



Disease and vaccination

A quick reference guide
to vaccine-preventable
diseases in Canada.

Provided as an educational
service by sanofi pasteur.

Based on information adapted
from www.phac-aspc.gc.ca.

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At the end of this booklet, you will find space to write down any questions you have for your child's doctor.



Paediatric Illness

Infants are all born with some natural protection against disease in the form of *antibodies* passed on from the mother. However, over the first year of life, this natural *immunity* declines as a child's *immune system* develops. This first year can be a critical time for a child, as the *immune system* is exposed to many potentially dangerous *bacteria* and *viruses*.¹

Vaccination against disease

Childhood vaccination may be a safe and effective way to build up *resistance* to some of the more common childhood (and some adult) diseases.¹

Vaccinations work by introducing a small amount of the disease-causing *bacteria* or *virus* into the body so that the *immune system* will attack it to prevent disease. The *bacteria* or *virus* that is in the vaccine is either dead or very weak, so the body wins the fight easily, and *antibodies* are produced against future *infection*.¹

In Canada, vaccination is considered routine. All provinces and territories offer vaccination free-of-charge against many childhood diseases. These vaccines are given by injection and are commonly called "shots". Shots commonly start at about the age of two months. Some are routine and are automatically given to all children. Others are only given if your child is at increased risk of coming into contact with the disease, like if you and your child are travelling outside of Canada. It is important to discuss with your doctor which shots your child needs.¹

Common vaccine-preventable diseases are described in the following pages of this booklet.



Vaccine-preventable diseases

Check with your province or territory for up to date immunization schedules and guidelines.²

Diphtheria

Diphtheria affects the upper *respiratory tract*. It is caused by toxic strains of the *Corynebacterium diphtheriae* bacteria, which causes the formation of a greyish membrane in the *respiratory tract* that makes it difficult to breathe. The *bacteria* are primarily found in the nose and on the skin of affected carriers. *Infection* is spread by breathing in small *bacteria*-containing droplets of moisture coughed or sneezed out by an infected person. Once exposed, symptoms normally do not appear for two to five days. The person is *infectious* for up to two weeks. Diphtheria is fatal in 5% to 10% of cases.^{3†}

Haemophilus influenzae type b (Hib)

Haemophilus influenzae type b (Hib) is the most common cause of meningitis, swelling of the brain tissue, in Canada. The *bacteria* can also cause other diseases like *epiglottitis*, *septicemia*, *cellulitis*, *pneumonia*, *septic arthritis*, and *pericarditis*.³

Meningitis is most common in children between 1 month and 2 years of age. It's much less common in adults. Specific symptoms in infants are *fever*, feeding problems, vomiting, irritability, *seizures*, and high-pitched crying. In adults, symptoms generally include headache, stiff neck, sore throat and vomiting. Adults

can become extremely ill within 24 hours and children even sooner. Symptoms can rapidly progress to *stupor*, *coma*, and death in some cases.^{4†}

Before immunization became routine, well over half of Hib diseases occurred in children younger than 18 months of age and over 80% occurred in children younger than 5 years. Among infants who survive meningitis, 20% to 30% may experience permanent *neurologic damage*. An estimated 1% to 5% of Hib-related diseases are fatal.^{3†}

Hepatitis B

Hepatitis B is one of several *viruses* that cause *inflammation* of the *liver* (hepatitis). In about half of cases, *infection* with hepatitis B has no symptoms. Hepatitis B is usually spread through exposure to infected blood or *bodily fluids*. Once infected, an individual may become a *chronic* carrier of the disease. Hepatitis B is fatal in about 1% of cases.^{3†}

Measles (red measles)

Measles is a common disease in many parts of the world, although it is much less commonly seen in countries with widely-used vaccination programs, like Canada.³ It is highly *contagious*.⁴ In infants and adults, *infection* with measles usually leads to the development of other diseases like *otitis media*, *pneumonia* and *encephalitis*.³

The symptoms of measles usually begin about a week or two after *infection*. Symptoms may first appear to be a cold or flu *infection*, but usually after a few days an infected person may develop white spots inside the mouth and a skin rash. The rash begins near the ears



and spreads to the rest of the body as it begins to fade on the face. Measles *infection* is spread by breathing in small *virus*-containing droplets of moisture coughed or sneezed out by an infected person. Once infected with the measles *virus*, a person is usually *infectious* for a few days before the rash appears and until the rash disappears.⁴ Measles vaccine is usually given in combination with mumps and rubella (MMR vaccine).³

