

# The human reproductive system

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Image 1. Pregnancy leads to many changes in the mother's body. Photo from Pexels.

Reproduction is possible thanks to a complex system of organs and tissues called the reproductive system. Every animal species has a reproductive system which follows certain steps. In the case of humans, provided all organs are present, normally constructed and functioning properly, the essential steps are:

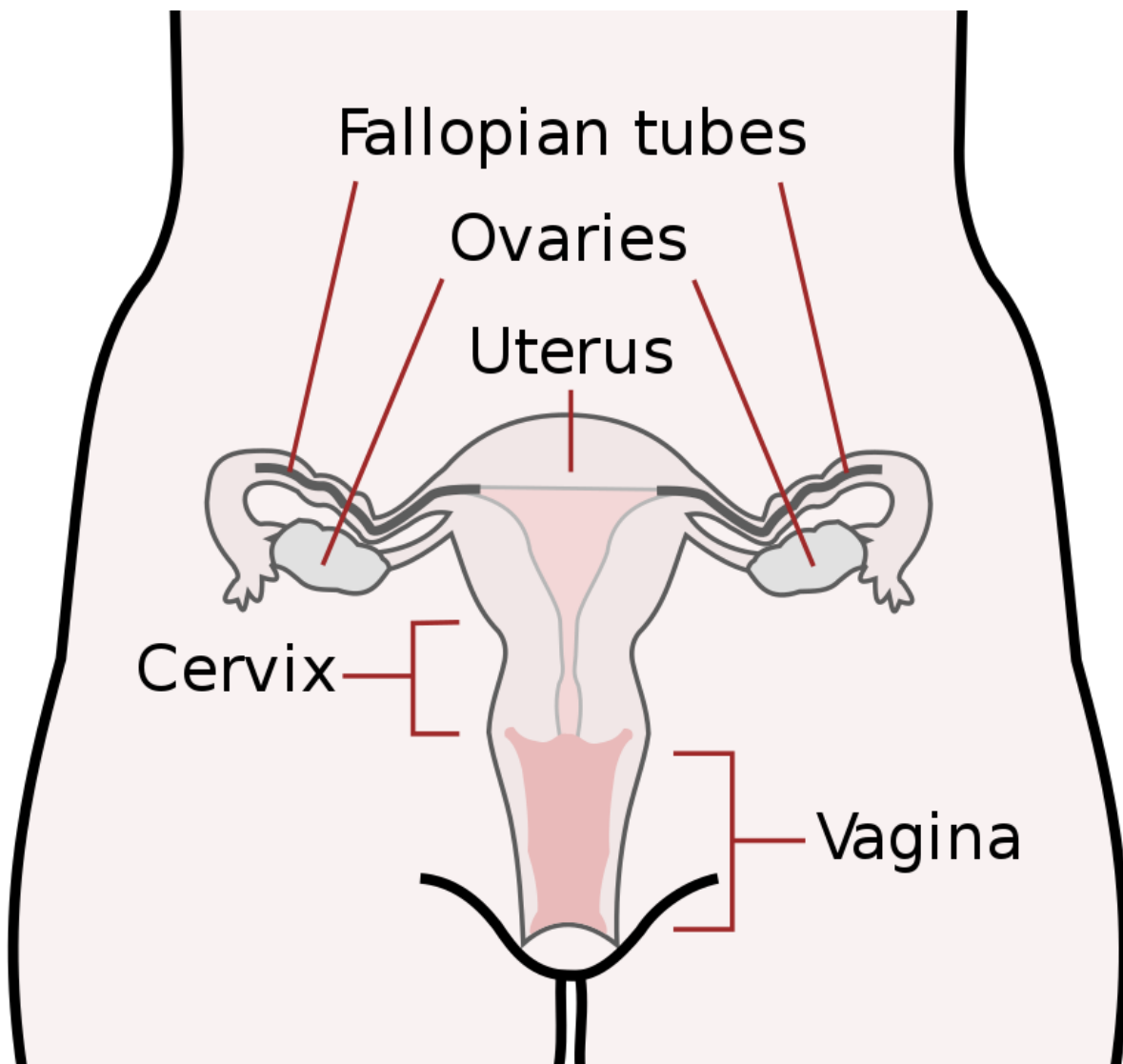
1. Liberation of an ovum, or egg, at a specific time in the reproductive cycle.
2. Internal fertilization of the ovum by spermatozoa, or sperm cells.
3. Transport of the fertilized ovum to the uterus, or womb.
4. Implantation of the blastocyst, the early embryo developed from the fertilized ovum, in the wall of the uterus.
5. Formation of a placenta and maintenance of the unborn child during the entire period of gestation.

