A guide to childhood immunisations
Immunisation is the safest way to protect your child’s health

Public Health England
How vaccines work & why they're important

How do vaccines work?

You are given a small amount of a harmless form of a disease...

...Then your body makes antibodies to fight it off

Then if the real disease attacks...

...your body already has the antibodies, so you don’t get sick.

You are immune.

What is immunisation?

Immunisation is the safest way to protect your child against an infectious disease. Once your child has been immunised, they will have the ability to fight off the disease should they come into contact with it again. They will be considered immune to the disease.

How does immunisation work?

Immunisation takes advantage of the natural functions of your immune system that are already in place to protect you against disease. When a disease-causing agent, such as a virus or bacteria, invades your body, your immune system recognises it as harmful and will trigger a response to destroy it. One of the ways your immune system fights off infection is by creating large proteins known as antibodies. These antibodies act as scouts, hunting down the infectious agent, and marking it for destruction by the immune system. Each antibody is specific to the disease-causing organism that it has detected and will trigger a specific immune response. These specific antibodies will remain in the immune system after the infection has gone, meaning that if the same disease is encountered again, your immune system is ready to destroy it before you get sick and any symptoms can develop. This process is known as immunity.

Vaccination is the most common way to be immunised. Vaccines contain a harmless form of the bacteria or virus that causes the disease you are being immunised against. The bacteria or virus will be killed or greatly weakened before use in the vaccine so they can trigger an immune response without making you sick. However, your immune system will still attack the bacteria or virus from the vaccine and will produce antibodies to fight it off. The immune system then maintains a memory of the disease, so if a vaccinated person encounters the disease itself later in life, their immune system is ready to fight it off and prevent an infection from developing.
Is it better for my child to get the disease naturally?
No. The only way to get the disease naturally would be through infection with the bacteria or virus that causes the disease. This would pose a serious risk to your child’s health, potentially making them very ill and causing long-term effects. Immunisation allows your child to build up immunity in a safe and controlled environment without becoming ill with the disease. In some cases, immunisation has been found to provide better immunity as it can protect you against more than one strain of the disease.

How effective is immunisation?
Immunisation is extremely effective and most vaccines produce immunity in over 90% of vaccinated children. It is considered one of our greatest global health achievements and is estimated to save 2-3 million lives a year.

Thanks to immunisation, life-threatening diseases such as diphtheria, whooping cough and polio, that used to be common in young children in the UK, are now extremely rare to the point that you may not have even heard of them. Through vaccination some diseases have even been eradicated completely, such as smallpox. If smallpox had not been eradicated, it would cause 2 million deaths a year!

If you look at the history of vaccine preventable disease, you can see a massive drop in the number of cases of a disease following the introduction of a vaccine against it into the immunisation programme.

<table>
<thead>
<tr>
<th>Year the vaccine was introduced</th>
<th>Cases per year in England and Wales before the vaccine</th>
<th>Cases per year now</th>
</tr>
</thead>
<tbody>
<tr>
<td>1942 Diptheria vaccine</td>
<td>50,804</td>
<td>1</td>
</tr>
<tr>
<td>1957 Pertussis vaccine (whooping cough)</td>
<td>92,407</td>
<td>3,506</td>
</tr>
<tr>
<td>1968 Measles vaccine</td>
<td>460,407</td>
<td>130</td>
</tr>
<tr>
<td>1991 Hib vaccine</td>
<td>862</td>
<td>12</td>
</tr>
<tr>
<td>1998 MenC vaccine</td>
<td>883</td>
<td>28</td>
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</table>
If these diseases are so rare, why does my child need to be vaccinated?

Many vaccine preventable diseases still exist in the world today. Therefore, if your child has not been immunised there is still a risk that they could get the disease and become very sick. We know that decreases in vaccination uptake can result in outbreaks of diseases such as measles. Regular vaccination is needed to keep our children healthy, prevent outbreaks from occurring and to eventually eradicate these diseases all together.

Infectious diseases are easily passed from person to person and entire communities can rapidly become infected. If a high enough proportion of a community is protected by immunisation, it makes it difficult for the disease to spread because the number of people who can be infected is so small. This type of protection is known as ‘herd immunity’ and is particularly crucial for individuals who are unable to be vaccinated, because they are too young, too old, undergoing medical treatment (such as for cancer) or have a health condition that leaves them vulnerable to infection (such as HIV). Declines in herd immunity caused by decreasing immunisation rates have caused outbreaks of measles and whooping cough in the UK.

For herd immunity to work, a high percentage of your community needs to be vaccinated. Although average vaccine rates in the UK are relatively high, there are still pockets of the UK where vaccination rates fall significantly below what is required for herd immunity. If the immunisation rates in your community are not high enough, it will leave the most vulnerable in your neighbourhood at a much greater risk of catching the disease. By vaccinating your child, you’re not only protecting them but you are also protecting the most vulnerable in your community.