Meningococcal disease

Meningococcal disease is caused by a bacterium known as *meningococcus*. Some people carry this *germ* in their throat or nose without getting sick. However, in rare instances, the *germ* can cause meningitis (an *inflammation* of the tissue surrounding the brain and *spinal cord*), and meningococemia (a widespread *infection* of the blood and other organs).⁵

Meningococcal *infection* is not very *contagious* and is fairly rare in Canada. The disease is spread through close contact with an infected person, such as kissing or sharing food utensils or water bottles. Symptoms are similar to *infection* with *haemophilus influenzae* type b (Hib), described earlier in this brochure. Children under the age of five, and particularly those under the age of one, are at highest risk, followed by teenagers between 15 and 19 years of age. About 10% of meningitis and meningococemia are fatal, and another 10% of those who recover will have serious long-term complications such as brain damage, deafness, or *seizures*.^{5†}

Mumps

Mumps is caused by the paramyxovirus, a relative of the measles *virus*. It is quite contagious and causes painful swelling of the salivary glands accompanied by high *fever*. Mumps can also lead to swelling of the brain, *pancreas*, *testes* or *ovaries*.⁴ Prior to the widespread use of the mumps vaccine, mumps was a major cause of viral meningitis in Canada.³

Mumps is spread by breathing in small *virus*-containing droplets of moisture coughed or sneezed out by an infected person, or by touching objects that have been exposed to contaminated saliva. The first symptoms begin to appear about two to three weeks after *infection*.⁴ Mumps vaccine is usually given in combination with measles and rubella (MMR vaccine).³

Pertussis (whooping cough)

Pertussis (whooping cough) is caused by the *bacteria Bordetella pertussis*. It is a highly *contagious infectious* disease characterized by severe coughing spasms. The coughs usually end in a prolonged, high-pitched, deeply indrawn breath, hence the name whooping cough. Pertussis can be severe and complications are most frequent in children under one year. Complications include *apnea*, *pneumonia*, *seizures*, *inflammation* of the brain, and death. In children under one year of age, whooping cough is fatal in one out of every 200 cases.[†] Incidences of pertussis have been increasing in Canada in recent years.^{3,4}



Pertussis is spread by breathing in small *bacteria*-containing droplets of moisture coughed out by an infected person. Mild cold-like symptoms begin to appear about one to two weeks after *infection*, followed by severe coughing fits and gradual recovery. *Infection* lasts about six weeks, however a person is generally not *infectious* after about the third week of illness.⁴

Pneumococcal

The *bacteria Streptococcus pneumoniae* (pneumococcus) is the leading cause of *invasive bacterial infections*, meningitis, bacterial *pneumonia* and acute *otitis media* (AOM) in children. Young children and the elderly are most at risk.³

Many people carry pneumococcus without getting sick. However in some cases, the *bacteria* overpowers the body's natural defences and leads to serious disease. The most serious of these is meningitis. Like other causes of meningitis, the symptoms are similar to *infection* with *haemophilus influenzae* type b (Hib), described earlier in this brochure. Pneumococcal meningitis is fatal in up to 26% of cases.⁴ Among those who recover, it can cause permanent health effects, including brain damage and hearing loss.⁶

Polio

Polio (poliomyelitis) is caused by poliovirus. It affects mainly the brain and *spinal cord*. Prior to a vaccine for polio being available, poliomyelitis was a common disease in Canada and other industrialized countries. Polio *infections* can result in *paralysis* and about

11,000 people in Canada were paralyzed between 1949 and 1954 due to *infection* with the *virus*. Currently less than 1 in 100 *infections* result in *paralysis*. Canada has been considered polio-free since 1994, nonetheless routine vaccination is still recommended because of the risk of contracting the disease outside of Canada. For example, in 1996, a 15-month old Canadian boy travelling abroad contracted poliovirus.³

Poliovirus is spread by swallowing food or water contaminated with infected *faeces*. In children, symptoms usually appear three to five days after *infection*. These generally include a general feeling of not being well, slight *fever*, headache and vomiting. Most children recover in two to three days. In adults and older children, symptoms start to appear about seven days following *infection* and are generally more severe: severe headache, joint stiffness, deep muscle pain, odd sensations such as pins and needles, and in some cases permanent *paralysis*. Permanent muscle weakness in one or more muscles is also a common consequence of polio *infection*. Currently, polio cannot be cured and must run its course.⁴

