

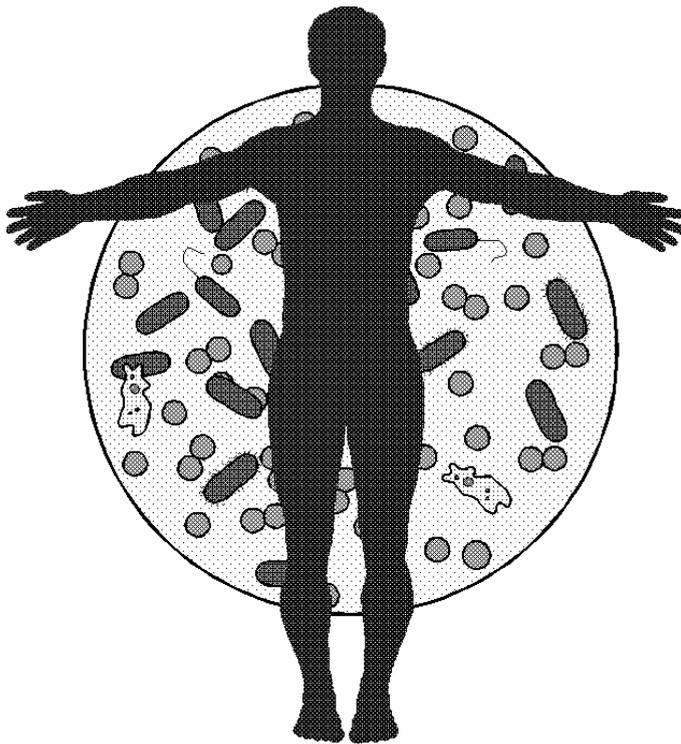
Mathematics Science Strand

Health and Physical Education

Module

H2

Diseases



Student Support Material

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Primary and Secondary Teacher Education Project

Australian Agency for International Development (AusAID)

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Unit overview

(Based on the National Curriculum Guidelines)

The shaded Module represents the one studied in these materials.

Unit	Code	Module
Health and Physical Education	H1	Human Body
	H2	Diseases
	H3	Nutrition
	H4	Human Movement
	H5	Movement Skills

Symbols used in these materials.

The symbols shown in the table indicate the type of activity to be completed while studying this module.



Read or research



Write or summarise



Activity or discussion



Safety note



First Aid procedure

Why study this module?

The study of diseases and their effect on the population of Papua New Guinea is very important to ensure that teachers in the Primary Schools are well informed. A knowledge of the common and threatening diseases will, through education, provide communities of PNG with the ability to control the spread and contain some of the epidemics currently being experienced. It is important for the trainee teachers to have a good understanding of these diseases to be good healthy teachers in the primary school.

This module concentrates on the most serious threats to the life styles of PNG citizens. Therefore the three main topics in this module are:

1. Infectious diseases
2. Parasitic diseases
3. Drugs

Objectives

At the end of this module students should be able to:

- outline the main contagious diseases affecting PNG citizens;
- describe the causes of the serious contagious diseases;
- apply a knowledge of the prevention of AIDS and other STDs to their own lives and teaching in community schools;
- prepare teaching resources outlining ways of minimising and/or preventing the most serious contagious diseases in PNG;
- recognise and describe the major parasitic diseases of PNG;
- describe the life cycle of malarial mosquitoes and the way malaria is spread;
- recognise the common symptoms of and outline the treatment for malaria;
- plan an educational presentation to educate the public about preventing the breeding of malarial mosquitoes;
- list the drugs most frequently used in PNG society;
- describe the effects of misuse of both prescription and non-prescription drugs;
- research information on the effects of contagious diseases, malaria and drugs on the PNG population;
- conduct library research and share information with peers;
- prepare teaching resources on this module for Primary school classes.

1. Infectious diseases

Agents of infection

Bacteria

Bacteria are a single-celled organism with a protective wall. They can be round or rod shaped and vary in size from 1 to 20 000th of a millimetre. Some are aerobic (depend on oxygen) and are found on the surface of the skin or respiratory tract. Others are anaerobic (live in an oxygen-free environment) and are found in such places as deep wounds or the bowel. The three main shapes are spherical (cocci), rod (bacilli) and spiral (spirillum) as shown in figure 2.

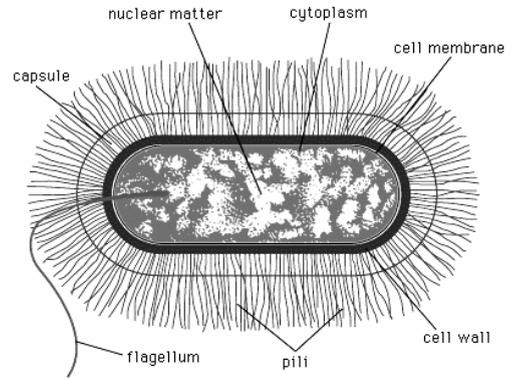


Figure 1. Bacterium cell. (Britannica 2001 CD ROM, Oxford University Press.)

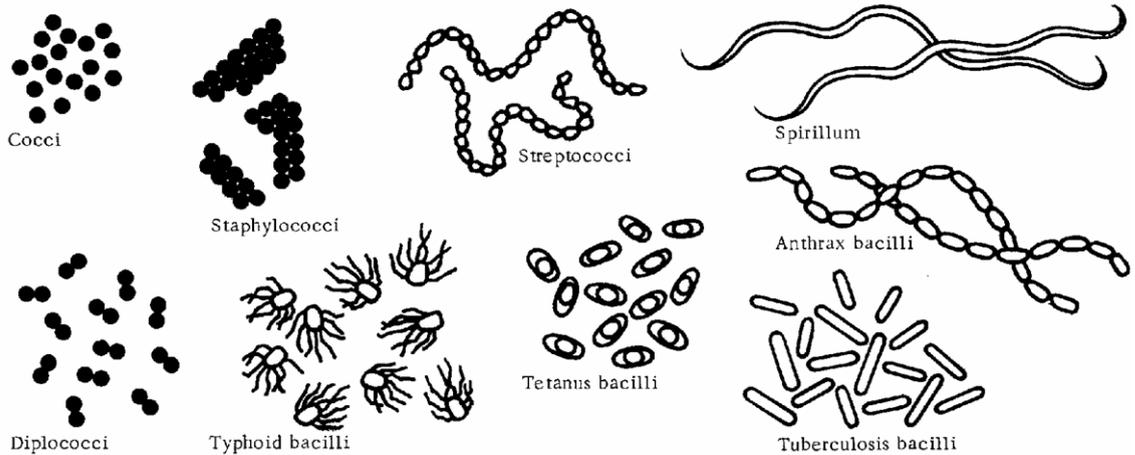
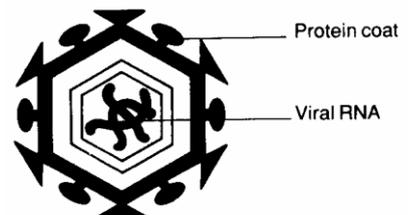


Figure 2. Different forms of common bacteria. (Heidenstam, D, (Ed.) (1976). *Mans' Body: An owner's Manual*. Paddington Press.).

