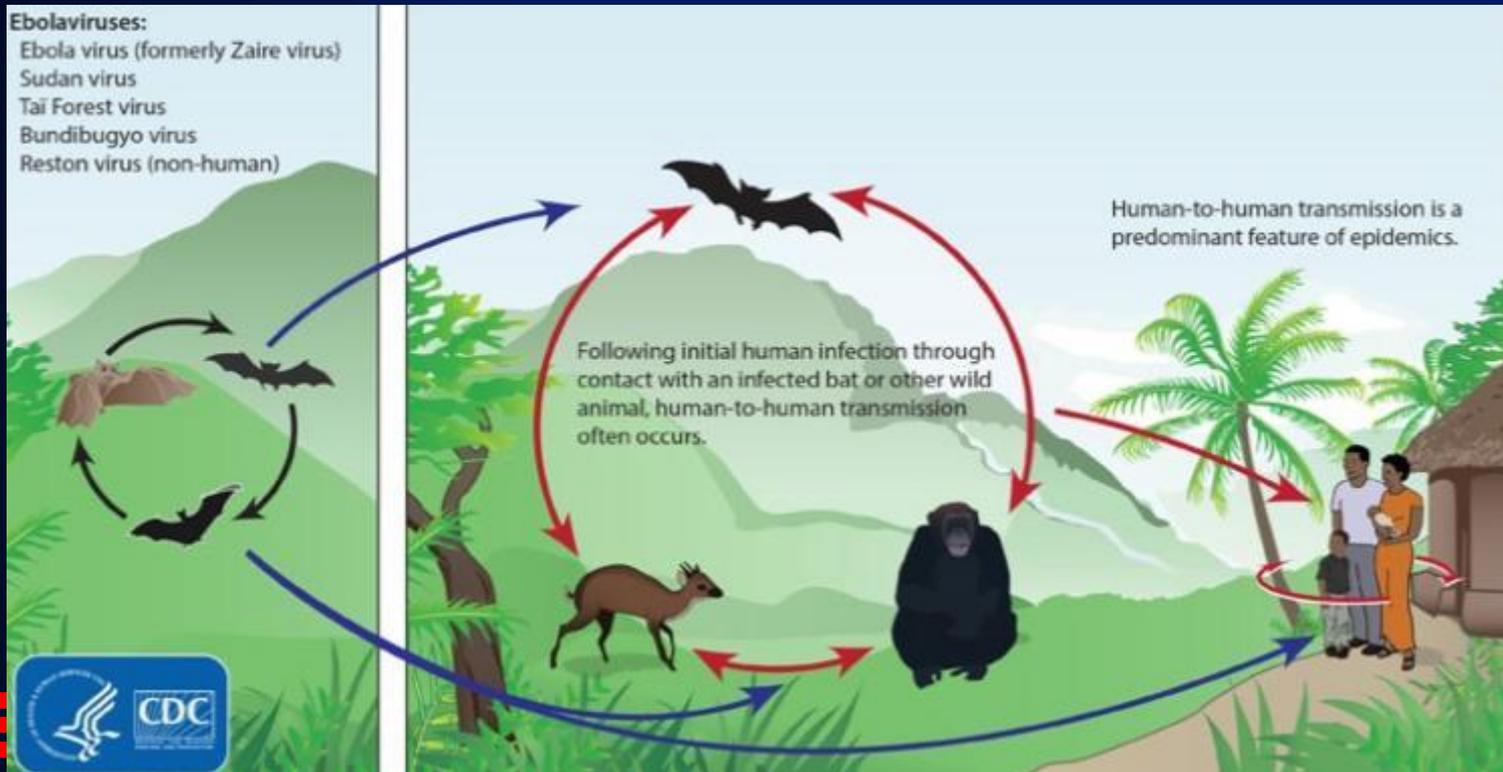
# Ebola Virus

- Prototype Viral Hemorrhagic Fever Pathogen
  - Filovirus: enveloped, non-segmented, negative-stranded RNA virus
  - Severe disease with high case fatality
  - Absence of specific treatment or vaccine
- >20 previous Ebola and Marburg virus outbreaks
- 2014 West Africa Ebola outbreak caused by *Zaire ebolavirus* species (five known Ebola virus species)

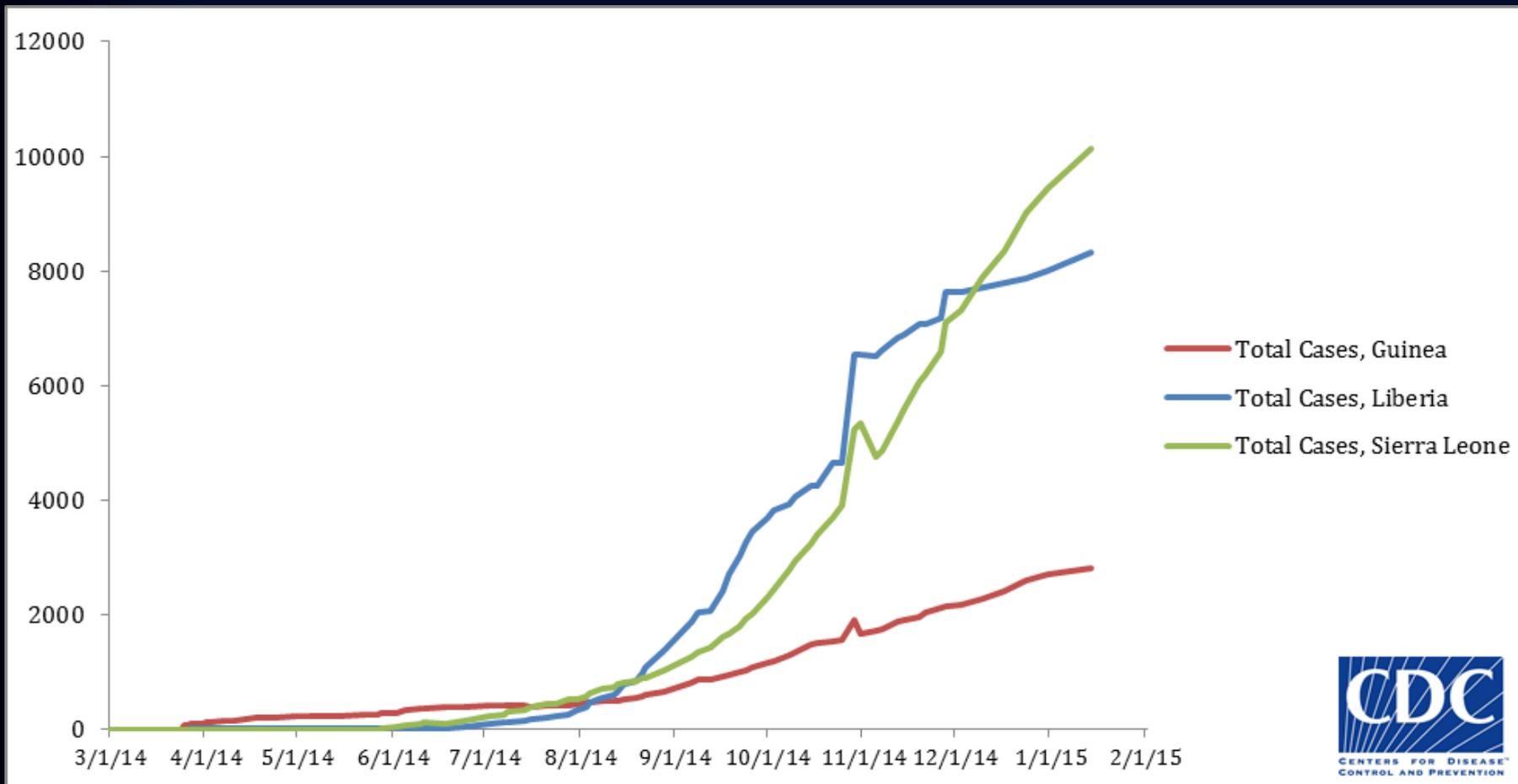


# Ebola Virus

- Zoonotic virus – bats the most likely reservoir, although species unknown
- Spillover event from infected wild animals (e.g., fruit bats, monkey, duiker) to humans, followed by human-human transmission



# 2014 Ebola Outbreak



This graph shows the cumulative reported cases in Guinea, Liberia, and Sierra Leone provided in [WHO situation reports](#) beginning on March 25, 2014 through the most recent situation report on January 14, 2015.

# Ebola Virus Transmission

- Virus present in high quantity in blood, body fluids, and excreta of *symptomatic* EVD-infected patients
- Opportunities for human-to-human transmission
  - **Direct contact** (through broken skin or unprotected mucous membranes) with an EVD-infected patient's blood or body fluids
  - **Sharps injury** (with EVD-contaminated needle or other sharp)
  - **Direct contact with the corpse** of a person who died of EVD
  - **Indirect contact** with an EVD-infected patient's blood or body fluids via a contaminated object (soiled linens or used utensils)
- Ebola can also be transmitted via contact with blood, fluids, or meat of an **infected animal**
  - Limited evidence that dogs become infected with Ebola virus
  - No reports of dogs or cats becoming sick with or transmitting Ebola

# Human-to-Human Transmission

- Infected persons are not contagious until onset of symptoms
- Infectiousness of body fluids (e.g., viral load) increases as patient becomes more ill
  - Remains from deceased infected persons are highly infectious
- Human-to-human transmission of Ebola virus via inhalation (aerosols) has not been demonstrated

# Ebola Symptoms

Signs include fever ( $> 38.0^{\circ}\text{C}$  or  $100.4^{\circ}\text{F}$ ) (87%) and:

- Fatigue (76%)
- Vomiting (68%)
- Diarrhea (66%)
- Loss of appetite (65%)
- Severe headache
- Muscle pain
- Abdominal pain
- Unexplained hemorrhage
- Incubation period: 2 – 21 days (average 8-10 days)
  - Not contagious until symptomatic