6. Birth of the child and expulsion of the placenta.

7. Suckling and care of the child, with an eventual return of the maternal organs to virtually their original state.

## **Organ Overview**

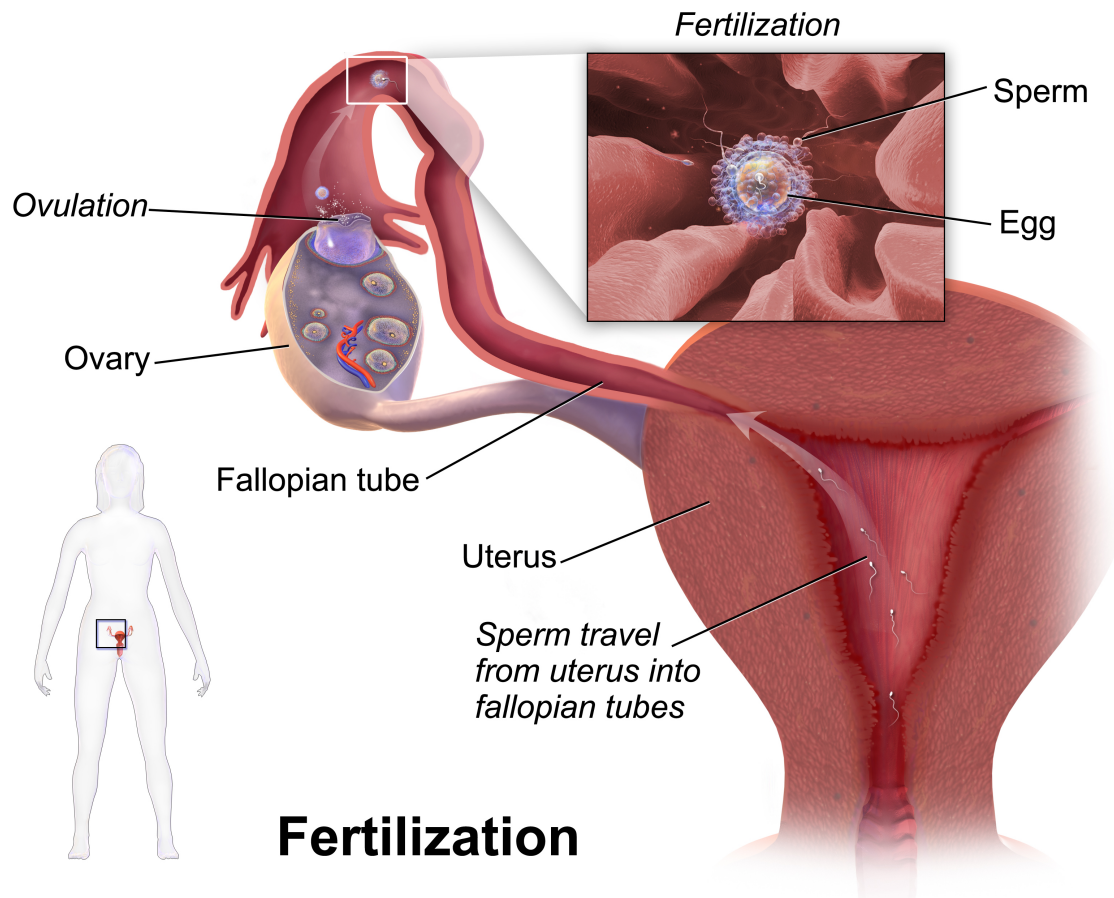
For this biological process to be carried out, certain organs and structures are required in both the male and the female. The source of the ova (the female germ cells) is the female ovary; that of spermatozoa (the male germ cells) is the testis. In females, the two ovaries are situated in the pelvic cavity; in males, the two testes are enveloped in a sack of skin, the scrotum, lying below and outside the abdomen.



Besides producing the germ cells, or gametes, the ovaries and testes are the sources of hormones that cause full development of secondary sexual characteristics and also the proper functioning of the reproductive tracts. These tracts comprise the fallopian tubes, the uterus, the vagina, and associated structures in females and the penis, the sperm channels (epididymis, ductus deferens and ejaculatory ducts) and other related structures and glands in males.

The function of the fallopian tube is to convey an ovum, which is fertilized in the tube, to the uterus, where gestation (development before birth) takes place. The function of the male ducts is to convey spermatozoa from the testis, to store them and, when ejaculation occurs, to eject them with secretions from the male glands through the penis.

