

Sexual Organs

What do we mean by sex organs?

The expression "sex organs" has a double meaning:

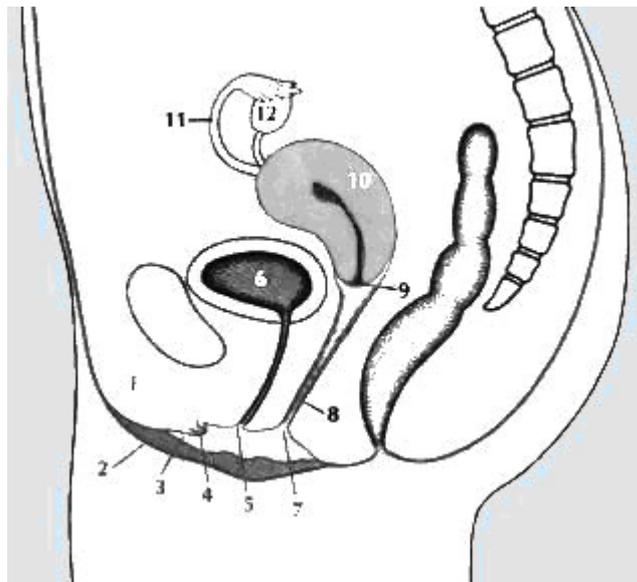
1. The organs that **determine a person's physical sex** . They account for the greatest anatomical difference between the sexes. For this reason the sex organs are also called primary sexual characteristics.
2. The term also suggests that they are **involved in a person's sexual response** . Indeed, some people are under the false impression that the "sex organs" are the only organs so involved. However, the human sexual response is not restricted to a few particular organs but is a response of the whole body. Thus the mouth and the skin, for example, are also "sex" organs because they transmit and receive sexual stimulation.

Inappropriate terms

In many medical and professional textbooks the sex organs are called **genitals** (lat. *genitalia*: organs of generation) or "**reproductive organs** ." These one-sided terms can lead to misunderstandings, because they are ideological and misrepresent the facts: They emphasize the possible childproducing, procreative function of the sex organs at the expense of their pleasure-giving, erotic function. Indeed, most of the time the so-called reproductive organs are not used for the purpose of reproduction at all, but function exclusively as organs of sexual pleasure. This is already obvious to children who may experience orgasms many years before they can reproduce. It is also obvious to self-pleasuring adolescents, to women after the menopause, and to any couple using contraception.

The Sex Organs

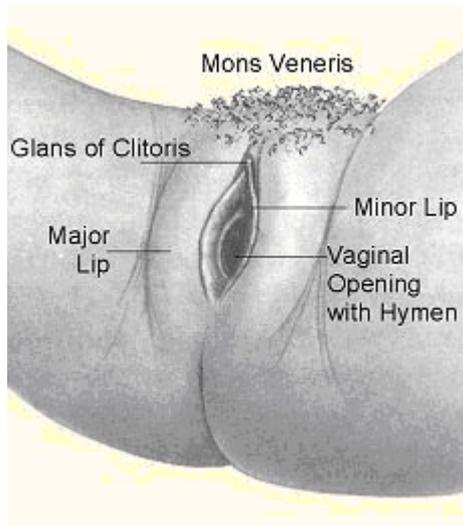
The Female Sex Organs



1. Mons Veneris
2. Major lip
(one of a pair)
3. Minor lip
(one of a pair)
4. Glans of the clitoris
5. Opening of urethra
6. Urinary bladder
7. Vaginal opening
8. Vagina
9. Cervix
10. Uterus
11. Fallopian tube
(one of a pair)
12. Ovary
(one of a pair)

Schematic depiction of the female external and internal sex organs

The External Sex Organs



The female external sex organs consist of the **Mons Veneris** , the **major and minor lips** , the **glans of the clitoris** , and the **vaginal opening** . All of these parts together are also often referred to collectively as the **vulva** (lat. covering).

Click on picture.

The External Sex Organs



The Mons Veneris

The *Mons Veneris* (lat.: mountain of Venus) consists of fatty tissue under the skin just over the pubic bone. On the outside, the area is covered with pubic hair, which first develops during puberty, and which makes the mons veneris by far the most conspicuous part of the vulva.

The Major Lips

The major lips (lat. *labia majora*) are two thick and fatty folds of skin which extend from the mons Veneris downward, forming the outer borders of the vulva. On the outside, they are also covered with hair just as the mons Veneris. As the major lips usually lie close together, they seem to keep the other parts of the vulva covered.

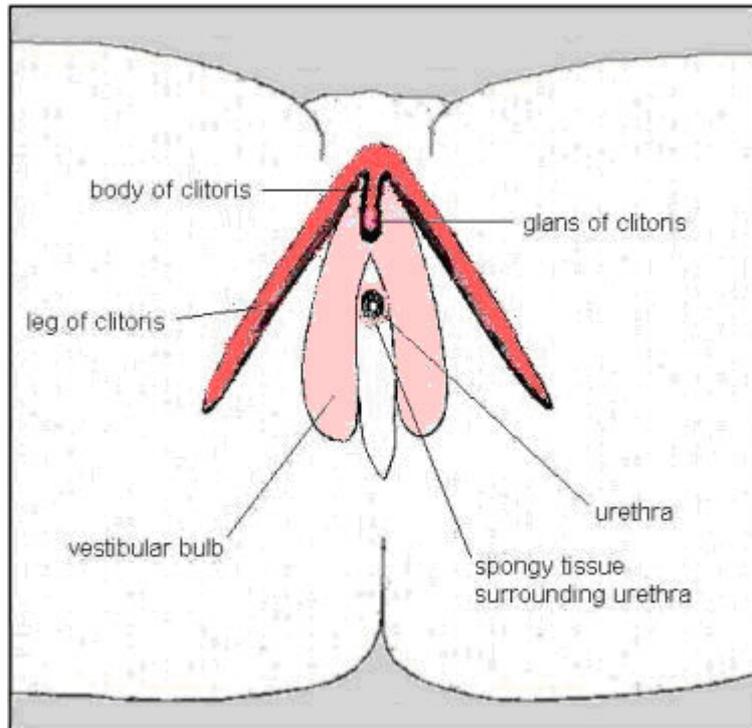
The Minor Lips

Just beneath the major lips lie the minor lips (lat. *labia minora*). These are two thin folds of skin richly endowed with blood vessels and nerve endings. As a result, they are quite sensitive to the touch. The minor lips merge at the top forming a single fold of skin covering the glans of the clitoris. This fold is also called the foreskin or prepuce of the clitoris, or simply the clitoral hood.

The External Sex Organs

The Clitoris

The tip or glans of the clitoris (gr. *kleitoris*: little elevation) is located below the Mons Veneris at the point where the minor lips meet, forming a foreskin or prepuce. Externally visible under this foreskin is the glans of the clitoris. The body or shaft of the clitoris is a short cylindrical organ composed mainly of erectile tissue, i.e., of two spongy bodies (lat. *corpora cavernosa*) which can quickly fill with blood and thus cause the entire organ to stiffen and increase in size. Following it further inside, the clitoral shaft divides into two legs, each of which lies next to a bulb on either side of the vagina, and all of these structures swell under sexual stimulation. This is also true of spongy tissue surrounding the urethra.