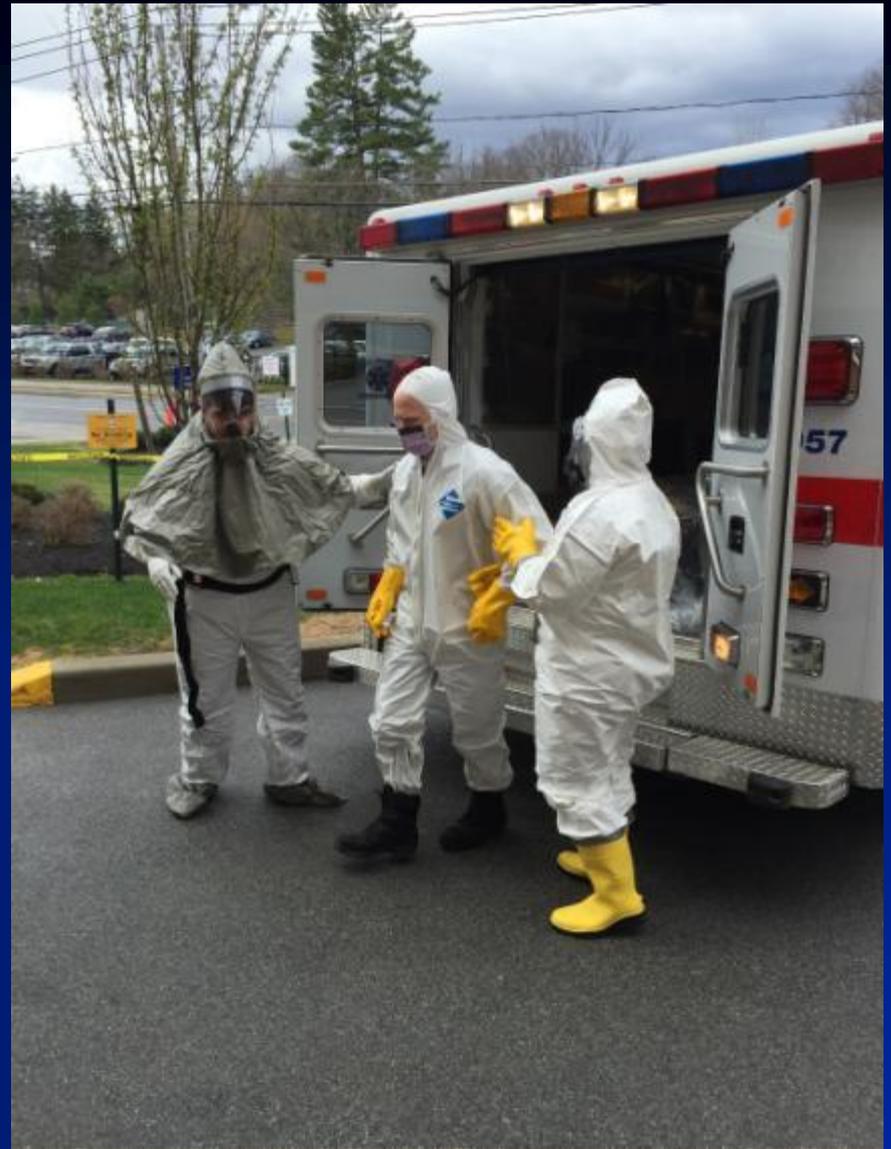


# Ebola Response

- BERT (Biological Emergency Response Team)



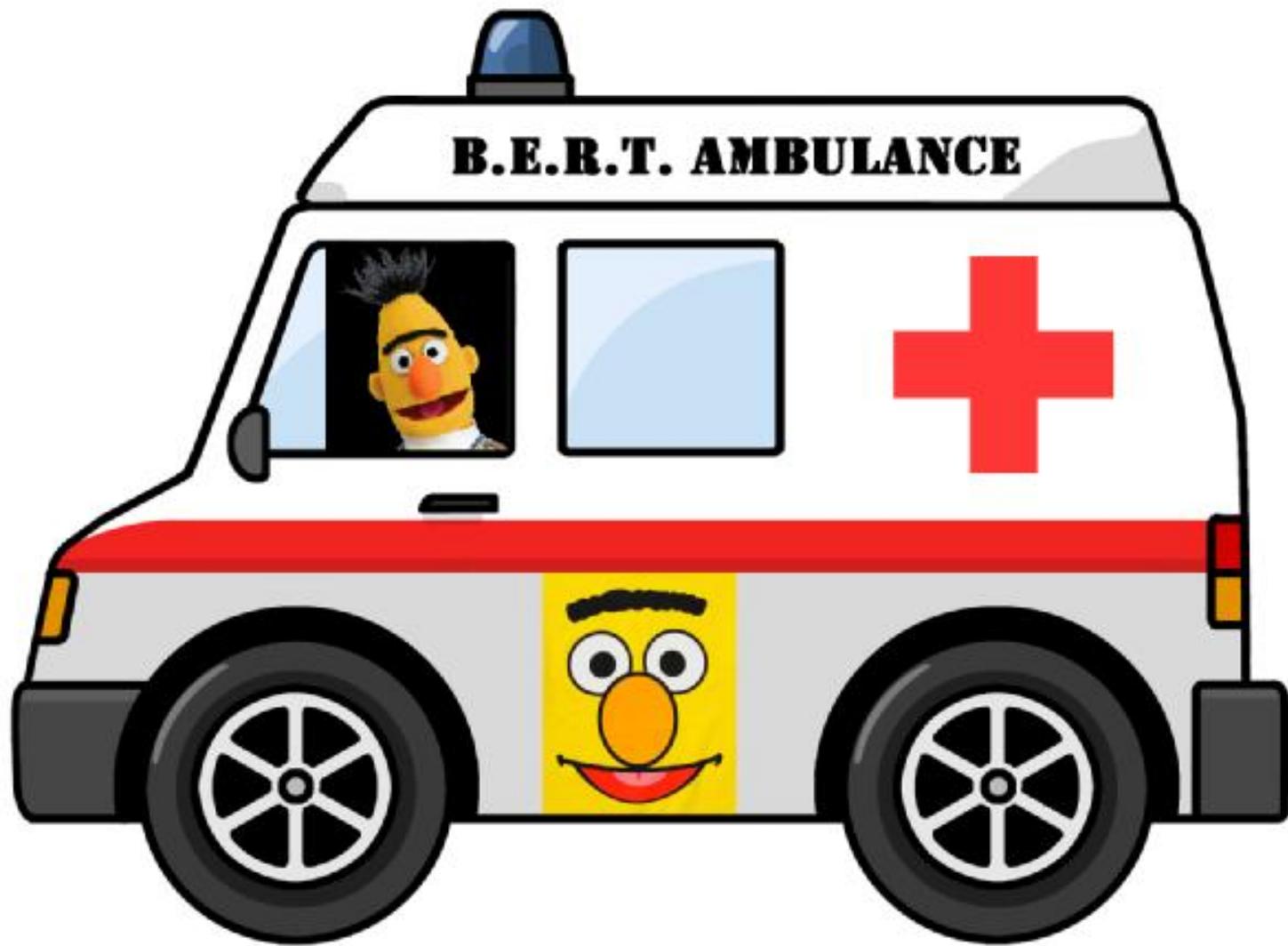
# BERT



# BERT



<http://saratogaems.org/Downloads/BERTMAPolicy2015JuneRevision.pdf>



**B.E.R.T. AMBULANCE**



# Influenza Virus

- **Orthomyxoviridae** single strand RNA respiratory viruses
- **Type A (most severe, 2 subtypes)**
  - Humans, birds (avian)\*, pigs (swine), horses (equine), other animals. \* **wild birds are natural hosts**
  - Affects all ages
  - Epidemics and pandemics
- **Type B (less severe, no subtypes)**
  - Humans only
  - Primarily affects children (can be severe in elderly)
  - Milder epidemics, cannot cause pandemics
- **Type C (mild to no symptoms)**
  - Humans and pigs (swine)
  - Rare (?) - by age 15, most have antibodies