Viruses

Viruses are the smallest known infectious agents. Viruses consist of a core of genetic material (**RNA**) surrounded by a protein coat. A virus can multiply in a living cell, using the host tissue's own replicating material (**DNA**). When viruses get inside our bodies they can cause cold or influenza 'flu' or diseases like HIV/AIDS. Different viruses cause different infections.

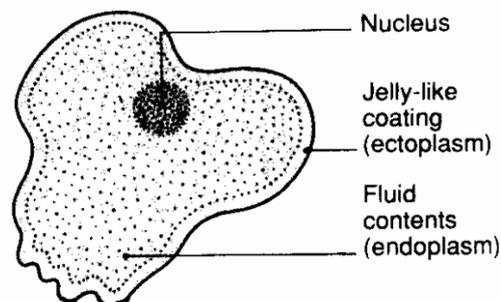


Because some virus may continually change their form and the way in which they invade tissues and **replicate**, it is very difficult to produce immunisation against a number of viruses, e.g., HIV.

Protozoa

Protozoa are single-celled parasites that are slightly larger than bacteria. Many live in the human intestine and are harmless. However some types cause malaria, giardia and dysentery.

Malaria is caused by the *Plasmodium sp.*, which is carried by the female *Anopheles* mosquitoes. The malaria parasite goes through a number of stages and infects the blood cells of humans. **Amoebic dysentery** is caused by an amoeba, which is a protozoan.



Routes of infection

Infective agencies have four main routes into the human body:

- through breaks in the skin, or in the mucous membrane that lines the mouth, nose and throat. (Breaks may be wounds or bites made by the same insect that brings the infection);
- down the respiratory tract into the lungs;
- down the digestive tract, into the stomach and bowels and
- up the reproductive and urinary systems, via the genitals.

In all cases, the infectious agent may remain localised at its point of entry, or may enter the blood or lymph system and be distributed through the body. For example, infection of a wound may result in an abscess filled with pus that may infect other flaws in the skin. An infection may also travel up the lymph canals to the lymph nodes perhaps being trapped there and causing a further abscess.

How infections occur

Water droplets in the air

The most frequent source of common infections is **inhalation of water droplets** carried in the air. **Breathing, speaking, coughing** and **sneezing** all spread droplets of saliva, sputum or secretion into the air. These can carry bacteria that are inhaled (or taken in with food) by other people. Ordinary breathing can spread droplets over a range of 1.2 metres, and loud speaking over about 2 metres, while a sneeze can spread 20 000 droplets over a distance of up to 5 metres. Infections spread in this way include colds, influenza, sore throat, scarlet fever, diphtheria, measles, mumps, whooping cough, meningitis, and tuberculosis.

Other sources of infection

- a) inhalation of dried bacterial spores in dust-carrying air (e.g., anthrax);
- b) direct physical contact with an infected person (STDs, some skin diseases);
- c) contact with clothing and eating utensils that someone else has infected;
- d) eating or drinking infected food and liquid (dysentery, typhus, cholera, brucellosis);
- e) entry of soil or dust into a wound (tetanus, gangrene);
- f) the bites of parasitic insects such as the mosquito (malaria), tsetse fly (sleeping sickness), rat flea (bubonic plague), and lice (typhus fever);
- g) the bites of infected animals (rabies) or contact with infected animals (brucellosis);
- h) insufficiently sterile medical procedures as in surgery and hypodermic injection (hepatitis, HIV);
- i) infection carried by the mother in her blood stream and passed on to the fetus during pregnancy.

Infections from a human origin can come from someone who has no symptoms. With many infections someone who has had or is catching the infection can infect others. Sometimes a person who never shows signs of the illness can infect others. These people are immune but **carry** the infection (typhoid, diphtheria, cholera, and dysentery). They are called **carriers**.

The final cause of infection is self-infection, that is, the transference of bacteria from a part of the body where they are harmless (such as skin surface or rectum) to a part where they can cause infection (such as a wound). This is mostly caused by lack of hygiene (especially of the hands) and is often caused by scratching. The resulting illnesses are not usually passed on to others. With all sources of infection it is very important how long the organisms have to multiply before they enter the body. The taking in of a few isolated bacteria is not normally going to cause illness.

Infections of the blood

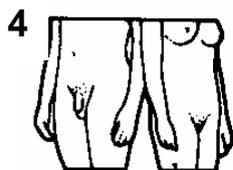
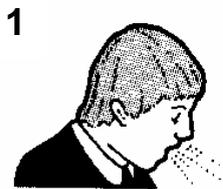
There are many diseases that infect blood components, which include red blood cells, white blood cells and the organs involved in blood production and renewal. HIV is just one of these. **Hepatitis** is a very contagious viral disease of the liver and it damages the liver cells. It can occur in a number of variants: Hepatitis A, Hepatitis B and Hepatitis C being the main ones. Type A is passed on through contaminated food, cutlery, clothing and bed linen, and faeces. It is the least destructive and is easily eradicated. Type B is spread through blood and sexual secretions. Vaccines are available for

the A and B types and these are given in three combined injections of vaccines. Hepatitis C is very infectious and is transmitted in the same ways as HIV, through blood or blood contact. It is often associated with intravenous drug users as well as HIV patients. Hepatitis C is now classed as the fastest growing infectious disease in some developed countries. Worldwide about 300 million people are infected with the virus.

 **Activity 1. Spreading infections**

Work in groups and use each of the illustrations given below to create an educational poster that shows how infections may be spread.

- 1. For each diagram, list the way infection occurs and PNG examples of infections spread in each way.*
- 2. List examples of the types of infections spread by each method of transmission.*
- 3. Research the best prevention method for each example you have named.*



The body's defenses

The body has three levels of natural defence to infection.

- Prevent foreign organisms from entering the body's tissue;
- Kill the ones that it cannot prevent;
- Render harmless the ones it cannot immediately kill.

