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Prevention and Control of Influenza - Part I

Recommendations of the Advisory Committee on Immunization Practices (ACIP)

This article summarizes the 2004 recommendations by the Advisory Committee on Immunization Practices (ACIP) for the use of influenza vaccine (Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices [ACIP]. MMWR: May 28, 2004/ 53(RR06);1-40). The 2004 recommendations include new or updated information regarding 1) influenza vaccine for children aged 6-23 months; 2) vaccination of healthcare providers with live, attenuated influenza vaccine (LAIV); 3) personnel who may administer LAIV; 4) the 2004-05 trivalent inactivated vaccine virus strains; and 5) the assessment of vaccine supply and timing of influenza vaccination. Although the optimal time to vaccinate against influenza is October and November, vaccination in December and later continues to be strongly recommended. The complete report, available at www.cdc.gov/mmwr/preview/mmwrhtml/rr5306a1.htm, provides more detailed information.

Introduction

Epidemics of influenza typically occur during the winter months in temperate regions and have been responsibile for an average of approximately 36,000 deaths/year in the United States (1990-1999). Influenza viruses cause disease among all age groups. However, while rates of infection are highest among children, rates of serious illness and death are highest among persons aged ≥65 years and among persons of any age with medical conditions that place them at increased risk for complications from influenza. 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, the *Virginia Epidemiology Bulletin* (VEB) summarizes the Advisory Committee on Immunization Practices (ACIP) recommendations for healthcare providers in Virginia each year. This article covers the recommendations for the use of the influenza vaccine (inactivated and live attenuated) for the 2004-2005 influenza season; the September issue of the VEB will include a summary of recommendations for the use of antiviral agents for treatment and prophylaxis of influenza, as well as prevention strategies for institutions.


Droplet spread

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 (H) and neuraminidase (N). Influenza B viruses are not categorized into subtypes. A person's immunity to the surface antigens reduces the likelihood of infection and severity of disease if infection occurs. However, waning immunity over time and the development of antigenic variants through antigenic drift mean that seasonal epidemics occur.

Annual influenza vaccination is the primary method for preventing influenza and its severe complications. Vaccination is associated with reductions in influenza-related respiratory illness and physician visits among all age groups, hospitalization and death among persons at high risk, otitis media among children, and work absenteeism among adults. Therefore, the primary target groups for annual vaccination are:

1) persons at increased risk for influenza-related complications (e.g., persons aged ≥65 years, children aged 6-23 months, pregnant women, and persons of any age with specific chronic medical conditions);
2) persons aged 50-64 years—due to the elevated prevalence of chronic medical conditions; and
3) persons who live with or care for persons at high risk (e.g., healthcare providers, family or contacts of children aged < 23 months, etc.).

Influenza vaccination is the most effective means of reducing the impact of

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influenza. And while antiviral medications also have a role in managing influenza (to be covered in the September issue of the VEB), these medications should not be considered a substitute for vaccination.

Clinical Signs and Symptoms of Influenza

Influenza virus spreads from person to person primarily in droplets produced through the coughing and sneezing of infected persons. However, spread can occur by the hands touching droplets from an infected person and then touching the nose or mouth before hand washing. The incubation period for influenza is 1-4 days, with an average of 2 days. Adults typically are infectious from the day before symptoms begin through approximately 5 days after illness onset. Young children can shed virus for up to 6 days before their illness onset, and can be infectious for ≥10 days. Severely immunocompromised persons can shed influenza viruses for weeks or months.

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 approximately 20% of children hospitalized with influenza can have febrile seizures.

Influenza illness typically resolves after 2-7 days for the majority of persons[1], although cough and malaise can persist for >2 weeks. Among certain persons, influenza can exacerbate underlying medical conditions (e.g., pulmonary or cardiac disease), lead to primary influenza viral pneumonia or secondary bacterial pneumonia, or occur as part of a coinfection with other viral or bacterial pathogens. Influenza infection has also been associated with encephalopathy, transverse myelitis, Reye syndrome, myositis, myocarditis, and pericarditis.

Older adults account for ≥90% of deaths attributed to pneumonia and influenza. Influenza-related deaths can result from pneumonia as well as from exacerbations of cardiopulmonary conditions and other chronic diseases. Deaths from influenza are uncommon among children—preliminary reports indicate that there were 143 laboratory-confirmed influenza-related pediatric deaths in the U.S. during the 2003-04 influenza season. Of these, 41% were aged <2 years. For pediatric deaths from influenza among those aged 2-17 years in 2003-04, 45% did not have an underlying medical condition considered to place a person at risk for influenza-related complications.[2]

Role of Laboratory Diagnosis

Appropriate treatment of patients with respiratory illness depends on accurate and timely diagnosis. Early diagnosis of influenza can reduce the inappropriate use of antibiotics and provide the option of using antiviral therapy. The accuracy of clinical diagnosis of influenza on the basis of symptoms alone is limited since symptoms from illness caused by other pathogens can overlap considerably with influenza.

Diagnostic tests available for influenza include viral culture, serology, rapid antigen testing, polymerase chain reaction (PCR) and immunofluorescence. Sensitivity and specificity of any test for influenza might vary by the laboratory that performs the test, the type of test used, and the type of specimen tested. Among respiratory specimens for viral isolation or rapid detection, **nasopharyngeal specimens** are typically more effective than throat swab specimens.

Commercial rapid diagnostic tests can be used by laboratories in outpatient settings to detect influenza viruses within 30 minutes. Different tests can detect 1) only influenza A viruses; 2) both influenza A and B viruses, but not distinguish between the two types; or 3) both influenza A and B and distinguish between the two. The types of specimens acceptable for use (i.e., throat swab, nasal wash, or nasal swab) also vary by test. The specificity and, in particular, the sensitivity of rapid tests are lower than for viral culture and vary by test. Therefore, healthcare providers should consider confirming negative tests with viral culture or other means. Further, when interpreting results of a rapid influenza test, healthcare providers should consider the positive and negative predictive values of the test in the context of the level of influenza activity in their community.

