

## Advances in Influenza Prevention

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## Presentation Outline

- Historical Overview
- The Disease and Its Complications
- Understanding the Burden of Disease
- Target Groups for Vaccination
- Health-Care Workers: An Urgent Target
- Influenza Prevention: How Are We Doing?
- Effective Strategies for Influenza Prevention
- Available Influenza Vaccines
- Opportunities for Immunization Improvement
- Practical Considerations
- Summary

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## Influenza: Historical Overview

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### Influenza: An Age-Old Disease, A Disease for All Ages

- Epidemics described since 12th century
- Many animal species vulnerable
- Virus can move from animals to humans
- Aquatic birds: a reservoir for human disease

Belshe RB. *N Engl J Med*. 2005;353:2209-2211.

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### Epidemic, Pandemic, Interpandemic

- Epidemic
  - Regional outbreak; Excess disease incidence of varying magnitude; Seasonal in temperate zones occurring in midwinter peak (Dec-Jan in FL)
- Pandemic
  - Worldwide outbreak ; Severe disease; Infrequent
  - 1918 (Spanish)\*: US=0.5 and WW  $\geq$ 40 million
  - 1957 (Asian)\*: WW  $\geq$  2million
  - 1968 (Hong Kong)\*: US=34,000
- Interpandemic
  - Refers to annual seasonal outbreaks

Dolin R. *N Engl J Med*. 2005;353:2535-2537  
\*Deaths

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### Influenza Disease Burden in the United States in an Average Year

\* All-cause hospitalization and mortality associated with influenza virus infection.  
Thompson WW et al. *JAMA*. 2003;289:179-186; Thompson WW et al. *JAMA*. 2004;292:1333-1340.  
Couch RB. *Ann Intern Med*. 2000;133:992-998; Patriarca PA. *JAMA*. 1999;282:75-77; ACIP. *MMWR*. 2004;53(RR06):1-40.

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## The H5N1 (Avian Influenza) Virus

- H5N1 strain infects wild and domestic birds
- Has spread in birds from Asia to Europe and Africa, and now in the US
- Human cases:
  - Are rare, but over 244 cases with > 50% (143) deaths\*
  - Related to direct contact with diseased poultry
- New subtype could infect humans
  - Pandemic possible if H5N1 mutates to human-transmissible form
- WHO and CDC are monitoring the situation

World Health Organization. Available at: [www.who.int/csr](http://www.who.int/csr). Accessed: July 6, 2006; \*As of 8/20/06

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## Clinical Description/Diagnosis

- Incubation period<sup>1</sup>
  - 1 to 4 days
  - Adults: infectious from day before to +5 days after illness onset
  - Children: infectious ≥ 10 days (can shed virus several days before onset)
  - Severely immunocompromised: Can shed virus for months
- Likely transmission paths<sup>2</sup>
  - Coughing & sneezing → respiratory droplets
  - Contact with an infected person, not washing hands afterward

1. CDC. *MMWR*. Early Release. 2006;55:1-3.  
2. American Academy of Pediatrics. *Red Book*. 2003, 382-391.

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## Signs and Symptoms

- Abrupt onset:
  - Fever, myalgia, headache, malaise, nonproductive cough, sore throat, rhinitis
- Differential diagnosis:
  - Can be difficult based on symptoms alone, unless influenza is already present in the community
- Can last up through 7 days

CDC. *MMWR*. Early Release. 2006;55:2-3.

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## Complications of Influenza

- Most vulnerable patients<sup>1</sup>
  - Age  $\geq 65$  yrs and children  $\leq 2$  yrs of age
  - Underlying chronic conditions at any age
    - Heart or lung disease
    - Diabetes
    - Compromised immune system
- Secondary complications<sup>2,3</sup>
  - Primary influenza viral pneumonia or secondary bacterial pneumonia
  - Exacerbation of underlying cardiac or pulmonary disease
  - Secondary or co-infection with other viral and bacterial pathogens

1. CDC. *MMWR*. Early Release. 2006;55:3. 9-10.  
2. HHS. Available at: [www.hhs.gov](http://www.hhs.gov). Accessed July 6, 2006.  
3. American Academy of Pediatrics. *Red Book*. 2003:382-391.

