Chapter 16
Making choices about contraception

Unit
2B

Unit content

Body systems
Reproductive technologies related to:

- contraception.

The relevance of human biology to everyday life
The rate of change in human biology means that there is a range of alternative treatments available. Each treatment has its risks, ethical concerns and benefits based on individual variations and the condition being treated. Health choices can be based on myths or misconceptions about human biology.

Medical technologies:

- birth control methods.

Figure 16.1 Many methods of contraception are available. Understanding some of the issues relating to birth control will help you make responsible decisions

Control of human reproduction is an excellent example of how advances in human biological science have had enormous impacts on individuals and on society. For many people these same advances have challenged their beliefs and values.

It is only in relatively recent times that people have been able to plan a family. Although some of the family planning techniques described in this chapter have been used for centuries, they were notoriously unreliable. Modern science has made the older methods more effective and has also introduced new and highly reliable methods of birth control. The ability to control reproduction has led to a great many social changes for women and for men. People can now decide whether they want children or not. If they decide to have a family, the number and the time interval between babies can be planned.

Most methods of family planning, or birth control, involve prevention of fertilisation and hence conception. Measures that prevent a woman from having a child are therefore usually called **contraception**.

Abstinence, that is, not having sex at all, is the only option that has no risk of either pregnancy or side effects. Science has provided choice but choice brings with it responsibilities, and each of us must examine the issues and make responsible decisions about family planning.

Puberty is the time of sexual maturation when both males and females become able to reproduce. It is also the time when sexual feelings intensify. Until relatively recent times, puberty—and the accompanying development of sexual desire—occurred at an age when young people were nearing adulthood. They were emotionally fairly mature and able to cope with their developing sexuality. Today, for reasons that are not yet fully understood, puberty and sexual feelings develop at an earlier age. In addition, many young people are postponing having children to a later age than in the past.

This is the basis for a social problem. There may be an extended period of sexual maturity without emotional maturity and without the stable relationships traditionally considered acceptable by many cultures. These biological and social changes may be responsible, in part, for increased promiscuity among young people in their teens and early twenties. For young people to continue such experiences without the risk of an unwanted pregnancy, knowledge of the methods of birth control is essential.

Methods of contraception

Detection of ovulation

Some methods of birth control rely on a female's ability to determine the time of ovulation. She can then abstain from sexual intercourse on the days when fertilisation is most likely. This is known as **periodic abstinence** or the 'safe period' technique. There are a number of ways of determining the safe period.

1. The **rhythm method** is based on the fact that an egg is available for fertilisation during a period of only three to five days in each menstrual cycle (see Fig. 16.2). If a female has a regular 28-day menstrual cycle, ovulation is likely to occur on about the fourteenth day. As the egg can survive for only two days unless it is fertilised, and sperm can survive in the female reproductive tract for four days at the most, sexual intercourse should not occur between four days before and four days after ovulation if pregnancy is to be avoided. An extra allowance should then be made in case the egg is not released exactly on day 14, but a day or so earlier or later. Figure 16.2 illustrates the safe and unsafe days for a 28-day cycle.

Most women do not have cycles that are exactly the same each month, and seldom is the cycle exactly 28 days. For this reason, the rhythm method is now usually used in combination with the other methods described below.

2. The **temperature method** is a refinement on the rhythm method of predicting ovulation. A female can take her body temperature each morning to determine the time of ovulation more accurately. Ovulation is accompanied by a sharp drop in body temperature and then a rise (Fig. 16.3). Using this method a woman then knows she can safely have intercourse three days after the temperature rise has occurred.
3. The **mucus method**, developed by an Australian doctor, is another way of predicting the safe period more accurately. The probable time of ovulation is predicted by observing a change in the mucus of the cervix. Immediately after menstruation the tissues of the vaginal opening feel dry. As ovulation approaches, mucus can be detected. At first it is cloudy and sticky but as the cervix secretes more mucus its nature changes: the mucus becomes clearer, feels slippery to the touch, and strands will stretch without breaking. On the day of ovulation the peak of clear mucus is reached, after which it becomes cloudy again. Sexual intercourse is safe when there is no mucus, and more than three days after the last day of the clear mucus.
4. The **symptothermal method** uses the rhythm method and a combination of the temperature and cervical mucus methods to predict the fertile period of a female's cycle more accurately. A Fertility Monitor has been developed to measure daily changes in body temperature and cervical mucus.