Despite the availability of rapid diagnostic tests, collecting clinical specimens for viral culture is 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. Virus isolates are also needed to monitor the emergence of antiviral resistance and the emergence of novel influenza A subtypes that might pose a pandemic threat.

Influenza Vaccine

Vaccine Supply

During the 2003-04 season, approximately 87 million doses of vaccine were produced. Shortages of vaccine were noted in regions of the United States after an unprecedented demand for vaccine lasted longer into the season than usual, caused in part by increased media attention. Manufacturers anticipate production of 90-100 million doses of vaccine for the 2004-05 season. The Centers for Disease Control and Prevention (CDC) will make recommendations regarding the need for tiered timing of vaccination of different risk groups, if this should become necessary. [Note: as of press-time, Chiron reported a delay in the release of its supply of influenza vaccine (Fluvirin®) until October. However, it is expected that almost all of the vaccine will be available in October and November—as a result, this delay should have a minimal impact on vaccination efforts.]

For the 2004-05 season, both inactivated influenza vaccine and Live Attenuated Influenza Vaccine (LAIV) will be available (Table 1). Overall, both contain strains of influenza viruses antigenically equivalent to the annually recommended strains, use viruses grown in eggs, and need to be administered annually to provide optimal protection against influenza infection. How-

ever, the inactivated influenza vaccine uses killed viruses, is administered intramuscularly by injection, is less expensive, and is approved for use among persons aged ≥6 months, including persons who are healthy and those with chronic medical conditions. LAIV contains attenuated live viruses capable of replication, is administered intranasally by sprayer, and is approved for use only among healthy persons aged 5-49 years.

Composition

Both the inactivated and live, attenuated vaccines prepared for the 2004-05 season will include:

- A/Fujian/411/2002 (H3N2)-like or equivalent antigens;
- A/New Caledonia/20/99 (H1N1)-like antigens; and,
- B/Shanghai/361/2002-like or equivalent antigens.

Since influenza viruses (for both the inactivated and LAIV) are initially grown in embryonated hens' eggs, both vaccines might contain limited amounts of residual egg protein.

For the inactivated vaccine, the vaccine viruses are made noninfectious (i.e., killed). Manufacturers might use different compounds to inactivate influenza viruses and add antibiotics to prevent bacterial contamination. For example, thimerosal, a mercury-containing compound, may be present in inactivated influenza vaccine to reduce the likelihood of bacterial contamination. Thimerosal preservative-containing inactivated influenza vaccines, distributed in multidose containers in the United States, contain 25 mcg of mercury/0.5-mL dose. For the 2004-05 influenza season, 6-8 million single-dose syringes of inactivated influenza virus vaccine without thimerosal as a preservative should also be available. *Preservative-free* vaccines contain only trace amounts of thimerosal as a residual from early manufacturing steps (<1 mcg mercury/0.5-mL dose or <0.5 mcg mercury/0.25-mL dose). Package inserts should be consulted for additional information. LAIV does not contain thimerosal.

To date, no scientifically conclusive evidence exists of harm from exposure to thimerosal preservative-containing vaccine, whereas evidence is accumulating of lack of any harm resulting from exposure to such vaccines. Therefore, the benefits of influenza vaccination outweigh the theoretical risk, if any, for thimerosal exposure through vaccination. Nonetheless, certain persons remain concerned regarding exposure to thimerosal. Since reductions in thimerosal in other vaccines have been achieved and have resulted in substantially lowered cumulative exposure to thimerosal from vaccination among infants and children, persons who should receive inactivated influenza vaccine may receive either vaccine preparation.

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

Factor	LAIV	Inactivated influenza vaccine
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)	Same as LAIV
Vaccine virus strains updated	Annually	Same as LAIV
Frequency of administration	Annually	Same as LAIV
Approved age and risk groups*	Healthy persons aged 5-49 years	Persons aged ≥6 months
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)	Inactivated influenza vaccine preferred	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 4 weeks of another live vaccine	Prudent to space 4 weeks apart	Yes
If not simultaneously administered, can be administered within 4 weeks of an inactivated vaccine	Yes	Yes

*Populations at high risk from complications of influenza infection include persons aged >65 years; residents of nursing homes and other chronic-care facilities that house persons with chronic medical conditions; adults and children with chronic disorders of the pulmonary or cardiovascular systems; adults and children with chronic metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunosuppression; children and adolescents receiving long-term aspirin therapy (at risk for developing Reye syndrome after wild-type influenza infection); pregnant women; and children aged 6-23 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.

Efficacy and Effectiveness—Inactivated Influenza Vaccine

The effectiveness of inactivated influenza vaccine depends primarily on the age and immunocompetence of the vaccine recipient and the degree of similarity between the viruses in the vaccine and those in circulation. The majority of vaccinated children and young adults develop high postvaccination hemagglutination inhibition antibody titers. These antibody titers are protective against illness caused by strains similar to those in the vaccine.

Children. Children aged as young as 6 months can develop protective levels of antibody after influenza vaccination. One study of children aged 1-15 years found that inactivated influenza vaccine was 77%-91% effective against influenza respiratory illness.

Adults Aged <65 Years. When the vac-

cine and circulating viruses are antigenically similar, influenza vaccine prevents influenza illness among approximately 70%-90% of healthy adults aged <65 years. Vaccination of healthy adults has resulted in decreased work absenteeism and decreased use of healthcare resources when the vaccine and circulating viruses are well-matched.

Adults Aged ≥65 Years. Older persons and persons with certain chronic diseases might develop lower postvaccination antibody titers than healthy young adults and thus can remain susceptible to influenza-related upper respiratory tract infection. One study of noninstitutionalized persons aged ≥60 years reported a vaccine efficacy of 58% against influenza respiratory illness, but indicated that efficacy might be lower among those aged ≥70 years. The vaccine can also be effective in preventing secondary complications and reducing the risk for influenza-related hospitalization and death among adults ≥65 years with and without high-risk medical conditions (e.g., heart disease and diabetes). Among elderly persons not living in nursing homes or similar chronic-care facilities, influenza vaccine is 30%-70% effective in preventing hospitalization for pneumonia and influenza. Among older persons who do reside in nursing homes the vaccine can be 50%-60% effective in preventing hospitalization or pneumonia and 80% effective in preventing death, although the effectiveness in preventing influenza illness often ranges from 30%-40%.

