



Understanding Immunization

A Decision-Making Toolkit
for First Nations Parents

June 2010



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Under the Canadian Constitution Act, 1982, the term Aboriginal Peoples refers to First Nations, Inuit and Métis people living in Canada. However, common use of the term is not always inclusive of all three distinct people and much of the available research only focuses on particular segments of the Aboriginal population. NAHO makes every effort to ensure the term is used appropriately.

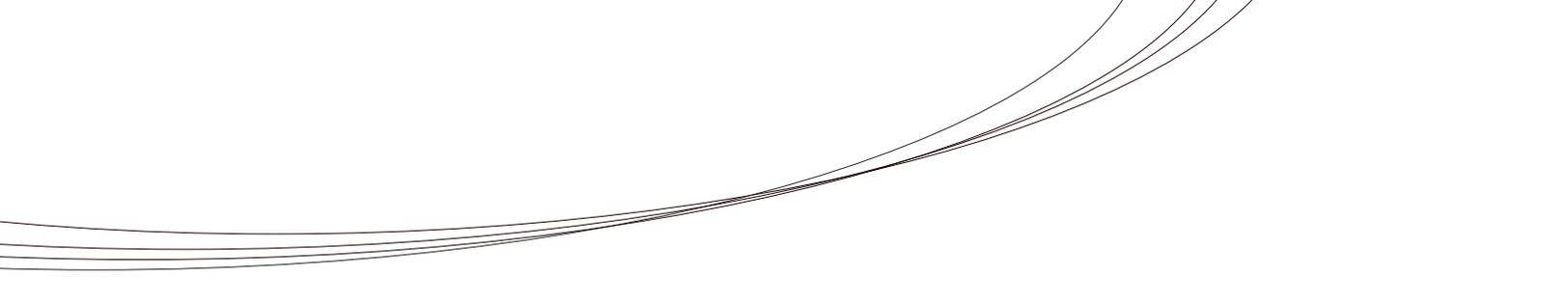


Table of Contents

Understanding Immunization

Risks of the Vaccine vs. Risks of the Disease

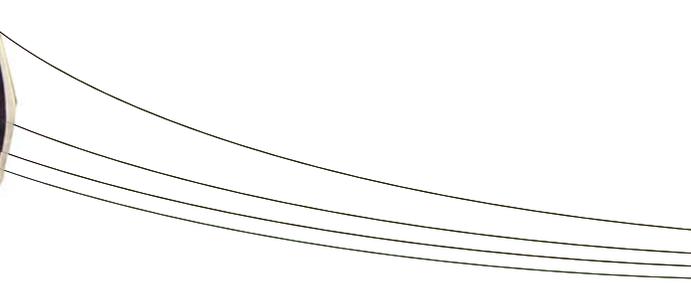
Vaccine Effectiveness

Vaccine Components

Immunization Schedule

Things to Consider / Pros and Cons

Questions to Ask My Health Care Provider



Understanding Immunization

Vaccination is a personal choice. To make a decision about vaccines you should consider both the benefits and risks of vaccination. This toolkit will give you the facts about vaccines and the diseases they prevent so you make an informed decision regarding vaccination for yourself and your children.

Background

What is immunity?

Immunity is the body's ability to fight infections. When we get sick our immune system creates 'antibodies' to destroy the bacteria or virus that causes the disease. The immune system remembers the germs so the next time a person contacts that germ they are able to fight it before getting sick. They develop 'immunity' to it. The immunity developed by experiencing a disease usually lasts for life (Gold, 2006, p. 9).

What is a vaccine?

Another way to get immunity is through vaccination. Vaccines are made of weakened or killed forms of one infectious disease or a combination of diseases. They are given as a needle, also called

an injection or shot. Vaccines work by getting the body to create antibodies to the illness without the person actually getting sick. Ideally, when the vaccine is injected, the person's immune system creates antibodies specific for each germ just as it would with the actual disease (CDC, 2007). If the person contacts that germ their body will remember how to fight it because of the vaccine.

Some vaccines have to be given several times at first, so that enough antibodies are made to fight the bacteria or viruses that the vaccine is targeting. Others don't work as well after some time has passed and have to be repeated to keep the antibody levels high enough to provide protection. The process of developing immunity is complex (Qin, Gilbert, Corey, McElrath & Self, 2007, p. 1308).

What is Community Immunity?

When most of the people in a community have been vaccinated, people who are not vaccinated get some protection. This is because it is harder for a disease to spread if there are few people in the community who don't have protection from the disease and who will get sick (PHAC, 2006, p. 31). This is called herd immunity (or community immunity or



the herd effect). Even if a person in this community gets sick, most of the people in contact with the sick person already have immunity to the disease. The disease cannot spread if there is no one who will get sick.

Herd immunity protects those who refuse vaccines, those who can't get vaccines (because of other health problems or allergies), and those who have been vaccinated but did not develop immunity. Herd immunity is effective only when a very small number of people in the community are not vaccinated. If the number of children not vaccinated against common diseases such as mumps, measles, and whooping cough increases herd immunity doesn't work and the diseases can make a comeback (Allen, 2007, p. 354).

Do vaccines work right away?

Vaccines do not provide full protection instantly after vaccination. There is a "lag time" between vaccination and full effectiveness of the vaccine. The body needs time to develop antibodies to the disease. The length of the lag time depends on factors including the age of the person getting the vaccine and the strength of the person's immune system. In most

