CHAPTER 21

SEXUALLY TRANSMITTED INFECTIONS

UNIT 2 CONTENT

SCIENCE INQUIRY SKILLS
- interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments

SCIENCE UNDERSTANDING
Human reproduction
- Sexually transmitted infections (STIs), diseases transmitted through unprotected sex or genital contact, can be prevented through safe sex methods; early detection and treatment of infection are important and, if left untreated, STIs can lead to serious health consequences
Sexually transmitted infections (STIs), formerly referred to as sexually transmitted diseases (STDs), are infections that are transmitted by close body contact, usually with the genital organs. They are caused by viruses, bacteria, fungi or parasites that are passed from an infected person to a partner during sexual activity. Historically syphilis and gonorrhoea, both bacterial infections, were the best known. The introduction of reliable contraception has led to people having increased numbers of sexual partners with a resultant increase in the incidence of STIs. While syphilis and gonorrhoea still occur (and with increasing frequency), their importance has been overshadowed by infections such as chlamydia, herpes and the human immunodeficiency virus (HIV) (Figure 21.1).

The rapid spread of HIV during the 1980s stimulated worldwide efforts to find an effective treatment for the infection and to develop a vaccine that would prevent it. At the same time, many countries developed programs to educate people about safe sex practices. As a result, the incidence of some STIs started to decline. However, that decline has been followed by an increase in more recent times (Figure 21.2). This is in sharp contrast to most other communicable diseases, the incidence of which has declined markedly.

Young people are most at risk. In Australia, three-quarters of known cases of STIs occur in people aged 15 to 29 years. Unlike many other communicable diseases, as yet there is no vaccine readily available for the majority of STIs. Furthermore, for many of the STIs, one attack does not make a person immune or any less likely to contract the disease if exposed to infection again.

Chlamydia

For many years a very common sexually spread disease was known as non-specific genital infection (NSG). About 90% of these cases now appear to be chlamydia, caused by a micro-organism called Chlamydia trachomatis (Figure 21.3, page 290). The cause of the disease was difficult to identify because, although behaving in many ways like a virus, the organism is in fact a highly specialised and adapted bacterium. However, as it can only reproduce when inside a living human cell, Chlamydia trachomatis was difficult to isolate. It was impossible to grow the bacterium on normal nutrient media because such media do not contain living cells. This bacterium is now known to be the cause of the world’s most common STI.

Chlamydia trachomatis is transmitted by vaginal or anal sex with an infected person. Both men and women may be infected and it occurs most frequently in people aged under 25 years. The incidence of chlamydial infection in Australia has risen dramatically in the past few years, as indicated in Figure 21.4 on page 290. Although there were 82 000 reported cases in 2012, many cases go unreported and some health experts suggest that there were as many as 500 000 new cases in that year. Most people show no symptoms and are unaware that they are infected. It is therefore sometimes called the ‘silent infection’. When infection is diagnosed it can be treated with antibiotics.
Men may develop an infection of the urethra known as **non-specific urethritis (NSU)**. About half of the known cases are thought to be caused by *Chlamydia trachomatis*. Urethritis simply means **inflammation** of the urethra, and does not indicate the cause of the inflammation. Frequently, pus is produced but when examined it shows no evidence of disease-causing organisms. When a micro-organism is identified, it is often *Chlamydia trachomatis*. Other organisms that can cause NSU are *Escherichia coli* (a bacterium), *Candida albicans* (a fungus) and *Herpes simplex* (a virus). The symptoms of NSU experienced by men are a yellow, mucus-like discharge from the penis and a burning sensation when passing urine.

If the chlamydia infection in males is not treated, the bacterium can spread to the epididymis, where it causes inflammation. This inflammation, called **epididymitis**, causes pain and swelling of the epididymis. In Australia, chlamydia is the most common cause of epididymitis in men under the age of 35. It can lead to infertility if both testes are infected. However, epididymitis in both testes is very rare.