Interior view of the clitoris and surrounding erectile tissue

The glans

The glans of the clitoris is partly covered by the clitoral hood or foreskin. It is possible for genital secretions (smegma) to accumulate under this foreskin, thus causing irritation and other problems. The glans is extremely sensitive to the touch as it is studded with innumerable nerve endings. Unlike the penis, however, the excited head of clitoris does not protrude but retracts under its hood. The clitoris is easily excitable by mechanical stimulation, and it plays an essential role in a woman's sexual excitement.

A pleasure organ

The average length of a clitoral shaft in its unexcited state is less than an inch and most of it is hidden from view. However, in the state of excitement it may swell to twice its usual diameter, and the rest of the tissue swells accordingly. This entire system of erectile tissue might correctly be called clitoral system or clitoris for short. This would also make the parallels to the penis much more obvious, even with regard to size. Furthermore, the clitoris is obviously the principal female pleasure organ, and it has no reproductive function.

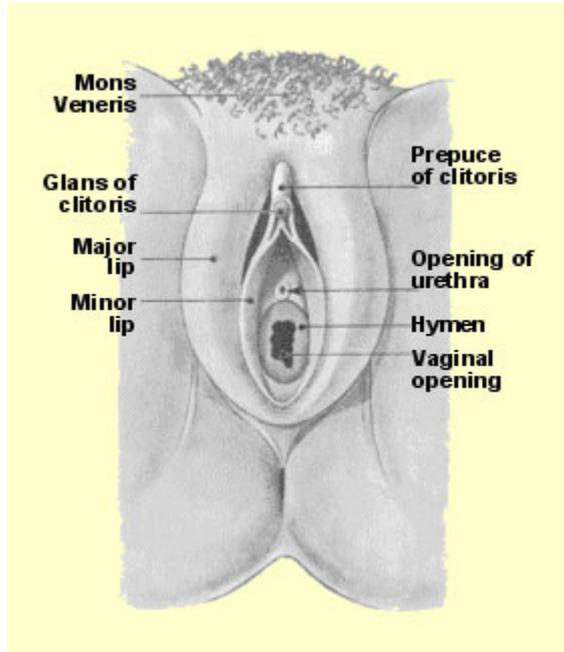
An internal organ

All in all, the clitoris is more an internal than an external sex organ. It is listed here among the external organs only according to a now obsolete textbook tradition.

The External Sex Organs

The Vaginal Opening

The vaginal opening lies below that of



Click on picture

the urethra which, in females, is independent from the sex organs and is used exclusively for the release of urine. The urethral opening is very small, and it lies roughly halfway between the clitoris and the vaginal opening. By contrast, the vaginal opening is rather large, although it may be partially closed by a thin membrane called **the hymen** .

The Hymen

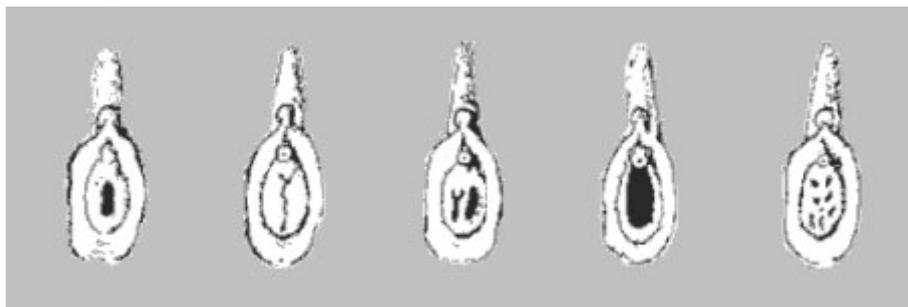
What is the function of the hymen?

The hymen has no known biological function. However, in some ancient and even modern cultures it was and is given some psychosocial significance.

What was and is the psychosocial significance of the hymen?

There was and is a belief that an unbroken hymen proves a woman's virginity, i.e. her sexual inexperience. However, such a belief is nothing more than a superstition. A hymen usually has one or several holes in it which may be stretchable and thus allow for the insertion of fingers, or even a penis, without tearing.

On the other hand, in some women the hymen tears easily, not only as a result of coitus but also because of strenuous physical exercise or sports activities. In some cases, the hymen is even absent altogether. Therefore, the condition of a woman's hymen does not prove anything one way or the other about her sexual innocence or experience. In most cases, the first coitus may very well be the occasion for the breaking of the hymen, but it can, of course, also occur during masturbation and petting, or when the woman first uses menstrual tampons.



Various shapes of the hymen

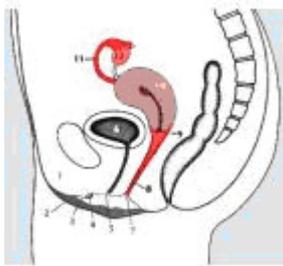
The hymen differs from one woman to another.

It may almost totally close the vaginal opening, or it may have several small or even one large hole in it. In the latter case, it may seem broken when it is actually still intact.

Does the tearing of the hymen hurt?

The tearing of the hymen may cause some initial discomfort and slight bleeding. However, there is no reason for women to fear any great pain. On both sides of the vaginal opening, between the edge of the hymen and the minor lips, are the greater vestibular glands (Bartholin's glands), which correspond to the bulbourethral (Cowper's) glands in the male. The greater vestibular glands secrete a small amount of lubricating fluid. However, most of the vaginal lubrication needed for coitus is not provided by these glands but by the wall of the vagina itself.

The Internal Sex Organs



The female internal sex organs consist of the **ovaries** , the **Fallopian tubes** , the **uterus** , and the **vagina** .

Click on picture.

The Internal Sex Organs: The Ovaries

Location, form and function

The ovaries (female sex glands or gonads) are two walnut-sized bodies which are located inside the abdomen on either side of the uterus. The ovaries serve a double function:

1. They produce **eggs** which are released into the Fallopian tubes.

2. They produce **hormones** which are secreted directly into the bloodstream.

The Internal Sex Organs: The Ovaries

The Production of Eggs

Before a baby girl is born, all of the cells that will later grow into eggs are already formed in her ovaries. In their primitive beginnings, the cells are called oogonia. These oogonia first turn into primary oocytes and then into secondary oocytes, some of which eventually give rise to mature eggs (*ova*).

The primary oocytes - a large, but gradually dwindling number

The process of egg production, called oogenesis, begins in the female fetus, but soon comes to a halt at birth. Thus, every girl is born with nearly 500,000 primary oocytes which remain in their state of suspended development until she reaches puberty. During this time most of them gradually die. By the time a girl reaches puberty, there may be no more than 30,000 primary oocytes left that are capable of further development.

At the age of thirty, this number has dwindled even further to about 10,000, and when the woman reaches her menopause, all primary oocytes are gone.

The mature eggs (ova) - a small number produced monthly until menopause

Once the process of egg production has resumed during puberty, one or several mature eggs are produced each month by either one of her ovaries until both of them cease functioning following menopause. In the course of her fertile life, a woman may produce some 400 mature eggs. Of course, only a very small fraction of these can ever contribute to conceptions. All of this provides a striking contrast to the way sperm cells are produced in the male (continuous production of millions of sperm daily, beginning with puberty).