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## Severity of Disease in Children

- Common complications
  - Acute otitis media (30% of cases)
  - Bronchiolitis, bacterial rhinosinusitis
  - Severe pneumococcal pneumonia
- Nonrespiratory complications
  - Myositis, myocarditis
  - Central nervous system
    - Encephalitis
    - Febrile seizures
    - Reye syndrome
- Hospitalization rates at  $\leq 2$  yrs of age similar to rates in elderly

Principi N, et al. *Lancet Infect Dis*. 2004; 4:75-83.

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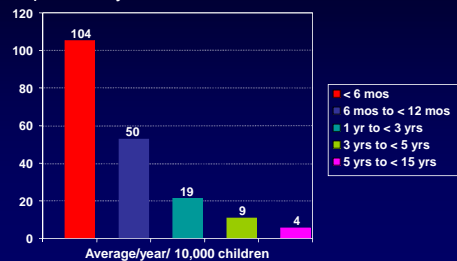
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## Hospitalization Rates in Children < 15 Years

- Influenza season, excess hospitalization rates per year for cardiopulmonary conditions



Neuzil KM, et al. *N Engl J Med*. 2000;342:225-231.

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**Influenza-related Deaths in Children, 2003-2004**

- 40 states, 153 laboratory-confirmed deaths (ave 92 deaths/yr in <5 yr olds)
- Median age 3 yrs; 63% age < 5 yrs
- Highest mortality rates:
  - Highest < 6 mo age, next highest 6 to 23 mo
- 29% deaths within 3 days of onset
- Bacterial co-infection in 24%
- 47% previously healthy
- 33% ACIP defined hi-risk condition and only 26% received  $\geq 1$  dose of vaccine

Bhat N, et al. *N Engl J Med*. 2005;353:2559-2567.

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**Antivirals for Treatment and Prophylaxis: 2005-2006 Season**

- Adjuncts to influenza vaccine<sup>1</sup>
- Adamantanes
  - Approved for treatment, prophylaxis of influenza A only
  - Amantadine, rimantadine
  - Ineffective for influenza prophylaxis or treatment if resistance is present<sup>2-3</sup> – CDC recommendations
- Neuraminidase inhibitors<sup>2</sup>
  - Have activity against influenza A and B viruses
  - Zanamivir
    - Approved to treat ages  $\geq 7$  yrs
    - Approved for chemoprophylaxis ages  $\geq 5$  yrs<sup>4</sup>
  - Oseltamivir
    - Approved to treat ages  $\geq 1$  yr
    - Approved for chemoprophylaxis ages  $\geq 1$  yr
- CDC: Primary influenza prevention strategy = annual vaccination<sup>3</sup>

1. CDC Recommendations. Jan. 14, 2006. Available at: [www.cdc.gov/flu/professionals/treatment/recommendations.htm](http://www.cdc.gov/flu/professionals/treatment/recommendations.htm). Accessed July 6, 2006.  
 2. CDC Fact Sheet. Jan. 17, 2006. Available at: [www.cdc.gov/flu/professionals/pdf/antiviralsbackground.pdf](http://www.cdc.gov/flu/professionals/pdf/antiviralsbackground.pdf). Accessed July 6, 2006.  
 3. FDA News, press release: March 29, 2006.  
 4. CDC Health Alert. Jan. 14, 2006. Available at: [www.cdc.gov/flu/han011406.htm](http://www.cdc.gov/flu/han011406.htm). Accessed July 6, 2006.

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**American Academy of Pediatrics Recommendations**

**High-risk children and adolescents**

- Asthma, other chronic pulmonary diseases (eg, cystic fibrosis)
- Hemodynamically significant cardiac disease
- Immunosuppressive disorders or therapy
- HIV infection
- Sickle cell anemia, other hemoglobinopathies
- Diseases requiring long-term aspirin therapy (eg, rheumatoid arthritis, Kawasaki disease)
- Chronic renal dysfunction
- Chronic metabolic disease (eg, diabetes mellitus)

American Academy of Pediatrics. *Pediatrics*. 2004;114:1441-1447.

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**2008: Expanded Pediatric Influenza Recommendations**

- ACIP recommends annual influenza vaccination for
  - All children aged 6 mos up to 18 yrs
  - Household contacts and out-of-home caregivers of children aged 0 to 59 mos
- ACIP says children 6 to 59 mos with influenza are “nearly as likely” as children 6 to 23 mos to require office, ER visits

CDC, Press Release, February 23, 2006.