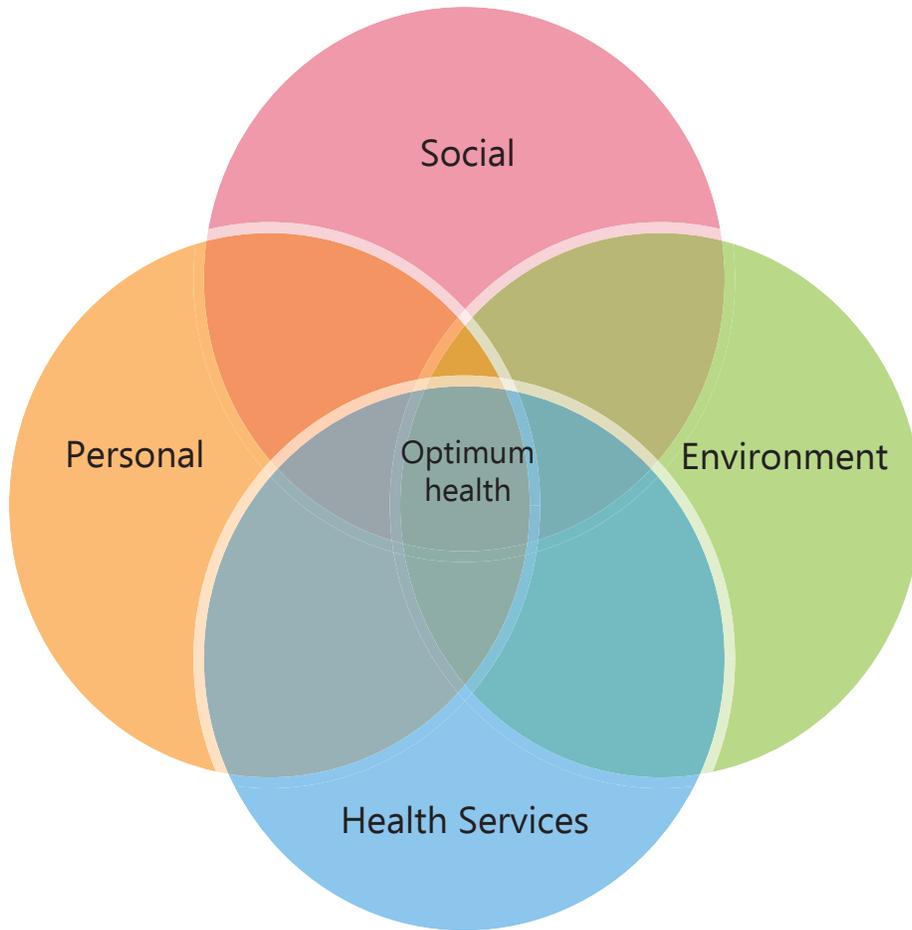
cases full effectiveness is achieved within a few weeks after vaccination (PHAC, 2006, p. 211-212). Sometimes more than one dose of the vaccine is needed to get the best protection.

Decision Making Information

No vaccine is 100% safe and effective. (Dennehy, 2001, p. 899; PHAC, 2009) However, severe adverse reactions to vaccines are rare. The Public Health Agency of Canada has a reporting system that allows health care providers to report adverse reactions to vaccines. (PHAC, 2009) There have been about one or two reports for every 100,000 doses given.

This toolkit gives information on infectious diseases, vaccines and vaccine effectiveness and risks. As shown in the diagram on the following page, health is affected by personal (for example, hereditary, behavior, attitude), social (family, friends, community, culture), environmental (water, air, earth) and health service factors (health centres, traditional healing, alternative health practices, public health programs, hospitals). Public health programs like immunization are one way to fight diseases. They fit into the health services category.

Understanding Immunization



Factors contributing to optimum health

Vaccines act on a person's immune system. In a holistic approach to health, it is helpful to remember all of the ways that we can keep ourselves healthy. Optimum health is a balance between personal,

social, environmental, and health services factors. When making a decision regarding vaccination for you and your children, be sure to consider the impacts of all four categories.



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Risks of the Vaccine vs. Risks of the Disease

Diphtheria

What is it?

- Bacteria that releases a toxin that damages the lining of the nose/throat and sometimes the skin.
- Causes patches of pus appear in the throat that can sometimes be so thick they block air and can cause suffocation.

How does it spread?

- Through close contact with an infected person or their coughs or sneezes.
- It does not spread from contaminated objects.
- Some people can be infected and spread the bacteria without symptoms

What are the symptoms?

- Initial symptoms: sore throat, loss of appetite, and low fever.
- After a day or two: the infected person will become weak, gray patches of pus appear in the throat.

How serious is it?

- It causes death for one of every ten people infected with it (Gold, 2006, p. 301).
- Treatment requires an antitoxin (to stop the effects of the toxin) and antibiotics (to stop the bacteria from producing more toxin) (Heymann, 2004, p. 175).

The Vaccine and Vaccine Side Effects

- The vaccine is given with vaccines for tetanus, pertussis and polio and sometimes Haemophilus influenza type b (the vaccine is called DTaP-IPV (or DTaP-IPV-Hib) for children). Adolescents receive the vaccine without polio and Haemophilus influenza type b, called Tdap and adults are recommended to have a tetanus diphtheria booster (Td) every 10 years.
- Redness, swelling, and pain at the injection site, fever, irritability (PHAC, 2006, p. 170).

Given at 2, 4, 6 & 18 months and between 4 & 6 years.
Booster shot given between 14 & 16 years.



Haemophilus influenzae type b

What is it?

- Infection starts in the nose/throat and may go to the bloodstream. vomiting, drowsiness, confusion, irritability, crying, agitation, and other general symptoms.
- Once in the blood, the bacteria can infect the lungs, heart, joints, and skin.
- Does not cause the flu but can cause meningitis**, pneumonia, blood infection (bacteremia), ear infections, eye infections, and epiglottitis (infection of the flap that closes off your airways when you swallow).

How does it spread?

- Through direct contact with an infected person or through their coughs or sneezes.
- Through contact with contaminated objects such as doorknobs.

What are the symptoms?

- Some people will not feel or look sick.
- The symptoms depend on the illness but can include: fever, loss of appetite, nausea,

How serious is it?

- Bacterial meningitis kills about one out of every 20 children infected. This infection can have long-term effects, such as deafness (PHAC, 2006, p. 374).
- Epiglottitis can make it difficult for a child to breathe. It develops quickly and without emergency treatment the child can suffocate.
- Treatment for Hib infection requires antibiotics. All serious cases of Hib disease require intravenous (IV) antibiotics.