# Influenza Vaccine

- 2015-2016:
  - (A) H1N1
  - (A) H3N2
  - (B) Phuket (2013)
  - (B) Brisbane\*



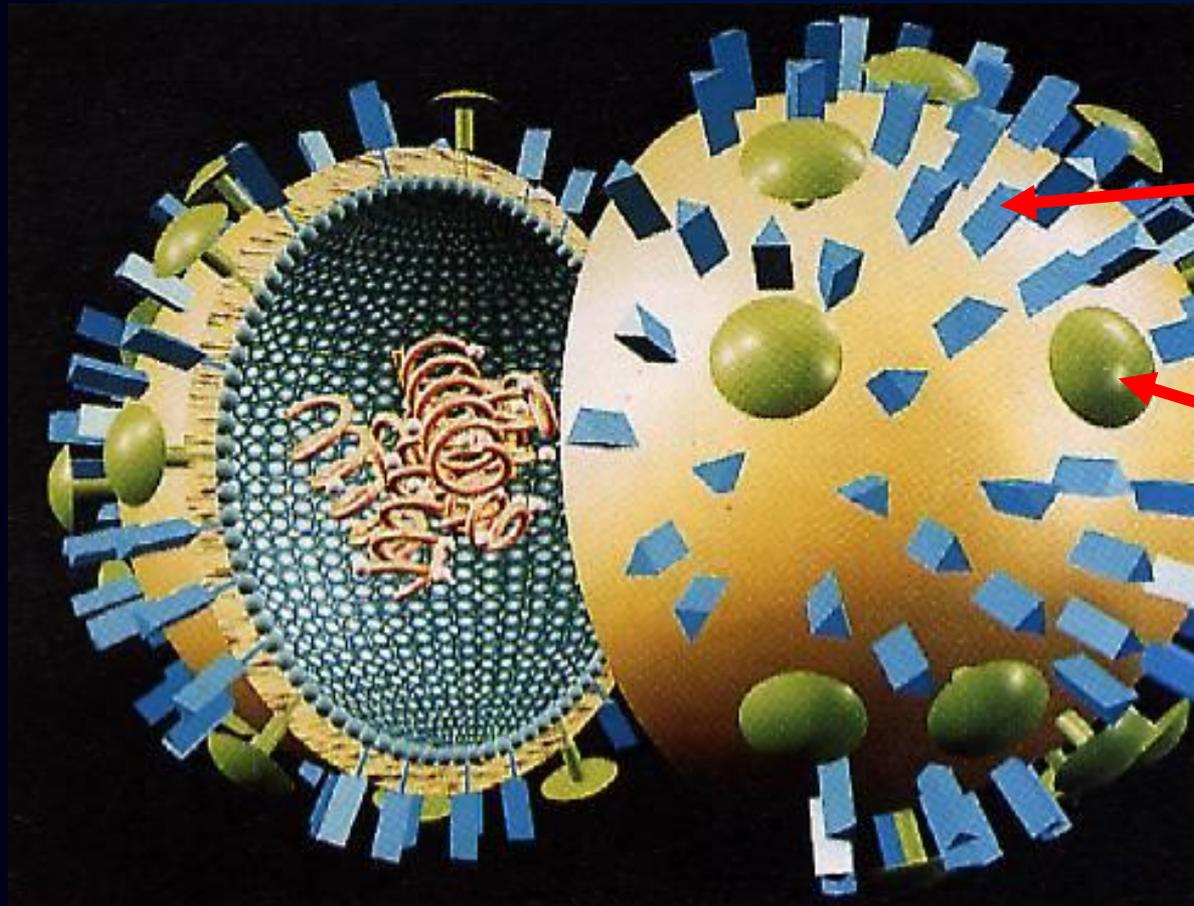
\*Quadrivalent only

# Flu Vaccine Effectiveness

- SWAG method
- 2011-2012 was 71% effective
- 2014-2015 was only 18% effective
  - Antigenic drift responsible
  - Two different strains combine



# Influenza A - subtypes



**HA**  
(hemagglutinin)

**15 types**  
(H5, H7, H9)

**NA**  
(neuraminidase)

**9 types**  
(N1, N2)

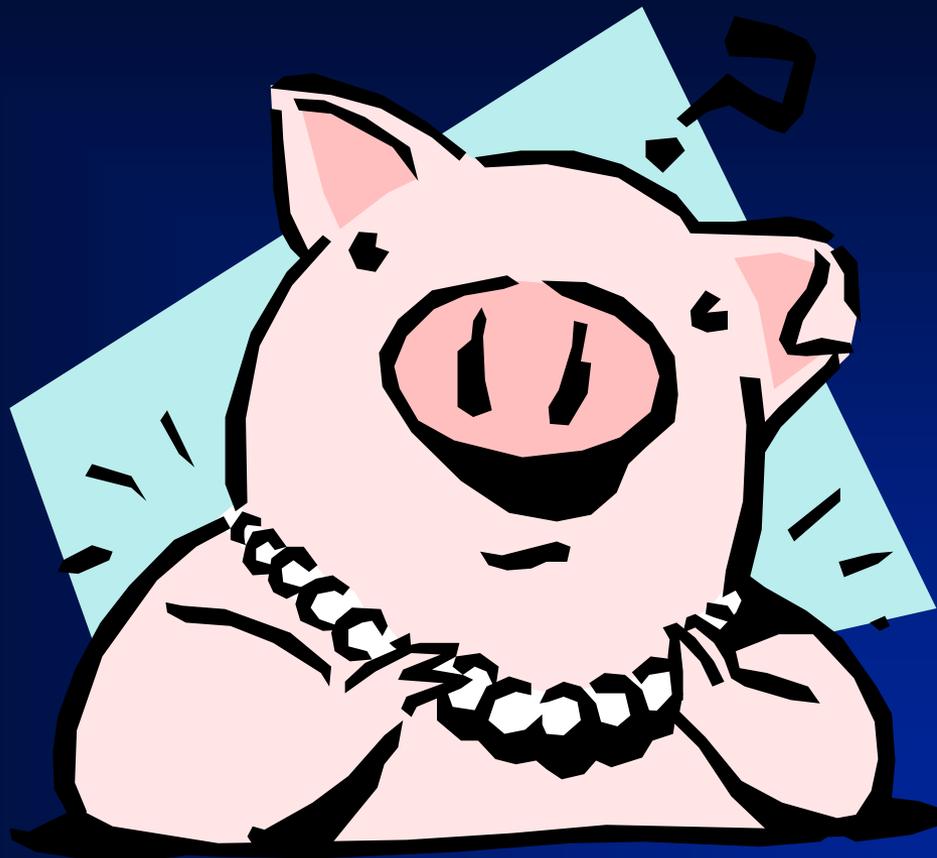
# Influenza Epidemiology

- Viruses normally species specific
- “Spill over” extremely rare

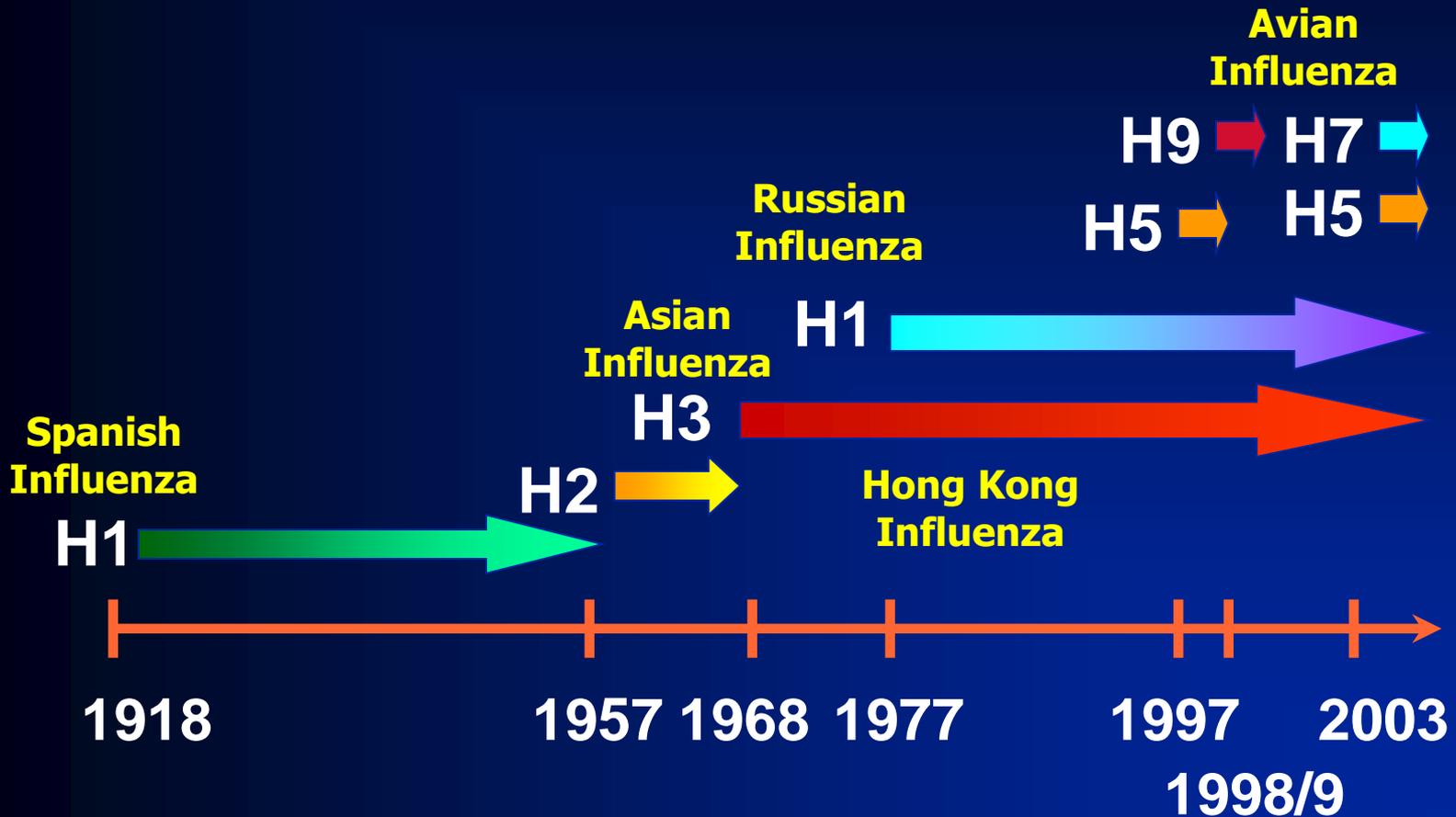




# From animals to people:



# Timeline of Emergence of Influenza A Viruses in Humans



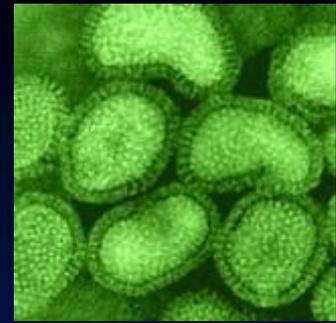
# **Influenza is a serious illness**

- **Annual deaths (US): 36,000\***
- **Hospitalizations: >200,000\***

\* 1990's estimates from average 500 million annual cases  
(Worldwide death rate > 250,000 annually)

- **Who is at greatest risk for serious complications?**
  - persons 65 and older (comprise 85% of deaths)
  - persons with chronic diseases
  - infants
  - pregnant women
  - nursing home residents (attack rates of 60% vs. general population attack rates of 5-20%)

# Influenza



- Respiratory infection
- Transmission: Contact with respiratory secretions from an infected person who is coughing and sneezing
- Incubation period: 1 to 5 days from exposure to onset of symptoms (typical 2 days)
- Communicability: Maximum 1-2 days before and 4-5 days after onset of symptoms (kids > 10 days and possibly up to 6 months)
- Timing: Peak usually December - March (NA)

# Flu or common cold?

What distinguishes  
flu from a butt  
kickin' common  
cold?



