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Prevention and Control of Influenza

Recommendations of the Advisory Committee on Immunization Practices (ACIP) - 2007

Introduction

Epidemics of influenza typically occur during the winter months in temperate regions and cause an average of approximately 36,000 deaths/year in the United States (1990-1999). As a result of the predictability of the problem, the potential severe impact on the health of a wide range of people, and the numerous strategies available to combat influenza, each year the *Virginia Epidemiology Bulletin* (VEB) reviews the updated influenza recommendations from the Advisory Committee on Immunization Practices (ACIP). This article summarizes the 2007 ACIP recommendations for the use of influenza vaccine (inactivated and live attenuated) and the use of antiviral agents for treatment and prophylaxis of influenza for the 2007-2008 influenza season [MMWR: June 29, 2007 / 56(Early Release);1-54]. The full report can be accessed at www.cdc.gov/flu.

Background

Influenza A and B are the two main types of influenza viruses that cause epidemic human disease. Influenza A viruses are categorized into subtypes on the basis of two surface antigens: hemagglutinin and neuraminidase. A person's immunity to these surface antigens reduces the likelihood of infection, or the severity of disease if infection occurs. However, waning immunity over time and the development of antigenic variants through point mutations (i.e., antigenic drift) lead to the occurrence of seasonal epidemics. This requires annual changes to the vaccine composition and re-vaccination.

Influenza viruses spread from person to person primarily through large-particle respiratory droplet transmission (e.g., when an infected person coughs or sneezes near a susceptible person). Transmission via large-particle droplets requires close contact between source and recipient persons because droplets do not remain suspended in the air and generally travel only a short distance (≤1 meter) through the air. Spread can also occur when a person contacts respiratory droplet-contaminated surfaces and then touches the nose or mouth before hand washing. Airborne transmission [via small-particle (<5µm) residue of evaporated droplets that might remain suspended in the air] also is thought to be possible, although data supporting airborne transmission are limited.

The incubation period for influenza is 1-4 days (average two days). Adults typically are infectious from the day before symptoms begin through approximately five days after illness onset. Young children can shed virus for sev-

eral days before illness onset, and can be infectious for ≥10 days after the onset of symptoms. Severely immunocompromised persons can shed influenza viruses for weeks or months.

Influenza viruses can cause disease among persons in any age group. While rates of infection are highest among children, rates of serious illness and death are highest among persons aged ≥65 years, children aged <2 years, and persons of any age who have medical conditions that place them at increased risk for complications from influenza. In particular, older adults (aged >65 years) account for ≥90% of deaths attributed to influenza; the risk for influenza-associated death is even higher among the oldest elderly, with persons aged ≥85 years 16 times more likely to die from an influenza-associated illness than persons aged 65-69 years. Deaths from influenza are uncommon among children (estimated annual average influenza-related death rate of 0.4/100,000 among children aged <5 years, compared with 98.3/100,000 among adults aged ≥65 years) but represent a substantial proportion of vaccine-preventable deaths. During the 2006-07 influenza season 67 laboratory-confirmed influenza-related pediatric deaths were reported in the U.S. to the Centers for Disease Control and Prevention (CDC).

Clinical Signs and Symptoms of Influenza

Uncomplicated influenza illness is characterized by the **abrupt** onset of constitutional and respiratory signs and symptoms (e.g., fever, myalgia, headache, malaise, nonproductive cough, sore throat, and rhinitis). Among children, otitis media, nausea, and vomiting are commonly reported with influenza illness. Young children with influenza infection can also have initial symptoms mimicking bacterial sepsis with high fevers, and 6-20% of children hospitalized with influenza can have febrile seizures.

Influenza illness typically resolves after 3-7 days for the majority of persons, although cough and malaise can persist for >2 weeks. However, influenza can exacerbate underlying medical conditions (e.g., pulmonary or cardiac disease), lead to primary influenza viral pneumonia or secondary bacterial pneumonia, or contribute to co-infections with other viral or bacterial pathogens. Influenza infection has also been uncommonly associated with encephalopathy, transverse myelitis, myositis, myocarditis, pericarditis, and Reye's syndrome.

Role of Laboratory Diagnosis

Early diagnosis of influenza can reduce the inappropriate use of antibiotics and provide the option of using antiviral therapy. However, respiratory illnesses caused by influenza virus infection are difficult to distinguish clinically from illnesses caused by other respiratory pathogens. As a result, the diagnosis of influenza should be considered in any patient with respiratory symptoms or fever during influenza season. If bacterial infections are suspected, they should be treated appropriately, as secondary invasive bacterial infections can be a severe complication of influenza.

Diagnostic tests available for influenza include viral culture, serology, rapid antigen testing, reverse transcriptase-polymerase chain reaction (RT-PCR), and immunofluorescence assays. Among respiratory specimens for viral isolation or rapid detection, **nasopharyngeal specimens** have higher yields than throat swab specimens. Diagnostic tests perform best when collected as close to illness onset as possible: ideally, samples should be collected within the first two days of illness.

Overall, influenza testing does not need to be done on all patients with respiratory illness. For individual patients, tests are most useful when they are likely to give the healthcare professional results that will help with diagnosis and treatment decisions. During outbreaks of respiratory illness when influenza is suspected, testing for influenza can be very helpful, and some samples should be tested by both rapid tests and by viral culture. Viral culture can also help identify causes of respiratory illness other than influenza (e.g., respiratory syncytial virus). **The collection of some clinical specimens for viral culture is also critical because only culture isolates can provide specific information regarding circulating influenza subtypes and strains**. This information is needed to compare current circulating influenza strains with vaccine strains to guide decisions regarding influenza treatment and chemoprophylaxis, and to formulate vaccine for the coming year.

Additional information concerning diagnostic testing is available from the CDC at www.cdc.gov/flu/professionals/labdiagnosis.htm.

Options for Controlling Influenza

Overall, vaccination is the most effective method for preventing influenza virus infection and its potentially severe complications. Influenza immunization efforts are focused primarily on vaccinating persons at risk for influenza complications and contacts of these persons. Routine vaccination of certain persons [e.g., children and healthcare professionals (HCPs)] who serve as a source of influenza virus transmission might provide additional protection to persons at risk for influenza complications and reduce the overall influenza burden.

Antiviral drugs used for chemoprophylaxis or treatment of influenza are adjuncts to vaccine but are not substitutes for annual vaccination. Nonpharmacologic measures, including respiratory etiquette, handwashing, and isolation, are reasonable and inexpensive; these strategies have been demonstrated to reduce respiratory diseases but have not been studied adequately to determine if they reduce transmission of influenza virus. Limited information exists on the effects of community-level respiratory disease mitigation strategies (e.g., closing schools, avoiding mass gatherings, or using masks) on reducing influenza virus transmission during typical seasonal influenza epidemics.