Note: The 2003-04 influenza season was characterized by the early onset of influenza activity, reports of severe illness particularly in children, and the predominant circulation of an influenza A (H3N2) virus strain that was antigenically different from the influenza A (H3N2) vaccine strain. Recent studies showed that, despite the antigenic differences, the influenza vaccine had some effectiveness (25%-49% against nonlaboratory-confirmed influenza and 38%-52% against laboratory-confirmed influenza) in preventing illness during the 2003-04 influenza season. This supports recommendations to continue influenza vaccination efforts even when suboptimal matches between the predominant influenza A (H3N2) circulating and vaccine strains occurs.[2]

Efficacy and Effectiveness— LAIV

Healthy Children. A study of healthy children initially aged 15-71 months found that LAIV was 92% effective in preventing culture-confirmed influenza during the two-season study. LAIV also reduced febrile otitis media by 27%.

Healthy Adults. A study among healthy adults aged 18-64 years found no difference between LAIV and placebo for preventing febrile episodes, however the vaccine and circulating A (H3N2) strains were not well-matched. The study did find that vaccination with LAIV was associated with a 19% reduction in severe febrile illnesses and a 24% reduction in febrile upper respiratory tract illnesses. Vaccination was also associated with fewer days of illness, fewer days of work lost, fewer healthcare provider visits, and reduced use of prescription antibiotics and over-the-counter medications. Another study among healthy adults aged 18-41 years compared LAIV and inactivated vaccine and found the overall efficacy in preventing laboratory-documented influenza was 85% and 71%, respectively (difference not statistically significant).

Primary Changes and Updates in the Recommendations

The 2004 recommendations include four principal changes or updates:

1. ACIP recommends that healthy children aged 6-23 months, and close contacts of children aged 0-23 months, be vaccinated against influenza.
2. Inactivated vaccine is preferred over live, attenuated influenza vaccine (LAIV) for vaccinating household members, healthcare providers, and others who have close contact with severely immunosuppressed persons (e.g., hematopoietic stem cell recepients) during periods when such persons require care in a protected environment. If a healthcare provider receives LAIV, the healthcare provider should refrain from contact with severely immunosuppressed patients for 7 days after vaccine receipt. No preference exists for inactivated vaccine use by healthcare providers or other persons who have close contact with persons with lesser degrees of immunosuppression.
3. Severely immunosuppressed persons should not administer LAIV. However, other persons at high risk for influenza complications may administer LAIV.
4. The 2004-05 trivalent vaccine virus strains are A/Fujian/411/2002 (H3N2)-like, A/New Caledonia/20/99 (H1N1)-like, and B/Shanghai/361/2002-like antigens. For the A/Fujian/411/2002 (H3N2)-like antigen, manufacturers may use the antigenically equivalent A/Wyoming/3/2003 [H3N2] virus. For the B/Shanghai/361/2002-like antigen, manufacturers may use the antigenically equivalent B/Jilin/20/2003 virus or B/Jiangsu/10/2003 virus.

Recommendations for Influenza Vaccination

LAIV is approved for use only among healthy persons aged 5-49 years. Inactivated influenza vaccine is approved for persons aged ≥6 months, including those at increased risk for complications from influenza, including:

- persons aged ≥65 years;
- residents of nursing homes and other chronic-care facilities that house persons of any age who have chronic medical conditions;
- adults and children who have chronic disorders of the pulmonary or cardiovascular systems, including asthma;
- adults and children who have required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunosuppres-

sion (e.g., due to medications, human immunodeficiency virus [HIV]);
- children and adolescents (aged 6 months-18 years) on long-term aspirin therapy and, therefore, who might be at risk for experiencing Reye syndrome after influenza infection;
- women who will be pregnant during the influenza season; and
- children aged 6-23 months.

In 2000, approximately 73 million persons in the United States were included in one or more of these target groups.

Additional Information Regarding Vaccination of Specific Populations

Persons Aged 50-64 Years

Vaccination is recommended for persons aged 50-64 years because approximately 29% of people in this group have one or more high-risk medical conditions. Influenza vaccine has been recommended for this entire age group because age-based strategies are more successful in increasing vaccine coverage than patient-selection strategies based on medical conditions. Persons aged 50-64 years without high-risk conditions also receive benefit from vaccination in the form of decreased rates of influenza illness, decreased work absenteeism, and decreased need for medical visits and medication, including antibiotics.

Persons Who Can Transmit Influenza to Those at High Risk

Persons who are clinically or subclinically infected can transmit influenza virus to persons at high risk for complications from influenza. Decreasing transmission of influenza from caregivers and household contacts to persons at high risk might reduce influenza-related deaths among persons at high risk. Evidence indicates that vaccination of healthcare personnel is associated with decreased deaths among nursing home patients.

Therefore, the following groups should be vaccinated:
- physicians, nurses, and other personnel 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
- household contacts (including children) of persons in groups at high risk.

In addition, because children aged 0-23 months are at increased risk for influenza-related hospitalization, vaccination is recommended for their household contacts and out-of-home caregivers, particularly for contacts of children aged 0-5 months.

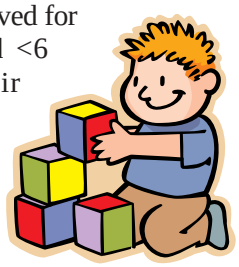
Healthy persons aged 5-49 years in these groups who are not contacts of severely immunosuppressed persons can receive either LAIV or inactivated influenza vaccine. All other persons in this group should receive inactivated influenza vaccine.

