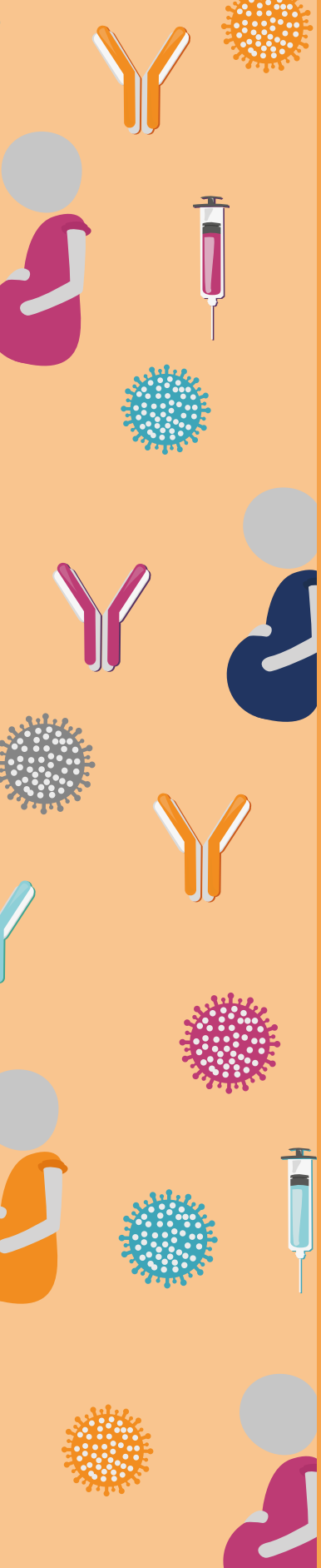

British Society for immunology

Guide to vaccinations during pregnancy

Contents

> ***Vaccination is the most important thing we can do to protect ourselves and our children against ill health.***
>
> *NHS*

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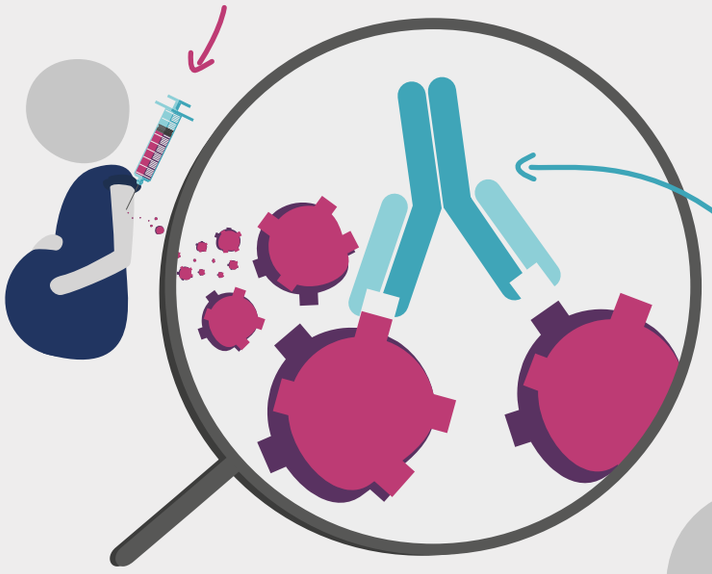
How vaccines work and why they are important for you and your baby

How do vaccines work?

You are given a small amount of a harmless form of a bacteria or virus.



The vaccine activates your immune response, and your body creates antibodies. Your immune system will remember the infection and how to create antibodies to fight it off in the future.

After you receive a vaccination, antibodies produced by your body can transfer over to your baby giving them protection after they are born.

What is vaccination?

Vaccines train your immune system to fight an infection before you come into contact with it. Vaccination is a safe and effective way to protect both you and your baby against infectious diseases. After you have been vaccinated, if you do encounter the infection, you are much less likely to develop serious illness.

The NHS recommends different vaccines at points throughout your life to help keep you healthy. The vaccines offered during pregnancy can help to protect you and your baby while you are pregnant and after your baby is born.