2007-08 Influenza Vaccine

Trivalent inactivated (i.e., killed virus) influenza vaccine (TIV) and live, attenuated influenza vaccine (LAIV) are available for use in the United States (Table 1). Currently, influenza vaccine manufacturers are projecting that approximately 100 million doses of influenza vaccine will be available

in the United States for the 2007-08 influenza season.

When educating patients regarding influenza vaccination, healthcare professionals should emphasize:

1. inactivated influenza vaccine contains noninfectious killed viruses **and cannot cause influenza** (note: LAIV does contain weakened influenza viruses, but these cannot replicate outside the upper respiratory tract and are unlikely to infect others); and,
2. respiratory disease unrelated to vaccination with either TIV or LAIV can occur after vaccination.

Antigenic Composition

During the preparation of TIV, the vaccine viruses are made noninfectious (i.e., inactivated or 'killed'). Only subvirion and purified surface antigen preparations of TIV (often referred to as "split" and subunit vaccines, respectively) are available in the United States. TIV is administered intramuscularly by injection. Sanofi Pasteur, Inc. (formerly Aventis Pasteur, Inc.) produces FluZone®, an inactivated influenza vaccine for persons aged ≥6 months. Norvartis (formerly Chiron) produces Fluvirin™, an inactivated influenza vaccine licensed for use in persons aged ≥4 years. GlaxoSmithKline, Inc. produces Fluarix™, an inactivated influenza vaccine for persons aged ≥18 years (Table 2).

MedImmune produces FluMist™, an attenuated live virus vaccine that is intranasally administered and approved for use only among healthy

Table 1. Live, attenuated influenza vaccine (LAIV) compared with inactivated influenza vaccine (TIV)

Factor	LAIV	TIV
Route of administration	Intranasal spray	Intramuscular injection
Type of vaccine	Live virus	Killed virus
Number of included virus strains	3 (2 influenza A, 1 influenza B)	3 (2 influenza A, 1 influenza B)
Vaccine virus strains updated	Annually	Annually
Frequency of administration	Annually*	Annually*
Approved age and risk groups§	Healthy, non-pregnant persons aged 5-49 yrs	Persons aged ≥6 mos
Interval between two doses recommended for children aged ≥6 mos - 8 yrs who are receiving influenza vaccine for the first time	6-10 weeks	Four weeks
Can be administered to family members or close contacts of immunosuppressed persons not requiring a protected environment	Yes	Yes
Can be administered to family members or close contacts of immunosuppressed persons requiring a protected environment (e.g., hematopoietic stem cell transplant recipient)	No	Yes
Can be administered to family members or close contacts of persons at high risk but not severely immunosuppressed	Yes	Yes
Can be simultaneously administered with other vaccines	Yes¶	Yes**
If not simultaneously administered, can be administered within four weeks of a live vaccine	Prudent to space four weeks apart	Yes
If not simultaneously administered, can be administered within four weeks of an inactivated vaccine	Yes	Yes

*Children aged ≥6 months who have never received influenza vaccine before should receive two doses. Those who received only one dose in their first year of vaccination should receive two doses in the following year.

§Annual vaccination against influenza is reccommended for 1) all persons, including school-aged children, who want to reduce their risk of becoming ill with influenza or of transmitting influenza to others; 2) all children aged 6-59 months (i.e., 6 months - 4 years); all persons aged ≥50 years; 3) children and adolescents (aged 6 months - 18 years) receiving long-term aspirin therapy who therefore might be at risk for experiencing Reye's syndrome after influenza virus infection; 4) women who will be pregnant during the influenza season; 5) adults and children who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, hematologic, or metabolic disorders (including diabetes mellitus); 6) adults and children who have immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus; 7) adults and children who have any condition (e.g., cognitive disfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration; 8) residents of nursing homes and other chronic-care facilities; 9) healthcare professionals; 10) healthy household contacts (including children) and caregivers of children aged <5 years and adults aged ≥50 years, with particular focus on vaccinating contacts of children aged <6 months; and 11) healthy household contacts (including children) and caregivers of persons with medical conditions that put them at higher risk for severe complications from influenza. However, no vaccine is approved for children aged <6 months.

¶No data are available regarding effect on safety or efficacy.

**Inactivated influenza vaccine coadministration has been evaluated systematically only among adults with pneumococcal polysaccharide vaccine.

Table 2. Approved influenza vaccines for different age groups, United States, 2007-08 season

Trade name	Manufacturer	Presentation	Thimerosal mercury content (mcg Hg/0.5-mL dose)	Age group	No. of doses	Route
Inactivated (TIV)*						
Fluzone®	Sanofi Pasteur	0.25-mL prefilled syringe	0	6-35 mos	1 or 2†	Intramuscular§
		0.5-mL prefilled syringe	0	≥ 36 mos	1 or 2†	Intramuscular§
		0.5-mL vial	0	≥ 36 mos	1 or 2†	Intramuscular§
		5.0-mL multi-dose vial	25	≥ 6 mos	1 or 2†	Intramuscular§
Fluvirin™	Novartis Vaccine	5.0-mL multi-dose vial	24.5	≥ 4 yrs	1 or 2†	Intramuscular§
Fluarix™	GlaxoSmithKline	0.5-mL prefilled syringe	< 1.0	≥ 18 yrs	1	Intramuscular§
FluLuval™	GlaxoSmithKline	5.0-mL multi-dose vial	25	≥18 yrs	1	Intramuscular§
Live, attenuated (LAIV)						
FluMist™**	MedImmune	0.2-mL sprayer	0	5-49 yrs	1 or 2†	Intranasal

*Trivalent inactivated vaccine (TIV). A 0.5-mL dose contains 15 mcg each of A/Solomon Islands/3/2006 (H1N1)-like, A/Wisconsin/67/2005 (H3N2)-like, and B/Malaysia/2506/2004-like antigens.

†Two doses (administered at least 1 month apart for TIV, or at least 6 weeks apart for LAIV) are recommended for children aged 6 months - 8 years who are receiving influenza vaccine for the first time or who received influenza vaccine for the first time in a previous season but only received a single dose. Children who are in their third or more year of being vaccinated and who received only one dose in each of their first two years of being vaccinated should continue receiving a single annual dose.

§For adults and older children, the recommended site of vaccination is the deltoid muscle. The preferred site for infants and young children is the anterolateral aspect of the thigh.