Pregnant Women

Women who will be pregnant during the influenza season should be vaccinated. Vaccination can occur in any trimester. One study of influenza vaccination of >2,000 pregnant women demonstrated no adverse fetal effects associated with influenza vaccine. Estimates suggest that 1-2 hospitalizations can be prevented for every 1,000 pregnant women vaccinated against influenza.

Healthy Young Children

Because children aged 6-23 months are at substantially increased risk for influenza-related hospitalizations, ACIP recommends vaccination of <u>all</u> children in this age group. ACIP continues to recommend influenza vaccination of persons aged ≥6 months who have high-risk medical conditions. Since the current inactivated influenza vaccine is not approved for use among children aged <6 months, vaccinating their household contacts and out-of-home caregivers might decrease influenza infection among these children.



Beginning in March 2003, the group of children eligible for influenza vaccine coverage under the Vaccines for Children (VFC) program was expanded to include all VFC-eligible children aged 6-23 months and VFC-eligible children aged 2-18 years who are household contacts of children aged 0-23 months.

Persons Infected with HIV

The risk for influenza-related death has been estimated at 9.4-14.6/10,000 persons with acquired immunodeficiency syndrome (AIDS) compared with 0.09-0.10/10,000 among all persons aged 25-54 years and 6.4-7.0/10,000 among persons aged ≥65 years. Influenza symptoms might be prolonged and the risk for complications from influenza increased for certain HIV-infected persons. Therefore, vaccination will benefit HIV-infected persons, including HIV-infected pregnant women.

Breastfeeding Mothers

Influenza vaccine does not affect the safety of mothers who are breastfeeding or their infants. Breastfeeding does not adversely affect the immune response and is not a contraindication for vaccination.

Travelers

The risk for exposure to influenza during travel depends on the time of year and destination. In the tropics, influenza can occur throughout the year. In the temperate regions of the Southern Hemisphere, the majority of influenza activity occurs during April-September. Persons at high risk for complications of influenza who were not vaccinated with influenza vaccine during the preceding fall or winter should consider receiving influenza vaccine before travel if they plan to
- travel to the tropics,
- travel with organized tourist groups at any time of year, or
- travel to the Southern Hemisphere during April-September.

No information is available regarding the benefits of revaccinating persons before summer travel who were already vaccinated in the preceding fall. Persons at high risk who receive the previous season's vaccine before travel should be revaccinated with the current vaccine the following fall or winter. Persons

aged ≥50 years and others at high risk should consult with their healthcare providers before embarking on travel during the summer to discuss the advisability of carrying antiviral medications for either prophylaxis or treatment of influenza.

General Population

In addition to the groups for which annual influenza vaccination is recommended, healthcare providers should administer influenza vaccine to any person who wishes to reduce the likelihood of becoming ill with influenza (the inactivated vaccine can be administered to children aged ≥6 months), depending on vaccine availability. 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) should be encouraged to receive vaccine.

Inactivated Influenza Vaccine

Dosage and Route

Dosage recommendations for inactivated influenza vaccine vary according to age group (Table 2). Among previously **unvaccinated** children aged <9 years, 2 doses administered ≥1 month apart are recommended for satisfactory antibody responses. If possible, the second dose should be administered before December. If a child aged <9 years receiving vaccine for the first time does not receive a second dose of vaccine within the same season, only 1 dose of vaccine should be administered the following season (i.e., two doses are not required at that time). Among adults, studies have indicated limited or no improvement in antibody response when a second dose is administered during the same season. Even when the current influenza vaccine contains one or more antigens administered in previous years, annual vaccination with the current vaccine is necessary because immunity declines during the year after vaccination. Vaccine prepared for a previous influenza season should not be administered to provide protection for the current season.

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.

Table 2. Inactivated influenza vaccine* dosage, by age group, United States, 2004-2005 season

Age group†	Dose	No. of doses	Route§
6-35 months	0.25 mL	1 or 2¶	Intramuscular
3-8 years	0.50 mL	1 or 2¶	Intramuscular
≥9 years	0.50 mL	1	Intramuscular

** A 0.5-mL dose contains 15 mg each of A/Fujian/411/2002 (H3N2)-like, A/New Caledonia/20/99 (H1N1)-like, and B/Shanghai/361/2002-like antigens. For the A/Fujian/411/2002 (H3N2)-like antigen, manufacturers may use the antigenically equivalent A/Wyoming/3/2003 (H3N2) virus, and for the B/Shanghai/361/2002-like antigen, manufacturers may use the antigenically equivalent B/Jilin/20/2003 virus or B/Jiangsu/10/2003 virus. Manufacturers include Aventis Pasteur, Inc. (Fluzone® split virus); and Chiron (Fluvirin™ purified surface antigen vaccine). Fluzone is approved by the Food and Drug Administration for use among persons aged ≥6 months. Fluvirin is approved for use among persons aged ≥4 years. For further product information, call Aventis Pasteur at 800-822-2463 or Chiron at 800-200-4278.*

† Because of their decreased potential for causing febrile reactions, only split-virus vaccines should be used for children aged <13 years. Whole-virus vaccine is not available in the United States. Split-virus vaccine might be labeled as split, subvirion, *or* purified surface antigen *vaccine. Immunogenicity and side effects of split- and whole-virus vaccines are similar among adults when vaccines are administered at the recommended dosage.*

§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.

¶Two doses administered at least 1 month apart are recommended for children aged <9 years who are receiving influenza vaccine for the first time.

Persons Who Should Not Be Vaccinated with Inactivated Influenza Vaccine

Inactivated influenza vaccine should not be administered to persons with a known anaphylactic hypersensitivity to eggs or to other components of the influenza vaccine without first consulting a physician. Prophylactic use of 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 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, particularly among children with mild upper respiratory tract infection or allergic rhinitis.

Side Effects and Adverse Reactions

When educating patients regarding potential side effects, healthcare providers should emphasize:

1) inactivated influenza vaccine contains noninfectious killed viruses **and cannot cause influenza**; and,
2) coincidental respiratory disease unrelated to influenza vaccination can occur after vaccination.