Figure 16.2 The 28-day cycle showing 'safe days'

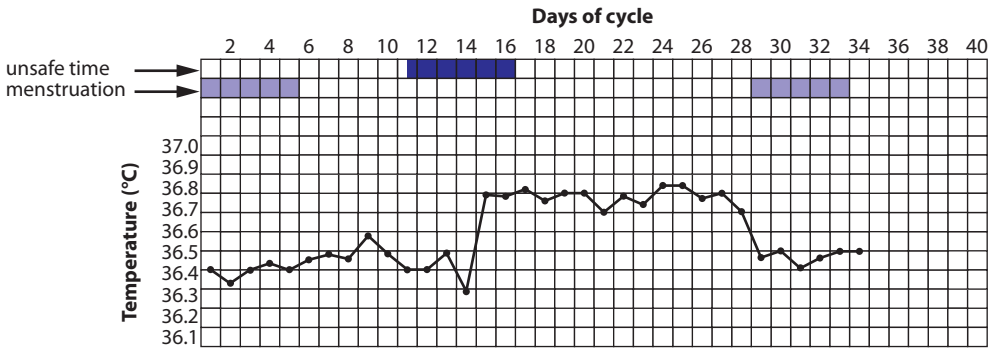

Figure 16.3 Body temperature and the ovarian cycle

None of these safe period methods is particularly reliable and all rely on the woman keeping careful records. Another problem is that in a close relationship it is very difficult to have sex according to a calendar and not according to desire. Close cooperation and support from the woman's partner is essential. However, if the couple are motivated and the woman is properly trained in the methods for detecting ovulation, very low pregnancy rates can be achieved.

Coitus interruptus

Coitus interruptus, or withdrawal, is the removal of the penis just before male orgasm so that ejaculation takes place outside the female vagina. This, the oldest method of contraception, is highly unreliable. It depends on the male being able to recognise the sensations that occur just before ejaculation and requires considerable self-control for withdrawal to occur in time.

Mechanical barriers

A variety of mechanical barriers can be used to prevent the sperm from reaching the egg.

1. A **condom** is made from very thin latex rubber (Fig. 16.4), which is rolled onto the erect penis just before intercourse. There is some evidence that condoms made of animal membrane were in use over 2000 years ago. A condom is effective in preventing semen from entering the vagina, provided it does not tear or slip off after ejaculation. Condoms have an additional advantage in providing protection against sexually transmitted infections such as HIV/AIDS and the sexually transmitted forms of hepatitis B.
2. The **diaphragm** is a mechanical barrier used by the female. It is a thin rubber cap that fits across the top of the vagina (Fig. 16.4). The correct size must be prescribed by a doctor. It must be inserted before intercourse, and is normally used with a spermicidal cream or jelly to increase effectiveness.
3. The **cervical cap** is a similar device, but smaller than the diaphragm, that fits directly over the cervix (Fig. 16.5). Both the diaphragm and the cervical cap prevent sperm from reaching the uterus, and both must remain in position for 6 hours after the male has ejaculated.
4. The **female condom** (the Femidom) is a more recent innovation. It is a lubricated polyurethane sheath, which lines the vagina (Fig. 16.6). There is a flexible ring at each end of the sheath; the one at the closed end fits over the

Figure 16.4
Diaphragm (top) and condom (bottom)

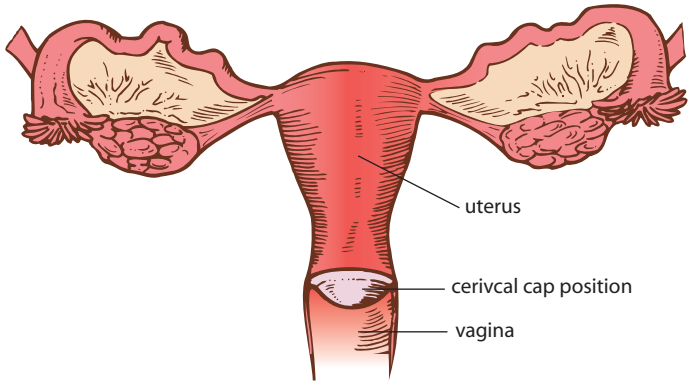

Figure 16.5 Cervical cap in position

cervix, and the other sits over the folds of skin that surround the entrance to the vagina. The female condom is an effective contraceptive device and gives protection against sexually transmitted infections.

Figure 16.6 The Femidom, a condom for females

Spermicides and foams

Spermicides and foams may be used with the condom, diaphragm and cervical cap. They are available as creams, tablets, pessaries or as an aerosol foam. Spermicides and foams work in two ways: they contain a spermicide, which immobilises sperm; and they react with moisture in the vagina to form bubbles of carbon dioxide gas, which present a physical barrier to the sperm. They are very unreliable when used alone but they do add to the effectiveness of barrier devices.

Hormonal contraceptives for women

One of the most effective methods of contraception is to prevent ovulation by changing the hormone levels in the female's body. The oral contraceptive pill, or 'the Pill', is the best known of these methods. Since their introduction in Australia in 1961, oral contraceptive pills have become widely used due to their reliability and convenience. Many different brands are available, but there are two main types.