# Influenza Symptoms

- **Rapid onset of:**
  - Fever ( $>100^{\circ}\text{F}$  in 99.3%)
  - Chills
  - Body aches
  - Sore throat
  - Non-productive cough
  - Runny nose
  - Headache
- **Hallmark = sudden onset**



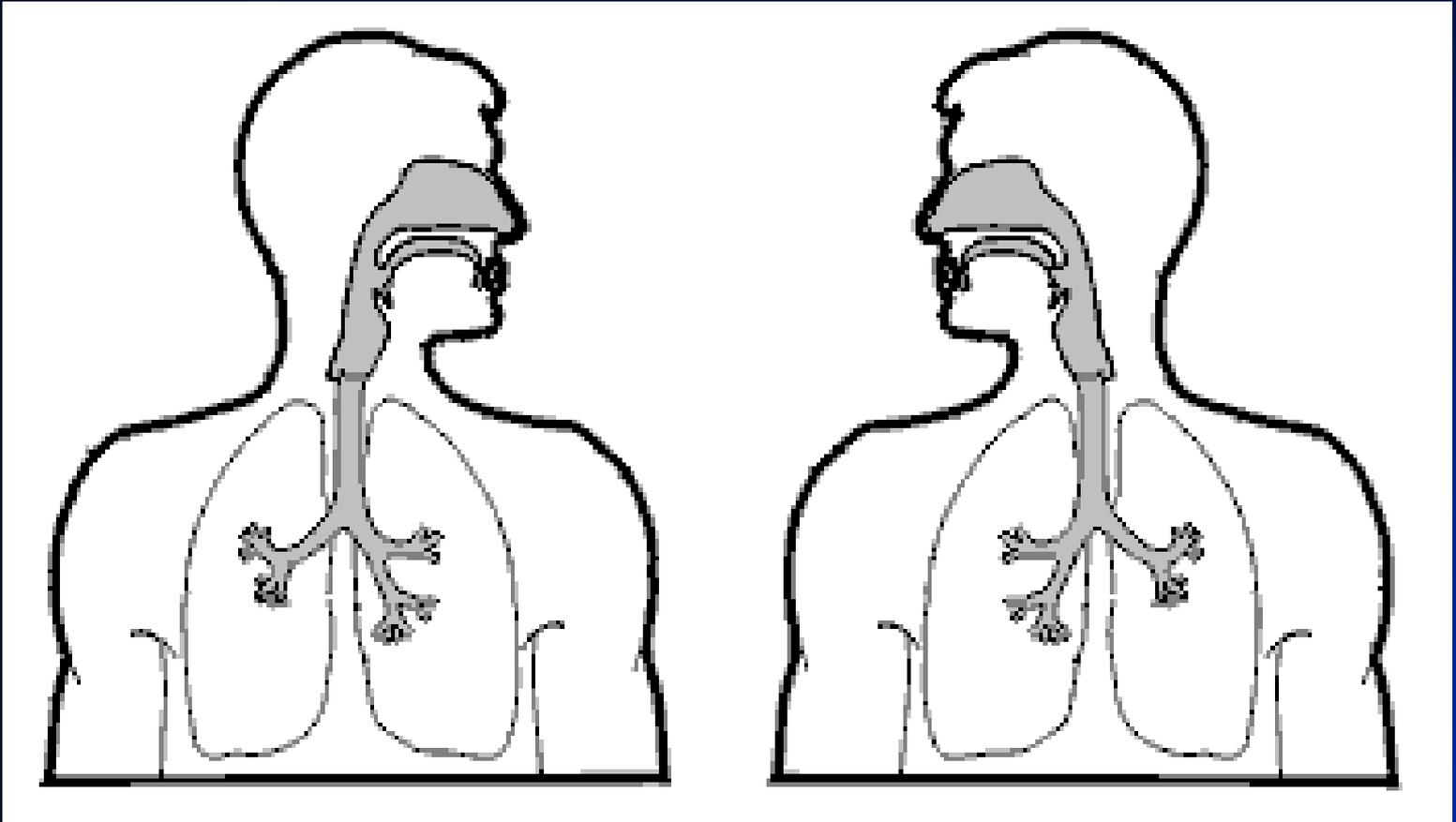
# How you get the flu:

- Germs are transmitted
- Greatest period of infectivity correlates with **fever**



# How close is too close?

Danger area around sick people is 3 feet



# How germs are transmitted: Nose → Hand → Object



- Doorknob
- Telephone
- Radio mic
- Pens, keyboards
- SCBA, EMS bags
- Steering wheel
- Etc...

# Influenza Viruses

- **Hard non-porous surfaces 24-48°**
  - Plastic, stainless steel, etc.
- **Cloth, paper & tissue 8-12°**
  - Transferable to hands for 15 minutes
- **Hands → viable for < 5 min**
- **↓ temp, ↓ humidity = ↑ survival**

# Prevention: Vaccination

Did you get a  
flu vaccine?

Vaccination is  
our single most  
powerful  
weapon



**I Don't Need a Flu Shot!**



# Take Home Points: Flu Shot

1. Employers must offer flu shots
2. Just because you never get sick:
  - Does not mean you won't infect family
  - Does not mean you won't infect patients
3. Unvaccinated HCW are negligent



# Revised Flu Guidelines 2011

- Surgical mask on the patient
- Vaccinate all FF, EMS, and HCW
- Handwashing
- Gloves
- Consider mask for EMS
- N-95 only for AGP (Aerosol Generating Procedures)



# Flu Vaccination – NYS 2013

- **Mandatory for HCW**
  - Employer must provide at no cost
  - Sign a declination form if refused
- **Unvaccinated HCW must wear a mask for all patient contacts**
- **Does not (currently) cover EMS**
  - Commissioner's regs do not reach EMS
  - Hospitals will require unvaccinated EMS workers to wear mask when entering ED



# Flu Pandemics 20<sup>th</sup> Century



1918:  
“Spanish Flu”

**A(H1N1)**

20-40 m deaths

>675,000 US deaths



1957:  
“Asian Flu”

**A(H2N2)**

1-4 m deaths

70,000 US deaths



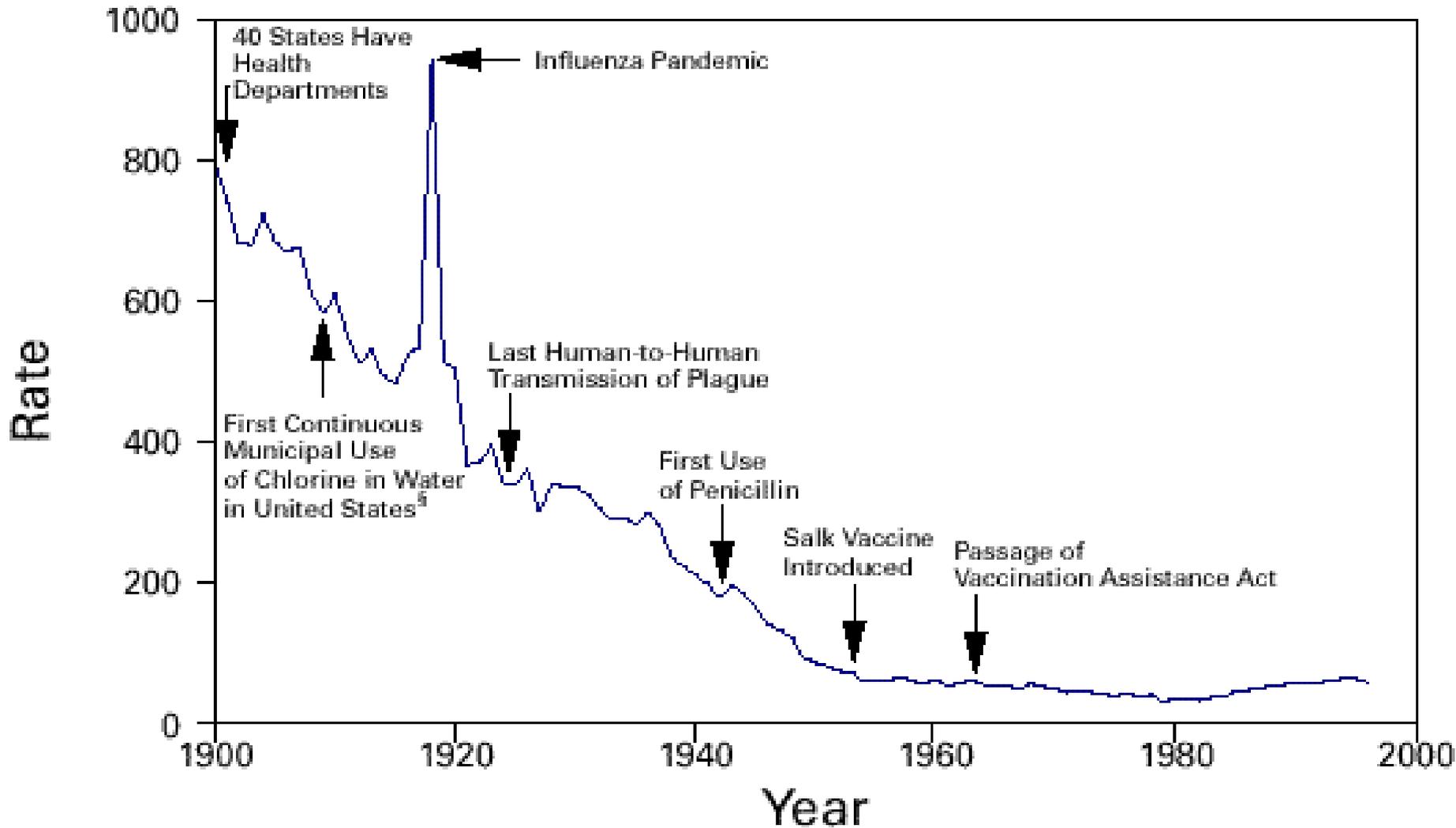
1968:  
“Hong Kong Flu”

**A(H3N2)\***

1-4 m deaths

34,000 US deaths

**FIGURE 1. Crude death rate\* for infectious diseases — United States, 1900–1996†**



\*Per 100,000 population per year.

