

Patient information from the BMJ Group

Measles, mumps, and rubella: prevention

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Measles, mumps, and rubella: prevention

Measles, mumps, and rubella (also called German measles) used to be quite common childhood diseases. They're much less common now that children are routinely vaccinated against them. Most people who get these diseases recover fully. But there is a small chance of dangerous complications. Vaccination will protect your child against these diseases.

We've brought together the best research about preventing measles, mumps, and rubella, and we've weighed up the evidence. You can use our information to talk to your doctor and decide what's best for your child.

What are measles, mumps, and rubella?

Measles, mumps, and rubella are infections caused by three different viruses. They usually affect children, but you can catch them at any age. Most children make a full recovery. But some get serious complications that can cause long-term problems. Rubella is usually a mild illness, but it can damage your unborn child if you catch it while you're pregnant.



Children are more likely to catch measles, mumps, and rubella if they haven't been vaccinated against them.

Measles spreads very easily from person to person. Rubella (also called German measles) and mumps do not spread so easily.

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You are most likely to catch one of these infections by breathing in droplets in the air after an infected person coughs or sneezes.^[1] These droplets contain the virus that causes the infection. You can also catch rubella by touching someone who has the infection. And there's a possibility that the mumps virus may also be spread through urine.

If you are infected, you can pass on these diseases before you see any symptoms, such as a rash or swelling. To find out more, see [How long am I infectious?](#)

Your child is more likely to catch these infections if they haven't been vaccinated against them. But there are some other things that make a child more likely to catch the infections.

These are called risk factors. They include:^[2]

- **Low 'herd immunity'**. This means that not enough of the children where you live have been vaccinated. The more people who have been vaccinated, the more difficult it is for the virus to pass from person to person. If you live in an area where not many people have been vaccinated, your child has more chance of catching the virus^[2]
- **Overcrowding**. When people live close together, measles, mumps, and rubella viruses are more easily spread when an infected person coughs or sneezes.

Newborn babies are less at risk of catching measles than older babies and toddlers. Your baby is also less likely to catch mumps in their first year. They are protected by special substances, called antibodies, which they get from their mother if she has been vaccinated against measles, mumps, or rubella, or had these infections before. Antibodies help the body to recognise and fight off germs. So a baby coming into contact with a virus is ready to fight it off.

However, during recent outbreaks of measles in the US, more babies caught the disease than was expected. That's because babies born to vaccinated mothers have fewer antibodies than babies born to mothers who have been naturally infected with measles.^{[3] [4]}

If you or your child catch measles, mumps, or rubella, there's no treatment that can get rid of the viruses. You or your child's body will get rid of the infection naturally. But you can take painkillers, such as paracetamol or ibuprofen, to make you feel better in the meantime.

What are the symptoms of measles, mumps, and rubella?

Measles is an unpleasant, and sometimes serious, illness. But many people don't get any symptoms when they are infected with rubella (German measles). And about one-third of people with mumps may not realise they have it.

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Symptoms of measles

Some people mistake rashes caused by other viruses for measles. But measles is not just a mild, red rash that soon goes away. Your child is likely to feel very miserable for at least a few days.

It takes 6 to 19 days for the symptoms of measles to appear after someone is infected.

^[6] You or your child may get some or all of these symptoms:

- A runny nose, a high temperature, and sore, red eyes (conjunctivitis) at first
- Small white spots inside the mouth
- A red, blotchy rash. This normally appears about two to four days after the first symptoms. It usually starts on the head and neck, and spreads down the body
- Feeling unwell and having a fever for five to six days. After this time, the fever should ease and the rash should fade.

Most people feel better within 7 to 10 days. But some people get a cough that lasts longer.

Symptoms of mumps

The main symptoms of mumps are swollen and painful glands in the neck. Sometimes other parts of the body are affected. But you may get no symptoms at all, or only mild ones.

It takes 15 to 24 days to get symptoms of mumps after being infected. ^[6] You or your child may get some or all of these symptoms:

- A feeling that you have flu, with aches, pains, and tiredness
- Swollen, painful saliva glands. The saliva glands are on your neck, just below your ears. They make the saliva that drains into your mouth. You may get swelling on one or both sides
- Mild abdominal pain and headaches. You may find it hurts to chew and swallow.

The swelling usually goes away within 7 to 10 days. Some people don't get any symptoms, or have only mild ones. About one-third of people who get mumps may not realise they have it. ^[7]

Symptoms of rubella

Most people who catch rubella (German measles) are not very ill. You may get a rash and swollen glands. Or you may not notice any symptoms at all.

