

HIV EXAMINER

A Monthly Newsletter of Writers Against Aids and Tobacco Smoking

November Edition

Skin Cancer

I Introduction

Skin Cancer, malignancy in the skin, and the most common of all cancers. Every year more than a million Americans are diagnosed with skin cancer. The most common skin cancers are easily cured and are rarely life-threatening unless left untreated. Ultraviolet radiation (UV) from sunlight is the major cause of skin cancer. To prevent skin cancer, physicians recommend that people avoid exposing their skin to sunlight, especially when the sun is strongest—between 11 AM and 3 PM.

II TYPES OF SKIN CANCER

Skin cancers develop in the epidermis, the outer layer of skin. There are three main types of skin cancer, classified by the kind of skin cell affected: basal cell carcinoma, squamous cell carcinoma, and melanoma. The vast majority of skin cancers are basal cell or squamous cell.

Basal cell carcinoma, the most common type of skin cancer, develops in the basal, or bottom, layer of the epidermis. It usually occurs in areas exposed to sunlight, especially the head and neck. It grows slowly and rarely spreads, but it can recur.

Squamous cell carcinoma, the second most common type of skin cancer, develops in the upper layers of the epidermis. It can appear as lumps, often reddish in color. It frequently occurs in areas exposed to sunlight, including the face, neck, and back of the hands, but sometimes occurs elsewhere on the body. It is somewhat more likely to spread to the lymph nodes than basal cell cancer is.

The third type of skin cancer, melanoma, develops in melanocytes, or pigment cells, that are found throughout the basal layer. Melanoma is the most dangerous type of skin cancer and accounts for the vast majority of skin cancer deaths. It is about ten times more common in whites than in African Americans.

A rare and aggressive form of skin cancer, called Merkel cell carcinoma, forms in hormone-making skin cells known as Merkel cells. It primarily strikes older people and people who have weakened immune systems as a result of human immunodeficiency virus (HIV) infection. Researchers have linked Merkel cell carcinoma to a virus.

III RISK FACTORS



Skin Cancer

The dark patch on this person's lower leg is a dangerous form of skin cancer known as malignant melanoma. Overexposure to ultraviolet radiation in sunlight is the cause of most skin cancers.

James Stevenson/Science Photo Library/Photo Researchers, Inc.

Skin cancers can grow in any part of the skin, but approximately 90 percent develop in areas exposed to the sun, especially the face, neck, backs of the hands, and the scalps of bald men.

Exposure to direct sunlight, especially during childhood, is the chief risk factor for skin cancer. The greater the number of severe sunburns a person has had, the greater the risk of developing skin cancer later in life. People with pale skin are at greatest risk for skin cancer, particularly if their skin burns or freckles easily. Men are at greater risk of skin cancer than women.

Someone who has had skin cancer is at high risk of developing it again. A family history of skin cancer increases the risk of melanoma. Radiation therapy also increases the chances of developing skin cancer in the area exposed to the radiation. Skin damaged by severe burns or by certain skin diseases is also at increased risk of cancer.

IV SYMPTOMS AND DIAGNOSIS

Early detection and treatment are the keys to survival, especially for melanoma. Any of several skin changes may signal skin cancer and should be reported to a physician. These include any change in the size, shape, color, or texture of a mole or other darkly pigmented area; any mole that begins to itch or becomes tender; the development of a new mole or other growth, particularly if it feels hard; any mole or other growth that spontaneously or persistently bleeds; a sore that does not heal; and a black spot under a toenail or fingernail that extends beneath the cuticle.

Basal cell carcinomas may be flat, firm, and pale, or appear as raised, pink or red, shiny areas. They may bleed from a minor injury. Squamous cell carcinomas may appear as lumps with a rough or scaly surface, or as flat, reddish patches.

Melanomas often begin as tiny molelike growths that then grow bigger and change their color. Melanomas are generally tan, brown, or black. The American Cancer Society recommends an *ABCD* rule for spotting melanoma. *A* stands for *asymmetry*—the halves of the growth do not match in shape. *B* stands for *border* irregularity—the growth has a ragged border. *C* stands for *color*—the color of the growth is uneven. *D* stands for *diameter* greater than 6 millimeters (about the size of a pencil eraser).

To confirm a diagnosis of skin cancer a physician usually performs a biopsy, removing a small piece of the skin to examine under a microscope for the presence of cancerous cells.