†Adapted from Armstrong GL, Conn LA, Pinner RW. Trends in infectious disease mortality in the United States during the 20th century. JAMA 1999;281:61–6.

§American Water Works Association. Water chlorination principles and practices: AWWA manual M20. Denver, Colorado: American Water Works Association, 1973.

# Pandemic oops:



1976:  
“Swine Flu”

**A(H1N1)**

1 death (13 infected)

>25 GBS deaths  
from 40 m vaccines



2003:  
“SARS”

**unknown**

774 deaths

No US deaths



2003:  
“Bird Flu”

**A(H5N1)**

262 deaths to date

No US deaths

**But were there lessons learned?**



**First Indian SARS patient, Punde, Goa NYT April 2003**





# Severe Acute Respiratory Syndrome (SARS)

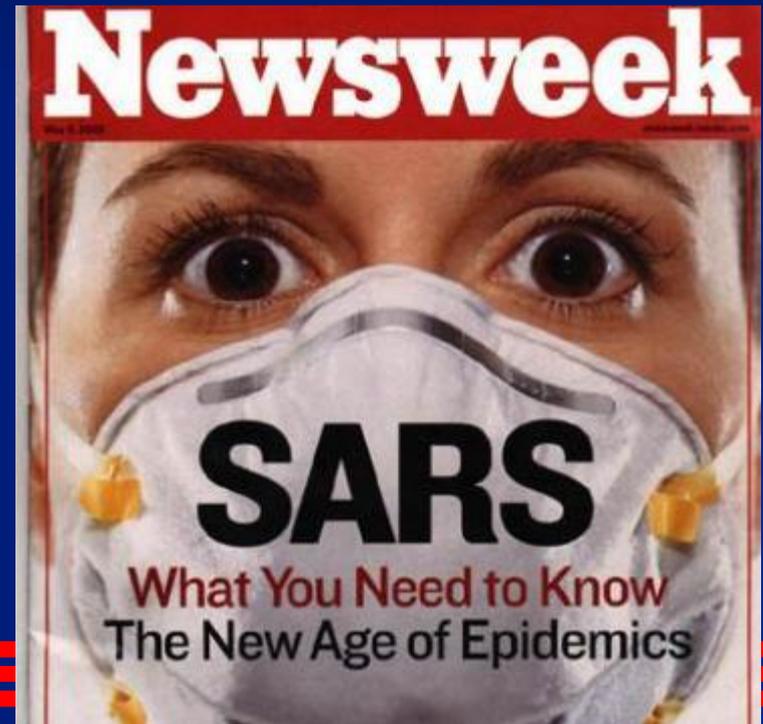


**Except:**



# Toronto EMS – Spring 2003

- 41 Stations
- 95 units/shift (180,000 transports/year)
- 850 medics
- Over 400 medics quarantined for unprotected SARS exposures
- 4 actually infected
- Crippled 911 system



# Is this **JUST** an EMS Problem?

- **Most certainly NOT!**
- *Total deaths worldwide from SARS: 916 (of total 8,422 cases reported from Nov 2002 through Aug 2003).*
- *25 % of deaths were HCWs (Health Care Workers). Fully one quarter of SARS infections were HCWs.*

# Health Care Worker Deaths

- Startling numbers of HCWs infected
- *Total deaths worldwide from SARS: 916 (of total 8,422 cases reported from Nov 2002 through Aug 2003)*
- *25 % of deaths were HCWs (Health Care Workers). Fully one-quarter of SARS infections were HCWs.*
- *Reason? Breaks in infection control procedures!*

# Name change to protect pigs

**H1N1**

~~**SWINE  
FLU**~~



# Tasmania, Australia EMS

- 10 ambulance officers isolated (15% of force) H1N1
- 4 June 2009



**“If people don’t take it seriously,  
this sort of thing will happen...”**

# U.S. Response

- **CDC: notified clinicians, issued guidance**
- **Public Health Emergency declared**
  - Allowed release of funds
  - ¼ SNS pushed to states (Rx, N-95s)
- **Laboratory testing**
  - Test kits developed for State labs
  - Sensitivity to Oseltamivir (Tamiflu®) & Zanamivir (Relenza®)
- **States charged to direct local actions...**
- **Vaccine development begun**



**Did the plan work?**



**What plan?**

# US caught with pants down

- Pandemic plans were predicated on outbreaks starting in Europe
- Believed U.S. would have weeks or months to prepare
- Instead, outbreak started in U.S. !
- AND: plans all predicated on large numbers of deaths...

AUTO SPIES



# Novel H1N1 Spread...

## Geographic spread of influenza activity

(Geographic spread reflects the number and distribution of regions within a country reporting influenza activity.)

Status as of Week 31  
27 Jul - 02 Aug 2009



# H1N1 projections



- US Population = 307 million
- Projected 20 – 60 % infected
  - CDC estimated 40% if no vaccine ready
  - Usually 5 – 20% infected with seasonal flu
  - Seasonal flu death rate is 1 per 1000 (0.1%)
  - H1N1 death rate turned out to be 1 per 48,000 (0.048%)

# H1N1 actual

- US Population = 307 m
- 57 million became ill (19%)
  - 257,000 hospitalized
  - 11,690 deaths (rate = 0.0002%)
  - Over 8 month period, peaked in October
  - Was not widespread in any single state for greater than 1 month



Source: CDC 15 Feb 2010

# And in hindsight...

*The Washington Post*

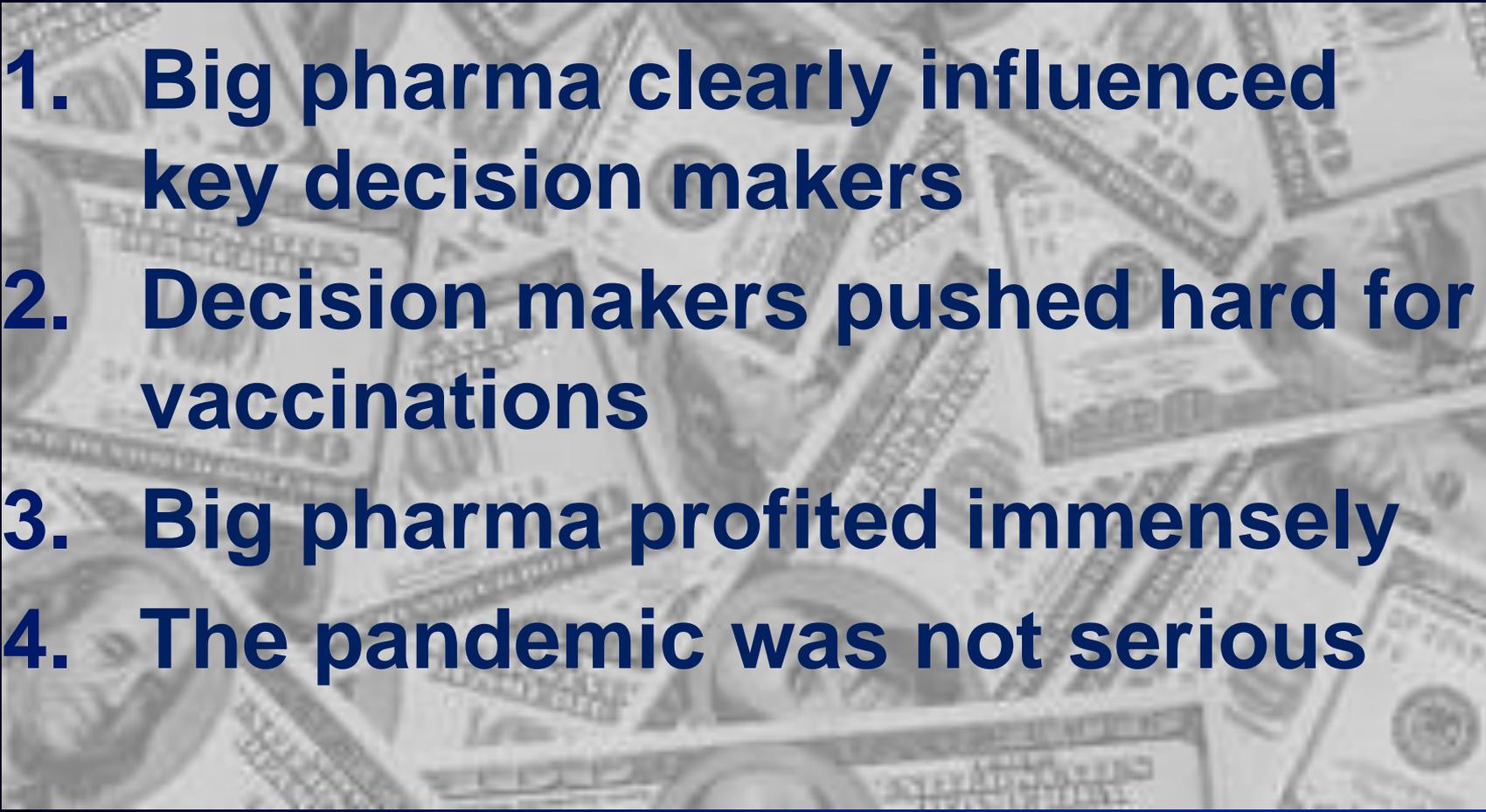
*June 4, 2010*

- Parliamentary Assembly Council of Europe (PACE) denounces WHO's **“waste of large sums of public money...unjustified scares...undue influenced by pharmaceutical industry”**
- British Medical Journal (BMJ) investigation of WHO uncovered **“lack of transparency...conflicts of interest...key pandemic scientists funded by Roche and GSK (antiviral drug companies) that profited tremendously from WHO recommendations”**

# Why all the hysteria?



# **It appears we were duped**

- 1. Big pharma clearly influenced key decision makers**
  - 2. Decision makers pushed hard for vaccinations**
  - 3. Big pharma profited immensely**
  - 4. The pandemic was not serious**
- 



