Information on childhood vaccines

Overview of the immune system

There are two parts of our immune system which help our bodies protect us from infections and foreign bodies. They include:

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1. Innate (or natural) immune system

Everyone is born with this part of this immune system and gives a general type of protection. It protects us from certain germs. This immunity includes external barriers of the body for example the skin and mucous membranes (line the nose, ear, throat, stomach and intestines), this is the first line of defense and prevents diseases entering our bodies. If this barrier is broken (e.g. a cut) our body quickly attempts to heal it and special cells attack the germs on the skin.

Furthermore in innate immunity, the white blood cells engulf infectious agents as they can distinguish between antigens which are non-self (i.e. coming from an infection agent), however they cannot recognise specific pathogens. For example they cannot tell the difference between a hepatitis virus from an influenza virus but are able to realise that a viral infection is happening within the body. The majority of infections are controlled by these cells, but when it becomes too great these cells alert the other parts of the immune system.

2. Adaptive immune system

This second part of our immune system continues to develop throughout our lives. It identifies individual antigens by the amino acid sequences that different antigens have which are unique. However, this response initially takes longer to produce (4 – 7 days) than the innate immune response but results in a memory to the specific antigen. Once the immune system has a memory of that specific antigen, this response becomes quickly activated. It means that when an individual is re-infected with the same pathogen the memory response will eradicate the infectious agents before it can cause disease (i.e. 2 – 3 days). Thus the adaptive immune system develops as individuals are exposed to diseases or immunized against diseases through vaccinations.

There is another type of immunity called **passive immunity**, where immunity is "borrowed" from an external source and only lasts for a short period of time. An example of passive immunity is the antibodies from a mother's breast milk provide the baby with temporary immunity to diseases the mother has been exposed to.

The immune system defends the body against invaders through an immune response, which attach organisms/substances that cause disease. A network of cells, tissues and organs work together to protect the body, the cells involved are white blood cells (leukocytes) that find and kill these invaders. There are 2 types of leukocytes

1. **Phagocytes**: they swallow up invading organisms.
   There are various types of phagocytes, the most common being neutrophils, which mainly fights bacteria.
2. **Lymphocytes**: they help the body remember and recognize any foreign pathogens that have attacked the body previously and help eradicate them. There are 2 kinds of lymphocytes
   a. **B lymphocytes (B cells)**: they are like our body's immune control & surveillance centre that find their targets and send defenses to latch onto. The B cells produce antibodies (immunoglobulin or Ig – several different classes) which can neutralize viruses, bacteria or toxic proteins in the blood and other body fluids
   b. **T lymphocytes (T cells):** these cells are like soldiers, destroying the invaders that the control centre has identified. The T cells develop into killer cells, which kill these invaders. The T cells bind to the pathogens and kill them to prevent spread of the organism within the body.

Different parts of the immune response involve many different cells. These cells need to community with each other to coordinate the immune response. The cells from different parts of the immune system also need to communicate with each other. All white blood cells communicate via small molecules called **cytokines**. Cytokines are often referred to as immune hormones. These messengers can act to promote or inhibit production of certain immune cells, induce cell proliferation and recruit cells to areas of injury or infection.

Immune memory

The development of the immune system begins early in fetal life, exposure to antigens do not occur until after birth. The exposure to antigens from pathogens is required for the infant to develop a memory response.
Exposure to microbial antigen can occur in two ways 1) from infection or 2) from immunization.

Exposure to microbial antigen functions to educate the immune system about those infections and form immune memory. Thus when an infant is infected with pathogen(s) again, it will have a faster immune response and quickly neutralize them before they cause disease, or at least improve the severity of the infection. The "memory" resides in the form of specific T-cells and B-cells

How the immune response works

When foreign substances invade the body (antigens) are detected, several types of cells work together and respond. These trigger the B lymphocytes to produce special proteins that flag (antibodies) specific antigens.

Antibodies recognize antigens and flag them are not able to destroy them without assistance. The T lymphocytes are the cells that destroy the antigens that have been tagged or cells that have changed.

Once the antigens are produced, the same ones exist in the individual's body, so that if the same foreign substances was to invade the body and the immune system recognized, the antibodies are there, ready to attack.

In addition, antibodies can neutralize toxins (poisonous or damaging substances) produced by organisms. They also activate a group of proteins in the immune system called complement that help kill bacteria, viruses or infected cells.

