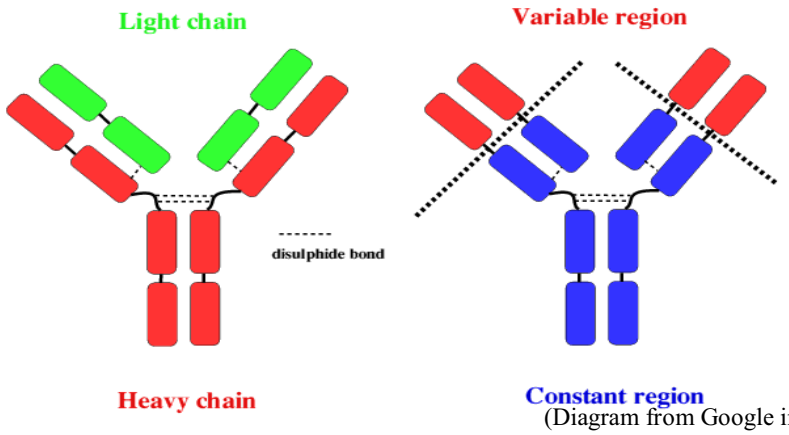
Immunity

Immunisation is a quick, simple and safe way to protect an individual from infection. The more people immunised in childhood, the more rare diseases become. Immunisation therefore protects not just your child but babies, adults and other children too.

Artificial immunisation is a way of creating immunity to certain infections using relatively harmless antigens that come from, or are similar to, the micro organism that cause infection. Microorganisms can be viruses, such as measles, or bacteria such as Diphtheria.

An antibody is an immunoglobulin (protein molecule produced to combat microbial infection and provide immunity) produced because of an antigen introduced to the body. An antigen is a substance that stimulates an immune response (triggered when the body detects the presence of foreign material, this substance is an antigen) e.g. can be pathogens, vaccines, pollen, and even some food. Each antigen stimulates the production of a specific antibody itself. The antibody helps the body to fight against infection. Antibody production is a major function of the immune system and is carried out by B-lymphocytes; these are a type of white blood cells.

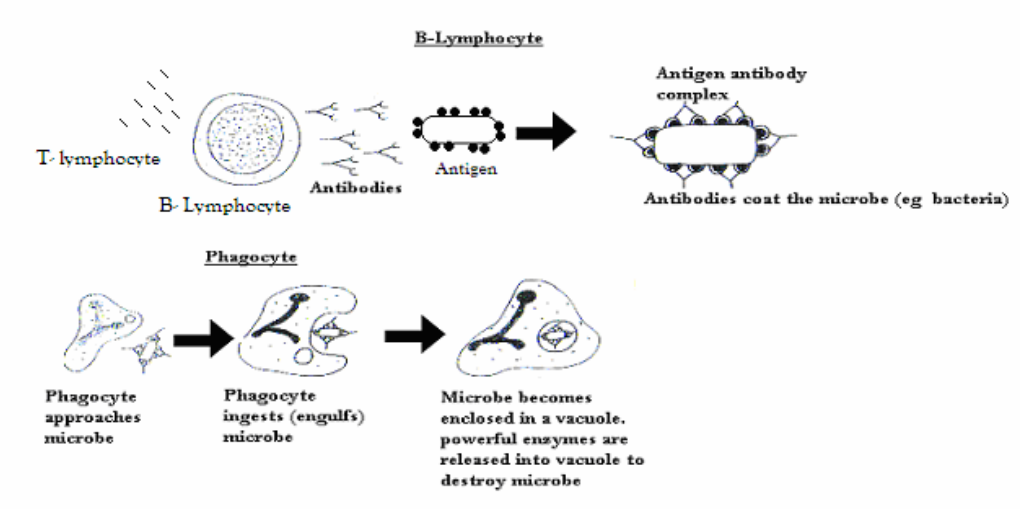
Basic structure of an Antibody



(Diagram from Google images research)

Cells called T-lymphocytes "regulate the immune response by releasing chemicals to stimulate or suppress antibody production" (GNVQ advanced options, Human physiology and health in the caring context). The T-lymphocytes take part in cell killing (cytotoxicity) and inflammation, in the case of AIDS "the virus attacks the T-lymphocyte and the victim cannot then make antibodies effectively" (GNVQ advanced options, Human physiology and health in the caring context). B-lymphocytes work by identifying antigens either as virus or bacterium, they then secrete specific antibodies that bind to antigens (antigen antibody complex) and identify antigen complex to fight the infection. In the serum and lymph, antibodies act on antigens. B-cell produced antibodies may either be attached to B-cell membranes or free in the serum and lymph. A phagocyte (white blood cell with a lobed nucleus) then approaches the enzyme and engulfs it. Once engulfed the microbe is attacked and destroyed. This process happens out in the blood.