**We need to be  
smarter**



# **Fire Police Captain John Brenckle** **1947 - 2004**



**Berkeley Hills Fire  
Company Station 247**

**Pittsburgh, PA**

**LODD September 23,  
2004**

**Necrotizing Fasciitis**

# Success is within reach



# Why do HCW get infected and die?



# **Show me the money...**

## *HCW non-adherence w/ PPE recommendations:*

- 1. Believe not necessary, inconvenient, disruptive**
- 2. Lack of PPE availability**
- 3. Inadequate infection control training**
- 4. Lack of systematic HCW safety approach**
- 5. Failure to recognize need (situational)**

**Daugherty et al. Crit Care Med 2009;37:1210-6**

**Swaminathan et al. Emerg Infect Dis 2007;13:1541-7**

**Visentin et al. CJEM 2009;11:44-56**

# First Rule of Infection Control

**Wash your hands!**



- Alcohol based hand rubs
  - Superior (CDC, October 25, 2002)
- Soap & water when dirty





# EMS Handwashing

- Urban EMS System – Minneapolis, MN: 6 month study



The Journal of Emergency Medicine, Vol. 47, No. 2, pp. 163–168, 2014  
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0736-4679/\$ - see front matter

<http://dx.doi.org/10.1016/j.jemermed.2013.08.070>



## ***Selected Topics: Prehospital Care***



### **HAND SANITIZATION RATES IN AN URBAN EMERGENCY MEDICAL SERVICES SYSTEM**

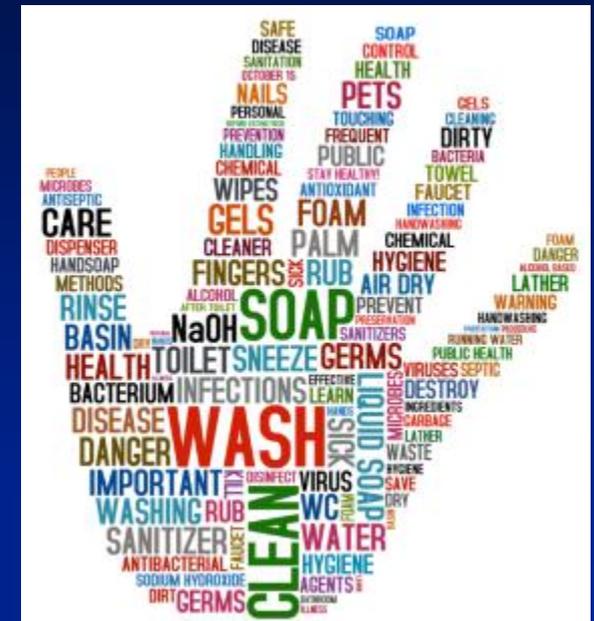
Jeffrey D. Ho, MD,\*† Rebecca K. Ansari, MD,‡ and David Page, EMT-P§

\*Departments of Emergency Medicine and Emergency Medical Services, Hennepin County Medical Center, Minneapolis, Minnesota, †Emergency Medicine Program, University of Minnesota Medical School, Minneapolis, Minnesota, ‡Department of Emergency Medicine, North Memorial Medical Center, Robbinsdale, Minnesota, and §EMS Education Department, Inver Hills Community College, Inver Grove Heights, Minnesota

Reprint Address: Jeffrey D. Ho, MD, Departments of Emergency Medicine and Emergency Medical Services Hennepin County Medical Center, 701 Park Avenue South, Minneapolis, MN 55415

# EMS Handwashing

- Urban EMS System – Minneapolis, MN: 6 month study
- Medics:
  - 1.1% prior to patient contact
  - 62.8% after patient contact
  - 19% before meals
  - 59.5% after meals



HAND SANITIZATION RATES IN AN URBAN EMERGENCY  
MEDICAL SERVICES SYSTEM

Jeffrey D. Ho, MD,\*† Rebecca K. Ansari, MD,‡ and David Page, EMT-P§

# Resistance

- Bacteria become tolerant, they also become less sensitive to certain antibiotics
- Triclosan has induced resistance to INH



# Exposure Control Plan

## Gloves, worn once, thrown away



# The Glove Problem

Wilson et al. *Antimicrobial Resistance and Infection Control* 2013, **2**(Suppl 1):O3  
<http://www.aricjournal.com/content/2/S1/O3>



ANTIMICROBIAL RESISTANCE &  
INFECTION CONTROL

ORAL PRESENTATION

Open Access

## O003: The misuse of clinical gloves: risk of cross-infection and factors influencing the decision of healthcare workers to wear gloves

J Wilson<sup>1\*</sup>, S Lynam<sup>2</sup>, J Singleton<sup>3</sup>, H Loveday<sup>4</sup>

*From* 2nd International Conference on Prevention and Infection Control (ICPIC 2013)  
Geneva, Switzerland. 25-28 June 2013

**Wilson J, Lynam S, Singleton J, Loveday H. The misuse of clinical gloves: risk of cross-infection and factors influencing the decision of health care workers to wear gloves. *Antimircob Resis Infect Contr.* 2013; 2(Suppl 1):O3**

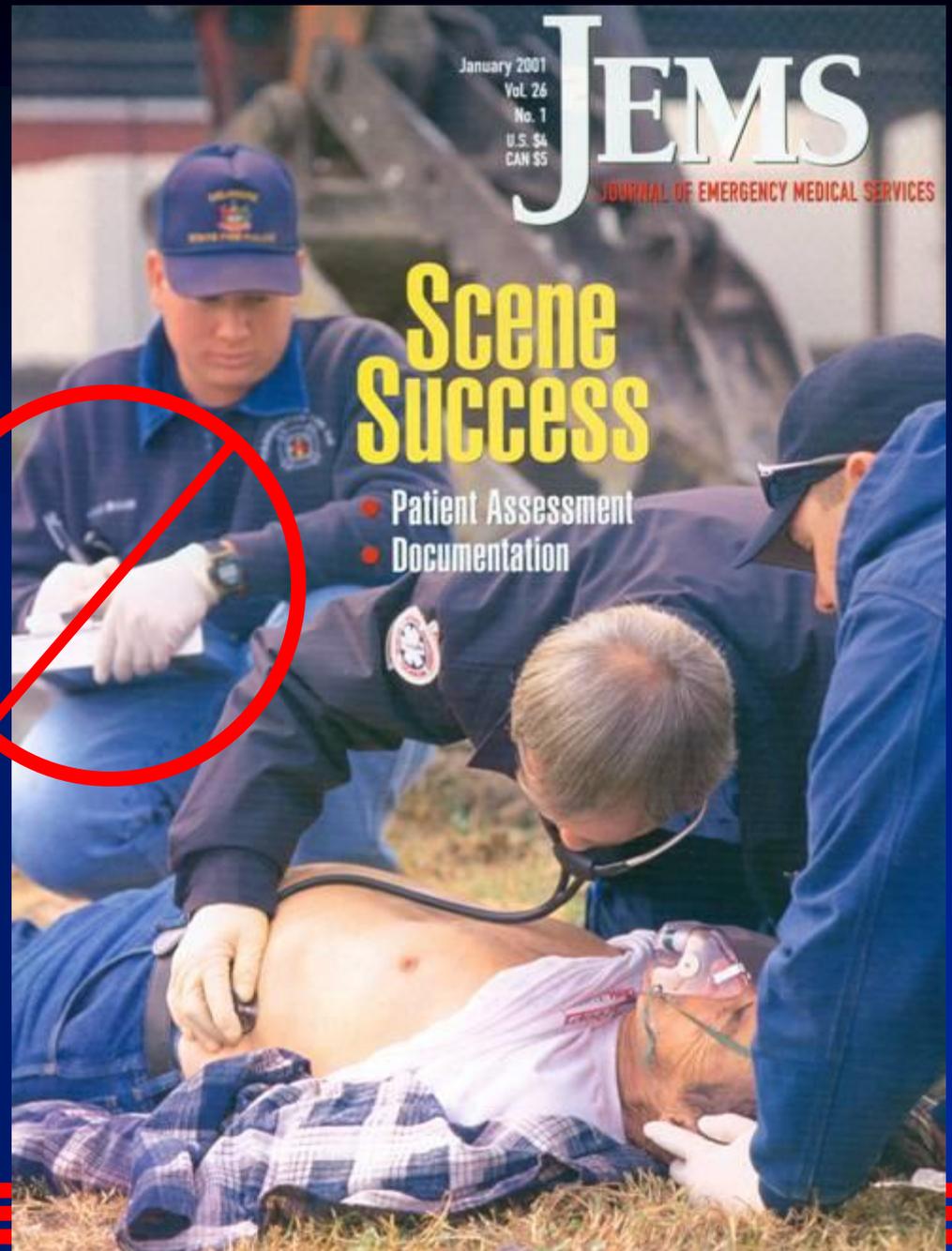
# The Glove Problem

- **Gloves used inappropriately 42% of time**
  - ✓ Inappropriate = no risk of BBP exposure
- **39% uses involved cross-contamination**
  - ✓ More likely with inappropriate use (58% vs. 28%)
- **24% involved > 5 objects touched by gloved hand prior to performing procedure**

**Wilson J, Lynam S, Singleton J, Loveday H. The misuse of clinical gloves: risk of cross-infection and factors influencing the decision of health care workers to wear gloves. Antimicrob Resis Infect Contr. 2013; 2(Suppl 1):03**

# Gloves

For people, not  
equipment



# Second Rule of Infection Control

**Stay Away!**



- If you are sick, stay home! (until 24 hr w/o fever)
- If you must be around others, don't touch them and wear a mask.