**FluMist dosage and storage requirements have changed for the 2007-08 influenza season. FluMist is now shipped to end users at 35ºF-46ºF (2ºC-8ºC). LAIV should be stored at 35ºF-46ºF (2ºC-8ºC) upon receipt and should remain at that temperature until the expiration date is reached. The dose is 0.2 mL, divided equally between each nostril.

non-pregnant persons aged 5-49 years (Table 2).

Both inactivated influenza vaccine and LAIV prepared for the 2007-08 season will include:

- A/Solomon Islands/3/2006 (H1N1)-like;
- A/Wisconsin/67/2005 (H3N2)-like (or A/Hiroshima/52/2005); and,
- B/Malaysia/2506/2004-like (or B/Ohio/1/2005) antigens.

These viruses have been selected because they are representative of influenza viruses that are anticipated to circulate in the United States during the 2007-08 influenza season and have favorable growth properties in eggs. Because circulating influenza A (H1N2) viruses are a re-assortment of influenza A (H1N1) and (H3N2) viruses, antibody directed against influenza A (H1N1) and influenza A (H3N2) vaccine strains provides protection against circulating influenza A (H1N2) viruses.

Package inserts should be consulted for additional information on vaccine composition.

Recommendations for Influenza Vaccinations

Annual vaccination with trivalent inactivated influenza vaccine (TIV) is recommended for the following persons who are at increased risk for severe complications from influenza, or who are at higher risk for influenza-associated clinic, emergency department, or hospital visits:

- children aged 6-59 months;
- all persons aged ≥50 years;
- children and adolescents (aged 6 months-18 years) who are receiving long-term aspirin therapy and who therefore might be at risk for experiencing Reye's syndrome after influenza virus infection;
- women who are pregnant during the influenza season (vaccination can occur in any trimester);
- adults and children who have chronic pulmonary (including asthma), renal, hepatic, hematological or metabolic disorders (including diabetes mellitus), or immunosuppression (including immunosuppression caused by medications or by HIV) (note: hypertension is not considered a high-risk condition);
- adults and children who have any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions, or that can increase the risk for aspiration; and,
- residents of nursing homes and other chronic-care facilities.

To reduce the impact of influenza or the risk of influenza transmission, vaccination with TIV or LAIV (unless

contraindicated) also is recommended for the following persons:

- healthcare professionals. This includes:
  - physicians, nurses, and other workers in both hospital and outpatient-care settings, including medical emergency response workers (e.g., paramedics and emergency medical technicians);
  - employees of nursing homes and chronic-care facilities who have contact with patients or residents;
  - employees of assisted living and other residences for persons in groups at high risk;
  - persons who provide home care to persons in groups at high risk; and,
  - students in these professions who will have contact with patients
- household contacts (including children) and out-of-home caregivers of children aged 0-59 months (i.e., aged <5 years) and adults aged ≥50 years;
- household contacts (including children) and out-of-home caregivers of persons with medical conditions that put them at higher risk for severe complications from influenza; and,
- any person who wishes to reduce the likelihood of becoming ill with influenza. Persons who provide essential community services should be considered for vaccination to minimize disruption of essential activities during influenza outbreaks. Students or other persons in institutional settings (e.g., those who reside in dormitories or correctional facilities) should be encouraged to receive vaccine.

Healthy non-pregnant persons aged 5-49 years in these groups who are not contacts of severely immunosuppressed persons can receive either LAIV or inactivated influenza vaccine. Breastfeeding does not affect the immune response adversely and is not a contraindication for influenza vaccination. Women who are breastfeeding may receive either TIV or LAIV unless contraindicated because of other medical conditions.

Reducing seasonal influenza risk through influenza vaccination of persons who might be exposed to non-human influenza viruses (e.g., H5N1 viruses) might reduce the theoretical risk for recombination of an avian influenza A virus and a human influenza A virus by preventing seasonal influenza virus infection within a human host. Therefore, the CDC has recommended that persons who are charged with responding to avian influenza outbreaks among poultry should receive seasonal influenza vaccination.

Travelers may also consider influenza vaccination. In the temperate regions of the Southern Hemisphere, influenza activity occurs typically during April-September, and in the tropics influenza occurs throughout the year. Traveling as part of large tourist groups (e.g., on cruise ships) that may include persons from areas of the world where influenza viruses are circulating may also lead to infection. Any traveler who wants to reduce the risk for influenza infection should consider influenza vaccination, preferably at least two weeks before departure. Persons at high risk who receive the previous season's vaccine before summer travel should be revaccinated with the current vaccine the following fall or winter.

Schedule

Where not contraindicated by a medical condition, the following schedule is recommended for providing annual influenza vaccinations:

- Children aged 6 months-4 years previously unvaccinated at any time with inactivated influenza vaccine should receive two doses of TIV separated by at least four weeks.
- Children aged 5-8 years previously unvaccinated at any time with either LAIV or inactivated influenza vaccine should receive two doses of TIV **or** LAIV (if not contraindicated) separated by at least four or six weeks, respectively.
- Children aged ≥6 months-4 years previously vaccinated with two doses in a single season with inactivated influenza vaccine should receive one dose of TIV annually. Children aged 5-8 years previously vaccinated with two doses in a single season with influenza vaccine should receive one dose of TIV **or** LAIV annually.
- Children aged 6 months-8 years previously vaccinated with only a single dose of influenza vaccine (either TIV or LAIV) in their first year of influenza vaccination should receive two doses of age-appropriate vaccine in the next vaccination season (note: this applies even if there is a gap of years in which the child receives no influenza vaccine, as long as they are still younger than nine years of age). Children who are in their third or more year of being vaccinated and who received only one dose each year in preceding years should continue to receive a single annual dose.
- Persons aged 9-49 years may receive one dose of TIV or LAIV annually.
- Persons 50 years of age or older should receive one dose of TIV annually.

When two doses are to be provided in a single season, if possible, both doses should be administered before the onset of influenza season (typically late November/early December in Virginia). However, vaccination, including the second dose, is recommended even after influenza virus begins to circulate in a community. For children requiring two doses of influenza vaccine in a single season, one dose may be TIV and the other dose LAIV (as long as the child is healthy and at least five years of age). If TIV is administered first, wait four weeks to administer LAIV. If LAIV is given first, wait six weeks to administer the TIV dose.

ACIP does **not** recommend that a child receive influenza vaccine for the first time in the spring with the intent of providing a priming dose for the following season.

Inactivated Influenza Vaccine

TIV should be stored at 35°F-46°F (2°C-8°C) and should not be frozen. TIV that has been frozen should be discarded. Vaccine prepared for a previous influenza season should not be administered to provide protection for any subsequent season.

