Rob Reddick looks at the facts about vaccines

How effective are vaccines, and why do they require boosters?

Vaccines are very effective at providing individuals with immunity to certain diseases, though they don’t provide immunity in 100 per cent of cases. Every person’s immune system is different: some people won’t create antibodies in response to a vaccine’s antigens and therefore won’t become immune.

Rates of effectiveness vary from vaccine to vaccine: a three-dose course of the inactivated polio vaccine is 99 per cent effective, whereas the effectiveness of typhoid vaccines is only around 70 per cent.

A further complication is that the effects of some vaccinations wear off over time. Two doses of the MMR (measles, mumps and rubella) vaccine will usually provide 20 years’ protection against measles, but the effects of a typhoid vaccine will typically wear off after three years. Scientists are currently trying to work out why this happens. This is why we have boosters – to ‘remind’ our immune system how to identify certain pathogens and top up our immunity.

At the population level vaccines are highly effective. They have eradicated some diseases, such as smallpox, and vastly reduced the threat of others. In the UK in the 1940s and 1950s annual deaths from measles numbered in the hundreds – today, it’s rare for the disease to kill more than one or two people a year.

This success is achieved through herd immunity. No vaccine is 100 per cent effective, and not everyone in a population will be vaccinated; however, if most of a population are vaccinated and become immune to a disease, its ability to spread will be vastly reduced. This protects people without immunity from infection too (see our article Herd mentality for more information).

What risks are associated with vaccines?

Vaccines are very safe in the Western world – national regulatory authorities govern their testing and manufacture, which ensures that they are safe for human use.

Even so, not everyone may be able to be vaccinated. People allergic to trace elements such as egg protein or pork gelatine have to avoid vaccines that are grown using these substances. Some people may be allergic to the antibiotics used in some vaccines. This is why antibiotics that are known to
often cause allergic reactions, such as penicillin, are generally not used in vaccines.

It is recommended that pregnant women avoid taking live vaccines, to prevent live pathogens affecting their unborn child. Likewise, adults recovering from certain illnesses are advised to delay taking certain vaccines until they have recovered. For example, the NHS says you shouldn’t have a flu jab while you are recovering from a fever.

There are many rumours about negative side-effects of vaccines which are not just untrue but potentially very damaging. A false claim linking the MMR vaccination to autism in the UK in the 1990s caused levels of vaccination to fall significantly in some parts of the country. This led to a reduction in herd immunity and resulted in outbreaks of measles and mumps in recent years. Both these diseases can cause encephalitis, a rare but potentially deadly inflammation of the brain.

The greatest risks surrounding vaccination are in low-income countries. These risks concern not the vaccines themselves, but their regulation and administration. Unreliable regulatory authorities in some countries may not be able to stop fake vaccines being produced; failure to keep the vaccines cold right up until they are administered (the so-called ‘cold chain’) may result in spoiled, ineffective vaccines being administered; and insufficient education among those administering vaccines may result in needles being reused, risking the spread of blood-borne diseases such as HIV/AIDS.

QUESTIONS FOR DISCUSSION

If being unvaccinated threatens herd immunity, should everyone able to have a vaccine be forced to receive one?

Aside from improving the cold chain so that vaccines are kept cold right up until they are given, what else can be done to increase the safety of vaccination in low-income countries?

Only one human disease – smallpox – has been successfully eradicated through vaccination. Why do you think other diseases affecting humans haven’t?

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