Most women have no symptoms and therefore no idea that they have chlamydia. This makes the disease very dangerous, because if untreated it can lead to infertility, eye infection and arthritis. Some women show symptoms of **pelvic inflammatory disease (PID)**, which is inflammation of the organs in the pelvic region such as the uterus and uterine tubes. Continual inflammation of the uterine tubes may lead to blockage by scar tissue, and thus to infertility. Implantation of an embryo outside the uterus – an **ectopic pregnancy** – may also occur. If the infected woman is pregnant, there is a 70% chance that the disease will be passed to the foetus during birth. The baby may then suffer from conjunctivitis (inflammation of the mucous membrane covering the eyeball), nose and throat infections, or pneumonia. There is also some evidence that chlamydia may cause a significant increase in the risk of having a premature birth or a stillborn child.

Correct diagnosis and treatment of chlamydia is vital. If a chlamydial infection is suspected, a urine test can be done in males and in females. A more accurate diagnosis can be made with a swab from the vagina, cervix, anus or penis, which is then analysed in a laboratory. If infection by *Chlamydia trachomatis* is confirmed, the usual treatment is a course of antibiotics, although even with prolonged treatment the bacterium may never be completely eliminated from the body. Research into a vaccine against chlamydia is being carried out in Australia and elsewhere. Researchers at the Queensland University of Technology have been testing a vaccine in mice. They have developed a vaccine that prevents infertility from Chlamydia in mice. It is an innovative approach in that it does
not aim to vaccinate against contracting the disease, but instead builds the body’s tolerance to the bacterium. In this way the vaccine prevents the presentation of negative symptoms such as infertility. However, a vaccine for use in humans is still at least a decade away.

It is interesting to note that the same bacterium that causes the sexually transmitted chlamydial infection also causes the eye disease trachoma. Trachoma is endemic in 51 countries and is the main cause of infectious blindness. It has largely been eliminated from developed countries due to improved standards of sanitation and hygiene, but it still persists in developing countries.

Genital herpes

Genital herpes is a common STI caused by the Herpes simplex virus (Figure 21.5). There are two forms of the virus. Herpes simplex type 1 (HSV1) usually produces ‘cold sores’ on the lips but can also affect the genitals. Herpes simplex type 2 (HSV2) produces blisters on the genital organs. Both types of the virus are transmitted by skin-to-skin contact and can therefore be passed on during genital, oral or anal sex.

The first episode of genital herpes is usually the most severe and can be very painful and distressing. Blisters develop in areas such as the penis of males, and the labia and in the vagina of females (Figure 21.6). Blistering may be accompanied by flu-like symptoms or a rash. The blisters break, forming ulcers that then develop scabs. Healing occurs over a period of one or two weeks. Although healing has occurred, some of the virus passes into the nervous system, where it remains for life. The virus can then reinfect the skin or mucous membranes of the genital organs at any time, and the blisters can recur for the rest of the person’s life. Recurrent episodes are not normally as painful and are of shorter duration than the first attack. It is important to note that the virus can still be passed on to others even when there are no symptoms.

The Herpes simplex virus can be transmitted from an infected mother to a baby during birth. In children born to infected mothers, serious malformations and life-threatening diseases may occur, although these complications are not common.

There is no way of removing the herpes virus from the body once infected. The treatment for genital herpes includes medication to reduce the pain, saline dressings to clean up the blisters, and sexual abstinence for the duration of the eruption. Antiviral drugs specific to herpes can be prescribed. They do not cure the disease but act to reduce the severity and length of an attack.
Genital warts

Genital warts are usually found on the genital area – the vagina, labia, cervix or penis – but may occasionally be found around the anus or in the throat. They may be flat, raised or cauliflower-like growths. The warts are caused by a virus, the human papillomavirus (HPV) (Figure 21.7). More than 100 types of HPV have been identified and only a few of these cause genital warts. Some other HPV types cause ordinary skin warts that can also occur on the genitals, but in such cases sexual transmission is not likely to be the cause.