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It takes 15 to 20 days to start getting symptoms after being infected.^[6] You may not get any symptoms at all. But if you do, you may get:^[6]

- Swollen glands behind your ears, and possibly in other parts of your body
- A spotty, pink-red rash that appears up to seven days after your glands swell. The rash usually starts on the face and spreads to the rest of the body. The rash lasts one to five days before fading
- A mild fever, a cold, a cough, a sore throat, or sore, red eyes (conjunctivitis).

How common are measles, mumps, and rubella?

These are common childhood illnesses all over the world. But measles, mumps, and rubella are now rare in the UK, because children are usually vaccinated against these diseases. More people catch these diseases in places where fewer people have been vaccinated.

Measles

Around 30 million people in the world catch measles each year.^[8] But only a few people get measles in countries where children are routinely vaccinated.

- In the United States, for example, more than 9 out of 10 children used to get measles by the time they were 15 years old. But measles almost disappeared once children started to be vaccinated against the disease in 1963.
- In countries where most people are vaccinated against measles, only 10 or fewer people in every 100,000 get measles.^{[9] [10] [11]}

Mumps

Before vaccination against the disease started most people used to get mumps as children. But now there is no mumps at all in some countries because of vaccination.

- Almost 9 out of 10 people had mumps infection by age 10 in England before vaccines were given.^[12] After the introduction of the combined measles, mumps, rubella vaccine (the MMR vaccine), mumps became much rarer.
- In some countries, such as Finland, nobody gets mumps anymore because people have been vaccinated against it.^[13]

People who get mumps now in the UK are usually older. That's because they are less likely to have been vaccinated against the illness.

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Rubella (German measles)

Before vaccinations began, 8 out of 10 people were infected with rubella during childhood. ^[14] Most people got rubella when they were 5 to 10 years old. ^[15] Now rubella is rare in countries where children have the MMR vaccine.

- In the US, for example, the number of cases of rubella has fallen to the lowest level ever. Only nine people had the disease in 2004. ^[16]
- More than 100,000 people had rubella in Romania in 2003. Almost 50 children were born with disabilities caused by [congenital rubella syndrome](#). Romania did not give the MMR vaccination to all children at that time. ^[17] (Congenital rubella syndrome happens when a mother is infected with rubella during pregnancy and her baby is born with serious birth defects.)

What works for preventing measles, mumps, and rubella?

Measles, mumps, and rubella (also called German measles) used to be common childhood diseases. They're much less common now that children are routinely vaccinated against them. Most people who get these diseases recover fully. But there is a small chance of dangerous complications, which vaccination can prevent.

Key points about treating measles, mumps, and rubella

- **Vaccination** can protect a child against measles, mumps, and rubella. There's a combined vaccine, called the MMR, and also single vaccines against each disease. MMR stands for measles, mumps, and rubella.
- Both the combined and single vaccines protect children against **infection**. Both types of vaccine have a small risk of side effects, but these don't usually last long and are rarely serious. For more about the two types, see [Combined or single vaccine?](#)
- If fewer people have their children vaccinated against measles, mumps, and rubella, more people are at risk of catching and spreading these infections. More children could get sick and have complications from these illnesses. If more people are vaccinated in a community, it's harder for viruses to spread from person to person. This is called 'herd immunity'.
- Some people worry that the MMR vaccine may be linked to **autism**. We looked carefully at the research and found no evidence of a link between the MMR vaccine and autism. To find out more, see [The MMR vaccine and autism](#).

We've looked closely at the research to see how well vaccines work for measles, mumps, and rubella, and we've looked at the chances of getting side effects.

Treatment Group 1

Treatments for prevention of measles, mumps, and rubella

Treatments that work

- [Vaccines for measles \(including MMR\)](#)
- [Vaccines for mumps \(including MMR\)](#)
- [Vaccines for rubella \(including MMR\)](#)

What will happen to my child?

Most children who get measles, mumps, or rubella (German measles) make a full recovery. But mumps and measles can cause serious complications, which may lead to long-term problems and, in rare cases, even death. If you are pregnant and get rubella, it can harm your unborn child.

Measles

Most children who have measles recover completely in a week to 10 days. But in the past, before children were vaccinated against measles in the UK, almost 7 in 100 people got complications from the illness. ^[18]

Complications from measles can be temporary problems, such as having convulsions (fits) or diarrhoea, or very serious problems, such as brain damage.

To learn more, see [Complications of measles](#).

Mumps

Most people who have mumps recover completely after a week to 10 days. But some people do get serious complications that can lead to long-term health problems. The most important problems affect the nervous system, pancreas, ears, and testicles.

To learn more, see [Complications of mumps](#).