How does my immune system fight infection?

The **immune system** is a network of cells, tissues and organs that work together to keep us healthy.

During our everyday lives, we come across many harmful organisms, such as bacteria, viruses or fungi, that can cause disease. These are called **pathogens**. We can be infected by these pathogens in many different ways; for example, by contact with people or animals that are infected, touching surfaces that have germs left on them from infected people, or by insect bites.

Your immune system recognises the unique features on the surface of a pathogen, called **antigens**, which can trigger an immune response.

One response is for specialised immune cells called **B cells** to create **antibodies**. Antibodies act as scouts: they hunt down the pathogen, stick to its antigens and prevent it from infecting your cells, or they mark it for the immune system to destroy. Each antibody is specific to the pathogen it has detected, matching the shape of the antigen like two jigsaw pieces.

Another way the immune system fights off infection is by

activating other specialised immune cells called **T cells**. T cells coordinate the immune response and attack and kill any cells that are infected with the pathogen.

If your immune system wins the fight against the harmful pathogen, then the B cells and their antibodies, and the T cells remain in the body after the infection has gone. This gives you an **immune memory** for that infection. That means if the same pathogen is encountered again, your immune system has a 'memory' of the pathogen and is ready to quickly destroy it before symptoms develop and you get sick.

Occasionally, the immune system doesn't win this initial battle against the harmful bacteria or virus, and you can become very ill or, in extreme cases, die.

How does my immune system change during pregnancy?

During pregnancy, your immune system adapts to protect you and your baby. We used to think that your immune system was suppressed during pregnancy, but more recent research suggests that as your body changes throughout pregnancy, your immune system is flexible and responds to support you and your baby in the right way. This makes your body better able to protect you against some kinds of pathogens, but less able to protect you against others. In particular, being pregnant makes you more vulnerable to some viruses, such as flu.

How does vaccination work?

Vaccines contain a harmless form of the pathogen that causes the disease you are being vaccinated against. The harmless form of the pathogen has either been killed, greatly weakened, or small parts of it have been recreated in a lab, so that they can trigger your immune response without causing the disease. The immune system still generates a response against the harmless form of the pathogen in the vaccine. This immune response can sometimes make you feel a little ill but it means you produce antibodies, and your body then keeps a 'memory' of how to fight that infection. So, if you encounter the disease in the future, your immune system is ready to fight it off and prevent a severe infection from developing.

Why is it important for me to be vaccinated during pregnancy?

Getting vaccinated during pregnancy can help to protect both you and your baby from severe illness.

Protecting you and your baby during pregnancy

If you become seriously ill during pregnancy, this can cause problems for both you and your baby. For example, there is strong evidence to suggest that you have a higher chance of developing serious complications if you catch flu without being vaccinated, particularly during the later stages of pregnancy.[1] It can develop into a serious illness for you, such as pneumonia, and cause your baby to be born too soon, or too small.

Protecting your baby after they are born

When babies are born, they are quite vulnerable to infection as their immune systems are still developing. They have not yet been exposed to pathogens, so they don't have the immune 'memory' of diseases and the antibodies to fight them, meaning they are more likely to experience severe illness.

During pregnancy, you are recommended to receive vaccines for respiratory syncytial virus (RSV) and whooping cough. After vaccination, your body will create antibodies against these pathogens to protect you. Some of the antibodies that you create will also cross the placenta and give protection to your baby in the first months after birth, when they are most vulnerable. Antibodies can cross the placenta from about week 12 of pregnancy.

So, vaccinations are given between 16 and 32 weeks of pregnancy to allow enough time for you to create antibodies and then transfer enough of them across the placenta to protect your baby before full term is reached at 37 weeks.

The protection provided to your baby through vaccination during pregnancy gradually decreases over time, in particular during the first six months after your baby has been born. This is why your baby will be given childhood vaccines against whooping cough at 8, 12 and 16 weeks old so they can start to create their own antibodies. There is currently no childhood vaccine against RSV available in the UK, so your baby can only be protected against RSV if you get the vaccine while you are pregnant.

