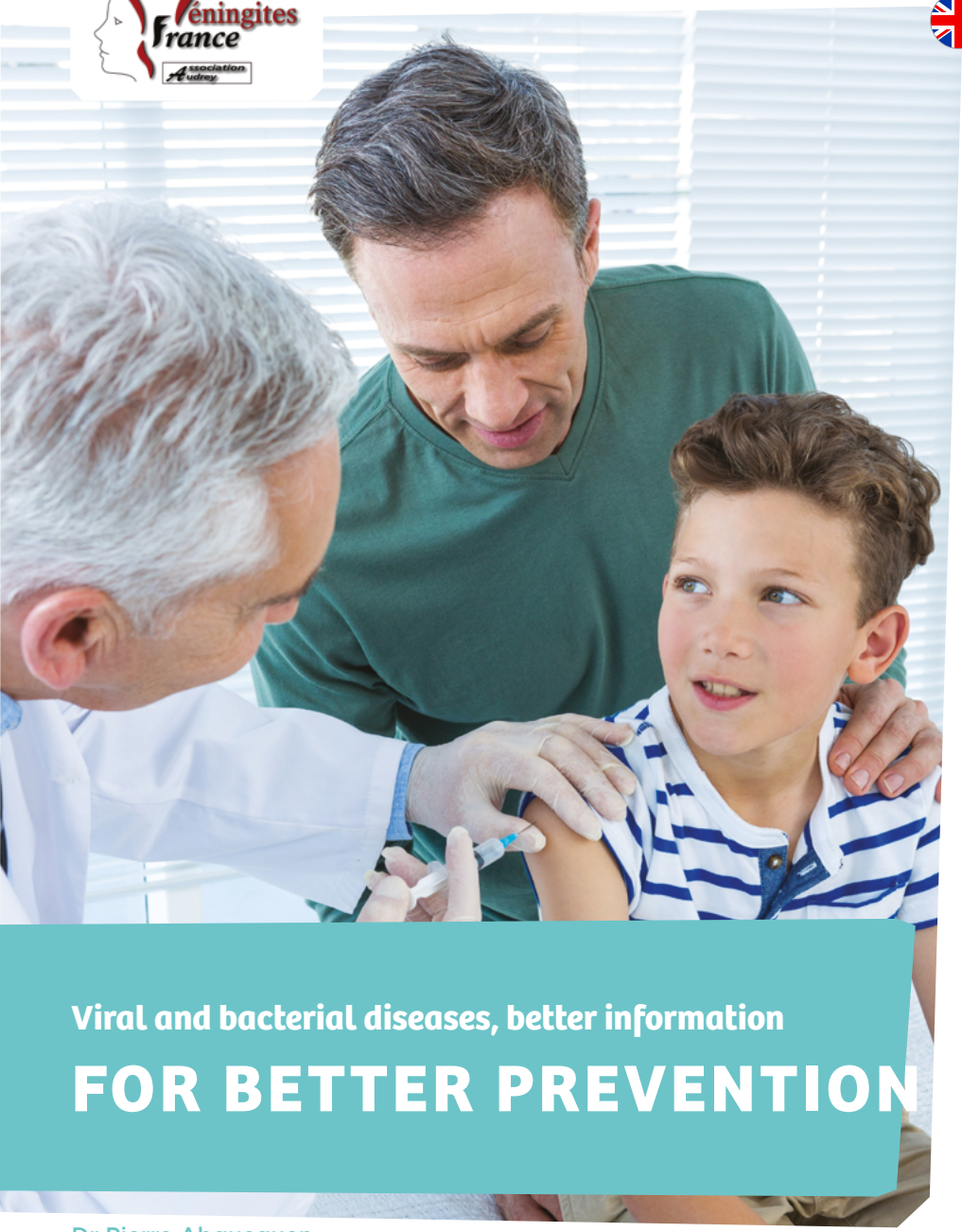
Méningites France
Association Audrey



Viral and bacterial diseases, better information

FOR BETTER PREVENTION

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Viral and bacterial diseases, better information for better prevention

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Summary

Being informed in order to act

For many years, health authorities, notably the French High Council for Public Health, have observed and expressed concern about the decline in vaccinations in France.

Confidence in immunization has been eroded, but this is not the only issue currently at stake. Public knowledge of measles, invasive meningococcal disease, rubella and tetanus is insufficient.

Thanks to public health campaigns and vaccination, some of these bacterial or viral diseases have almost disappeared from mainland France and therefore from many people's minds. At most, they are often considered to be simply benign childhood diseases.

However, on a regular basis, too regularly, they return to the headlines when a person dies.

Now more than ever, therefore, it is necessary to strengthen communication, both on vaccination (to combat misconceptions and misinformation), and on the various diseases from which immunization protects us.

Through this booklet, designed by Méningites France - Association Audrey, and with the support of numerous stakeholders, we aim to contribute to public health and, first and foremost, to highlight the benefits of vaccination, often the only way to prevent some very deadly diseases.