Rubella

It's rare for children with rubella to have complications from the disease. Most people recover completely within 8 to 12 days. But if you are pregnant and catch rubella in the first few months of pregnancy, the virus is likely to harm your unborn baby. ^[19] This is known as **congenital rubella syndrome** (CRS).

To learn more, see [Complications of rubella](#).

Treatments:

Vaccines for measles

In this section

There's good evidence that both the combined MMR vaccine and the single measles vaccine work to prevent measles. (The combined MMR vaccine includes vaccines for measles, mumps, and rubella.)

These vaccines protect you from getting infected with measles. If enough children are vaccinated, very few people will catch measles, or get complications or die from it. For this to happen at least 90 in 100 children need to be vaccinated.^[81] If fewer than 90 in 100 children have the vaccine then measles could become more common.

Having the MMR or measles vaccine makes your body produce substances called antibodies in your blood. These antibodies work against the measles virus. This means your body can fight off the measles virus if it enters your body.

Studies show that more than 90 in 100 people who have the vaccine produce antibodies to fight measles (anti-measles antibodies).^{[82] [83] [84]} Another study looked at people who had anti-measles antibodies. It showed that none of them went on to get measles.^[85]

Researchers have looked at large groups of children to see how many get measles if they have been vaccinated and if they haven't.^{[86] [87] [88]}

All these studies showed children are much less likely to get measles if they've been vaccinated. One huge study looked at all children in the US, over the course of seven years (1985 to 1992). It showed that about 7 in 100 children who hadn't been vaccinated got measles, compared with only 3 in 10,000 who had been vaccinated.^[86]

When lots of children have been vaccinated, less measles virus is spread around. Studies show that 95 in 100 children need to be vaccinated to stop people getting measles altogether.^[89]

There's lots of evidence to show that the number of people catching measles drops when a country starts vaccinating children. There are also fewer deaths from measles and fewer cases of serious complications.^{[90] [91] [92] [93] [94]} To learn more, see [How well does vaccination against measles work?](#)

It's very unusual to get serious side effects from being vaccinated against measles, whether you have the single vaccine or the MMR vaccine. You have a much bigger risk of getting serious complications if you catch measles.

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Your child may get some mild side effects from the vaccine, such as a high temperature. And very rarely children have convulsions (fits). But children usually recover quickly from these problems. There's no evidence of long-term harm. ^[82] ^[83] ^[84]

The studies show that the side effects for the MMR vaccine and single measles vaccine are similar: ^[82] ^[83] ^[84]

- About 33 in 100 children had a fever with either kind of vaccine
- About 66 in 100 children were irritable after either kind of vaccine
- About 40 in 100 children got a rash up to three weeks after either kind of vaccine
- About 2 in 100 children who had the MMR vaccine got a temporary swelling of their **glands**, while 1 in 100 children who had the single measles vaccine got this
- About 1 in 100 children who had the MMR vaccine had an infection of their saliva glands (known as parotitis).

To learn more about rare side effects, see [Is the MMR vaccine safe?](#)

There's no evidence that the MMR vaccine causes **autism**. To learn more, see [The MMR vaccine and autism](#).

Vaccines for mumps

In this section

There's good evidence that both the combined MMR **vaccine** and single mumps vaccine work to prevent mumps. (The combined MMR vaccine includes vaccines for measles, mumps, and rubella.)

These vaccines protect you from getting infected with mumps. If enough children are vaccinated, very few people will catch mumps, or get complications or die from it. For this to happen at least 90 in 100 children need to be vaccinated. ^[81] If fewer than 90 in 100 children have the vaccine then mumps could become more common and spread more easily.

Having the MMR or single mumps vaccine makes your body produce substances called **antibodies** in your blood. These antibodies work against the mumps **virus** (they are anti-mumps antibodies). This means your body can fight off the mumps virus if it enters your body.

Studies show that about 90 in 100 people who have the MMR or single mumps vaccine produce anti-mumps antibodies. ^[99] ^[100] ^[101]

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Children are much less likely to get mumps if they've been vaccinated. We found two studies of the single mumps vaccine.^{[102] [103] [104] [105]} At least 60 in 100 children who weren't vaccinated got mumps. But only 2 in 100 children who had been vaccinated got the illness.

But studies show vaccines against mumps don't protect everyone. During a mumps outbreak in the UK from 1998 to 1999, about 30 in 100 people who'd had the MMR vaccine got mumps.^[106]

We found lots of studies that show a big fall in the number of people catching mumps because countries started vaccinating children against the disease. Very few people in the UK now get mumps, and very few people have to go to hospital because of the disease.^[107]

The research shows vaccines to protect your child against mumps can cause some mild side effects.