The Vaccine and Vaccine Side Effects

- Fever, reaction at injection site including pain, swelling, and redness in 5% to 30% of those vaccinated (PHAC, 2006, p. 178).
- Rash and abnormal crying are less common side effects (Lawrence et al., 2005, p. 258).
- Sometimes included with the DTaP-IPV vaccine (DTaP-IPV-Hib).

***Meningitis is an infection of the tissues and fluid surrounding the brain and spinal cord and is most common in children between the ages of 2 months and 5 years. (Swingler, Michaels, & Hussey, 2007).*

Given at 2, 4, 6 and 18 months.

Risks of the Vaccine vs. Risks of the Disease

Hepatitis B

What is it?

- Virus that causes an infection of the liver.
- Very few people actually look or feel sick (Heymann, 2004, p. 253).
- Some infected people will not be able to get rid of the virus and will be infected for life. These people are able to spread the virus to other people.

How does it spread?

- Through contaminated body fluids (such as blood, semen, vaginal secretions) (PHAC, 2006, p. 190) and by contaminated equipment (such as shared needles, razors, or other sharp items that may come into contact with blood).
- Newborn babies can get the virus before or during birth.

What are the symptoms?

- The most common symptoms are: fever, weakness,

tiredness, loss of appetite, abdominal pain, aches and pains, nausea and vomiting, skin rash, and yellow skin and eyes (jaundice). (PHAC, 2006, p. 189)

- Urine may become very dark.

How serious is it?

- Almost all babies infected during birth have long-term illness, including liver damage, and can give the virus to other people.
- Most adolescents and adults will have mild illness and will completely recover.
- With acute infection, about 1 in 100 people will have liver failure.

The Vaccine and Vaccine Side Effects

- Slight fever, headache, diarrhea, and redness and soreness at the injection site. (PHAC, 2006, p. 203; Mathew et al., 2008, p. 16).
- **Anaphylactic reaction*** is possible but rarely happens.

**Anaphylaxis or anaphylactic shock is a serious allergic reaction that can be life threatening. The body produces a strong response to an allergen and*

affects all body systems. It can result in difficulty breathing, abdominal cramps, vomiting, diarrhea, circulatory collapse, coma, and even death.

3 doses given in infancy or 2 - 3 doses given to pre-teens.



Influenza (The flu)

What is it?

- An infection of the airways caused by a common virus that can also lead to bronchitis and pneumonia. There are many different strains of the flu virus. The strain that is circulating and causing illness changes each year.
- The flu can cause complications for people with health conditions such as diabetes, heart disease, or cancer.

How does it spread?

- Through direct contact with an infected person or through their coughs or sneezes.
- Through direct contact with contaminated objects, such as doorknobs and toys.

What are the symptoms?

- The symptoms are similar to those of a cold (runny nose, sore throat, and cough) but can also be: fever, chills, headache, aches and pains, muscle weakness, loss of appetite, vomiting, abdominal pain, diarrhea, and tiredness.

How serious is it?

- Pneumonia and bronchitis can occur, especially in the elderly and children under two years old.
- Severe complications can lead to death. Almost all flu deaths are elderly people (Gold, 2006, p. 242. Heymann, 2004, p. 282).

- Every year between 2000 and 8000 Canadians die from influenza (Gold, 2006, p. 242; PHAC, 2010).

The Vaccine and Vaccine Side Effects

- Soreness at the injection site lasting up to 2 days (PHAC, 2006, p. 218).
- Fever and muscle aches.
- Allergic reactions can occur especially for people with allergies to eggs (PHAC, 2006, p. 218). Individuals who have severe allergies to egg need to speak with their health care provider before getting the flu shot.
- Other effects such as wheezing, coughing, red eyes, chest tightness, difficulty swallowing, sore throat, and facial swelling can occur (oculorespiratory syndrome) (PHAC, 2006, p. 218).
- A rare side effect is Guillain-Barré syndrome (weakness, paralysis, and abnormal sensations) can occur (PHAC, 2006, p. 218; Lawrence et al., 2005, p. 257; Gold, 2006, p. 254). It is estimated to occur in one in a million doses (NACI, 2008, p. 22; CDC, 2003).
- Anaphylactic reaction is possible but rarely happens.
- The flu vaccine is recommended each year because the circulating viruses change yearly.

1 to 2 doses given between 6 & 23 months.

Risks of the Vaccine vs. Risks of the Disease

Measles

What is it?

- Caused by a highly contagious virus (Heymann, 2004, p. 349).
- Infection is more severe in very young or malnourished children and in infants under 1 year of age.

How does it spread?

- Through contact with respiratory droplets containing the virus (from sneezing or coughing) or direct-contact with nose or throat secretions of an infected person. Less commonly, the virus spreads through contact with objects and surfaces that have been contaminated with nasal and throat secretions from an infected person (PHAC, 2008).
- The virus can stay in the air and be breathed in hours later.

What are the symptoms?

- Runny nose, cough, high fever, and rash (the rash appears first on the face and head and then spreads over the body to the arms and legs).
- The rash can last up to 2 weeks.

How serious is it?

- In Canada, about one out of every 3000 cases of measles causes death (PHAC, 2008).

- Some people with measles get ear infections, pink eye (conjunctivitis), diarrhea, or pneumonia (PHAC, 2006, p. 228).
- Brain swelling (encephalitis) occurs in about one in 1000 cases and can result in permanent brain damage (PHAC, 2006, p. 303).

The Vaccine and Vaccine Side Effects

- The vaccine is combined with mumps and rubella vaccines (the MMR vaccine).
- Fever and rash. About 1 in 3000 children may have convulsions associated with the fever (PHAC, 2006, p. 233).
- Sometimes children will have low levels of **platelets*** in their blood (this occurs in 1 in 22,000 and 1 in 29,000 children) occurring up to 2 months after vaccination (Demiceli et al., 2005; Scheifele et al., 2003, p. 216; PHAC, 2006, p. 233).
- Brain swelling (encephalitis) may occur in 1 child for every 1 million doses of the vaccine (PHAC, 2006, p. 233).
- Anaphylactic reaction is possible but rarely happens.

