Influenza:
Questions and Answers

Q&A

INFORMATION ABOUT THE DISEASE AND VACCINES

What causes influenza?

Viruses cause influenza. There are two basic types, A and B, which can cause illness in humans. Their genetic material differentiates influenza A and B viruses. Both influenza A and influenza B can cause mild to severe illness in all age groups. While influenza A viruses infect humans and other animals, influenza B viruses affects only humans, primarily children.

Subtypes of the type A influenza virus are identified by two antigens (influenza virus proteins called hemagglutinin [H] and neuraminidase [N]) on the surface of the virus. These antigens can change, or mutate, over time. Because these antigens change, people can get influenza infections multiple times over their lifetime. An antigen "shift" (major change) creates a new influenza A virus with a new H, or H and N, that can cause a global epidemic if the virus can spread easily among people and if most people do not have immunity against it. This happened most recently in 2009 when the novel H1N1 influenza virus appeared and led to a major pandemic.

How does influenza spread?

Influenza is transmitted through the air from the respiratory tract of an infected person when they talk, cough, or sneeze. It can also be transmitted by touching a surface that has respiratory droplets with influenza viruses and then touching the nose, mouth, or possibly eyes.

How long does it take to develop symptoms of influenza after being exposed?

The incubation period of influenza is usually two days but can range from one to four days.

What are the symptoms of influenza?

Typical influenza disease is characterized by sudden onset of fever, aching muscles, sore throat, and nonproductive cough. Additional symptoms may include runny nose, headache, a burning sensation in the chest, and eye pain and sensitivity to light. Typical influenza disease does not occur in every infected person. Someone who has been previously exposed to similar virus strains (through natural infection or vaccination) is less likely to develop serious clinical illness. Not everyone with influenza illness has a fever, especially older adults. Some people may also have nausea, vomiting, or diarrhea; these symptoms are more often seen in children.

How serious is influenza?

Although many people think of influenza as just a common cold, it is really a specific and serious respiratory infection that can result in hospitalization and death. Rates of infection from seasonal influenza are highest among children. The risks for influenza-related complications, hospitalizations, and deaths are highest among adults ages 65 years and older, children younger than 5 years, pregnant women, and people of any age who have medical conditions that place them at increased risk for complications from influenza.

From the 2010–11 through 2018–19 seasons, the annual influenza-related disease burden varied from 9–49 million illnesses, 4–23 million medical visits, 140,000–960,000 hospitalizations, and 12,447–79,400 deaths per year. The number of influenza laboratory-confirmed deaths in children reported to CDC averaged 122 (range 37–187) per year. This is considered an underestimate of actual pediatric deaths as some influenza-related deaths are likely not reported or recognized. For more information on the health burden of influenza, see www.cdc.gov/flu/about/burden/index.html.

What are possible complications from influenza?

The most frequent complication from influenza are viral and bacterial pneumonia. Other complications include inflammation of the heart (myocarditis), brain (encephalitis) or muscle (myositis). Influenza also can worsen chronic medical conditions like cardiovascular disease, leading to heart attacks or worsening congestive heart failure, and worsening asthma and diabetes.

Reye syndrome is a complication that occurs almost exclusively in children – patients suffer from severe vomiting and confusion, which may progress to coma because of swelling of the brain. To decrease the chance

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of developing Reye syndrome, infants, children, and teenagers should not be given aspirin for fever reduction or pain relief.

What is the best way to prevent influenza?

The best way to prevent influenza is with annual influenza vaccination.

Is there an alternative to vaccination in preventing influenza?

No. Vaccination is the single best way to prevent influenza and its complications. Some steps that may help prevent the spread of respiratory illnesses, like influenza, include:

1. Cover your nose and mouth with your sleeve or a tissue when you cough or sneeze – throw the tissue away after you use it and then wash your hands.
2. Wash your hands often with soap and water, especially after you cough or sneeze. If you are not near water, use an alcohol-based hand cleaner.
3. Stay away as much as you can from people who are sick.
4. If you get influenza, stay home from work or school for at least 24 hours after the fever has ended. If you are sick, don't go near other people to avoid infecting them.
5. Try not to touch your eyes, nose, or mouth. Viruses often spread this way.

Are any drugs available to prevent or treat influenza?

There are six antiviral drugs approved for preventing or treating influenza in selected patients. Only four, oral oseltamivir (Tamiflu) and oral baloxavir (Xofluza), inhaled zanamivir (Relenza), and intravenous peramivir (Rapivab) will provide protection against both A and B viruses. The other two, amantadine and rimantadine, protect only against the A viruses and are not recommended for use because of high levels of resistance to these medications.