The most frequent side effect of 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 vaccination with 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). Persons who have a severe egg allergy, such as hives or swell-

ing of the lips or tongue, or who have experienced acute respiratory distress or collapse after eating eggs should consult a physician for appropriate evaluation to help determine if vaccine should be administered. Persons who have documented immunoglobulin E (IgE)-mediated hypersensitivity to eggs, including those who have had occupational asthma or other allergic responses to egg protein, might also be at increased risk for allergic reactions to influenza vaccine. Protocols exist for safely administering influenza vaccine to persons with egg allergies.

Although exposure to vaccines containing thimerosal can induce hypersensitivity, the majority of patients do not have reactions to thimerosal when it is administered as a component of vaccines, even when patch or intradermal tests for thimerosal indicate hypersensitivity. Hypersensitivity to thimerosal usually consists of local, delayed-type reactions.

Investigations to date indicate no substantial increase in Guillain-Barré Syndrome (GBS) associated with influenza vaccines (other than the swine influenza vaccine in 1976). Even if GBS were a true side effect of vaccination since 1976, the estimated risk for GBS would be approximately 1 additional case/1 million persons vaccinated. Therefore, the potential benefits of influenza vaccination in preventing serious illness, hospitalization, and death substantially outweigh the possible risks for experiencing vaccine-associated GBS.

However, persons with a history of GBS do have a greater likelihood of subsequently experiencing GBS than persons without such a history. Thus, the likelihood of coincidentally experiencing GBS after influenza vaccination is expected to be greater among persons with a history of GBS than among persons with no history of this syndrome. Whether influenza vaccination specifically might increase the risk for recurrence of GBS is unknown; therefore, avoiding vaccinating persons who are not at high risk for severe influenza complications and who are known to have experienced GBS within 6 weeks after a previous influenza vaccination is prudent. Influenza antiviral chemoprophylaxis for these persons is a consideration. Although data are limited, for the majority of persons who have a history of GBS and who are at high risk for severe complications from influenza, the established benefits of influenza vaccination justify yearly vaccination.

Adverse Reaction Reporting

Healthcare providers should promptly report all clinically significant adverse events after influenza vaccination of children to Food and Drug Administration (FDA)/CDC Vaccine Adverse Event Reporting System (VAERS), even if the healthcare provider is not certain that the vaccine caused the event. The Institute of Medicine has specifically recommended reporting potential neurologic complications (e.g., demyelinating disorders such as GBS), although no evidence exists of a causal relationship between influenza vaccine and neurologic disorders in children.

Live, Attenuated Influenza Vaccine

LAIV is an option for the vaccination of healthy persons aged 5-49 years, including persons in close contact with groups at high risk and those wanting to avoid influenza. The LAIV produced by MedImmune, Inc. (Gaithersburg, Maryland) is marketed under the name FluMist™. It is a live, trivalent, intranasally administered vaccine. The vaccine is

- attenuated, producing mild or no signs or symptoms related to influenza virus infection;
- temperature-sensitive, a property that limits the replication of the vaccine viruses at 38°C-39°C (restricting LAIV viruses from replicating efficiently in human lower airways); and,
- cold-adapted, replicating efficiently at 25°C, a temperature that is permissive for replication of LAIV viruses in the mucosa of the nasopharynx.

The protective mechanisms induced by vaccination with LAIV are not completely understood but appear to involve both serum and nasal secretory antibodies. Possible advantages of LAIV include its potential to induce a broad mucosal and systemic immune response, its ease of administration, and the acceptability of an intranasal rather than intramuscular route of administration.

Available data indicate that both children and adults vaccinated with LAIV can shed vaccine viruses for >2 days (range: 3-10 days) after vaccination, although in lower titers than typically occurs with shedding of wild-type influenza viruses. Shedding should not be equated with person-to-person transmission of vaccine viruses, although, in rare instances, vaccine viruses that are shed can be transmitted to nonvaccinated persons. The estimated probability of acquiring vaccine virus after close contact with a single LAIV recipient in a child care population was 0.58%-2.4%.

LAIV Dosage and Administration

LAIV is intended for intranasal administration only and should not be administered by the intramuscular, intradermal, or intravenous route. LAIV is supplied in a prefilled single-use sprayer containing 0.5 mL of vaccine. The vaccine can be administered by holding an individual sprayer in the palm of the hand until thawed, with subsequent immediate use. Alternatively, the vaccine can be thawed in a refrigerator and stored at 2°C-8°C for ≤24 hours before use. Vaccine should not be refrozen after thawing. Approximately 0.25 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 should be administered annually according to the following schedule (Note: One dose equals 0.5 mL divided equally between each nostril):

- Children aged 5-8 years previously unvaccinated at any time with either LAIV or inactivated influenza vaccine should receive 2 doses of LAIV separated by 6-10 weeks. If possible, the second dose should be administered before December.
- Children aged 5-8 years previously vaccinated at any time with either

LAIV or inactivated influenza vaccine should receive 1 dose of LAIV. They do not require a second dose.

- Persons aged 9-49 years should receive 1 dose of LAIV.
- 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.
- Whether concurrent administration of LAIV with other vaccines affects the safety or efficacy of either LAIV or the simultaneously administered vaccine is unknown. Following the ACIP general recommendations for immunization is prudent: inactivated vaccine can be administered either simultaneously or at any time before or after LAIV. Two live vaccines not administered on the same day should be administered ≥4 weeks apart when possible.