Platelets are required for blood clotting.

Given at 6 months and between 18 months and 6 years.



Meningococcol

What is it?

- Bacteria that cause meningitis, bacteremia (infection of the blood), septicemia (severe blood infection), and other infections. (Conterno et al., 2006, p. 4)

How does it spread?

- Through direct contact with saliva (through kissing and sharing drinks or cutlery) or through an infected person's coughs or sneezes.
- Many people can have the bacteria without having any symptoms (Heymann, 2004, p. 361).

What are the symptoms?

- The most noticeable symptom of invasive disease is a rapidly spreading rash. Most, but not all, cases develop the rash.
- Other symptoms are the same as the flu (fever, rash, body aches, joint pain, nausea, vomiting, drowsiness, headache, stiff neck, rapid breathing, and loss of appetite).

How serious is it?

- Septicemia can lead to shock (quick drop in blood pressure), and can damage organs including the lungs, heart, and kidneys.

- Meningococcal meningitis used to kill about half of the people infected (Heymann, 2004, p. 359). Antibiotics, intensive care units, and other measures have reduced the chance of death to between 8% and 15% of cases (Heymann, 2004, p. 359; Conterno et al., 2006, p. 4). It still kills half of all children if the infection gets into the blood.
- One in ten infected people will have deafness, brain damage, or limb amputation. (Gold, 2006, p. 303)

The Vaccine and Vaccine Side Effects

- The vaccine only protects against certain strains of the bacteria.
- Redness, soreness, and swelling at the injection site in half the people who get the vaccine. (PHAC, 2006, p. 247)
- Other side effects include irritability, fever, and more crying than usual in infants. (Conterno et al., 2006, p. 19)
- Headaches may occur in one in four people who receive the vaccine (Lawrence et al., 2005, p. 253; PHAC, 2006, p. 247).
- Anaphylactic reaction is possible but rarely happens.

Given between 2 & 6 months, and between 12 & 18 months and at 12 years.

Risks of the Vaccine vs. Risks of the Disease

Mumps

What is it?

- Caused by a virus and is more common in adolescents and adults than children.
- There is no treatment for mumps.

How does it spread?

- Through direct contact between people or through an infected person's cough or sneeze.
- Sometimes mumps is spread from objects contaminated by an infected person.

What are the symptoms?

- Some infected people will not look or feel sick.
- The typical symptom of mumps is swollen saliva glands.
- It usually starts as a fever, with body aches, and loss of appetite.
- Other symptoms can include: headache, neck stiffness, stomach pain, tiredness, or dizziness.

How serious is it?

- Can cause swelling of the testicles or ovaries in post-pubertal boys and girls (PHAC, 2006, p. 375).

- Mumps meningitis occurs in up to 10% of cases but it is usually mild (Heymann, 2004, p. 376).
- Mumps encephalitis (swelling of the brain) can occur in one or two people of every 10,000 cases and causes death in about 1% (Heymann, 2004, p. 376).
- It can lead to temporary or permanent deafness, seizures and paralysis (PHAC, 2006, p. 251).

The Vaccine and Vaccine Side Effects

- The vaccine for mumps is included with measles and rubella in the MMR vaccine.
- Fever and rash lasting 3 days and occurring 7-12 days after vaccination.
- About 1 in 3000 children may have convulsions associated with the fever (PHAC, 2006, p. 254).
- Some children will have low levels of platelets in their blood (platelets are required for blood clotting). This can occur up to 2 months after vaccination (PHAC, 2006, p. 254).
- Anaphylactic reaction is possible but rarely happens.

Given at 6 months and between 18 months and 6 years.



Pertussis

What is it?

- Caused by bacteria and is known as 'whooping cough' because the common symptom is coughing spells that end with a 'whoop' sound as the person takes a breath. The 'whoop' is most common in children with the disease.
- The cough can last for months after infection (Heymann, 2004, p. 399). Coughing spells can be so severe that they interfere with breathing or cause vomiting.

How does it spread?

- Through close, direct contact with an infected person or their coughs and sneezes.
- Sometimes through contact with contaminated objects, such as toys (Heymann, 2004, p. 401).

What are the symptoms?

- In children, the first symptoms are usually runny nose and cough. The cough will get worse over a period of a couple of weeks, and can result in severe coughing spells. The child may have coughing spells that persist for months.

How serious is it?

- About one in four infants need to be hospitalized and of these, about one in 400 will die and the same number will have permanent brain damage.
- There are one to three deaths each year from whooping cough in Canada (PHAC, 2006, p. 257).
- Antibiotics can be used to treat whooping cough, but they will not prevent the cough unless they are given early in the infection (Heymann, 2004, p. 404).

The Vaccine and Vaccine Side Effects

- The vaccine is included in the DTaP-IPV (Hib) vaccine.
- Pain, redness, and swelling at the injection site as well as fever, irritability, drowsiness, and less commonly persistent crying, and convulsions (PHAC, 2006, p. 264).
- Anaphylactic reaction is possible but rarely happens.

Given at 2, 4, 6 & 18 months and between 4 & 6 years. Booster shot given between 14 & 16 years.

Risks of the Vaccine vs. Risks of the Disease

Pneumococcal

What is it?

- Caused by a bacteria called *Streptococcus pneumoniae*.
- Can cause several different "diseases", including: meningitis (brain infection); bacteremia (blood infection); pneumonia (lung infection); and otitis media (middle ear infection). It is important to remember that other germs can also cause these infections. The pneumococcal vaccine will not protect your child from these infections if they are caused by a different germ. (Gold, 2006, p. 363)
- There are many different strains of these bacteria.

How does it spread?

- The bacteria spread through direct contact with an infected person through coughing, sneezing, kissing, and sharing drinks, cutlery, lipstick, etc.

What are the symptoms?

- Some people will not look or feel sick.
- The symptoms depend on the type of infection. For example, the symptoms of pneumococcal pneumonia are high fever, chills, muscle aches, headache,

cough, chest pain, difficulty breathing, and fast breathing (Heymann, 2004, p. 413).