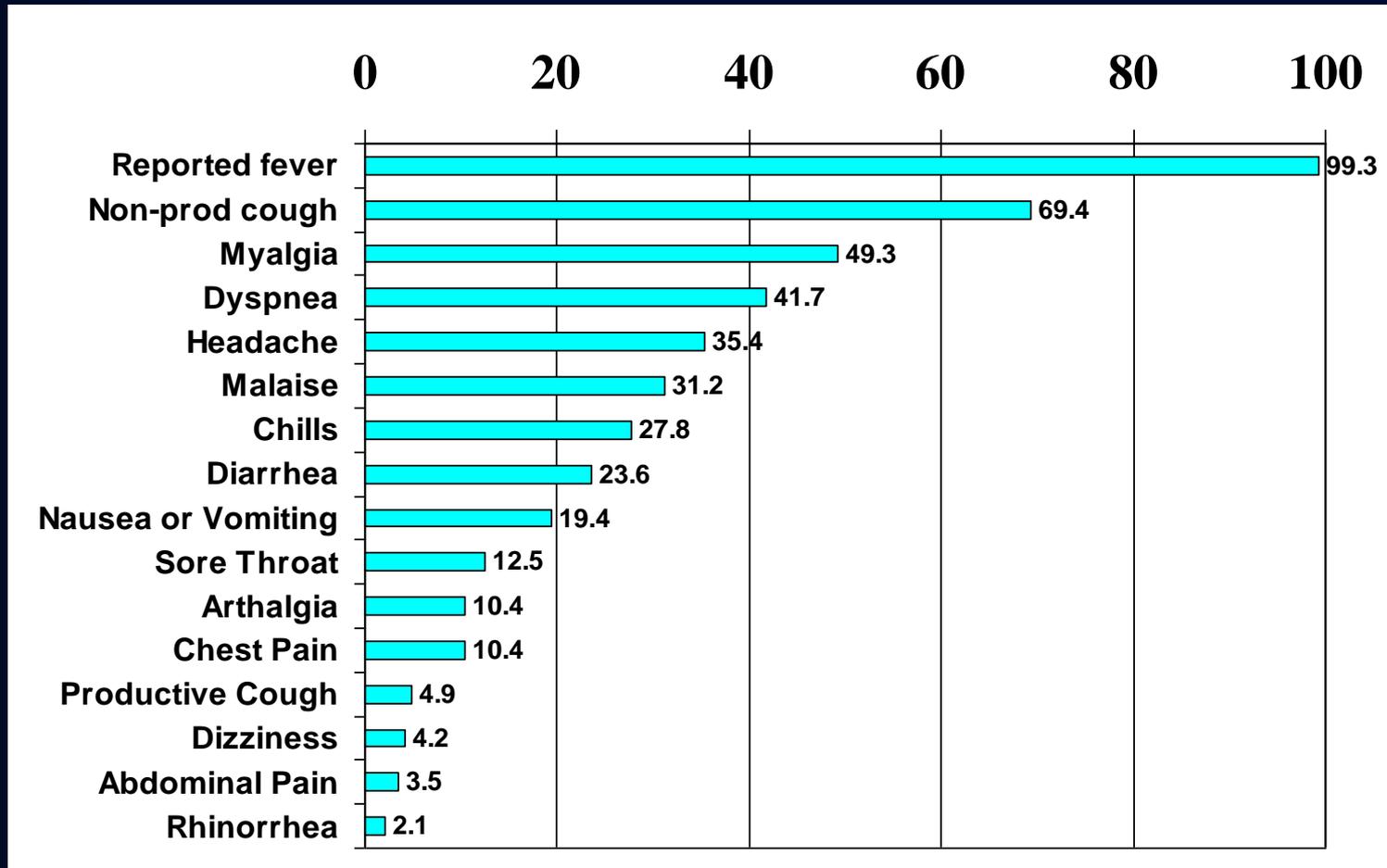


# How do you detect flu?

- Signs and symptoms
  - Fever most consistent s/s any infection
  - Not just fever, but high fever ( $> 100^{\circ}$  F)



# SARS Symptoms Reported at Hospital Admission (% with symptom, n=144)



JAMA, June 4, 2003 – Vol 289, No. 21 (SARS in the Greater Toronto Area)

# Who's infected?



# Measuring Temperature

## Hospital

1. PA (Pulmonary Artery)
2. Esophageal
3. UBT (Urinary Bladder)
4. Rectal
5. Oral
6. Tympanic

## Prehospital

1. Patient opinion
2. Provider impression
3. Tympanic screening



# Measuring Temperature

The BEST method:

1. Patient opinion



# Public Safety Oversight

Does your 911 center question callers about severe respiratory illness?



# 36 PANDEMIC FLU (OFFICIALLY ANNOUNCED)

# Measuring Temperature

## KEY QUESTIONS

- Is s/he **completely alert** (responding appropriately)?
- (Difficulty speaking) Describe to me what her/his voice sounds like.
  - (INEFFECTIVE BREATHING) Describe to me what her/his voice sounds like to this?
 

Yes \_\_\_\_\_

No \_\_\_\_\_
- Is s/he **changing color**?
  - (Yes) Describe the color change.
- Does s/he have a **fever** (hot to touch in room temperature)?
- Is s/he **coughing**?
- Does s/he have a **sore throat**? \* per Rule 2
- Does s/he have **body aches**?
- Does s/he have a **runny or stuffy nose**?
- Does s/he have **diarrhea or vomiting**?
- Is s/he having **chills or sweats**?
- Does s/he have a **headache**?
  - (Yes & no other flu symptoms) Was there a sudden onset of severe pain?
 

Yes \_\_\_\_\_

No flu symptoms in KQ 4-11 \_\_\_\_\_

36-D-1  
6



18  
CC

## POST-DISPATCH INSTRUCTIONS

- (If regular dispatch) I'm sending the **paramedics** (ambulance) to you. Please stay on the phone until they arrive. I will tell you what to do.
- (If reduced/limited dispatch) I'm **arranging care** for you now. An ambulance (or Care Van) will come to check you **when they are available**. This might take (several hours).
- (If quarantine and no dispatch) Because of the extent of the flu epidemic, an **ambulance cannot be sent** to you. I will **connect you to a flu care specialist** who will advise you on what to do.
- (Patient medication requested and Alert) Remind her/him to do what her/his **doctor has instructed** for these situations.
- (≥ 1 + DELTA) If there is a **defibrillator** (AED) available, send someone to get it ready in case we need it later.

# At EMD

DLS \* Link to X-1 unless:

INEFFECTIVE BREATHING and Not alert ABC-1

LEVELS	#	DETERMINANT DESCRIPTORS	→ A B C	CODES	LEVEL 1 (A)	LEVEL 2 (B)	LEVEL 3 (C)
<b>D</b>	1	INEFFECTIVE BREATHING with flu symptoms		36-D-1			
	2	Not alert with flu symptoms		36-D-2			
	3	DIFFICULTY SPEAKING BETWEEN BREATHS with flu symptoms		36-D-3			
	4	CHANGING COLOR with flu symptoms		36-D-4			
<b>C</b>	1	Chest pain ≥ 35 with <b>single</b> flu symptom		36-C-1			
	2	Abnormal breathing with <b>single</b> flu symptom		36-C-2			
<b>A</b>	1	Chest pain ≥ 35 with <b>multiple</b> flu symptoms		36-A-1			
	2	Chest pain < 35 with <b>single</b> flu symptom		36-A-2			
	3	Abnormal breathing with <b>multiple</b> flu symptoms		36-A-3			
<b>Ω</b>	1	Flu symptoms <b>only</b> (cough, fever, chills or sweats, sore throat, diarrhea, body aches, headache, etc.)		36-Ω-1			
	2	Chest pain < 35 with <b>multiple</b> flu symptoms		36-Ω-2			



# Infection Keys:

- Rash



# Infection Keys:

- High Fever **or** Rash

**AND**

- Look sick



# Public Health Initiatives

- Drive through flu-screening clinics
  - Not desirable to have infected patients in doctors offices or hospital EDs
  - Quick, easy, large numbers seen
- Confounders
  - Comorbidities
  - CO



# CO Signs and Symptoms

SpCO%	Clinical Manifestations
<5%	None
5-10%	Mild headache, tire easily
11-20%	Moderate headache, exertional SOB
21-30%	Throbbing headache, mild nausea, dizziness, fatigue, slightly impaired judgment
31-40%	Severe headache, vomiting, vertigo, altered judgment
41-50%	Confusion, syncope, tachycardia
51-60%	Seizures, unconsciousness