Jimmy Voisine
President of Méningites France - Association Audrey

Viral and bacterial diseases, a public health challenge

Every year in France, the seasonal influenza epidemic occurs between December and April. Approximately 2.5 million people are affected. Mortality from seasonal influenza is mainly among the elderly (over 90% of influenza-related deaths occur in people aged 65 and over). It is estimated at around 4,000 and 6,000 deaths on average each year in France.

The chronic form of hepatitis B, meanwhile, is responsible for more than 1,000 deaths each year in France.

Between 2008 and 2012, more than 24,500 cases of measles were reported in France. Taking underreporting into account, the number of measles cases potentially preventable by vaccination can be estimated at more than 50,000. Of all reported cases, more than 1,500 developed severe pneumonia, 35 developed encephalitis (a serious neurological complication) and there were 20 deaths. France remains the European country that reported the most cases of measles in 2019 with 2,636 cases, of which 31 patients were admitted to intensive care and 2 patients died

These three examples demonstrate that viral and bacterial diseases as a whole still represent a public health challenge. This challenge can be summarized in one word: prevention. On the one hand, it is a matter of protecting each individual from the disease and, on the other hand, it is about protecting the population from an epidemic (something that remains a possibility). Moreover, as antibiotic resistance develops, it is becoming harder to fight these diseases. Prevention is therefore essential.

Since the work of Edward Jenner and then Louis Pasteur, knowledge of these diseases, their monitoring and the development of vaccinations have made spectacular progress. This must not distract from the work that remains to be done.

The prevention of viral and bacterial diseases remains a public health challenge in which everyone can play an active role by protecting themselves and those around them via vaccination.

Whooping cough

Whooping cough is an infection caused by a bacterium - *Bordetella pertussis* or *parapertussis* - that causes a prolonged cough by secreting a toxin. In young children under 6 months of age, whooping cough can lead to complications and the development of more serious forms of the disease, with a risk of after-effects and even death.

Macrolide antibiotics may be prescribed. They have only limited effect on symptoms, but quickly reduce contagiousness and allow a return to the community after 5 days of treatment (or 3 days if treated with the Azithromycin antibiotic).

Diagnosis can be made up to the 3rd week of symptoms with the help of molecular biology techniques using nasopharyngeal secretions (aspiration or swabbing).

How is whooping cough transmitted?

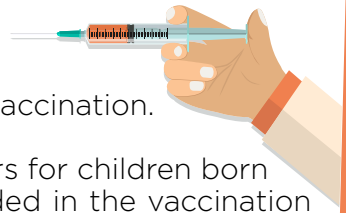
Whooping cough is an airborne disease (in particular droplets produced by coughing) transmitted up to 3 weeks after the onset of symptoms.

Young children are often infected by those around them (parents or grandparents) who have not been vaccinated or who are insufficiently vaccinated. Individuals at risk are also those likely to develop severe forms of whooping cough or those who have an underlying condition such as people with chronic respiratory disease, immunosuppressed individuals and pregnant women.

Patients are isolated in a single room when they are hospitalized and anyone entering their room must wear a mask. In the absence of severe symptoms, children can return to the community after antibiotic treatment is completed.

Only humans can be infected. In developing countries, children remain the main source of contamination. Expanded immunization programs aim to eradicate the disease.

How is whooping cough prevented?



Whooping cough can be prevented by vaccination.

It is compulsory before the age of 2 years for children born on or after 1 January 2018, and is included in the vaccination timetable from the age of 2 months, with vaccinations against diphtheria, tetanus, poliomyelitis, hepatitis B and Haemophilus b; a second dose follows at 4 months and 11 months. Booster doses are scheduled at 6, 11 and 25 years of age.

Updating the whooping cough vaccinations of future parents, grandparents and those around young children is recommended. This vaccination can be offered at the maternity ward. Whooping cough revaccination, indicated for those who have not received an adult dose for more than 10 years, is referred to as the « cocooning » strategy.

Care-givers, as well as early childhood personnel, must be vigilant regarding their own vaccinations: the booster doses for 25, 45 and 65-year olds should include the whooping cough valence (dTcaP). A number of epidemics of infections contracted in hospital, known as nosocomial infections, have been documented on French territory in connection with insufficiently vaccinated healthcare personnel.

Treatment limits patients' contagiousness. It is important to detect cases as early as possible as well as any people coughing in the vicinity of these cases and who may be carriers. Any unexplained chronic cough should be screened for whooping cough.

Antibiotic treatment to prevent infection may be prescribed to children and adults who have not been vaccinated, or who were vaccinated more than 5 years ago, within 3 weeks of exposure

Dr. Valérie Rabier

Diphtheria

Diphtheria is an infectious bacterial disease with symptoms similar to those of a sore throat. It is associated with painful and sometimes enlarged lymph nodes in the neck.

On examination, the tonsils are covered with a pearly white coating (false membranes), evolving to a greyish colour. These false membranes extend into the cavities of the nose and mouth, which can lead to the appearance of a nasal voice and a thick discharge from the nose. Extension to the larynx with voice alteration and a hoarse cough is a therapeutic emergency.

Complications can arise in some cases:

- Cardiac damage around the 10th day after the onset of symptoms with a risk of sudden death requiring close cardiological monitoring.
- Neurological impairment that may appear late, causing swallowing problems, paralysis of the limbs or respiratory muscles.
- More rarely, kidney damage.