How serious is it?

- Young and elderly people are at increased risk of serious illness as well as people with other health conditions, such as diabetes, HIV/AIDS, heart or lung disease, or kidney failure.
- Up to one in five pneumococcal meningitis patients die even with treatment. About the same number have brain damage or deafness (Gold, 2006, p.303).

The Vaccine and Vaccine Side Effects

- Redness, swelling, and pain at the injection site can last for up to 2 days (Gold, 2006, p. 129).
- Fever and irritability are also common (Gold, 2006, p. 129; PHAC, 2006, p. 274).
- Anaphylactic reaction is possible but rarely happens.

Given at 2, 4, 6 and between 12 - 15 months.



Polio

What is it?

- This virus infects the throat then the intestines and spreads to the lymph nodes, blood, and sometimes to the spinal cord and brain (central nervous system) (Heymann, 2004, p.425).
- Almost all infected people have no symptoms, but an infected person who doesn't look or feel sick can still spread the virus.
- One in 100 people who are infected with polio have the form of the disease that causes paralysis (Heymann, 2004, p.425; PHAC, 2006, p.277).

How does it spread?

- Through direct and indirect contact and through coughing or sneezing.
- Infected people can spread the virus in throat secretions for up to 1 week and in their feces for up to 6 weeks.
- The virus can spread from food, water, or hands contaminated with feces (Heymann, 2004, p. 427).

What are the symptoms?

- Some people have minor symptoms, such as fever, headache, sore throat, muscle aches, vomiting, abdominal pain and constipation.
- People with the severe form of polio will have weakness or paralysis of muscles including the muscles used for breathing.

How serious is it?

- Severe infections can permanently weaken or damage muscles causing paralysis (affects legs more often than arms).
- The virus can affect a person's ability to breathe and swallow and can be life-threatening. These patients may require mechanical ventilators to survive (called "iron lungs" in the past).
- Among people who are paralyzed from polio, about 5 per cent to 10 per cent will die (PHAC, 2006, p. 374).
- There is no cure for polio.

The Vaccine and Vaccine Side Effects

- The vaccine is included in Dtap-IPV-(Hib).
- Common side effects are pain and redness at the injection site (Gold, 2006, p. 92).
- Anaphylaxis has been reported rarely (PHAC, 2006, p. 282).
- The oral vaccine caused paralysis in one of every 2.4 million people vaccinated. (PHAC, 2006, p. 282) This vaccine is not used anymore in Canada. It was last used in 1995-1996 (PHAC, 2006, p. 277).
- Anaphylactic reaction is possible but rarely happens.

Given at 2, 4, 6 & 18 months and between 4 & 6 years.

Risks of the Vaccine vs. Risks of the Disease

Rubella

What is it?

- Caused by a virus (also called German measles).
- If a pregnant woman gets rubella in the first 20 weeks of pregnancy, the baby can be born blind, deaf, or have heart damage (Gold, 2006, p. 360). The risk is highest early in pregnancy but there are risks throughout the whole pregnancy (all pregnant women are screened for immunity to rubella in Canada as part of their prenatal blood tests).

How does it spread?

- Through an infected person's cough or sneeze.
- A person can be contagious a week before any symptoms start.
- Babies born with congenital rubella syndrome can spread the virus for months in their urine or saliva (Heymann, 2004, p. 466).

What are the symptoms?

- Symptoms are low fever, general aches and pains, swollen glands, and eye redness.
- A rash appears on the face and scalp about 2 days after the start of symptoms, and spreads over the whole body (similar to measles) (Heymann, 2004, p. 464).

How serious is it?

- Almost all babies born to women infected with rubella during the first trimester will get congenital rubella syndrome (CRS) (Heymann, 2004, p. 465). It can cause miscarriage, stillbirth, or effects on the baby, (i.e. congenital heart disease, cataracts, deafness, and mental deficiency) (PHAC, 2006, p. 375).
- Effects of CRS can appear years after birth and it may lead to diabetes and brain swelling (encephalitis) later in life.
- Encephalitis occurs in one out of every 6000 cases of rubella, more often in adults (PHAC, 2006, p. 375).
- There is no treatment for rubella and there is no way to reverse the damage of CRS (Heymann, 2004, p. 468).

The Vaccine and Vaccine Side Effects

- The vaccine is part of the MMR vaccine.
- Rash, swollen lymph nodes, muscle pain or joint pain that can last up to 3 weeks occur rarely after vaccination (PHAC, 2006, p. 303).
- Joint pain occurs rarely and is most common in adult women (Gold, 2006, p. 313).
- Anaphylactic reaction is possible but rarely happens.

Given at 6 months and between 18 months and 6 years.



Tetanus

What is it?

- Bacteria that live in dirt (Gold, 2006, p. 357).
- Have a special coating that allows them to live outside the body in the environment. They are very hard to kill.
- The bacteria produce a toxin that blocks nerves. Tetanus can make it hard to swallow and open your mouth and it can be fatal if it affects the muscles responsible for breathing.
- Other muscles can be affected including muscles in the neck, chest, abdomen, arms, leg, and face.

How serious is it?

- Tetanus is a serious disease (PHAC, 2006, p. 374). About one or two people out of every 10 infected will die from the disease even with treatment (Gold, 2006, p. 302).
- Newborn babies can get tetanus if the umbilical cord is cut using unclean tools.
- Tetanus can be treated with antitoxins and antibiotics and requires surgical cleaning of the wound to remove bacteria.

How does it spread?

- It does not spread from person to person.
- Infection occurs if bacteria in the environment get into the body through an injury (i.e. a puncture, scrape, or bite). The injury does not have to be severe to become infected. If it is not cleaned and has been exposed to tetanus, the person can get sick.

What are the symptoms?

- The major symptom is long, uncontrollable, and painful muscle spasms.
- In many cases the first symptom is a spasm in the jaw muscle (another name for tetanus is "lockjaw") (PHAC, 2006, p. 374).