The monthly process of egg maturation

The development of a mature egg proceeds in several steps:

- Each primary oocyte is contained in a cluster of supporting cells. These clusters lie beneath the outer layer of the ovary. Each month, under the influence of certain hormones, one of the clusters grows to a point where it appears as a rather large blister on the surface of the ovary. This blister is called a Graafian follicle (after the 17th century Dutch anatomist Regnier de Graaf). During the period of follicle growth, the primary oocyte, which like any other female body cell contains 46 chromosomes (including two X chromosomes), divides into two new cells of very unequal size: a relatively large secondary oocyte and a minute so-called polar body. In this division, the 46 chromosomes are split apart, and half of them are allotted to each of the new cells. Thus, the secondary oocyte as well as the polar body each contain only 23 chromosomes (including one X chromosome). The polar body dies and disintegrates.
- Only the secondary oocyte is destined for further maturation. First, it floats freely inside the growing follicle which contains fluid. Eventually,

the follicle bursts, releasing the secondary oocyte into the abdominal cavity. This release is known as ovulation. The secondary oocyte then enters the nearest Fallopian tube.

- The secondary oocyte now divides again into two new cells of unequal size: a relatively large ootid (mature egg cell) and a minute second polar body. However, this time the division reproduces rather than splits the number of chromosomes. Thus, both of the new cells retain 23 chromosomes (in each case including one X chromosome). This last division and the expulsion of the second polar body occur only after fertilization. While the second polar body dies just as the first one, the 23 chromosomes of the mature egg cell unite with the 23 chromosomes of the sperm cell, thus forming a new cell (the zygote) which again contains 46 chromosomes like all other cells of the body.

The Internal Sex Organs: The Ovaries

The Production of Hormones

The ovaries, just as the testicles, also produce certain hormones. These gonadal hormones have been divided into female hormones (estrogens) and male hormones (androgens). However, these terms are somewhat misleading because **both "female" and "male" hormones can be found in every female and male body. Only the quantity and balance of these hormones differ in the two sexes.**

In addition to estrogens (and androgens), the ovaries of a sexually mature female also produce a hormone called progesterone. The production of progesterone takes place mainly in association with the *corpus luteum* (lat.: yellow body) which is formed from the wall of the ruptured follicle after ovulation. During a woman's fertile years, the estrogens as well as progesterone play an important role in her reproductive cycle.

The Internal Sex Organs

The Fallopian Tubes

Location, form and function

The Fallopian tubes (named after the 16th century Italian anatomist Gabriele Fallopio) lead from the ovaries to the uterus. They are also sometimes called oviducts (lat.: paths of eggs), a term that accurately describes their function. They provide a passageway for the egg down to the area where it could implant in case of a fertilization. (They also provide a passageway for sperm cells swimming upward from the uterus trying to reach the egg). The wide ovarian end of a Fallopian tube has fingerlike extensions called *fimbriae* (singular: *fimbria*) which move across the surface of the ovary; the uterine end leads directly into the inside of the uterus. The fertilization of an egg normally occurs in the upper part of a Fallopian tube. Inside the tube, there are innumerable hairlike growths called *cilia* (singular: *cilium*) whose movements, together with muscular contractions of the tubal wall, sweep the egg toward the uterus. (Inside the male *vas deferens*, the sperm cells are transported the same way since they are still unable to move by themselves at that point).

The Uterus

Location, form and function

The uterus (lat.: womb) is a muscular organ which is situated between and slightly below the ovaries, approximately in the center of the lower abdomen. The shape of the uterus, which is about 3 inches (ca. 7 cm) long, resembles that of a small pear turned upside down. The Fallopian tubes enter the uterus on either side near the top. The wide upper part, known as the body of the uterus, is usually tilted forward over the dome of the urinary bladder, and it is separated from the narrow lower part by a slight constriction. This lower part is called the cervix or neck of the uterus, and it ends in the deep portion of the vagina. The cervix contains a small opening through which sperm cells can travel from the vagina into the uterus. However, except for a certain period during ovulation, the cervical opening is plugged by an impenetrable mucus.

The three layers of the uterine wall

The thick walls of the uterus are made up of three layers:

1. the external cover called the **perimetrium** ,
2. the middle or muscular layer called the **myometrium** , and
3. the inner layer called the **endometrium** .

This endometrium consists of special tissue which thickens every month as the uterus prepares for the possible implantation of a fertilized egg. If no implantation occurs, the endometrium deteriorates and is discharged through the cervix and the vagina during menstruation.

The uterus during pregnancy

In case of a pregnancy, the uterus expands with the growing fetus. The extraordinary muscular structure of the myometrium not only allows for such vast expansion, but also provides the necessary pressure during labor when the fetus is finally expelled. The uterine muscles also contract during orgasm.

The Vagina

Location, form and function

The vagina (lat.: sheath) is a muscular tube about 3 1/2 inches long extending from the cervix to an external opening which is part of the vulva. The vagina serves three main functions:

1. It provides a passageway for the **menstrual flow** from the uterus to the outside.
2. It serves as a receptacle for a man's **penis** and his ejaculated sperm which then may move on through the cervix.
3. It provides a passageway for the **baby** during birth from the uterus to the outside

The vaginal walls

Under ordinary circumstances, the vagina is a collapsed tube, i.e., more a potential than actual space. Its inner surface, like that of the mouth, hosts different kinds of organisms which live in a healthy ecological balance. This balance can be upset, however, as a result of chemical interference. For this reason, vaginal sprays and douches should be avoided.

The vagina cleanses itself with its own secretions. It also possesses a special protection against infection. The vaginal walls, which lie close together, contain mucous crypts and many blood vessels, but no glands and few nerve endings. During sexual excitement, these walls secrete a watery substance which serves as a lubricant during coitus. Without such lubrication, the insertion of a penis could be painful to both the woman and the man.

The vagina during sexual intercourse

The vagina adjusts to the size of any inserted penis, large or small. However, that portion of the vagina which lies closest to the external opening may, in some cases, become too relaxed for the preference of either sexual partner. This can happen after childbirth, for instance, or simply as a result of the aging process.

Conversely, it is also possible for the vaginal entry to become so tense and tight that it cannot be penetrated. Such a vaginal spasm is called vaginismus. Both problems can usually be solved by behavior therapy and/or appropriate exercises. Some of these exercises, the so-called Kegel exercises (named after the 20th century American gynecologist Arnold Kegel), can easily be performed by all women at all times, anywhere.

Ejaculation from the vagina?

Some (by no means all!) women also expel some fluid from the urethra during orgasm. In the past, it was often assumed that the fluid could only be urine, and this caused the women some embarrassment. Sometimes another explanation was given: The fluid must have come from the vagina itself,

perhaps as sudden excessive lubrication or as secretion from the Bartholin's glands. However, both explanations were wrong:

The fluid did indeed come from the urethra, but it was not urine. Recent research suggests that the fluid is secreted by a system of urethral (or paraurethral) glands, i.e., glands which surround the urethra and open into it. This system of glands is more developed in some women than in others. In any case, it corresponds to the prostate in males, which also surrounds the urethra. Some researchers have therefore gone so far as to speak of a "female prostate." By the same token, the expulsion of fluid from this glandular system during orgasmic contractions has been called "female ejaculation," especially since the fluid itself has been shown to be similar to

male prostatic fluid. (There are no sperm cells in these "female ejaculations", of course).