Barriers to infection

The main barrier to infection is the skin surface, a physical barrier that is constantly being repaired. Few foreign organisms can penetrate the skin when it is unbroken. The skin also secretes antiseptic substances in sweat so that few infectious agents are able to survive on it for long. (Tear fluid does the same job for the crevices around the eyelid.)

Where the orifices of the body form necessary openings, their lining of mucous membrane also presents a physical and antiseptic barrier.

The digestive and respiratory tracts are also guarded by a ring of lymph tissue around the pharynx at the back of the mouth.

Finally if outside organisms do get beyond these barriers, they are usually either caught in the layer of mucus that coats the respiratory tract, or destroyed by hydrochloric acid in the stomach juice.

Phagocytic cells

Certain cells in the body are "phagocytic" in that they recognise and eat intruders. The white corpuscles in the blood are mobile **phagocytes**. If infective microbes penetrate the body tissue the phagocytes may deal with them. Others phagocytes are located at points throughout the body especially in the spleen and liver, where they can filter infection out of the blood. Some are also located in the lymph nodes, where they can filter the lymph circulation.

Antibodies

Some invading organisms cannot be destroyed immediately however **antibodies** may neutralise them. This is a chemical process. Bacteria and viruses have an outer sheath of protein. To neutralise them, the body manufactures another protein called an **antibody**. Antibodies are formed in the lymphoid tissue and released into the circulation.

How do antibodies work?

The molecules of the antibody interlock with those of the protein sheath of the invading microorganism, just like pieces of a jigsaw puzzle. This is then coated with other proteins present in the blood and the whole mass can be eaten in the usual way by phagocytes.

However antibodies are **specific**, that is, they usually react with one particular organism. Different organisms are almost always sheathed in different protein that requires another antibody to neutralise it. This means that the body has to learn how to neutralise each new threat and, if the threat comes in overwhelming numbers, the body has no time to learn.

Allergies are often over-reactions of antibodies to organisms that are not dangerous but that the body regards as such.

Sometimes the response of producing the correct antibody has been acquired from the mother during nurturing. Otherwise the body needs mild contact with the threat first so it has the chance to create antibodies. Then in the face of a serious threat it can immediately put that (antibody) protein into mass production. This “remembering” is called **immunity**.

Immunisation

For **active immunisation**, vaccines are developed from altered forms of the infecting organism. Vaccines provoke the immune system into creating antibodies that help the body resist specific infections. Some vaccines are created from the killed micro-organism. This also stimulates the immune system. This type of vaccination leads to production of antibodies and provides **immunity** to invasion by a similar organism. Many **vaccines** have been developed to provide protection against a number of viral infections.

Once effective antibodies are created, long term active immunity is assured. Some vaccines must have boosters, that is, another dose is needed at specified times. These include **Hepatitis** and **Tetanus**. Sometimes immunity may diminish with age.

With **passive immunisation**, a serum containing antibodies is extracted from blood and injected into the patient.

There are many different vaccinations, usually given to children, to prevent different diseases such as tetanus. Scientists are working hard to find a vaccination against AIDS but so far none has been found.

Preventable diseases of children

There are a number of common diseases that affect children more than adults. These can be fatal or cause permanent disability. These diseases are preventable using common and readily available vaccines.

There should be no reason for children to contract any preventable disease



Activity 2 Immunization

- 1 Draw a table using the headings and for each disease research the cause, signs/symptoms, treatment and immunisation.

Disease	cause	signs/symptoms	treatment	immunisation
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- 2 Discuss within a group the incidence of these diseases in PNG and explain your findings.

Diphtheria	Measles
Tetanus	German measles (Rubella)
Whooping cough	Mumps
Polio	Tuberculosis

Other cell defences

Antibodies are carried in the body fluids not in the cells. However some cells can produce substances that will attack organisms that enter them. For example chemicals for destroying the cold virus are produced in the mucous membrane of the nose.

Sexually transmitted diseases

The term **sexually transmitted disease** (STD) is used for certain infections that are almost always passed on by sexual contact. This is because the micro-organisms (bacteria or viruses) infect the genitals, anus or mouth (for some cases) of one of the partners. The infecting organism has to enter through one of the **orifices** – genital opening, anus or mouth. Unprotected sexual activity involving any one of the orifices provides an opportunity for infection to occur.

The micro-organisms usually enter the body during sexual intercourse. Micro-organisms may also pass from an infected pregnant woman to her baby in the womb. This is termed **perinatal** and is a real problem with HIV infection. The first symptoms for common STDs generally occur on the part/organ that has been in contact with the infected part/organ of the infected person (partner).

Trichomoniasis infects 19% of PNG female population. It is an infection of the vagina due to a germ (protozoan) causing vaginal discharge. It can be transmitted to males but usually does not cause many symptoms in males.

Chlamydia infects 18% of PNG population.

Syphilis infects 4% of PNG population. The ulcer or sore of **syphilis** is painless. The disease can be dormant for many years before finally causing death.

Gonorrhoea symptoms develop a couple of days or a week after infection and include pain on passing urine and discharge of pus from penis or vagina. Some infected people, however, experience no symptoms. In untreated cases, the infection may spread throughout the reproductive system, causing inability of men and women to have a baby.

There are also many non-specific urinary (NSU) tract infections, which are associated with sexual contact. These may be low grade and have mild symptoms or cause irreparable damage to the urinary tract organs, bladder and kidneys if unchecked.

The diseases described on this page are easily controlled with drugs. It is important to recognise the symptoms early and have treatment at a clinic.

HIV/AIDS

“**Acquired Immune Deficiency Syndrome (AIDS)** is a new and fatal disease caused by the **Human Immunodeficiency Virus (HIV)**. It has spread rapidly and is having a serious impact on the social, cultural and economical structure of many countries. In some areas AIDS has become a major threat to child survival. Productive young adults are becoming ill and dying, which leaves children and the elderly without support. At present there is no cure for AIDS and no vaccine available.”

(From: Holmes, Dr. W. *HIV Infection – Virology and Transmission.*)

The National AIDS Council of Papua New Guinea reported in December, 2000, that there were 3428 positive HIV cases from 1987 to 2000. At the same time the **cumulative** number of AIDS cases confirmed in PNG was 1153 and there were 242 deaths. However there are many unreported or undetected HIV cases in PNG. **World Health Organisation (WHO)** estimates that the actual number of HIV cases in PNG could be between 10 000 and 15000 with a possible high of 27000.