The Vaccine and Vaccine Side Effects

- The vaccine is included in the DTaP-IPV-(Hib) vaccine for children or Tdap or Td for adults (Gold, 2006, p. 357).
- Redness and swelling at the injection site, fever, swollen lymph nodes, and rarely brain or spinal cord swelling, and nerve problems in the shoulder causing pain and weakness of the arm rarely occur (PHAC, 2006, p. 313).
- Difficulty opening the mouth occurs in a few people (PHAC, 2006, p. 314).

Given at 2, 4, 6 & 18 months and between 4 & 6 years. Booster shot given between 14 & 16 years and every 10 years after that.

Risks of the Vaccine vs. Risks of the Disease

Tuberculosis (TB)

What is it?

- TB affects the lungs and can affect other body parts.
- It can be in your body without making you sick. Most infected people will not have any symptoms or need any treatment (Heymann, 2004, p. 560).

How does it spread?

- Through an infected person's breathing, coughing, sneezing, or even talking (PHAC, 2008a).
- People who live in over crowded houses without good air circulation are at greater risk (PHAC, 2008a).

What are the symptoms?

- The symptoms are cough, fever, night sweats, loss of appetite and weight loss.

How serious is it?

- TB can also infect the lungs, kidneys, brain, or spine.
- Treatment for TB can take up to 9 months.

The Vaccine and Vaccine Side Effects

- The vaccine is called Bacille Calmette-Guerin (BCG). It is no longer routinely used except in certain on-reserve First Nations communities in Alberta, Manitoba, the Northwest Territories, Ontario, and Saskatchewan.
- Common side effects from the vaccine include redness and a small bump or divot at the injection site that can leave a scar (PHAC, 2006, p. 154).
- There may be swollen lymph nodes near the injection site (PHAC, 2006, p. 154). Less commonly, the lymph nodes become infected in up to 4 people out of every 1000 people vaccinated (PHAC, 2006, p. 154).
- A serious complication of vaccination is BCG infection spread throughout the body which can occur in up to 1 out of every 1 million people vaccinated and can be fatal (PHAC, 2006, p. 154).
- Anaphylactic reaction is possible but rarely happens.



Varicella (Chickenpox)

What is it?

- It is caused by a very contagious virus (Gold, 2006, p. 303).
- Infection starts with a fever and leads to a rash of itchy red spots that turn into blisters filled with fluid.
- An infected person may have hundreds of spots. After about four or five days the spots dry out and the scabs fall off. The whole illness lasts between 7 and 10 days.

How does it spread?

- The virus spreads easily through exposure to droplets in respiratory secretions or from direct contact with the rash.
- The rash can release the virus into the air.
- People are most contagious the day before the rash appears.

What are the symptoms?

- Before the rash, an infected person might have a fever, aches and pains, headache, and loss of appetite.
- The rash usually appears first on the face and scalp and spreads to the trunk, arms, and legs. The rash is usually itchy.

How serious is it?

- Chickenpox is usually mild

(Gold, 2006, p. 305). Few adults get chickenpox, but most chickenpox deaths are in adults (NACI, 2002, p. 3).

- Complications of chickenpox include ear infections, pneumonia, heart problems, skin infections, and encephalitis (brain swelling) (Heymann, 2004, p. 95).
- If a pregnant woman gets chickenpox, the baby may have damaged eyes or blindness, skin scars, abnormal growth of arms or legs, or brain damage. The risk is higher if the infection happens close to delivery. Between 17% and 30% of infants born to mothers infected at this time have severe chickenpox and effects on the brain, heart, and liver (PHAC, 2006, p. 328). One in five infected newborns dies without treatment.
- The virus can cause a painful rash of blisters called shingles years after the chickenpox (Heymann, 2004, p. 95).

The Vaccine and Vaccine Side Effects

- Pain, swelling, and redness at the injection site in 10% to 20% of those vaccinated (PHAC, 2006, p. 337).
- Up to 5% of people vaccinated get a chickenpox-like rash (Kimmel, 2002, p. 2118).
- Anaphylactic reaction is possible but rarely happens.

Given between 12 & 18 months.

Risks of the Vaccine vs. Risks of the Disease

Potential Longer Term Effects of the Vaccines

There are gaps in the information about long term effects of vaccines. Most studies only look at adverse events that occur within four weeks of vaccination (Ward, 2000, p. 207). Links have been made between vaccines and various conditions and disorders, but research hasn't confirmed these links.

There will always be adverse events following immunization. This does not mean that the vaccine itself is responsible for the illness. Studies have not been able to clearly show that vaccines cause long-term illnesses (PHAC, 2009a).

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Vaccine Effectiveness

Vaccine effectiveness (or efficacy) refers to how well the vaccine protects a person from getting the disease it is intended to prevent. Effectiveness is reported by measuring antibody levels in the blood after immunization. It may also be reported by the number of people in the population who get sick after being vaccinated.

A vaccine is considered effective if people who get the vaccine develop antibodies and if fewer people get sick with the disease (Qin et. al., 2007, p.1309-1310). For example (see Table 1), 96% to 99% of people who get the chickenpox vaccine develop antibodies to chickenpox (PHAC, 2006, p. 329), but studies have found that the vaccine is 70% to 90% effective in preventing chickenpox infection (Dennehy, 2001, p. 877). So, almost all people develop antibodies after vaccination but up to three in ten people may still get sick even though they had the vaccine.

No vaccine is able to prevent disease in all people who get vaccinated.

Some vaccines are effective at making the symptoms or complications related to the disease less severe. For example, the chickenpox vaccine is more than 95% effective in preventing severe chickenpox, so while you still might get chickenpox if you have had the vaccine, almost all people who get it after being vaccinated will not get as sick as they would have without it (Dennehy, 2001, p. 877).

A clinical effectiveness of 50% means that your chances of getting sick are half of what they would be if you did not get vaccinated. These numbers tell us the chances that someone might get sick, but they do not tell us specifically who will get it and who will not. The chickenpox vaccine is 70% to 90% effective, but we never know if we are going to be one of the 10% or 30% who will get the chickenpox or one of the 70% to 90% who will not get it.

