**10. The Reproductive system**

The reproductive system enables humans to reproduce.

**The Reproductive system**

Unlike many of the other anatomical systems in the body, the organs in this system differ completely in men and women. In men, they include the prostate gland, testes, testicular vessels, penis and scrotum and in women they include the ovaries, Fallopian tubes, uterus, cervix, vagina and labia. In both sexes, the pelvic girdle is the bony cavity which protects the organs.

**TOPIC 1: MALE REPRODUCTIVE SYSTEM**

The male reproductive system is more visible than the female system, with most of the organs outside the body. This, as you will discover, is for a very good reason.

**WHAT IS THE PELVIC GIRDLE?**

The pelvic girdle is the bony cavity which forms a protective basin for the reproductive organs. Both men and women have one, although it is wider in women to allow for the passage of a baby in childbirth.

**Structure:** the pelvis is a circle of bones, consisting of the two hip, or innominate bones (each one combining three bones fused together: ilium, ischium and pubis) and, anteriorly, the symphysis pubis, the cartilaginous link between the left and right sides of the girdle. Posteriorly, the sacrum forms the back of the girdle.

**Functions:** the pelvic girdle protects the internal organs of the reproductive system, as well as the bladder and rectum. It supports the spine and provides attachments for the muscles of the lower back, abdomen and thighs.

**WHAT IS THE PROSTATE GLAND?**

**Structure:** the prostate is a small gland situated between the bladder and the rectum. It surrounds the beginning of the urethra (known as the prostatic urethra).

**Functions:** the prostate's position, at the start of the urethra, is important because it produces two secretions carried in semen. One secretion helps keep the lining of the urethra moist and the other is part of the seminal fluids, which help semen to travel along the urethra and into the female.

**WHAT ARE THE TESTES?**

The testes (testis or testicle singular) are the male gonads or glands.

**Structure:** testes are two glands contained within a sac of skin and muscle called the scrotum. They develop in the abdomen before descending into the scrotum just before birth.

**Functions:** the testes produce spermatozoa (also known as sperm) and the male sex hormone testosterone which is responsible for male sexual characteristics. Spermatozoa develop in the testes, and are also stored there because they must be kept at a slightly lower temperature than the average body temperature (35Ž).

**WHAT ARE THE TESTICULAR VESSELS?**

The testicular vessels are the epididymis and the vas deferens, two tubes which form the passageway from the testes to the urethra.

**EPIDIDYMIS**

**Structure:** the epididymis is a tightly coiled tube. It opens from the top of each testis, continues down along the side of the gland then straightens out into the vas deferens.

**Functions:** to store and transport sperm as well as acting as a site where immature sperm can develop.

**VAS DEFERENS**

**Structure:** a duct with muscular walls leading from the epididymis to the urethra.

**Function:** the vas deferens acts as a passageway for the transfer of sperm from the storage site of the epididymis to the prostatic urethra and eventually to the penis. This occurs during sexual activity. By contracting its muscular walls the vas deferens pushes the sperm forward.

**SCROTUM**

One of two external sex organs in the male, the scrotum is a sac which contains the testes, epididymis and vas deferens. It hangs behind the penis.

**Structure:** a sac made of an outer layer of skin and an inner layer of muscle. A membrane divides it into two halves, one for each testis.

**Functions:** to support and protect the testes as well as maintain the correct temperature for them. The testes are kept outside the body in order to keep them at a slightly lower temperature than the body. However, if the temperature in the scrotum drops, it reacts by contracting its muscular walls, thus moving itself and the testes closer to the body and thus raising the temperature of the glands. If the temperature is too high, the muscles relax, moving the scrotum and testes away from the body and thus lowering the temperature.

**PENIS**

The penis is the main external sex organ of the male. It has three important parts: erectile tissue bodies, the foreskin and the urethra.

**Structure:** the penis consists of three bodies of spongy, erectile tissue all running lengthways. Two of these run side by side above the urethra, a tube that runs through the centre of the penis and acts as a duct for urine and semen. The third lies underneath them, forming a tube containing the urethra which becomes the tip of the penis, known as the 'glans'. This tissue is full of blood vessels. Surrounding the glans is the prepuce, or foreskin, a loose double fold of skin which protects the glans. The foreskin is sometimes removed either to prevent infection or for religious reasons.

