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Vaccines and egg allergies

Some types of vaccine are made using a process that involves chicken eggs or chicken embryos, and contain small amounts of egg protein. Egg allergy is one of the most common food allergies, especially in children. In the past, people with egg allergies have been told to avoid having any vaccines made with chicken eggs, due to concerns about safety. In many cases, research has since shown that these vaccines are safe for people with egg allergies, although some vaccines should still be avoided.

Which vaccines contain egg?

There are two types of vaccine, given as part of the UK's routine immunisation programme, which may contain very small amounts of egg protein. These are:

- The measles, mumps and rubella (MMR) vaccine.
- Some types of influenza (flu) vaccine.

Other vaccines - not required by most people in the UK, but sometimes given to people who are travelling to certain countries - may also contain egg protein (See "Which other vaccines contain egg?" at the bottom of this leaflet for more.).

Does the MMR vaccine contain egg?

> The MMR vaccine is safe for people with egg allergy.

The MMR vaccine is made using cells grown from chicken embryos in a lab. It can contain extremely small amounts of egg protein. Several decades ago, people with egg allergies were advised to avoid having the vaccine, or to take special precautions in doing so.

In fact, the amount of egg protein in each vaccine is exceptionally low, and far below a level that could cause an allergic reaction. Measurements of egg protein in MMR vaccines range from zero, to one nanogram (one billionth of a gram).

Studies involving a large number of children with egg allergies have shown that the MMR vaccine is safe for them. All children with egg allergy should be given the MMR vaccine as part of their routine immunisations.

Does the flu jab contain egg?

Most, but not all, influenza vaccines are grown using hen's eggs and therefore contain very small amounts of egg. These are:

- The nasal spray influenza vaccine, also known as the live attenuated flu vaccine (LAIV) and under the brand name Fluenz® Tetra in the UK and Europe, and FluMist® Quadrivalent in the USA.
- Some types of injected inactivated flu vaccines ('flu shots') - specifically, the egg-grown quadrivalent vaccines (QIVe) and adjuvanted egg-grown quadrivalent vaccine (aQIV).

The amount of egg proteins in these vaccines is very small. The exact amounts are published each year (see Further Reading). In the 2022-23 flu vaccination period, the nasal spray vaccine (Fluenz® Tetra) contained less than 0.024 micrograms of ovalbumin (egg protein) per dose, and egg-containing injected flu vaccines contained between 0.05 micrograms and 1 microgram per dose, depending on brand.

The lowest dose of egg protein ever reported to have caused an allergic reaction is 130 micrograms, and the theoretical minimum dose calculated to cause only a mild allergic reaction in extremely egg-allergic people is 30 micrograms.

By comparison, one egg contains about 20 grams of ovalbumin, which is over 800 million times the maximum amount in the nasal flu vaccine.

Is it safe to have the flu jab with an egg allergy?

The nasal flu vaccine is safe for children with egg allergies. Even children who have required treatment in intensive care for severe egg allergy can have it, although they should have the vaccine in hospital, as a precaution.
Injected flu vaccines with a 'very low' egg protein level, or vaccines that are completely egg free, are safe to use in people with egg allergies. People who need an injected vaccine, and have required intensive care treatment for anaphylaxis to egg in the past should have an egg-free vaccine, as a precaution.

We have good evidence that the nasal flu vaccine is safe for children with egg allergy, even for children who have had life-threatening reactions to egg. This vaccine has been extensively used in the UK - over 10 million doses have been given to children in the UK, with a good safety record. A set of research studies - called SNIFFLE - tested the safety of the nasal flu vaccine in 887 children (see Further Reading). One third of them had previously had a serious, and potentially life-threatening, allergic reaction (anaphylaxis) to egg. No children in the study had serious reactions to the vaccine.

This led the UK's Joint Committee on Vaccination and Immunisation (JCVI) in 2015 to state that the nasal flu vaccine is safe to give to children with egg allergies, and can be given to children in any suitable setting (including schools and GP surgeries). The exception is children who have required admission to an intensive care unit for anaphylaxis to egg.

These children were not included in the SNIFFLE studies, so we don't have the same direct evidence of safety, although it is likely that the vaccine is still safe for them. As a precaution, the JCIVI recommends that children who have had egg allergies that have required admission to intensive care should be given the intranasal flu vaccine in hospital.

For people with egg allergies who require an injected flu vaccine, the JCVI recommends that vaccines that are egg-free, or have a 'very low' ovalbumin level (less than 0.06 micrograms per 0.5 mL dose) are used. For people who have previously had severe anaphylaxis to egg requiring intensive care treatment, they recommend that egg-free injected vaccines only are used.