The first type, known as the **combined pill**, contains substances similar to the two female hormones, oestrogen and progesterone (see Chapter 11). Brands with slightly different proportions of the two hormones can be chosen to suit the individual. When taken daily for the first 21 days of the menstrual cycle, the substitute hormones prevent the release of mature eggs from the ovary. The cervical mucus becomes thick and sticky, making it difficult for sperm to travel upwards from the vagina. In addition, the 'hormones' alter the lining of the uterus so that it becomes less receptive to the implantation of an embryo. These three effects of the substitute hormones protect a female against an unwanted pregnancy provided the pill is taken daily. If missed for more than two days, hormone levels drop and there will be no protection. Some brands use inactive pills for the seven days during which hormonal substitutes are not required. This means that a pill is taken every day, making it less likely that one will be missed.

The second type of contraceptive pill, called the **mini pill**, contains only the progesterone substitute, progestogen. This 'hormone' makes the cervical mucus thicker so that sperm cannot enter the uterus. The mini pill must be taken daily at the same time each day.

Depo-Provera is a progestogen hormone that is injected and lasts for 12–14 weeks. It works in a similar way to the mini pill.

A newer way of delivering progestogens is to use **Implanon**. This is a capsule the size of a matchstick (Fig. 16.7). Under local anaesthetic the Implanon capsule is inserted beneath the skin on the inner side of the upper arm. The progestogen diffuses through the capsule wall into the body and provides contraception for three years. The implant can be easily removed and ovulation usually returns within three weeks.

Oestrogen and progesterone can also be delivered by a vaginal ring, marketed in Australia as **NuvaRing**. The soft plastic ring is

Figure 16.7 The hormonal contraceptives NuvaRing (top) and Implanon (right) both provide longer term contraception. An applicator for placing the NuvaRing in the vagina is also shown.

placed in the vagina where it releases low doses of the two hormones. It is left in the vagina for three weeks and taken out for one week. The small amounts of hormones released prevent ovulation, cause the mucus in the cervix to thicken so that sperm cannot enter the uterus and change the lining of the uterus so that implantation cannot occur. NuvaRing has the same hormones as the combined pill, and produces the same effects, but the woman does not have to remember to take a pill each day.

It is the oestrogen in the combined pill that causes many of the side effects of hormonal contraception. As the progestogen-only pills, injections or implants do not contain the oestrogen substitute, many of the side effects of the combined pill do not occur.

Despite the risk of side effects, the combined pill is currently the most reliable hormonal contraceptive available. Provided it is taken daily, it gives almost 100% protection. With continual research and development, the formulation of the combined pill has gradually changed and the amount of hormone substitutes has been reduced considerably. This has resulted in a marked decrease in the incidence of side effects. The most serious side effect of the contraceptive pills now in use is the increased risk of developing a blood clot in a vein or an artery. Although small, the risk does increase with age. For women over the age of 35 the combined pill is quite safe as long as they do not smoke; if a woman wants to smoke, she should be using some other form of contraception.

Emergency contraception for women

Sometimes it is necessary to try to prevent pregnancy after sex instead of before. This could happen if a condom breaks, a pill is forgotten or rape occurs. The so-called **morning-after pill** is most commonly taken as two tablets of progestogen, known as Postinor-2. Since 2004 it has been available over the counter at Australian pharmacies.

The first pill must be taken within 120 hours (5 days) of having unprotected sexual intercourse. The second pill is taken 12 hours after the first. The sooner the pill is taken after unprotected sex the more effective it will be; effectiveness is much reduced after 72 hours.

Emergency contraception works by preventing or delaying ovulation, preventing sperm from reaching an egg and by preventing implantation of an embryo in the lining of the uterus.

There are few side effects from the emergency contraceptive pill. Nausea and vomiting may occur but they are not common. Other possible, but rare, side effects are headache, stomach ache, breast tenderness, dizziness or spot bleeding from the vagina.

In Australia there has been concern from parents and others that the morning-after pill is now available from pharmacies without a doctor's prescription. Young girls can buy the pills over the counter from the local chemist. Parents, with legal responsibility for their children, may be unaware that their daughters are using emergency contraception. This is one example of developments in human biological science causing tensions for individuals and society.

Hormonal contraception for men

Male hormonal contraceptives are being developed in a number of different forms. One that has been trialled in Australia involved an implant of the hormone testosterone being placed under the skin every four months. This was combined with an injection of progesterone every three months and was found to be effective in suppressing sperm

production. Much more testing and development is necessary before any of the male hormonal contraceptives become available.