Genital warts are passed on by a sexual partner infected by the virus. As the warts may be inside the vagina or penis where they cannot be seen, there is a risk of being infected by a person who is unaware of the infection. A newborn child can become infected during passage through the birth canal.

Some types of HPV can cause cancer of the cervix but those that cause genital warts do not cause cervical cancer.

Human immunodeficiency virus

Infection with the human immunodeficiency virus (usually referred to as HIV) weakens the body’s immune system, and so the infected person is susceptible to infection by other microorganisms and to some forms of cancer. Almost all cases of HIV infection eventually result in acquired immune deficiency syndrome or AIDS. Acquired means that the condition is not inherited and syndrome refers to a set of symptoms or illnesses that occur as a result of one cause. In the case of AIDS the cause is infection by HIV.

HIV is a retrovirus, containing an RNA core rather than a core of DNA. It is similar to other viruses in that it is unable to reproduce by itself. The HIV infects white blood cells known as T-lymphocytes (see Figure 21.1). Inside the host cells the virus uses an enzyme, called reverse transcriptase, to convert its RNA into DNA. The DNA then produces millions of copies of itself that are released into the blood to infect more T-lymphocytes.

About a month or so after the first infection with HIV, an infected person may suffer flu-like symptoms. The immune response (discussed in Human Perspectives Units 3 & 4) deals with the infection at this stage and the patient recovers. A long period during which the person is seemingly fit and well then follows. During this period, the virus continues to destroy T-cells until the number of these cells becomes so low that the immune system is no longer able to resist bacterial, viral or fungal infections and cancers are also likely to develop. The patient now has AIDS.

Anyone infected with HIV remains infected for life. However, the time taken for the infection to develop into AIDS varies depending on the person. It may take months or, in some people, up to 20 years.

The spread of HIV

HIV/AIDS is now a pandemic, meaning that it has spread to all parts of the world. The virus does not survive for long outside the human body, and is not transmitted through air or water. Body fluids in which the virus is present must be passed directly into a person’s bloodstream or come into contact with mucous membranes. The body fluids that are able to carry enough HIV to be infectious are blood (including menstrual blood), seminal fluid (including pre-ejaculatory
fluid), vaginal and cervical fluids, and breast milk. Unless blood is present, the virus is not found in sufficient quantities to be infectious in urine, faeces, vomit, tears, sweat or saliva. Therefore, normal social contacts such as hugging, kissing and handshaking will not spread HIV. There is also no risk of getting the virus from activities such as playing sport, swimming in a pool with others, or from such things as coughing, sneezing or sharing cutlery or crockery. HIV may be spread:

❯ by unprotected sexual intercourse (anal, vaginal or possibly oral) with an infected person
❯ by the sharing of needles and syringes with an infected person
❯ from an infected mother to her child during pregnancy, childbirth or through breastfeeding
❯ by blood transfusions in countries where blood is not carefully tested
❯ by implements that pierce the skin if they have not been sterilised – for example, equipment used for ear and body piercing, tattooing and for medical or dental procedures.

To reduce the risk of becoming infected with HIV, there are a number of preventive measures that should be taken.

❯ A person may choose not to have sexual intercourse or to inject drugs.
❯ A person should have protected sex with their chosen partner until they and their partner are sure they will not have sex with any other person. This may require both partners agreeing to be tested to ensure they are both free of HIV infection.
❯ If a person wants to have sex with more than one partner, or if their partner has sex with others, a condom should always be used.
❯ Things that are likely to have human blood on them, such as needles or syringes, should never be shared.
❯ Any open cuts or sores on the skin should be washed and covered and not allowed to come into contact with human blood.

