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# The Danish Childhood Vaccination Programme



## The Danish Childhood Vaccination Programme

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# Introduction

The health authorities in all countries recommend vaccinating children against diseases that may be serious and cause permanent injury and, in the worst case, be fatal.

Children adhering to the Danish childhood vaccination programme are well protected against developing the following ten diseases:

- Diphtheria
- Tetanus
- Whooping cough (pertussis)
- Polio
- Meningitis and epiglottitis caused by *Haemophilus influenzae* type b (Hib)
- Meningitis and other serious diseases caused by pneumococci
- Measles
- Mumps
- Rubella
- Cervical cancer and other HPV related cancers

The vaccinations are free of charge and participation is voluntary. General practitioners carry out the vaccinations.

Women may be vaccinated against rubella free of charge if they are not previously vaccinated, and all adults can be vaccinated against measles if they are not already immune through either infection or vaccination.

## The Danish childhood vaccination programme

The table shows the recommended vaccinations and time of administration.

Age	Vaccination	Health check-up
5 weeks		√
3 months	Diphtheria, tetanus, pertussis, polio, <i>Haemophilus influenzae</i> type b (Hib) + pneumococci	
5 months	Diphtheria, tetanus, pertussis, polio, <i>Haemophilus influenzae</i> type b (Hib) + pneumococci	√
12 months	Diphtheria, tetanus, pertussis, polio, <i>Haemophilus influenzae</i> type b (Hib) + pneumococci	√
15 months	MMR: measles, mumps and rubella	
2 years		√
3 years		√
4 years	MMR: measles, mumps and rubella	√
5 years	Diphtheria, tetanus, pertussis and polio booster vaccination	√
12 years	Cervical cancer and other HPV related cancers ( <i>Human Papillomavirus</i> – HPV) (twice)	
Women above 18	Rubella (MMR)	
Adults above 18	Measles (MMR)	

## Why do we vaccinate children in Denmark?

The childhood vaccination programme protects your child against diseases that may be serious and cause permanent injury. At worst, they could be fatal.

Some of the diseases have almost been eradicated, but they still occur outside Denmark. If we do not vaccinate children, the diseases may occur in Denmark again.

- Some vaccines protect against illnesses that may be life-threatening for infants, such as pertussis and pneumococcal disease.
- Other vaccines protect children against infections that are so contagious that most children would get the diseases without a vaccination programme. Children normally recover from these diseases, but during every epidemic, some children become severely ill and may suffer permanent injury from diseases such as measles, mumps and polio.
- Some vaccines prevent serious, but rare diseases such as tetanus and diphtheria.

Unvaccinated children can get the infection later in childhood or adulthood, when the risk of more severe effects of the diseases is increased.

# The diseases

## Diphtheria

Diphtheria is caused by the bacterium *Corynebacterium diphtheriae*. Diphtheria can be fatal even under optimal and modern treatment conditions.

The disease often begins with a fever and a severe throat infection with a thick coating and swelling of the mucous membranes, which can cause asphyxia.

The bacteria can produce a toxin that may spread to other parts of the body. This may cause inflammation of the heart muscle and nervous system disorders.

Denmark has seen few cases of diphtheria in the past 50 years. But there is still a risk of getting the disease outside Denmark, and visitors may also bring the disease into the country.

## Tetanus

Tetanus is caused by the bacterium *Clostridium tetani*. The bacteria are especially prevalent in soil and enter the body through such pathways as contaminated wounds.

Tetanus cannot be transmitted between people.



The bacteria produce a toxin that enters the nervous system and leads to muscle stiffness and cramps. In the most severe cases of tetanus, the patient cannot breathe.

Infants previously got tetanus through contamination of the navel. Now the risk is higher among older, unvaccinated people who get a contaminated wound. Today the disease is rare with less than two cases yearly.

### Whooping cough (pertussis)

Pertussis is caused by the bacterium *Bordetella pertussis*. Bacteria are transmitted through droplets from the respiratory tract, often expelled by coughing or sneezing. The bacteria are transmitted very easily. Pertussis can be life-threatening for infants.