All forms of the disease may occur: from the common sore throat to the severe form, which can quickly become life-threatening.

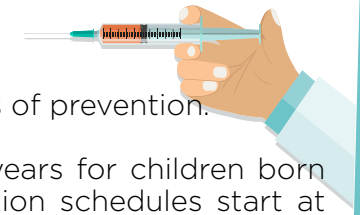
The infectious agent responsible for diphtheria is a bacterium called *Corynebacterium diphteriae*. It produces a toxin that is particularly damaging to heart and nerve cells.

How is diphtheria transmitted?

Diphtheria is mainly transmitted by airborne droplets from the respiratory tract of the person affected by the bacteria.

Corynebacterium diphteriae is an almost exclusively human bacterium.

Other modes of transmission are described: cutaneous (mainly in developing countries and/or in precarious populations) or more rarely ocular or genital.



How can diphtheria be prevented?

Vaccination is the main effective means of prevention.

It is compulsory before the age of 2 years for children born on or after 1 January 2018. Immunization schedules start at two months, combined with vaccinations against whooping cough, tetanus, poliomyelitis, hepatitis B and Haemophilus b. Boosters are scheduled at 6, 11 and 25 years of age and must be continued throughout the adult's life (at 45, 65, 75 years of age).

This has led to the virtual eradication in Europe (excluding the former USSR) of diphtheria linked to toxin-producing bacteria. Diphtheria has practically disappeared in France, with a few occasional alerts in connection with patients from countries where vaccination is not widespread (imported diphtheria).

Nevertheless, vaccination coverage in France remains insufficient among adults, falling from 90% among children to less than 50% among adults over 40 years of age.

Diphtheria is a notifiable disease in France, any confirmed case must be declared to the health authorities. Diphtheria persists throughout the world, mainly in South-East Asia and the countries of the former USSR, due to poor immunization coverage.

Dr. Hélène Cormier

Seasonal influenza

Influenza is caused by a virus that develops in the upper (consisting of the nose, mouth, pharynx and larynx) and lower (consisting of the trachea, bronchus, bronchioles and alveoli) airways. It is a respiratory virus.

There are a large number of human and non-human influenza viruses in the world. These viruses can exchange genetic material or mutate. This explains the need for a new vaccine every year.

In humans, there are three types, each comprising several strains. The influenza A virus is the most dangerous because it can change significantly and radically. The type B virus is very common and is the cause of epidemics.

Two to three days normally elapse between the time the virus enters the body and the first symptoms. This is the incubation period. This is followed by general discomfort, fatigue, aches and pains, and fever. The abruptness of the symptoms and their intensity is characteristic of the disease, but the signs are non-specific and can be misleading. They last about 5 days. Fever can exceed 40°C, accompanied by episodes of shivering, very intense fatigue causing the patient to be bedbound, headaches, aches and pains, and a cough.

The intensity of the symptoms often require a break from work of about a week. However, progress is being made towards recovery in less than a week. Nonetheless, in people suffering from chronic diseases (respiratory or cardiac diseases, diabetes, immunosuppression, etc.), or aged 65 and over, or pregnant women (the subgroups targeted for vaccination), influenza can cause serious, even fatal, complications.

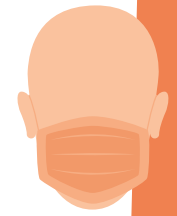
How is influenza transmitted?

Influenza is primarily transmitted through the respiratory tract. When someone has influenza, they cough, sneeze and send out microparticles of saliva that are so light that they «float» in the air and are inhaled by people closest to them, who are then contaminated.

Transmission also occurs through direct contact, such as handshakes, kissing or simply by touching objects.

How is influenza prevented?

The best ways to protect yourself from influenza are hygiene and vaccination. First, washing your hands is straightforward and always useful. Second, vaccinations are recommended for people 65 of years of age and older, as well as for certain at-risk populations and health professionals. Annual vaccination is necessary due to the variability of influenza viruses. This explains why the influenza vaccine is different every year.



In the event of proven illness, affected persons may wear a mask to limit the circulation of the virus. Furthermore, if you cough, instead of putting your hand in front of your mouth, it is better to place your forearm in front of your mouth to avoid spreading the virus via your hands.

The most common treatment offered relieves symptoms by lowering fever or reducing pain. Influenza can be complicated by bacterial superinfection, resulting in otitis, sinusitis and especially pneumonia. Antiviral treatment may be proposed and prescribed by the treating physician in certain situations. This is only really effective if it is prescribed within the first 48 hours of the onset of symptoms.

Dr. Pierre Abgueguen

Invasive Hæmophilus influenzae disease

Hæmophilus influenzae is an exclusively human bacterium, largely found in the respiratory tract.

This bacterium can be surrounded by a capsule whose nature defines its identity (this is called a serotype). Six serotypes are described and named from (a) to (f).

Colonization of mucosal surfaces can cause local or invasive infections. Invasive infections are more common during the winter.

Invasive infections can have different characteristics. Septicemia is the most frequent manifestation in all age groups (about 61% of cases in Europe).

