

## Vaccines for influenza

### ***Vaccines are a good option for controlling influenza – but it is a constant battle keeping up with an ever-changing virus***

Influenza viruses evolve rapidly, so new vaccines are frequently updated to match viral strains in circulation. To deal with seasonal flu, the World Health Organization monitors strains circulating in the southern hemisphere and the tropics during its winter and predicts which are most likely to hit the northern hemisphere later in the year. Vaccine manufacturers take these predictions and, in a race against time, develop and test new vaccines.

Each vaccine covers two influenza A strains and two B strains. Six months later, the process is repeated for the southern hemisphere. Traditionally, vaccines have been grown in chicken eggs, but new, more efficient cell culture systems are now beginning to be used. Vaccines produced by recombinant DNA technology have also been licensed for use.

If a vaccine is a close match to the strains that eventually dominate, it will give better protection. If the circulating virus changes more than expected, or a minor strain becomes unexpectedly common, the vaccine will be less effective. Protection is typically effective in 60–80 per cent of cases (but is lower in elderly people, who tend to have weaker immune systems).

Vaccine responses can be enhanced by adjuvants – chemicals that ‘turbocharge’ immune responses. This is a way to eke out vaccine supplies, as lower doses of the viral haemagglutinin can be used (‘antigen sparing’). Adjuvants come in many forms, but can include harmless components of bacteria that provoke a non-specific immune response. Clinical trials have shown that an antigen-sparing vaccine and adjuvant combination is at least as effective as a standard H1N1 vaccine. (See [A helping hand: immunological adjuvants](#) for more.)

Increasing use is being made of ‘live attenuated influenza vaccines’, which are also antigen sparing. In these vaccines the virus is still active but does not cause serious disease. These can also be given through a nasal spray, and are beginning to be used to immunise children in the UK. (See [Flu vaccine and young people](#).)

#### **In search of a universal vaccine**

Most valuable would be a vaccine that recognised all influenza strains. One such ‘universal’ vaccine, targeted at the less rapidly evolving M2 protein, has been successfully tested in animals. ‘Virus-like

#### **ABOUT THIS RESOURCE**

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particles' containing a mix of flu proteins have also shown promising results in animal studies.

Researchers are working on other new types of vaccine as well, including those that recognise all strains of influenza. It is now clear that vaccines based on structures common to many strains of influenza – such as the 'stalk' region of haemagglutinin – can generate immune responses that provide protection against infections. It may also be possible to produce virus-neutralising antibodies in bulk to give to infected patients or people at risk of infection.

## QUESTIONS FOR DISCUSSION

Which do you think are best for controlling influenza – drugs or vaccines?

What are the benefits of vaccines over drugs?

## REFERENCES

Selecting the viruses in the seasonal influenza (flu) vaccine

FDA approves first seasonal influenza vaccine manufactured using cell culture technology

FDA approves new seasonal influenza vaccine made using novel technology

Vaccine effectiveness – how well does the flu vaccine work?

Influenza antigen-sparing by immune stimulation with Gram-positive enhancer matrix (GEM) particles (2010)

Relative efficacy of AS03-adjuvanted pandemic influenza A(H1N1) vaccine: results of a controlled efficacy trial (2014)

New vaccines against influenza virus (2014)

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