Use of antiviral medications can reduce the severity and length of influenza illness. People with severe illness and people at increased risk of severe illness (e.g., people at high risk of influenza complications, such as young children, people with chronic medical conditions, and older adults) should be treated with influenza antiviral medications when influenza is suspected.

Antiviral medicine is also recommended for use in certain outbreak situations (e.g., nursing home outbreaks); in such cases, antiviral medication can be used for both treatment and prevention (also called prophylaxis). It is important to remember that antiviral drugs are not a substitute for vaccination. CDC has more information on the use of influenza antiviral medications at www.cdc.gov/flu/professionals/antivirals/index.htm.

If I contract influenza, what should I do?

Call your healthcare provider to discuss your particular situation. If you are at high risk of developing complications from influenza, you should consult your healthcare provider immediately if you develop influenza-like symptoms; you may benefit from influenza antiviral medicine. You will need to get plenty of rest and drink a lot of liquids. You can also take medications to relieve the symptoms of influenza (but never give aspirin to children or teenagers who have influenza-like symptoms, particularly fever). Antiviral medicines are most beneficial when started within the first 1–2 days of influenza illness. For purposes of treatment and prevention, antiviral medicines are prioritized for people at high risk for influenza-related complications, such as people 65 years or older, people with chronic medical conditions, pregnant women, and young children.

When is a person with influenza contagious?

A person may pass virus from 1 day before symptoms start through 5–7 days after illness onset.

Can you get influenza more than once?

Yes. Influenza viruses change frequently and infection with one strain does not provide protection against all strains.

When did influenza vaccine first become available?

The first influenza vaccine in the United States became available in 1945.

What kind of vaccine is it?

The most common influenza vaccine is made from inactivated (killed) viruses that are given as an intramuscular injection. Two different influenza vaccines (cell-culture based inactivated vaccine and recombinant influenza vaccine or RIV) are made without the use of eggs. A nasal spray influenza vaccine containing live viruses that have been weakened (attenuated) is also available. Influenza vaccine in the United States contains either 3 or 4 strains of influenza virus. There

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is no preference for one type of vaccine over another for people for whom more than one recommended and age-appropriate vaccine is available.

How are the vaccines made?

Every year, researchers and manufacturers develop a vaccine that contains virus strains they believe will most likely circulate during the upcoming influenza season. Influenza vaccines contain both type A and type B viruses.

For the inactivated (injectable) vaccine, the viruses are inactivated (killed), purified, and packaged in vials or syringes. Live attenuated influenza virus vaccine is packaged in a special nasal sprayer. Recombinant technology is used to make recombinant influenza vaccine; this vaccine only includes one part of the influenza virus, the hemagglutinin, in the vaccine. About six months are required to produce influenza vaccine each year. For more information about how influenza vaccines are made, see www.cdc.gov/flu/prevent/how-fluvaccine-made.htm.

How is the vaccine given?

The inactivated and recombinant vaccines are given as an intramuscular injection. The live attenuated vaccine is sprayed into the nose.

Is the vaccine that contains 4 viruses preferred over the vaccine that contains 3 viruses?

Most influenza vaccine available in the United States contains 4 strains of influenza virus. CDC and other groups do not have a preference for use of the 4-virus vaccine over the 3-virus vaccine.

Who should get influenza vaccine?

Annual influenza vaccination is recommended for all people ages 6 months and older who do not have a contraindication to the vaccine.

What are the unique features of giving influenza vaccine to children compared with adults?

Children ages 6 months through 8 years should receive two doses of influenza vaccine, separated by at least 4 weeks, the first time they receive this vaccine. Children who received 2 or more total doses of influenza vaccine before the most recent July 1 need only one dose for the current season. Your doctor or other healthcare professional should be able to tell you if your child needs a second dose.

Children age 6 through 35 months should receive only Afluria, Fluarix, Flulaval, or Fluzone inactivated vaccine. Children age 2 years and older can receive FluMist if they do not have contraindications to FluMist.

Who recommends the influenza vaccine?

The Centers for Disease Control and Prevention, the American Academy of Pediatrics, the American Academy of Family Physicians, the American College of Physicians, the American College of Obstetricians and Gynecologists, and the American College of Nurse Midwives all recommend this vaccine.

How often should this vaccine be given?

Influenza vaccine is given each year because immunity decreases after a year and because each year's vaccine is formulated to prevent only that year's anticipated influenza viruses. An annual vaccination is recommended even if the strains included in the vaccine are not changed from one year to the next.

When should people be vaccinated?