Dosage and Administration

Dosage recommendations for inactivated influenza vaccine vary according to age group (Table 2).

The intramuscular route is recommended for inactivated influenza vaccine. Adults and older children should be vaccinated in the deltoid muscle. Infants and young children should be vaccinated in the anterolateral aspect of the thigh.

Persons Who Should Not Be Vaccinated with Inactivated Influenza Vaccine

Since influenza vaccine viruses are grown in embryonated hens' eggs, inactivated influenza vaccine should not be administered to persons with a known anaphylactic hypersensitivity to eggs or to other components of the influenza vaccine. Chemoprophylaxis with antiviral agents is an option for preventing influenza among such persons. Vaccination may also be an option after appropriate allergy evaluation and desensitization.

Persons with moderate to severe acute febrile illness usually should not be vaccinated until their symptoms have abated. However, minor illnesses with or without fever do not contraindicate use of influenza vaccine. History of Guillain-Barré Syndrome (GBS) within six weeks following a previous dose of TIV is considered to be a precaution for use of TIV—antiviral chemoprophylaxis for these persons is a consideration.

Since inactivated influenza vaccine contains only influenza virus subunits and no live virus, no contraindication exists to the co-administration of inactivated influenza vaccine and influenza antiviral medications.

Thimerosal, a mercury-containing compound, has been used in multidose vials of inactivated influenza vaccine to reduce the likelihood of bacterial contamination. No scientifically conclusive evidence exists of harm from exposure to thimerosal preservative-containing vaccine, and evidence is accumulating that supports the absence of any harm resulting from exposure to such vaccines. Many single-dose syringes and vials of inactivated influenza vaccine are thimerosal-free or contain only trace (<1 mcg mercury/dose) amounts of thimerosal; nevertheless, the benefits of influenza vaccination for all recommended groups, including pregnant women and young children, outweigh the unproven risk from thimerosal exposure through vaccination.

Side Effects and Adverse Reactions

The most frequent side effect of TIV vaccination is soreness at the vaccination site that lasts <2 days. These local reactions typically are mild. Fever, malaise, myalgia, and other systemic symptoms can occur after administration of inactivated vaccine and most often affect persons who have had no prior exposure to the influenza virus antigens in the vaccine (e.g., young children). These reactions begin 6-12 hours after vaccination and can persist for 1-2 days. Among older persons and healthy young adults, influenza vaccine is not associated with higher rates of systemic symptoms compared with placebo injections.

Immediate, presumably allergic, reactions (e.g., hives, angioedema, allergic asthma, and systemic anaphylaxis) rarely occur after influenza vaccination. These reactions probably result from hypersensitivity to certain vaccine components (e.g., residual egg protein).

Data demonstrating safety of TIV for HIV-infected persons are limited, but no evidence exists that vaccination has a clinically important impact on HIV infection or immunocompetence. Limited information is available concerning the effect of antiretroviral therapy on increases in HIV RNA levels after either natural influenza virus infection or influenza vaccination.

Healthcare professionals should promptly report all clinically significant adverse events after vaccination to the CDC/Food and Drug Administration (FDA) Vaccine Adverse Event Reporting System (VAERS) even if the healthcare professional is not certain that the vaccine caused the event. Options for reporting include the VAERS website at www.vaers.hhs.gov or by telephone at 1-800-822-7967.

Live, Attenuated Influenza Vaccine

LAIV is an option for the vaccination of healthy, non-pregnant persons aged 5-49 years, including persons in close contact with groups at high risk. Possible advantages of LAIV include its potential to induce a broad mucosal and systemic immune response, its ease of administration, and the possibly increased acceptability of an intranasal rather than intramuscular route of administration. No preference is indicated for LAIV or TIV when considering vaccination of healthy, nonpregnant persons aged 5-49 years. However, during periods when inactivated vaccine is in short supply, use of LAIV is encouraged when feasible for eligible persons in order to increase the availability of TIV for persons in groups targeted for vaccination but who cannot receive LAIV.

Each dose of LAIV contains the same three antigens used in TIV for the influenza season. However, the antigens are constituted as live, attenuated, cold-adapted, temperature-sensitive vaccine viruses. Additional components of LAIV include stabilizing buffers containing monosodium glutamate, hydrolyzed porcine gelatin, arginine, sucrose, and phosphate. LAIV does not contain thimerosal. LAIV does not cause systemic symptoms of influenza in vaccine recipients; however, recipients may experience effects of intranasal vaccine administration or local viral replication (e.g., nasal congestion).

Dosage and Administration

In January 2007, a new formulation of LAIV (FluMist™) was licensed that will replace the older formulation for the 2007-08 influenza season. Compared with the formulation sold previously, the principal differences are 1) the temperature at which LAIV is shipped and stored after delivery to the clinic, and 2) the amount of vaccine administered.

The new formulation of LAIV is shipped to end users at 35°F-46°F (2°C-8°C). LAIV should be stored at 35°F-46°F (2°C-8°C) upon receipt, and can remain at that temperature until the expiration date is reached; it should **not** be frozen.

LAIV is intended for intranasal administration only and should not be administered by the intramuscular, intradermal, or intravenous route. LAIV is not approved for vaccination of children aged <5 years or adults aged >49 years. The new formulation of LAIV is supplied in a pre-filled, single-use sprayer containing 0.2 mL of vaccine. Approximately 0.1 mL (i.e., half of the total sprayer contents) is sprayed into the first nostril while the recipient is in the upright position. An attached dose-divider clip is removed from the sprayer to administer the second half of the dose into the other nostril. If the vaccine recipient sneezes after administration, the dose should not be repeated.

LAIV can be administered to persons with minor acute illnesses (e.g., diarrhea or mild upper respiratory tract infection with or without fever). However, if nasal congestion is present that might impede delivery of the vaccine to the nasopharyngeal mucosa, deferral of administration should be considered until resolution of the illness.

Inactivated vaccines do not interfere with the immune response to other inactivated vaccines or to live vaccines, and can be administered either simultaneously or at any time before or after LAIV. Other live vaccines may be administered simultaneously with LAIV. However, following administration of one or more live vaccines, at least four weeks should pass before another live vaccine is administered.