V TREATMENT

Although skin cancer is the most common cancer in the United States, it is also the most curable, especially when detected early. One of several surgical methods is used to remove the cancerous tissue. It can be cut from the skin through surgery, or it can be destroyed through the application of intense cold, a technique known as cryosurgery, or through the application of electric current.

In advanced cases of melanoma, surgical removal of the tissue coupled with radiation, chemotherapy, or immunotherapy may be required. Immunotherapy involves using drugs to boost the immune system's ability to fight the cancer. The drugs alpha interferon and interleukin-2 can shrink tumors but have serious side effects.

VI PREVENTIVE MEASURES

Sunlight that reaches the earth's surface contains two kinds of ultraviolet (UV) radiation. UV-A and UV-B both contribute to sunburn and skin cancer, as well as to conditions such as premature wrinkling of the skin. The U.S. Environmental Protection Agency has determined that depletion of the ozone layer in the upper atmosphere will continue to increase radiation damage to skin and skin cancer rates in the future.

The Skin Cancer Foundation recommends that people avoid the sun at its peak (from 11 AM to 3 PM), seek shade, and cover up with clothing and a brimmed hat. It also recommends the regular use of sunscreen, which has been shown to prevent the development of precancerous keratoses (skin lesions that appear during middle age) and thereby to decrease the risk of skin cancer. The sunscreen should have a sun protective factor (SPF) of 15 or higher. Because skin cancer develops slowly over many years, it is important that protection from too much sun begin in childhood. Indoor tanning parlors should also be avoided, since they expose people to the same kinds of ultraviolet radiation as sunlight.

Learning to identify early signs of skin cancer is crucial, as is periodic self-examination of the skin. Any skin changes or abnormalities should be reported to a physician.

VII PROGNOSIS

According to the American Cancer Society, the five-year survival rate for patients with malignant melanoma is just over 90 percent. For melanoma that has not spread to other parts of the body, the five-year survival rate rises to 99 percent.

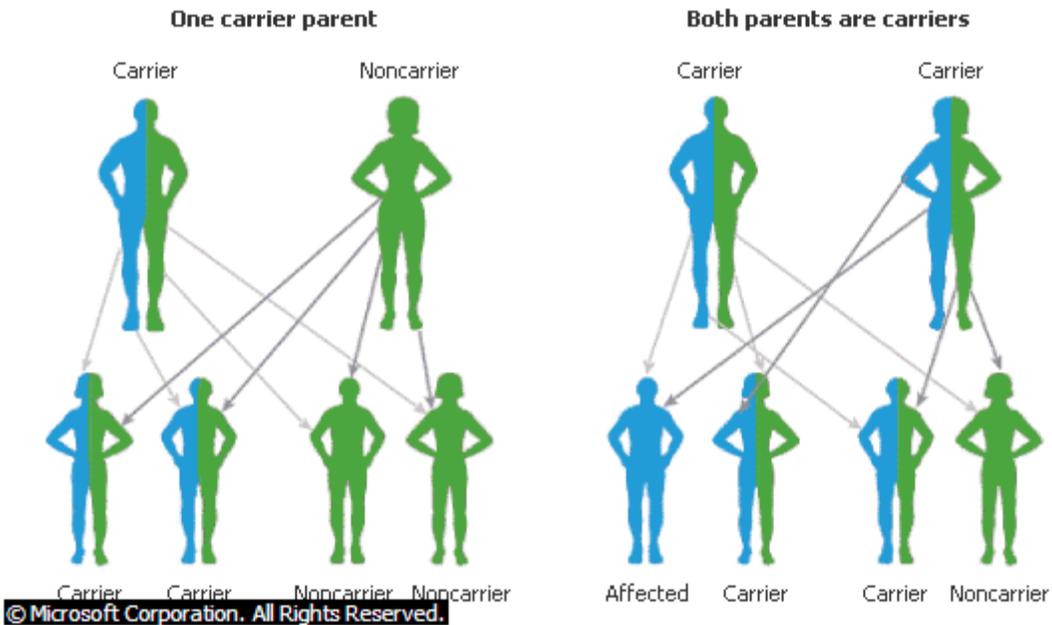
BIRTH DEFECTS

I Introduction

Birth Defects, also called congenital disorders, any abnormalities of structure or function that are present at birth. The process of fetal development can be disrupted by a variety of external factors such as exposure to radiation, heat, chemicals, infectious agents, or maternal disease. An external agent that alters fetal development is called a teratogen (Greek *teratos*, “monster”; *genes*, “born”). Developmental malformations can also be the result of abnormalities in the genetic makeup of the fetus, or they can be caused by a combination of genetic and environmental influences.