**Diagnosis of HIV infection**

If a person thinks they may have been infected with HIV, a treatment called post-exposure prophylaxis (PEP) can be given. The treatment, consisting of a course of drugs that must be taken for a month, must be started within three days of the possible exposure to HIV. The drugs prevent the replication of the virus so that it does not become established in the body. It is not 100 per cent effective.

The body responds to infection with HIV by producing chemical substances called antibodies. Infection with HIV can therefore be diagnosed by tests that detect the presence of an HIV antibody in the blood. Depending on the individual, it takes from 2 to 12 weeks for the antibodies to build up to the point where they can be detected. If a person believes they have put themselves at risk of acquiring the infection, they should have a test at least two weeks after the possible exposure. Even then, if the test result is negative, a second test 10 to 12 weeks later is recommended, to be sure that no antibodies have developed.

In Australia, other tests for HIV are also available that measure viral load. **Viral load** is the term used to describe the amount of HIV in the blood and gives an indication of the activity of the virus. The activity of the virus can be determined from the rate at which the virus replicates, and gives a guide to the likelihood of damage to the immune system. The results of viral load tests are given in terms of the number of viral copies of HIV per millilitre of blood.

**Treatment**

As yet there is no cure for HIV infection and no vaccine to prevent infection. Many centres around the world are working hard in an effort to find drugs to treat the infection or to develop a vaccine that will protect those not infected with HIV. Currently a number of antiviral drugs that inhibit the reproductive cycle of the virus are available. These drugs are divided into different classes depending on which stage of the viral life cycle they affect.
Patients are usually given a combination of many drug classes—a so-called cocktail of drugs. The content of a patient’s multi-drug therapy depends on how high the viral load is, and whether they have had previous treatment with some of the drugs to which the virus has developed resistance.

These combination therapies have resulted in slowing the replication of HIV and suppressing the progression of the disease for some people. In some cases, they reduce the viral load to levels that cannot be detected. However, the virus still remains in the body in such tissues as the spleen and lymph nodes. Therefore, therapy must be continued indefinitely.

Many researchers are working to develop an HIV vaccine. A number have been trialled but so far none have been successful. One of the problems in trialing a vaccine is that researchers must urge all volunteers to continue to employ safe sex practices. Therefore, details on the effectiveness of the vaccine will become available only if enough people in the trial ignore this advice and expose themselves to the virus. This means that it may take many years before the reliability of the vaccine is established.

**HIV/AIDS in Australia**

The first case of HIV infection in Australia was diagnosed in 1982. By the end of 2012, 10,872 people had developed AIDS, of whom 6,852 had died. It is estimated that over 34,000 people in Australia were infected with the virus at the end of 2012 and about 70% of those are aged between 15 and 49 years. Figure 21.8 illustrates the trends in HIV infections in Australia since 1984.

![Figure 21.8](image-url) **Figure 21.8** Number of new cases of HIV infection and AIDS diagnosed in Australia, 1984 to 2012

Since May 1985 in Australia, all donated blood products, body organs and other tissues have been tested for HIV. Thus, there should be very little risk of infection to anyone who has received a blood transfusion or blood product since May 1985. In addition, donors of sperm for sperm banks are tested for evidence of HIV infection.

The number of cases in Australia where HIV infection develops into AIDS has reduced markedly in recent times due to the improved treatment available for HIV patients. During 2012, 75 new cases were reported, down from a peak of 953 in 1994. Figure 21.8 indicates the general decrease in AIDS cases that has occurred in Australia since the introduction of antiviral medications in 1996.
Trichomoniasis

Trichomoniasis is an infection caused by a protozoan, *Trichomonas vaginalis* (Figure 21.9). It causes inflammation of the mucous membranes of the vagina in women and of the urethra in men. In women it causes great discomfort, with symptoms including vaginal discharge and severe vaginal itch. Men often have the infection without symptoms; however, even without symptoms a man can transmit the infection to his female partner. The disease can be cured quickly and easily with antibiotics. Both partners should be treated at the same time even if one has no symptoms.

