

# Thank a chicken...and a cow... for your flu vaccine!



## What are vaccines and how do they work?

Vaccines are given to protect you from infections by bacteria or viruses. In other words, vaccines give you immunity to diseases. Vaccines work by exposing you to a harmless form of bacteria or virus so that your body's immune system is ready to fight the real thing in the future.

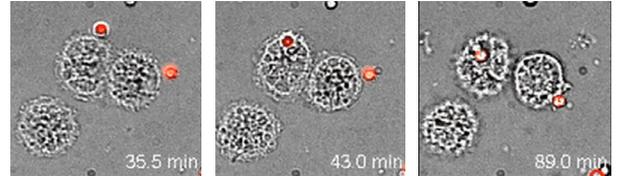
### Find out more ►

Your immune system works to protect you by recognizing and attacking foreign invaders such

as bacteria and viruses that cause disease. White blood cells called macrophages eat up some of the invaders.

Other white blood cells called lymphocytes make chemical weapons called antibodies to destroy lots more of these invaders. Foreign invaders that stimulate your immune system are called antigens. The first time a certain antigen invades your body, the lymphocytes need time to learn how to make the right antibodies to attack it. Unfortunately, while waiting for your body to make these antibodies, you can become very sick from the invaders.

A vaccine (given as a shot, nasal mist, or liquid) gets your body ready to fight a disease faster by exposing you to a harmless version of the bacteria or virus that causes that disease. Not knowing the "fake" invader is harmless, your body produces antibodies. Later, if the real bacteria or virus invades your body, your lymphocytes will already know how to make the right antibodies and will attack so quickly that you won't get sick.



*Two highly active macrophages ingesting fungus spores (red).\**

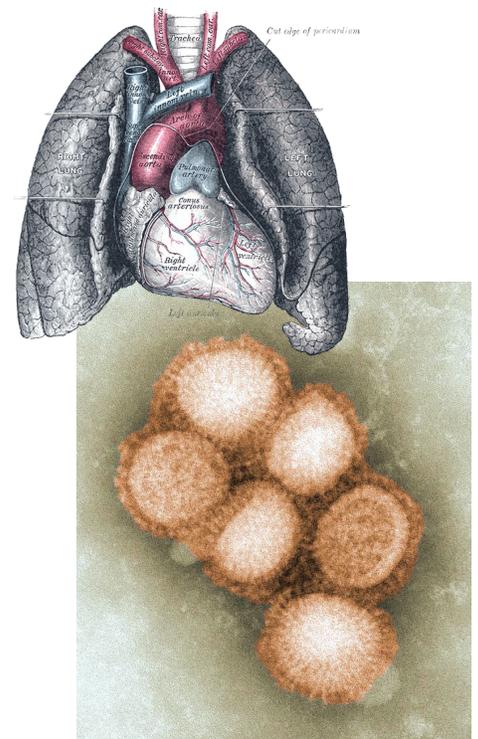
## What is the flu?

"Flu" is short for influenza. It's an infection from a virus and mostly affects the nose, throat, and lungs. You might hear people say they have the "flu" when they have a cold or an upset stomach, but the real flu usually makes you a lot sicker.

Slightly different types, or strains, of flu virus appear every year. Because people mostly get sick from these viruses in the fall and winter seasons, they are called seasonal flu. Sometimes, a new strain of flu virus shows up that's very different from seasonal flu, like the H1N1 virus (also called swine flu) that's around now.

**Find out more ►** Influenza is caused by three species of viruses called Influenzavirus A, Influenzavirus B, and Influenzavirus C. These viruses infect people, birds, and other mammals such as seals, horses, and pigs. Type A flu viruses cause the most severe disease. They have been to blame each time flu has traveled worldwide and infected many people.

Flu viruses are always slowly changing, so the viruses causing this year's seasonal flu are not exactly the same as last year's. This constant, gradual change is called antigenic drift. Sometimes, two or more different kinds of virus combine with each other to form a dramatically different virus. This type of sudden, big change is called antigenic shift. The 2009 H1N1 virus is a result of antigenic shift.