Intrauterine devices

Intrauterine devices, or **IUDs** (sometimes called intrauterine contraceptive devices, IUCDs), are small devices, usually made of plastic and copper, that are inserted into the uterus. They are usually suitable only for women who have had children, and even 20% of these women are unable to use them because they either expel the device or it causes undue pain or bleeding. It is uncertain exactly how IUDs work but it seems that they irritate the lining of the uterus, making it difficult for an embryo to implant. The copper in the device alters the levels of enzymes and trace elements in the lining of the uterus, and copper acts as a spermicide. Progestogen-releasing IUDs (Mirena IUDs) suppress the normal development of the uterine lining and may inhibit ovulation. They are effective for up to five years.

IUDs have been produced in a great variety of sizes and shapes (Fig. 16.8). Some have caused so many health problems that they are no longer sold. One of the most popular has been the Lippes loop (Fig. 16.9).

For those women who can use them, IUDs are a highly effective, simple-to-use contraceptive. Although not as efficient as oral contraceptive pills or the injectable forms of progestogen, less than 1% of women become pregnant each year while using an IUD. This rate is about the same for all IUDs. If a woman does become pregnant she should see her doctor as early as possible to avoid the risk of complications.

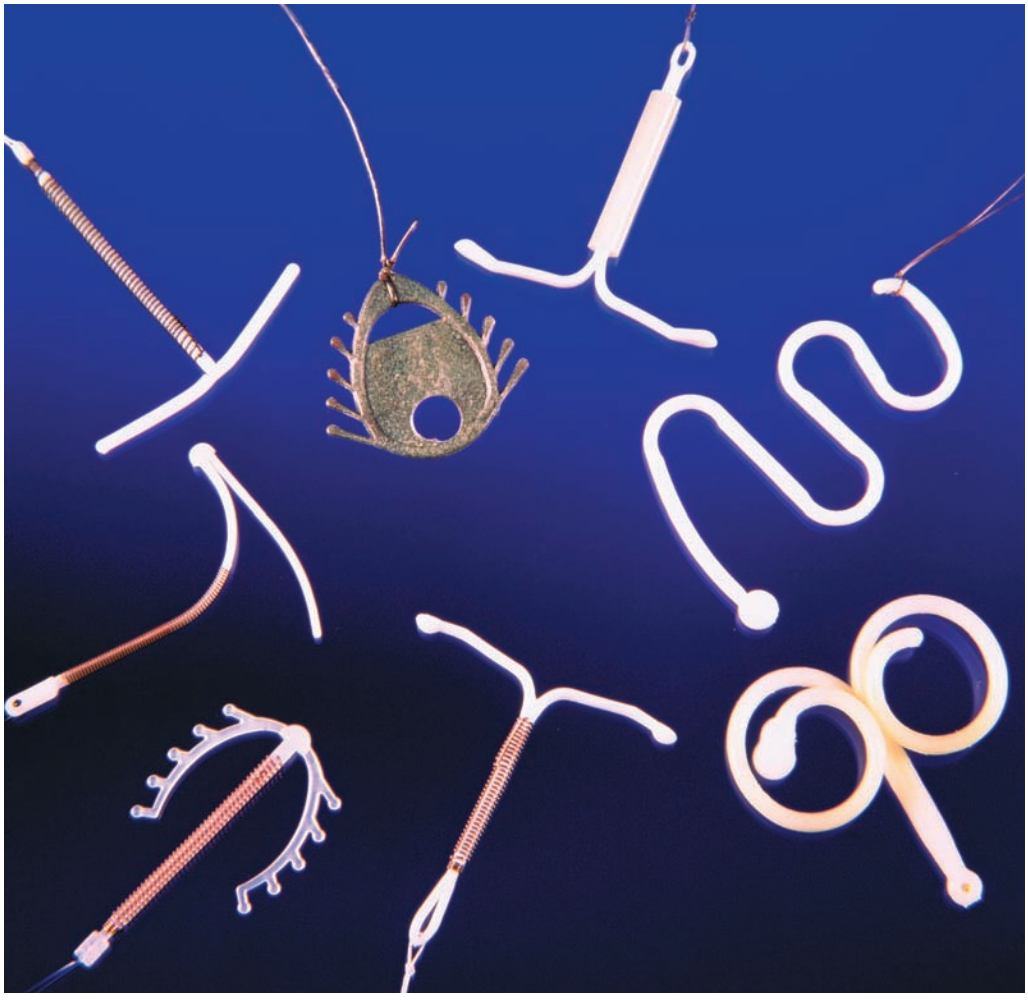

Figure 16.8 A variety of intrauterine devices (IUDs), showing the range of shapes and sizes available. Lippes Loop, one of the most popular, is at centre right.