How well the vaccine works depends on:

- How new the vaccine is and how well it has been



studied: Researchers study and monitor vaccines and make changes to improve them.

- Effectiveness is sometimes lower when vaccines are new and gets better with more research and monitoring (Dennehy, 2001, p. 873).
- The type of vaccine (Dennehy, 2001, p.880): For example, Canada bought two kinds of H1N1 vaccine from one company.
- The manufacturer. There are a number of pharmaceutical or drug companies that make vaccines and effectiveness may not be the same for each. The United States is using H1N1 vaccine developed by five different companies.
- Whether the vaccine matches the type of disease the strain - (i.e. the flu) that people are getting: For example, the flu vaccine has been found to be 80% effective at preventing

the flu when the strains in the vaccine match the strains in circulation. (Demicheli et al., 2007, p. 7)

- Overall health: Underlying health conditions may lower the effectiveness of some vaccines.
- Age: Vaccines may have different levels of effectiveness depending on the age of the person being vaccinated.
- Living setting: for example, in a long-term care facility, versus in the community.

In general, vaccines produce antibodies in most people who receive them. The immune response from vaccines is different for each vaccine, but for children, most vaccines are between 70% and 100% effective at producing an antibody response (PHAC, 2006, p. 168, 175, 192,212, 230, 239, 252, 260, 329). It is important to note that other factors, such as good sanitation, hand washing and clean water can prevent diseases.

Vaccine	Clinical effectiveness of the vaccine
Diphtheria	95% effective at preventing diphtheria (National Network for Immunization Information, 2008). Immunity lasts about 10 years so booster shots are recommended.
Haemophilus influenza type b (Hib)	After introduction of Hib vaccines in the United States, the number of cases reduced by about 95% compared to the number of cases before routine immunization (Dennehy, 2001, p. 881)
Hepatitis B	Over 90% effective in preventing spread of hepatitis B through sexual contact and 95% effective at preventing the spread from infected mothers to newborns (Gold, 2006, p. 239).

Vaccine Effectiveness

Influenza	Effective at preventing the flu in 82% of those vaccinated and preventing 33% of flu-like illness (not caused by the flu virus) (Jefferson et al., 2008, p. 99).
Measles	The number of cases of measles in Canada has decreased by 99% (Gold, 2006, p. 157).
Meningococcal	97% effective at preventing illness in adolescents, and 92% in children (Ramsey et al., 2001, p. 195-196).
Mumps	64% effective for protection from mumps after one dose of the vaccine and 88% after two doses (Harling et al., 2005, p. 4072)
Pertussis	The DTaP (diphtheria, tetanus, acellular pertussis) vaccine has been found to be at least 88% effective but protection decreases over time (Wilson, 2006, p. 233). The effectiveness of the acellular pertussis vaccine ranges from 58% to 93% (Dennehy, 2001, p. 881).
Pneumococcal	83% effective at preventing systemic pneumococcal infections caused by types included in the vaccine and 73% caused by all types (vaccine and non-vaccine types) (Hutchinson et al., 1999, p. 2391).
Polio	90% protection after 2 doses of the vaccine and about 100% protection after 5 doses (Gold, 2006, p. 95).
Rubella	There have been big decreases in the number of cases of rubella and congenital rubella syndrome (Gold, 2006, p. 203). The number of cases of congenital rubella syndrome has decreased by over 99%.
Tetanus	The vaccine is almost 100% effective at preventing tetanus however, immunity only lasts for 10 years so a booster shot is recommended every 10 years (National Network for Immunization Information, 2009)
Tuberculosis (BCG)	The vaccine is 51% effective at preventing tuberculosis (TB). In newborns the protective effect of BCG vaccine against TB is estimated at 74% (PHAC, 2006, p. 150)
Varicella (Chicken-pox)	70% to 90% effective in preventing chickenpox infection and 95% effective in preventing severe disease (Dennehy, 2001, p. 877).



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Vaccine Components

What is in a vaccine?

Description of vaccine components.

Component	Health Concerns	Reasons for its use
Aluminum	Vaccines with aluminum cause more redness and hardness where the vaccine is injected in children under 18 months old (Jefferson, Rudin, & Di Pietrantonj, 2004, p. 88). Older children may have more pain for up to 14 days (Jefferson, Rudin, & Di Pietrantonj, 2004, p. 88).	Added to strengthen the immune response so less bacteria or virus or fewer doses of the vaccine is needed (Atkinson et al., 2009, p. E-1; CDC, 2009).
Antibiotics (e.g. neomycin)	May cause allergic reactions in children with neomycin allergies. Individuals with neomycin allergies should be monitored for reactions.	Added to prevent bacteria from growing in the vaccine (PHAC, 2008).
Bovine serum	When the vaccine is purified, the bovine serum is removed. There may be some proteins from the cells in the vaccine (Gold, 2006, p. 325).	Added to help the cell culture grow (Gold, 2006, p. 325).
Egg Protein	May cause allergic reactions in people with egg allergies. People with allergies to eggs should not routinely get the flu shot. Of these individuals, those at risk of complications from the flu should see an allergy specialist if possible. If this is not possible the risk of an allergic reaction to the vaccine must be weighed against the risk of the flu (Canadian Immunization Guide, 2006, p. 87).	The flu virus is grown in fertilized chicken eggs (Gold, 2006, p. 250).
Formaldehyde	Formaldehyde has been found to cause cancer when it is breathed in. There is little information about formaldehyde that is injected but the amounts within vaccines is very small (Sears, 2007, p. 209).	Inactivates viruses and toxins (PHAC, 2006, p. 5) and prevents contamination while the vaccine is being made (CDC, 2009). Routine Canadian vaccines contain very small amounts of formaldehyde (GlaxoSmithKline, 2008a, p. 21; GlaxoSmithKline, 2009, p. 14; Sanofi Pasteur, 2009, p. 15).