Cumulative totals are obtained by adding new cases to previous confirmed cases



Activity 3 Reporting statistics about HIV

1 What is misleading about this diagram used to report the state of HIV, AIDS and deaths from AIDS in PNG during 2000?

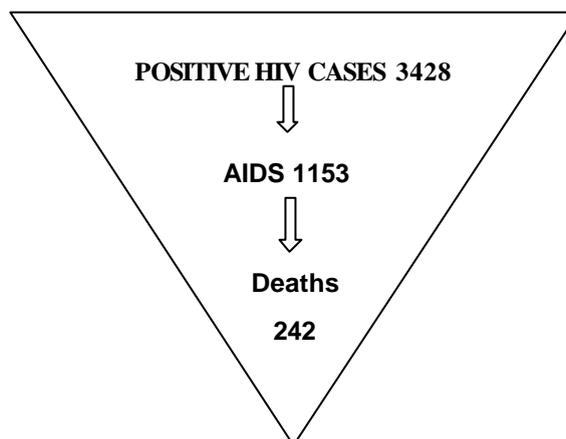
2 How would you better present these statistics?

3 Discuss in groups the following extract from the **PNG National HIV/AIDS Medium Term Plan 1998 – 2002**:

“There is no means to effectively measure the true extent of HIV infection in the population. It has been estimated, however, that for every known case of HIV there could be up to 100 unreported cases.”

4 Given the statement above what might be the estimate of HIV cases for PNG?

5 Comment on your answer given that **WHO** estimates the PNG HIV cases to be as low as 11 000 and as high as 27 000.



By the Year 2006, without aggressive intervention, the cumulative estimates for HIV/AIDS cases in PNG have been given as:

- 62 000 HIV cases
- 13 500 AIDS cases
- 12 000 DEATHS



Activity 4 . HIV cases in PNG

Year	No. HIV cases reported each year	Cumulative total
1987	6	
1988	12	
1989	19	
1990	36	
1991	37	
1992	32	
1993	40	
1994	75	
1995	128	
1996	196	
1997	359	
1998	696	
1999	815	
2000	970	
2001		

- 1 Use the data given in the table to **calculate** the cumulative totals for HIV cases in PNG?
- 2 Discuss these statistics in groups. What do the figures mean?
- 3 Use the data to draw bar graphs to show the changes from 1987 to 2000 in:
 - (a) the number of reported HIV cases each year.
 - (b) The cumulative total of HIV cases since 1987.
- 4 If the PNG population is 4 million what was the HIV infection rate in year 2000. (Divide the cumulative total for Year 2000 by 4 million).
- 5 Comment on how this compares to a rate of 3.4 in 1993.
- 6 Suggest reasons for the apparent drop in reported cases of HIV in 1992.



Activity 5 What are HIV and AIDS?

Read the booklet, *New Horizons in Health: Protection of life – Your Questions answered on HIV/AIDS*.

Form discussion groups and prepare a response to the following statements or questions:

- 1 What is the difference between AIDS and HIV?
- 2 Why can't a person with HIV be readily identified?
- 3 What are the symptoms of AIDS and how long does it take before any symptoms of AIDS appear?
- 4 How is HIV spread and how can the spread be prevented? Describe ways to be sure of not catching AIDS.
- 5 Can people catch AIDS by looking after or living with someone who has AIDS? List the situations where HIV/AIDS is not passed on to others.
- 6 What is the difference between "safe sex" and "protected sex"? List unsafe sexual practices. List safe sexual practices.
- 7 Draw a poster to show of how HIV is spread and show the effects on family and community.



The HIV infection

There are no obvious symptoms of the infection by HIV in the early stages. Infections without symptoms are called **asymptomatic**. This is why HIV is so contagious. Infected persons do not know they have got the infection and pass it onto other sexual partners. In addition, the symptoms of communicable diseases common in PNG tend to mask the symptoms of HIV-related illness. The spread of HIV will continue at a dramatic rate in PNG if not checked. Preventing the further transmission of HIV depends on radical change in the perception of risk among the general population combined with action to minimise risk practice.

HIV belongs to a group of **retroviruses**, which can incorporate their **genome** into that of the host cells, thus causing a permanent infection. The virus can survive for a few days outside the body if dry. **The virus is sensitive to heat and is killed by boiling.**

The HIV virus reduces the body's ability to produce **lymphocytes**, which in turn reduces immunity to bacterial, fungal and protozoal infections. This leads to immune deficiency and the body is unable to fight the infections that are normally kept in check.

The final stage of infection with HIV is the Acquired Immune Deficiency Syndrome, AIDS. AIDS is characterised by **opportunistic** infections and malignancies due to the breakdown of the immune system. The life-threatening infections include tuberculosis, pneumonia and meningitis. A number of other less life-threatening diseases, which are normally controlled in healthy bodies, also take over. These include a number of fungal and bacterial infections. Neurological disease may also develop due to infection of brain cells.

Dengue fever

Dengue, also known as “break-bone fever”, is caused by a virus carried by a different type of mosquito to malaria, *Aedes aegyptii*. There are a number of subspecies of this mosquito found throughout the World. This mosquito has been called the “tree-hole” mosquito as it can breed in temporary puddles of water. The eggs do not need water to hatch. There are many subspecies that have even adapted to living in human junk such as tyres, cans, jars, etc.

The virus is an **RNA flavivirus** that has many types (**serotypes**). There is no vaccine or treatment for this virus. (See the previous sections on viruses and vaccines). The virus is spread by bite and passed from person to person. Infection in humans takes one to five days. The virus incubates in mosquitoes for 8 to 11 days. This mosquito can live for up to 65 days and remains infective for this time.

There are four types of dengue, producing different antigens. They give rise to three dengue diseases: Classic, Dengue Haemorrhagic Fever (DHF) and mild dengue.

Symptoms

Classic dengue: fever, severe headache, joint pains, weakness and skin rashes. Incubation is 5 to 8 days. Patient is very ill for a week followed by intense weakness for weeks afterwards.

Dengue Haemorrhagic Fever (DHF): Fever, cough, headache, abdominal pain, vomiting persist for 2 to 4 days. Abnormal blood clotting is associated with this type. Extensive circulatory collapse and internal haemorrhaging will result in death. DHF may also lead to Dengue shock syndrome (DSS) evidenced by convulsions and nervous disorders. DHF is more likely to occur after exposure to milder types.

Mild dengue: This is similar to Classic Dengue but only lasts about 72 hours.

Treatment

No vaccine exists. Plenty of rest and painkillers are the only form of relief.

Environmental control

As with malarial mosquitoes the same preventative measures will be effective.

There are mechanical, chemical and biological ways to kill or stop mosquitoes breeding.

Mechanical: Remove or destroy all potential breeding containers (cans, etc) that can hold rain water.