Before the era of vaccination, *Hæmophilus influenzae* serotype b was the main bacterium responsible for meningitis in children.

Epiglottitis is an acute infection of the epiglottis, which covers and protects the larynx during swallowing, as well as adjacent tissues. This causes acute respiratory distress that can quickly lead to fatal airway obstruction.

In addition to invasive infections, *Hæmophilus influenzae* is frequently responsible for non-invasive infections.

These are mainly acute otitis media, sore throat, sinusitis, conjunctivitis and non-invasive pneumopathy, especially in the elderly and COPD (chronic obstructive pulmonary disease) patients.

How is invasive Hæmophilus influenzae disease transmitted?

Propagation between people occurs through respiratory droplets (generated by coughing or sneezing, etc.).

Neonatal transmission can also occur by aspiration of amniotic fluid or contact with genital secretions.

How is invasive Hæmophilus influenzae disease prevented?

Vaccination is specifically directed against *Hæmophilus influenzae b* because of the severity of diseases related to this serotype. This protective vaccine, given from the first months of life, is included in the childhood immunization schedule.

It is compulsory before the age of 2 years for children born on or after 1 January 2018.

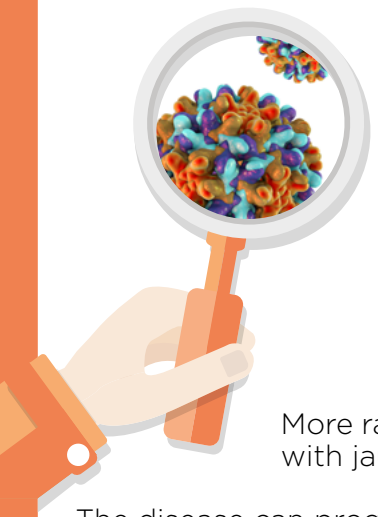
Vaccination is carried out with two doses two months apart (2 months and 4 months), followed by a booster at 11 months.

Haemophilus influenzae b vaccine is usually combined with other mandatory (hexavalent) childhood vaccines (diphtheria, tetanus, polio, acellular pertussis and hepatitis B).

Catch-up vaccinations for unvaccinated children differ according to their age: from 6 to 12 months, two injections and a booster; from 1 to 5 years, one injection is sufficient.

Dr. Muhamed-Kheir Taha

Hepatitis B



Hepatitis B is a disease of the liver caused by the hepatitis B virus (HBV). In the majority of cases, acute infection does not give rise to any apparent symptoms.

Only 40% of acute HBV infections are accompanied by symptoms: fatigue, loss of appetite, abdominal pain, nausea and vomiting, flu-like symptoms (fever and aches and pains).

More rarely, these symptoms may be associated with jaundice and dark coloration of the urine.

The disease can progress in different ways:

- In more than 90% of cases, acute hepatitis B heals spontaneously within a few weeks.
- Very rarely, it can progress to fulminant hepatitis, a serious form of liver disease that may require transplantation.
- In 5% of cases, the virus persists in the bloodstream for months, years, sometimes for life: this is known as chronic hepatitis B. If mother-to-child transmission occurs at the time of delivery, the disease progresses in the newborn child to a chronic form in 90% of cases.

These forms can develop into fibrosis or cirrhosis. Cirrhosis is the most serious stage of fibrosis. At this stage, liver cancer may develop. It is essential that anyone infected with HBV receive regular medical follow-up.

How is hepatitis B transmitted?

The hepatitis B virus is transmitted through blood and other body fluids, primarily vaginal secretions and semen.

Contamination is therefore possible through:

- unprotected sex;
- the sharing of toiletries (toothbrushes, nail clippers, razors, etc.) because they may contain blood droplets;
- a contaminated syringe in drug users;
- tattoo or piercing with unsterilized or poorly sterilized equipment...
- An infected mother can also pass the virus to her baby during delivery.

In France, transmission through sexual contact and among drug users is predominant.

How is hepatitis B prevented?

In France, vaccination is compulsory for all children born on or after January 1st, 2018.

Catch-up vaccination is recommended for children and adolescents up to and including the age of 15 years.

From the age of 16, vaccination is recommended for people at risk of HBV infection: those from countries where the disease is common, travellers, close relatives of a person with hepatitis B, intravenous drug users, people having unprotected sex, etc. It is mandatory for certain professionals and students, including those in the health sector.

The hepatitis B vaccine is highly effective. Protection is very long-lasting, probably for life, even if the antibodies are no longer detected in the blood. There is no need for boosters.

Dr. Valérie Delbos

Invasive meningococcal disease

Meningococcus is a bacterium found in humans. It resides in the throat without causing symptoms in the majority of cases (asymptomatic carrying).

Some hyperinvasive strains are able to pass through the bloodstream to spread throughout the body and cause serious infections such as septicemia (infection in the blood) or meningitis (when the bacteria cross the barrier that separates and protects the central nervous system).

Meningococcus is surrounded by a capsule the composition of which defines the serogroup of the strain. Serogroups A, B, C, W, Y and X are responsible for almost all cases of the disease worldwide but with varying proportions among these serogroups. Serogroup B is predominant in Europe.