Trichomoniasis is spread by vaginal intercourse and use of a condom will prevent infection.

Pubic lice and scabies

Both pubic lice and scabies cause intense itching in the genital area. Pubic lice are insects called *Phthirus pubis*, which are broader than they are long (Figure 21.10). They are usually confined to the pubic and anal areas of the body, but in very hairy people may be found on the chest and in the armpits. The intense itching is thought to be due to an allergic reaction to the lice or to their faeces.

Scabies is caused by a mite, *Sarcoptes scabei* (Figure 21.11). Mites are members of the class Arachnida, which includes spiders and scorpions. (All arachnids have eight legs.) They appear to prefer the genital region, wrists and finger webs, and these infected areas become extremely itchy, especially at night, often making sleep impossible. The itch may be due to sensitivity to the mite or to its faeces.

Both pubic lice (often referred to as ‘crabs’) and scabies (‘the itch’) can be transmitted by sexual contact. However, sexual contact is not necessary if the partners are sharing the same bed: transmission frequently occurs merely through prolonged, warm, close contact.

Pubic lice and scabies are both treated using lotions that are applied to the skin. The lotions kill the insects or mites and also their eggs.
Gonorrhoea

Gonorrhoea, or ‘the clap’, was once the most common sexually transmitted infection. It is not a modern disease, being referred to by the ancient Egyptians and many of the Greek philosophers and writers, including Aristotle and Plato. Hippocrates, the Greek physician who became known as the founder of medicine, writing around 500 BCE described the transmission of the infection as ‘excesses of the pleasures of Venus’. (Venus was the goddess of love.) Thus, 2500 years ago it was known that the disease was sexually transmitted. Another Greek physician, Galen (130–210 CE), was the first to use the term ‘gonorrhoea’.

Gonorrhoea is an infectious disease that mainly affects the mucous membranes of the excretory and reproductive systems, the rectum, and occasionally the eyes and throat. The disease is caused by a bacterium, *Neisseria gonorrhoeae*, named after Dr Albert Neisser who first discovered it in pus taken from patients in 1889. This bacterium, commonly known as a gonococcus (plural, gonococci) because of its spherical shape (Figure 21.12), is normally transmitted during sexual intercourse. The disease affects both males and females, and symptoms appear about two to ten days after infection – although in females these may not be recognised. The period between infection and the appearance of symptoms is called the incubation period of a disease.

In males, the bacterium enters the urethra (the duct that carries urine and sperm) during intercourse with an infected partner. After the incubation period, inflammation in the urethra results in a burning feeling in the penis and extreme pain when passing urine. Later, there is a yellow discharge of pus from the penis. If untreated the urethra may become permanently constricted, resulting in difficulty in urinating. Lack of treatment can also result in spread of the infection to other organs of the body, such as to the testes, causing eventual sterility; to the joints, causing a type of arthritis; or to the heart or eyes.

In females, the disease is sometimes considered more serious, as there may be no early symptoms or the symptoms may go unrecognised. The gonococcus enters the vagina during intercourse with an infected male, and infection occurs most often in the urethra or in the cervix. There is usually no pain, so any pus produced is usually taken to be normal vaginal discharge. More than 70% of women infected with gonorrhoea have no symptoms. Women often find out that they have the disease only when the sexual contacts of infected men are traced. A woman may have the disease for months before pain causes her to seek medical treatment. Untreated, the infection spreads to the oviducts and to the abdominal membranes. Oviduct infection may cause permanent blockage and thus sterility. Because of the seriousness of an untreated infection and the fact that symptoms frequently do not appear, women who have sexual intercourse with a number of partners are advised to have smears taken on a regular basis to check for possible infection.

Discharge from the affected mucous membranes is the source of infection, and the bacteria are transmitted by direct contact – usually sexual. As gonorrhoeal infection in women occurs in the cervix and the vagina, children born to women with the disease may be infected during birth. The gonococci may enter through the baby’s eyes, causing an acute eye infection that can lead to blindness (Figure 21.13).