(Diagram from teachers notes)



There are two types of immunity, active immunity and passive immunity. Active immunity contains an attenuated (weakened) or killed form of the disease-causing organism, or a killed sample if the disease, this is also known as inactivated. Passive immunity saves the body from making its own antibodies, serum from an already immune person is injected into an infected person, and this is not a vaccine.

The vaccine for active immunity is either given by mouth or injection. The given vaccine helps the immune system to produce antibodies that fight against that particular bacterium or virus. Clones of B-lymphocyte memory cells stay in the blood so that if the body comes into contact with the antigen again it will not result in development of the antigen, as the body will have the knowledge of how to fight it. This is called active immunity because the immune system is relied on to produce antibodies. Attenuated (weakened) disease organism vaccines are not given to people with damaged immune systems. Some vaccines require booster treatment; this means that they have to be given more than once following a particular schedule others only require one vaccine.

<u>Differences between active and passive immunity:</u>

Active	Passive
Long-term defence, lifetime. The antibodies stay in the blood to protect against future infection.	Short-term defence- only temporary defence.
After the body has produced the necessary antibodies active immunity protects when individual comes into contact with the disease.	Gives immediate protection
Protects when individual comes into contact with the disease.	Protects an already ill person. Stops the production of toxins.
Vaccination- either attenuated or killed sample of the disease-causing organism.	Sample of serum from an already immune person given to ill individual to fight the disease.

Primary and secondary response of antibody production

"The production of antibody, involving circulating monocytes, T and B - lymphocytes and tissue bound macrophages, may result in either a primary and/or secondary response." (www.blood.co.uk)

After the individual first comes into contact with a particular antigen is the primary response. The body will take 3-14 days after infection until it produces antibodies. The period between infection and the onset of anti body production is the Primary latent period. After this latent period the amount of antibodies in the blood rises rapidly and then begins to fall. Memory cells are produced during the immune response, these are clones of the lymphocytes that fought of the pathogen (micro organism that cause disease) remain in the body. The body now has long term defence against second infection of this antigen.

The secondary response happens if a second infection occurs. A much smaller amount of antigen will induce the secondary response. The body will have a rapid production of antibodies in which more antibodies are produced than before. This is a quick response, which means the pathogen is destroyed before it causes symptoms. A booster vaccination may be needed at a later time.

(Diagram form teacher's notes)

Passive immunity

Passive immunity is when blood is taken from an already immune person, this blood contains antibodies and an extract of the blood (immune serum) is given to an infected individual to help them become immune. Passive immunity is not a vaccine. Passive immunity immediately helps the infected individual however this is only temporary protection.

Immunisation in children

Babies and young children are more vulnerable to infection because they may not have had all the vaccinations needed to fight a certain disease so when they come into contact with it will get this disease because there body has not produced the antibodies needed to fight the disease however once they've had the vaccination required they will have life long immunity. Babies and young children also have weaker bodies, like the elderly, so are not strong enough fight off the disease.

Because children are so vulnerable to infection there is an immunisation schedule for children. This is a set sequence of vaccinations for children in the UK. This schedule is to avoid large-scale outbreaks of disease as they are protected for life from some potentially lethal diseases this schedule is however not compulsory. For particular vaccinations such as Diphtheria, tetanus, pertussis and polio booster vaccinations are required to ensure immunity. From these

vaccinations there is a small risk of side effects however these are outweighed by the dangers of contracting the disease.

The first immunisation is one injection given at two, three and four months old for diphtheria, tetanus, pertussis, polio and Hib (DtaP/IPV/Hib) there is also one injection given at two, three and four months old given for MenC. The next immunisation is also one injection given at approximately thirteen months to protect against measles, mumps and rubella, this is also known as the MMR vaccination. At three years four months to five years booster vaccination for diphtheria, tetanus and polio is offered and also a booster injection for measles, mumps and rubella these are also singular injections. Finally a further booster vaccination is given at thirteen- eighteen years old and is for tetanus, diphtheria and polio this again is a singular injection.