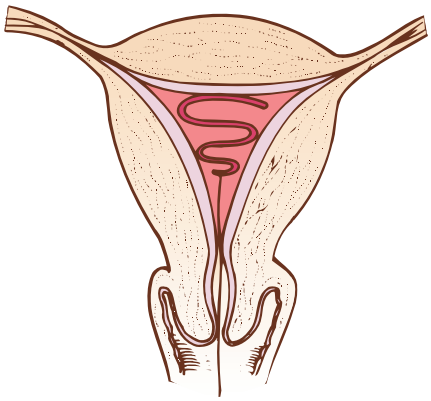

Figure 16.9 An IUD (Lippes loop) in the uterus

Sterilisation

Sterilisation is a permanent method of birth control for both men and women. The operation in the male, called **vasectomy** (Fig. 16.10), has traditionally involved the removal of a small piece of each vas deferens. The operation is relatively simple: a small cut is made on each side of the scrotum. A small segment is then removed from each vas deferens and the cut ends are tied or sealed with heat. The cuts in the scrotum are then closed. Most operations are done under local anaesthesia, but a general anaesthetic can be used.

Sterilisation does not result in any loss of sexual desire or pleasure. Many men who have had a vasectomy report that their sex life has improved, probably because the fear of causing an unwanted pregnancy has been removed.

Sterilisation in women is generally achieved by performing a **tubal ligation** (Fig. 16.11). This operation is a relatively simple procedure, requiring only a short stay in hospital. Under a general anaesthetic, a small incision is made in the abdomen and the uterine tubes are located. Each tube is then cut, a small piece is removed, and the ends are tied. An instrument called a laparoscope may be used. It is passed into the abdominal cavity through a small, 1 cm long cut at the lower edge of the navel. Once it is inside the abdominal cavity, the doctor is able to locate the uterine tubes and fit metal clips to each, crushing that section of the uterine tube. After tubal ligation sperm cannot reach the egg, and the egg cannot reach the uterus. A female has no decrease in sexual desire as a result of this operation.

Sterilisation for women without a general anaesthetic and major surgery is now available using a technique called **Essure**. Essure uses a device that consists of an inner wire surrounded by a larger coil of wire with synthetic fibre between the two wires. A device is inserted through the cervix and uterus into the entrance of each uterine tube (Fig. 16.12a and 16.12b). This procedure is performed with a mild local anaesthetic and no cuts are required. Over the following two to three months the uterine tube grows around the Essure device (Fig. 16.12c). The procedure cannot be reversed because removal would destroy part of the uterine tube.

The choice of sterilisation as a birth control method for both men and women should be considered only when no further children are wanted. It should be thought of as a permanent procedure.

The sterilisation techniques discussed here should not be confused with the removal of the sex organs. **Castration** is the removal of the testes and **oophorectomy** is the removal of the ovaries. Both of these operations affect the balance of the reproductive

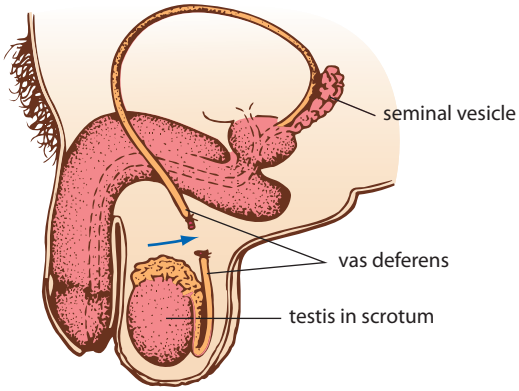

Figure 16.10 Vasectomy (the arrow indicates where the section of vas deferens has been removed)

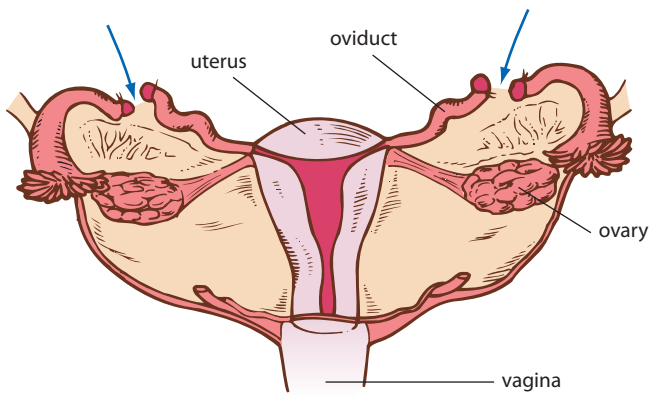

Figure 16.11 Tubal ligation (the arrows indicate where sections of the oviduct have been removed)