Gelatin	Allergic reactions occur in about 1 out of every 2 million doses given (PHAC, 2006, p. 5). People who have had allergic reactions to gelatin should be referred to an allergist before receiving vaccines (PHAC, 2006, p. 6).	Used as a stabilizer (PHAC, 2006, p. 5).
Human Albumin	Most human albumin is removed when the vaccine is purified. The final product may contain some proteins from the cells. (Gold, 2006, p. 325)	Used as a stabilizer in virus vaccines and used as part of the growth medium (Broker & Zent, 2005, p. 5699; CDC, 2009).
Lactose	Lactose is a concern for parents whose children are allergic to lactose however, since the vaccine is injected it never enters the digestive system which is where a potential reaction would occur.	Used as a stabilizer when the vaccine is freeze-dried and filled (Atkinson et al., 2009, p. E-3).
Phenoxyethanol	Phenoxyethanol can cause diarrhea and vomiting and can affect the central nervous system (United States Food and Drug Administration, 2008).	Added to prevent contamination with bacteria or fungus (PHAC, 2006, p. 5). Used as a stabilizer for when the vaccine is exposed to heat, light, acidity, or humidity (Atkinson et al., 2009, p. E-3; CDC, 2009). Phenoxyethanol is also used in many cosmetics and medications.
Polysorbate 80	Can cause allergic reactions such as redness or rash (Coors et al., 2005, p. 596).	Used while the vaccine is being made and only small amounts may be in final product (Sanofi Pasteur Limited, 2008, p. 4). Polysorbate 80 is in many other products and foods (Sears, 2007, p. 209).
Monosodium glutamate (MSG)	When large quantities are eaten, MSG can cause nerve damage and can affect brain functioning (Sears, 2007, p. 210).	Used as a stabilizer for when the vaccine is exposed to heat, light, acidity, or humidity (Atkinson et al., 2009, p. E-3; CDC, 2009). The amount of MSG in routine childhood vaccines in Canada ranges from 0 mg to 0.36 mg (GlaxoSmithKline, 2007, p. 11; Merck Frosst 2009b, p. 12).
Sorbitol	Eating too much sorbitol can cause stomach and intestinal discomfort and diarrhea (Health Canada, 2005).	Used as a stabilizer and to dissolve other components (Atkinson et al., 2009, p. E-4). Sorbitol is a sugar alcohol and is also an additive in food (Health Canada, 2005).

Vaccine Components

Sucrose	Sucrose can affect blood sugar levels, however the amount of sucrose in Canadian vaccines is very small (GlaxoSmithKline, 2007, p. 11; GlaxoSmithKline, 2008b, p. 13; Merck Frosst, 2009a, p. 18; Merck Frosst 2009b, p. 12).	Used as a stabilizer (Broker & Zent, 2005, p. 5699).
Thimerosal (contains mercury)	Except for the flu vaccine, thimerosal has not been used in routine childhood vaccines in Canada since 2001 (Gold, 2006, p. 324). Most vaccines have not contained thimerosal since 1998 (Gold, 2006, p. 324). A thimerosal-free version of the flu vaccine is available (PHAC, 2006, p. 5).	Added as a preservative to multi-dose vials of vaccines to prevent bacterial or fungal contamination. (PHAC, 2006, p. 5; Atkinson et al., 2009, p. E-5)

Vaccine Components in Routine Childhood Immunizations

Please note that the table on the following page is accurate as of October, 2010. As vaccines are developed or modified the components within the vaccines may change. This table combines all the components in the vaccines from different manufacturers or preparations. Since the manufacturers may use different components not all vaccines will contain all the components that have a "✓". This table gives you an idea of the possible components in a certain vaccine. If you have concerns about vaccine components speak to your health care provider.

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DTaP-IPV:	diphtheria, tetanus, acellular pertussis, and inactivated polio	Routine Immunization Schedule for First Nations Infants and Children (adapted from the Public Health Agency of Canada: Immunization Schedules) (PHAC, 2010). Please be aware that the schedules vary from province to province. The timing and number of required doses of vaccines given may be different. Not all provinces have all vaccines. Always check with your health care provider to find out what schedule and vaccines are right for your child. This schedule from the Public Health Agency is current as of September 15, 2010.
Hib:	Haemophilus influenza type b	
MMR:	measles, mumps, rubella	
Var:	varicella	
HB:	hepatitis B	
Pneu-C:	pneumococcal conjugate	
Men-C :	meningococcal conjugate	
Tdap:	diphtheria, tetanus, acellular pertussis (given to individuals older than 7)	
Flu:	influenza vaccine	

Additionally, on-reserve First Nation infants in some communities in Alberta, Saskatchewan, Manitoba, Ontario, and the Northwest Territories receive the Bacille Calmette Guerin (BCG) vaccine. This vaccine is not recommended for all infants but is used in communities with high numbers of tuberculosis infections (NACI, 2004, p. 1-2; PHAC 2006, p. 151-152). Infants from these communities are given the vaccination at birth (Northwest Territories Health and Social Services, 2007). In Saskatchewan, First Nation infants also receive the hepatitis A vaccine at 12 and 18 months (Health Canada, 2005, p. 49).

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Things to Consider

- o Your child's age
- o Your child's general health status
- o Do you know someone who has been sick with one of the diseases mentioned in this paper?
- o What was their experience?
- o Have you been sick with one of the diseases mentioned in this paper?
- o What was your experience?
- o Have you had one of the vaccines mentioned in this paper before?
- o What was your experience (the side effects you experienced and the effectiveness of the shot)?
- o Has your child received a vaccine in the past?
- o What was his/her experience?
- o If your child gets vaccinated but still gets one of the diseases, how will this make you feel?
- o If your child gets vaccinated and has side effects, how will this make you feel?
- o If your child does not get vaccinated and gets a vaccine-preventable disease, how will this make you feel?
- o What health services are available in your community if your child gets sick with one of the disease mentioned in this toolkit?

Questions I have for my health care provider

1. _____

2. _____

3. _____

4. _____

Immunization Record

Use this record to keep track of your child's immunizations.

Immunization	Date Given	Date Given	Date Given	Date Given	Comments
DTaP-IPV					
HiB					
MMR					
Var					
HB					
Pneu-C-7					
Men-C					
DTaP					
Flu					

