You can't get influenza from a flu shot

June 25 2019, by Allen Cheng And Katherine Kedzierska

Credit: AI-generated image (disclaimer)

Influenza is a moving target for vaccines. Each year, up to four different strains circulate, and they are constantly evolving to escape our immune system.

So rather than childhood jabs giving long lasting immunity, we need annual flu shots to provide optimal protection against influenza.

But while you might sometimes get sick after having a flu shot, it's a myth that having a flu shot can give you the flu.

A quick history of the flu vaccine

Influenza vaccines were first developed in the 1930s and 1940s, starting with the isolation of the influenza virus.

Back then, we learned there were many different influenza strains. To be effective, early research showed the vaccine needed to be matched to the circulating strains, and to be able to stimulate a response from the immune system.

The process to produce modern influenza vaccines now occurs on a much more refined and industrial scale. Hundreds of thousands of influenza viruses are collected by hundreds of national influenza centres around the world.

From these, four strains are selected for the annual flu vaccine, based on the viruses that are circulating at that time, how well the vaccines activate the immune system, how the strains are evolving, and the effectiveness of previous vaccines.

Most modern vaccines are manufactured by growing large quantities of live virus—mostly in chicken eggs or less commonly animal cells—which are then purified, deactivated and split into smaller components. These vaccines are inactive and cannot replicate.

There are also two new "enhanced" vaccines that are used in older people, who don't tend to respond as strongly to vaccines: Fluzone High Dose and Fluad, which is designed to better stimulate immunity and draw immune cells to the site of vaccination.

How the immune system fights the flu

The human immune system has several strategies to protect against infection. For viral infections such as influenza, the key strategy is known as adaptive immunity. This part of the immune system can "remember" previous exposure to pathogens.

When you get an influenza infection, the virus enters and hijacks the machinery of the host cell to replicate itself, before releasing these copies to infect more cells.

T lymphocyte cells of the immune system can recognise this viral incursion. T cells protect against further spread of the virus by activating pathways that cause infected cells to trigger a "suicide" process.

Another strategy the body uses is to produce antibodies, which are molecules produced by B cells that recognise components of the viral capsule. These antibodies work by sticking to the surface of the influenza virus to prevent it spreading and facilitating disposal.

Credit: AI-generated image (disclaimer)

Flu shots help mount a quicker defence

On a first exposure to a pathogen, our B cells take at least two weeks to ramp up production of antibodies. However, on subsequent challenges, antibody production occurs much more quickly.

Influenza vaccines harness this arm of the immune system, known as "humoral" immunity. By "practising" on viral components, vaccines allow the immune system to react more quickly and effectively when faced with the real virus.

So why do you sometimes get sick after a flu shot?

There are several reasons why you might feel a bit off after getting your flu shot.

First, your flu shot only protects you against influenza and not other respiratory illness which might causes similar cold or flu symptoms. This includes RSV (respiratory syncytial virus), which is common in late autumn and early winter.

Second, stimulating the immune system can result in symptoms similar to that of influenza, although much milder and short-lived. These include local inflammation (redness, pain or swelling at the site of the vaccine) and more general symptoms (fever, aches and pains, tiredness).

Third, vaccine-induced protection isn't complete. In some years, the vaccine is not well matched to circulating strains. Usually this is due to mutations that may develop in circulating strains after the vaccine strains are selected.

The flu vaccine also doesn't "kick in" for two weeks after vaccine administration. In some people, particularly those who are older and those who have weakened immune systems, antibody production is not as strong, and the level of protection is lower.

Despite this, studies have consistently shown that vaccinated people are less likely to get influenza or complications from the flu than those who aren't vaccinated.

A better way to protect against the flu

A problem with current vaccines is the reliance on eggs, which results in a relatively slow and labour-intensive production process.

Current work is aiming to speed up this process by using different

technologies so that vaccine manufacturers can react more quickly to changes in circulating viruses.

The "holy grail" for influenza vaccines is to stimulate an effective immune response to a component of influenza that doesn't change each year, so annual vaccination is not required.

These efforts have proved elusive so far.

A better strategy might be to harness T cell immunity. Recent work has shown that a type of T cell, known as "killer" T cells, can recognise other parts of the influenza virus, and therefore can provide broad protection against seasonal and pandemic strains.

But while we wait for a better alternative, getting an annual flu shot is the best way to avoid the flu.

Provided by The Conversation