The mortality rate of invasive meningococcal diseases remains high (10%) despite good management. These diseases can leave serious after-effects in survivors, including amputations.

How is meningococcal disease transmitted?

Meningococcus is a fragile germ and cannot survive outside the human body.

It is transmitted from person to person through contact with respiratory droplets (generated by coughing or sneezing, etc.) of infected people (sick or asymptomatic carriers).

It is promoted by close face-to-face contact (less than one meter) and the risk of transmitting it increases with the duration of contact.

How is meningococcal disease prevented?

Preventive measures to be taken in the patient's environment (antibiotics and vaccination in some cases) aim to eliminate the bacteria in asymptomatic carriers, reduce the risk of secondary cases and limit the spread of the bacteria in the general population.

In addition, vaccination is recommended as a preventive strategy. In Europe, the vaccines available are against serogroup C or against serogroups A, C, Y, W. There is also a protein vaccine (non capsular) against serogroup B strains.

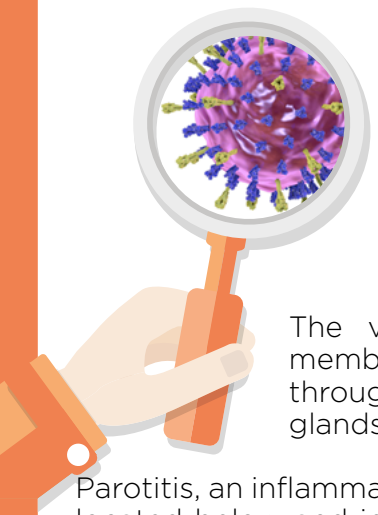
In France, vaccination against meningococcus C is compulsory for children born on or after January 1st, 2018, with a dose at 5 months and another at 12 months. In addition, catch-up vaccination against meningococcus C is recommended for unvaccinated individuals aged 2 to 24 years (one dose of vaccine).

Good immunization coverage in adolescents and young adults is important to establish herd immunity because meningococcal carrying and transmission are common in these age groups.

Vaccination against other serogroups is recommended in subjects at risk and for the control of epidemic situations.

Dr. Muhamed-Kheir Taha

Mumps



Mumps is caused by the mumps virus, which only affects humans. It is a contagious disease. In a third of cases, the disease has no symptoms, it is said to be asymptomatic. In other cases, the disease appears 2 to 3 weeks after contact with a person carrying the virus.

The virus penetrates through the mucous membranes of the nose or mouth and passes through the bloodstream to reach the parotid glands, genitals, pancreas, brain, etc.

Parotitis, an inflammation of the parotid gland, a salivary gland located below and in front of each ear, is the most common manifestation of the disease. This leads to painful swelling of one or both parotid glands, associated with ganglions in the neck area. There may be fever, usually moderate, and headaches.

Mumps can also cause orchitis, an inflammation of the testicles, especially after puberty. This causes painful swelling of one testicle, sometimes both. The inflammation can be responsible for destruction of the testicle, which can lead to fertility problems or even sterility. The other diseases are inflammation of the pancreas, pancreatitis, and damage to the brain such as meningitis (for which evolution is favorable) and more rarely encephalitis, which can be fatal and responsible for neurological after-effects. Once the disease is declared, there is no specific treatment.

How is mumps transmitted?

The disease is mainly airborne, transmitted through contact with an unvaccinated and infected person, who may or may not be symptomatic. This person sends microparticles of saliva into the air which may be inhaled by people nearby.

More rarely, transmission occurs through direct contact with objects that have been contaminated with the saliva of people with the disease.

How is mumps prevented?

The first step in protecting yourself against mumps is to avoid contact with anyone who has the virus. It is therefore recommended that people who are affected stay at home.

But the best way to protect yourself against mumps is vaccination. In France, this is compulsory, before the age of 2, for all children born on or after 1 January 2018.

It consists of two injections, given at 12 months of age and then between 16 and 18 months of age, as some children do not respond to the first injection.

This vaccination is combined with measles and rubella vaccinations in the same injection. It then provides long-term protection. Vaccination also prevents the virus from circulating if enough people are vaccinated. The mumps vaccine is a so-called live attenuated vaccine, i.e. it contains a strain of the virus that no longer has the ability to induce the disease but allows the body to develop defence mechanisms against the virus.

It is contraindicated in people who are immunocompromised, i.e. whose immune system is not functioning properly, whether due to illness such as immune deficiencies or HIV infection, or due to treatments such as chemotherapy, immunosuppressive drugs or corticosteroids.

Dr. Diane Sanderink

Human Papillomavirus or HPV

Human papillomaviruses are a family of viruses that can infect the skin and mucous membranes, especially genitals.

More than 200 HPV types have been characterized.

They can cause benign but sometimes very embarrassing and contagious lesions such as warts (on the skin) and condylomas or papillomas on the mucous membranes (oral, anal or genital).

Certain types of papillomavirus, notably HPV 16 and 18, known as high-risk oncogenic HPV, can cause cancer: cervix, vagina, vulva, penis, throat (tonsils, base of tongue) and anus.

It is estimated that high-risk HPVs are responsible for nearly 100% of cervical cancers, 88% of anal cancers and 30% of oropharyngeal cancers.