**Carbon Monoxide Poisoning Presents Like the Flu!**

# CO: The Leading Cause of Poisoning Deaths Worldwide



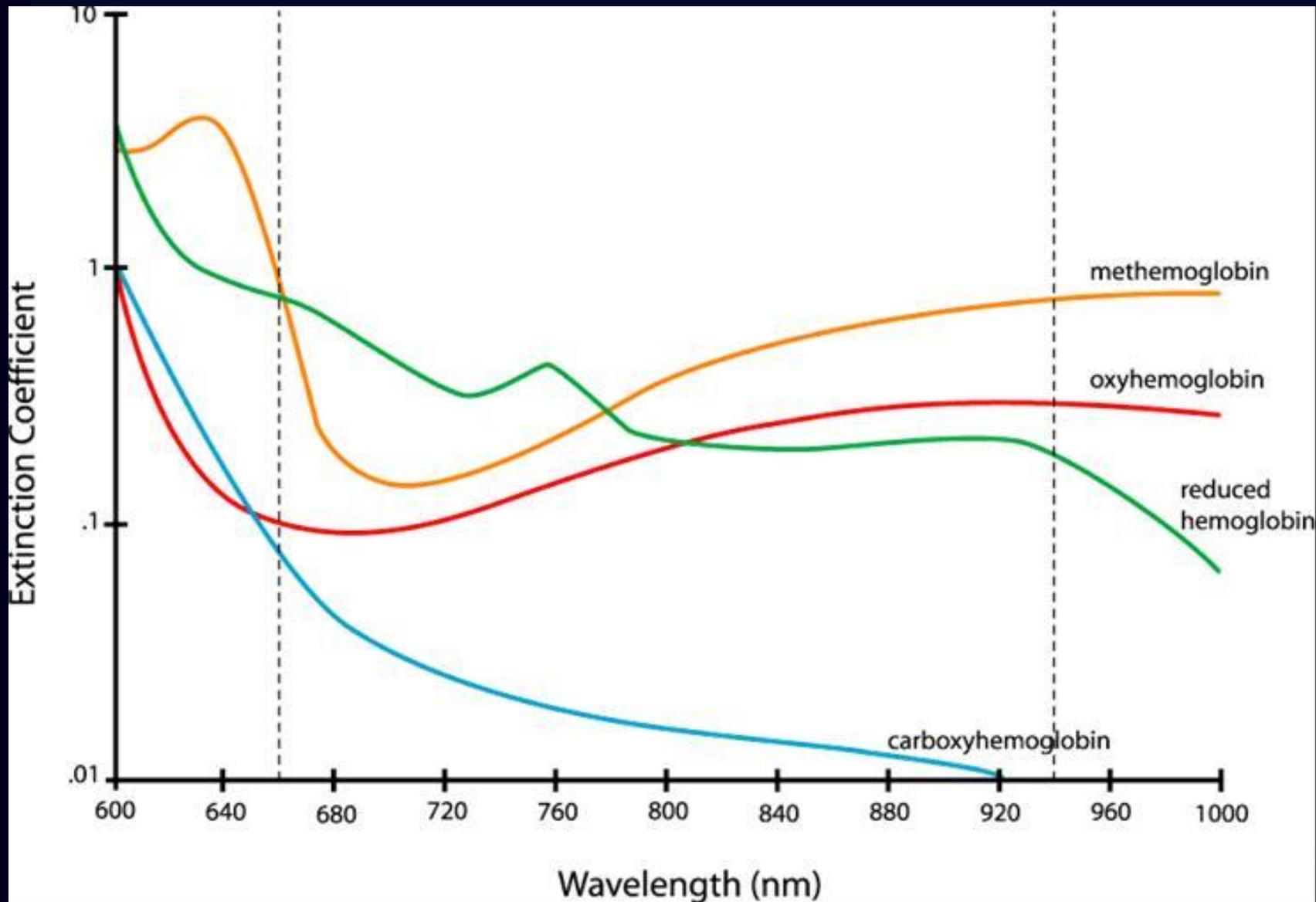
**30-50 % of CO-exposed patients  
presenting to Emergency Departments are  
misdiagnosed**

Barker MD, et al. J Pediatr. 1988;1:233-43  
Barret L, et al. Clin Toxicol. 1985;23:309-13  
Grace TW, et al. JAMA. 1981;246:1698-700

# Pulse CO-oximetry



# Hgb Signatures: SpCO Physics

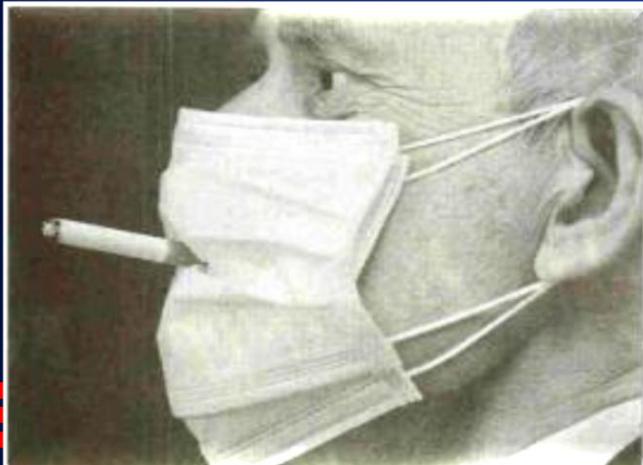


# Pandemic Panic?



# What about Supplies?

- Extreme shortages
  - Masks
  - Hand gel
  - Gloves
- Many had no stockpiles
  - Private sector better prepared



# US Hospitals: Reported shortages and backorders

	Prior to Dec. 2009	Jan. 2010 & beyond	Continued Jul. 2010
N-95 masks	58%	21%	26%
Surgical masks	38%	11%	17%
Eye Protection	11%	2%	9%
Needles	22%	10%	12%
Hand gels	28%	6%	11%

*Materials Management in Healthcare,  
AHRMM and APIC: July 2010*

**A SEVERE SHORTAGE OF SURGICAL MASKS  
PROMPTS SOME PEOPLE TO THINK  
OF ALTERNATIVE PROTECTIVE  
MEASURES AGAINST THE  
SARS EPIDEMIC**

*(SEVERE ACUTE RESPIRATORY SYNDROME)*



# More About Masks

- 
- Benefit of wearing masks by well persons in public settings has not been established
    - Persons may **choose** to wear a mask:
      - Keep hands away from your face!
      - Clean hands if you touch your mask!

## Surgical Mask vs N95 Respirator for Preventing Influenza Among Health Care Workers: A Randomized Trial

Mark Loeb; Nancy Dafoe; James Mahony; et al.

*JAMA*. published online Oct 1, 2009; (doi:10.1001/jama.2009.1466)

<http://jama.ama-assn.org/cgi/content/full/2009.1466v1>

### Conclusion:

“...use of a surgical mask compared with an N95 respirator resulted in noninferior rates of laboratory confirmed influenza.”

---

Alicia Sarabia, MD

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Verne Glavin, MD

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Richard Webby, PhD

---

Marek Smieja, MD

---

David J. D. Earn, PhD

---

Sylvia Chong, BSc

---

Ashley Webb, BS

---

Stephen D. Walter, PhD

**Objective** To compare the surgical mask with the N95 respirator in protecting health care workers against influenza.

**Design, Setting, and Participants** Noninferiority randomized controlled trial of 446 nurses in emergency departments, medical units, and pediatric units in 8 tertiary care Ontario hospitals.

**Intervention** Assignment to either a fit-tested N95 respirator or a surgical mask when providing care to patients with febrile respiratory illness during the 2008-2009 influenza season.

**Main Outcome Measures** The primary outcome was laboratory-confirmed influenza measured by polymerase chain reaction or a 4-fold rise in hemagglutinin titers. Effectiveness of the surgical mask was assessed as noninferiority of the surgical mask

# CDC: Dental Offices



Department of Health and Human Services  
Centers for Disease Control and Prevention

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## Infection Control in Dental Settings

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> [Guidelines](#)

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> [Device Screening and Evaluation Forms](#)

## To prevent H1N1 Transmission:

- Dentists wear n-95 masks
- Patients wear surgical masks

### Contact Info

Centers for Disease Control and Prevention  
Division of Oral Health  
Mail Stop F-10  
4770 Buford Highway NE  
Atlanta, GA 30341

November 23, 2009

### Transmission of 2009 H1N1 Influenza

Exposure to 2009 H1N1 influenza virus occurs in household, community, and occupational settings, and transmission is thought to occur through droplet exposure of mucosal surfaces; through indirect contact, usually via the hands, with respiratory secretions from an infectious patient or contaminated surface; and through inhalation of small particle aerosols in the vicinity of the infectious individual.

### Symptoms of Influenza

Persons with influenza, including 2009 H1N1 influenza, may have some or all of these symptoms:

**Do you have  
an alert  
system?**



# What to advise the public:

- Wash your hands
- Cover your cough
- If you're sick, stay home
- Be prepared:
  - Get a flu shot every year
  - Stay rested and eat a healthy diet
  - Keep supplies on hand for self & family



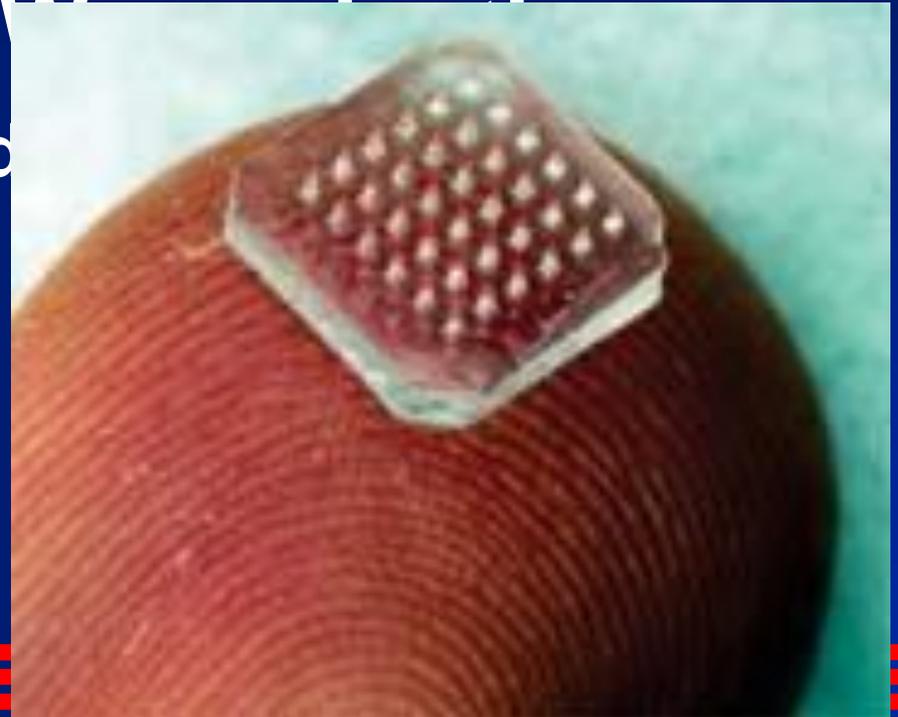
# What's coming?

## 1. Transdermal flu vaccine

- Just beginning 5 year clinical trials
- Appears more effective than injectable

## 2. Mandatory HCW vaccination

- Already required
- States and CDC



# Glo Germ Powder™

[www.glogerm.com](http://www.glogerm.com)

- Synthetic Organic Colorant
- Colorless, odorless, same size as typical bacteria (5 microns)
- Appears under ultraviolet (black) light



# Questions?



[www.mikemcevoy.com](http://www.mikemcevoy.com)