The baby's immune system

An infant's immune system is intact but immature at birth. The main problem is that the baby's immune system is naïve as they have not been exposed to any pathogens. This means that babies have to generate a full immune response to every pathogen they encounter. Each immune response takes about 10 days to generate. This is where maternal antibody can be important. It will help to protect an infant if they are exposed to a pathogen in the first 10 days. Babies get most of their maternal antibodies through placental transfer of IgG. But there is some antibodies that are transferred through breast milk but these levels are much lower. Human baby's stomachs cannot absorb the antibodies in breast milk, therefore most of these antibodies work in protecting pathogens crossing the oral cavity.

Function	Difference during infancy	Implications
Non specific immunity	Phagocytes cannot migrate towards infectious sites, although their bactericidal (killing) activity is normal	Slow response to infection
Cytokine production	Poor production of cytokines Th1 cytokines such as interferon gamma by T-cells	Impaired responses of other cell populations that rely on their functions such as natural killer cells
Specific immunity (T-cells and B-cells)	Develops in prenatal life: T cells and B cells appear in key organs from early point in foetal development ○ Bone marrow (8 - 10 weeks) ○ Thymus (8 weeks) ○ Spleen ○ Lymph nodes (11 weeks) ○ Appendix (11 weeks(○ Tonsils (14 weeks) Specific immune responses appear to be possible after as little as 12 weeks of foetal development. However, T and B cells are 'naïve', encountering antigens for the first time. IgG sub group is not produced until the second year of life	Relatively naivety of T and B cells mean primary immune response is relatively inefficient accounting for the particular susceptibility of newborns, especially premature babies, to bacterial and viral infections. Repeated leads to the complete maturation of specific immunity during the first few years of life.
Immunoglobulin (Ig or antibody) production	Impaired production of some isotypes. Low serum IgM, IgA and IgE. IgG is mostly of maternal origin.	Inability to respond to polysaccharide encapsulated bacteria such as meningococcal and pneumococcal until about to 2 years of age. Thus those <2 years are unable to respond to polysaccharide vaccines
Maternal antibody protection from placenta	IgG against some infectious organisms cross the placenta. Wanes during the first year of life.	Give protection against some infections that mother exposed to or immunised against including measles and meningococcal disease. This can interfere with vaccines such as MMR Little or no protection against other diseases such as whooping cough
Maternal protection from breast milk	Mostly IgA	Provides additional protection against gut microbes, less effective against respiratory infections.