The G-spot

While only relatively few women "ejaculate" in this sense, many more have a certain sensitive spot, a cluster of tissue surrounding the urethra, which can be felt and stimulated through the anterior vaginal wall. This tissue (which is probably identical or at least connected with the system of urethral glands) first swells under intense stimulation and then contributes to a specially intense orgasmic release. Anatomically, this sensitive area has now become known as the "Gräfenberg spot" (G-spot) after **Ernst Gräfenberg**, a German-American gynecologist, who first described it in 1950.

Some Homologous Structures

Some Homologous Structures in the Female and Male Sexual Systems

Before a baby boy is born, the "male" hormone testosterone transforms his originally undifferentiated embryo, leading to the development of a male body with male sex organs. In case of a baby girl, the absence of testosterone at this stage lets the embryo grow "automatically" into a female body with female sex organs. However, since both male and female sex organs derive from the same embryonic cell mass, they still correspond to each other or, in scientific language, are "homologous."

Female

Ovaries
Urethra
Labia minora (minor lips)
Labia majora (major lips)
Clitoris
Bartholin's glands
Paraurethral glands ("female prostate")

Male

Testicles
Prostatic urethra
Urethral tube of penis
Scrotum
Penis
Cowper's glands
Prostate

The Menstrual Cycle

What is the menstrual cycle?

A woman becomes capable of reproduction during puberty and then loses this capacity in her early fifties. However, even in her fertile years she can conceive only during a certain time once a month when one of her ovaries releases an egg. The monthly recurrence of this event, together with other regular body changes, constitute the female reproductive cycle. Its most obvious external sign is menstruation (monthly bleeding). For this reason, the

reproductive cycle may also be called **menstrual cycle**. Indeed, this latter term has the advantage of referring to a concrete experience which is familiar to practically all women, including those who do not reproduce.

First and last menstruation

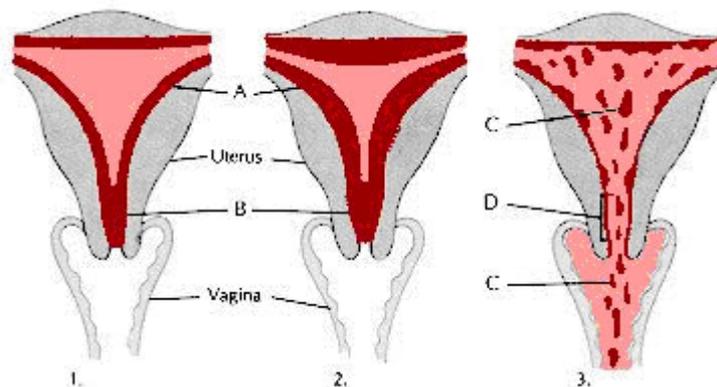
A girl's first menstruation (gr.: *menarche*) usually occurs between the ages of 11 and 13. However, the second menstruation may very well be much farther away than just another month. During adolescence, menstrual cycles are rather irregular. It is only later that some definite pattern is established. In a mature woman, menstrual cycles usually last between 28 and 35 days. Still, some irregularity is always possible and quite normal. The irregularity increases again as the woman grows older. Finally, after menopause, her menstruations cease altogether.

The Menstrual Cycle: The Three Phases of the Menstrual Cycle I

In scientific textbooks, the menstrual cycle is usually divided into two, three, four, or more different phases. For our present purposes, a division into three phases seems adequate.

The Three Phases of the Menstrual Cycle

(Seen as beginning after the last day of menstruation)



1. Preparing for Ovulation The endometrium begins to grow after menstruation.

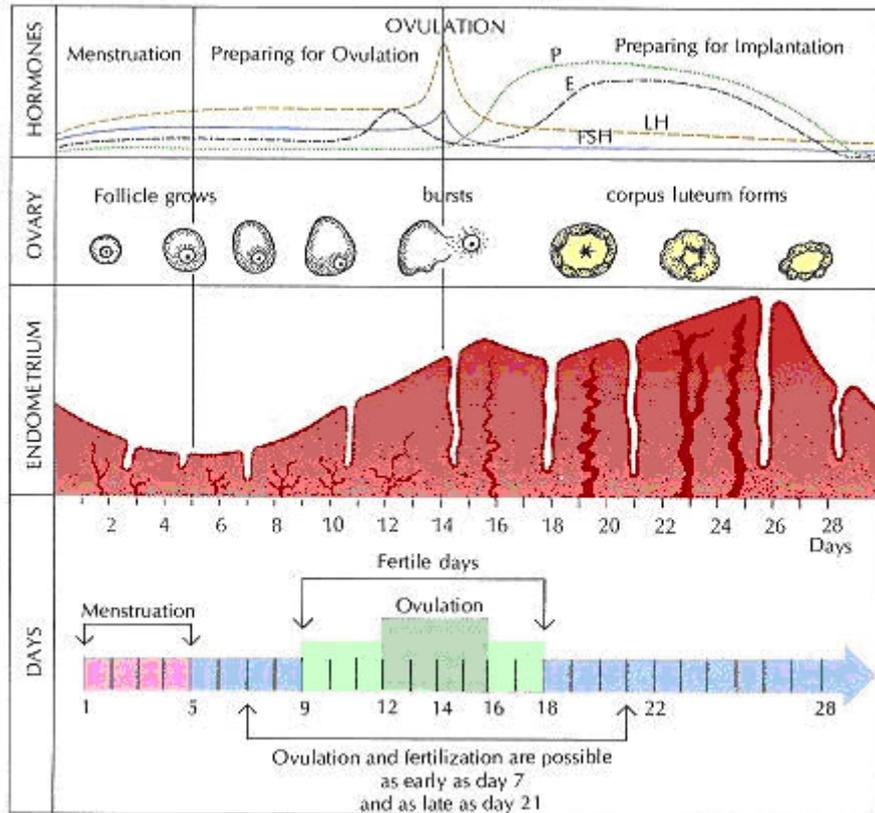
2. Preparing for Implantation The endometrium is becoming ready for the implantation of a blastocyst.

3. Menstruation If no implantation occurs, the endometrium breaks down and is discharged in menstruation.

Key: A. Endometrium B. Cervical mucus plug C. Detached endometrium being discharged D. Unplugged area.

The Three Phases of the Menstrual Cycle

(Seen as beginning with the first day of menstruation)



Key: FSH: the follicle stimulating hormone; E: estrogen; LH: the luteinizing hormone; P: Progesterone.
 Note that the progesterone level rises considerably within twenty four hours after ovulation.

The Menstrual Cycle: The function of the menstrual cycle

The basic function of the menstrual cycle is easily summarized:

It prepares the lining of the uterus for the possible implantation of a fertilized egg.

If no implantation occurs, the lining breaks down and is discharged through the vagina. This discharge is known as menstrual bleeding or simply menstruation.

When the bleeding has stopped, the preparation of the uterine lining and thus the entire cycle starts again. Theoretically, a description of the menstrual cycle could begin with any of its phases. For the purposes of medical calculation, for example, the menstrual cycle is assumed to start with the first day of menstruation and to end with the last day before the next menstruation. However, in the present context it seems most useful to begin with the growth of the egg (*ovum*) and the gradual thickening of the uterine lining (*endometrium*).