Persons Who Should Not Be Vaccinated with LAIV

LAIV is not currently licensed for use in the following groups, and these persons should **not** be vaccinated with LAIV:

- Persons aged <5 years or those aged >50 years;
- Persons with any of the underlying medical conditions that serve as an indication for routine influenza vaccination, including asthma, reactive airways disease, or other chronic disorders of the pulmonary or cardiovascular systems; metabolic diseases such as diabetes, renal dysfunction, and hemoglobinopathies; or known or suspected immunodeficiency diseases or immunosuppressed states;
- Children or adolescents receiving aspirin or other salicylates (due to the association of Reye's syndrome with wild-type influenza infection);
- Persons with a history of Guillain-Barré Syndrome;
- Pregnant women; or,
- Persons with a history of hypersensitivity, including anaphylaxis, to any of the components of LAIV or to eggs.

Protection from influenza using inactivated influenza vaccine or antivirals may be an option for some persons in these groups.

Use of inactivated influenza vaccine is preferred for vaccinating household members, healthcare professionals, and others who have close contact with severely immunosuppressed persons (e.g., patients with hematopoietic stem cell transplants) as a result of the theoretical risk that a live, attenuated vaccine virus could be transmitted to the severely immunosuppressed person and cause disease. No preference exists between inactivated influenza vaccine or LAIV use by healthcare professionals or other healthy persons aged 5-49 years who have close contact with persons with lesser degrees of immunosuppression (e.g., persons with diabetes, persons with asthma taking corticosteroids, or persons infected with human immunodeficiency virus) or other groups at high risk from influenza.

If a person receives LAIV, that person should refrain from contact with severely immunosuppressed patients for seven days after vaccine receipt. However, such persons need not be excluded from visitation of patients who are not severely immunocompromised.

Personnel Who May Administer LAIV

Low-level introduction of vaccine viruses into the environment is likely unavoidable when administering LAIV, and the risk of acquiring vaccine viruses from the environment is unknown. As a result, severely immunosuppressed persons should not administer LAIV. Other persons with underlying medical conditions placing them at high risk for influenza complications (e.g., pregnant women, persons with asthma, and persons aged ≥50 years) may administer LAIV.

LAIV and Use of Influenza Antiviral Medications

The effect on safety and efficacy of LAIV co-administration with influenza antiviral medications has not been studied. However, because influenza antivirals reduce replication of influenza viruses, LAIV should not be administered until 48 hours after cessation of influenza antiviral therapy, and influenza antiviral medications should not be administered for two weeks after receipt of LAIV. Persons receiving antivirals within the period two days before to 14 days after vaccination with LAIV should be revaccinated at a later date.

Side Effects and Adverse Reactions

Among children (aged 5-17 years), signs and symptoms reported more often among vaccine recipients than placebo recipients included: runny nose or nasal congestion, headache, fever, vomiting, abdominal pain, and myalgias. Symptoms were associated more often with the first dose and were self-limited. Children with asthma have not demonstrated differences in postvaccination wheezing or asthma exacerbations. Among adults, runny nose or nasal congestion, headache, cough, chills, tiredness/weakness and sore throat have been reported more often among vaccine recipients than placebo recipients. Overall, serious adverse events among healthy individuals aged 5-49 years occurred at a rate of <1%. As with inactivated influenza vaccine, healthcare professionals should promptly report all clinically significant adverse events after LAIV administration to VAERS at http://vaers.hhs.gov or by calling the 24-hour national toll-free hotline at 800-822-7967.

Timing of Annual Influenza Vaccination

In the United States, seasonal influenza activity can begin to increase as early as October or November, although influenza activity has not reached peak levels in the majority of recent seasons until late December-early March. Although vaccine distribution has begun,

distribution probably will not be completed until December or January. As a result, healthcare providers, those planning organized campaigns, and state and local public health agencies should structure vaccination efforts to reflect this phased distribution and ensure the vaccination of as many persons as possible over the course of several months. In addition, contingency plans should exist for the timing and prioritization of administering influenza vaccine if the supply of vaccine is delayed or reduced. The CDC and other public health agencies will assess the vaccine supply on a continuing basis and will distribute recommendations should a substantial delay or an inadequate supply occur.

Vaccination Before October

Persons at increased risk for serious complications and their household contacts (including out-of-home caregivers and household contacts of children aged 0-59 months) should be offered vaccine beginning in September during routine healthcare visits or during hospitalizations, if vaccine is available. In addition, two doses of vaccine (i.e., a booster dose at least 4 or 6 weeks after the initial dose, depending upon whether they are receiving inactivated influenza vaccine or LAIV) are needed for children aged 6 months-8 years who have not been previously vaccinated, or who have been vaccinated for the first time during the previous season but received only one dose. Therefore, these children should receive their first dose as soon as is feasible after vaccine becomes available, so that both doses can be administered before the onset of influenza activity.

In facilities housing older persons (e.g., nursing homes) vaccination before October typically should be avoided because antibody levels in such persons can begin to decline relatively rapidly after vaccination.

To avoid missed opportunities for vaccination, providers should offer vaccination during routine healthcare visits or during hospitalizations whenever vaccine is available.

Vaccination in October and November

The optimal time for vaccination efforts is usually during October-November. In October, vaccination in provider-based settings should start or continue for all patients—both high risk and healthy—and extend throughout November. If supplies of vaccine are not adequate, efforts to vaccinate non-high-risk persons who wish to decrease their risk for influenza virus infection should not begin until November; however, if such persons request vaccination in October then vaccination should not be deferred.

Vaccination in December and Later

After November, many persons who should or want to receive influenza vaccine remain unvaccinated. Vaccine administered after November is likely to be beneficial in the majority of influenza seasons, even if influenza activity has already begun. Therefore, **healthcare providers should routinely offer influenza vaccine throughout the influenza season** as long as vaccine supplies are available.

Strategies for Implementing Vaccination Recommendations in Healthcare Settings

Successful vaccination programs combine publicity and education for healthcare professionals and other potential vaccine recipients, a plan for identifying persons at high risk, use of reminder/recall systems (e.g., mail or telephone reminders, flagging charts), assessment of practice-level vaccination rates with feedback to staff, and efforts to remove administrative and financial barriers that prevent persons from receiving the vaccine. **When possible, the use of standing orders programs is recommended for long-term care facilities, hospitals, and home health agencies to ensure the administration of recommended vaccinations for adults.**

Persons and institutions planning substantial organized vaccination campaigns (e.g., health departments, occupational health clinics, and community vaccinators) should consider scheduling these events after at least mid-October because the availability of vaccine in any location cannot be ensured consistently in early fall. Scheduling campaigns after mid-October will minimize the need for cancellations because vaccine is unavailable. Vaccination clinics should focus on settings that serve children aged 6-59 months, pregnant women, other persons aged <50 years at increased risk for influenza-related complications, persons aged ≥50 years, healthcare professionals, and persons who are household contacts of children aged ≤59 months or other persons at high risk.