In 80-90% of cases, infection with all these types of HPV virus is transient, without any particular signs. The immune defences make it possible to eliminate them spontaneously within 12-18 months.

But when infection with high-risk HPV persists, it may lead to the development of precancerous lesions that can progress to cancer after 10-20 years.

How is HPV transmitted?

Contamination of the mucous membranes occurs mainly through sexual intercourse (vaginal, oral, anal) and skin contact (intimate touching) of lesions infected with HPV viruses.

Approximately 80% of men and women are exposed to these viruses during their lifetime and the majority of infections occur early in sexual life.

HPV infections are related to the number, type and frequency of sexual intercourse, the number of partners and the timing of intercourse.

How is HPV prevented?

There is no treatment for human papillomavirus infection. Condom use only provides partial protection but is still the best prevention against other Sexually Transmitted Infections (STIs) or condyloma (genital warts).

Prevention of HPV is therefore primarily through vaccination.

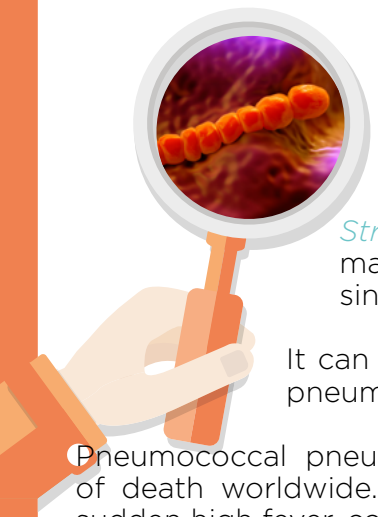
In France, it is recommended in young girls, before first sexual contact, from the age of 11 to 14 years old with catch-up until the age of 19 years old. It is also recommended for boys since January 1st, 2021.

Since April 2017, the French Ministry of Solidarity and Health offers vaccination to men who have sex with men up to the age of 26.

Different vaccines are available that protect against certain types of HPV. The currently recommended vaccine is a vaccine that protects against 7 high-risk HPV types and 2 types of HPV that cause warts.

Dr Pascale Fialaire

Pneumococcal disease



Pneumococcus is a bacterium that lives only in humans. It is naturally present episodically in the pharynx (throat) of many people (about 10% of adults and 30-60% of children).

Streptococcus pneumoniae is one of the main bacteria responsible for otitis and sinusitis.

It can also cause very serious diseases, mainly pneumonia and meningitis.

Pneumococcal pneumonias are one of the leading causes of death worldwide. They typically manifest themselves as sudden high fever, cough, chest pain and difficulty breathing.

The treatment of these diseases is based on antibiotics. It is sometimes necessary to hospitalize patients with this condition, especially if they have breathing difficulties. Without proper antibiotic treatment, many patients with pneumococcal pneumonia may be at risk of death.

Pneumococcal meningitis is the most common and most serious form of bacterial meningitis. Signs include head and neck pain, fever, and sometimes neurological disorders and vomiting. Treatment of meningitis due to pneumococcus includes high doses of antibiotics and, in adults, corticosteroids that limit brain inflammation.

Even when properly treated, the prognosis is bleak, with 20-30% of patients dying. Survivors often have neurological after-effects, including hearing impairment.

How is pneumococcal disease transmitted?

Pneumococcal disease is spread from person to person through direct and close contact with the infected person or carrier, especially through kissing, coughing or sneezing.

An individual with pneumococcus in the pharynx can pass it on to others by talking or coughing. Fortunately, people infected in this way do not, in most cases, develop any disease. This is called asymptomatic carrying.

A person who has had a pneumococcal disease is not protected against other pneumococcal diseases. One reason for this is that there are many capsular serogroups of pneumococcus.

How is pneumococcal disease prevented?

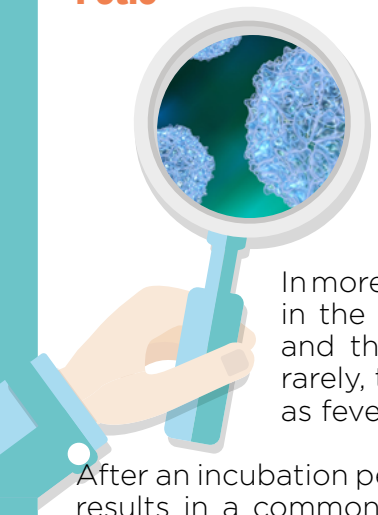
La vaccination contre le pneumocoque est la meilleure Vaccination against pneumococcus is the best measure to prevent infection from this bacteria. In all countries where the vaccination is used, it has significantly reduced the number of serious pneumococcal infections.

In France, it was introduced in 2002 and is compulsory before the age of 2 years for all children born on or after 1 January 2018. It is also recommended for adults at high risk of severe pneumococcal disease: patients with immune system disorders, and people with chronic diseases such as chronic respiratory or cardiac disease, diabetes, etc. Pneumococcal vaccination includes 3 injections and protects against pneumococcus from several different capsular serotypes (13 serotypes for children under 2 years old and 24 serotypes for adults).