Why do flu vaccines contain egg?

To make enough virus to produce vaccines, manufacturers have to grow the virus in controlled conditions. Chicken eggs have been used for this purpose for many years. Samples of flu virus are injected into a fertilized egg; the virus multiplies in the egg; the viral particles are then collected, and purified.

For the injected (inactivated) vaccines, the virus particles are then killed. For the intranasal (live attenuated) vaccine, the viruses remain alive, but are weakened and only able to survive inside the nose, and not elsewhere in the body (like in the lungs). Purification efforts have become better over time, meaning very little egg protein makes it into the final vaccine.

Newer techniques have been developed to make inactivated flu vaccines; these include:

- Cell-based vaccines, where mammal cells are infected with flu virus, which multiplies inside those cells and is then collected.
- Recombinant vaccines, where DNA from the flu virus is inserted into cells in a lab, causing them to produce a set of proteins from the virus which can then be collected and used to make a vaccine.

Both the cell-based and recombinant methods do not use eggs at all, and vaccines produced with this method are completely egg-free.

In the UK, the nasal spray (live attenuated) vaccine is the first choice vaccine for children and young people aged 2-18 because:

- The evidence suggests it is more effective at preventing flu than the injectable (inactivated) vaccines.
- As a nasal spray rather than an injection, it is often easier and less uncomfortable to give.

- Side-effects are usually milder than for injectable vaccines.

This vaccine is currently only made using eggs.

There is debate over whether the newer methods for making inactivated flu vaccines work better than the older method that uses eggs. Influenza viruses grown in eggs change slightly to enable to them to live in chicken eggs, which makes them slightly different to the flu viruses that are circulating in the population, and therefore vaccines made with these viruses might be slightly less effective.

Some data suggests that inactivated vaccines made using the cell-based and recombinant methods may be more effective at protecting against flu, although other findings are inconclusive; this area is still under investigation. In the UK, the JCVI makes recommendations each flu season on which flu vaccines are most likely to be effective, based on the evidence thus far and international predictions of which type of flu viruses are likely to be circulating. The NHS then uses these recommendations to order appropriate vaccines.

Are there any egg-free flu vaccines available?

Cell-based and recombinant flu vaccines are egg-free. All of these are given as injections. The exact types available each year may differ; the egg-free vaccine that was available in the 2024-25 UK flu season was:

- A recombinant quadrivalent vaccine made by Sanofi Pasteur - branded as Supemtek® in the UK and Europe, and Flublok® Quadrivalent in the USA.

Which other vaccines contain egg?

There are other vaccines which are not given routinely to everyone as part of the UK's vaccination programme, but may be given to people who are travelling to areas where those diseases are found, or given to people who are otherwise at particularly high risk of those conditions. Examples of these vaccines that may contain egg include:

- Yellow fever. The UK guidance is that people who have had anaphylaxis to egg should **not** have this vaccine. Some countries require proof of yellow fever vaccination to enter; a letter of exemption can be provided for people who cannot have it.
- Tick-borne encephalitis (under the brand name Tico-Vac®). Similarly, the UK national guidance states that people who have had anaphylaxis to egg should **not** have this vaccine.
- Rabies. Some types of rabies vaccine - eg, Rabipur® (called Rabavert® in the USA), contain traces of egg. Egg free rabies vaccines can be given instead for people who have had a serious reaction to egg.

Other types and brands vaccines may also contain egg, and this can change over time. For example, one type of hepatitis A vaccine, Epaxal®, contained egg, but this has now been withdrawn, and the hepatitis A vaccines currently used in the UK are egg free.

> Let your healthcare professional know if you have an allergy to egg - or anything else - before having a vaccine, so they can ensure it is safe for you.

Further reading

- 2020/2021 Influenza vaccine recommendations for children with egg allergy and/or asthma
- Khakoo GA, Lack G; Recommendations for using MMR vaccine in children allergic to eggs. BMJ. 2000 Apr 1;320(7239):929-32.
- Turner PJ, Southern J, Andrews NJ, et al; Safety of live attenuated influenza vaccine in atopic children with egg allergy. J Allergy Clin Immunol. 2015 Aug;136(2):376-81. doi: 10.1016/j.jaci.2014.12.1925. Epub 2015 Feb 13.
- Kelso JM; Administering influenza vaccine to egg-allergic persons. Expert Rev Vaccines. 2014 Aug;13(8):1049-57. doi: 10.1586/14760584.2014.933079. Epub 2014 Jun 25.
- The Green Book Chapter 19 Influenza; GOV.UK
- The Green Book Chapter 21 Measles; GOV.UK
- The Green Book Chapter 31 Tick-borne encephalitis; GOV.UK

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