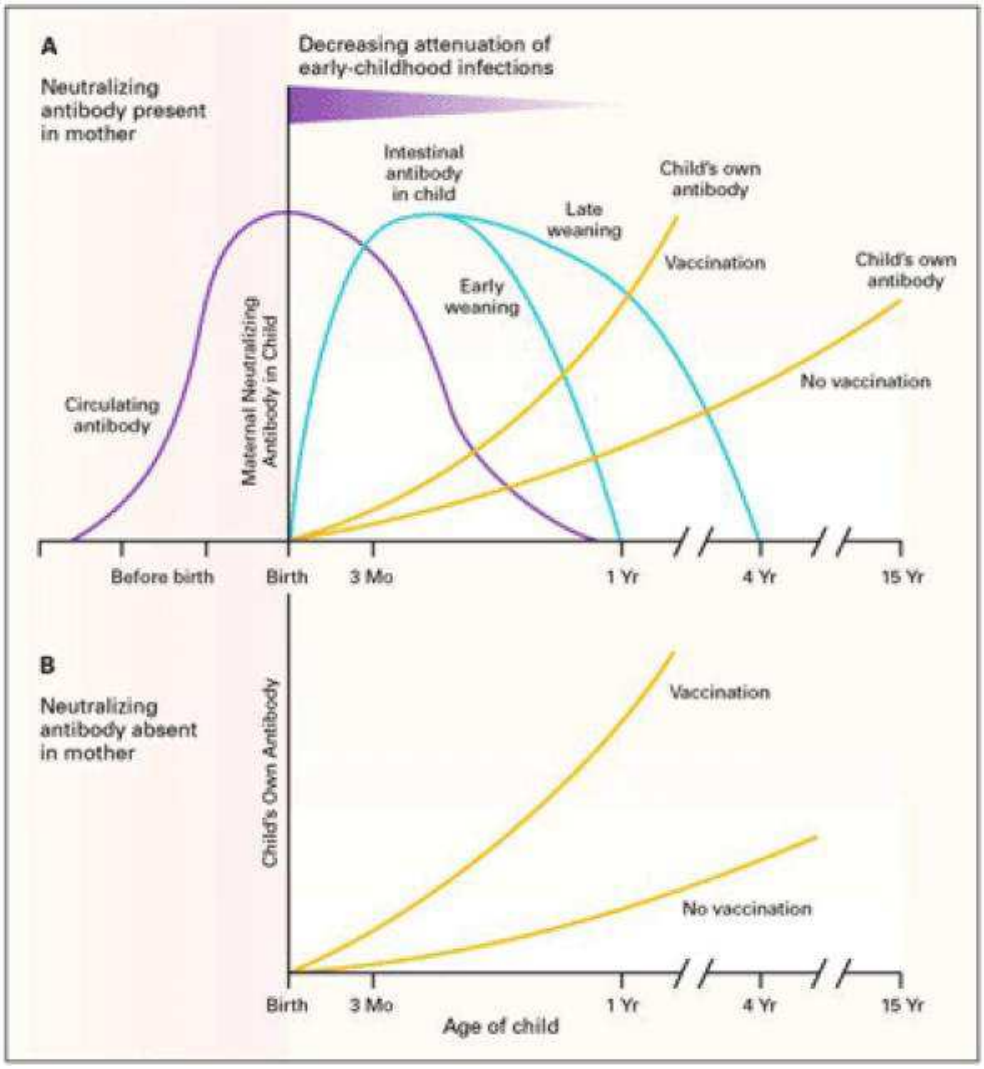
The IgG antibodies received from the mother are important for the protection of the infant during the first few months of life while the infant is starting to develop its own immunity. The major driving force for the expansion of lymphocytes (B and T cells) is the exposure to microbes which colonise the gut during birth.

Premature and low birth weight infants are at increased risk of experiencing complications of vaccine preventable diseases although the immunogenicity of some vaccines may be decreased in the smallest preterm infants, the antibody concentrations achieved are usually protective

The relative immaturity of the infant immune system leaves them unable to respond well to certain infectious agents as well as some types of vaccine.

A. If maternal antibodies are present that provide protection to the infant & can also weaken infections the infant may contract to help develop their immunity.

B. There is no protection offered to the infant in the absence of maternal antibody



How do vaccinations work?

Vaccinations are based on how the immune response works, involving antibodies and antigens that prevent certain diseases. Vaccinations present antigens to the body so they don't make them sick but allowed the body to produce antibodies against that particular antigens. These antibodies protect the individual's body from future attack by these organisms that cause a specific disease.

What are vaccines made of?[1]

Active components – antigens

Type of antigen	How these antigens work
Live-attenuated vaccines	Natural viruses cause disease by reproducing themselves millions of times in the body's cells. In this vaccine, the virus is weakened, thus can be injected into the body to produce an immune response without causing a severe disease. However, a few of the viruses may contain mutations, which will enable them to reproduce and cause infection. This type of vaccine is advantageous as only one or two doses generally provide lifelong immunity. However, around 1% of individuals die as a result of this vaccine.
Intact but non-living organisms	These vaccines are where the viruses or some parts of the virus is inactivated (killed) with a chemical such as formaldehyde. The killed virus cannot reproduce itself or cause disease. The advantage of this vaccine is that the body can still recognise the virus and mount an immune response. Since the virus cannot reproduce itself, it can be given to those with weakened immunity. However, the disadvantage with this virus is that several doses must generally be given multiple doses for long-term immunity. In those with weakened immunity, their immune system may not even respond to the vaccine despite multiple doses.
Subcellular fragments (Part of the virus or bacteria)	Part of the virus or bacteria that can cause an immune response is identified and separated from the part of the virus/bacteria which causes the disease symptoms. Hepatitis B: vaccine is made from a protein that is on the surface of the virus Hib: the outer coat (polysaccharide) is used, which is joined to a protein so that the immune system can respond to it Capsular polysaccharides- (usually encapsulated bacteria, by taking part of the capsule of the bacteria) - people without a spleen are at most risk of these infections as the spleen (important in the immune response to encapsulated bacteria) → thus they must be vaccinated every 5 years
Toxoids - using a toxin produced by the bacteria	These vaccines are made by chemically inactivating specific bacterial toxins. This inactivated toxin is called a toxoid. The vaccines contain a small amount of a bacteria's toxoid, which is introduced to the body to produce a good immunity response that cannot cause disease. Also with diseases such as diphtheria and tetanus that are caused by toxoids having had the disease does not ensure life-long immunity. Several doses of the vaccine are required to be immune to it.