Assisted living housing, retirement communities, and recreation centers should consider annual programs to immunize unvaccinated residents and attendees on-site before the start of influenza season. Other settings (e.g., outpatient facilities, managed care organizations, correctional facilities, pharmacies, and adult workplaces) are encouraged to introduce standing orders programs as well.

Beginning in October each year, healthcare facilities should offer convenient access to influenza vaccine at the work site, to all personnel, including night and weekend staff. Particular emphasis should be placed on providing vaccinations to persons who care for members of groups at high risk. Efforts should be made to educate healthcare personnel regarding the benefits of vaccination and the potential health consequences of influenza illness for themselves and their patients.

Antiviral Agents for Influenza

The primary methods of controlling the spread of influenza consist of immunization and good respiratory etiquette. However, influenza antiviral medications can play an important role in the management of influenza both as chemoprophylaxis to prevent illness and as treatment of influenza infection.

Influenza Antiviral Agents

Currently, four influenza antiviral agents are licensed and available in the

United States: amantadine, rimantadine, zanamivir, and oseltamivir (Table 3).

Amantadine and rimantadine are chemically related drugs known as adamantanes (or M2 inhibitors). Because antiviral testing results indicate that circulating influenza viruses have high levels of resistance, **neither amantadine nor rimantadine should be used for the treatment or chemoprophylaxis of influenza in the United States during the 2007-08 influenza season**. Information on amantadine and rimantadine is available in previous publications of the ACIP influenza recommendations.

Zanamivir and oseltamivir belong to the class of drugs known as neuraminidase inhibitors – they have activity against **both influenza A and B viruses**. When considering use of influenza antiviral medications, clinicians must consider the patient's age, weight, and renal function (Table 3); the presence of other medical conditions (e.g., zanamivir is not recommended for persons with cardiac disease or underlying airways disease such as asthma or chronic obstructive pulmonary diseases); the indications for use (i.e., chemoprophylaxis or treatment); and the potential for interaction with other medications. Package inserts should be consulted for additional information as needed.

Treatment

Oseltamivir is approved for treatment of persons aged ≥1 year, and zanamivir is approved for treatment of persons aged ≥7 years (Table 3). When administered within **two days** of illness onset to otherwise healthy adults, zanamivir and oseltamivir can reduce the duration of uncomplicated influenza A and B illness by approximately one day. The benefit of antiviral treatment when initiated >2 days after illness onset is minimal for uncomplicated influenza. The recommended duration of treatment with either zanamivir or oseltamivir is five days.

Data are limited regarding the effectiveness of these agents in preventing serious influenza-related complications (e.g., bacterial or viral pneumonia or exacerbation of chronic diseases) or their effectiveness for the treatment of influenza among persons at high risk for serious complications of influenza. Among influenza virus infected participants in 10 clinical trials, the risk for pneumonia among those participants receiving oseltamivir was approximately 50% lower than among those persons receiving a placebo. Even fewer studies of the efficacy of influenza antivirals have been conducted among pediatric populations.

Chemoprophylaxis

Oseltamivir is licensed for influenza chemoprophylaxis in persons aged ≥1 year, and zanamivir is licensed for influenza chemoprophylaxis in persons

Table 3. Recommended daily dosage of influenza antiviral medications for treatment and chemoprophylaxis, United States

	Age group (yrs)				
Antiviral agent	**1 - 6**	**7 - 9**	**10 - 12**	**13 - 64**	**≥ 65**
Zanamivir*					
Treatment, influenza A and B	N/A†	10 mg (two inhalations) twice daily	10 mg (two inhalations) twice daily	10 mg (two inhalations) twice daily	10 mg (two inhalations) twice daily
Chemoprophylaxis, influenza A and B	**Ages 1 - 4** N/A	**Ages 5 - 9** 10 mg (two inhalations) once daily	10 mg (two inhalations) once daily	10 mg (two inhalations) once daily	10 mg (two inhalations) once daily
Oseltamivir					
Treatment,§ influenza A and B	Dose varies by child's weight¶	Dose varies by child's weight¶	Dose varies by child's weight¶	75 mg twice daily	75 mg twice daily
Chemoprophylaxis, influenza A and B	Dose varies by child's weight**	Dose varies by child's weight**	Dose varies by child's weight**	75 mg once daily	75 mg once daily

NOTE: Zanamivir is manufactured by GlaxoSmithKline (Relenza® - inhaled powder). Zanamivir is approved for treatment of persons aged ≥ 7 years and approved for chemoprophylaxis of persons aged ≥ 5 years. Oseltamivir is manufactured by Roche Pharmaceuticals (Tamiflu® - tablet). Oseltamivir is approved for treatment or prophylaxis of persons aged ≥ 1 year. No antiviral medications are approved for treatment or prophylaxis of influenza among children aged < 1 year. This information is based on data published by the U.S. Food and Drug Administration (FDA), which is available at www.fda.gov.

*Zanamivir is administered through oral inhalation by using a plastic device included in the medication package. Patients will benefit from instruction and demonstration of the correct use of the device. Zanamivir is not recommended for those persons with underlying airway disease.

†Not applicable.

§A reduction in the dose of oseltamivir is recommended for persons with creatinine clearance < 30 mL/min.

¶The treatment dosing recommendations of oseltamivir for children weighing ≤ 15 kg is 30 mg twice a day; for children weighing > 15 - 23 kg, the dose is 45 mg twice a day; for children weighing > 23 - 40 kg, the dose is 60 mg twice a day; and for children weighing > 40 kg, the dose is 75 mg twice a day.

**The chemoprophylaxis dosing recommendations of oseltamivir for children weighing ≤ 15 kg is 30 mg once a day; for children weighing > 15 - 23 kg, the dose is 45 mg once a day; for children weighing > 23 - 40 kg, the dose is 60 mg once a day; and for children weighing > 40 kg, the dose is 75 mg once a day.

aged ≥5 years (Table 3). While influenza chemoprophylaxis is not generally a substitute for vaccination, antivirals are critical adjuncts in the prevention and control of influenza. They may be used, for example, as a component of influenza outbreak-control programs to limit the spread of influenza within chronic-care institutions.

Community studies of healthy adults indicate that both oseltamivir and zanamivir are similarly effective in preventing febrile, laboratory-confirmed influenza illness (efficacy: zanamivir, 84%; oseltamivir, 82%). Both agents have also been reported to prevent influenza illness among persons administered chemoprophylaxis after a household member was diagnosed with influenza. Experience with prophylactic use of these agents in institutional settings or among patients with chronic medical conditions is limited, but the majority of published studies have demonstrated moderate to excellent efficacy. One six-week study of oseltamivir prophylaxis among nursing home residents reported a 92% reduction in influenza illness.