In both males and females, oral sex with an infected person can result in infection of the throat.

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**Figure 21.12** A coloured scanning electron micrograph of *Neisseria gonorrhoeae* – the pink/red spheres are the bacteria that cause gonorrhoea.

**Figure 21.13** A baby whose eyes are oozing pus due to a gonorrhoeal infection.
Antibiotics are used in the treatment of gonorrhoea and normally result in an easy and effective cure, provided treatment is begun early enough. However, strains of gonococcus that are resistant to antibiotics have evolved and in some cases are becoming increasingly difficult to cure. These resistant strains are present in Australia. In 2011, a strain of gonococcus that was resistant to all existing antibiotics, the extensively drug resistant (XDR) strain, was identified in Japan. By the end of 2013 no cases of XDR strain gonorrhoea had been reported in Australia but authorities say it is only a matter of time. Many experts fear that gonorrhoea may become untreatable.

For many years, the development of an effective vaccine has been viewed as the best way to control gonorrhoea. Although several vaccines have been trialed, none have yet proved effective. Research is continuing and in 2013 a vaccine trialed on mice in the United States gave some promising results. Once developed, even if it did not provide complete immunity, the vaccine may decrease the rate at which the infection is spread through the population.

**Syphilis**

**Syphilis**, also known as ‘the pox’, gained its name from a poem written by a Venetian physician, Fracastorius, in 1521. The poem described a shepherd named Syphilis who had the disease. Syphilis is caused by a thin, flexible, spiral-shaped bacterium, *Treponema pallidum* (Figure 21.14), which can live only in humans and some other mammals. The disease is normally contracted by direct sexual contact. Infections by indirect contact are extremely rare, as the bacterium can survive for only a brief time outside human tissues. Syphilis affects men and women in the same way, and the course of the disease follows four stages if it is untreated.

The skin is normally a very effective barrier preventing the entry of pathogenic micro-organisms but any damage to the skin can allow pathogens to enter. The **primary stage** of syphilis begins when the syphilis bacterium enters through any small break in the skin. Such infection takes place during sexual activity with an infected person. During an incubation period ranging from ten days to ten weeks, but usually from about two to four weeks, the bacteria multiply and spread through the whole body. The first symptom is one or more small sores, known as **chancres** (pronounced ‘shankers’). These usually appear on the sex organs but may occur elsewhere on the skin such as lip, finger or eyelid. Chancres may be up to 1 cm in diameter or so small that they are not noticed. They are usually painless, and in women often develop in the vagina or cervix where they cannot be seen easily. The chancre heals in three to eight weeks, even without treatment – a situation that gives the infected person a false sense of security.

The **secondary stage** usually follows a few weeks after the primary stage, but may be delayed for up to twelve months. There is a large range of possible symptoms during this stage, including skin rashes, sore or ulcerated mouth or throat, mild fevers, and disorders of the bones or eyes. The skin rash due to syphilis persists for several weeks (Figure 21.15); any rash that appears and fades over a few days is not due to the disease. In some cases the symptoms are quite mild and may not be taken seriously, but the patient is highly infectious during this stage of the disease. This secondary stage lasts about two years and all symptoms eventually disappear even without medical treatment.
A latent stage, or hidden stage, then follows, beginning when symptoms from the primary and secondary stages go away. This stage has no noticeable symptoms, but the body is still infected. It may last for many years, and in some cases for the rest of the person’s life. During this latent period, the infection cannot be passed on to others. However, sometimes the symptoms of the secondary stage return. If this does happen, the infection can then be passed to others while the symptoms persist.

Even without treatment, only a minority of people infected with syphilis develop the complications associated with the tertiary, or late, stage of the disease. However, when symptoms do appear again, which may be anywhere between 5 and 40 years after the initial infection, the results may be devastating – syphilitic heart disease, insanity, blindness, weakening of the blood vessels, physical incapacity, and many other serious afflictions.