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**Expanded Pediatric Recommendations**

- Cover an additional 10.6 million children and their household contacts or out-of-home caregivers
- ACIP “strongly recommends” vaccination of all children (of all ages) with asthma, diabetes, kidney disease, other chronic conditions
- ACIP will continue to review vaccination strategies, “including ... expanding routine influenza vaccination recommendations to the entire US population”

CDC Press Release, Feb. 23, 2006.

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**Why Target Healthy Children?**

- Children acquire and shed virus more frequently than adults
- Role in transmission of virus in day care, school, and households<sup>1,2</sup>
- Significant socioeconomic effects of influenza on children and their household contacts<sup>3</sup>
- Presence of children the most important determinant of influenza within the family<sup>4</sup>

1. Brownstein JS, et al. *Am J Epidemiol*. 2005;162(7):686-693.  
 2. Neuzil KM, et al. *Pediatr Infect Dis J*. 2001;20:733-740.  
 3. Principi N, et al. *Pediatr Infect Dis J*. 2003;22:S207-S210.  
 4. Principi N, et al. *Lancet*. 2004;4:75-83.

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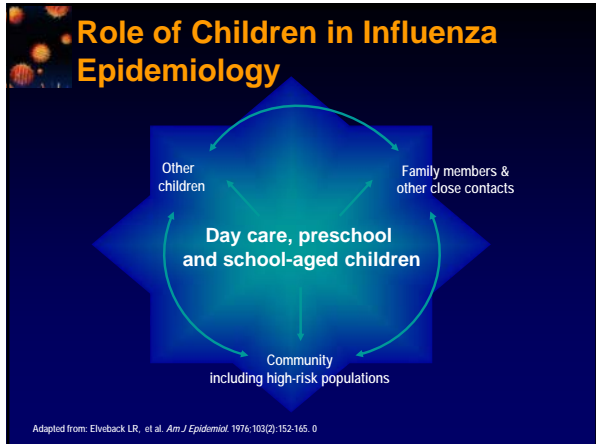
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- ### Targeting Children: The Japanese Experience
- 1962-1987: mandatory immunization
    - 80% of Japanese schoolchildren aged 7 to 15 yrs were vaccinated
    - Excess mortality ↓ in all age groups
    - 37,000 to 49,000 excess deaths/yr prevented
  - Evidence of herd immunity
    - Vaccination of children prevented spread to elderly
- Reichert TA, et al. *N Engl J Med* 2001;344:889-897.

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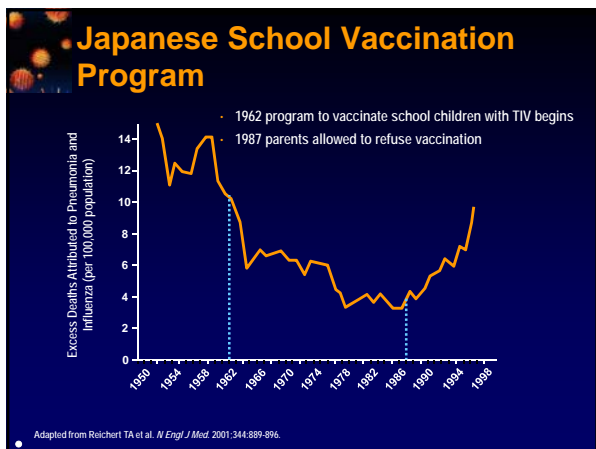
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## Health-Care Workers: An Urgent Target

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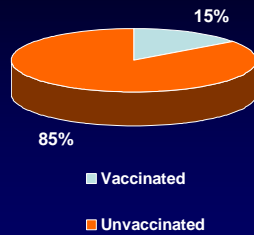
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## Nosocomial Outbreak: Neonatal Intensive Care Unit

- 19 infants infected, 1 died
- Only 15% of staff had been vaccinated
- No history of ILI in mothers during pregnancy



Cunney RJ, et al. *Infect Control Hosp Epidemiol*. 2002;21:449-451.