Health experts recommend that patients should be vaccinated by the end of October. Vaccination should continue into the winter and spring, even until April or May. Travelers should be aware that the influenza season typically occurs from April to September in the Southern Hemisphere and throughout the year in the tropics. If they missed vaccination in the previous season, they should still be vaccinated before they travel, even if it's in the following spring or summer.

CDC recommends that children age 6 months through 8 years that have not received two prior doses of influenza vaccine need 2 doses for the current season. They should get their first dose as soon as vaccine becomes available; the second dose can be given 28 days or more after the first dose.

For people that need only 1 dose, early vaccination (i.e., July and August) can result in reduced protection toward the end of the influenza season, particularly for older adults.

Should siblings of a person with a chronic illness receive influenza vaccine even though the chronically ill person has been vaccinated?

Yes. Vaccination is recommended for all people ages 6 months and older, including contacts of people with chronic illnesses. It is important to vaccinate everyone who may have close contact with people at increased

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risk of severe influenza to better protect them from influenza and its complications. Either inactivated, recombinant, or live virus vaccines can be used.

Should siblings of a healthy child who is younger than age 6 months be vaccinated?

Yes, it is especially important that all household contacts of children too young to be vaccinated against influenza (i.e., younger than age 6 months) receive annual influenza vaccination to protect the infant from serious infection. This is very important because these infants are too young to be vaccinated and are most vulnerable to complications from influenza.

Why are different influenza vaccines (Fluzone High-Dose; Fluad) available for adults 65 and older?

Aging decreases the body's ability to develop a good immune response after getting influenza vaccine. Vaccine manufacturers have taken two different approaches to improve the immune response in older people. For Fluzone High-Dose, a larger amount of antigen in the vaccine gives older people a better immune response and provides better protection against influenza. Data from clinical trials comparing regular Fluzone to Fluzone High-Dose among people age 65 and older indicate that higher antibody levels occur after vaccination with Fluzone High-Dose. Compared to standard Fluzone, the high-dose formulation reduced laboratory-confirmed influenza by about 24%.

For Fluad, the manufacturer includes an adjuvant to improve the response to the vaccine. The adjuvant is called MF59 and is an oil-in-water emulsion containing squalene, an oil that occurs naturally in many plants and animals. Fluad is the first influenza vaccine licensed in the U.S. that contains an adjuvant. Compared to trivalent influenza vaccine, one study found that Fluad reduced laboratory-confirmed influenza by about 63%.

Both Fluzone High-Dose and Fluad are trivalent formulations (containing H3N2, H1N1 and B viruses) and both are approved for use only in people 65 years of age and older. Neither vaccine should be given to people younger than 65 years.

CDC has stated no preference for using high-dose or adjuvanted vaccine or standard-dose or recombinant influenza vaccine for people age 65 and older. But it is reasonable for a person age 65 years or older to receive either Fluzone High-Dose or Fluad if it is readily available. However, influenza vaccination should not be deferred if the high-dose or adjuvanted formulation is not immediately available. Standard dose or recombinant vaccine should be given.

If a patient is undergoing treatment for cancer, is it safe to vaccinate her or him against influenza?

People with cancer need to be protected from influenza. Cancer patients and survivors are at higher risk for complications from influenza, including hospitalization and death. They can and should receive injectable (inactivated) influenza vaccine (not the live nasal spray vaccine) even if they are being treated for cancer. Here is a helpful CDC web page on cancer and influenza for patients: www.cdc.gov/cancer/flu.

Is it safe for pregnant women to get influenza vaccine?

Yes. In fact, vaccination with the inactivated or recombinant vaccine is recommended for women who will be pregnant during the influenza season. Pregnant women are at increased risk for serious medical complications from influenza. One recent study found that the risk of influenza-related hospitalization was four times higher in healthy pregnant women in the fourteenth week of pregnancy or later than in nonpregnant women. An increased risk of severe influenza infections was also observed in postpartum women (those who delivered within the previous 2 weeks) during the 2009–10 H1N1 pandemic. In addition, vaccination of the mother will provide protection for her newborn infant from influenza during the first 6 months of life. Women who are breastfeeding may be vaccinated.

A 2017 study suggested an increase in miscarriage among women who received inactivated influenza vaccine, but earlier studies and a later follow-up study did not find any risk of miscarriage. Please provide details.