The Menstrual Cycle: Description of the cycle

For a better understanding, the following offers, in sequence, a detailed description of the

three phases of the cycle:

1. **Preparing for Ovulation**
2. **Preparing for Implantation**
3. **Menstruation**

Preparing for Ovulation

When the menstrual flow comes to a halt, the uterine lining is very thin. However, it slowly begins to thicken under the influence of estrogen, a hormone that is produced by the ovaries and released into the bloodstream. The rising estrogen level also stimulates the growth of some of the Graafian follicles that encase the immature ova. Eventually, only one of these follicles completes its growth, while the others recede. After approximately two weeks, one follicle ruptures and releases the ovum.

This release is known as ovulation. At the time of ovulation, the uterine lining has thickened considerably and is close to becoming ready for a possible implantation. **An ovulation occurs about 14 days before the beginning of the next menstruation.** That is to say, if the ovum is not fertilized and implanted, the uterine lining will break down and will be discharged two weeks later.

Thus, counting backward, in a menstrual cycle of 28 days, ovulation occurs on the 14th day; in a cycle of 35 days, it occurs on the 21st day. In other words, while the time period between ovulation and next menstruation is relatively constant, that between menstruation and next ovulation can vary considerably. Couples who practice the rhythm method of contraception have to keep this fact well in mind.

Preparing for Implantation

Shortly before ovulation, the follicle that encases the ovum begins to produce a new hormone called progesterone. This production increases dramatically after ovulation when the ruptured follicle is transformed into a "yellow body" (*corpus luteum*). In addition to progesterone, which plays an important part in the final preparation of the uterine lining, the yellow body also continues the production of estrogen.

Under the influence of this hormonal stimulation, the lining of the uterus soon achieves its greatest thickness and receptivity for implantation. **After its release from the ovary, the ovum enters the nearest Fallopian tube and begins traveling toward the uterus. Within a few hours, it undergoes its final maturation and becomes ready for fertilization.** After its fertilization, the ovum develops into a cell cluster which continues its journey through the Fallopian tube to the uterus, where it arrives about three days later.

Finally, after another three to four days, it begins to implant in the nourishing uterine lining, thus starting pregnancy. A pregnancy helps to sustain the yellow body and its production of estrogen and progesterone. As a result, no new ovulation occurs, and the uterine lining does not deteriorate. In other

words, in case of a pregnancy, the menstrual cycle is suspended at this point and does not enter the third phase described [here](#) .

Menstruation

A fertilization is possible only within the first 24 hours after ovulation. If the ovum does not encounter any sperm cells during this time, it simply dies and disintegrates. Obviously, in this case there is no implantation either. As a result, the thick special lining of the uterus is not needed, but soon begins to break down and slough off.

The waste material, consisting mainly of mucus, lining tissue, and variable amounts of blood, is discharged through the vagina. This discharge is known as the monthly bleeding or menstruation (from lat. mensis, month). It usually lasts between 3 and 5 days. In popular language, these days are also sometimes referred to simply as the "period." The first day of menstruation is usually considered the first day of the entire menstrual cycle.

The Menstrual Cycle: Some practical issues

There are some practical issues caused by the menstrual cycle:

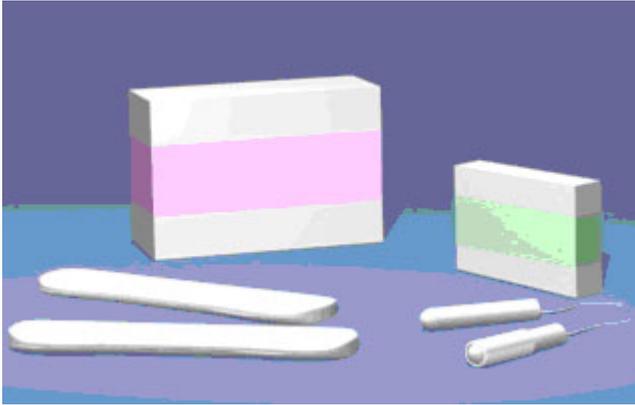
1. **Discomfort during and before menstruation (PMS)**
2. **Tampons and menstrual napkins**
3. **Sexual Intercourse During Menstruation**

Discomfort during and before menstruation (PMS)

During her "period," a woman may experience some physical discomfort, such as backaches, headaches, or cramps in the pelvic area. Indeed, some women develop these symptoms a few days before the menstruation begins. In this case, one speaks collectively of a "[premenstrual syndrome](#)" (PMS) . Such menstrual discomforts can often be alleviated by adopting a healthy lifestyle, by physical exercise, and, in severe cases, by medication. In any case, there is rarely a need for an interruption of regular daily activities. For example, a menstruating woman can participate in sports without impairing her health in any way.

The Menstrual Cycle: Some practical issues

Left: Menstrual pads. Right: Tampons.



Tampons and menstrual napkins

Most modern women wear tampons during their menstrual periods. These tampons are made of cotton or similar absorbent material, and they are introduced into the vagina where they absorb the menstrual flow. As long as they are replaced often enough, there is no medical objection to their use. In case of heavier menstrual bleeding, the traditional menstrual pads or napkins may be more appropriate.

Sexual Intercourse During Menstruation

In the past, many societies had strong prohibitions against sexual intercourse during menstruation. Generally, women were considered "unclean" during this time, and in some cultures there was a belief that sexual intercourse with a menstruating woman could make a man ill. However, modern medical research has exposed these and similar views as mere prejudices and superstitions.

From a purely medical standpoint, there is no reason why sexual intercourse should not take place at any time during the menstrual cycle. In fact, many women are particularly responsive just before or during their periods. Still, some couples may hesitate to engage in coitus because of aesthetic objections to the bleeding. In this case, the use of a diaphragm should be considered. It will not only hold back the blood, but will also act as a means of contraception. After all, sperm cells can stay alive inside a woman's body for several days, and menstrual cycles can be quite irregular. An early ovulation can never be ruled out with complete certainty.

The Menstrual Cycle: Menopause

Usually between the ages of 45 and 50 a woman will notice that her menstrual cycles become more and more irregular until, eventually, she ceases to menstruate altogether. This permanent cessation of menstruation is called menopause. A broader term, climacteric (gr.: critical period), refers to the general physiological and psychological changes that occur during this time in a woman's life.