**Functions:** the penis has a double role -

* Organ of excretion. It carries urine from the bladder for excretion.
* Organ of reproduction. During sexual activity the penis becomes erect. This 'erection' is caused by an increase in the amount of blood circulating in the vessels of the spongy tissues. These tissues then swell up causing the penis to enlarge. Eventually, the tissues become rigid which allows penetration into the vagina of the female and safe delivery of the semen during intercourse.

**WHAT IS A SPERM?**

**Structure:** sperm look like microscopic tadpoles. Each one consists of a head (the male sex cell), a middle section and a tail, which helps to propel the sperm along the vagina and into the uterus. The head is a nucleus that contains 23 chromosomes whereas the tail is a flagellum, a projection resembling a thread, which moves backwards and forwards enabling the sperm to 'swim' to its destination.

**A sperm cell**

**Function:** sperm fertilises the ova (singular: ovum) that the female reproductive system produces. Ova, or eggs, are the female sex cells. The head of the sperm, carrying the important genetic information in the form of chromosomes, inserts itself into the ovum and the tail, which is no longer needed, breaks down. Although semen (the fluid ejaculated during intercourse) contains millions of sperm, only one is needed to fertilise an ovum. Once fertilised, the ovum usually grows and develops into a baby.

**WHAT IS SEMEN?**

Semen is the fluid discharged from the penis during sexual intercourse. It contains sperm and secretions from the prostate gland and seminal vesicle (a small structure behind the bladder).

**TOPIC 2: FEMALE REPRODUCTIVE SYSTEM**

**The female reproductive system**

This system is hidden inside the body, apart from the entrance to the vagina and the vulva. Just like the male system, the organs within the body are contained and protected by the pelvic girdle. This bony cavity has the same structure in men and women but is wider in the female, in order to allow room for the passage of a baby.

**WHAT IS THE UTERUS?**

The centre of the female reproductive system is the uterus, also known as the womb. It is here that a fertilised ovum grows into a baby. The top end opens out into the Fallopian tubes (which lead to the ovaries) and the bottom end, or cervix, opens into the vagina and forms the birth canal.

**Structure:** the uterus is a muscular, hollow organ that sits at a right angle to the vagina and connects with the Fallopian tubes. It is the size and shape of an upside-down pear, about 7.5cm long and 5cm wide and expands during pregnancy to accommodate the foetus. The lining of the uterus consists of layers of tissues which respond to hormonal secretions. These layers thicken every month ready to act as a nourishing bed for the fertilised ovum.

**Function:** the uterus is the place where the foetus grows and develops. Every month it prepares itself for a possible pregnancy and if there is no fertilised ovum, menstruation occurs

**WHAT IS THE CERVIX?**

**Structure:** the cervix is the narrow neck of the uterus which opens into the vagina. Usually it is the width of a pencil lead but during childbirth it dilates to allow the passage of the baby.

**Function:** the cervix forms the first part of the birth canal. The dilation of the cervix is a measurement used to determine how soon childbirth will begin.

**WHAT ARE THE OVARIES?**

The ovaries are the female gonads or glands.

**Structure:** the ovaries are glands. They are approximately the size and shape of almonds and they are positioned either side of the uterus, just below the Fallopian tubes.

**Function:** the ovaries secrete the hormones responsible for female sexual characteristics (progesterone and oestrogen) as well as storing female sex cells called ova or eggs (singular: ovum). Unlike sperm, ova exist in the body at birth, but in an immature and undevelopedform in follicles. After puberty one of these follicles will develop and rupture, releasing an ovum every month. This is known as ovulation (see Menstrual Cycle).

**WHAT IS A FOLLICLE?**

These are small structures on the surface of the ovary, which are known as Graafian follicles when they mature. They contain fluid and an egg or ovum. As soon as an ovum is mature and ready to be fertilised, the follicle splits, releasing the ovum which then travels along the Fallopian tube to the uterus.

**WHAT ARE THE FALLOPIAN TUBES?**

**Structure:** the Fallopian tubes are funnel-shaped tubes which start at the top of the uterus and continue along to the ovaries. They are named after the Italian anatomist who discovered them.