What is ‘herd immunity’?

If only a few people are vaccinated...

...then one person is infected... the disease spreads very fast.

But if lots of people are vaccinated...

...then the disease can’t spread very far, so the whole community stays safe.
This is ‘herd immunity’.
How do I know vaccines are safe?

Before a vaccine can be given to the population it must go through rigorous testing. Like all medicines, vaccines undergo extensive clinical trials, where they are administered and monitored in groups of volunteers. In the UK, the results of the trials are then assessed by the Medicines and Healthcare products Regulatory Agency (MHRA). Once licensed, the vaccine must then be further approved before it is added to the routine immunisation programme.

Even once a vaccine becomes part of the immunisation program, it is continuously monitored for safety and effectiveness by the MHRA. Any suspected side effects are reported by medical providers or patients to the MHRA using the yellow card scheme.

No medicine can ever be completely risk free or 100% effective. However, strong licencing processes and safety tests ensure that the health benefits of medicines being given through the NHS greatly outweigh any risk.

What are vaccines made of?

Each vaccine will be made up of slightly different ingredients depending on the disease it is targeting. The majority of the vaccine will be made up of water and all other ingredients are in extremely small amounts. Many vaccine ingredients can already be found in the body or in food, usually in much larger quantities than the amount used in a vaccine.

A vaccine ingredient often discussed in the media that has caused concern is aluminium. The amount of aluminium is actually extremely low, lower than the safe levels of aluminium that can be found in breast milk, formula and some foods.

For a more extensive list of ingredients in each individual vaccine, you can ask your GP or refer to the Patient Information Leaflet (PIL) or Summary of Product Characteristics (SPC) sheet that comes with each vaccine. Both can be found online.

Your immune system is there to protect you; by vaccinating your child, you give his/her immune system all the tools it needs to keep them safe from many severe diseases.

Meike Heurich-Sevcenco, BSI Vaccine Ambassador

Immunisation is a proven tool for controlling and eliminating life-threatening infectious diseases and is estimated to avert between 2 and 3 million deaths each year.

World Health Organization
Can I have vaccines when I am pregnant?

Yes. Some vaccines, such as the inactivated flu virus and the whooping cough vaccine are offered to pregnant women to protect them and their unborn child. These vaccines are safe and are extremely effective at preventing serious illness from these infectious diseases. Inactivated vaccines do not contain any live version of the virus it is protecting against.

During pregnancy, your natural immune system is weakened. This may make it more difficult for you to fight infection and increase your risk of harm from common diseases, such as flu. Therefore, pregnant women are among a group that are especially vulnerable to flu complications, something which the vaccine can protect against.

Whooping cough or pertussis is a very serious infection and young babies are the most at risk. During pregnancy, vaccination against whooping cough will lead to the production of antibodies, which will be passed on to your baby during birth.

Therefore, pregnancy vaccines not only protect you during but also protect your unborn and newborn child.

If a vaccine involves a live version of the virus, pregnant women will usually be advised to wait until after birth to receive these. It is important that you speak with your GP or midwife if you are concerned about vaccines during pregnancy.

Many women question whether or not they should receive vaccines during pregnancy. Doctors recommend that pregnant women get vaccinated against flu and whooping cough to protect themselves and to share that protection with their baby.
Why are changes made to the immunisation schedule?

The immunisation schedule is constantly monitored to ensure that the timing and type of vaccination is as beneficial to your child as possible. Improvements to the schedule may involve changing the recommended age a vaccine is given at, the number of doses required, or introducing a new vaccine combination. Newly discovered vaccines will also be added to the schedule, after rigorous testing, to increase the number of diseases that your child can be protected from.

The most important thing to remember is that these changes in the immunisation schedule are there to help keep your child as safe as possible, by protecting your child from a greater number of diseases and ensuring a vaccine is as effective as possible.

Can receiving multiple vaccinations overload the immune system?

No. Your child's immune system fights off millions of germs every day. The amount of bacteria or virus in a vaccine is very small in comparison and will put no extra strain on your child's immune system. Even if your child received a number of different vaccines at once, they would still only be using about a thousandth of their immune system's capacity.

Why do I have to vaccinate my child at specific times? Can I wait until they’re older?

The immunisation schedule has been designed so that your child can be vaccinated as soon as possible, at a time when the vaccine will be the most effective.

It is important to vaccinate your child at the age advised to make sure that they are protected from an early age. Babies and young children are the most vulnerable to disease and the longer you wait to vaccinate your child, the greater the possibility of them catching the disease and becoming extremely ill.