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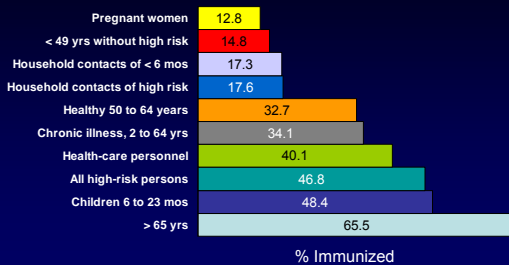
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## Immunization by Risk Category, 2003



CDC. *MMWR*. Early Release. 2006;55:9-11; National Health Interview Survey (Available at: [www.cdc.gov/nlu](http://www.cdc.gov/nlu). Accessed July 7, 2006).

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## Influenza Vaccines Approved in the United States

- Trivalent Inactivated Vaccine (TIV)
  - Delivered by intramuscular injection
- FluMist® (Influenza Virus Vaccine Live, Intranasal)
  - Delivered by intranasal administration



FluMist is indicated for influenza prevention in healthy children and adolescents, 5-17 years of age, and healthy adults, 18-49 years of age.

Photo of injectable influenza vaccine courtesy of Mainstreet Media Group, Gilroy, CA; Morgan Hill Times, December 16, 2003. Photo of intranasal influenza vaccine courtesy of MedImmune, Inc., Gaithersburg, MD.

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## Vaccines on the Market

- Four TIV, administered IM
  - Fluzone®  $\geq 6$  mo of age
  - FLUVIRIN®  $\geq 4$  years of age
  - FLUARIX™  $\geq 18$  years of age
  - FluLaval®  $\geq 18$  years of age (10/5/06)
  - More coming in future years
- One Intranasal
  - FluMist® (CAIV-T): 2 to 49 years of age

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## Efficacy of TIV

- Majority of vaccinees protected when vaccine and circulating viruses are antigenically similar (i.e; no mismatch)
- Healthy adults
  - 70% to 90% protected against influenza
  - Reduced work absenteeism
  - Decreased use of health-care resources
- Healthy children
  - Up to 91% effective against influenza
  - 30% lower incidence of febrile otitis media

CDC. MMWR. Early Release. 2006;55:6-8.

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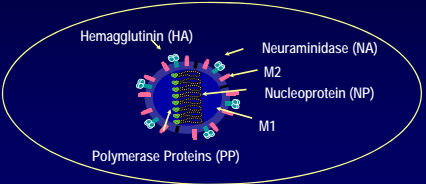
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### FluMist® Immunogenicity

- Replicating the whole virus may help elicit immunity to viral antigens other than HA (NA, NP, M2),
- Possibly related to protection against drifted, antigenically distinct strains (i.e; mismatched strains)
- Immune response more closely resembles the immune response observed after natural infection
- Mucosal infection primes the immune system



Cox RJ et al. *Scand J Immunol*. 2004;59:1-15.

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### Intranasal Flu vaccine: Efficacy Trial in Children: Year 1 (1996 to 1997)

- Double-blind, vac:pla, 2:1 randomization
- N=238 children aged 60 to 71 months
- 2 doses
- Prim efficacy end pt: culture +ve flu
- Vaccine strains matched circulating strains 1996 to 1997
  - A(H3N2) and B strains circulating
  - No A(H1N1) circulating

Belshe RB et al. *N Engl J Med*. 1998;338:1405-1412; FluMist® Prescribing Information, 2005.

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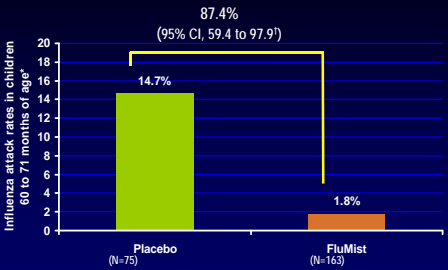
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### Intranasal Vaccine: Efficacy Trial in Children: Year 1 (1996 to 1997)



Group	Attack Rate (%)	Sample Size (N)
Placebo	14.7%	75
FluMist	1.8%	163

Overall efficacy against Type A (H3N2) and Type B wild-type viruses. Field efficacy against wild Type A (H1N1) viruses could not be determined because those strains did not circulate during the study period.  
 \*Denotes statistically significant, P-value ≤ 0.05

FluMist® [prescribing information], Gaithersburg, MD, MedImmune Vaccines, Inc. 2006.