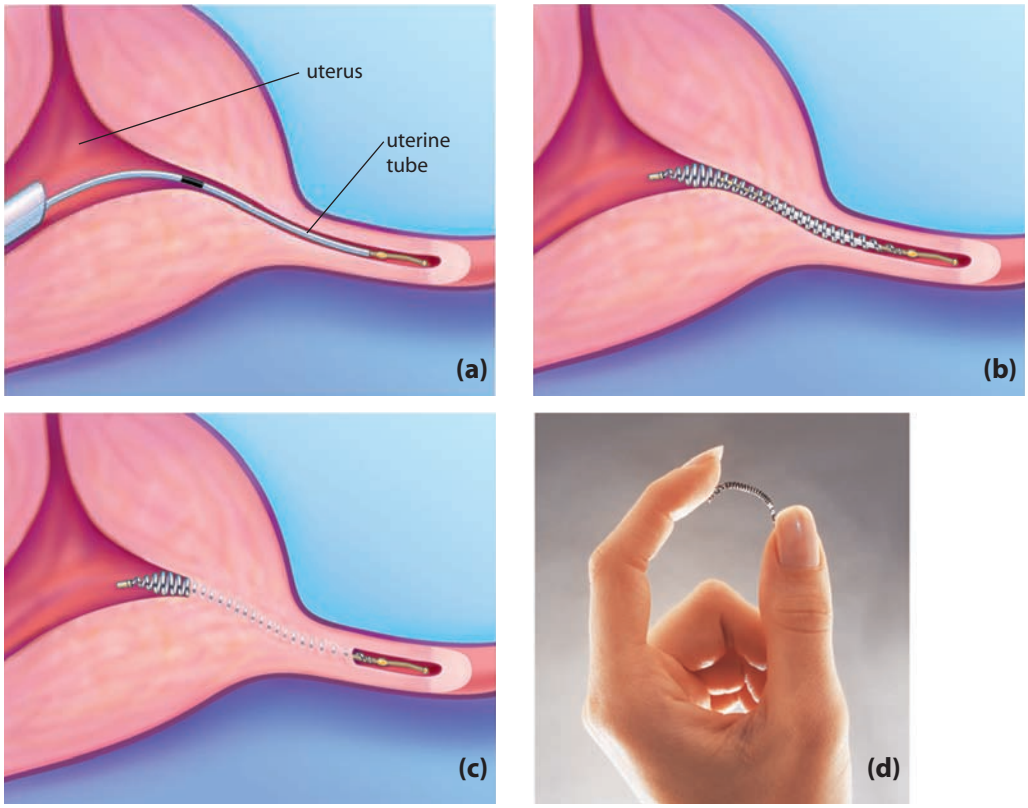

Figure 16.12 An Essure device: **(a)** the micro-insert is placed in the uterine tube inside a metal sleeve; **(b)** the metal sleeve is removed; **(c)** a tissue barrier forms around the micro-insert, blocking the uterine tube; **(d)** a photo of the micro-insert.

hormones and have profound effects on sexual drive and on body characteristics. They are usually performed only when the organs are diseased. In women, the removal of the uterus, called a **hysterectomy**, also results in sterility.

Choice of contraception methods

Use of contraception is your choice—and your responsibility. You can choose to abstain from sexual intercourse or you can choose a contraceptive method that suits your circumstances. Table 16.1 gives a summary of some of the advantages and disadvantages of the various methods.

Selection of a method of contraception is often based on personal beliefs and values, but reliability is also an important criterion to be considered.

Reliability

Contraceptive methods vary greatly in their reliability and in the extent of possible side effects. The older methods are all relatively safe but their effectiveness can often be quite low. Even though the newer methods are more reliable, they may be accompanied by harmful or uncomfortable side effects. Recent advances in controlling the amount and delivery of hormones have considerably reduced the incidence of side effects from hormonal contraceptive agents.

Most people make their choice based on convenience; this, in addition to its high reliability, may account for the popularity of oral contraception. People are unlikely to select a method that is extremely inconvenient, no matter how reliable it is. Table 16.2 shows the effectiveness of commonly used contraceptive devices.

New methods of contraception are being researched all the time, and it is certain that in the future very reliable, simple-to-use measures will be readily available.