Menopausal symptoms

As described earlier, the number of a woman's oocytes dwindles to zero over the years. Correspondingly the woman also ceases to produce the hormones necessary for the preparation of the uterine lining. In some women, the

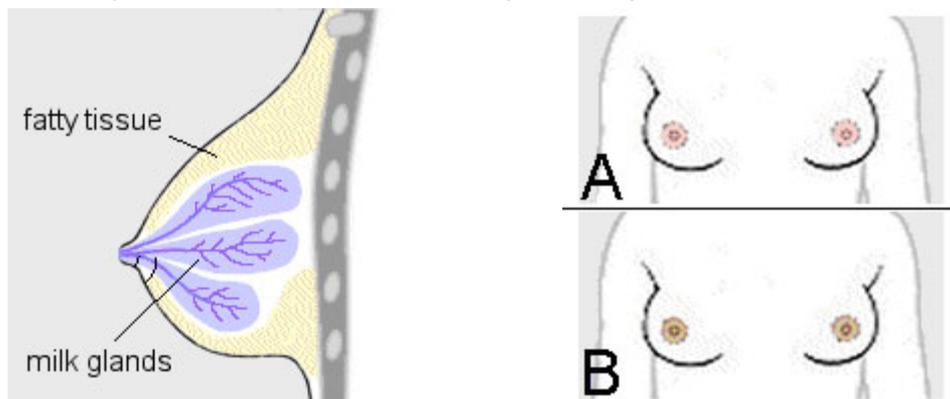
resulting hormonal changes may, for a while, produce rather distressing symptoms, such as headaches, dizziness, fatigue, insomnia, and depression. Another symptom that may occur repeatedly is a "hot flash" or brief heat sensation spreading over the body. Such a flash may last from a second to a few minutes, and it may be followed by chills or heavy perspiration. These and other menopausal complaints can often be alleviated or even avoided by hormonal treatment. In most cases, the entire climacteric does not last longer than about two years.

Gradual loss of fertility

Although menstruations become increasingly rare during this period, ovulations (and therefore conceptions) are still possible. A woman who does not want to become pregnant during her climacteric is therefore well advised to continue the use of contraception. After one year without menstruation, however, she can safely assume that she is no longer fertile. The loss of fertility does not affect a woman's sexual responsiveness. In fact, many women show a renewed and increased interest in sexual intercourse once they can stop worrying about unwanted pregnancies.

Form and function

Although the rounded female breasts cannot be considered sex organs in the narrow sense of the term, they usually play an important part not only in erotic arousal, but also in the nurturing of the newborn. In a sense then, the breasts can be said to have some erotic as well as reproductive function. The breasts of a mature woman are two cushions of fat and tissue which surround her mammary glands. Whenever she gives birth to a child, these glands begin to secrete milk into special ducts leading to the nipples. The nipples, which are composed of smooth muscle fiber, and which contain many nerve endings, are very sensitive to the touch and can become erect during sexual excitement. The area around the nipples (areola) is pinkish, but becomes-and then remains-darker as a result of pregnancy. The female breasts begin to develop fully during puberty as a result of hormonal stimulation. Their eventual shape and size is determined by heredity.



Left: Cross section of a female breast. Right: A: Nipples before the first pregnancy. (Areola is pinkish.) B: Nipples after the first pregnancy. (Areola is brownish.)

The Breasts

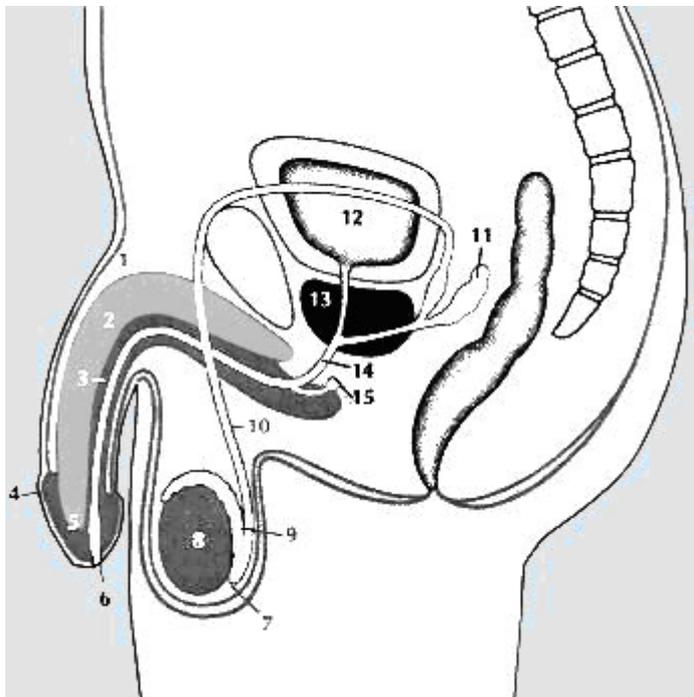
Sexual significance

For many men and women, the breasts have a special sexual significance. However, as in all sexual matters, preferences vary widely. In certain societies, long, pendular breasts are considered superior; in others, the taste runs to the round and firm. In some cultures, small breasts are praised as the most beautiful, while in others the ideal is an ample bosom. Even within one and the same culture, the concept of female beauty may change from one generation to the next, indeed from one individual to another.

The male breasts

Men also have breasts, although they are less well developed. Nevertheless, the male nipples may also be very sensitive to the touch. They can also become erect, and they may play an important part in sexual arousal. There is one important difference, however- the male breast contains only rudimentary mammary glands. In fact, a male may "give milk" only once in his life - at birth. A newborn baby still shares certain hormones with the mother, including those that stimulate her milk production. For this reason, the baby's breasts also contain *colostrum*, a premilk substance (the so-called witches' milk). This is true for both female and male babies. Naturally, the condition does not last long.

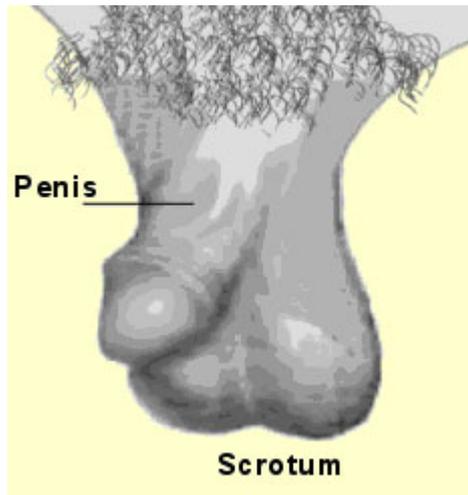
The Sex Organs - The Male Sex Organs



1. Penis
2. Corpus cavernosum (one of a pair)
3. Corpus spongiosum
4. Foreskin
5. Glans
6. Opening of urethra
7. Scrotum
8. Testicle (one of a pair)
9. Epididymis (one of a pair)
10. Vas deferens (one of a pair)
11. Seminal vesicle (one of a pair)
12. Urinary bladder
13. Prostate gland
14. Urethra
15. Bulbourethral (Cowper's) gland (one of a pair)

Schematic depiction of the male external and internal sex organs

The External Sex Organs



The male external sex organs consist of the **penis** and the **scrotum**. The testicles and their attachments, which are contained in the scrotum, are usually considered internal organs, although they are outside the abdominal cavity.

Circumcised adult penis.

The External Sex Organs: The Penis

The penis (lat. tail) is a cylindrical organ which contains erectile tissue. To be more precise, there are three elongated spongy bodies inside the penis which extend through its entire length—two running parallel on top (the **two corpora cavernosa**) and one running along the underside (the **corpus spongiosum**). This latter body contains the **urethra** (the duct through which urine and semen are released).

Corpora cavernosa and corpus spongiosum

The External Sex Organs: The Penis

Erection

The penis arteries can quickly fill the three spongy bodies with blood, thus causing them to stiffen. As a result, the penis becomes erect. Conversely, when the blood leaves the spongy tissue the erection subsides.

Erections of the penis are usually triggered by sexual excitement, but they can also occur for other reasons. During an erection the penis increases in size. This is possible because the covering skin is very loose.