Adjuvants

Adjuvants are used to enhance the immune response to a vaccine. These include various aluminum salts (e.g. Aluminum hydroxide, aluminum phosphate & potassium aluminum sulphate – alum). They are thought to improve the immune response by keeping the antigen near the injection site so they can be readily accessed by cells of the immune system. By using aluminum adjuvants usually a lower dose of antigen is given and fewer doses are needed.

[1] http://www.ncirs.usyd.edu.au/immunisation/fact-sheets/vaccine-components-fact-sheet.pdf

Diluents

A diluent is a liquid given separately and used to dilute a vaccine to the proper concentration before injection. The diluent is usually sterile saline or sterile water.

Stabilizers

Additives are used as stabilizers and help maintain a vaccine's effectiveness by keeping the antigen and other vaccine components stables during storage. They prevent eh vaccine components sticking to the side of the container. Some examples of additives include lactose and sucrose which are sugars, glycine and monosodium glutamate (they are amino acids or salts of amino acids) and human or cow serum albumin

Preservatives

Preservatives are used to prevent bacterial and/or fungal contamination of the vaccines and present in some vaccines. Preservatives were used in vaccines that were provided as multi-dose vials (one vial of the vaccine, could be used multiple times or different people). However, the use of multi-dose vials is no longer routinely used in Australia. The preservatives used include thiomersal, phenoxyethanol and phenol.

Thiomersal is a mercury-containing compound, more information can be found about it on page

Phenoxyethanol is an aromatic ether alcohol which is used as a preservative in many cosmetics as well. Phenol is an aromatic alcohol used in very few vaccines.

Trace components

Trace components are the remaining minute quantities of substances that were used earlier in the production of the individual vaccines. This is dependent on the manufacturing process of the different vaccines and the trace components may include extremely small amounts of culture fluids, egg proteins, yeast, antibiotics or inactivating agents.

There are different types of vaccines that vaccinations are made from, these include:

Vaccinations	**Type of antigen**
Hepatitis B	Recombinant DNA - contains hepatitis B surface antigen
Diphtheria, tetanus, pertussis	Made of diphtheroid toxoid, tetanus toxoid, pertussis toxoid
Hib	Purified Hib capsular polysaccharide
Polio	Killed virus
Pneumococcal	Sub cellular fragments
Rotavirus	Live attenuated
Varicella	Live attenuated
Measles, mumps and rubella	Live attenuated
Meningococcal C (two types)	Sub cellular fragments (*N. Meningitidis* serogroup C oligosaccharide)

Diseases and their vaccinations[2]

Hepatitis B

- Hepatitis B is a serious condition caused by a virus that affects the liver and can be contracted at any point in life – this virus is present in infected body fluids (e.g. blood & semen), and is transmitted via blood to blood
- Transmission – blood to blood contact, sharing needles, sexual contact & contaminated instruments
- Babies who get the virus, only present with mild symptoms, some having no symptoms at all – they have the highest risk of becoming a lifelong carrier of the virus
- Around ¼ of hepatitis B carriers develop liver cancer or failure later in life.
- Immunization for hepatitis B requires multiple doses at various ages to give full protection against the disease
- Some preterm babies do not response well as term babies and thus may require and extra dose to ensure they have enough protection, which needs to be discussed with your doctor

Possible side effects: most are minor & disappear fast, which can include soreness at the injection site, as well as mild fever, nausea, feeling unwell and joint paint. More serious side effects are very rare, there have been some cases linked to multiple sclerosis but research has not found this to be conclusive.

Diphtheria

- Caused by bacteria found in the mouth, nose & throat of an infected person
- It can cause a membrane to grow around the inside of the throat which can lead to trouble swallowing, breathlessness and suffocation.
- Diphtheria bacteria produces potent toxin that can spread all over the body – causing serious complications e.g. paralysis and heart failure
- ~7% of those infected will die from it

Tetanus

- Fatal disease caused by harmful toxin made by bacteria in soil & manure
- The bacteria can enter the body through a minute wound and is not spread from person to person
- Tetanus damages the nervous system - causing severe muscle spasms, first felt in the neck & jaw muscles (lockjaw). The effects spread, making it hard to breath, painful convulsions and abnormal heart beats.