WHEN TO IMMUNISE	WHAT IS GIVEN	HOW IT IS GIVEN
2, 3 and 4 months old	Diphtheria, tetanus, pertussis (whooping cough), polio and Hib (DTaP/IPV/Hib)	One injection
	MenC	One injection
Around 13 months old	Measles, mumps and rubella (MMR)	One injection
3 years and 4 months to 5 years old	Diphtheria, tetanus, pertussis (whooping cough) and polio (dTaP/IPV or DTaP/IPV)	One injection
	Measles, mumps and rubella (MMR)	One injection
13 to 18 years old	Diphtheria, tetanus, polio (Td/IPV)	One injection

(Table from www.immunisation.nhs.uk)

Immunisation in children

Name of disease	Bacteria/ Virus Type of microbe	Cause	Main symptoms	Treatment
Diphtheria (Coryne*b*acteriu*m* di*ph*theriae**)**	**Bacteria**	**Spread in droplets of moisture coughed into the air**	**Mild sore throat, low grade fever, nausea vomiting, head ache, fast heart rate**	**Diphtheria antitoxin is administered (either intravenously or by intramuscular injection)**
Pertussis/ Whooping cough (*B*ordetella *p*ertussis**)**	**Bacteria**	**Airborne droplets containing the bacteria** *B*ordetella Pertussis **breathed in usually form coughing**	**Severe inflammation of the whole respiratory tract, results in bouts of coughing**	**No specific treatment, children with asthma would need to be monitored, antibiotics are sometimes used in the early stages of the disease**
Tetanus/ Lockjaw (Clostridiu*m* tetani**)**	**Bacteria**	**Germs that are found in soil and manure get in the body through open cuts or burns**	**Stiffness of the jaw, facial muscles, the neck, abdominal and back muscles**	**Globulin, given intramuscularly, is the immediate treatment of unimmunized individuals exposed to material likely to contain the tetanus bacteria. Treatment includes bed rest and quiet conditions**

Name of disease	Bacteria/ Virus Type of microbe	Cause	Main symptoms	Treatment
Measles	**Virus**	**Spread through airborne droplets, contaminated clothes, toys etc**	**Sore throat, cold symptoms, red eyes and coughing with a high temperature, red rash which starts near the ears and spreads to the trunk and parts of the limbs in a couple of days (individual is infectious for approximately four days before the rash appears but kolpiks spots can be seen around the molars before the rash appears)**	**Vitamin A, paracetamol for temperature**
Mumps	**Virus**	**Spread through airborne droplets**	**Swelling of the parotid glands on the cheeks and in the front of the ears, fever and difficulty opening mouth. Men may develop Orchitis (inflammation in testes) in one or both testes and in 10% of cases may become sterile in the affected organ/s.**	**Analgesics for pain, antipyretics for fever, and adequate fluid intake to prevent dehydration from fever and anorexia. If the patient cannot swallow, I.V. fluid replacement may be used.**
Rubella (German measles)	**Virus**	**Spread by airborne droplets**	**Short lived rash, swollen glands and a sore throat.**	**No specific treatment**

Immunisation recommended for travellers

Few immunisations are compulsory for travellers to countries abroad however many immunisations are recommended for travel outside Europe, North America, Australia and New Zealand. Booster doses of immunisations given in childhood may be required on medical advice; people who travel regularly must maintain their immunisations. Common examples of diseases travellers may need to be protected from are; Cholera, Hepatitis A, Typhoid, Rabies and Malaria.

Vaccinations for travellers are given at any age and different countries have specific health risks so certain vaccinations are required. For example most Asian and African countries have a high risk to becoming infected by Cholera as it comes from contaminated food or water, often from sewage and these countries have low hygiene standards. Most countries outside Europe, North America, Australia and New Zealand have high risks of becoming infected by the bacterial disease Typhoid Fever; this is spread by contaminated food and water, flies and typhoid carriers, it is also common because these countries may have low hygiene standards. UK, Scandinavia, Australia and New Zealand are the only countries that are Rabies free however a recent spread in Northern Europe has increased the risk of Rabies entering Britain.