Chemical: Spraying programs that eradicate mosquitoes may also be effective. These include oil and sulfur fumigation or malathion spray.

Biological: Predatory fish (guppies) and bacteria may also be introduced to control mosquitoes in dams and lakes.

2. Parasitic infections

Parasitic infections may be caused by a number of organisms that live in or on the human body as the host. The invading organism obtains nutrient for growth from human tissues. The most life threatening in PNG are the protozoans that cause **malaria**, e.g., *Plasmodium falciparum* and *P. vivax*.

There are also other parasites, which will affect health and can lead to death if untreated. The roundworm, hookworm and tapeworm are serious parasites of human internal organs. The skin is also prone to attack by a range of **fungal infections**, e.g., white spot, tinea.



Research

Parasites of PNG

Research the occurrence of parasites in PNG. Draw a map of PNG and show the incidence of parasite occurrence in each province.

Malaria

Malaria is one of the main fatal diseases in the tropics. It is only likely to affect people who live in or travel to such places. Malaria is the biggest killer of children under age five (5) in PNG. It needs to be treated immediately. The

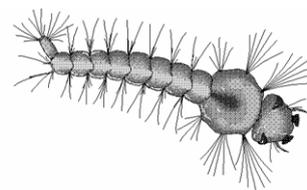


Figure2. The Anopheles mosquito larvae do not have an air tube and rest parallel to the water surface. (Source: CorelDraw 5.0®)

risk of waiting is fatal in small children who have little immunity to the parasite.

Malaria is both an acute and chronic disease caused by protozoa of the genus *Plasmodium*. Four species cause human malaria: *P. falciparum*, *P. vivax*, *P. malariae*, and *P. ovale*. The protozoa are transmitted to humans by female mosquitoes of the genus *Anopheles*. Some signs and symptoms of the illness are high fever, chills, headache, anaemia, and splenomegaly (spleen enlargement). Most serious and fatal complications are caused by *P. falciparum*.

Malaria transmission occurs in more than 100 countries. Regions include Africa, Asia, islands of the South, west, and central Pacific Ocean, Latin America, certain Caribbean islands, and Turkey. These areas, all between 45° N and 40° S latitude, possess tropical or subtropical zones wherein anopheline mosquito habitats exist.

Environmental factors

Anopheles mosquitoes are essential for development, multiplication, and spread of plasmodia. Therefore, any area harbouring *Anopheles* mosquitoes may be at risk for malaria transmission. Specific environmental conditions include temperatures between 20° and 30°C and a mean relative humidity of 60%. High relative humidity increases mosquito life span, thereby increasing the probability of mosquitoes becoming infective. Areas with high rainfall have increased malaria incidence because of an increase in breeding sites. The accompanying high humidity increases survival rates of female *Anophele* mosquitoes. Cooler temperatures, associated with higher altitudes above 2000-2500 metres, and lower humidity reduce transmission.

Life cycle of malaria parasite

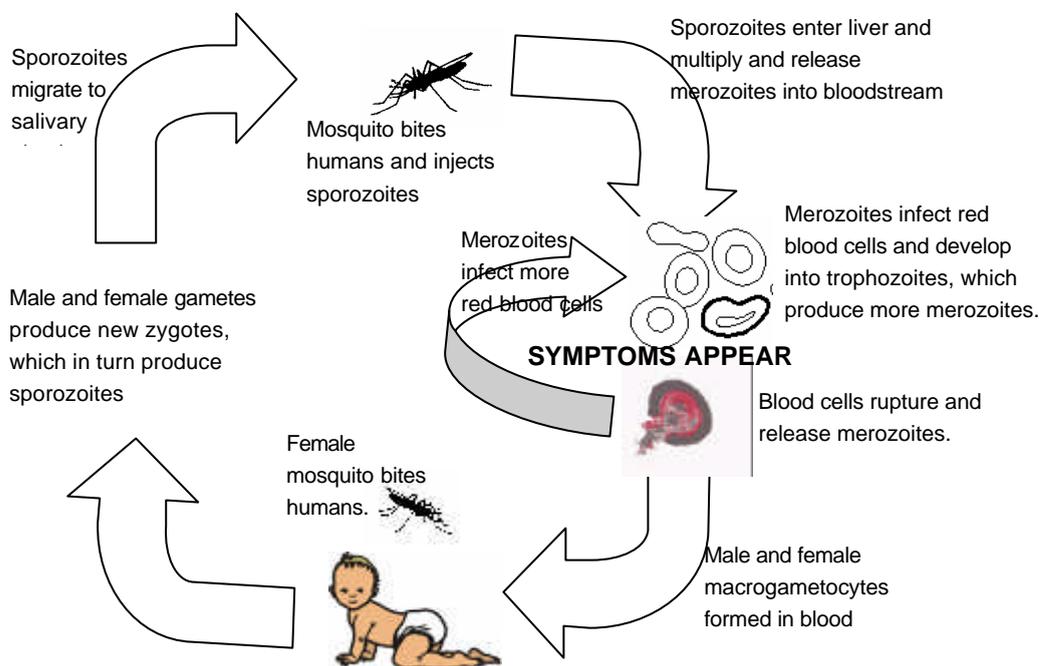
The life cycle is far from simple. The parasite lives in and depends on the female *Anopheles* mosquito during one part of its life cycle. It lives in and depends on human beings during other parts of its life cycle.

It is transferred to people in the saliva of the female mosquito as she penetrates ('bites') the skin. The malaria parasite enters the bloodstream and settles in the liver. At that time no symptoms appear but the malaria parasite multiplies in the liver.

Following its stay in the liver the parasite enters another phase of its life cycle, circulating in the bloodstream, penetrating and destroying red blood cells and reproducing again. If the plasmodia then transfers back to a female *Anopheles* mosquito via another 'bite', the parasites breed once more and are again ready to start a human infection.

After the emergence from the liver, when the plasmodia are entering and rupturing the red blood cells, the malaria produces the symptoms of high

fever and profuse sweating alternating with equally agonising episodes of shivering and chills. One strain of malaria (there are four) produces a single



severe attack which can be fatal. The other three strains cause recurrent attacks, sometimes extending over many years.

Figure 3. The life cycle of the malaria parasite and the way it affects humans.

Table 1. Selected Characteristics of the Four Species of Human Malaria

Malaria species	Incubation (days)	Exoerythrocytic cycle in liver (days)	Erythrocytic cycle in blood (hours)	Fever period (hours)	Relapses
<i>P. falciparum</i>	12 (9-14)	5.5-7	48	none	No
<i>P. vivax</i>	13 (12-17)	6-8	42 - 48	48	Yes
<i>P. ovale</i>	17 (16-18)	9	49 - 50	48	Yes
<i>P. malariae</i>	28 (18-40) or longer	12-16	72	72	No

The medical response to malaria takes three forms: **prevention**, the **treatment** of symptomatic attacks and the **eradication** of the plasmodia (radical cure).