- Your child may get a skin rash: about 14 in 100 children had a rash after MMR vaccination, compared with 2 in 100 who had the single mumps vaccine.^[101] Your child may also get a high temperature. About 33 in 100 children had a high temperature after MMR vaccination, compared with about 25 in 100 children after the single mumps vaccine.^[101]
- Some children get skin reactions where they are injected: This is more likely to happen after the single vaccine.^[101]
- Children can also get swollen glands, coughs and colds, and sore eyes.^[101]

These mild side effects usually go away on their own.

To learn more about rare side effects, see [Is the MMR vaccine safe?](#)

There's no evidence that the MMR vaccine is linked to **autism**. To read more, see [The MMR vaccine and autism](#).

Vaccines for rubella

In this section

There's good evidence that both the combined MMR **vaccine** and single rubella vaccine work to prevent rubella (German measles). (The combined MMR vaccine includes vaccines for measles, mumps, and rubella.)

These vaccines protect you from getting infected with rubella. If enough children are vaccinated, very few people will catch mumps, or get complications or die from it. For

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this to happen at least 90 in 100 children need to be vaccinated.^[81] If fewer than 90 in 100 children have the vaccine then rubella could become more common.

Having the MMR or single rubella vaccine makes your body produce substances called **antibodies** in your blood. These antibodies work against the rubella **virus** (they are anti-rubella antibodies). This means your body can fight off the rubella virus if it enters your body.

Studies show that everyone who has the MMR or single rubella vaccine produces anti-rubella antibodies.^[108]

We also found two good-quality studies (**randomised controlled trials**) that show you're much less likely to get rubella if you've been vaccinated against the disease.^{[109] [110]}

One study looked at what happened to 385 students during an epidemic of rubella in Japan. More than two-thirds of people who hadn't been vaccinated got rubella. But nobody who had been vaccinated got the infection.^[110]

We also found lots of studies that looked at large groups of people. They showed that far fewer babies were born with birth defects due to **congenital rubella syndrome** after countries started vaccinating children against rubella.^{[111] [112] [113] [114] [115] [116]} Congenital rubella syndrome happens when a mother is infected with rubella during pregnancy and her baby is born with serious birth defects.

In the US in the 1970s, 20 to 70 babies were born with birth defects due to rubella each year. After the US started vaccinating children routinely, this went down to only two a year by 1985.^[111] Only nine people caught rubella in the US in 2004.^[111]

In countries where people don't get vaccinated against rubella, babies are at much higher risk of being born with birth defects. There was an outbreak of rubella in Greece in 1993, when only about half of the people in the country had been vaccinated. In the following year, 25 babies with birth defects due to rubella were admitted to hospital. Seven of the babies died.^[117]

The research shows that vaccines to protect your child against rubella can cause some mild side effects:

- Your child may get some pain in their joints, a high temperature, a rash, or swollen glands. These side effects are slightly more common after having the MMR vaccine than after having the single rubella vaccine^[108]
- Your child may also get a skin reaction (where they had the injection), coughs and colds, and sore eyes. This is just as likely with either vaccine.

These mild side effects usually go away on their own.

To learn more about rarer side effects, see [Is the MMR vaccine safe?](#)

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There's no evidence that the MMR vaccine is linked to [autism](#). To read more, see [The MMR vaccine and autism](#).

Further informations:

How long am I infectious?

You can pass on these diseases before and after you have symptoms. ^[5]

Measles: You are infectious from one day before symptoms begin until about five days after the rash appears. So you shouldn't mix with other people for five days after a rash begins.

Mumps: You are infectious from a few days before your glands start to swell until about five days after. So you shouldn't mix with other people once mumps is suspected.

Rubella: You are infectious from one week before symptoms begin until five days after the rash appears. So you shouldn't mix with other people for five days after a rash begins.

Complications of measles

Most children who have measles recover completely. But some do get the following complications. Some of these happen at the time of the infection.

- **Difficulty breathing:** Almost 4 in 100 people get problems with breathing when they have measles. ^[20]
- **Convulsions:** 5 in 100 people get convulsions (fits). ^[21] In a convulsion, a person may shake or twitch, or go rigid.
- **Pneumonia:** 6 in 100 people get pneumonia. This is an inflammation of the lungs caused by an infection. It's treated with antibiotics. ^[22]
- **Diarrhoea:** 9 in 100 people get diarrhoea. ^[22]
- **Bruising easily:** Doctors call this **idiopathic thrombocytopenic purpura** (or ITP). You bruise and bleed easily because your blood does not clot properly. This is because there aren't enough platelets in your blood. Platelets help blood clot and stop bleeding. You may get purple bruises on your skin. We don't know exactly how likely ITP is if you get measles. Children usually recover naturally from this condition. ^[23]

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Rarely, people with measles get more serious conditions. These may happen after the infection. Here are some of the more serious complications that can happen.