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## Intranasal Vaccine: Efficacy Trial in Children: Year 2 (1997 to 1998)

Same study design as year 1

- Randomization maintained
- N=544 children aged 60 to 84 months
- 1 dose
- Mismatched A(H3N2) strain
  - Vaccine strain: A/Wuhan/359/95 (H3N2)
  - Circulating strain: A/Sydney/5/97 (H3N2)

Belshe RB et al. J Pediatr. 2000;136:168-175.  
FluMist® [prescribing information]. Gaithersburg, MD. MedImmune Vaccines, Inc. 2006.

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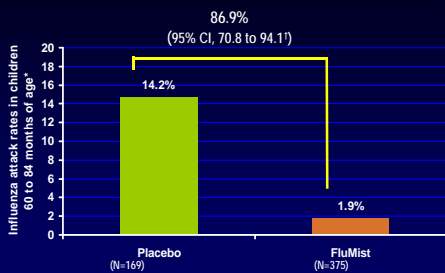
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## Intranasal Vaccine: Efficacy Trial in Children: Year 2 (1997 to 1998)



\*Includes illness caused by A/Sydney/05/97 (H3N2), an antigenic variant not included in the vaccine.

†Denotes statistically significant, p-value  $\leq 0.05$ .

FluMist® [prescribing information]. Gaithersburg, MD. MedImmune Vaccines, Inc. 2006.

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## Pivotal Efficacy Trial in Children: Conclusions

- Intranasal vaccine demonstrated high efficacy in a year with vaccine match
  - Efficacy: 87.4% (95% CI, 59.4-97.9)
    - Children aged 60 to 71 months
- FluMist® demonstrated high efficacy in a year with vaccine mismatch
  - Efficacy: 86.9% (95% CI, 70.8-94.1)
    - Children aged 60 to 84 months

FluMist® [prescribing information]. Gaithersburg, MD. MedImmune Vaccines, Inc. 2006.

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### Intranasal Vaccine Safety

- Influenza-like illness: Similar to placebo
- Reversion: None identified
- Adverse events: Similar to placebo
- Asthma signal: Because of concerns about triggering of asthma and reactive airway diseases in  $\leq 60$  month olds it is not indicated in this age group
- May change next season
- Transmission: Finnish study not significant

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### Cold Adapted Intranasal Vaccine-Trivalent (CAIV-T)

- Randomized, double-dummy, double-blind (1:1 randomization), CAIV-T vs. TIV study
- N=8497, 6 to 59 mo age enrolled
- Culture +ve flu  $\geq 14$  days post-vaccine
- Overall efficacy CAIV-T 55% > TIV
- Mismatched strains CAIV-T 58% > TIV

Belshe R PAS 2006

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### Extending the Season

- Optimal time to vaccinate:
  - October - November
- Peak seasonal influenza activity in US:
  - Late December - early March
- Avoid missed opportunity in high-risk persons:
  - Offer vaccine beginning in September and continuing through February-March

CDC. MMWR. Early Release 2006;55:21-22.

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## Vaccine Composition, 2006-2007

- For the 2006-2007 vaccine, the FDA<sup>1</sup> and WHO<sup>2</sup> recommended virus strains are
  - A/New Caledonia/20/99 (H1N1)-like
  - A/Wisconsin/67/2005 (H3N2)-like (candidate viruses include A/Wisconsin/67/2005 and A/Hiroshima/52/2005 strains)
  - B/Malaysia/2506/2004-like (candidate viruses include B/Malaysia/2506/2004 and B/Ohio/1/2005 strains)

1. FDA. Influenza Virus Vaccine, 2006-2007. Available at: [www.fda.gov/cber/flu/flu2006.htm](http://www.fda.gov/cber/flu/flu2006.htm). Accessed March 25, 2006.

2. World Health Organization. Available at: [www.who.int](http://www.who.int). Accessed March 25, 2006.

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## ANTIGENIC SHIFT & DRIFT

### SHIFT

- Major change, new subtype
- Exchange of gene segments
- Occurs in A only
- May cause pandemic
- 68: H3N2 replaced H2N2 in 1968

↓  
Occurs infrequently

### DRIFT

- Minor subtype change
- Point mutations
- Occurs in A & B
- May cause epidemic
- 03-04: drifted A/H3N2/Fujian circulated vs. A/H3N2/Panama (vaccine strain)

↓  
Occurs continuously

Cox NJ, Subbarao K. *Lancet*. 1999;354:1277-1282.