Whooping cough (Pertussis)

- This is a highly contagious disease caused by spread of water droplets e.g. sneezing or coughing – the disease affects the airways making it difficult to breathe
- Severe coughing spasms occur between spasms – a child asps for air that causes the typical "whoop" sound often proceeded by vomiting
- The cough may lasts for months
- Dangerous disease for those <12 months, as most need to admitted to hospital

[2] http://www.ncirs.usyd.edu.au/immunisation/fact-sheets/vaccine-components-fact-sheet.pdf

- Complications of this disease: convulsions, pneumonia, coma, inflammation of the brain, permanent brain damage and long-term damage
- 1 in 200 babies <6 months infected with it, die from it

The diphtheria, tetanus and whooping cough vaccines are all given as one DTPa vaccine.

Possible side effects of DTPa vaccination: some children may have mild fever and redness, soreness and swelling in the area were the injection was given. Most side effects settle without treatment, but using paracetamol may help reduce fever and soreness at the injection site. There have been concerns in regards of the whooping cough vaccine causing inflammation of the brain (Encephalitis) and brain damage, but there has been not yet been proof from research about this connection.

Polio

- Polio varies from mild to very severe disease – it is a gastrointestinal virus that causes fever, vomiting and muscle stiffness and can affect nerves causing permanent disability
- The virus can cause paralysis of breathing and swallowing muscles, thus lead to death
- Around 1 in 20 of those hospitalized with Polio, die from it; 1 in 2 will survive although with permanent paralysis
- Even though Australia is polio free, there is a continual risk of it being imported from other countries thus it is important to get your child immunized
- There are 2 types of polio vaccines, an inactivated (IPV) which is injected and oral polio vaccine
- 3 doses of the vaccine is required to give good protection in children with a booster at 4 years of age

Possible side effects of IPV: can cause muscle aches, soreness, swelling or redness at the injection site. Up to 10% of children may experience low grade fever and loss of appetite.

Haemophilus influenza type b (Hib)

- Hib used to be a common cause of meningitis before the vaccine was introduced, with rapid swelling in the throat that would block breathing and lead to death if left untreated
- The disease can also cause pneumonia, joint infection or infection of tissue below the skin, usually on the face (cellulitis)
- Several doses of the vaccine is required to adequately protect a child
- Some preterm babies do not respond well compared to term babies, thus an extra dose may be required to ensure optimal protection and this should be discussed with your doctor

Possible side effects*:* this vaccine is very safe. Mild swelling, redness and pain at the infection site have been reported in up to 5% of children. Fever and irritability are not common, and more serious have not been reported

Pneumococcal

- Pneumococcal is a potentially life-threatening group of infections that occurs most often in children <2 years of age & those >65 years; the disease is more common in winter and spring
- Life-threatening forms of the disease include meningitis (inflammation around the brain), blood poisoning (septicemia) and infection of the lungs (pneumonia)
- Middle ear infections is the most common less serious form of pneumococcal disease in children

- Pneumococcal bacteria is spread by droplets shed from the mouth or nose through coughing, sneezing or having contact with objects that are infected with droplets – the bacteria is present in the back of the throat & nose of healthy children and adults
- Children with medical conditions such as impaired immunity or chronic disease are at increased risk

There are medical risk factors that predispose children to high incidence or more severe forms of pneumococcal infection are:

- Congenital immune deficiency
- Immunosuppressive therapy e.g. chemotherapy or large doses of steroids
- Poor functioning spleen e.g. In those with sickle cell anemia or surgical removal of spleen
- HIV infection
- Kidney failure, relapsing or persistent nephritic syndrome
- Down's syndrome
- Heart disease associated with cyanosis or cardiac failure
- All premature infants with chronic lung disease
- All infants born less than 28 weeks of
- Cerebrospinal fluid leak
- Intracranial shunts and cochlear implants

Possible side effects of pneumococcal immunization: There may be swelling, redness and soreness at the injection site. A child may have low grade fever, be sleepy, restless or irritable. Uncommon side effects include: vomiting, decreased appetite or diarrhea. Severe reactions are very rare and have an extremely small chance of complications such as a severe allergic reaction. However, the vaccine cannot cause the pneumococcal disease.