When determining the timing and duration for administering influenza antiviral medications for chemoprophylaxis, factors related to cost, compliance, and potential side effects should be considered. Currently, oseltamivir is the recommended antiviral drug for chemoprophylaxis of influenza. To be maximally effective as prophylaxis, antivirals must be taken each day for the duration of influenza activity in the community.

Appropriate use of influenza chemoprophylaxis includes:

- Persons at High Risk Who Are Vaccinated **After** Influenza Activity Has Begun. Persons at high risk for complications of influenza can still be vaccinated after an outbreak of influenza has begun in a community. However, in adults the development of antibodies after vaccination takes approximately two weeks. When influenza vaccine is administered while influenza viruses are circulating, chemoprophylaxis should be considered for persons at high risk from the time of vaccination until immunity has developed. Of note, children aged <9 years who receive influenza vaccine for the first time would require at least six to eight weeks of prophylaxis (i.e., prophylaxis for four to six weeks after the first dose of inactivated vaccine or LAIV, respectively, and an additional two weeks of prophylaxis after the second dose).
- Persons Who Provide Care to Those at High Risk. To reduce the spread of virus to persons at high risk during community or institutional outbreaks, chemoprophylaxis during peak influenza activity can be considered for **unvaccinated** persons who have frequent contact with persons at high risk. This may include employees of hospitals, clinics, and chronic-care facilities, household members, visiting nurses, and volunteer workers. Chemoprophylaxis should be considered for all such persons, regardless of their vaccination status, if an outbreak may be caused by a variant strain of influenza that might not be controlled by the vaccine (e.g., as indicated by significant levels of influenza among vaccinated persons or circulation in the community of strains not included in the vaccine).
- Persons Who Have Immune Deficiencies. Chemoprophylaxis can be considered for persons at high risk who are expected to have an inadequate antibody response to influenza vaccine. This category includes persons infected with HIV, chiefly those with advanced HIV disease. Such patients should be monitored closely if chemoprophylaxis is administered.
- Other Persons. Chemoprophylaxis throughout the influenza season or during peak influenza activity might be appropriate for persons at high risk who should not be vaccinated. In general, chemoprophylaxis could be used by any person who wishes to avoid influenza illness, but healthcare professionals and patients should make this decision on an individual basis. Persons aged ≥50 years and others at high risk should consult with a healthcare professional before embarking on travel during the summer to discuss the advisability of carrying antiviral medications for either prophylaxis or treatment of influenza.
- Residents and Staff of Institutions During Outbreaks. Using antiviral drugs for the treatment and prophylaxis of influenza is a key component of influenza outbreak control in institutions (or other closed or semi-closed settings) in addition to other infection control measures such as droplet precautions, cohorting, vaccinations, and restricting staff movement between wards. When confirmed or suspected outbreaks of influenza occur in institutions that house persons at high risk, chemoprophylaxis should be started as early as possible to reduce the spread of the virus. In these situations, having pre-approved orders from physicians or plans to obtain orders for antiviral medications on short notice can expedite administration of antiviral medications.

When outbreaks occur in institutions, chemoprophylaxis should be administered to all residents, regardless of whether they received influenza vaccinations during the previous fall, and should continue for a minimum of two weeks. If surveillance indicates that new cases continue to occur, chemoprophylaxis should be continued until approximately one week after the end of the outbreak.

In addition to use in nursing homes, chemoprophylaxis also can be considered for controlling influenza outbreaks in other closed or semi-closed settings (e.g., dormitories, correctional facilities, or other settings in which persons live in close proximity).

To limit the potential transmission of drug-resistant influenza virus during outbreaks in institutions, measures should be taken to reduce contact as much as possible between persons taking antiviral drugs for treatment and other persons, including those taking antiviral drugs for chemoprophylaxis.

Dosage and Administration

Oseltamivir is administered orally in capsule or oral suspension form. Zana-

mivir is available as a dry powder that is self-administered via oral inhalation by using a plastic device included in the package with the medication (patients will benefit from instruction and demonstration of correct use of this device). Dosage recommendations vary by antiviral medication, age group, weight, and medical conditions (Table 3). Duration of treatment is typically five days.

Note: none of the current influenza antiviral medications are approved for use in children <1 year of age. Otherwise, no reduction in dosage of oseltamivir or zanamivir is recommended on the basis of age alone.

As noted in Table 3, for patients with creatinine clearance of <30 mL/min, a reduction of the treatment dosage of oseltamivir to 75 mg once daily and in the chemoprophylaxis dosage to 75 mg every other day is recommended. No treatment or chemoprophylaxis dosing recommendations for oseltamivir are available for patients undergoing routine renal dialysis treatment. No dose adjustment is necessary for zanamivir for a five-day course of treatment for patients with either mild-to-moderate or severe impairment in renal function.

Because of the risk for serious adverse events and because efficacy has not been demonstrated among patients with underlying airway disease (e.g., asthma or chronic obstructive pulmonary disease), zanamivir is not recommended for use in this population. Neither zanamivir nor oseltamivir has been studied among persons with hepatic dysfunction.

Side Effects and Adverse Reactions

In studies, nausea and vomiting were reported more frequently among adults receiving oseltamivir for treatment than among those receiving placebo. Similar types of adverse events were reported in studies of oseltamivir prophylaxis. Nausea and vomiting might be less severe if oseltamivir is taken with food. Transient neuropsychiatric events (self-injury or delirium) have been reported among persons taking oseltamivir; the majority of reports were among adolescents and adults living in Japan. The FDA advises that persons receiving oseltamivir be monitored closely for abnormal behavior.

In studies, the type and frequency of adverse events in persons receiving inhaled zanamivir were similar to those receiving placebo (i.e., inhaled lactose vehicle alone). The most common adverse events reported by both groups were diarrhea; nausea; sinusitis; nasal signs and symptoms; bronchitis; cough; headache; dizziness; and ear, nose, and throat infections. Each of these symptoms was reported by <5% of persons in the clinical treatment studies combined. Allergic reactions, including oropharyngeal or facial edema, have been reported. Zanamivir does not impair the immunologic response to TIV.

While seizure events have been reported during post-marketing use of zanamivir and oseltamivir, no epidemiologic studies have reported any increased risk for seizures with either zanamivir or oseltamivir use.