Prevention

Prevention is the most important line of defence against malaria. The best prevention method is don't get bitten. However this is not always possible in village communities in PNG. Communities should:

- actively remove possible breeding areas in and around houses;

- avoid being bitten if at all possible by covering up at dusk and dawn;
- using protection in the form of repellents;
- screening houses or sleeping areas wherever possible, and
- sleeping under insecticide-treated mosquito nets.

Treatment

Malaria tests

The proven test is by means of blood smears (slides) at a health centre or clinic. However blood tests are not needed to confirm the malaria when the symptoms are readily identified. Blood tests may also be negative at times depending on the cycle at the time of the test. There are also some blood testing kits available which will also identify *vivax* and *falciparum*, however these need to be administered by the chemist or doctor. **If these test kits are out of date they should not be used.** Once the symptoms of malaria are confirmed it is a matter of urgency to obtain medical treatment.

Drugs for malaria

For someone planning a trip to an area in which malaria is prevalent, drugs are given that destroy the parasites before they can reach the liver. Treatment begins the week before arrival in the malarial area and should continue for four to six weeks after return. This method of prevention/control is called **prophylactics**. However this is not practical in areas where malaria is endemic. In PNG malaria is treated with appropriate drugs when necessary.

A number of drugs are available for malaria. The choice depends on many factors such as the region in which the disease may have been contracted and whether it is thought that the type of malaria plasmodium prevailing in that area is resistant to any of the commonly used drugs. In some areas of PNG, *P. vivax* and *P. falciparum* are resistant to **chloroquine**. The doctor or health person will advise on alternatives.

Most anti-malarial drugs act by rapidly killing plasmodia in the bloodstream. Taken to prevent the disease, the drugs kill the plasmodia before they enter the liver thereby stopping them from multiplying. Once the plasmodia have multiplied in the liver the same drugs given in higher doses kill the parasites that re-enter the bloodstream. The same drugs are effective during the symptomatic period, relieving the episodes of fever and chills.

However, these medicines do not destroy the plasmodia remaining in the liver. Future malarial attacks are probable, sometimes occurring many years later. Only **primaquine** destroy the plasmodia in the liver, and it is the only approved drug effective as a **radical cure**. More recently a new drug, **etaquine**, has been developed and is being tested. It will be more effective

and less dangerous than primaquine in eradicating malaria. To rid someone of the infection completely a 14-day course of **primaquine** is administered. Although highly effective in destroying the plasmodia in the liver, the drug is curiously weak against those in the cell-bursting stage. Primaquine treatment is recommended only after a person leaves the malarial area because of the high risk of re-infection. This treatment is advisable whether or not an individual has suffered attacks of malaria because the infection can be present for several weeks without causing symptoms.



Activity 6 Malaria and treatment in PNG

- 1 *Research the main countries around the world where death from malaria is a major problem. Explain to your partner why malaria has that distribution.*
 - 2 *Work in groups and research the statistics about deaths from malaria in PNG provinces.*
 - 3 *Construct a table giving the cause, effects and prevention measures used in PNG. Discuss the table within the class.*
 - 4 *Describe the life cycle of the **Anopheles** mosquito. Make a chart, which shows each of the stages in this cycle as it relates to malaria.*
 - 5 *Prepare a chart for a Primary Class showing how the malaria parasite propagates and thrives inside the human bloodstream and liver.*
 - 6 *Prepare charts to educate a Grade 4 class about ways to prevent the breeding of the mosquito and to protect against bites.*
 - 7 *Draw a table to show the treatment and doses for malaria for infants, children, adults and expectant mothers in PNG. Comment on the effectiveness and cautions for the drugs used.*
-

Worms

There are many types of worms (helminths), which use humans as their host to complete their life cycles. They usually flourish in the small intestine and sometimes the large intestine. Some may pass to the lungs, liver and other parts of the body where they form cysts. Intestinal worms are classified as roundworms, tapeworms and flukes.

Most worms can be eradicated quickly with a one dose treatment of Combantrim (pyrantel).

 **Activity 7. Worms**

The table below lists some of the worms, which can invade the human body. Refer to an appropriate **Health Care Manual** and complete the table using the headings given.

Worm	Symptoms and signs	Site of infection	Treatment
Hookworm			
Threadworm			
Strongiloides			
Tapeworm			
Flukes			
Filariasis			

Fungal infections

There are many forms of fungi that become opportunistic on or in the human body. Fungi like damp places. One way to ensure they do not grow is to make sure you dry yourself properly. There are also fungi that are contagious and are passed on by contact. Fungi that invade humans include forms of tinea (grille and white spot), ringworm and athletes foot.

 **Activity 8 Fungal infections**

Fungi	Symptoms and signs	Site of infection	Treatment
Ringworm			

Lice and scabies

Lice

Lice can infest the hair of the head, the body or the pubic area. Head lice are a common problem in school children and the lice are passed on to others through close contact or by using their possessions such as combs. The child will experience itching and will scratch. Lice may not be seen but close inspection will reveal small white nits (eggs) attached to the hairs.

Treatment: Use a fine tooth comb to remove nits; apply a chemical treatment (malathion, lindane or a solution of pyrethrins); Wash all bedding and clothing and sun for several hours.

Scabies

This is a condition of the skin caused by a very small itch mite, which burrows more than 3 mm underneath the skin and lays its eggs, causing intense itching. Scratching the area leads to severe inflammation with papules (small solid swellings of the skin less than 0.5 cm in diameter) and pus formation due to secondary infections. These mites are very small and can be seen only with a microscope. Scabies is an extremely contagious disease affecting many members of the family. The small eggs hatch in 6 to 7 days and the mite then grows rapidly. Scabies usually affects the soft parts such as forearm, thighs, folds of buttocks, neck, breasts and fingers and toes.

Treatment: Use much the same treatment as for lice however benzyl benzoate lotion is preferred.

3. Drugs

Drugs are chemicals, which affect the human body. Some drugs are useful (medicinal) if taken in moderate quantities. Any drug can be harmful if taken in large quantities. Some powerful drugs can be harmful even if taken in very small quantities.