**Functions:** the Fallopian tubes are a passageway from the ovaries to the uterus for the ovum, as well as the site of fertilisation. Sperm swim up these tubes to reach the ovum.

**WHAT IS THE VAGINA?**

**Structure:** the vagina is a muscular passage leading from the cervix to the vulva. It connects the internal sex organs with those on the outside of the body. During sexual activity the blood vessels in the vaginal walls fill with blood causing them to swell and become engorged.

**Functions:** the vagina connects the cervix to the vulva, and thus to the outside of the body. It serves as a passageway for menstrual blood, forms part of the birth canal during labour and is the site of penetration during intercourse.

**WHAT IS THE VULVA?**

The external organs of the female reproductive system are known collectively as the vulva. They include the mons pubis, the labia majora and minora and the clitoris.

**Mons pubis:** a protective pad of fat over the symphysis pubis which is covered in hair after puberty.

**Labia majora:** two large folds of fatty tissue which run lengthways either side of the vulva from the mons pubis to the perineum (skin and tissues between the sex organs and the anus). They protect the entrance to the vagina and urethra.

**Labia minora:** two smaller folds of skin within the labia majora which surround the clitoris and form a hood (prepuce) to protect it. Clitoris: a very small, sensitive organ which contains erectile tissue like the penis. It is situated just below the mons pubis. During sexual activity the erectile tissues fill with blood and swell.

**THE BREASTS**

The breasts are accessory organs to the reproductive system. Although not directly involved in the process of reproduction, they develop during pregnancy ready for their function as milk-secreting glands.

**Structure:** the breasts are glands which sit on the front of the female chest (men also have breasts, but they are undeveloped). Their size varies considerably. Each breast is circular and convex, with a central, raised nipple. Breasts consist of adipose and areolar tissue supported by fascia. The tissue forms lobes, subdivided into lobules, which open into several ducts. These ducts open on the surface of the nipple. During pregnancy the lobules develop and produce milk. Hormones cause the breasts to grow during puberty and then activate the secretion of milk during pregnancy.

**Function:** to secrete milk post-pregnancy.

**TOPIC 3: PREGNANCY**

There are six main stages of pregnancy.

**FERTILISATION**

Post-ovulation, the ovum enters the Fallopian tube in the direction of the uterus. It reaches the centre of the tube in around 30 minutes. If sperm (in semen) have been deposited in the vagina within 24 hours of ovulation, there is a three day window in which fertilisation may occur. Several hundred sperm (out of the many million deposited) will have swum through the uterus and into the Fallopian tubes in the search for an ovum. Only one sperm is needed to fertilise an ovum. The sperm penetrates the ovum's membrane and enters the ovum. This is fertilisation.

**POST-FERTILISATION**

The tail of the sperm breaks down and its head or nucleus grows. The nucleus of the sperm and the nucleus of the ovum fuse to make a single nucleus. Within this new nucleus, the male and female chromosomes join up forming the zygote, the first cell of a new baby.

**CELL DIVISION**

Once the zygote has formed, it undergoes a process of mitotic cell division, dividing into two, then four, then eight cells and so on until a ball of cells, called a morula, is formed. After five days this develops into a blastocyst (a multi-celled structure) which enters the uterus and implants in the endometrium of the uterus on the seventh day (post-fertilisation).

**FORMATION OF EMBRYO**

By day 24 the blastocyst has formed an amniotic cavity (a fluid-filled sac) containing an embryo that looks a little like a seahorse. The endometrium and part of the blastocyst mesh and develop into the placenta, the baby's support system (which allows the passage of nutrients, oxygen and waste to and from baby and mother).

**DEVELOPMENT OF FOETUS**

The embryo is known as the foetus from eight weeks. It develops in the amniotic cavity. The fluid protects the baby from shocks and pressure and allows it to grow unhindered.

**BIRTH (PARTURITION)**

Just before birth, the membrane of the amniotic cavity breaks and the amniotic fluid is released via the vagina. Childbirth usually occurs in the 40th week after fertilisation.