Pertussis initially resembles a normal cold, but develops within 1–2 weeks into very violent and prolonged coughing fits.

The coughs typically come in rapid succession and prevent the child from breathing. When the child then inhales, it produces a whooping sound, hence the name ‘whooping cough’. The child coughs up thick phlegm and may vomit during an attack. Attacks are exhausting, and infants do not have the strength to cough up the thick phlegm.

Mild cases among older children or adults may resemble a cold or throat infection.

Infants are often infected by older siblings or adults at home. People with colds or coughs should – to the extent possible – stay away from

unvaccinated infants. General practitioners may give prophylactic antibiotics to infants exposed to pertussis.

## Polio

Polio is caused by *poliovirus*, which is very contagious.

Most people experience no or only mild symptoms such as fever and headache for a few days. A small minority develop severe paralysis.

The paralysis may affect a few muscle groups or be so extensive that the respiratory muscles are paralysed. Some patients are paralysed permanently, while others recover. Polio can be fatal.

Few countries still see cases of polio. Even though polio has not been reported in Denmark for almost 40 years, it is important that all children are given the vaccine until the disease is eradicated worldwide.

## Meningitis and epiglottitis

– caused by *Haemophilus influenzae* type b

*Haemophilus influenzae* type b (Hib) are bacteria that may cause serious and potentially life-threatening diseases such as meningitis and epiglottitis, especially among young children.

Children with meningitis generally have high fever and feel unwell. They may be drowsy or uneasy, and it can be difficult establishing contact. Epiglottitis commonly causes pain on swallowing and general

unease. Breathing may be affected. Hib-meningitis may cause permanent injury such as impaired hearing and brain damage.

Before the vaccination was included in the Danish childhood vaccination programme, young children died from the disease every year. Now, the disease is rare.

The vaccine does not protect against the types of meningitis caused by other bacteria or viruses.

## **Meningitis and other diseases**

### **– caused by pneumococci**

Pneumococcal diseases are caused by the bacterium *Streptococcus pneumoniae*. Severe pneumococcal diseases may cause permanent disabilities such as impaired hearing and brain damage, and occasionally death.

Infection with pneumococci often causes acute middle ear or sinus infections or pneumonia. Pneumococci can be life-threatening when they enter the bloodstream and cause septicaemia and/or meningitis.

Young children, older people and people with reduced immune functioning are especially vulnerable to pneumococcal diseases. The risk of severe pneumococcal disease declines with age, and children older than 4 years have a very small risk of getting severe pneumococcal diseases.

Before the vaccination was introduced, Denmark had about 20 annual cases of meningitis and about 50 other severe cases of pneumococcal

diseases in children younger than 2 years. Number of cases has been reduced by more than 50% after introduction of vaccination.

## Measles

Measles is caused by *morbillivirus*, a very contagious virus. Measles may occasionally cause serious complications such as encephalitis, which can cause permanent brain damage, deafness and, in worst case, death.

Measles usually starts with high fever and a cold. A red blotchy rash develops about 3-4 days after the first symptoms. There are often comorbid diseases such as middle ear infection and pneumonia.

Nearly all children in Denmark had measles, before vaccination against morbillivirus was included in the childhood vaccination programme. Measles has been rare in Denmark for many years. But the disease remains widespread in many countries, including some European countries.

Adults can get free vaccination against measles if they are not already immune through either infection or vaccination.

## Mumps

Mumps is caused by mumps virus.

This virus causes inflammation and swelling of the salivary glands, mild fever and general malaise. Up to 10% of the people who get

mumps experience meningitis. Some children become deaf in one ear after having mumps.

Mumps may infect boys' testicles during or after puberty. This can reduce the quantity of sperm they produce, either temporarily or permanently, and there is a risk of increased difficulties in conceiving children.

## Rubella

Rubella is caused by *rubella virus*. Among children, the symptoms are often cold-like symptoms and a low-grade fever, and the course of the disease is mild.

After about 24 hours, the lymph nodes in the neck get sore and swollen and a rash may emerge. The rash is blotchy and reddish and declines after 2-3 days.