Medicine

A **medicine** (drug), which may be of vegetable or chemical origin, is a substance used in the diagnosis, prevention, or treatment of disease. A **controlled drug** is one whose supply, distribution and storage are regulated and monitored under government requirements. **Prescription drugs** are those which need a doctor's prescription and cannot be purchased without one. An **over-the-counter (OTC) medicine** is one for which you do not need a doctor's prescription and can be bought from a pharmacy or store. A **generic medicine** is one that has been developed by a pharmaceutical company but is no longer protected by a patent. Other pharmaceutical companies can then produce and sell that medicine under different brand

names. Generic medicines are usually much cheaper than the various brand name equivalents. **Brand names** are the commercial names under which medicines are prescribed and sold. For example: aspirin is the generic name of a common pain-relieving medicine but it is sold under numerous brand names

Drug abuse

Drug abuse involves a range of drugs including prescription drugs, illegal drugs and readily available substances, such as tobacco, alcohol and betel nut. Drugs are categorised as legal, illegal, socially acceptable or unacceptable.

Drugs, other than prescription ones, may be taken for a number of reasons. These include **social conformity**, **addiction** and **habitual**. Drugs are generally described by the effect, the dependence and tolerance. These include **depressants** (barbiturates, tranquillisers, opiates, alcohol), **stimulants** (amphetamines, cocaine, nicotine, caffeine) and **hallucinogens** (LSD) and **marijuana** (acts as a stimulant, sedative and hallucinogen).

*Opiates include:
opium, heroin,
codeine and
morphine*

Prescription drugs

Prescription drugs are classified by the organism against which they are effective. These are **antibiotics** (bacteria), **antivirals** (virus), **antiprotozoals** (protozoan), **antifungals** (fungus) and **antihelmentics** (worms).

Antibiotics

Antibiotics are a synthetic substance used to kill a range of specific types of invading bacteria. They are not usually used against viruses. Taking antibiotics for a cold or flu is a waste of time unless bacterial complications have occurred. There are many types of antibiotics but the two main functions are to:

- Interfere with the bacterium's ability to build cell wall (e.g., Penicillin and Cephalosporins);
- Prevent the production of proteins that the bacteria need to multiply or survive.

Antiviral drugs

Viruses are simpler and smaller organisms than bacteria. Viruses are less able to sustain themselves. They can only survive by penetrating body cells. Common viral infections include **influenza** (flu), mumps, chickenpox and some forms of **bronchitis**, **pneumonia**, **gastroenteritis** and **meningitis**.

Generally the body is able to combat most viral infections and drugs are only given to relieve secondary symptoms such as fever. **However pneumonia and meningitis require close medical supervision.**

 **Activity 9** **Useful drugs**

- 1 *Make a list of some of some useful drugs. Report your findings in a table using the headings:*

Drug	Use	Effectiveness
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- 2 *Explain how even useful drugs can be harmful if taken in too great a quantity.*
-

Alcohol

Alcohol is a drug that is not thought harmful if taken in moderation. Excessive alcohol consumption is harmful to the individual and to the people around the individual.

Excessive alcohol consumption may permanently damage the liver (**cirrhosis**) and the nervous system. It may also lead to dietary problems and deficiencies.

 **Activity 10** **Alcohol abuse**

- 1 *Alcohol, in the current form, was virtually unknown to PNG societies before European settlement. What forms of alcohol did exist in PNG culture before this time?*
 - 2 *Research as a group/team the effects excessive alcohol consumption has on the human body and human behaviour.*
 - 3 *Write a short dramatic play on the effects of excessive alcohol consumption on family life. Act out the play with members of your group.*
 - 4 *Organise a debate on the topic "Alcohol consumption should be banned in PNG".*
-

Tobacco

Raw tobacco products are commonly smoked in PNG. Smoking is one of the main causes of lung and throat cancer. There is little or no filtering of the tars, the main irritant and carcinogen. Nicotine, a substance contained in tobacco, causes an addiction to tobacco. This makes people crave for more nicotine and causes more smoking of tobacco products.

Marijuana

Marijuana (smukgras) is a very common drug grown in PNG, particularly in the Highlands due to the ideal climatic conditions. The plant belongs to the Hemp Family and causes symptoms, ranging from euphoria to anxiety when smoked or inhaled.

It is still being debated whether the drug has long-term effects on people. However there is evidence that links the use of marijuana to the use of harder drugs such as opium and heroin.



Figure 4. Marijuana leaf.
(Source: CorelDraw 5.0)

Opium and heroin

The opium poppy belongs to the poppy family of plants. The drug comes from the sap of the flowers (poppies). The opium drug has been used by some World cultures for centuries and in recent years has become a large problem in many Western societies. The purified form of the drug is called heroin. Morphine is useful drug derived from opium. Morphine is a powerful pain-relieving drug used by medical practitioners, particularly for cancer sufferers.

Heroin is often combined with other substances (cut) and sold as single doses. The doses are applied into veins with a syringe. The discarded syringes have caused many problems due to innocent people being jabbed by the needle. **A significant proportion of heroin users carry the HIV infection.** This may be passed on and infect others through needle sharing or accidental pricking if needles are left lying around.

In some countries injecting centres are being trialed to control the environment and hygiene. Needle exchange programs also operate in some countries. It is hoped that this will reduce the amount of discarded needles.



Betel nut

Betel nut (buai) is a drug. It causes a mild state of euphoria and intoxication. However, betel nut contains potent alkaloids, which are irritants. It also contains bitter substances, which taste unpleasant. To overcome this taste the betel nut is chewed with lime to sweeten it.

Coral is “burned” to make lime for the chewing of betel nut. Burnt lime is actually calcium oxide (CaO) or quicklime. When quicklime dissolves in water it produces calcium hydroxide which is called slaked lime. This slaked lime is the substance that reacts with the betel nut to make it more palatable. However slaked lime also reacts with the flesh inside the mouth. When the burnt lime is very fresh betel nut chewers are at great risk of burning holes into the flesh inside their mouth due to the extreme affinity for water by the quicklime. The flesh is destroyed.

Betel nut chewing may lead to cancer of the mouth. The continual irritation of the tissues in the mouth may eventually lead to the formation of cancerous cells.

The lime also damages the teeth and leads to increased dental decay, ulcers and many other mouth disorders.



Activity 11. Drugtaking!

Work in groups and discuss the following questions:

- 1 *Make a list of the reasons why people consume drugs.*
- 2 *Discuss and list the effects of drug taking on the economy, social life, family life and communities in PNG.*
- 3 *Compose a chart or poster to present your findings to the class. You might use the idea shown as a starter.*
- 4 *How may drug taking be minimised in PNG?*





DRUG POISONING

Emergency action is necessary in any of the following circumstances:

- If a person has taken an overdose of any high-danger drugs.
- If a person has taken an overdose of a less dangerous drug, but has one or more of the danger symptoms listed below.
- If a person has taken or is suspected of having taken an overdose of an unknown drug.
- If a child has swallowed or is suspected of having swallowed any prescription or non-prescription drug.