Two of the many websites that deal with contraceptive choices are:

- http://www.betterhealth.vic.gov.au/BHCV2/bhcarticles.nsf/pages/Contraception_choices_explained
- http://www.netdoctor.co.uk/sex_relationships/facts/contraception_which.htm

Table 16.1 Advantages and disadvantages of the various methods of birth control

Method of birth control	Advantages	Disadvantages
Natural methods	No side effects; no costs; acceptable to certain religious groups	Poor reliability
Periodic abstinence (safe period)		Time and effort required to determine ovulation; not very reliable; abstinence required at certain times
Withdrawal		Requires self-control; very unreliable
Spermicides and foams	Relatively easy to use	Very unreliable on their own; need to be used in conjunction with another barrier like a diaphragm or cervical cap; no protection against STIs
Intrauterine devices	Effective; long lasting; easily reversed; once in place can be forgotten	Must be inserted by doctor; in some women cause pain and bleeding at menstruation; no protection against STIs
Mechanical barriers		
Diaphragm and cervical cap	Does not affect the menstrual cycle; can be used during menstruation; can be inserted ahead of time so that spontaneity of intercourse is not affected	Difficult or unpleasant to insert; correct size must be prescribed by doctor; spermicide must be used to improve reliability
Condom	Easy to buy; relatively cheap; good protection against HIV and other STIs	May affect spontaneity; partners need to be motivated and cooperative
Femidom	May be put in place long before intercourse; stronger than male condoms; good protection against HIV and STIs	Placement needs practice; more expensive than male condoms
Hormonal contraception for women		
Combined pill	Very reliable; regular periods; reduced incidence of ovarian and uterine cancer; unrelated to sexual activity	Regular doctor's prescription required; pill must be taken daily; possible side effects; no protection against STIs
Mini pill	Reliable if take carefully; suitable for women who cannot take oestrogen	Must be taken at same time every day; no protection against STIs
Implanon	Lasts three years; relatively cheap; nearly 100% effective	May cause menstrual irregularities; possible side effects; no protection against STIs
Depo-Provera	Very effective; convenient; periods cease	Injection cannot be reversed; delay in return to fertility when injections cease; possible side effects; no protection against STIs
NuvaRing	Daily pill not required; very reliable	Regular placement and removal required; no protection against STIs
Sterilisation—tubal ligation, Essure and vasectomy	Permanent; nearly 100% effective	Cannot be easily reversed; require a surgical procedure; specialist referral necessary for female sterilisation
Morning-after pill	May be useful when other methods have failed or have not been used; fairly effective; available over the counter	Emergency use only; needs to be started within 72 hours of sexual intercourse

Table 16.2 Relative effectiveness of birth control procedures

Method	Percentage of women who become pregnant in first year of use
Oral contraceptives	
Combined pill	0.1–5
Mini pill	0.5–5
Implants (Implanon)	0.1
Injections of progestogen (Depo-Provera)	0.3
Condom	
Male	3–14
Female	5–21
Diaphragm with spermicide	6–20
Cervical cap with spermicide	9–40
IUD	0.1–0.6
Natural methods (rhythm and others requiring periodic abstinence)	1–25
Withdrawal	4–19

Source: Beers MH, ed. *Merck Manual of Medical Information*. 17th edn. Whitehouse Station, NJ: Merck Research Laboratories, 2004.

Ethical issues

There are several ethical issues associated with birth control. For example, the view of the Roman Catholic Church, and some other Christian faiths, is that the only acceptable method of family planning is abstinence from intercourse at times when fertilisation is most likely to occur.

Some people believe that methods that allow fertilisation but prevent implantation, such as IUDs and morning-after pills, are morally wrong. The arguments against these methods centre on the question of when an embryo becomes a human being: is it at the moment of fertilisation, the time of implantation, or some later stage of embryonic development? (See Chapter 12 for a discussion on when human life begins.)

Questions relating to our beliefs and values cannot be answered by science. Each of us must consider the implications carefully and make our own decisions about such matters.

EXTENSION

In Australian society, attitudes to sex and marriage have changed markedly since the introduction of oral contraceptive pills in 1961.

Find out:

- how attitudes have changed and what role the pill may have played in the shift in attitudes
- what impact the pill has had on quality of life for Australian men and women.

Termination of pregnancy

Pregnancy may be terminated by the removal of the developing embryo after it has implanted itself in the wall of the uterus. This is called an **induced abortion**. The operation is usually done by stretching the cervix and removing the contents of the uterus by suction through the vagina. The inside of the uterus is then scraped to make sure no contents remain. The whole procedure takes less than 15 minutes.

An alternative to the surgical operation is a so-called medical abortion. The drug RU486 (also known as mifepristone) blocks the effects of progesterone, the hormone responsible for maintaining the pregnancy. Without progesterone, the lining of the uterus breaks down and development of the embryo cannot continue. RU486 is mostly used in the first nine weeks of pregnancy.

When performed by qualified personnel, under hospital conditions, an induced abortion is quite safe, although it is estimated that complications occur in about 3% of cases. The safest abortion is one that is performed on a healthy female, by a skilled medical practitioner, when the pregnancy is of less than 12 weeks' duration. The earlier an abortion is performed, the safer it will be for the female.