- **Premature birth:** Your baby may be born early if you get measles when you are pregnant. ^[24] But there's no evidence to show your baby will be damaged by the measles virus. ^[25]
- **Inflammation (swelling) of the brain:** Doctors call this **encephalitis**. About 1 in 1,000 people get this complication. It can damage the brain. ^[20]
- **Infection of the nervous system:** Doctors call this **subacute sclerosing panencephalitis (SSPE)**. This is an infection of your nervous system. It starts 7 to 10 years after you had measles. It's caused by an altered form of the measles virus. It can lead to death within a few years. The first signs are usually abnormal behaviour, irritability, and memory loss. Later on, people have problems with walking, speaking, and swallowing. Eventually, people with SSPE become blind and end up in a coma. SSPE is more common in people who had measles before they were a year old. ^[26] But it's still very rare. About 18 in 100,000 children who had measles before their first birthday get SSPE.

Children occasionally die from measles. These are usually children who have not been vaccinated. In the early 1990s, more than 150 children died in the US because of a measles outbreak among young children who hadn't been vaccinated. ^[22] ^[27] ^[28]

Children with a poor immune system (for example, children with leukaemia or AIDS) are more likely to die if they catch measles. ^[27] ^[29] ^[30] In developing countries, measles is still one of the major causes of death in children.

Complications of mumps

Most people who have mumps recover completely. But some people get complications that can affect their health. These are some of the problems that can happen.

- **Pancreatitis:** This is inflammation of the pancreas, which is one of the glands near your stomach. The pancreas produces substances that digest your food and control the sugar in your blood. Pancreatitis can be serious. One study showed that 4 in 100 people with mumps get pancreatitis. ^[31] It's the most common complication of mumps. A study of people who were in hospital because of mumps found almost half had pancreatitis. ^[32] If the pancreas is damaged by the infection, you could get diabetes.
- **Meningitis:** The type of meningitis you get with mumps is called aseptic meningitis. It isn't as dangerous as another type called bacterial meningitis. You get a headache

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and fever. The protective tissues covering the brain (the **meninges**) become swollen. Most people recover completely from this type of meningitis. Mumps was one of the most common causes of aseptic meningitis, before the introduction of the combined measles, mumps, rubella vaccine (the MMR vaccine) in the UK. ^[33]

- **Inflammation (swelling) of the brain:** Doctors call this **encephalitis**. It is a serious complication, but it isn't common. ^[34] It can damage your brain and cause you to lose co-ordination in your arms and legs, making walking difficult. This is called ataxia. A study in Finland found that 5 in 100 children who had encephalitis because of mumps developed this problem. And four months to two years later, more than 15 in 100 had behaviour problems. ^[35]
- **Deafness:** Mumps can make you lose hearing in one or both ears. We don't know for certain how common this is. Some doctors think this may happen to 1 in 3,400 people who have mumps. ^[36]
- **Inflamed testicles:** Doctors call this **orchitis**. The testicles get inflamed by the infection. This can cause the testicles to shrink once the inflammation goes down. Some men who get orchitis have problems with fertility. This means it may be hard for them to father a child. A large study in the US looked at more than 1,000 people. It showed mumps caused orchitis in 10 in 100 men. It was much more common in men who caught mumps as adults. ^[37]
- **Miscarriage:** You are more likely to miscarry your baby if you get mumps in the first three months of pregnancy. ^[38] But there's no evidence that your baby will be born early or damaged if you get mumps later on in your pregnancy. ^[39]

You're very unlikely to die from mumps. Before people were vaccinated against mumps, there were about five deaths a year from the disease in England and Wales. ^[40] People are more likely to die from mumps if they are over age 40.

Complications of rubella

Most people recover completely from rubella, but there is a risk of complications. The most important of these is **congenital rubella syndrome**.

Congenital rubella syndrome is when babies are born with serious birth defects because their mother was infected with the rubella virus during pregnancy.

Your baby is most likely to be affected if you were infected early in your pregnancy. Birth defects can include deafness and the baby's heart not being properly formed (congenital heart disease).

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One study looked at more than 1,000 pregnant women in England and Wales who got rubella. It found:^[41]

- All babies with mothers infected before the 11th week of pregnancy were born with abnormalities
- More than 80 in 100 babies whose mothers had rubella were affected if their mother was infected in the first three months of pregnancy
- More than 33 in 100 babies whose mothers had rubella at 13 to 16 weeks were affected
- About 25 in 100 babies were affected if their mother was infected at six months of pregnancy
- The babies of mothers infected in later pregnancy (after six months) were not harmed.