Vaccinating children has had the unexpected effect of reducing infections in the elderly. Vaccinated children carry less pneumococcus in their pharynx and therefore transmit less to their grandparents.

Dr. Vincent Dubée

Polio



Poliomyelitis is caused by a virus that is strictly human-transmitted. It is an enterovirus, which means that it develops in the digestive tract. The disease mainly affects children, most often before the age of 5 years.

In more than 90% of cases, the virus develops only in the digestive tract, antibodies are produced and the disease is cured spontaneously. More rarely, there are minor forms manifesting mainly as fever.

After an incubation period of a few days to 1 month, the disease results in a common infectious state with fever, sore throat, abdominal pain and muscle aches.

Ultimately, only 1% of polio cases develop neurologically and result in either meningitis or paralysis. Paralysis can be very severe, affecting the respiratory muscles as well, and can be life-threatening.

Poliomyelitis is a highly contagious infectious disease, and despite the very low percentage of forms with complications, in the 1940s there were still nearly 1,000 cases of paralytic forms per year.

What's more, these paralytic forms are irreversible. In fact, the virus develops in the cells that control muscle contraction and destroys them permanently. It is these neurological forms that determine the seriousness of the disease, with possible deaths in these cases.

In children with paralysis, the death rate reported by the World Health Organization is around 5-10%.

How is polio transmitted?

The virus multiplies in the digestive tract. It is passed in the stool for up to 20 weeks after infection begins. It is therefore a disease that is part of what is known as fecal peril. This means a disease transmitted by direct contact, from person to person, in unhygienic conditions. It is nowadays present in countries where the health system is failing. Water and food contaminated with human feces can also be a mode of transmission.

These viruses can survive for several weeks in the external environment and are resistant to many antiseptics. Even asymptomatic patients will pass the virus in their stool for several weeks, which explains the high contagiousness of the virus.

How is polio prevented?

The only method of prevention available today is vaccination. There is only one type of vaccine used in France today. The vaccine is made up of dead viruses that are said to be inactivated. It prevents paralyzing neurological forms and has almost no side effects or contraindications. It is combined with other routinely recommended vaccinations such as diphtheria, tetanus, whooping cough and Haemophilus. It is compulsory, before the age of 2 years, for all children born on or after 1 January 2018.

There is no cure for the disease. Vaccination is the only existing weapon against this virus.

For neurological disorders that can lead to significant disabilities with paralysis or deformities due to the progressive disappearance of muscles, only surgery and appliances can be offered. It is estimated that 50,000 people in France still have polio after-effects.

Dr. Pierre Abgueguen

Measles

Measles is a highly contagious viral disease causing a high fever accompanied by spots all over the body.

It can be accompanied by respiratory complications (bronchitis, pneumonia) and neurological complications (encephalitis, myelitis) that can leave after-effects.

It was very frequent before the introduction of vaccination for young children at the beginning of the 1980s, and remains present in France due to insufficient vaccination coverage.

In 2019, 2,636 cases of measles we reported. 31 patients were admitted to intensive care. 2 patients died.

The disease occurs 10 to 14 days after contact with a contagious person. Symptoms begin with a high fever, cough, conjunctivitis and watery eyes. Pimples appear after 4 days, starting behind the ears and moving down to the chest and the rest of the body. They don't itch and disappear after a week. Inflammation of the mucous membranes of the mouth with whitish pimples and the Koplik sign (small bluish-white spots on the inside of the cheeks before the rash), are characteristic of the disease. There is no specific treatment for measles. Fever medication and antibiotics in case of bacterial superinfection may be offered to the patient.

How is measles transmitted?

Measles is probably one of the most contagious diseases in the world. A sick person can infect at least 20 non-immune people. Humans are most affected by the virus. It is transmitted by air.

Transmission is facilitated by the fact that patients cough a lot.

In hospital, patients suspected of measles are isolated in a single room and the nursing staff must wear a special mask called an FFP2 mask. Several nosocomial epidemics have been described due to insufficient vaccinations among healthcare personnel.

How is measles prevented?

The vaccine marketed in France is combined with rubella and mumps vaccines. It is a live attenuated vaccine that is contraindicated in immunocompromised people, pregnant women, children under 6 months of age and people with egg allergy.

As of January 2018, it is estimated that 20.4 million deaths have been averted worldwide through the use of the vaccine. The eradication of measles is one of the objectives of the World Health Organization.

In France vaccination against measles is compulsory, before the age of 2 years, for all children born on or after January 1st, 2018. A vaccine is offered at 12 months and a second dose between 16 and 18 months.

People who are affected, if they are not hospitalized, must stay at home and wear a mask. School avoidance is recommended for up to 5 days after the outbreak. Persons in contact with a contagious person can be vaccinated within 3 days of contact. If the vaccine is contraindicated, an injection of immunoglobulin, antibodies, may be offered in a hospital setting.

Health personnel should pay particular attention to their own vaccinations. It is mandatory for health professionals to report any case of measles to the health authorities.

Dr. Valérie Rabier

Rubella

Rubella is caused by a virus that only affects humans.

In half of the cases, it causes no symptoms. In others, about 2 weeks after being in contact with a person carrying the virus, the disease manifests itself as a short flu-like syndrome, with moderate fever, muscle and joint pain and nodes in the neck.