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## Summary

- Yearly influenza epidemics impose a costly burden of morbidity and mortality
- Influenza is a vaccine-preventable disease
- Effective vaccines are available to prevent influenza
- Nevertheless, immunization coverage falls short of *Healthy People 2010* targets

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## Summary

- Intensive efforts to increase influenza vaccination coverage
- Health-Care providers can serve as effective advocates for influenza immunization by
  - Educating patients and dispelling myths
  - Developing effective immunization strategies
  - Getting immunized ourselves
- The resources to prevent influenza are at our disposal; let's put them to work, this year and every year!

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## Vaccine Mismatch Due to Drifted Strains

- Vaccine mismatch occurs when a major circulating influenza strain does not match one of the strains selected for the vaccine formulations
- Even in a year with a good match, minor variant strains can circulate
- Vaccine mismatch is a potentially serious problem that can increase the incidence of influenza in a particular influenza season

Beltz RE, Gubler WC, Woodhams PM, et al. *J Pediatr*. 2003;155:168-175

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## Vaccine Mismatch is Potentially a Serious Problem

CDC: vaccine mismatch occurred in 5 of the last 10 years

Season	Vaccine Strain	Drifted Strain	Drifted in Mismatched Type	Drifted strain/ all strains (all isolates)
05-06	B/Shanghai	B/Victoria	78%	22%
04-05	A(H3N2)/Wyoming	A(H3N2)/California	78%	51%
03-04	A(H3N2)/Panama	A(H3N2)/Fujian	89%	82%
00-01	B/Beijing	B/Sichuan	89%	40%
97-98*	A(H3N2)/Wuhan	A(H3N2)/Sydney	81%	77%

\*CDC. MMWR. 1998;47(14):280-284. Available at <http://www.cdc.gov/mmwr/PDF/wk/mm4714.pdf>. Accessed on July 7, 2006.  
CDC. Flu Activity. Available at [www.cdc.gov/flu/week/fluactivity.htm](http://www.cdc.gov/flu/week/fluactivity.htm). Accessed on June 20, 2006.

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# QUESTIONS?

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## Strain Drifts are a Common Occurrence

- Unlike other childhood vaccines, influenza vaccines can only provide immunity for a limited duration
  - Consequently, focus has been on high-risk categories rather than universal vaccination
- If the virus strain drift is considered significant, vaccine composition is changed

Type	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
A/H1N1	A/Beijing/262/95	A/New Caledonia/20/99	→	→	→	→	→	→
A/H3N2	A/Sydney/5/97	A/Moscow/10/99	→	→	→	A/Fujian/411/2002	A/California/7/2004	A/Wisconsin/67/2005
B	B/Beijing/184/93	→	B/Sichuan/379/99	B/Hong Kong/330/2001	→	B/Shanghai/361/2002	→	B/Malaysia/2506/2004

www.cdc.gov/flu/twokeyfluupdates/flu-drift.htm. Accessed on June 20, 2006.  
www.who.int/csr/disease/flu/influenza/vaccine/recommendations/1/en/index.html

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## TIV Immunogenicity and Vaccine Mismatch

- TIV is a split-virus vaccine
  - HA is the only standardized component of TIV
  - NA may be included
- Strain drift may impact influenza vaccination efficacy

Adapted from: Hayden FG et al. Clin Virol. 1997;911-942.

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### Finnish Day Care Study: Transmission of Vaccine Virus Strains

- Randomized (1:1), double-blind, placebo-controlled
- N=197 children aged 8 to 36 months
- Nasal cultures on the first 2 days after dosing and at least 3x/week for 3 weeks
  - More than 2000 cultures (~10/child)
  - Extensive genotyping and phenotyping of isolates

Vesikari T et al. /CAAC 2001: G-450.  
FluMist® [prescribing information] Galithersburg, MD. MedImmune Vaccines, Inc. 2006.

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### Low Probability of Influenza Virus Vaccine Live, Intranasal Viral Strain Transmission

Transmission in Finnish Day Care Children	Probability (95%CI)*	Comments
1 confirmed Type B	0.58% (0 to 1.7)	1 of 11 swabs +ve Day 15 only. Retained ts, ca, att phenotypes of the vaccine strain
4 unconfirmed A strains (A/Panam a [H3N2]) plus 1 confirmed B	2.4% (0.13 to 4.6)	Samples not available for further characterization

Reed-Frost Model.  
FluMist® [prescribing information] Galithersburg, MD. MedImmune Vaccines, Inc. 2006.