Rubella (german measles)

Infection with the rubella *virus* generally produces mild rash and joint-pain symptoms.⁴ The primary objective of vaccination against rubella is to prevent *infection* during pregnancy.³ *Infection* during the first 16 weeks of pregnancy may lead to miscarriage or serious birth defects.⁴ Vaccination against rubella was introduced in Canada in 1969, and rubella incidence in Canada has remained relatively low since the mid-70s.³



Rubella is spread by breathing-in small *virus*-containing droplets of moisture coughed or sneezed out by an infected person. The first symptoms begin to appear about two to three weeks after *infection*. Once infected with rubella, a person is usually *infectious* for a few days before the rash appears and until the rash disappears.⁴ Rubella vaccine is usually given in combination with mumps and measles (MMR vaccine).³

Tetanus (lockjaw)

Tetanus is a serious, acute disease caused by an extremely potent *neurotoxin* produced by the *Clostridium tetani bacteria*, which is found in soil and animal *faeces*. Tetanus is uncommon in Canada and other developed countries, mainly due to vaccination and hygiene, but is quite common throughout the world. Tetanus is fatal in 20% to 90% of cases.^{3†}

Symptoms usually appear five to ten days after *infection*, but they may appear sooner. Jaw stiffness, or lockjaw, is the most common symptom. Other symptoms include restlessness, difficulty swallowing, headache, sore throat, *fever*, muscle spasms, and general stiffness. In severe cases, full-body spasms may prevent normal breathing due to the constriction of chest and throat muscles, resulting in oxygen deprivation or fatal suffocation. Prevention through vaccination is considered far better than treating tetanus once it develops. In young children tetanus is often given in combination with diphtheria and pertussis (whooping cough).⁴

Varicella (chickenpox)

Varicella is generally considered a childhood disease, although it can affect adults as well.³ Most people are familiar with the characteristic itchy rash of chickenpox: clusters of small, raised or flat spots, fluid-filled blisters, and *crusting*.⁴

Chickenpox is highly *contagious*. It is spread by breathing-in small airborne droplets of moisture containing the varicella-zoster *virus*. Symptoms begin 10 to 21 days after *infection*, and usually include headache, *fever* and general feeling of illness. The characteristic chickenpox rash begins to appear about a day or two later. Most of the rash is on the body trunk with relatively few spots on the face, arms and legs. Once infected, a person is *contagious* as soon as symptoms start to appear, and remains *contagious* until the last blisters have *crusted*.⁴



The Myths and Facts about Vaccination

Myth: Nobody gets these diseases anymore in Canada, so there is no need to vaccinate.

Fact: Unless a disease has completely disappeared, there is still a real risk of an outbreak. This is especially true in a global society, such as ours, because some diseases that are rare in Canada are much more common in other parts of the world. The only disease that has really been eliminated worldwide is small pox. By vaccinating against vaccine-preventable diseases, we are helping to keep the incidence of these diseases low in Canada.⁷

Myth: Vaccines don't work.

Fact: Although no vaccine will work 100% of the time in 100% of people, vaccines are nonetheless extremely effective. In fact, many vaccines work so well that many of the diseases that they prevent are now rare in Canada. Some vaccines need to be taken several times to be fully effective in some people. This is why some immunization programs have a second or third dose of the vaccine. Other vaccines require a "booster shot" because the protection offered by the vaccine wears off over time.⁷

Myth: Vaccines aren't safe.

Fact: Serious side effects with vaccines are very rare. The most common severe side effect is an allergic reaction to the vaccine. But the chances of this happening are less than one in a million. The dangers of vaccine-preventable illness are much higher. Minor side effects from vaccines are relatively common.

These include a mild *fever* or tenderness around the injection site. These are annoying but are quite normal. In fact they show that your *immune system* is reacting normally to the vaccine.⁷

Myth: Vaccines contain toxic ingredients.