The earlier the infection occurred, the more serious the defects. Affected children whose mothers were infected before 11 weeks had both congenital heart disease and deafness. Affected children with later infections only had deafness.

Although rubella is usually a mild illness, there is a risk of some other complications.

- **Bruising easily.** Doctors call this **idiopathic thrombocytopenic purpura (ITP)**. You bruise and bleed easily because your blood does not clot properly. This is because there aren't enough platelets in your blood. Platelets help blood to clot and stop bleeding. You may get purple bruises on your skin. Children usually recover naturally from this condition.^[42] ITP happens to 1 in 3,000 people who get rubella.^[43]
- **Inflammation (swelling) of the brain.** Doctors call this **encephalitis**. It can cause brain damage. This is rare with rubella. Even if it does happen, it's usually less serious than with [measles](#).^[44]
- **Pain and stiffness in the joints.** Doctors call this **arthralgia**. It's rare for children with rubella to get this condition. But it does happen to adults, especially women. A study in London found that most women have arthralgia after a rubella infection.^[45]

Combined or single vaccine?

Both the combined MMR vaccine and the single vaccines work well. But there are some things you may want to consider when choosing what's right for your child.

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- By having the MMR vaccine, your child is protected quickly against all three diseases. Usually children get one injection when they're about 13 months old and another one when they're between 3 and 5 years old.
- Protecting your child with the single vaccines involves having six injections, instead of two injections with the MMR vaccine. This means you'll need to visit the doctor more often and your child will need to have more injections.
- Your child is at risk of getting one of these infections while waiting for the next injection. There's also more chance of missing a jab and not getting full protection.
- There's no evidence that the individual jabs cause fewer side effects than MMR.
- Only the combined MMR vaccine is available on the NHS. You'll have to pay for single vaccines from a private clinic.

The MMR vaccine and autism

Why the worry?

A 1998 study raised questions about the combined measles, mumps, and rubella vaccine (the MMR vaccine) and autism. ^[46] The researchers thought there may be a link between someone having the vaccine and getting a problem with their bowels. This bowel problem may cause a kind of autism. But, in the end, the researchers said that their study **didn't prove any such link**.

The study has now been discredited and was withdrawn in 2010 by the medical journal that published it. ^[47] Even at the time, other researchers said the study was not done well. ^[48] It was small and only looked at 12 children. But the study showed up in newspapers and on TV. Some parents decided not to give their children the MMR vaccine. ^[49]

What does the evidence say?

It can be hard to prove beyond any doubt that a vaccine is safe. This is because millions of children get vaccines. And some of these children later get diseases. But this doesn't mean vaccines caused the diseases.

To prove a link between the MMR vaccine and autism, we would need to do a type of study called a randomised controlled trial. In a study like this, some children would get the vaccine and some would not.

But this study would be hard to do, for several reasons. We know that vaccines help a lot in stopping infections. So it would be unfair to not give some children the vaccines.

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Also, the study would have to go on for many years to spot any problems that take time to show up.

Other types of studies have given us reliable evidence about the MMR vaccine and autism. Two types are cohort studies and case control studies .

- In cohort studies, researchers have looked at a large group of people, usually many thousands, to see how many got autism. Then they have checked how many of these people have had the MMR vaccine.
- In case control studies, researchers have looked at two groups. One group has autism. The other group does not have autism. Otherwise, the two groups are very similar. The researchers have then checked which people have had the MMR vaccine.

There have been many of both of these types of studies on the MMR vaccine and autism. There **is no evidence of a link between the MMR vaccine and autism.** ^[48]

Here is what these studies show.

Although there has been a big rise in autism, there has only been a small increase in MMR vaccination over the same period:

- The number of kindergarten children in California with autism rose by almost 400 percent from 1980 to 1994. ^[50] But this wasn't linked to a similar increase in MMR vaccination
- Although autism increased among boys in the UK from 1988 to 1993, the number of children vaccinated with MMR stayed about the same. ^[51]

Unvaccinated children are just as likely as vaccinated children to have autism:

- A large study of more than 500,000 children born in Denmark found no link between autism and whether a child had been vaccinated. ^[52] However, it is possible that some of the children were too young for researchers to know whether they had autism at the time of the study
- A study of 1.8 million people in Finland found that no children developed autism after being vaccinated. ^[53] But some cases of autism may not have been reported, so this study may not be reliable.

The increase in autism did not start at the same time as MMR vaccination started:

- A study of almost 500 children diagnosed with autism between 1979 and 1998 found the increase in autism wasn't linked to the start of MMR vaccination. ^[54] There was

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also no increase in children with autism who showed **developmental regression** (lost skills they had previously learnt) or who had bowel symptoms. ^[55]

In Japan, doctors stopped using the MMR vaccine in the early 1990s. It was replaced with single vaccines. This change didn't have any effect on rates of autism in Japan, which continued to rise. ^[56] This suggests that MMR isn't linked to autism.