Vaccination against rubella is mainly given to prevent children from transmitting the virus to pregnant women. Rubella, in the first half of pregnancy, increases the risks of congenital deformities such as eye abnormalities, impaired hearing, brain damage or heart disease.

Many other viral diseases resemble rubella, which makes it difficult for women to know whether they have had the disease. To prevent that the virus is transmitted to pregnant women, all children are vaccinated against vaccine.

Childbearing women can get free vaccination against rubella if they are not already immune through either infection or vaccination.

## Cervical cancer

Cervical cancer is caused by certain strains of *human papillomavirus* (HPV), that is transmitted through sexual contact.

HPV is very common, especially among young people. Many people do not have symptoms, and the infection clears up spontaneously for most people. However, some people continue to carry the virus. This may result in cervical cellular changes that may cause cancer many years later.

Vaccination protects against the seven strains of HPV that cause approximately 90% of cervical cancer cases. In addition, it protects against two strains which cause genital warts.

Since HPV vaccination does not protect against all cases of cervical cancer, women are invited to be screened for any cervical cellular changes from the time they turn 23 years. This screening programme can find preliminary stages of disease before they develop into cancer.

# The vaccinations

The table below shows when each vaccination was included in the Danish childhood vaccination programme:

YEAR INTRODUCED IN THE CHILDHOOD VACCINATION PROGRAMME	
Diphtheria	1943
Tetanus	1949
Polio	1955
Pertussis	1961
Measles, mumps, rubella (MMR)	1987
<i>Haemophilus influenzae</i> type b (Hib)	1993
Pneumococcal diseases	2007
Cervical cancer (HPV)	2009

The diseases we have vaccinated against for many years are almost eradicated or at least they only affect very few persons.

However, a vaccination programme only succeeds if nearly all the target group is vaccinated, because otherwise the diseases continue to spread. The diseases may be more widespread outside Denmark and may spread again if we stop vaccinating against them.

When we decide which vaccinations to recommend for the vaccination programme, we assess whether each infectious disease is frequent and serious enough to recommend that all children are vaccinated against it. We also assess whether the vaccine is safe and whether it can fit into the existing vaccination programme.

## Questions and answers on vaccination

*What does a vaccine consist of?*

Vaccines can include components of a killed virus or bacteria (e.g. pneumococci). Vaccines can also be attenuated vaccines created by reducing the virulence of live viruses or bacteria.

Other vaccines can comprise inactivated toxins (e.g. tetanus), or genetically engineered virus-like particles (e.g. HPV).

*How do vaccines work?*

Vaccination causes the child's immune system to create antibodies that protect against the microbes that cause illness in the same way as if the child had got the disease. The child has become immune.

If the child later encounters this virus or bacterium, the body remembers this and the antibodies fight the infection and disease.

*Can several vaccines be given simultaneously?*

Yes. Studies have shown that vaccination against several diseases can be carried out simultaneously, so that children get fewer injections.



### *Where are the vaccines injected?*

The location of the injection depends on each type of vaccine. Generally, young children are vaccinated in the thigh and older children in the shoulder.

### *Should ill children be vaccinated?*

Your doctor should decide whether your child is too sick to get vaccinated. Children who have a mild cold can be vaccinated. To protect the youngest children from, e.g., pertussis, it is important that vaccines are administered at the recommended time. You should always consult your doctor if you consider postponing a vaccine.

### *Can a vaccination be postponed?*

We recommend that you stick with the indicated times in this pamphlet. If for various reasons you consider postponing your child's vaccination, you should consult your doctor.

If a vaccination is postponed, the vaccination series does not have to be started over.

## **Side effects**

### *The effects and any side effects of the vaccines*

The general practitioner who gives the vaccination must inform the child and the parents about effects and side effects of the vaccines.

The general practitioner can also hand out the package leaflet, which describes known side effects of the vaccine. You can find the package

leaflet in Danish at [www.indlægsseddel.dk](http://www.indlægsseddel.dk), and information in English and other languages at [www.ema.europa.eu](http://www.ema.europa.eu).