Measles

- Measles is a serious highly contagious viral disease – causes rash, fever, runny nose, cough and conjunctivitis (infection of the eye)
- Complications of can be very serious, 4% of cases develop pneumonia; around 1 in 2000 develop inflammation of the brain (encephalitis); 1 in 10 children who get measles die and 4 will have permanent brain damage
- Measles has caused more deaths in Australia in the last 15 years than Rubella, diphtheria and whooping cough combined
- A very serious but rare disease , known as sub acute sclerosing pan encephalitis (SSPE) can occur in children after several years of getting measles – SSPE rapidly destroys the brain and is fatal, it develops in about 1 in 2500 cases of measles

Mumps

- Mumps is a viral disease that causes fever, headache and inflammation of salivary glands
- At times it can cause infection of the tissue covering the brain (meningitis) but permanent effects are rare

- Up to 1 in 200 patients develop encephalitis (inflammation of the brain) and can also cause permanent deafness
- Around 20% of adolescent or adults males who develop measles get painful inflammation & swelling of tests which can cause a small chance of infertility

Rubella (German measles)

- Rubella is a mild disease of childhood
- Symptoms usually include: mild fever, swollen glands, joint pain and a rash which generally appears on the face and neck, lasting for around 2 – 3 days
- Recovery from rubella is almost always rapid and complete
- The most dangerous for of rubella is congenital rubella, where highly contagious infection in the first 20 weeks may lead to devastating abnormalities in the newborn baby. Deafness, blindness, heart defects and mental retardation can occur. This is why it is important all moths are immunized prior to pregnancy.

Measles, mumps and rubella (MMR) are all given as once vaccine, the possible side effects of the vaccination.

Possible side effects of MMR vaccination

The most common reaction is feeling unwell and having a low grade fever, possible with a rash, occurring 7 to days after immunization and lasting 2 to 3 days. Children who develop the rash are not infections. Fever can be treated with paracetamol. Sometimes children develop mild swelling of the salivary glands about 3 weeks after immunization because of the mumps component of the vaccine. More serious reactions are uncommon with around 1 in 30 500 developing bruising or bleeding (thrombocytopenia) which gets better by itself. In the case of inflammation of the brain (encephalitis) occurring following an MMR immunization with a rate of 1 in 1 000 000.

Meningococcal C disease

- Uncommon life-threatening infection caused by bacteria that live at the back of the throat in about 10% of health people – it is spread from the nose or throat via droplets through coughing & spluttering and can be spread by many hours of close contact as the bacteria does not live long outside the body
- Onset of disease is sudden and can cause rapid brain infection (meningitis) or blood poisoning (septicemia) or both
- There is higher rate of this disease in children under 5 years
- Meningococcal disease occurs more during winter and spring
- There are different strains of this disease with strains B and C being most common – however meningococcal C accounts for >50% of all meningococcal deaths

Possible side effects*:* some mild side effects your child might experience. Most common are pain, redness and swelling the site of injection, fever, irritably, decreased appetite (for a few hours) and headaches. These side effects last only for a short period of time. More serious side effects are rare e.g. seizures

Varicella (Chicken pox)

- Highly contagious disease – cased by varicella-zoster virus begins with cold like symptoms e.g. runny nose, mild fever, cough & fatigue followed by rash which appears on trunk and face and spreads all over the body – rah begins as small red spots that will turn into blisters
- Chickenpox is spread through coughs and sneezes through direct contact with fluid in the blisters of the rash
- In health children, chicken pox is usually mild disease lasting 5 – 1days
- The chickenpox rash can be very itchy and scratching can lead to bacterial infections of the spots
- Children with other medical conditions are at risk of developing life-threatening conditions such as pneumonia or inflammation of the brain
- Adults tend to have more sever disease than children and are more likely to develop complications

Possible side effects: uncommon and may include pain, redness or swelling at injection site. Serious side effects very rare

National Immunization Program [3]