Is the MMR vaccine safe?

The MMR vaccine can cause side effects, but most are not serious. It's very rare for a child to get a serious problem after having the vaccine. (The MMR vaccine includes vaccines for measles, mumps, and rubella.)

Your child may get a high temperature in the three weeks after having the vaccine. This is quite common. There's a small risk that this could cause a [febrile convulsion](#). A febrile convulsion is a convulsion (fit) that can happen when someone has a high temperature. Your child may lose consciousness for a few seconds and shake, or go rigid. But almost all children recover completely from this.

A big study in the US looked at children who had a febrile convulsion after having the MMR vaccine. None of the children had long-term problems as a result. ^[57]

There are other, much rarer, side effects that some children get after having the MMR vaccine.

- **Aseptic meningitis.** This is very rare. It happens to about 2 in 10,000 children who have the vaccine. ^[58] They get headaches, fever, and inflammation of the protective tissue covering the brain. It's not as serious as the type of meningitis caused by bacteria. Children usually recover fully from this type of meningitis. It's much less likely to happen if your child is vaccinated with the type of MMR vaccine used in the UK. ^[59] ^[60]
- **Bruising easily.** Doctors call this **idiopathic thrombocytopenic purpura** (or ITP). This is a blood disorder that means you bruise and bleed easily. It happens to between 25 and 40 children in every million who have the vaccine. ^[61] ^[62] Children can also get this problem if they catch measles or rubella. The risk of getting ITP from the vaccine is much lower than the risk of getting it from measles or rubella. ^[63] Children usually recover naturally from this condition.
- **Arthritis and arthralgia.** Some studies show that children can get a mild pain in their joints after having the MMR vaccination. ^[64]

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- Very occasionally, children have a serious allergic reaction to a vaccine. This is called **anaphylaxis**. It can be life-threatening. Anaphylaxis after having the MMR vaccine is extremely rare.^[65] In the UK in 1994, 1 in 100,000 children had anaphylactic reactions.^[66]

The MMR vaccine has been very well studied to see if it may be linked to lots of different diseases. These include asthma, eczema, bowel disease, diabetes, and other serious conditions. In all of these cases, the researchers found there is **no evidence that the MMR vaccine causes these conditions**.^[67] ^[68] ^[69] ^[70] ^[71] ^[72] ^[73] ^[74] ^[75] ^[76] ^[77] ^[78] ^[79] ^[80]

None of the studies we looked at found a link between the MMR vaccine and autism. But we know that because there has been so much publicity about this, lots of people worry about it. To learn about the research, see [The MMR vaccine and autism](#).

How well does vaccination against measles work?

The research shows that measles vaccination is linked to a big drop in the number of people catching measles. Worldwide, deaths because of measles fell by 74 percent between 2000 and 2007.^[95]

- In 2000, about 750,000 people, most of them children, died from measles.
- In 2007, about 197,000 people, most of them children, died from measles.

However, measles outbreaks still happen, even in countries where most people have been vaccinated. An outbreak is most likely to happen among small groups of children who haven't been vaccinated. This happened in a school in the Netherlands where only 7 in 100 children had been vaccinated.^[96]

The studies also show that fewer children now die from measles. But deaths do still happen, usually among children who haven't been vaccinated.

Four children died in Italy in 2002. At that time, fewer than 70 in 100 children in the country had been vaccinated.^[97]

Three unvaccinated children died during an outbreak of measles in Ireland from 1999 to 2000.^[98] About 33 in 100 children aged over 15 months were vaccinated at that time.

Glossary:

infection

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You get an infection when bacteria, a fungus, or a virus get into a part of your body where it shouldn't be. For example, an infection in your nose and airways causes the common cold. An infection in your skin can cause rashes such as athlete's foot. The organisms that cause infections are so tiny that you can't see them without a microscope.

viruses

Viruses are microbes (tiny organisms) that need the cells of humans or other animals to exist. They use the machinery of cells to reproduce. Then they spread to other cells in the body.

vaccination

A vaccination is an injection a doctor can give you to protect you from getting an infectious illness (an illness that spreads between people).

antibodies

Antibodies are an important part of your immune system. They are proteins made by white blood cells (another part of your immune system). They help destroy bacteria and other agents that cause infections.

gland

A gland is any group of cells in the body that makes and releases something for use by another part of the body. For example, the thyroid gland makes a hormone called thyroxine. This acts on receptors within cells. By acting on the receptors it gives the cells a message to speed up their metabolism and work harder.