Persons Who Should Not Be Vaccinated with LAIV

The following populations should not be vaccinated with LAIV:

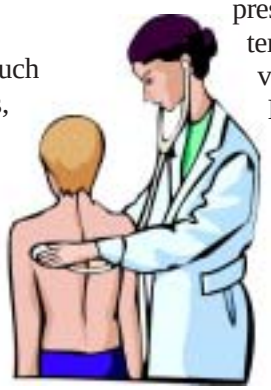
- Persons aged <5 years or those aged ≥50 years;
- Persons with asthma, reactive airways disease, cystic fibrosis, chronic obstructive pulmonary disease or other chronic disorders of the pulmonary or cardiovascular systems;
- Persons with other underlying medical conditions, including such metabolic diseases as diabetes, renal dysfunction, and hemoglobinopathies;
- Persons with known or suspected immunodeficiency diseases or who are receiving immunosuppressive therapies;
- Children or adolescents receiving aspirin or other salicylates (because of the association of Reye syndrome with wild-type influenza infection);
- Persons with a history of GBS;
- Pregnant women; or
- Persons with a history of hypersensitivity, including anaphylaxis, to any of the components of LAIV or to eggs.

However, protection from influenza using inactivated influenza vaccine may be an option.

Close Contacts of Persons at High Risk for Complications from Influenza

Close contacts of persons at high risk for complications from influenza should receive influenza vaccine to reduce transmission of wild-type influenza viruses to persons at high risk. Use of inactivated influenza vaccine is preferred for vaccinating household members, healthcare providers, 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. However, no preference exists for inactivated influenza vaccine use by healthcare providers 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 healthcare provider receives LAIV, that healthcare provider should refrain from contact with severely immunosuppressed patients for 7 days after vaccine receipt. Hospital visitors who have received LAIV should refrain from contact with severely immunosuppressed persons for 7 days after vaccination; however, such persons need not be excluded from visitation of patients who are not severely immunosuppressed.



Personnel Who May Administer LAIV

Low-level introduction of vaccine viruses into the environment is likely unavoidable when administering LAIV. The risk of acquiring vaccine viruses from the environment is unknown but probably limited. 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 coadministration 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 2 weeks after receipt of LAIV.

LAIV Storage

LAIV must be stored at -15°C or colder. LAIV should not be stored in a frost-free freezer because the temperature might cycle above -15°C, unless a manufacturer-supplied freezer box or other strategy is used. LAIV can be thawed in a refrigerator and stored at 2°C-8°C for ≤24 hours before use. It should not be refrozen after thawing.

Side Effects and Adverse Reactions

The incidence of adverse events possibly complicating influenza (e.g., pneumonia, bronchitis, bronchiolitis, or central nervous system events) has not been found to be statistically different among LAIV and placebo recipients aged 5-49 years.

Among children, 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.

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.

In studies, serious adverse events among healthy children aged 5-17 years or healthy adults aged 18-49 years occurred at a rate of <1%. Healthcare providers should promptly report all clinically significant adverse events after LAIV administration to VAERS, as recommended for inactivated influenza vaccine.

Recommended Vaccines for Different Age Groups

When vaccinating children aged 6 months-3 years, healthcare providers should use inactivated influenza vaccine that has been approved by FDA for this age group. Inactivated influenza vaccine from Aventis Pasteur, Inc., (FluZone split-virus) is approved for use among persons aged ≥6 months. Inactivated influenza vaccine from Chiron (Fluvirin) is labeled in the United States for use only among persons aged ≥4 years. Live, attenuated influenza vaccine from MedImmune (FluMist) is approved for use among healthy persons aged 5-49 years (Table 3).

Timing of Annual Influenza Vaccination

Adults develop peak antibody protection against influenza infection 2 weeks after 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. Therefore, the optimal time to vaccinate is usually during October-November, but vaccine administered after November is likely to be beneficial.

The ACIP recommends that to avoid missed opportunities for vaccination of persons at high risk for serious complications, such persons should be offered vaccine beginning in September during routine healthcare visits or during hospitalizations, if vaccine is available. 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 within a limited time after vaccination. In addition, children aged <9 years who have not been previously vaccinated can receive their first dose in September or earlier because those persons need a booster dose 4-6 weeks (depending on vaccine type) after the initial dose.

Vaccination efforts in October and earlier should focus on persons aged ≥50 years, persons aged <50 years at increased risk for influenza-related complications (including children aged 6-23 months), household contacts of persons at high risk (including out-of-home caregivers and household contacts of children aged 0-23 months), and healthcare providers. Efforts to vaccinate other persons who wish to decrease their risk for influenza infection should begin in November; however, if such persons request vaccination in October, vaccination should not be deferred.

Persons planning substantial organized vaccination campaigns should consider scheduling these events after 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.

After November, many persons who should or want to receive influenza vaccine remain unvaccinated. To improve vaccine coverage, influenza vaccine should continue to be offered in December and 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 providers and other potential vaccine recipients, a plan for identifying persons at high risk, use of reminder/recall systems, and efforts to remove administrative and financial barriers that prevent persons from receiving the vaccine, including use of standing orders programs. **When possible, using standing orders programs is recommended for long-term-care facilities, hospitals, and home health agencies to ensure the administration of recommended vaccinations for adults.**

Staff in facilities providing ongoing medical care (e.g., physicians' offices, public health clinics, employee health clinics, hemodialysis centers, hospital specialty-care clinics, and outpatient rehabilitation programs) should identify and label the medical records of patients who should receive vaccination. Vaccine should be offered during visits beginning in September and throughout the influenza season. The offer of vaccination and its receipt or refusal should be documented in the medical record. Patients for whom vaccination is recommended and who do not have regularly scheduled visits during the fall should be reminded by mail, telephone, or other means of the need for vaccination.

Beginning each September, acute healthcare facilities (e.g., emergency rooms and walk-in clinics) should offer vaccinations to persons or provide written information regarding why, where, and how to obtain the vaccine. This written information should be available in languages appropriate for the populations served by the facility.

During October and November each year, vaccination should be routinely provided to all residents of chronic-care facilities with the concurrence of attending physicians. Consent for vaccination should be obtained from the resident or a family member at the time of admission to the facility or anytime afterwards. All residents should be vaccinated at one time, preced-

Table 3. Approved influenza vaccines for different age groups

Vaccine	6 mos - 3 yrs	4 yrs	5-49 yrs	≥50 yrs
FluZone® (Aventis Pasteur, Inc.)	X*	X	X	X
Fluviron™ (Chiron)		X	X	X
FluMist™ (Medimmune, Inc.)			X	

*Children aged 6-35 mos should receive 0.25 mL/dose. Persons aged >35 mos should receive 0.50 mL/dose.

ing the influenza season. Residents admitted through March after completion of the facility's vaccination program should be vaccinated at the time of admission.