Some women suffer emotional problems after an abortion, sometimes caused by the sudden change in hormone balance when a pregnancy is terminated, or sometimes caused by feelings of guilt. Abortion should not normally be regarded as a method of birth control. It is better to rely on contraceptive measures to prevent the problem of an unwanted pregnancy. However, despite the best efforts of the couple concerned, contraception does sometimes fail and an abortion may be requested. An abortion may also be considered appropriate if the foetus is diagnosed as being abnormal.

Accurate data for terminations of pregnancy are not kept in Australia but a government report issued in 2005 estimated that there were over 91 000 abortions nationwide each year. This would mean that about 1 in 5 pregnancies in Australia are terminated. This is similar to the rate in New Zealand, England and Wales, the United States and Canada.

Abortion is a highly emotive subject for many people. The issues involved are frequently grouped into either the 'rights of the child' (pro-life) or the 'rights of the mother' (pro-choice). Those against abortion claim that the unborn child is a human being from the moment of conception, and that the destruction of that life is the same as murder. As such, it violates one of the fundamental laws of human societies. Those for abortion claim that a woman should be able to do what she chooses with her body, that all children should be born wanted, and that if a woman does not want to be pregnant the only logical solution is to allow abortion.

Some anti-abortionists believe that termination should be used only when the health of the mother is threatened; others are more restrictive, believing that it should be reserved for rape or incest victims; still others believe that there are no circumstances that warrant the taking of a human life.

On issues such as this it is important for people to examine all sides of the argument rationally and logically before arriving at their own opinions. Their opinions, however, remain personal ones, and the opinions of others should be respected.

Working scientifically

Activity 16.1 Developments in contraception

The following is a list of research topics relating to the material in this chapter. In cooperation with your teacher choose one of these topics to research and prepare a short talk to present to the rest of your class:

1. The search for a satisfactory male, oral contraceptive
2. Latest developments in production of a contraceptive vaccine
3. Methods of birth control for less-developed countries
4. A brief history of birth control
5. The amount of promiscuity today compared with the past
6. The use of abortion as a means of birth control
7. The use of RU486 for medical abortion
8. The effectiveness of vasectomy reversal
9. Improvements in the detection of ovulation
10. The history of condom use and manufacture.

REVIEW QUESTIONS

1. **(a)** Define contraception.
   (b) List the methods of contraception available to both a man and a woman.
   (c) Draw up a table comparing each of the methods of contraception discussed in this chapter. In your table have a column for reliability, a column for advantages and a column for disadvantages.
2. **(a)** Outline the principle behind the rhythm method of birth control.
   (b) Discuss two ways in which the time of ovulation can be detected.
   (c) List advantages and disadvantages of the various 'safe period' methods as a means of birth control.
3. **(a)** What is coitus interruptus?
   (b) List the major disadvantages of this technique.
4. **(a)** Distinguish between a condom, a diaphragm and a cervical cap.
   (b) Are there any special advantages to these methods of contraception?
   (c) How can the effectiveness of such mechanical devices be improved?
5. **(a)** Briefly outline the way in which chemical methods of contraception work.
   (b) In what forms are these chemicals available?
6. **(a)** Distinguish between the two main types of hormonal contraceptives available to women.
   (b) Briefly explain how each of these is thought to operate.
   (c) Discuss the various ways in which these hormonal methods can be administered.
7. **(a)** List the advantages and disadvantages of hormonal contraceptive techniques.
   (b) Discuss some of the major side-effects that may occur after prolonged use of a hormonal contraceptive.
8. **(a)** What is an IUD?
   (b) How do IUDs prevent a pregnancy from occurring?
   (c) Discuss the major disadvantages of using an IUD as a method of birth control.

9. **(a)** Distinguish between a vasectomy and a tubal ligation.
   (b) Essure is an alternative to tubal ligation. What is Essure? Does it have any advantages over tubal ligation?
10. **(a)** What is an induced abortion?
    (b) Explain the difference between a surgical abortion and a medical abortion.

APPLY YOUR KNOWLEDGE

1. Explain why many millions of dollars are spent annually on research into birth-control techniques. Give as many reasons as you can for the commercial and social importance of birth control.
2. Which partner in a sexual relationship should have the responsibility for contraception? How should this decision be arrived at for the couple? Write a short essay to argue your case.
3. What factors should a person consider before having a vasectomy or tubal ligation?
4. **(a)** Rising population is a major problem in many countries. High birth rates occur in less-developed countries, rather than in developed countries such as Australia. Of the contraceptive measures described in this chapter, which do you think would be most suitable for use in a less-developed country? Which would be least suitable? Give reasons for your answers.
   (b) How would you go about promoting the use of the contraceptive measure that you selected in (a)?
5. Advances in human biological science have resulted in the development of a wide range of contraceptive techniques. Describe situations where these developments have created tensions between individuals or groups in society.