diarrhoea

Diarrhoea is when you have loose, watery stools and you need to go to the toilet far more often than usual. Doctors say you have diarrhoea if you need to go to the toilet more than three times a day.

pancreas

Your pancreas is an organ that's behind your stomach. It makes several different chemicals. Some of the chemicals help your body digest food. Your pancreas also makes a chemical called insulin, which helps your body use the sugar in your blood.

pneumonia

Pneumonia is an infection in your lungs. Anything that causes infections (bacteria, viruses or fungi, for example) can give you pneumonia.

inflammation

Inflammation is when your skin or some other part of your body becomes red, swollen, hot, and sore. Inflammation happens because your body is trying to protect you from germs, from something that's in your body and could harm you (like a splinter) or from things that cause allergies (these things are called allergens). Inflammation is one of the ways in which your body heals an infection or an injury.

antibiotics

These medicines are used to help your immune system fight infection. There are a number of different types of antibiotics that work in different ways to get rid of bacteria, parasites, and other infectious agents. Antibiotics do not work against viruses.

platelets

Platelets are small disc-shaped particles found in your blood (along with red blood cells and white blood cells). Platelets form the clots that stop the bleeding when you've been cut. People who don't have enough platelets have problems with bleeding too much.

immune system

Your immune system is made up of the parts of your body that fight infection. When bacteria or viruses get into your body, it's your immune system that kills them. Antibodies and white blood cells are part of your immune system. They travel in your blood and attack bacteria, viruses and other things that could damage your body.

leukaemia

Leukaemia is a type of cancer that affects your body's production of white blood cells. White blood cells are important for fighting infections. So, if you have leukaemia, you are more likely to catch an infectious disease.

AIDS

AIDS stands for acquired immunodeficiency syndrome. People who are infected with the human immunodeficiency virus (HIV) get AIDS when the virus has destroyed most of their immune system. When people have AIDS, their body isn't able to fight infections. So even common infections, such as colds, can cause serious problems.

diabetes

Diabetes is a condition that causes too much sugar (glucose) to circulate in the blood. It happens when the body stops making a hormone called insulin (type 1 diabetes) or when insulin stops working (type 2 diabetes).

Ataxia-telangiectasia

Ataxia-telangiectasia is a rare disease that affects children. It causes problems with walking, talking and balance. Children with the disease also have a weakened immune system, so they're more likely to get infections and some types of cancer. Ataxia means clumsiness or poor coordination. Telangiectasias are tiny, red 'spider' veins. People with the disease get these veins in the corners of their eyes or on their ears or cheeks.

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autism

Autism is a serious condition that affects how the brain works. It usually appears in children when they are around three years old, although it can occur earlier. People with autism may have problems communicating with other people and may behave differently to other people. The cause of autism is unknown.

randomised controlled trials

Randomised controlled trials are medical studies designed to test whether a treatment works. Patients are split into groups. One group is given the treatment being tested (for example, an antidepressant drug) while another group (called the comparison or control group) is given an alternative treatment. This could be a different type of drug or a dummy treatment (a placebo). Researchers then compare the effects of the different treatments.

cohort study

A cohort study follows a group of people (a cohort) and records the different things that happen to them. For example, a cohort study could find out whether lung cancer is more common in people in the cohort who smoke. Prospective cohort studies (which begin at a certain time and then look at what happens to the people in the study) are more reliable than retrospective cohort studies (which look at groups of people after events have happened to them).

case control studies

A case control study matches patients in the case group with a control group. Only the case group receives the treatment that's being looked at. Both groups are followed over time to see if there are any differences in their outcomes. Retrospective case control studies compare the exposures of patients who developed a certain disease (such as cancer) with those who did not. Case control studies are considered a weak form of evidence.

bacteria

Bacteria are tiny organisms. There are lots of different types. Some are harmful and can cause disease. But some bacteria live in your body without causing any harm.

allergic reaction

You have an allergic reaction when your immune system overreacts to a substance that is normally harmless. You can be allergic to particles in the air you are breathing, like pollen (which causes hay fever) or to chemicals on your skin, like detergents (which can cause a rash). People can also have an allergic reaction to drugs, like penicillin.

asthma

Asthma is a disease of the lungs. It makes you wheeze, cough and feel short of breath. Asthma attacks are caused by inflammation and narrowing of your airways, which makes it hard for air to pass in and out of your lungs.

eczema

Eczema is a very itchy rash. It may be dark and bumpy and release fluid. Scratching makes it worse. You can get eczema anywhere on your body, but it is most common on the wrists, the insides of the elbows and the backs of the knees. If you have asthma or allergies you are more likely to get eczema than someone who doesn't have these conditions.

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