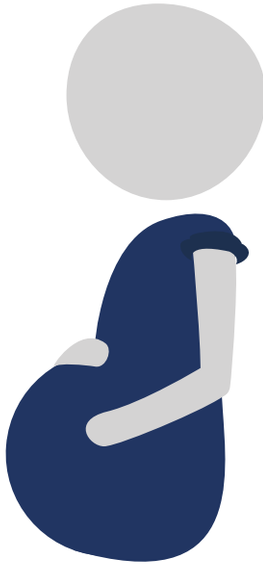
Antibodies can also be transferred to your baby by breastfeeding. This includes some of the antibodies gained from vaccination.[2] The research into this is limited but there is some evidence that the antibodies gained from flu vaccination can provide protection after being passed on through breastfeeding. Nonetheless, it is still important that your baby receives their scheduled childhood vaccinations.

How effective is vaccination?

Vaccination is extremely effective. It is considered one of our greatest global health achievements and is estimated to save 3.5–5 million lives a year.[3]

When a new vaccine is introduced, there is a huge drop in the number of cases of the disease that the vaccine protects against. Through vaccination, some diseases have even been eradicated (wiped out) completely; for example, smallpox. If smallpox had not been eradicated, it would cause 5 million deaths worldwide a year.[4] Life-threatening diseases that used to be common in the UK, for example whooping cough, are much less widespread because of the introduction of vaccines. The whooping cough vaccine is 90% effective at preventing hospitalisation in babies under 3 months.[5]

> ***During your pregnancy, you will be taking extra care of your health to give your baby the best start in life. Getting the vaccinations the NHS recommends is just one more way to do that.***
>
> *Dr Viki Male, BSI Member and Senior Lecturer in Reproductive Immunology, Imperial College London*



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Vaccination schedule for pregnancy, recommended by the NHS

What vaccines will I be offered, and when?

When?	What?
ANY STAGE OF PREGNANCY	**Influenza (flu)***
BETWEEN 16 AND 32 WEEKS	**Pertussis (whooping cough)**
28 WEEKS	**Respiratory syncytial virus (RSV)**

Information correct as of July 2025. Always check the NHS website for the most up-to-date information and please speak to your midwife.

**The Influenza (flu) vaccine is a seasonal vaccine and is usually offered from autumn to early winter.*

Flu vaccination

The flu vaccine, or inactivated influenza vaccination, protects against the influenza virus that causes the flu. The symptoms of flu are a dry cough, sore throat, fever, headache, muscle pains and extreme fatigue. For a lot of people, flu can be unpleasant, and they will get better within a few days. But in a few cases, it can lead to serious illness with long-term effects and potentially death. There is strong evidence that you have a higher chance of developing serious complications if you catch flu while you are pregnant without being vaccinated. It can develop into pneumonia and cause your baby to be born too early, or too small.[1]

Vaccination is the best protection against getting seriously ill with flu. In the UK, the NHS offers the flu vaccine to people at risk, including if you are pregnant, in autumn to early winter. The inactivated influenza vaccine is safe,[6] doesn't contain any live virus and cannot give you the flu.

Whooping cough vaccination

Whooping cough, also called pertussis, is an infection of the lungs and breathing tubes. The first symptoms of whooping cough are very similar to a cold, like a runny nose or a sore throat. After about a week, this can become coughing that lasts for a few minutes, difficulty breathing after coughing and possibly gasping for breath between coughs that sounds like a 'whoop', although this is less common in young babies. The cough can last for several weeks or months. Babies under 12 months old have an increased chance of developing complications from whooping cough such as dehydration, breathing difficulties, pneumonia and seizures.

The whooping cough vaccine offered in the UK is a combination vaccine that also protects against other illnesses such as diphtheria and tetanus. The vaccine will

give you protection against whooping cough and, as some of the antibodies will cross the placenta to your baby, it will protect your baby in the first few weeks after they are born when they are the most vulnerable.[7] The vaccine is safe[8] and has been shown to be around 90% effective at preventing hospitalisation in babies under 3 months old.[5] Your baby will then be vaccinated against whooping cough at 8 weeks old.