AGE	DISEASE	VACCINE
CHILDHOOD VACCINES		
Birth (Maternity units)	Hepatitis B	H-B-VAX II (babies before 8 days of age)
2 months	Diphtheria, Tetanus, Pertussis Haemophilus influenzae type B (Hib) Hepatitis B Polio	INFANRIX HEXA
	Pneumococcal	PREVENAR
	Rotavirus	ROTARIX (children born on/after 1 May 2007)
4 months	Diphtheria, Tetanus, Pertussis Haemophilus influenzae type B (Hib) Hepatitis B Polio	INFANRIX HEXA
	Pneumococcal	PREVENAR
	Rotavirus	ROTARIX (children born on/after 1 May 2007)
6 months	Diphtheria, Tetanus, Pertussis Haemophilus influenzae type B (Hib) Hepatitis B Polio	INFANRIX HEXA
	Pneumococcal	PREVENAR
*12 months	Measles, Mumps, Rubella Haemophilus influenzae type B (Hib) Meningococcal C	PRIORIX HIBERIX MENINGITEC
18 months	Varicella (Chicken pox)	VARILRIX
*4 years	Diphtheria, Tetanus, Pertussis, Polio Measles, Mumps, Rubella	INFANRIX-IPV PRIORIX

[3] http://www.health.nsw.gov.au/PublicHealth/Immunisation/programs/prog_schedule.asp

Pre-vaccination screening checklist

This checklist helps your doctor/nurse decide about vaccinating you or your child. Please tell your doctor/nurse if the person about to be vaccinated:

- is unwell today
- has a disease which lowers immunity (eg. leukaemia, cancer, HIV/AIDS)or is having treatment which lowers immunity (eg. oral steroid medicines such as cortisone and prednisone, radiotherapy, chemotherapy)
- has had a severe reaction following any vaccine
- has any severe allergies (to anything)
- has had any vaccine in the past month
- has had an injection of immunoglobulin, or received any blood products or a whole blood transfusion within the past year is pregnant
- has a past history of Guillain-Barré syndrome
- was a preterm infant
- has a chronic illness
- has a bleeding disorder

A different vaccine schedule may be recommended if the person to be vaccinated:

- identifies as an Aboriginal or Torres Strait Islander
- does not have a functioning spleen
- is planning a pregnancy or anticipating parenthood
- is a parent, grandparent or carer of a newborn
- lives with someone who has a disease which lowers immunity (e.g. leukemia, cancer, HIV/AIDS), or lives with someone who is having treatment which lowers immunity (e.g. oral steroid medicines such as cortisone and prednisone, radiotherapy, chemotherapy)

Circumstances when the vaccination schedule will be altered[4]

There are at times when the doctor may want to defer a vaccination or not recommend for your child not get it done or alter the vaccine schedule.

Condition or circumstance	**Action**	**Rationale**
Unwell today: • Acute febrile illness (current T ≥38.5°C). • Acute systemic illness.	Defer all vaccines until afebrile. NB. Children with minor illnesses (without acute systemic symptoms/signs) should be vaccinated.	To avoid an adverse event in an already unwell child, or to avoid attributing symptoms to vaccination.
Has a disease which lowers immunity or receiving treatment which lowers immunity.	Seek expert advice before vaccination NB. People living with someone with lowered immunity should be vaccinated, including with live viral vaccines.	The safety and effectiveness of the vaccine may be suboptimal in people with impaired immunity.
Anaphylaxis following a previous dose of the relevant vaccine.	Do not vaccinate.	Anaphylaxis to a previous dose of vaccine is a contraindication to receiving the vaccine.
A severe (anaphylactic) allergy to a vaccine component.	Do not vaccinate (seek specialist advice)	Anaphylaxis to a vaccine component is a contraindication to receiving the vaccine.
Received live parenteral vaccine or	Delay live vaccines by 4 weeks.	The immune response to a live viral vaccine may interfere with the response to a second live viral

[4] http://www.health.gov.au/internet/immunise/publishing.nsf/Content/handbook-prevaccination-screening