The External Sex Organs: The Penis

Foreskin

Toward the end of the penis some of this skin forms a freely hanging fold known as the foreskin or prepuce. This foreskin normally covers the tip or head of the penis called the glans. In the case of an erection, however, the glans protrudes from the foreskin and becomes fully exposed.

The External Sex Organs: The Penis

Glans

The glans is usually slightly thicker than the body of the penis, and its shape has been compared to that of an acorn (glans is Latin for acorn.) Actually it is the extension of the *corpus spongiosum*, and it contains the external opening of the urethra. Since its smooth surface is studded with innumerable nerve endings, the glans is extremely sensitive to the touch, particularly around its rim.

By the same token, it is also an important source of sexual pleasure for the male. The underside of the glans is attached to the foreskin by a thin tissue called frenum. Behind the rim of the glans and under the foreskin there are glands that secrete a cheeselike substance known as smegma. If the foreskin is tight this smegma may accumulate and cause irritation. In any case, good personal hygiene demands daily washing of the glans and removal of the smegma. For this the foreskin has to be pulled back. In some cultures, this problem does not arise because the foreskin is removed in a simple operation called circumcision.

Left: **Uncircumcised penis**

Right: **Circumcised penis**

The External Sex Organs: The Penis

Circumcision

Tightness of foreskin (also called *phimosis*) is one of the reasons for a popular operation called circumcision. It consists of the surgical removal of the foreskin. This practice has a long tradition among Jews and Moslems, for whom it also has a religious significance. However, in the meantime circumcision has found wide general acceptance, and in the United States today most males are circumcised as a matter of course right after birth regardless of their religion. Circumcision has no effect on a man's sexual capacity.

Circumcision for religious reasons

(Left) Circumcision in ancient Egypt, ca. 3000 BC. **(Right)** Today: For Jews and Moslems, male circumcision also has a religious significance because it expresses Abraham's covenant with God. Shown here are traditional Jewish circumcision instruments. Left: The barzel, a shield with a slit through which the foreskin is drawn before it is cut. Right: The izmel, a double-edged knife that can cut with either side.

The External Sex Organs: The Penis

Penis size

The average length of a grown man's penis is between 3 and 4 inches when flaccid and between 5 and 7 inches when erect. However, there may be great variations in size from one individual to the next. Contrary to some widely accepted myths, the size of the penis is not related to a man's body build, skin color, or sexual prowess. A very short man may have a larger penis than a tall one (and *vice versa*), a white man may have a larger penis than a black man (and *vice versa*), and a man with a small penis may have more orgasms than a man with a large penis (and *vice versa*). Furthermore, some penises which greatly differ in

size when they are flaccid may be of identical size when they are erect.

Does penis size matter in sexual intercourse?

Even a penis that remains relatively small during an erection serves every function of a larger penis. A woman's vagina, for instance, adjusts to any penis, no matter what its size, and since the vaginal walls contain few nerve endings, any difference in the woman's sensations depends on the firmness of her muscles surrounding the vaginal barrel as well as psychological factors. The latter is also true for sensations inside the rectum during anal intercourse. There is practically no feeling at all beyond the anal sphincter muscles. (This, incidentally, is the reason why some people who introduce long and hard objects into their rectum may seriously hurt themselves without realizing it.)

The External Sex Organs: The Scrotum

The scrotum is a bag or pouch of skin which contains the testicles, and which hangs between the thighs at the base of the penis. The skin of the scrotum is comparatively dark and contains many sweat glands. Inside the scrotum there are two separate compartments, each of which contains one testicle and its spermatic cord which leads upward into the abdominal cavity. Part of this spermatic cord is a thin tube through which the sperm travels - the vas deferens. It is this vas deferens that is cut in a vasectomy.

The spermatic cord also contains blood vessels, nerves, and muscles. In response to certain stimuli, especially cold temperatures, these muscles contract and pull the testicle closer to the abdomen. At the same time, the skin of the scrotum will also contract and appear thick and wrinkled. Ordinarily, however, the scrotum hangs loose, and its skin looks thin and smooth. In a way the scrotum acts like a thermostat, trying to provide an even temperature for the continuous production of sperm which is taking place inside the testicles. This temperature has to be slightly lower than that of the rest of the body.

The Internal Sex Organs

Click on picture. The male internal sex organs consist of the **testicles** which produce hormones and sperm, **a system of ducts** which transport and store the sperm, and **some accessory organs** whose secretions become part of the ejaculated semen.

The Internal Sex Organs: The Testicles

Location, form and function

The testicles (male sex glands or gonads) are formed within the abdomen during the development of the embryo. However, before the birth of a baby boy they normally descend into his scrotum. In the mature male the testicles are two oval-shaped bodies of about 1 ½

inches (4 cm) in length which are suspended in two separate sacs inside the scrotum outside the abdominal cavity. Although both testicles are of about the same size, the left one usually hangs a little lower and thus may give the appearance of being larger. The testicles serve a double function:

1. They produce **sperm** which may be ejaculated through a system of genital ducts.
2. They produce **hormones** which are secreted directly into the bloodstream.

The Internal Sex Organs: The Testicles

Click on picture.

The Production of Sperm

A testicle is composed of hundreds of small compartments which contain tightly coiled tubes not much thicker than a hair. Inside these tubes (called seminiferous tubules) the process of sperm production (called spermatogenesis) takes place. This process begins when the male reaches puberty and continues without interruption throughout his life. The production of sperm proceeds in three steps.

1. The First Step

The first step begins with the cells that lie closest to the outer edge of the tube. These cells are called **primitive spermatogonia** and, like any other cell in the body, they have 46 chromosomes, including an X chromosome and a Y chromosome. By means of cell division a single primitive spermatogonium forms two new identical daughter cells. One of these takes the place of the original cell, while the other moves toward the center of the tube. This latter cell is called the **primary spermatocyte**.

2. The Second Step

The primary spermatocyte does not duplicate itself the way all other cells do, but divides in a unique way: It splits in half, as it were, allotting 22 chromosomes plus 1 X chromosome to one of the new cells, and 22 chromosomes plus 1 Y chromosome to the other. The two new cells are called **secondary spermatocytes**, and each of them contains only half as many chromosomes (23) as all other body cells.

3. The Third Step

The two secondary spermatocytes move even closer to the center of the tube, and each divides again in the ordinary fashion, duplicating itself exactly. The four new cells are called **spermatids**. These spermatids now change their shape, develop a tail, and thus grow into mature sperm cells called **spermatozoa**. The entire process through all three stages of development takes about 64 days. As is obvious from their origin and development, spermatozoa come in two varieties: those containing an X chromosome (and 22 other chromosomes), and those containing a Y chromosome (and 22 other chromosomes). In case of a fertilization the X-bearing spermatozoa will help to produce girls; the Y-bearing spermatozoa will help to produce boys.

Inside a seminiferous tubule.

1. spermatogonium
2. primary spermatocyte
3. secondary spermatocyte
4. spermatids
5. cell division
6. interstitial cells producing testosterone
7. sperm cells

The Internal Sex Organs: The Testicles

The Production of Hormones

The male and female gonads (testicles and ovaries) also produce certain hormones. These gonadal hormones have been divided into male hormones (androgens) and female hormones (estrogens). However, these terms are somewhat misleading because both "male" and "female" hormones can be found in every male and female body. It is only the quantity and balance of these hormones that differ.