Depending on the disease it is wise to get vaccinations for diseases you could come into contact with when going to certain countries for example, you may be at high risk of coming into contact with malaria in over one hundred countries with tropical climates, you do not get vaccinated to protect against malaria instead you are given a series of tablets to take, you should start taking these tablets one week before you leave the country, the whole time you are in the country in which you can come into contact with the disease and for four weeks after leaving the infected area.

Depending on which vaccinations you have depend on how long you stay immune to the disease. Rabies is an acute viral infection spread by an infected animal; it can lead to the infection of the brain and nerv ous system, which is almost invariably fatal. To vaccinate against rabies you would have a course of three vaccinations the second one-week after the first and the third three weeks after the first this would last for approximately three to five years. Hep atitis A is a viral infection that results in the inflammation of the liver, hepatitis A is highly contagious the symptoms include, nausea vomiting, fever and chills, jaundice, pain in the abdomen including the liver and severe tiredness. To protect agains t hepatitis A you can receive two injections. If you only receive one of the vaccinations it will protect you for one year but if you receive the second six months after the first it will protect you for ten years, this vaccination is active immunity.

Immunisation recommended for travellers

Name of disease	Type of microbe	Cause	Main symptom	Treatment	Countries with high risk
Cholera	Bacteria	Contaminated food, water (often from sewage)	Severe, watery diarrhoea, rapidly causes dehydration and result in death if untreated	Water purification	Most Asian and African countries
Hepatitis A	Virus	Sewage contaminated food and water	Produces flu-like illness with jaundice or could be no symptoms	Food and personal hygiene. Passive immunity (3 month protection)	Countries with low hygiene standards
Typhoid	Bacteria	Contaminated food, water, flies or typhoid carriers	Fever, rash, diarrhoea, gastrointestinal complications	Wash hands after using the toilet	Most countries outside Europe, North America, Australia, New Zealand
Malaria	Protozoan	Contaminated water or food and toilet waste	High fever and shivering, great weakness	Use of mosquito nets, kill mosquitoes, take preventive drugs	Countries of tropical climate
Rabies	Virus	Bite or lick from an animal carrying rabies e.g. foxes, wolves, dogs	Fatal inflammation of the nervous system	Vaccine When bitten passive immunisation is given	Only free from rabies in UK, Scandinavia, Australia and New Zealand

Risks and side effects

All vaccines are not totally side effect free. When deciding whether to immunise you should think about the risks of the vaccine compared to those from the disease. For all vaccine preventable diseases the risk of complications with natural infections is very much greater than the risk of serious reaction following vaccine. Reactions to an immunisation can vary depending of the vaccine. You should also contact your nurse if a reaction occurs from vaccination.

Some examples of side effects and risks are shown below:

Diphtheria: (*Corynebacterium diphtheriae***)**
The diphtheria vaccination is given intramuscularly into the upper arm or anterolateral thigh. "This is to reduce the risk of localised reactions, which are more common when vaccines are given subcutaneously" (immunisation against infectious disease, 'The green book' chapters on Diphtheria, Hib, Pertussis, Polio and Tetanus) Vaccination should be given by deep subcutaneous injection to those with bleeding disorders to avoid heavy bleeding.

Cholera:
World Health organisation believes cholera vaccinations to be ineffective.

Pertussis (*Bordetella pertussis***)/ Whooping cough:**
"The risks of vaccination are far less than the dangers of the disease itself," (GCE AS level double award Health and Social care text book, Neil Moonie) The risks of the vaccination are; mild fever and irritability for approximately one day, 1 in 300,000 babies may develop permanent brain damage but risk is small. (Statistic from, 'Immunisation against infectious disease, 'The green book' chapters on Diphtheria, Hib, pertussis and Tetanus).

During the 1970's many chose not to have their children immunised against Pertussis because it was believed that the vaccination could cause the child to develop asthma, this however was completely untrue and the hysteria in which it caused was unnecessary.

Hepatitis A:
Like most injections the risks of the hepatitis A vaccination are, some may experience tenderness and redness at the site of the injection. "Hepatitis A cannot be contacted directly form the vaccine." (GlaxoSmithKline Travel Health, Hepatitis A pamphlet.)