Antibiotics are the usual treatment for all stages of syphilis, and during the primary stage cure is relatively easy. Surgery becomes necessary in the later stages. A special problem for pregnant women with syphilis is that the bacterium can cross the placenta and infect the developing foetus. Infection of the woman is not necessarily followed by foetal infection, but once the bacteria enter the foetal circulation there is nothing to stop their multiplication. The foetus can go through all the stages of syphilis before birth, and may suffer permanent damage to the heart, nervous system, joints or other organs. Blood tests for syphilis are usually carried out during the pregnancy, and antibiotics can be used to treat both the infected woman and the foetus.

Syphilis is a major public health problem in developing countries and in certain regions of developed countries such as Australia and the United States. Worldwide, it is estimated that there are 12 million new cases of syphilis per year, and at least 25 million people infected with the disease. The incidence of syphilis in Western Australia is shown in Figure 21.16.

In spite of the existence of safe and effective treatment with antibiotics, syphilis is unlikely to be controlled globally without an effective vaccine. Research so far has not resulted in a vaccine, although a number of possible vaccine antigens are currently under active investigation. The publication of the complete genetic sequence of *Treponema pallidum* in 1998 should facilitate a greater understanding of the way the bacterium infects its host. This information, together with the latest advances in vaccine research, should assist the future development of a syphilis vaccine.

![Figure 21.16](image-url) Number of notified cases of gonorrhoea and syphilis in Western Australia, 1985 to 2013
Control of sexually transmitted infections

Safe sex

What can be done to reduce the spread of STIs and to reduce the individual’s chances of catching such an infection? The only way to be absolutely certain that you will not catch an STI is never to have sex at all. That option does not suit most people, so to limit your chances of contracting an STI you should always have safe sex. Education about safe sex practices has already had a marked impact in reducing the spread of STIs, and it is each person’s responsibility to make sure that their behaviour does not put themselves or others at risk.

Safe sex involves taking precautions to make sure that your partner’s semen, vaginal fluids or blood do not enter your body and that your fluids do not enter your partner’s body. Parts of the body that may be infectious, such as warts or herpes sores, should be covered or contact with those parts avoided.

For vaginal or anal intercourse, safe sex involves use of a condom. This prevents exchange of body fluids and has the added advantage that it prevents pregnancy. For oral sex, condoms or dental dams can be used. A dental dam is a square of very thin latex that can be used as a barrier during oral sex.

Treatment and contact tracing

There are special clinics for the treatment of STIs in most of the major cities in Australia and free treatment is also available in all public hospitals. Treatment is strictly confidential and the names of patients are never revealed. In addition to treatment, an important part of the work of STI clinics is contact tracing. As mentioned before, a person may be unaware that he or she has chlamydia, syphilis or gonorrhoea because of the often mild nature of the symptoms. By tracing the sexual contacts of patients, the clinics aim to locate and treat people who unknowingly have these diseases. In this way the spread of the disease can be limited.

Another important role of STI clinics is education. If people know the dangers, and are aware of the symptoms, they are more likely to seek treatment early, when the disease is more easily cured and before they pass it on to others.
Science inquiry

ACTIVITY 21.1 The origin of HIV

Human immunodeficiency virus (HIV) was first identified as the cause of AIDS by French researchers in 1983, although it was not given its present name until 1986. Many hypotheses, some quite bizarre, were proposed to account for the origin of the virus. It is now generally accepted that HIV originated in monkeys or apes in sub-Saharan Africa and that some time in the late 19th or early 20th century it was transferred to humans.

The identification of HIV as the cause of AIDS and the investigations about the origins of the virus are an interesting example of the way in which science works – by the gradual accumulation of new knowledge as a result of painstaking research.

Using reliable sources of information, write a brief account of the history of the discovery of HIV and of its likely origins.