DANGER SYMPTOMS

Take emergency action if the person has one or more of the following symptoms:

- Drowsiness or unconsciousness
- Shallow, irregular, or stopped breathing
- Vomiting
- Fits or convulsions



FIRST AID TREATMENT

Check breathing. If not carry out mouth-to-mouth (EAR) and cardiac compression if necessary.

Check consciousness. If breathing but **unconscious**, clear airway and place person in recovery position.

If conscious but drowsy. Keep person under observation. Ascertain drug taken.

Seek medical help.

Effective treatment of drug poisoning depends on the doctor making a rapid assessment of the type and amount of drug taken. Collecting evidence that will assist the diagnosis will help. After you have carried out first aid look for empty or opened medicine containers. Keep any of the drugs that are left together with its container (or syringe) and give these to the nurse or doctor. Save any vomit for analysis in the

Glossary

Antiseptic	A chemical that destroys disease causing germs and that is sufficiently non-toxic to be applied to the skin or mucous membrane.
Anus	The opening where faeces come out of our bodies.
Bleach	Liquid containing chlorine which is used as disinfectant and to make things whiter.
Bleeding	The escape of blood from a rupture blood vessel.
Blood transfusion	Blood given to people when they are ill or need extra blood
Cancer	Any type of tumour or growth on the skin or in the body which grows uncontrollably. Kaposi's Sarcoma is a type of skin cancer.
Carrier	In medical terms someone who does not feel ill and does not look ill but has a germ causing a disease (for instance HIV) and can give it to another person.
Chlamydia	A very common STD caused by the bacteria, <i>Chlamydia trachomati</i> . In untreated cases the infection may spread throughout the reproductive system and may prevent a man or woman from having children.
Chronic	Describing a disease of long duration involving very slow changes. Opposite to acute.
Circumcision	An operation when some of the foreskin is cut away from a boy's or a man's penis. This is often done when a boy becomes a man. In PNG many young men cut the top of the foreskin. This is not real circumcision.
Contraception	This means using something to stop a woman from getting pregnant when she is having sex. Pills, injections and condoms are all used for contraception.
Detergents	Kinds of soap used for washing dishes and clothes
Diagnosis	The process of determining the nature of a disorder by considering patient's signs, symptoms and results of laboratory, and other examinations.
Diarrhoea	Going to the toilet for faeces or excreta more often. Usually the faeces are more liquid.

Donate	This means to give. People donate or give their blood so it can be used to help sick or injured people.
Donovanosis	A STD marked by a sore or ulcer on or near the genitals. Often it spreads and may cause an abscess and ulcer in the groin.
Ejaculation	When fluid comes out of a man's penis during sex. The fluid is called semen.
Fever	When a person's body is too hot, sometimes with sweating and sometimes with dry skin. The pulse is usually faster than normal. Fever comes with many illnesses, especially malaria.
Genital herpes	A STD caused by the herpes virus and characterised by painful blisters in the genital region. It is recurrent and extremely contagious. The fluid from the blisters and ulcers contains billions of viruses.
Genital warts	A small benign growth on the genitals or around the anus in both sexes.
Germ	Any microorganism (bacterium, virus, protozoan) that causes a disease.
Glands	These are small parts of our bodies which produce antibodies to help fight infections. They can swell when someone is ill.
Gonorrhoea	A sexually transmitted disease that affects the genital lining of either sex.
Infection	When something (germ, bug) gets into our body or onto our skin and makes us ill. Viruses, bacteria and fungi can all cause infection in people.
Injection	To put liquid (usually medicine) into some-one's body, usually using a syringe and needle.
Condom	An elastic/rubber sheath or tube worn on a man's penis during sex to prevent having babies or catching infections.
Contaminate	To make impure or dirty. May cause infection or other problems.
Malaria	A parasitic infection of the blood caused by a bite from mosquito. Fever and sweating are common systems. The mosquito can pass malaria from one person to another.
Mucous membrane	The moist membrane lining body cavities such as mouth, vagina, anus, and urethra.

Penis	This is the name for a man's or boy's sexual part.
Pregnant	A woman is pregnant when she is carrying a baby inside her.
Prostitute	Someone who has sex for money or other rewards. Prostitutes sometimes stay together in special houses or hotels. Boys, girls, men or women may be prostitutes. Another term for prostitute is sex worker.
Recurrent	Occurring or coming again, reappearing.
Saliva (spit)	A clear liquid that comes from our mouths. It keeps the inside of our mouths and tongue wet. When we spit it is saliva that comes out.
Scarification	Ceremonial superficial incision of parts of the skin often symbolising identity and adulthood.
Semen	The thick whitish liquid that comes out from a man's penis during sex. This liquid can carry the HIV virus.
Signs/symptoms	An indication of a particular disorder that is observed by a health worker.
Sores	A painful or tender wound or break in the skin.
Sterile	Completely free from any germs.
Sterilisation	Any means of rendering objects free of any germs.
Symptom	An indication of a disease or disorder noticed by the patient himself or herself
Syndrome	A combination of signs and/or symptoms that forms a distinct clinical picture indicative of a particular disorder.
Syphilis	A sexually transmitted disease.
Syringe	A glass or plastic tube used for injections when a needle is attached. It can also be used for taking blood out of the body.
Tattooing:	Ceremonial insertion of pigments in punctures to parts of the skin of the body. This is often done when the person becomes an adult.
Transfusion	An injection of blood into a person. Usually from a bottle or a bag.
Trichomoniasis	An infection of vagina due to a protozoan causing vaginal discharge. It can be transmitted to males but usually does not cause many symptoms in males.
Tuberculosis (TB)	An illness or disease which usually affects the lungs. People

	infected with TB cough and lose weight. It can be passed from one person to another by close contact.
Ulcers	Open sores where the skin has broken and left a patch with no skin over it.
Vaccination	A small injection of liquid which will prevent someone from getting infections.
Vagina	The opening between a girl's or woman's legs. The beginning of the opening is called the vulva and further inside is called the vagina. During sex a man puts his penis inside the woman's vagina.
Virus	Very, very small germs that can cause lots of different infections in people.
Womb	The womb is inside the woman's belly or tummy and is where she carries her baby when she is pregnant. The womb is also called the uterus. The vagina is the opening which leads to the womb.