A CDC-funded study, published in 2017, found that women who had been vaccinated early in pregnancy with an influenza vaccine containing the pandemic H1N1 (H1N1pdm09) component and who also had been vaccinated the prior season with a H1N1pdm09-containing influenza vaccine had an increased risk of spontaneous abortion (miscarriage) in the 28 days

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after vaccination. This study did not quantify the risk of miscarriage and did not prove that influenza vaccine was the cause of the miscarriage. Earlier studies have not found a link between influenza vaccination and miscarriage. A larger follow-up study, also funded by CDC, which included 3 more years of data found no association between early miscarriage and influenza vaccination, regardless of previous influenza season vaccination. These results are reassuring regarding the safety of influenza vaccination of pregnant women.

CDC, ACIP, and the American College of Obstetricians and Gynecologists (ACOG) have not changed the recommendation for influenza vaccination of pregnant women. It is recommended that pregnant women receive influenza vaccine during any trimester of their pregnancy because influenza poses a danger to pregnant women and the vaccine can prevent influenza infection.

How safe is this vaccine?

Influenza vaccine is very safe. The most common side effects of the injectable (inactivated) influenza vaccine include soreness, redness, or swelling at the site of the injection. These reactions are temporary and occur in 15%–20% of recipients. Less than 1% of vaccine recipients develop symptoms such as fever, chills, and muscle aches for 1 to 2 days following the vaccination. Experiencing these non-specific side effects does not mean that you are getting influenza.

Healthy children ages 2 through 4 years who received the live attenuated virus (LAIV) nasal spray vaccine during clinical trials appeared to have an increased chance of wheezing. In previous years, children with a history of recurrent wheezing or have had a wheezing episode within the past 12 months were not recommended to receive the live nasal spray vaccine. Healthy adults receiving the live influenza vaccine reported symptoms such as cough, runny nose, sore throat, chills, and tiredness at a rate 3%–18% higher than for placebo recipients.

Serious adverse reactions to influenza vaccine are very rare. Such reactions are most likely the result of an allergy to a vaccine component. In 1976, the swine influenza vaccine was associated with a severe illness called Guillain-Barré syndrome (GBS), a nerve condition that can result in temporary paralysis that occurred in about 1 per 100,000 persons. Injectable influenza vaccines since then have not been clearly linked with GBS, but if there is a risk of GBS after influenza vaccination, it is small – on the order of about 1–2 cases per million persons vaccinated. However, as a precaution, any person without a high risk medical condition who previously experienced GBS within 6 weeks of an influenza vaccination should generally not be vaccinated. Instead, their physician may consider using antiviral drugs during the time of potential exposure to influenza. About 80 to 160 people get GBS each week in the United States, regardless of vaccination.

What can you tell me about the preservative thimerosal that is in some injectable influenza vaccines and the claim that it might be associated with the development of autism?

Thimerosal is a very effective preservative that has been used to prevent bacterial contamination in vaccines for more than 50 years. It contains a type of mercury known as ethylmercury. Ethylmercury is different from methylmercury, which is the form that is in some fish and other seafood. At very high levels, methylmercury can be toxic to people, especially to the neurological development of infants.

Several large scientific studies have determined that thimerosal in vaccines does not lead to neurologic problems, including autism. However, because we generally try to reduce people's exposure to mercury if at all possible, vaccine manufacturers have voluntarily changed their production methods to produce vaccines that are now free of thimerosal or have only trace amounts. They have done this because it is possible to do, not because there was any evidence that the thimerosal was harmful. For a list of which influenza vaccines contain thimerosal, see www.cdc.gov/flu/professionals/vaccines.htm.

How effective is influenza vaccine?

Protection from influenza vaccine varies by the similarity of the vaccine strain(s) to the circulating strains, and the age and health of the recipient. Healthy people younger than age 65 years are more likely to have protection from their influenza vaccination than are older, frail individuals. Although the vaccine is not as effective in preventing influenza disease among the elderly, it is effective in preventing complications, including hospitalization, ICU admission, COPD exacerbations, influenza-related cardiovascular events, and death.

When the "match" between vaccine and circulating strains is close, the injectable (inactivated) vaccine prevents influenza in about 50%–70% of healthy people

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younger than age 65 years. Among elderly nursing home residents, the vaccine is most effective in preventing severe illness, secondary complications, and deaths related to influenza. CDC has summarized influenza vaccine benefits at www.cdc.gov/flu/prevent/vaccine-benefits.htm.

Can the vaccine cause influenza?

No. Neither the injectable (inactivated or recombinant) vaccine nor the live attenuated (nasal spray) vaccine can cause influenza. The inactivated injectable influenza vaccine contains only killed virus fragments and the recombinant vaccine contains only a part of the influenza virus so neither type of vaccine can cause influenza. Fewer than 1% of people develop influenza-like symptoms, such as mild fever and muscle aches, after vaccination. These side effects are not the same as having the actual disease. The nasal spray influenza vaccine contains live attenuated (weakened) viruses that can produce mild symptoms similar to a cold. While the viruses are able to grow in the nose and throat tissue and produce protective immunity, they are weakened and do not grow effectively in the lung. Consequently, they cannot produce influenza disease.