If you miss an appointment you can still get your child vaccinated after the recommended age. However, keep in mind that the longer you wait, the longer you leave your child unprotected and vulnerable to disease. Please speak to your GP for further information about vaccinating your child outside of the recommended times.

Is there a situation when a child shouldn’t be vaccinated?

It is very rare that a child is unable to be vaccinated. Only children with a weakened immune system, caused by a medical treatment such as chemotherapy, an allergy to the vaccine or its components, or a medical condition such as primary immunodeficiency, are unable to receive all the vaccines recommended in the immunisation schedule. Please speak to your GP if you are concerned about whether your child is able to receive all the vaccines on the immunisation schedule.

There is so much information out there about vaccines. Engaging with parents/carers on immunisations is a great way to help them make an informed decision about the best start to a healthy life for their child.

Shannon Lacombe, BSI Public Engagement and Vaccine Ambassador

Vaccine schedule recommended by the NHS and common questions
What is a booster jab and why does my child need one?

Booster jabs do exactly what they say on the tin – they give your immune system a boost against the disease! For some vaccines a further round of exposure to the bacteria or virus is required to increase immunity against the disease. Immunity can fade over time against some diseases and it is important to keep up to date with your child’s booster jabs to ensure that they are as protected as possible.

Why do some children still get the disease even after they’ve been vaccinated?

Most vaccines produce immunity over 90% of the time, making them the most effective medical intervention we have for preventing disease. However, no medicine can ever be 100% effective and the effectiveness of the vaccine will differ depending on how it is made and the disease it is protecting you from.

Variations in individual immune systems mean that the protective capacity of the vaccine will vary between different people, and in a very small number of cases, immunity against the disease will not fully develop. However, immunisation is extremely effective for the majority of the population, and if a high enough proportion of the population are immunised, those who have not developed immunity from the vaccine will be protected by herd immunity. Even if your child does catch the disease after they have been immunised, their symptoms will be much milder in comparison to children who have not received the vaccine.

Concerns over vaccine safety have allowed myths and misconceptions about immunisation to spread among parents, despite there being little, if any, evidence to back them up. However, the large amount of unverified information available on the internet about immunisation can make it difficult to distinguish the facts from the myths. Here are some of the most common myths about vaccines and the truth behind them.

Is there a link between the MMR vaccine and autism?

In 1998, a former and now discredited medical researcher published a fraudulent scientific paper stating that the MMR jab increased the risk of autism. The excessive amount of media coverage of the report caused panic amongst parents and a fall in immunisation rates, which ultimately resulted in dangerous measles outbreaks all over the country. The paper has since been removed from publication due to ethical violations, financial conflicts and serious errors in data collection.

Multiple studies have since been carried out, using a large number of participants, to investigate if there is any relationship between MMR and autism. None of these studies have been able to identify a link between MMR and autism. If you want to read more about the research investigating the link between autism and MMR, please follow the below link to HealthyChildren.org, sponsored by the American Association of Pediatrics.

Is it safer to receive vaccines separately rather than in combination?

Multiple vaccines are given in a single doctor’s appointment to make sure that your child is protected from a disease as soon as possible and to avoid you having to make multiple doctor appointments. There is no medical benefit to spreading vaccinations out over multiple appointments.

Some vaccines are combined into a single shot to limit the number of injections your child has to receive. There is no evidence to suggest that combined vaccines are any less effective, or pose a greater risk to your child, than if the vaccines were administered individually.

Are there any ingredients in vaccines that will be toxic for my child?

Mercury, also referred to as thiomersal, is no longer used in UK vaccines. Nevertheless, extensive research shows that there is no link between the levels of thiomersal used in vaccines and brain damage in children.

Do vaccines cause allergies and autoimmune diseases?

The occurrence of allergies and autoimmune diseases has increased over the last few decades and it is still unclear why this is happening. Immunisation rates have also increased during this time, which has led some people to believe that vaccines could be the cause. However, many large-scale studies have been unable to find any evidence to suggest that immunisation triggers allergies or causes autoimmune disease. The rise in allergies and autoimmune diseases has been more closely linked to life-style and environmental changes.

Additional resources

The British Society for Immunology
https://www.immunology.org/

Childhood routine immunisation schedule in the UK

Public Health England ‘Immunisations up to one year of age’ information booklet
http://bit.ly/PHEyear1

How vaccines work

Vaccines and your child’s immune system

How vaccines save lives

Benefits and risks of vaccines

Vaccine ingredients

Common side effects

Vaccine Knowledge Project (University of Oxford)
http://vk.ovg.ox.ac.uk/

Your GP and other healthcare professionals
The British Society for Immunology’s mission is to promote excellence in immunological research, scholarship and clinical practice in order to improve human and animal health.