**TOPIC 4: DISEASES AND DISORDERS (PATHOLOGIES)**

**ECTOPIC PREGNANCY**

This is a pregnancy which occurs outside the uterus. A fertilised ovum may develop inside the Fallopian tube instead of travelling to the uterus. There is a danger of haemorrhage and death.

**AMENORRHOEA**

**Causes:** can be caused by hypersecretion of testosterone in females, other hormonal imbalances, stress, radical weight loss, anaemia or excessive exercise.

**Effect:** absence of menstruation.

**DYSMENORRHOEA**

**Causes:** spasm or congestion of the uterus, imbalance in hormones or emotional disturbances.

**Effect:** extremely difficult and painful menstruation.

**POLYCYSTIC OVARIAN SYNDROME** (also known as Stein-Leventhal syndrome)

**Cause:** hyposecretion of female sex hormones (luteinising hormone).

**Effect:** irregular menstrual cycle, multiple growth of follicular ovarian cysts and sometimes infertility, enlarged ovaries, 50% of patients are obese and become hirsute (hairy); age range of sufferers is usually 16-30.

**CANCER**

Cancer is the development of malignant cells. It can occur in breasts, ovaries, the cervix, testes and/or prostate gland.

**CHLAMYDIA**

A sexually transmitted infection caused by bacteria of the genus Chlamydia; may cause genital inflammation, discharge, pelvic pain and fever.

**ENDOMETRIOSIS**

The presence of endometrium elsewhere than in the lining of the uterus; causes premenstrual pain and dysmenorrheal.

**FIBROIDS**

A benign tumour of the uterus that is comprised of either fibrous connective tissue or muscle.

**HYSTERECTOMY**

An operation in which the uterus is removed.

**MENSTRUAL DISORDERS**

Menorrhagia – abnormally heavy or prolonged menstruation; can be a symptom of uterine tumours and can lead to anaemia if prolonged.

**PROSTATITIS**

Inflammation of the prostate gland characterized by perineal pain, irregular urination and (if severe) chills and fever.

**VULVOVAGINAL CANDIDIASIS (THRUSH)**

A yeast infection of the vagina.

**BENIGN PROSTATIC ENLARGEMENT/ HYPERPLASIA**

An abnormal increase in tissue growth caused by excessive cell division.

**INFERTILITY**

This primarily refers to the biological inability of a person to contribute to conception. Infertility may also refer to the state of a woman who is unable to carry a pregnancy to full term.

**OVARIAN CYSTS**

Are fluid-filled sacs that can form on the ovary when one or more of the egg-containing follicles mature, but do not release the egg into the fallopian tube.

**PELVIC INFLAMMATORY DISEASE**

An inflammation of the female pelvic organs (especially the Fallopian tubes) caused by infection by any of several micro-organisms.

**PRE-ECLAMPSIA**

A condition in pregnancy characterized by abrupt hypertension (a sharp rise in blood pressure), albuminuria (leakage of large amounts of the protein albumin into the urine) and oedema (swelling) of the hands, feet and face. Pre-eclampsia is the most common complication of pregnancy.

**PROLAPSE**

The slipping or falling out of place of an organ e.g. the uterus/vagina.

**GONORRHOEA**

A common venereal disease caused by the bacterium Neisseria gonorrhoeae; symptoms are painful urination and pain around the urethra.

**SYPHILLIS**

A sexually transmitted disease caused by the spirochetal bacterium.

**TRICHOMONAS**

Commonly called "trick." It is caused by a single-celled organism that is a member of the protozoa family of micro-organisms. When this organism infects the vagina it can cause a frothy, greenish-yellow discharge.

**VAGINITIS**

Any inflammation of the vagina, usually referring to an infection due to bacteria, yeast, or other pathogens that result in discomfort, itching, and/or abnormal discharge.

**TOXIC SHOCK SYNDROME**

(TSS) is a very rare but potentially fatal illness caused by a bacterial toxin.

**INTERRELATIONSHIPS**

Reproductive links to:

**Endocrine:** hormones from the endocrine system govern the reproductive system particularly in females.

**Nervous:** sexual stimulus is relayed by nerve impulses.

**Summary**

The reproductive system

* Is different and complementary in men and women
* Is dedicated to the reproduction of the species.