Respiratory syncytial virus (RSV) vaccination

Respiratory syncytial virus (RSV) is a major cause of infection of the airways and is particularly dangerous for babies. The virus typically leads to mild, cold-like symptoms but can cause bronchiolitis and pneumonia and, in severe cases, can require hospitalisation and intensive care. The RSV vaccine was added to the recommended vaccine schedule in 2024. Before this, around 20,000 infants were hospitalised with RSV every year in England.[9]

By getting the RSV vaccine, you will be able to create antibodies against RSV. These antibodies can then cross over the placenta to your baby and give them protection once they are born, when they would be most at risk from serious complications if they caught RSV. In the UK in 2024–25, the RSV vaccine was 72% effective in preventing hospitalisation for babies whose mothers were vaccinated more than 14 days before delivery.[23]

Additional vaccines offered for those at higher risk

In some cases, additional vaccines are offered either for you, or your baby shortly after they are born. Sometimes a vaccine against tetanus will be offered, such as if you have not had a full course of tetanus vaccinations or if you suffer an injury that comes with a risk of tetanus. Vaccines against hepatitis B and tuberculosis are given to babies who are at high risk during their first 28 days.

Why are changes made to the vaccination schedule?

The schedule of vaccinations recommended in the UK is continually reviewed. This is to make sure that the type of vaccinations being offered and when they are offered are as beneficial to you and your baby as possible. Changes to the schedule might involve altering the recommended time a vaccine is given or introducing a new vaccine. For example, the RSV vaccine was added to the immunisation schedule in 2024.

Following the COVID-19 pandemic, the vaccination schedule initially included vaccination against COVID-19. As the risk of hospitalisation and death from COVID-19 has now reduced and most people will only get relatively mild symptoms, the vaccine is not included on the schedule as of Spring 2025.[10]

Any change to the vaccination schedule is there to help keep you and your baby as safe as possible, by protecting them from more diseases and making sure a vaccine is as effective as possible.

Are there vaccines that I should not have while I'm pregnant?

There are some routine vaccines that are not advised during pregnancy. These vaccines are made of live, but weakened, forms of pathogens and include the MMR vaccine, BCG, yellow fever, oral polio and oral typhoid vaccines. Although it is highly unlikely, there is a small potential risk that your baby could become infected through a live vaccine because their immune system is not fully developed.

There are some exceptions, such as when the risk of infection is greater than the risk of vaccination. In these cases, you may be advised to have a live vaccine. You should discuss this with your midwife or doctor, who will explain the risks and benefits.

3

Common questions and concerns

How do I know that vaccines are safe during pregnancy, both for me and for my baby?

Before a vaccine can be given, it must go through rigorous testing. Like all medicines, vaccines go through extensive clinical trials, where they are given to and monitored in groups of volunteers. In the UK, the results of these trials are then assessed by the Medicines and Healthcare products Regulatory Agency (MHRA). No medicine can ever be completely risk free or 100% effective, but strong licensing processes and safety tests make sure that the health benefits of medicines and vaccines given through the NHS greatly outweigh any risks.

As vaccines are given to healthy people, these regulatory measures are even stricter, meaning that the level of 'acceptable risk' for vaccines is much lower than it would be for other medicines.[11] Even after a vaccine becomes part of the vaccination schedule, it is continually 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 (see additional resources).

As with any vaccine, you may experience some minor side effects in the days after vaccination. This can include tenderness at the injection site, muscle aches or a raised temperature. Symptoms should only last a few days and are no cause for concern. If the side effects persist or you are worried at all, get in touch with your midwife or doctor.