Severe adverse events associated with the administration of antiviral medications used to prevent or treat influenza (e.g., those resulting in hospitalization or death) should be reported to MedWatch, FDA's Safety Information and Adverse Event Reporting Program, at telephone 1-800-FDA-1088, by facsimile at 1-800-FDA-0178, or via the Internet by sending Report Form 3500 (available at www.fda.gov/medwatch/safety/3500.pdf). Instructions regarding the types of adverse events that should be reported are included on MedWatch report forms.

Use During Pregnancy

Oseltamivir and zanamivir are both "Pregnancy Category C" medications. Therefore, no clinical studies have been conducted regarding the safety or efficacy of zanamivir or oseltamivir for pregnant women. Because of the unknown effects of influenza antiviral drugs on pregnant women and their fetuses, these two drugs should be used during pregnancy only if the potential benefit justifies the potential risk to the embryo or fetus. However, no adverse effects have been reported among women who received oseltamivir or zanamivir during pregnancy or among infants born to such women.

Drug Interactions

Clinical data are limited regarding drug interactions with zanamivir. However, no known drug interactions have been reported, and no clinically critical drug interactions have been predicted on the basis of *in vitro* data and data from studies using rats.

Limited clinical data are available regarding drug interactions with oseltamivir. Because oseltamivir and its active metabolite, oseltamivir carboxylate, are excreted in the urine by glomerular filtration and tubular secretion via the anionic pathway, a potential exists for interaction with other agents (e.g., probenecid) excreted by this pathway.

Antiviral Drug-Resistant Strains of Influenza

Resistance to zanamivir and oseltamivir can be induced in influenza A and B viruses *in vitro* but induction of resistance usually requires multiple passages in cell culture. Development of viral resistance to zanamivir and oseltamivir during treatment has been identified but does not appear to be frequent. Post-marketing surveillance for neuraminidase inhibitor-resistant influenza viruses is being conducted.

Conclusions

Although influenza vaccination levels increased substantially during the 1990s, estimated vaccination coverage remains <50% among certain groups for whom routine annual vaccination is recommended, including young children and adults with risk factors for influenza complications, healthcare personnel, and pregnant women. Therefore, there are many opportunities, such as reminder/recall systems and standing orders programs, for every healthcare provider in Virginia to work toward improving vaccination levels and the health of the population.

The appropriate use of antiviral agents in the treatment and prophylaxis of influenza can reduce influenza morbidity and mortality, especially in select populations. In particular, antivirals may significantly benefit people at risk for complications from influenza but who cannot take the vaccine, or aid in the prevention or control of an outbreak. However, the expense of these medica-

Cases of Selected Notifiable Diseases Reported in Virginia*

Disease	Total Cases Reported, July 2007: State	Regions: NW	N	SW	C	E	Total Cases Reported Statewide, January - July: This Year	Last Year	5 Yr Avg
AIDS	43	7	16	0	6	14	354	297	401
Campylobacteriosis	113	22	28	24	9	30	298	335	339
Chickenpox	118	16	41	17	19	25	958	1,115	512
***E. coli,* Shiga toxin-producing**	21	6	7	5	0	3	72	71	34
Giardiasis	36	6	19	4	4	3	237	234	214
Gonorrhea	435	36	20	38	189	152	3,458	3,623	4,896
Group A Strep, Invasive	5	1	0	2	1	1	100	86	66
Hepatitis, Viral									
A	5	2	3	0	0	0	53	30	46
B, acute	7	1	1	0	1	4	83	28	91
C, acute	0	0	0	0	0	0	5	4	6
HIV Infection	50	3	16	4	10	17	445	505	494
Lead in Children†	50	9	2	17	18	4	280	307	251
Legionellosis	9	2	0	3	1	3	20	31	28
Lyme Disease	35	1	26	4	2	2	391	84	61
Measles	0	0	0	0	0	0	0	0	0
Meningococcal Infection	1	0	1	0	0	0	12	14	18
Pertussis	20	2	2	2	2	12	60	126	124
Rabies in Animals	58	14	8	16	5	15	420	362	322
Rocky Mountain Spotted Fever	17	1	3	5	4	4	55	40	21
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	134	22	29	22	34	27	473	454	502
Shigellosis	7	0	1	4	0	2	68	35	192
Syphilis, Early§	23	3	5	4	3	8	205	172	131
Tuberculosis	40	2	30	1	2	5	138	148	146

Localities Reporting Animal Rabies This Month: Accomack 1 raccoon; Alexandria 1 bat, 1 raccoon; Alleghany 1 cat, 1 raccoon; Arlington 1 bat, 1 cat; Augusta 1 raccoon; Bath 1 raccoon; Bedford 1 bat, 1 raccoon; Botetourt 1 raccoon; Bristol 1 bat; Carroll 1 fox, 1 raccoon; Charles City 1 fox; Clarke 3 skunks; Fairfax 1 raccoon; Fauquier 2 bats, 1 raccoon, 1 skunk; Galax 1 fox, 2 raccoons; Grayson 1 skunk; Greensville 1 skunk; Hanover 1 raccoon; Henrico 1 raccoon; Highland 1 cat; Isle of Wight 1 fox; James City 1 fox; Loudoun 1 beaver, 1 fox; Montgomery 1 fox; Nelson 1 raccoon; Newport News 3 raccoons; Norfolk 1 raccoon; Northampton 3 raccoons; Northumberland 2 raccoons; Patrick 1 fox; Powhatan 1 bat; Prince William 1 raccoon; Richmond 1 raccoon; Rockingham 1 raccoon; Salem 1 fox; Shenandoah 1 cat, 1 raccoon; Virginia Beach 1 fox, 1 raccoon; Wythe 1 raccoon.

Toxic Substance-related Illnesses: Adult Lead Exposure 4; Asbestosis 2; Mercury Exposure 1; Methane Exposure 5; Pneumoconiosis 8.
*Data for 2007 are provisional. †Elevated blood lead levels ≥10µg/dL. §Includes primary, secondary, and early latent.

tions, as well as the risk of side effects, the risk of developing more wide-spread viral resistance, and the likely limited availability of such drugs during major outbreaks, makes judicious use important and reinforces the need for primary prevention (through vaccination and respiratory etiquette).

Information regarding influenza surveillance, prevention, detection, and control is available at www.cdc.gov/flu/weekly/fluactivity.htm. Updates or supplements to these recommendations (e.g., expanded age or risk group indications for currently licensed vaccines) might be required. **State and local health departments should be consulted concerning availability of influenza vaccine, access to vaccination programs, information related to state or local influenza activity, for reporting influenza outbreaks and influenza-related pediatric deaths, and for receiving advice concerning outbreak control. Additional information about the status of influenza in Virginia is available on the VDH website (www.vdh.virginia.gov/epi/newhome.asp).**

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