Persons of all ages (including children) with high-risk conditions and persons aged ≥50 years who are hospitalized at any time during September-March should be offered the influenza vaccine before they are discharged. The hospital serves as a setting in which persons at increased risk for subsequent hospitalization can be identified and vaccinated. Using standing orders in hospitals increases vaccination rates among hospitalized persons.

Beginning in October each year, healthcare facilities should offer influenza vaccinations 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 providers regarding the benefits of vaccination and the potential health consequences of influenza illness for themselves and their patients. All healthcare providers should be provided convenient access to influenza vaccine at the work site, free of charge, as part of employee health programs.

Conclusions

Although influenza vaccination levels increased substantially during the 1990s, estimated national adult vaccine coverage for the 2001-02 season was 66% for adults aged ≥65 years and 34% for adults aged 50-64 years. Vaccination levels are low among children at increased risk for influenza complications. In addition, vaccination levels among blacks and Hispanics continue to lag behind those among whites. Annual vaccination is also recommended for healthcare providers to protect patients, but coverage averages only 38% among healthcare providers. Therefore, there are many opportunities for every healthcare provider in Virginia to work towards improving vaccination levels and the health of the population.

Sources of Information Regarding Influenza and Its Surveillance

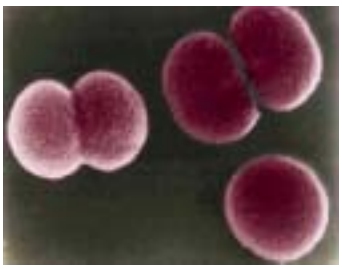
Information regarding influenza surveillance, prevention, detection, and control is available on the CDC/National Center for Infectious Diseases website: www.cdc.gov/ncidod/diseases/flu/weekly.htm. Additional information regarding influenza vaccine can be obtained at the CDC/National Immunization Program website: www.cdc.gov/nip/flu or by calling their hotline at 800-232-2522 (English) or 800-232-0233 (Spanish).

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, and for reporting influenza outbreaks and 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).

References:
1. Chin J. Control of communicable diseases manual.17th ed. Washington: American Public Health Association; 2000.
2. MMWR. Assessment of the Effectiveness of the 2003-04 Influenza Vaccine Among Children and Adults—Colorado, 2003. August 13, 2004 / 53(31);707-710.

Preventing Meningococcal Disease Among College Students

The Gram-negative bacterium *Neisseria meningitidis* is an important cause of bacterial meningitis and sepsis in the United States. Although meningococcal disease is rare (approximately 2,500-3,000 cases reported each year in the U.S.), it can have very serious consequences: the case fatality rate of invasive disease is 9%-12%, even with appropriate antibiotic therapy, while the fatality rate of meningococcal sepsis is 40%. Up to 20% of survivors have permanent sequelae, such as hearing loss, neurological damage, or loss of a limb. In 2003, 28 cases of meningococcal infection, including two deaths, were reported to the Virginia Department of Health.



Neisseria meningitidis

The proportion of cases of meningococcal disease among adolescents and young adults has increased in recent years. During 1992-1998, 28% of reported cases in the United States were 12-29 years of age. Recent studies have shown that college freshmen living in dormitories are at increased risk of meningococcal disease when compared with persons of the same age who are not attending college. Certain social behaviors, including drinking, smoking (both active and passive) and being in crowded situations such as a dormitory or bar, may also put college students at greater risk.

Between 66% and 80% of all cases of meningococcal disease in college students are vaccine preventable. The meningococcal polysaccharide vaccine protects against four of the five most common serogroups of *N. meningitidis* (A, C, Y and W-135) and is 85%-100% effective for three to five years. Due to the potential lethality of meningococcal disease and the availability of a safe, effective vaccine, **Virginia law requires that all incoming full-time students are vaccinated against meningococcal disease prior to enrollment in any public four-year institution of higher education**. In lieu of vaccination, students may also sign a waiver stating they are aware of the risks, but chose not to be vaccinated.

For more information on meningococcal disease and meningococcal vaccine, visit the VDH Division of Immunization web page: www.vdh.virginia.gov/imm/meningococcal.asp.

Updated Recommendations for Use of Pneumococcal Conjugate Vaccine:
Reinstatement of the Full Schedule

Production problems earlier this year caused shortages of 7-valent pneumococcal conjugate vaccine (PCV7; Prevnar®, Wyeth Vaccines) and prompted the Centers for Disease Control and Prevention (CDC) to reduce the recommended four doses to two to most effectively use the limited available doses.

Production capacity has been increased, and supply is now sufficient to meet the national demand for vaccine on the routine, 4-dose schedule. Effective immediately, CDC, in consultation with the Advisory Committee on Immunization Practices, the American Academy of Family Physicians, and the American Academy of Pediatrics, recommends that providers **resume administration of PCV7 according to the routine schedule**.

A vaccination schedule is provided for children who are incompletely vaccinated (Table). The highest priority for catch-up vaccination is to ensure that children aged <5 years at high risk for invasive pneumococcal disease because of certain immunocompromising or chronic conditions (e.g., sickle cell disease, asplenia, chronic heart or lung disease, diabetes, cerebrospinal fluid leak, cochlear implant, or human immunodeficiency virus infection) are fully vaccinated. Second priorities include vaccination of healthy children aged <24 months who have not received any doses of PCV7 and vaccination of healthy children aged <12 months who have not yet received 3 doses.

Because of the frequency of healthcare provider visits by children during their first 18 months, catch-up vaccination might occur at regularly scheduled visits for most children who receive vaccines from their primary-care providers. Programs that provide vaccinations but do not see children routinely for other reasons should consider a notification process to contact undervaccinated children.