During a vaccination series, most children will experience a mild reaction at some point, for example swelling at the vaccination site, brief fever or a rash. Young children who have been vaccinated may also become irritable or drowsy, sleep poorly, vomit or have diarrhoea and reduced appetite.

You can find more information about side effects at [www.laegemiddelstyrelsen.dk](http://www.laegemiddelstyrelsen.dk)

*Do not forget to report possible side effects!*

General practitioners are required to notify the Danish Medicines Agency of any severe or unexpected side effect.

Patients and their relatives can also report side effects at [www.meldenbivirkning.dk](http://www.meldenbivirkning.dk) (also in English).

You may claim compensation from the Danish Patient Insurance Association if your child suffers permanent injury caused by vaccination.

*Ill from the vaccine or just ill?*

Young children occasionally get infections or other diseases during the period in which the vaccination is given. You should consider seeing a general practitioner if your child seems ill in the days after vaccination.

## **Diphtheria, tetanus, pertussis, polio and *Haemophilus influenzae* type b vaccine**

The vaccine used against diphtheria, tetanus, pertussis, polio and *Haemophilus influenzae* type b is given to children three times: at 3, 5 and 12 months.

The vaccine comprises completely detoxified components of the toxoids of the bacteria that cause diphtheria, tetanus and pertussis as well as inactivated poliovirus and components of the inactivated *Haemophilus influenzae* type b bacteria.

*For how long is the vaccine effective?*

The three vaccinations effectively protect against diphtheria, tetanus, pertussis and polio until the child reaches 5-6 years of age.

The child receives a booster vaccination against diphtheria, tetanus, pertussis and polio at 5 years of age. This protects the child against diphtheria and tetanus for an additional 10 years.

The vaccination protects against pertussis for 5-10 years, and the protection against polio is considered lifelong.

Three vaccinations against *Haemophilus influenzae* type b give children lifelong protection.

*What are the side effects of diphtheria, tetanus, pertussis, polio and Haemophilus influenzae type b vaccine?*

The most frequent side effects are reddening and tenderness at the vaccination site. A few children also develop fever and general malaise in the first few days after vaccination. Some children with a fever will experience febrile seizures. This is especially seen among children who tend to get febrile seizures when running a fever.

### **Pneumococcal vaccine**

The pneumococcal vaccine protects against 13 pneumococci strains. When children are vaccinated, they are protected against the majority of pneumococci that cause serious disease. The vaccine also prevents some cases of pneumonia and middle ear infection caused by pneumococci.

Children younger than 2 years get the pneumococcal vaccine at 3, 5 and 12 months. It is given at the same times as the diphtheria, tetanus, pertussis, polio and *Haemophilus influenzae* type b vaccination, but with different injection sites – normally on the outer part of each thigh.

The pneumococcal vaccine does not protect against all types of pneumococci.

*For how long is the vaccine effective?*

The vaccine is effective until the child reaches 4 years. After that age, the risk of getting severe pneumococcal disease is very low.

### *What are the side effects of the pneumococcal vaccine?*

Up to half of all children experience fever after the vaccination. Some children develop high fever and may consequently have febrile seizures. Around one third experience tenderness and swelling at the vaccination site. Hypersensitivity reactions are seen, but they are rare.

### **Measles, mumps and rubella (MMR) vaccine**

MMR vaccine is given at 15 months and 4 years of age.

Adults above the age of 18 are offered measles vaccination if they are not already immune through either vaccination or previous infection.

Women may be given the MMR vaccination (which includes rubella) free of charge if they are above 18 years of age and have not previously been vaccinated against rubella.

The vaccine comprises live attenuated virus, which may produce mild symptoms suggestive of an infection.

Minor epidemics of the three diseases may still emerge in Denmark, because more than 10-15% of Danish children have not received the recommended MMR vaccine.

### *For how long is the vaccine effective?*

When children receive two MMR vaccinations, they are considered to be lifelong protected.