## The Act Of Reproduction



At copulation, or sexual intercourse, the erect penis is inserted into the vagina, and spermatozoa contained in the seminal fluid (semen) are ejaculated into the female genital tract. Spermatozoa then pass from the vagina through the uterus to the fallopian tube to fertilize the ovum in the outer part of the tube. Females exhibit a periodicity in the activity of their ovaries and uterus, which starts at puberty and ends at menopause. The periodicity is manifested by menstruation at

intervals of about 28 days; important changes occur in the ovaries and uterus during each reproductive, or menstrual, cycle. Periodicity, and subsequently menstruation, is suppressed during pregnancy and lactation.

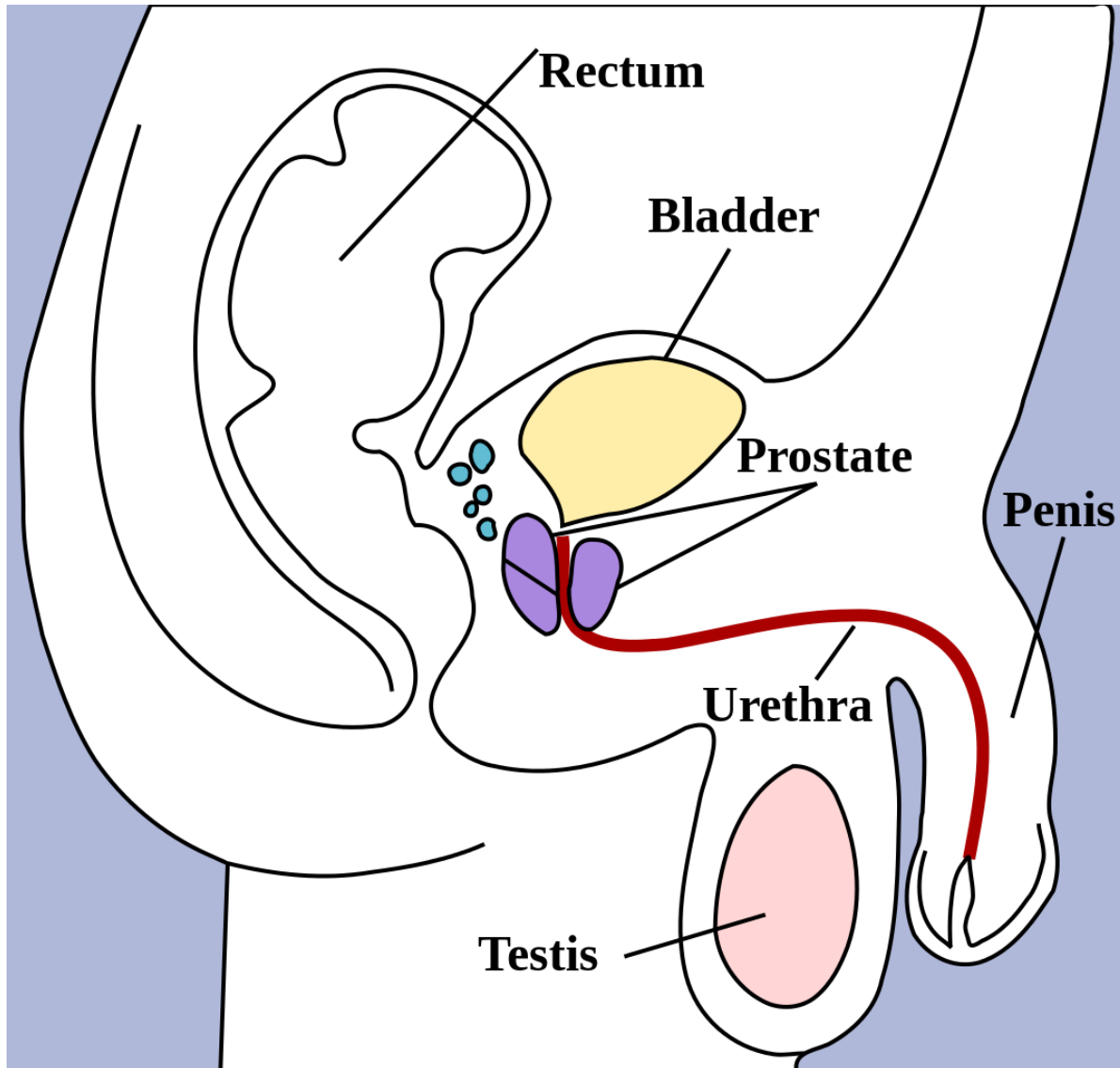
## **Differentiation**

The sex of a child is determined at the time of fertilization of the ovum by the spermatozoon. The differences between a male and a female are genetically determined by the chromosomes that each possesses in the nuclei of the cells. Once the genetic sex has been determined, there normally follows a succession of changes that will result, finally, in the development of an adult male or female. There is, however, no external indication of the sex of an embryo during the first eight weeks of its life within the uterus. This is a neutral or indifferent stage during which the sex of an embryo can be ascertained only by examination of the chromosomes in its cells.