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### Transmission Conclusion

- Secondary influenza infection after FluMist® is highly unlikely
  - Shedding usually between day 2 and 9 in children; shorter in adults
  - Maximal shedding is (at least) 10 to 100x less than with natural infection
  - Attenuated virus has not been shown to lose its sensitivity to temperature
  - Attenuated virus has not been shown to revert to wild-type and cause influenza
- Odds of reversion to wild-type are 1 in 100 x 10<sup>18</sup> replication cycles

Cosgrove SE. JAMA 2005;293:229-32

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## 2008-2009 ACIP Recommendations

- Routine vaccination is recommended for
  - All children from 6 months through 18 years of age<sup>1</sup>
  - All individuals who want to reduce the risk of becoming ill with influenza or of transmitting influenza to others<sup>2</sup>
  - Individuals at high risk for influenza-related complications and severe disease, including<sup>2</sup>
    - Pregnant women
    - Individuals of any age with certain chronic medical conditions
    - Adults aged ≥50 years
  - Household contacts and caregivers of<sup>2</sup>
    - Adults aged ≥50 years
    - Individuals at high risk
  - Healthcare personnel (HCP)<sup>2</sup>

Please refer to the specific prescribing information for each manufacturer's influenza vaccine as not all influenza vaccines are indicated for all ages.

<sup>1</sup> CDC Media relations. <http://www.cdc.gov/od/oc/media/pressrel/2008/080227.htm>. Accessed April 24, 2008.  
<sup>2</sup> CDC. [MMWR. 2007;56\(RR-6\):1-54.](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm3507a.htm)

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## Annual Vaccination of HCP Required by JCAHO

- New infection control standard for influenza vaccinations requires hospitals, critical access hospitals, and long-term care facilities to<sup>1</sup>
  - Establish annual influenza vaccination program
  - Provide access to vaccinations on-site
  - Educate staff & other independent practitioners
  - Annually evaluate vaccination rates and reasons for nonparticipation
  - Implement enhancements to the program to increase participation

CDC. [National Influenza Vaccine Summit Newsletter](http://www.cdc.gov/ncez/ncid/d/diseases/influenza/vaccines/vaccine_summ3/Newsletter.html). [http://www.cdc.gov/ncez/ncid/d/diseases/influenza/vaccines/vaccine\\_summ3/Newsletter.html](http://www.cdc.gov/ncez/ncid/d/diseases/influenza/vaccines/vaccine_summ3/Newsletter.html). Accessed May 1, 2008.

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## Can FluMist Cause the Flu?

- FluMist is engineered not to cause disease<sup>1</sup>—each of the 3 vaccine strains in FluMist is<sup>2</sup>:
  - Attenuated
    - Weakened so as not to cause influenza-like illness
  - Cold adapted
    - Replicates efficiently in the cooler temperatures of the nasopharynx
  - Temperature sensitive
    - Does not replicate efficiently in the warmer temperatures of the lower respiratory tract

<sup>1</sup> CDC. [Influenza Flu \(FluA\). <http://www.cdc.gov/od/oc/media/pressrel/2008/080227.htm>. Accessed April 24, 2008.](http://www.cdc.gov/od/oc/media/pressrel/2008/080227.htm)  
<sup>2</sup> [FluMist Prescribing Information](http://www.cdc.gov/od/oc/media/pressrel/2008/080227.htm). Gaithersburg, MD: MedImmune Vaccines, Inc. 2007.

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**Can Individuals in Close Contact With Immunocompromised Persons (e.g., patients with chemotherapy) Receive FluMist?**

- Inform vaccine recipients or their parents/guardians that FluMist is an attenuated live virus vaccine and has the potential for transmission to immunocompromised household contacts<sup>1</sup>
- The CDC/ACIP states that individuals who are in contact with immunocompromised persons—including those with immunosuppression due to chemotherapy—may receive FluMist<sup>2</sup>
  - All individuals are included except those who have close contact with severely immunocompromised persons (e.g., hematopoietic stem cell transplants) during those periods when the immunocompromised persons are in a protective environment<sup>1,2</sup>

<sup>1</sup> FluMist [prescribing information], Gaithersburg, MD: MedImmune Vaccines, Inc. 2007.  
<sup>2</sup> CDC. MMWR 2007;56(RR-6):1-24.

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