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

Vaccines are given at the time in your pregnancy, or the time of the year, when they will be most protective. If the best time for giving you two or more vaccines occurs together, you may be offered multiple vaccines in a single healthcare appointment, such as your flu and RSV vaccines. This also avoids you having to make multiple appointments. There is no medical benefit to spreading vaccinations out over multiple appointments. Even if you receive different vaccines at the same time, they would still only be using less than a thousandth of your immune system's capacity.[12]

Can receiving multiple vaccinations overload the immune system?

No. Your immune system fights off millions of germs every day. The amount of the pathogen in a vaccine is very small in comparison and will put no extra strain on your immune system.

What if I'm going on holiday or travelling outside the UK?

If you need to travel to an area where travel vaccinations are required, talk to your midwife or doctor and they can discuss the risks and benefits of any vaccinations you might need.

Many travel vaccines are live, weakened forms of the pathogen that they are designed to protect you against. It is recommended that you avoid these vaccines during pregnancy. Therefore, it is recommended that you avoid visiting countries or areas where these vaccinations are required, if you can.

If you do need to travel to one of these areas and there is

a high risk of infection, then it may be safer to have a live vaccine rather than travel unprotected. This is because the vaccine is less likely to cause harm to your baby than the illness itself.

Can I have vaccines if I'm breastfeeding?

Yes, you may be offered vaccines while you are breastfeeding. Research has shown that there is no risk from these vaccines to you or your baby.[13] Examples of vaccines that you may be offered include inactivated vaccines, such as flu or whooping cough, or live vaccines, such as the MMR vaccine.

Newborn babies do not have a fully developed immune system and so are more vulnerable to severe infection. If you are vaccinated against a disease, you are much less likely to catch and spread that disease. This means there will be less chance you will spread the illness to your baby. Some of your antibodies can also be transferred through breastfeeding, so they can protect your baby against infection too. There is some evidence that protection from vaccines received either during or after pregnancy, such as the flu vaccine, can be passed on to your baby through breastfeeding.[14]

Being vaccinated is very important for both you and your child's health.

Why might me or my baby still get ill after vaccination?

Vaccines are the most effective medical intervention we have for preventing disease. However, no medicine can ever be 100% effective. How effective a vaccine is will depend on how it is made and the disease it protects you from. Each of our immune systems are also unique. This means how well the vaccine protects us can vary a little between different people. Very rarely, a person's immune system may not respond to a vaccine so they will not be protected against the disease. However, vaccination is extremely effective for most people. In the unlikely case you do catch the disease after you have been vaccinated, your symptoms should be much milder than those in someone who has not had the vaccine.

Is it better for me or my baby to get the disease naturally?

No. Infections are a serious risk to you and your baby's health, potentially causing severe illness and long-term health effects. The immune system of a newborn baby is still developing, and they are particularly vulnerable to infection. Vaccination during pregnancy allows you and your baby to build up an immune response in a safe and controlled way without becoming ill with the disease.

> ***Immunisation is a global health and development success story, saving millions of lives every year.***
>
> *World Health Organization*

What's in a vaccine?

Active ingredient
A very small amount of a harmless form of the bacteria or virus you are immunising against.

Adjuvants (only found in some vaccines)
Create a stronger immune response to the vaccine. Pose no significant risk to health in the very small quantities used.

Preservatives and stabilisers
Maintain vaccine quality, safe storage and prevent contamination.

Residual traces of substances that have been used during vaccine manufacture, measured as parts per million or billion in the final vaccine.

Water
The main ingredient.

What are vaccines made of?

Each vaccine will be made of slightly different ingredients depending on the disease it is targeting. For vaccines recommended in pregnancy, the active ingredient is a very small amount of killed pathogen that causes the disease you are being vaccinated against, or small inactive parts of it.

Most of a vaccine is water. Vaccines also contain small amounts of preservatives and stabilisers, such as sorbitol and citric acid. Many of these ingredients are already found in the body and in food – usually in much larger quantities than the amount used in a vaccine.