BCG vaccine in past 4 weeks.		vaccine if given within 4 weeks of the first.
Has had any blood product in the past 7 months, or has had IM or IV immunoglobulin in the past 11 months.	Make a return appointment for this vaccination, and send a reminder later if necessary.	Antibodies within these products may interfere with the immune response to these vaccines.
Is pregnant.	Live vaccines* should be deferred until after delivery. Conception should be deferred until at least 28 days after administration of live viral vaccines. Inactivated vaccines are generally not contraindicated in pregnancy.	There is insufficient evidence to ensure the safety of administering live vaccines during pregnancy or within 28 days before conception. NB. Influenza vaccine is recommended for pregnant women. Vaccination of household contacts of pregnant women should be completed according to the NIP schedule.
History of Guillain-Barré syndrome (GBS)	Risks and benefits of influenza vaccine should be weighed against the potential risk of GBS recurrence	People with a history of GBS may be at risk of recurrence of the condition following influenza vaccine.
Was born preterm. *Vaccination of women planning pregnancy pregnant or breastfeeding women, and preterm infants.*	Preterm infants born at <28 weeks' gestation or <1500 g birth weight require an extra dose of PRP-OMP Hib vaccine at 6 months of age. Preterm infants born at <28 weeks' gestation and/or with chronic lung disease require extra pneumococcal vaccinations. Preterm infants born at <32 weeks' gestation or <2000 g birth weight may require an extra dose of hepatitis B vaccine.	Preterm infants may be at increased risk of vaccine preventable diseases (eg. invasive pneumococcal disease (IPD)), and may not mount an optimal immune response to certain vaccines (eg. hepatitis B, PRP-OMP).
Has a severe or chronic illness.	These people should receive pneumococcal vaccine and annual influenza vaccination. If there is significantly impaired immunity, they should not receive live vaccines, but inactivated vaccines should be considered (seek expert advice).	People with a severe or chronic illness may be at increased risk of vaccine preventable diseases (eg. IPD) but may not mount an optimal immune response to certain vaccines.
Has a bleeding disorder	The subcutaneous route could be considered as an alternative	Intramuscular injection may lead to haematomas in patients with disorders of haemostasis.
Does not have a functioning spleen.	Check vaccination status for pneumococcal, meningococcal and Hib vaccinations.	Individuals with an absent or dysfunctional spleen are at an increased risk of severe bacterial infections, most notably IPD.

Contraindications to vaccinations

- Anaphylaxis following a previous dose of the relevant vaccine
- Anaphylaxis following any component of the relevant vaccine

There are also further contraindications to live vaccines including:

- Live vaccines should not be given to those with impaired immunity, regardless whether treatment is caused by disease or treatment. The exception is wit the specialist advice, the MMR vaccine can be given to children who are HIV positive but their immunity is only mildly impaired
- Should not be given to pregnant women, and women are not advised to becoming pregnant within 4 weeks of receiving a live vaccine.

Are vaccinations compulsory?

- Vaccinations are not compulsory but they are highly recommended for all children
- **Conscientious objection form**[5] - this form is used to record a parent's personal, philosophical, religious or medical belief that immunisation should not occur. The form has to be signed by a doctor or immunisation provider and sent to the Immunisation Register.

What risks and concerns with vaccinations?

There are possible side effects from the vaccinations given to your child.

Thiomersal

- Mercury based (49.6% by weight) preservative used in vaccinations - prevents bacterial and fungal growth
- Has been used in small amounts in vaccines since the 1930s
- There have been many concerns over the risks of thiomersal causing mercury poisoning and its potential toxic effects and its possible link to autism
- In response to these concerns in July 199, U.S. Food and Drug Authority order all vaccine manufacturers to remove thiomersal from all vaccines or justify its continued use
- Since end of August 2000, no vaccines on the Standard Australian Vaccination schedule contains thiomersal
- Despite the eradication of thiomersal from vaccines there has still been an increasing rate of young people being diagnose with autism – thus it rules out thiomersal being a main contributing factor to the cause of autism

MMR vaccination and autism

There have been countless numbers of anecdotal evidence where parents believe that the MMR vaccine triggered the onset of their child(s) regressive autism. However, currently there are no scientific research has found this to be the case.

[5] http://www.medicareaustralia.gov.au/public/files/ma_conscientious_objection_form.pdf

Resources and further reading

National centre for Immunisation Research and Surveillance – They provide a lot of information regarding immunizations and downloadable fact sheets. They also have a MMR decision Aid which may help parents trying to decide whether to vaccinate their child with the MMR vaccine.
http://www.ncirs.usyd.edu.au/immunisation/index.php

The Australian Vaccination Network – provides information on less publicised issues regarding vaccines and immunsations **http://www.avn.org.au/**

Immunisation Advisory Centre – Useful information about immunizations - http://www.immune.org.nz/