# Anatomy and Physiology

5. The Reproductive System



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# The Reproductive System

# Tour of the System

Reproduction is any type of reproduction that conceives a child and the reproductive systems of both males and females are required for conception to occur.

Under normal circumstances, an embryo will form when a spermatozoa (gamete) fertilizes a female ovum (a gamete). Gametes are different to other cells in the body because they only contain half of the usual numbers of chromosomes (which contain the genetic information). Each gamete contains 23 chromosomes (including sex chromosomes) and when they join a zygote is formed, containing 46 (or 23 pairs) of chromosomes. This zygote then develops into an embryo.

Because the ovum always contains one female sex (X) chromosome, the spermatozoa dictates the sex of the unborn child. The sperm cell may contain another X chromosome (producing a girl) or a Y chromosome that will produce a male child.

The fundamental organ of both reproductive systems is the gonad. In adult females, these are the ovaries and in adult males, the testes.

In the embryo, the gonads are at first undifferentiated and it is impossible to see whether it is male or female. With time, the gonads differentiate and certain features develop, while other features are suppressed. This is probably due to the influence of environmental conditions such as hormone production.

Hormones are critical for development and regulation of the reproductive system and there are many different types of hormones involved. During puberty in girls, the pituitary gland (located at the back of the brain) releases various hormones. These hormones signal the ovaries to release an ovum every twenty-eight days as well as inducing the ovary to start functioning as an endocrine (hormone releasing) gland itself.

The first hormone that the ovaries produce is estrogen. Estrogen induces the development of the secondary sexual characteristics (growth of breasts, change of body shape etc.). A second hormone, progesterone, produced by the corpus luteum encourages the endometrium to thicken, so that if fertilization occurs, the ovum will have the best conditions to grow there.

There is a similar development process in boys. The hormones released from the pituitary gland cause development of secondary sexual characteristics (facial hair, pubic hair, penis growth etc.) and development of the reproductive organs. The key male androgen is testosterone and this is important for normal sperm development as well as physical and mental well being in men.

#### Female Reproductive System

When the ovum (or gamete) develops in the ovary, it is in an ovarian follicle (sac).

The ovum moves along the fallopian tube towards the uterus with the help of contractions.

As the ovum matures, the follicular sac ruptures. The ruptured sac closes after releasing the egg and forms the corpus luteum. This produces the hormone progesterone.

The corpus luteum grows for about two weeks and then dies, unless it receives a different hormone from a developing embryo.

In pregnancy, however, the corpus luteum develops for several months and becomes large until the placenta takes over its job.

If during this journey, the ovum meets a sperm, fertilization may occur.

Fertilization often occurs in the fallopian tube although it can be in the uterus.

Once an ovum is fertilized, it is a zygote.

The zygote usually makes its way into the uterus and attaches to the special lining of the uterus called the endometrium and begins to develop into an embryo.

In a sexually mature woman, (before the menopause), this lining thickens up, becomes engorged with blood and is shed every twenty-eight days through menstruation.

The key time for fertilization is around halfway through the ovulation cycle and menstruation cannot occur if fertilization has occurred.



### Male Reproductive System



The male reproductive system consists of two main organs, the testes and the penis. There are also various glands and complicated tubal systems.

The testes make and store sperm cells (spermatozoa).

Three main glands lubricate the male reproductive system and nourish the spermatozoa.

One of these, the seminal vesicle produces the energy source that spermatozoa require for movement (motility).

The second, the bulbourethral glands produce a fluid released into the urethra. This helps in nourishing the spermatozoa.

Spermatozoa move to the third and final gland, the prostate gland, which produces the fluid vehicle (semen).

Semen is a mix of sperm cells, prostate fluid and seminal fluid. It also contains an enzyme, hyaluronidase, which helps the spermatozoa with penetrating the outer covering of the ovum.

From the prostate gland, semen moves into the urethra for expulsion during ejaculation.

Once ejaculation has occurred, sperm then travels through the vagina, towards the cervix and into the uterus or fallopian tubes to fertilize the ovum.

#### **Functions**

Since there are differences between males and females, reproduction creates a greater combination of genetic material in the offspring (child).

# **Female Components**

Fallopian tube (or oviducts)

The two fallopian tubes connect to the uterus. They also have special properties that helps ova to move towards the uterus.

#### Uterus

This is the organ in which the embryo and then fetus develops during gestation. The uterus stays in place with the help of ligaments. The cervix of the uterus protrudes into the vagina. The uterus also plays an important part in the female sexual response, by diverting blood to the external genitalia.

#### Ovary

The ovaries produce the ovum (or gametes). Females have two, although they function independently. Ligaments attach the ovaries to the uterus, rather than to the fallopian tubes.

#### Vagina

The vagina is a flattened tube and serves as a sheath for the male organ in sexual intercourse. It opens to the exterior through two folds of skin, the labia majora, and the labia minora. At the anterior end of these folds is the clitoris, which is analogous to the head of the male penis. In fact, it has a common embryonic origin.

## **Male Components**

#### Testes

These have two functions, production of spermatozoa and production of the male sex hormone, testosterone. The release of other hormones stimulates the production of both of these. The scrotum protects the testes and these are outside the body as spermatozoa function better at a temperature slightly lower than normal body temperature.

#### Penis

One of the main male sex organs it also carries urine from the bladder. The penis contains erectile tissue so that when it fills with blood an erection can occur. The penis needs to be erect for ejaculation to occur.

## **Common Diseases and Disorders**

**Amenorrhea:** Is an absence of the menstrual cycle, caused by starvation, stress, major illness, as well as pregnancy.

**Dysmenorrhea:** These are severe symptoms of menstruation. During menstruation, it is usual for a woman to have stomach cramps, headaches and salt retention and if these affect daily living, it becomes dysmenorrhea.

**Ectopic pregnancy:** This is when a zygote attaches to the wall of the fallopian tube and begins to develop. It can also occur in the cervix, ovaries or abdomen.

**Prostate cancer:** This is one of the most common types of cancer in men, often diagnosed when men have difficulties with urinating.

#### **Medical Terminology**

Andrology: This is the branch of medicine for male reproductive health and urology.

**Androgen:** An androgen is any hormone that stimulates or maintains male characteristics, such as testosterone.

**Artificial insemination (AI)** or **Assisted Reproductive Technology**: This allows conception of a child without sexual intercourse/natural insemination.

**Gestation**: The length of time from fertilization until birth, around forty weeks in humans.

**Menopause:** This is when the ovaries no longer release ova and menstruation occur. This cessation is hormone-regulated. The formal date of menopause is from the time of the last menstruation, or period.

**Obstetrics:** This is the branch of medical care specifically for the female reproductive system, including pregnancy, birth and after birth (antenatal).

**Ovulation:** The point at which the ovum is released from the follicle sac.

**Urethra:** In men, the urethra carries both semen and urine out through the penis and in women; it carries urine from the bladder to the body exit.

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