Twenty percent or more of malformed fetuses are spontaneously aborted; the rest result in a newborn with a birth defect. Although each single type of birth defect is rare, taken together they make up almost 5 percent of all live births and cause about 20 percent of infant deaths in the period immediately after birth. About one in ten developmental disorders is hereditary and arises from an abnormality in a single gene. Another 5 percent of birth defects arise from physical abnormalities in the chromosome.

II GENETIC CAUSES



Recessive Gene Transmission

Some genes that cause genetic diseases interact in a dominant-recessive pattern. In these cases, two copies of the recessive gene are required for the disease to occur. A person who has just one copy of the recessive gene is termed a carrier, since he or she carries the gene but is not affected by it. In the illustration above, the dominant gene is represented in green, and the recessive in blue. For the couple on the left, the father has one copy of the dominant gene and one copy of the recessive gene. The mother has two copies of the dominant gene. Each parent can contribute just one gene to the child. The four children shown on the lower left represent the probabilities (not the actual children) for the combinations that can result from their parents. The children on the far left received the recessive gene from their father and the dominant gene from their mother, and are therefore carriers. For any child born to these parents, there is a 50 percent chance that the child will be a carrier. Since none of the children can inherit two copies of the recessive gene, none of the children will develop the disease. When both parents are carriers, however, as shown by the couple on the right, there is a 25 percent chance that any child born has the disease, a 50 percent chance that a child is a carrier, and a 25 percent chance that a child does not have the disease and is not a carrier.

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Some genetic disorders have symptoms that are manifest at birth. These disorders may result from mutations in a single gene or from more general chromosomal abnormalities. Many diseases and conditions are inherited in a recessive manner: Neither parent may have the defect even though they both carry the causative gene. When both parents have a dominant gene A and a recessive gene a , their offspring may inherit one of four different combinations: AA , Aa , aA , or aa . If the recessive gene a is defective, the statistical probability is that one in four of the offspring will bear the defective trait. In other congenital disorders the presence of only one copy of the recessive gene is sufficient to cause the condition. *See also* Genetics.

III EXTERNAL CAUSES

Approximately one in ten birth defects is the result of some force or factor that comes from outside the human body. For example, the effects of radiation were demonstrated by the increased incidence of birth defects in the offspring of pregnant Japanese women who were exposed to the atomic bomb in 1945 and of American women who underwent radiation therapy while pregnant. Although the risk from a diagnostic X ray is slight, radiologists recommend having only those X rays immediately necessary during pregnancy. Elevated temperature in a pregnant woman (such as that experienced by sitting in a hot tub) can also lead to birth defects.

The belief that the placenta, which unites the fetus to the maternal uterus, is a protective barrier against chemicals in the mother's blood was tragically disproved in the late 1950s and early 1960s. In many countries children were born with limbs missing or arrested in development after their mothers took the sedative thalidomide, which had not been approved for distribution in the United States. Other known teratogens include alcohol, anticonvulsants, chemotherapeutic agents, cocaine, retinoic acid (a treatment for acne), and the antibiotics streptomycin and tetracycline. In 1955 an outbreak of congenital cerebral palsy in Japan was found to be caused by pregnant women's consumption of fish contaminated with the industrial chemical methylmercury.

A number of infections, when contracted by a pregnant woman, can endanger her unborn child. One of these is rubella, or German measles, which can lead to mental retardation and abnormalities in sight and hearing in the newborn. Vaccination of girls during childhood or

adolescence can prevent a later infection during pregnancy. Other maternal infections occurring during pregnancy that can damage a fetus include acquired immunodeficiency syndrome (AIDS), chicken pox, toxoplasmosis, and cytomegalovirus.

Women with insulin-dependent diabetes mellitus who are not adequately treated during pregnancy are subject to an increased risk of giving birth to a child with heart defects and a variety of other problems. Poorly controlled phenylketonuria (*see* Metabolism) in a pregnant woman can also lead to multiple birth defects and mental retardation in the child.