Some vaccines also contain aluminium – usually in the form of aluminium hydroxide or aluminium phosphate. Aluminium is found naturally in nearly all foods and drinking water. In vaccines, aluminium is used as an adjuvant to strengthen the immune response and make it last longer to make you better protected against the disease.[15] The amount of aluminium in vaccines is extremely small and aluminium is also found in many other medicines, such as heartburn medication.[16]

Formaldehyde is used in the making of vaccines. It is found in many living things, and humans produce formaldehyde naturally. Although high levels of formaldehyde can be harmful to humans, the amount of formaldehyde in any vaccine is fifty times smaller than that found in a pear.[15]

For a full list of ingredients in each vaccine, you can look at the Patient Information Leaflet or Summary of Product Characteristics sheet that comes with each vaccine. Both can be found online. Helpful information can also be found on the University of Oxford's Vaccine Knowledge Project webpages – a link to this can be found in the back of the booklet and on the Reference webpage for this guide.

Are animal products used in vaccines offered during pregnancy?

The routine vaccinations offered to you by the NHS during pregnancy do not contain any animal products.

Some inactivated influenza vaccinations are grown using hen's eggs and so can contain a very small amount of egg. However, the flu vaccine offered during pregnancy is created differently, and does not contain any egg.[17]

Some live vaccines can contain gelatine, which is derived from pigs.[18] No live vaccines are part of the routine schedule offered by the NHS during pregnancy but there are some circumstances when you may be offered one (See "Are there vaccines that I should not have while I'm pregnant?" on page 13 and "What if I'm going on holiday or travelling outside the UK?" on page 15).

Gelatine is used to stabilise some other vaccines, so that vaccines can be stored safely at different temperatures. The gelatine used is highly purified and broken down into very small molecules. Members of some faiths may have concerns about using vaccines containing gelatine from pigs. According to Jewish laws, there is no problem with pig products in non-oral (not through the mouth) products – including vaccines.[18] Similarly, many Muslim leaders have ruled that gelatine in vaccines does not break religious dietary laws because it is highly purified and is not taken through the mouth.[18]

Is there mercury in vaccines and, will this be toxic for me or my baby?

No. Extensive research shows that there is no link between the levels of mercury, also referred to as thiomersal, used in vaccines and conditions such as brain damage and autism in children. Nevertheless, to reduce exposure to mercury, US and EU regulators have stopped using thiomersal in vaccines and no routine vaccines in the UK contain mercury.[15, 19]

Do vaccines cause autism, allergies or autoimmune diseases?

No. Large-scale studies have found no evidence to suggest that vaccination causes autism, allergies or autoimmune diseases.[20–22]

Vaccination rates have been increasing over the last few decades. At the same time, more people have been diagnosed with autism, there has been an increase in autoimmune diseases, such as rheumatoid arthritis, and allergies have also increased. This has led some people to believe that vaccines could be the cause, but there is no evidence for this.

It is thought that more people are being diagnosed with autism because of an increase in awareness, wider criteria for diagnosis and improved screening. The rise in allergies and autoimmune diseases has been more closely linked to lifestyle and environmental changes.

Additional resources

To access the references in this guide
https://www.immunology.org/vaccines-in-pregnancy-references

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

NHS website – vaccinations during pregnancy
https://www.nhs.uk/pregnancy/keeping-well/vaccinations

NHS website – why vaccination is safe and important
http://bit.ly/NHSsafe

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

Bumps – Best use of medicines in pregnancy
https://www.medicinesinpregnancy.org

MHRA Yellow Card – Making medicines and medical devices safer
https://yellowcard.mhra.gov.uk

If you have any questions about vaccines, ask your GP, midwife, nurse or other healthcare professionals.

This guide has been produced by the British Society for Immunology and is endorsed by IMPRINT, the Immunising Pregnant Women and Infants Network.

The British Society for Immunology's mission is to support our immunology community in driving scientific discovery and making a positive impact on health.

IMPRINT aims to build a sustainable network of researchers, industry, public health and policy makers, to tackle the challenges in the best use of vaccines in pregnancy and in newborns, and in the long term to improve maternal and newborn health.
https://imprint-network.co.uk

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