Fact: Vaccines are essentially very dilute solutions of the killed or weakened *germ*. This stimulates our *immune system* to recognize the *germ* if it encounters it again, and react quickly to prevent disease. In addition to the weakened *germ*, vaccines are usually mostly sterile water or salt-water. They may also contain *preservatives, stabilizers, and antibiotics*. Every batch of vaccine is tested for safety and quality in Canada before it is released for public use.⁷

Myth: I've heard that vaccines actually weaken the immune system.

Fact: Actually, vaccines strengthen the *immune system* by helping it to recognize specific diseases and more easily fight off disease in case of *infection*.⁷

Myth: Won't giving multiple vaccines at the same time overload the immune system?

Fact: No. Vaccines go through extensive testing processes. Only vaccines that have been shown to be safe and effective when administered together will be given at the same time. In fact, giving several vaccines at one time helps keep children safe by protecting them against more diseases sooner. It also reduces discomfort by reducing the number of injections, and saves time by reducing the number of times the child has to visit the doctor for injections.⁷



Glossary of Terms⁸

Antibiotics: A drug used to treat infections caused by bacteria.

Antibody/ies: A protein made by the immune system in response to an 'attack' by a virus or bacteria, and that allows the body to recognize and defend against future attacks by the same virus or bacteria.

Apnea: Not breathing.

Bacteria: Single-celled micro-organisms.

Bodily fluids: Fluids excreted or secreted from the human body.

Booster shot: An additional dose of a vaccine needed periodically to "boost" the immune system.

Cellulitis: A bacterial infection that spreads below the surface of the skin.

Chronic: A condition that lasts 3 months or more.

Coma: A state of deep unconsciousness.

Contagious: Capable of being transmitted from one person to another by contact or close proximity.

Crusted/ing: A rash that scabs over and becomes covered with a tightly adherent crust.

Encephalitis: Inflammation of the brain.

Epiglottitis: An infection causing inflammation of the epiglottis (the flap that covers the trachea) and surrounding tissues that may cause the airway to become blocked and cause suffocation.

Faeces: Excrement discharged from the intestines, commonly known as "poo".

Fever: Any body temperature above the normal of 98.6°F (37°C).

Germ: A microbe, like a bacterium, capable of causing disease.

Immunity: The condition of being protected against infection or a specific disease.

Immune system: The cells and organs of the body that defends the body against infection, disease and foreign substance.

Infectious: Capable of being transmitted by infection.

Infection/s: The result of harmful bacteria or other micro-organisms in the body.

Inflammation: A basic way the body reacts to infection, irritation or injury; the key features being redness, warmth, swelling and pain.

Invasive bacterial infections: An invasive disease is one that spreads to surrounding tissues.

Liver: An organ in the upper abdomen that aids in digestion and removes waste products and worn-out cells from the blood.

Neurological damage: Damage of the nervous system (the brain, the spinal cord, and the nerves).

Neurotoxin: A substance that causes damage to nerves or nerve tissue (e.g., lead).

Otitis media: Inflammation of the middle ear.



Ovaries: The pair of reproductive glands in women. The ovaries produce eggs (ova) and female hormones.

Pancreas: Organ that makes pancreatic fluids and hormones, including insulin. The pancreatic fluids are enzymes that help digest food in the small intestine. Insulin controls the amount of sugar in the blood.

Paralysis: Loss of voluntary movement (motor function).

Pericarditis: Inflammation of the lining around the heart (the pericardium) causing chest pain and accumulation of fluid around the heart.

Pneumonia: Inflammation of one or both lungs.

Preservatives: A chemical compound that is added to protect against decay or decomposition.

Resistance: Ability to withstand something.

Respiratory tract: The organs that are involved in breathing. These include the nose, throat, larynx, trachea, bronchi, and lungs.

Seizure/s: Uncontrolled electrical activity in the brain, which may produce a physical convulsion, minor physical signs, thought disturbances, or a combination of symptoms.

Septic arthritis: Joint inflammation that is caused by bacteria infecting the joint.

Septicemia: Serious body-wide illness due to infection of the bloodstream (i.e., blood poisoning).

Spinal cord: The major column of nerve tissue that is connected to the brain.

Stabilizers: A substance added to prevent or delay an unwanted change in physical state.

Stupor: Partial or nearly complete unconsciousness, where the person responds only to vigorous stimulation.

Testes: The male sex glands. The testes produce and store sperm, and are also the body's main source of male hormones, such as testosterone.

Virus/es: A virus invades living cells and uses their chemical machinery to keep itself alive and to replicate itself.