A good place to start is the Origin of HIV & AIDS weblink. (You can access all weblinks directly via http://hp1and2.nelsonnet.com.au.)

When you search the Internet for information on HIV and AIDS you will find many websites that dispute presently accepted ideas. Some websites even claim that HIV and AIDS do not exist. Keep in mind that the overwhelming scientific evidence supports the idea that HIV originated in African monkeys or apes and that HIV causes AIDS.

ACTIVITY 21.2 The social consequences of vaccines for STIs

If effective vaccines for sexually transmitted infections (STIs) such as HIV, gonorrhoea, syphilis and chlamydia were widely available, who do you think should be vaccinated? What social and moral issues would be raised by the availability of such vaccines? Work in small groups, or organise a class debate, to argue the advantages and disadvantages of widespread vaccination against particular STIs. During the discussion, list all the advantages and disadvantages suggested.
Review questions

1. a. Define ‘sexually transmitted infection (STI)’. Give examples of the most common forms.
   b. What types of organisms can cause STIs?
2. Which parts of the body are affected by infection with chlamydia in:
   a. males
   b. females?
3. Explain how chlamydial infection can lead to infertility in women.
4. Draw up a table that will show for each of gonorrhoea, syphilis, genital herpes and chlamydia:
   a. the organism that causes the disease
   b. the early symptoms of an infection
   c. the treatment available to overcome or manage the infection.
5. Genital warts and genital herpes are both caused by viruses. Explain the differences between these two diseases.
6. Describe the causative agent of acquired immune deficiency syndrome (AIDS), and why it is of such importance.
7. a. Outline the stages of an infection with human immunodeficiency virus (HIV) that eventually develops into AIDS.
   b. What complications are associated with AIDS?
8. a. Briefly outline the way in which HIV may be spread from person to person.
   b. What preventive measures are available to reduce the risk of infection by HIV?
9. Explain what is meant by ‘viral load’, and describe how viral load can be used as a test for HIV infection.
10. Genital warts, trichomoniasis, pubic lice and scabies are STIs that are not often publicised. Describe the causative agent, the symptoms and treatment for each of these infections.
11. Explain how an infant could be infected with:
    a. syphilis
    b. gonorrhoea.
12. Describe the measures available to control the spread of STIs.

Apply your knowledge

1. In Australia around 75% of known cases of STIs occur in people aged 15 to 29 years. Suggest as many reasons as you can to explain why STIs are so prevalent among younger adults.
2. How do sexually transmitted infections differ from other communicable diseases? List as many differences as possible.
3. Some people refer to STIs as ‘social’ diseases. Explain how this term may have arisen.
4. Refer to Figure 21.8 on page 294. Suggest why the number of cases of AIDS has declined in recent years but there has not been a similar decline in new cases of HIV infection.
5. Medical research into more effective treatment for STIs is taking place at various centres around the world. Using reference material, determine the most recent discoveries for:
   a. the treatment of HIV/AIDS
   b. a vaccine for syphilis or gonorrhoea
   c. reducing the incidence of chlamydia.
6. In Australia during 1988, nine people died from syphilis. Eight of these were people over the age of 65 and one was a child in her first year of life. From your knowledge of the progress of this disease, account for the marked age variation in these statistics.
7. Figure 21.16 on page 298 shows that the incidence of syphilis in Australia remained relatively constant from 2005 to 2013, whereas the incidence of gonorrhoea increased greatly over the same period. Suggest as many reasons as you can to account for this difference in the incidence of the two diseases.
8. Many of the STIs have common names. For example, gonorrhoea is called ‘the clap’; syphilis, ‘the pox’; pubic lice, ‘crabs’; and scabies, ‘the itch’. Use reference material to determine how these terms originated.
9. Design a campaign to increase student awareness of STIs. In designing your campaign, ensure that you employ techniques that will result in maximum student awareness of the need to adopt safe sex practices.