Tetanus (*Clostridium tetani***):**
Similarly to the hepatitis A vaccination, the tetanus vaccination has risks. These risks are; some may experience tenderness and redness at the site of injection. "Tetanus cannot be contacted directly form the vaccine." (GlaxoSmithKline Travel Health, Tetanus pamphlet.)

Typhoid:
The vaccination for typhoid does not offer 100% protection. (Immunisation against infectious disease, 'The green book' chapters on Diphtheria, Hib, pertussis and tetanus)

Measles:
The risk of not being immunised to fight against measles would be becoming infected with the disease. If you are infected with this disease you may develop certain symptoms/ side effects such as; rash and fever, one in twenty infected individuals develop ear infection. However if you receive the vaccination to fight

against measles you may develop very rare side effects such as rash or fever, ear infection or fits. Also one doctor claimed that getting the vaccination for measles can give you autism however this has been completely discredited as the MMR vaccination is the most extensively tested vaccination and there is no evidence to support links with autism despite extensive research.

Mumps:
The vaccination for mumps is a combined vaccine with measles and rubella (MMR). There has been speculation that the MMR vaccination causes autism, this was because in 1998 one doctor published a study claiming that it lead to a small group of children to develop autism after the first symptoms developed within the first two weeks after the vaccination was administered. The MMR vaccination can also have the side effects (like all medicines) such as a high temperature, rash or being irritable. Much more rare side effects include fits, sore joints and bleeding or bruising.

Rubella:
As the vaccination for rubella is a combined vaccination with measles and mumps (MMR) the risks form the vaccination are the same, high temperature, rash or being irritable. Also more rare side effects include fits, sore joints and bleeding or bruising.

Malaria:
To prevent malaria you are administered with tablets. Following the guidelines faithfully for these tablets may not guarantee complete protection. "If you get a fever between one week after first exposure and up to two years after your return, you should seek medical attention and tell the doctor that you have been in a malarious area." (www.fitfortravel.scot.nhs.uk)

Rabies:
The risks of this vaccination are; tenderness and redness at the site of injection and occasionally you may feel aches and headaches.

There are other risks in different contexts from vaccination:

Travel plans:
When thinking about where you will take your holiday you should think about the diseases in which you could come into contact with for example Typhoid is common most countries outside Europe, North America, Australia and New Zealand. Also the United Kingdom, Scandinavia, Australia and New Zealand are the only countries free from Rabies.

Time factors:
This means not leaving enough time to get the vaccination before coming into contact with the disease for example, if you were to be going to a country with a high risk of contact with Hepatitis A you should leave enough time to g et the vaccination and for your body to make the antibodies to fight the disease.

PIES and immunity

	Immunisation	Non immunisation
P- Physical	**If you are immunised for MMR you could develop, rash, fever, fits or ear infections**	**The child could come into contact with and develop a disease**
I- intellectual		**A pregnant woman with rubella could have a child who was intellectually slow.**
E- Emotional	**Distress for your child, watching them go through the immunisation**	**Worry for risk of infection**
S- Social	**If your child has been immunised it could effect who they play with as parents could have disagreements over immunisation**	**You may feel worried over who your child plays with if they come into contact with a disease.**

Religion and immunisation

Some people believe that the process of vaccination is more harmful to the body than the actual disease; they think that if the body comes into contact with the disease that it should fight it naturally and not by the use of vaccination. However vaccination has short- term side effects where as the actual infection can have permanent effect on the individuals' life.

Religious groups such as Jehovah's witnesses and Christian scientists also have other beliefs, they do not believe in blood transfusions or receiving blood products but permit vaccinations and feel that it is up to the individual concerned. They believe that healing is a spiritual process carried out by reading the bible.

My view on immunisation

After completing my report on immunisation I feel that being immunised is a good idea. I did not have very strong views on it before doing this report but always agreed with it, I think this is because I have been immunised when I have needed to be. After all the research I have carried out I am now able to back up my views with reason for example, although having the disease would give you life long immunity, immunisation would be better as the side effects of having the disease are permanent.

I understand why parents would have different views out of worry for their child as their have been many statements made as what risks and side effects some vaccinations can have (such as the MMR vaccination and its connection with autism of which I explained in my report) but further research would show the benefits of having their child immunised.

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