IV POLYGENIC AND MULTIFACTORIAL CAUSES

No definite cause is known as yet for about two-thirds of birth defects. Some spine and heart malformations are thought to be polygenic, that is, the result of several abnormal genes that are present simultaneously. Other appear to be multifactorial, resulting from abnormal genes interacting with harmful environmental factors. Some birth defects are found more frequently in children with older parents. It has been found that the risk of Down Syndrome, for instance, rises with the increasing age of the mother.

V DETECTION

Scientists have developed several tests for defective genes and for fetal disorders. For some hereditary conditions such as Tay-Sachs disease and sickle-cell anemia, tests are available to detect the defective gene in the healthy parents.

Many diseases can be diagnosed in the fetus by drawing a sample of the amniotic fluid surrounding the fetus and culturing fetal cells for analysis or testing the fluid itself (*see* Amniocentesis). Another method of obtaining fetal cells for study early in pregnancy is called chorionic villus sampling. The fetal cells can be tested for the presence of a particular function, or their DNA (*see* Nucleic Acids) can be scanned for evidence of a genetic disorder. Also, a sample of fetal blood for testing may be obtained directly from the umbilical cord, as may be necessary in cases where DNA diagnosis is not possible.

Some tests for birth defects can be performed on the mother without being as invasive as amniocentesis, chorionic villus sampling, or fetal blood sampling. One of these methods is ultrasonography (*see* Ultrasound), which can reveal a number of abnormalities, as well as an accurate determination of fetal age, the presence of multiple pregnancies, and even fetal sex. Elevated levels of alphafetoprotein in a pregnant woman's blood may indicate the presence of spina bifida; depleted levels sometimes indicate the presence of Down syndrome. Unusual concentrations of two other substances in maternal serum—unconjugated estriol and human chorionic gonadotropin—have also been found when the fetus has Down syndrome.

Many structural birth defects that result from arrested or incomplete development are amenable to corrective surgery (*see* Plastic Surgery). These include cleft lip and palate, failure of development of parts of the digestive tract, and openings between the chambers of the heart. The treatment of hereditary diseases with the techniques of genetic engineering is a novel approach, with great promise for the future, that has already reached the stage of clinical trials.

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CIRCUMCISION

I Introduction

Circumcision, surgical removal of all or part of the foreskin of the human male or of the corresponding tissues of the female. Circumcision of males has been widely practiced as a religious rite since ancient times. An initiatory rite of Judaism, circumcision is also practiced by Muslims (*see* Islam), for whom it signifies spiritual purification. Although its origins are unknown, earliest evidence of the practice dates from ancient Egypt. By the time of the Roman takeover of Egypt in 30 BC, the practice had a ritual significance, and only circumcised priests could perform certain religious offices.

II TRIBAL RITES

Male circumcision appears widely among tribal peoples of Africa, the Malay Archipelago, New Guinea, Australia, and the Pacific islands. Some form of genital surgery was ritually performed on males or females among certain South and Central Native American groups.

In tribal settings, circumcision is nearly always associated with traumatic puberty rites (*see* Rites of Passage). Occasionally the severed part is offered as a sacrifice to spirit beings. The operation certifies the subject's readiness for marriage and adulthood and testifies to his or her ability to withstand pain. Circumcision may also distinguish cultural groups from their uncircumcised neighbors.

III RELIGIOUS RITES



Jewish Circumcision Ceremony

This engraving by Bernard Picart shows a circumcision ceremony within Portugal's Jewish community in 1724. Jewish religious tradition regards male circumcision as a requirement of the covenant that the biblical patriarch Abraham made with God.

Historical Picture Archive/Corbis

In Jewish religious tradition, infant male circumcision is required as part of Abraham's covenant with God. According to the Levitical law (*see* Levites; Leviticus), every Jewish male infant had

to be circumcised on the eighth day after birth, under penalty of ostracism from the congregation of Israel. Jews employ a *mohel*, a man who has the requisite surgical skill and religious knowledge to perform the rite. After a ritual prayer, the *mohel* circumcises the infant and then names and blesses the child.

Among the Arabs, circumcision existed before the time of Muhammad (before AD 570). Although the Qur'an (Koran) does not mention it, Islamic custom demands that Muslim males be circumcised before marriage; the rite is generally performed in infancy. Some Islamic peoples practice female circumcision (clitoridectomy). This is done for aesthetic reasons and to reduce the female's sexual desires.