The next phase, one of differentiation, begins first in gonads that are to become testes and a week or so later in those destined to be ovaries. Embryos of the two sexes are initially alike in possessing similar duct systems linking the undifferentiated gonads with the exterior and in having similar external genitalia, represented by three simple protuberances. The embryos each have four ducts, the subsequent fate of which is of great significance in the eventual anatomical differences between men and women. Two ducts closely related to the developing urinary system are called mesonephric, or wolffian, ducts. In males each mesonephric duct becomes differentiated into four related structures: a duct of the epididymis, a ductus deferens, an ejaculatory duct and a seminal vesicle. In females the mesonephric ducts are largely suppressed. The other two ducts, called the paramesonephric or müllerian ducts, persist, in females, to

develop into the fallopian tubes, the uterus and part of the vagina; in males they are largely suppressed. Differentiation also occurs in the primitive external genitalia, which in males become the penis and scrotum and in females the vulva (the clitoris, labia and vestibule of the vagina).

## Hitting Puberty



At birth, the organs appropriate to each sex have developed and are in their adult positions but are not functioning. Various abnormalities can occur during development of sex organs in embryos, leading to hermaphroditism, pseudohermaphroditism and other chromosomally induced

conditions. During childhood until puberty, there is steady growth in all reproductive organs and a gradual development of activity. Puberty marks the onset of increased activity in the sex glands and the steady development of secondary sexual characteristics.

In males at puberty the testes enlarge and become active, the external genitalia enlarge and the capacity to ejaculate develops. Marked changes in height and weight occur as hormonal secretion from the testes increases. The larynx, or voice box, enlarges, with resultant deepening of the voice. Certain features in the skeleton, as seen in the pelvic bones and skull, become accentuated. The hair in the armpits and the pubic hair becomes abundant and thicker. Facial hair develops, as well as hair on the chest, abdomen and limbs. Hair at the temples recedes. Skin glands become more active, especially apocrine glands (a type of sweat gland that is found in the armpits and groin and around the anus).

In females at puberty, the external genitalia enlarge and the uterus commences its periodic activity with menstruation. The breasts develop, and there is a deposition of body fat in accordance with the usual contours of the mature female. Growth of axillary (armpit) and pubic hair is more abundant, and the hair becomes thicker.

Learning about the reproductive system and its various processes may take away some of the mysteries of birth. It also shows that this system involves both reproduction and an individual's development.

## Quiz

- 1 Which image included with the article BEST depicts the differentiation of the mesonephric duct?
- (A) Image 1
  - (B) Image 2
  - (C) Image 3
  - (D) Image 4
- 2 What limitations do the images included with the article have that the article itself DOES NOT?
- (A) The images do not illustrate how the reproductive organs are determined during and after fertilization.
  - (B) The images do not illustrate how the internal and external organs appear in males and females.
  - (C) The images do not demonstrate the effects of menopause on the individual reproductive organs.
  - (D) The images do not demonstrate the process and location of fertilization within the female body.
- 3 How effective is the introduction at presenting the article's KEY ideas for the reader?
- (A) Very effective; it provides a clear list of the steps in reproduction that are then addressed one by one in the following sections of the article.
  - (B) Mostly effective; it explains the steps in the creation of a child but does not explain the potential problems that could occur.
  - (C) Somewhat effective; it outlines the steps in reproduction, but also includes ideas about gestation and birth not addressed in the rest of the article.
  - (D) Not at all effective; it fails to explain how the steps in the human reproductive system differ from those in other healthy and functioning animals.



- 4      What is the BEST way to express how this article is organized and the MOST LIKELY reason the author chose this organizational structure?
- (A)      by question and answer; to clearly give detailed answers to questions that most readers have about the reproductive system
  - (B)      by sequential order; to explain the processes of reproduction and growth in order from birth to menopause
  - (C)      by compare and contrast; to contrast the effects of reproduction on male and female embryos in the womb
  - (D)      by biological process; to clearly describe how reproduction occurs and organs develop in the body over time