They are followed by a rash that starts on the face, spreads rapidly and lasts an average of 3 days.

The disease is usually not serious. More severe forms can affect the brain, meningoencephalitis, and cause joint pain for a few weeks. The disease is immunizing, which means that once you've have it once, you won't get it again. Rubella is very serious when it occurs in pregnant women because the virus is then passed on to the fetus. It is a teratogenic virus, which means it causes malformations in the fetus. It can be responsible for fetal death, severe heart, brain or eye damage, or deafness.

The disease can also manifest itself as a persistent, widespread, highly contagious infection, often associated with malformations, with an estimated 20% risk of death. This form of the disease has fortunately become rare nowadays thanks to the widespread use of vaccination.

How is rubella transmitted?

The disease is transmitted in two ways. First, through the air, in contact with an unvaccinated person who is infected with the virus, who may or may not present symptoms.

This person sends microparticles of saliva into the air to be inhaled by people nearby. The disease can also be transmitted by transplacental transmission, i.e. the infected mother passing the virus to her fetus.

How is rubella prevented?

The first way to protect yourself from rubella is to avoid contact with anyone who has the virus. It is therefore recommended that sick people stay at home.

The best way to protect yourself against it is to get vaccinated. In France, this is compulsory, before the age of 2, for all children born from 1 January 2018. It consists of two injections, given to children at the age of 12 months and again between 16 and 18 months.

This vaccination is combined with measles and mumps vaccinations in the same injection. It then provides long-term protection. Vaccination not only protects you against rubella yourself, but also, if enough people are vaccinated, prevents the virus from circulating.

Because of the risk of congenital rubella, it is particularly important to be protected during pregnancy. Women of childbearing age must have received two injections of rubella vaccine before pregnancy, as the vaccine cannot be given during pregnancy.

Any unvaccinated woman who has just given birth should be vaccinated against rubella very soon after delivery, to prevent her from remaining at risk in a subsequent pregnancy.

This vaccine is contraindicated for people who are immunocompromised, i.e. whose immune system is not functioning properly, whether due to a disease such as immune deficiency or HIV infection, or due to treatments such as chemotherapy, immunosuppressive drugs, etc.

Dr. Diane Sanderink

Tetanus

Tetanus is a disease whose effects are related to those of a toxin on our body. It involves damage to our nervous system by the «tetanospasmine» of the *Clostridium tetani*.

This toxin is responsible for an extremely intense and painful contraction of the muscles of our body which are then «tetanized».

The earliest damage is to the muscles of the jaw, which can no longer open.

More severe manifestations are also frequent and the muscles necessary for breathing (diaphragm, larynx) may then require intensive and prolonged medical care. Up to 2 out of 3 patients require ventilatory support with an artificial respirator for several weeks.

More rarely, this toxin can also reach the heart muscle and cause large arrhythmias that can lead to sudden death.

How is tetanus transmitted?

Clostridium tetani is naturally present in our environment (about 30% of soils contain it). Contamination usually occurs via a wound during gardening, for example, or with an object that has been dirtied by soil. The bacteria enter the body directly and multiply at the wound site. They then produce the toxin that acts locally on the first neurons and muscles it encounters but also on all the muscles of the body.

In France, it is the elderly, who have not received a booster vaccination for several decades, who are most at risk.

How is tetanus prevented?

Vaccination is the only way to protect against the disease, as the disease itself does not confer any protection (no antibodies to the toxin develop during the course of the disease, and therefore no residual protection).

Globally, the annual number of deaths due to maternal and neonatal tetanus decreased from about 200,000 in 2000 to 59,000 in 2008. In France, there are currently fewer than 10 deaths per year. All of these infections and deaths would have been prevented if these patients had been properly vaccinated.

Tetanus is one of the compulsory vaccinations in France, before the age of 2 years, for all children born on or after 1 January 2018. Vaccination is carried out with a first injection at 2 months of age, a booster at 4 months of age and another booster at 11 months of age. Subsequent boosters are recommended at age 6, 11-13, 25, 45, 65 and then every 10 years.

In a person who has never been vaccinated or whose booster is too old, depending on the situation, the age of the vaccination and the size of the wound, a booster may be proposed, possibly in combination with immunotherapy, which corresponds to an injection of antibodies, with tetanus immunoglobulin providing immediate protection while the vaccine has a delayed effect. When the vaccine is indicated, it is most often proposed to carry out a vaccine associated with diphtheria, polio, and whooping cough.

It will probably never be possible to completely eradicate this disease since it is transmitted by a bacterium that occurs naturally in most environments. Direct contact of the soil with a wound should therefore be avoided, for example by using gloves when gardening or doing DIY. In the event of a wound caused by a dirty object, the wound must be cleaned immediately.

Dr. Rafaël Mahieu

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For more information

On viral and bacterial diseases and vaccination:

- http://vaccination-info-service.fr
- www.santepubliquefrance.fr
- www.chu-angers.fr
- www.pasteur.fr

On patients' and families' associations working for immunization:

- www.ensemblecontrelameningite.org
- www.associationaudrey.fr
- www.comomeningitis.org

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