Protective immunity develops 1 to 2 weeks after vaccination. It is possible that a recently vaccinated person can be exposed to influenza disease before they develop immunity from the vaccine and consequently develop disease. This can result in someone erroneously believing they developed the disease from the vaccination.

Also, to many people "the flu" is any illness with fever and cold symptoms. If they get any viral illness, they may blame it on the influenza vaccination or think they got "the flu" despite being vaccinated. Influenza vaccine only protects against certain influenza viruses, not all viruses.

Who should NOT receive influenza vaccine?

In general, the inactivated (injectable) influenza vaccine can be given to everyone except children younger than age 6 months and people with a history of a severe allergic reaction to a previous dose of influenza vaccine (see next question). The recombinant vaccine is licensed for people 18 years and older. The live, attenuated influenza vaccine (LAIV) nasal spray is licensed for use only in healthy, nonpregnant individuals ages 2 through 49 years.

Contraindications to LAIV are

- History of a severe allergic reactions to a vaccine component (except egg, see next question) or after a previous dose of any influenza vaccine
- Concomitant aspirin- or salicylate-containing therapy in children and adolescents because of the risk of Reye syndrome
- Children ages 2 through 4 years who have received a diagnosis of asthma or whose parents or caregivers report that a healthcare provider has told them during the preceding 12 months that their child had wheezing or asthma or whose medical record indicates a wheezing episode in the preceding 12 months
- Immunosuppression due to any cause, including medications or HIV infection
- Close contacts and caregivers of severely immunosuppressed people who require a protected environment (e.g., reverse isolation in a hospital
- Pregnancy
- Receipt of influenza antiviral medication within the previous 48 hours

Precautions* to LAIV are

- Moderate or severe acute illness with or without fever
- History of Guillain-Barre syndrome within 6 weeks of receipt of influenza vaccine
- Asthma in a person age 5 years or older
- Underlying medical conditions that might predispose to complications after influenza virus infection, such as chronic pulmonary, cardiovascular (except isolated hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders, including diabetes mellitus

*As a general rule, people with a precaution should not receive LAIV, but there may be situations when the clinician may decide to administer it.

Healthcare workers, household members, and others who have close contact with severely immunocompromised individuals during the periods in which the immunosuppressed person requires care in protective isolation should receive the injectable vaccine or RIV rather than LAIV.

People who are moderately or severely ill at the time of their influenza vaccination appointment should usually wait until their symptoms are improved before getting the vaccine. Only serious, life-threatening allergies to thimerosal are reasons not to be vaccinated with an influenza vaccine containing thimerosal.

Some brands of influenza vaccine are packaged in vials or syringes that contain natural rubber or latex. People with a severe allergy to latex generally should not receive vaccine packaged in these vials or syringes.

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Please summarize the influenza vaccine recommendations for people who have an egg allergy.

CDC recommends that people with a history of egg allergy who have experienced only hives after exposure to egg should receive influenza vaccine without specific precautions (except for a 15-minute observation period for syncope). Any age-appropriate vaccine (IIV, RIV, or LAIV) may be used. People who report having had an anaphylactic reaction to egg (more severe than just hives) may also receive any age-appropriate influenza vaccine (IIV, RIV, or LAIV). The vaccine for those individuals should be administered in a medical setting (such as a physician office or health department clinic). Vaccine administration should be supervised by a healthcare provider who is able to recognize and manage severe allergic conditions. Although not specifically recommended by ACIP, providers may prefer an egg-free inactivated vaccine (Flucelvax Quadrivalent, Seqirus, licensed for people age 4 years and older) or recombinant vaccine (Flublok, Sanofi Pasteur, licensed for people age 18 years and older) with severe egg allergy.

A previous severe allergic reaction to influenza vaccine, regardless of the component suspected to be responsible for the reaction, is a contraindication to future receipt of the vaccine. For a complete list of vaccine components (i.e., excipients and culture media) used in the production of the vaccine, see the package insert (available at www.immunize.org/fda) or go to www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/B/excipient-table-2.pdf.

For more details about giving influenza vaccine to people with a history of egg allergy, see the ACIP guidance at www.cdc.gov/mmwr/volumes/68/rr/pdfs/rr6803-H.pdf. You also may find the IAC handout "Influenza Vaccination of People with a History of Egg Allergy" helpful (see www.immunize.org/catg.d/p3094.pdf).