### *What are the side effects of the MMR vaccine?*

Children may develop mild symptoms resembling the diseases 1–2 weeks after vaccination. The reason is that the vaccine comprises live attenuated viruses.

Most side effects include fever, a cold or rashes. Meningitis has in very rare instances been associated with MMR vaccinations.

## **Diphtheria, tetanus, pertussis and polio booster vaccination**

This vaccine contains the same components as the diphtheria, tetanus, pertussis, polio and *Haemophilus influenzae* type b vaccine but with reduced concentration for diphtheria and pertussis.

### *For how long is the vaccine effective?*

Children receive a diphtheria, tetanus, pertussis and polio booster vaccination at 5 years of age to ensure long-term protection against the diseases. This protects the children against diphtheria and tetanus for an additional 10 years. The period of protection against pertussis is 5–10 years. The protection against polio is considered lifelong.

### *What are the side effects of the vaccine?*

There is occasionally local swelling at the vaccination site after vaccination against diphtheria, tetanus, pertussis and polio.

## HPV vaccine against cervical cancer

HPV vaccine is offered to as part of the Danish childhood vaccination programme to girls 12 years of age. HPV is a sexually transmitted disease that can cause cervical cancer and other HPV-related cancers. The vaccine is prophylactic and should be given before the child is infected with the virus against which the vaccine protects. Girls are vaccinated at 12 years of age in order to ensure protection before their sexual initiation. The HPV vaccination programme is free of charge for girls under the age of 18.

Girls are vaccinated twice if they get the first vaccine before the age of 15. First and second vaccination should be at least five months and maximum 13 months apart. If these guidelines are not followed, three doses should be given.

Girls between 15 and 17 need three doses to be fully covered. The second vaccine is given at least one month after the first one, and the third another three months later. All three doses should be given within one year.

*For how long is the vaccine effective?*

We assume that the vaccine is effective for a long time.

*What are the side effects of the HPV vaccine?*

Many experience tenderness, reddening and swelling at the vaccination site. Some experience a mild fever. Hypersensitivity reactions and other serious side effects are rare.

Known side effects are described in the package leaflet for the HPV vaccine.

We closely monitor all reports of suspected HPV vaccine side effects. We also receive reports of suspected side effects that are not described in the package leaflet. You can find more information at [www.laegemiddelstyrelsen.dk](http://www.laegemiddelstyrelsen.dk)



# Monitoring the childhood vaccination programme

The childhood vaccination programme is continually monitored to determine whether it is functioning as intended and whether any changes are needed.

The numbers of cases of the diseases against which children have been vaccinated are monitored. Moreover, the numbers of vaccinations given by general practitioners are recorded, and finally we register the numbers and types of side effects reported by general practitioners and others.

Statens Serum Institut sends reminders to parents about missing vaccines when their child turns 2, 6½ and 14 years. They only send reminders if a child is missing at least one of the vaccinations we recommend in the childhood vaccination programme.

The purpose of the reminder is to ensure that as many children as possible are vaccinated and protected against the serious diseases that the vaccines can prevent.

The Danish childhood vaccination programme functions well. As a consequence, the diseases against which children are vaccinated are very rare in Denmark. However, it is important to continue vaccinating children, because they risk being infected when travelling outside Denmark and because there is still a risk that the diseases may occur in Denmark again.

## More information

[www.sst.dk/en](http://www.sst.dk/en) – Danish Health Authority

Information on infectious disease and public vaccination programmes.

[www.laegemiddelstyrelsen.dk](http://www.laegemiddelstyrelsen.dk) – Danish Medicines Agency

Information on vaccines and side effects.

[www.indlaegsseddel.dk](http://www.indlaegsseddel.dk)

[www.ema.europa.eu](http://www.ema.europa.eu)

Information on vaccines and side effects.

[www.ssi.dk](http://www.ssi.dk) – Statens Serum Institut

Information on the childhood vaccination programme, the individual diseases and vaccines.

[www.who.eu](http://www.who.eu) – World Health Organization (WHO)

Information on WHO's objectives for childhood vaccinations programmes and vaccination statistics in the WHO European Region.



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