The Production of Hormones at Different Life Stages

Before puberty

Before puberty, the androgen and estrogen levels in boys and girls are nearly equal.

Puberty

During adolescence, the hormones balance begins to shift. In the male body the androgens rise to a slightly higher level than the estrogens, and in the female body the estrogens rise to a much higher level than the androgens. In the male the increase of androgens during puberty helps to produce the male secondary sexual characteristics. There is still much to be learned about the role of hormones in the human body. Nevertheless, a few basic facts have already been established: While the gonadal hormones are necessary for a young person's physical maturation, they are not essential for the continued sexual activity of adults. In other words, males and females need the gonadal hormones during adolescence to develop their full sexual potential.

Adulthood

Once the full sexual potential has been attained in adult men and women, they can – up to a point - function sexually without these hormones. This has long been recognized in the case of women whose gonads (the ovaries) cease functioning after menopause without diminishing their sexual responsiveness. Many people are less willing to concede that the same is also true for men who might be deprived of their gonadal hormones (by castration, for example). A castration will, in most cases and over time, greatly diminish a man's sexual capacity and motivation. However, there are exceptions. In adult humans, sexual activity can be quite varied and need not be directly dependent on hormone levels, but is also influenced by social factors.

The Internal Sex Organs: The System of Genital Ducts

Location, form and function

The sperm cells produced in the testicles are transported to their point of discharge from the body by a system of genital ducts. These ducts, which consist of matched pairs (in sequence: **epididymides** , **vasa deferentia** , **ejaculatory ducts**), lead from the testicles

into the abdominal cavity where they eventually join the **urethra** , a single tube which discharges sperm as well as urine.

The Internal Sex Organs: The System of Genital Ducts

The Epididymides

The sperm cells which are constantly being produced in the seminiferous tubules are moved into collection tubes which lie on the surface of each testicle. Such a collection tube is called *epididymis* (plural: *epididymides*), and it is about ca. 6m (20 feet) long. However, it is so twisted and convoluted that it seems no longer than the testicle itself. A sperm cell needs several weeks to traverse the collection tube. During this time it develops a limited ability to move by itself.

Longitudinal section of a testicle showing the seminiferous tubules and the convoluted epididymis.

The Internal Sex Organs: The System of Genital Ducts

The Vasa Deferentia

Once the sperm cells have emerged from the collection tube, they enter a shorter and rather straight tube called *vas deferens* (plural: *vasa deferentia*). This tube leads from the scrotum into the abdomen. The lower portion of the *vas deferens* can be felt through the scrotal skin. Since it is so easily located, it can also easily be cut in a sterilization operation known as a vasectomy. Inside the abdomen the two *vasa deferentia* (one associated with each testicle) bend in a long curve and lead up to a point behind the urinary bladder where they become enlarged, each forming a sort of sac or storage compartment called *ampulla* (plural: *ampullae*). The sperm cells are moved to these storage compartments to await ejaculation. The *ampullae* join the ducts of two other saclike organs, the seminal vesicles, to form short and straight tubes called ejaculatory ducts. These ejaculatory ducts run inside the prostate gland and there join the urethra. Before entering the ejaculatory ducts, the sperm cells have only a limited capacity of moving by themselves. Instead, they are transported mainly by the movement of tiny hairlike structures inside the tubes and by muscular contractions. However, immediately upon ejaculation they begin to move very vigorously. This dramatic change is produced by several fluids from various sources which together make up the semen. Swimming in the semen, the sperm cells gain their full energy.

The Internal Sex Organs: The System of Genital Ducts

The Urethra

The urethra is a single tube which leads from the bladder to the tip of the penis. (The urethra should not be confused with the two ureters which lead

from the kidneys to the bladder.) In the male, the urethra serves two important functions: to release either urine or semen. (Because of certain muscles, urine and semen cannot be released together.) While the urine enters the urethra directly from the bladder, the semen is composed of several different fluids which enter through special openings in the urethral wall mainly in the region of the prostate gland.

The Internal Sex Organs: Accessory Organs

In order to survive after their ejaculation, the sperm cells need to swim in a thick, nourishing, protective fluid called semen. Actually, the semen is composed of several different fluids which come together at various points in the urethra. The most important of these fluids are produced by the organs described in the following sections.

The Internal Sex Organs: Accessory Organs

The Seminal Vesicles

The seminal vesicles are two sacs which lie next to the *ampullae* (the enlarged endings of the *vasa deferentia*) behind the bladder and near the top of the prostate gland. It was formerly believed that the seminal vesicles just served as storage space for accumulated sperm. However, today the opinion prevails that their main function is to provide a fluid which, together with that of the prostate gland, activates the vigorous movement of the sperm cells after ejaculation.

The Internal Sex Organs: Accessory Organs

The Prostate Gland

The prostate gland is a firm, round body about the size of a chestnut, and it lies directly below the bladder. It is traversed by the urethra as well as the two ejaculatory ducts described earlier. The prostate constantly produces secretions. Some of these are passed off with the urine. Others make up the greater portion of the semen. In some older men, the prostate gland enlarges, causing pressure on the enclosed part of the urethra and thus making urination difficult. In these cases, surgery may become necessary.

The Internal Sex Organs: Accessory Organs

The Bulbourethral Glands (Cowper's Glands)

Below the prostate gland, there are two small glands about pea size which during sexual excitement secrete a clear, alkaline fluid into the urethra. Often a small drop of this fluid can be seen at the opening of the penis well in advance of an actual ejaculation. It is not entirely impossible for the drop to contain some stray sperm cells. (This could account for the rare cases of pregnancy without ejaculation of semen).

Summing up: The composition of semen

The semen discharged in an ejaculation (usually somewhat less than a teaspoonful) is composed of sperm cells and secretions from the *epididymides*, the seminal vesicles, the prostate gland, and the bulbourethral (Cowper's) glands. None of these fluids contains any harmful substances. People who swallow semen, whether by accident or on purpose, have no reason to fear any ill effects (except, of course, if the semen carries bacteria or viruses causing a sexually transmitted disease). Semen is usually thick and greyish white in color. However, at times it may also be thin and rather watery. The exact amount, consistency, and composition of semen depends on the frequency of ejaculations. An ejaculation usually contains between 150 and 500 million sperm cells, with 200 million representing an average amount. The number varies from one person to another and even in the same individual, depending on his age and frequency of ejaculations.

Some Homologous Structures

Some Homologous Structures in the Female and Male Sexual Systems

Before a baby boy is born, the "male" hormone testosterone transforms his originally undifferentiated embryo, leading to the development of a male body with male sex organs. In case of a baby girl, the absence of testosterone at this stage lets the embryo grow "automatically" into a female body with female sex organs. However, since both male and female sex organs derive from the same embryonic cell mass, they still correspond to each other or, in scientific language, are "homologous."

Female

- Ovaries
- Urethra
- Labia minora (minor lips)
- Labia majora (major lips)
- Clitoris
- Bartholin's glands
- Paraurethral glands ("female prostate")

Male

- Testicles
- Prostatic urethra
- Urethral tube of penis
- Scrotum
- Penis
- Cowper's glands
- Prostate