*Colorized electron micrograph image of swine flu virus.\*\**

\* Behnen J, Narang P, Hasenberg M, Gunzer F, Bilitewski U, et al. (2007) Environmental dimensionality controls the interaction of phagocytes with the pathogenic fungi *Aspergillus fumigatus* and *Candida albicans*. *PLoS Pathog* 3(2): e13. doi:10.1371/journal.ppat.0030013

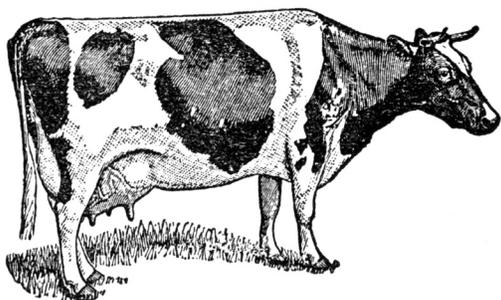
\*\* Centers for Disease Control and Prevention's Public Health Image Library, ID 11214.

## If I've already had vaccines, why do I need vaccines for H1N1 and seasonal flu?

You have probably been given a bunch of different vaccines—for measles, mumps, polio, and tetanus...to name a few. Each vaccine contains antigens—generally, weakened forms or small pieces of bacteria or viruses that cause certain diseases. Each vaccine protects you against just the diseases it contains antigens for. That's why you get so many different shots.

To your body, the different strains of flu virus that appear each season are like different diseases, so each year you need a new seasonal flu vaccine that contains antigens for the "new" disease. This year, people also need a vaccine that contains antigens for the 2009 H1N1 strain. Kids under 10 will need two vaccinations for seasonal flu and two vaccinations for H1N1 flu because young immune systems need a little more exposure to the antigens to form protective amounts of antibodies.

**Find out more** ▶ You might wonder why you can't just take medicine for the flu if you get sick and skip getting a vaccine. You've probably taken medicines called antibiotics when you've gotten sick in the past, but antibiotics only work on diseases caused by bacteria, like strep throat, not diseases caused by viruses, like the flu. Drugs called antivirals can treat people who've been infected by a virus, but it's important to remember that flu antiviral drugs are not a substitute for getting a flu vaccine. Antivirals need to be taken soon after becoming ill, and some flu viruses are resistant to the medicine. Plus, antivirals can have severe side effects. A vaccine can be given long before exposure to the virus and can provide protection over a long period of time.



## What do cows and chickens have to do with it?

We can thank cows for one of the first vaccines. The British doctor Edward Jenner (1749–1823) protected people from a deadly disease called smallpox by injecting them with cowpox, a weaker but similar disease found in cows. He invented the word vaccine based on the Latin word *vaccinus*, which means "from cows." We can thank chickens for providing the eggs in which flu viruses are grown for use in today's flu vaccine.

**Find out more** ▶ Edward Jenner's vaccine used a weakened form of cowpox found in nature. The French scientist Louis Pasteur (1822–1895) later developed artificially weakened forms of cholera, rabies, and anthrax that could be injected in people to prevent these diseases. Pasteur called these weakened diseases vaccines to honor Jenner's discovery.

## What else can I do to prevent flu?

Flu is passed from person to person by the tiny droplets that come out of your mouth and nose when you sneeze or cough. A very important way to prevent the spread of flu is to cough or sneeze into a tissue or your sleeve. Don't forget to also wash your hands frequently and keep your hands away from your eyes, nose, and mouth. Plus, you can support your immune system by getting plenty of fruits and vegetables, exercise, and sleep. For more tips, see [www.flu.gov](http://www.flu.gov).



*A sneeze in progress, revealing droplets as they are expelled from an open mouth.*  
Public Health Image library ID 11162

Visit [www.terrificscience.org/flu](http://www.terrificscience.org/flu) for a fun paper and pencil activity called "Vaccinate Me!" to go with this reading.