Additional information about the national PCV7 supply is available from the CDC at www.cdc.gov/mmwr/preview/mmwrhtml/mm5336a8.htm.

Recommended PCV7 regimens among children aged <5 years, by history and condition

Age at exam (months)		Previous PCV7 history	Recommended regimen*
2-6		0 doses	3 doses 2 months apart, 4th dose at age 12-15 months
		1 dose	2 doses 2 months apart, 4th dose at age 12-15 months
		2 doses	1 dose, 2 months after most recent dose, 4th dose at age 12-15 months
7-11		0 doses	2 doses 2 months apart, 3rd dose at 12-15 months
		1 or 2 doses before age 7 months	1 dose at 7-11 months, with another dose at age 12-15 months (≥2 months later)
12-23		0 doses	2 doses ≥2 months apart
		1 dose before age 12 months	2 doses ≥2 months apart
		1 dose at ≥12 months	1 dose ≥2 months after the most recent dose
		2 or 3 doses before age 12 months	1 dose ≥2 months after the most recent dose
24-59	Healthy children	Any incomplete schedule	Consider 1 dose ≥2 months after the most recent dose†
	High risk§	Any incomplete schedule of <3 doses	1 dose ≥2 months after the most recent dose and another dose ≥2 months later
		Any incomplete schedule of <3 doses	1 dose ≥2 months after the most recent dose

*For children vaccinated at age <12 months, the minimum interval between doses is 4 weeks. Doses administered at >12 months should be ≥8 weeks apart.

† Healthcare providers should consider administering a single dose to unvaccinated, healthy children aged 24-59 months, with priority given to children aged 24-35 months, black children, American Indian/Alaska Native children not otherwise identified as high risk§, and children who attend group child care centers.

§ Children with sickle-cell disease, asplenia, chronic illness (e.g., heart or lung disease, diabetes), cerebrospinal fluid leak, cochlear implant, HIV infection or other immunocompromising condition, and American Indian/Alaska Native children in areas with demonstrated risk for invasive pneumococcal disease more than twice the national average.

Continuing Medical Education (CME)
Escherichia coli O157:H7 Outbreak

The Centers for Disease Control and Prevention (CDC) has a new computer-based case study, "*E. coli* O157:H7 Infection in Michigan." Based on a real-life disease outbreak investigation, this self-instructional, interactive exercise teaches practitioners epidemiologic skills and allows them to practice these skills while working through an *E. coli* O157:H7 investigation.

The Foodborne Disease Outbreak Investigation Series is designed for students with knowledge of basic epidemiologic and public health concepts. The activity can be downloaded free of charge at www.phppo.cdc.gov/phtn/casestudies.

Completion of the course has been approved for the following continuing education credits:

- 3.0 CMEs (Continuing Medical Education Credits)
- 3.5 CNEs (Continuing Nursing Education Credits)
- 0.3 CEUs (Continuing Education Units)
- 3.0 CECHs (Continuing Education Contact Hours for CHES)

Cases of Selected Notifiable Diseases Reported in Virginia*

Disease	Total Cases Reported, July 2004: State	Regions: NW	N	SW	C	E	Total Cases Reported Statewide, January through July: This Year	Last Year	5 Yr Avg
AIDS	66	5	26	2	13	20	429	497	481
Campylobacteriosis	108	25	14	28	10	31	348	435	338
E. coli O157:H7	10	1	2	3	2	2	17	21	27
Giardiasis	61	11	17	14	10	9	233	203	190
Gonorrhea	906	63	52	93	252	446	5,165	5,112	5,649
Hepatitis, viral									
A, acute	8	1	0	1	5	1	56	47	72
B, acute	21	4	3	2	7	5	124	96	91
C, acute	3	1	0	1	1	0	14	4	4
HIV Infection	94	4	24	4	21	41	523	448	481
Lead in Children†	89	32	7	15	21	14	399	418	343
Legionellosis	14	5	1	6	0	2	23	50	20
Lyme Disease	32	7	0	1	2	22	56	39	57
Measles	0	0	0	0	0	0	0	0	<1
Meningococcal Infection	1	0	0	0	0	1	10	19	29
Mumps	0	0	0	0	0	0	1	1	4
Pertussis	28	7	0	4	14	3	99	60	43
Rabies in Animals	54	19	19	4	7	5	274	341	315
Rocky Mountain Spotted Fever	9	6	0	0	3	0	11	11	10
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	233	54	60	30	44	45	558	491	581
Shigellosis	31	4	12	0	9	6	81	234	240
Syphilis, Early§	17	0	7	0	2	8	121	105	149
Tuberculosis	27	5	9	0	4	9	119	151	149

Localities Reporting Animal Rabies This Month: Accomack 1 raccoon; Albemarle 2 raccoons; Alexandria 1 raccoon; Augusta 2 raccoons; Bath 1 raccoon; Buckingham 1 raccoon; Caroline 1 fox, 2 skunks; Carroll 1 raccoon; Charlotte 2 skunks; Chesterfield 1 bat; Culpeper 1 skunk; Dinwiddie 1 fox; Fairfax 2 bats, 1 cat, 4 foxes, 1 groundhog, 3 raccoons; Fauquier 1 raccoon, 1 skunk; Floyd 1 raccoon; Fredericksburg 2 raccoons; Giles 1 raccoon; Hanover 1 fox; Henry 1 raccoon; James City 1 raccoon; Loudoun 2 foxes, 4 raccoons; Mathews 1 fox; Norfolk 1 raccoon; Prince William 1 fox; Rappahannock 1 raccoon; Rockbridge 1 skunk; Shenandoah 1 fox; Stafford 2 raccoons; Sussex 1 dog; Warren 1 raccoon; York 1 raccoon.

Toxic Substance-related Illnesses: Asbestosis 3; Lead Exposure 7; Mercury Exposure 3; Pneumoconiosis 2.

*Data for 2004 are provisional. †Elevated blood lead levels ≥10µg/dL.

§Includes primary, secondary, and early latent.

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