In some Mediterranean and Islamic countries, clitoridectomy can be an aspect of family honor. In cases where female chastity is a matter of respectability, public evidence of a bride's lost virginity is an important sequel to marriage: a woman who is unable to demonstrate that she has lost her virginity to her new husband may be divorced or, in extreme instances, put to death by her own family.

Circumcision is absent from the Hindu-Buddhist and Confucian traditions, and in general the Christian church has no specific doctrine about it. At present the Abyssinian church alone among Christian bodies recognizes circumcision as a religious rite. *See also* Hinduism; Buddhism; Confucianism.

IV MEDICAL ASPECTS

Since the 19th century, many English-speaking peoples have adopted the custom of circumcision, primarily for medical reasons. In modern medical practice, circumcision of males is a minor operation usually performed in infancy for hygienic purposes. It is currently estimated that about two-thirds of male babies born in the United States are circumcised. The incidence among non-Jewish populations of continental Europe, Scandinavia, and South America is lower.

The medical case for circumcision has been tinged with controversy. Physicians in the 19th century advised the operation for many ailments, including hysteria, sexually transmitted disease, hypersexuality, and even hiccups. Modern proponents suggest that diseases result from the

buildup of smegma, a substance secreted under the foreskin. Also cited is evidence that circumcised populations (especially Jews) display lower rates of penile and cervical cancer. Research findings reported in 2006 indicated that circumcision could lower by more than half the risk of contracting AIDS among men who engaged in heterosexual intercourse. The research was conducted in Africa, and experts warned that the findings did not suggest that circumcised men could safely engage in unprotected sex.

Contributed By:

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Human Sexuality

I Introduction

Human Sexuality, general term referring to various sexually related aspects of human life, including physical and psychological development, and behaviors, attitudes, and social customs associated with the individual's sense of gender, relationships, sexual activity, mate selection, and reproduction. Sexuality permeates many areas of human life and culture, thereby setting humans apart from other members of the animal kingdom, in which the objective of sexuality is more often confined to reproduction. This article discusses the sexual anatomy, development, physiology, and behavior of human beings. For a more general discussion of animal reproduction, *see* Sex and Reproduction.

II HUMAN SEXUAL CHARACTERISTICS

Sexual characteristics are divided into two types. *Primary sexual characteristics* are directly related to reproduction and include the sex organs (genitalia). *Secondary sexual characteristics* are attributes other than the sex organs that generally distinguish one sex from the other but are not essential to reproduction, such as the larger breasts characteristic of women and the facial hair and deeper voices characteristic of men.

A Female Sexual Organs

Primary sexual characteristics of women include the external genitalia (vulva) and the internal organs that make it possible for a woman to produce ova (eggs) and become pregnant. The vulva includes the *mons pubis*, the most visible part of the woman's external genitalia, which is the pad of fatty tissue that covers the pubic bone and is commonly covered by pubic hair; the *labia majora*, the large outer lips; and the *labia minora*, the smaller, hairless inner lips that run along the edge of the vaginal opening and often fold over to cover it. The labia minora come together in front to form the clitoral hood, which covers the *clitoris*, a sensitive organ that is very important to the woman's sexual response. The opening of the *urethra*, the tubular vessel through which urine passes, is located midway between the clitoris and the vaginal opening. The area where the labia majora join behind the vagina is called the *fourchette*. The area of skin between the vaginal opening and the anus is the *perineum*. The *hymen* is a thin membrane that partially covers the vaginal opening. If the hymen is extensive and is still present at first intercourse, it may be broken or stretched as the penis enters the vagina and some bleeding and pain may occur, although more typically its presence is unnoticed. The presence or absence of a hymen is not a reliable indicator of virginity, although historically it was viewed as such.

The internal sex organs of the female consist of the vagina, uterus, fallopian tubes (or oviducts), and ovaries. The *vagina* is a flexible tube-shaped organ that is the passageway between the uterus and the opening in the vulva. Because during birth the baby travels from the uterus through the vagina, the vagina is also known as the birth canal. The woman's menstrual flow comes out of the uterus and through the vagina. When a man and a woman engage in vaginal intercourse, the penis is inserted into the vagina.

The *cervix* is located at the bottom of the uterus and includes the opening between the vagina and the uterus. The *uterus* is a muscular organ that has an inner lining (endometrium) richly supplied with blood vessels and glands. During pregnancy, the uterus holds and nourishes the developing fetus. Although the uterus is normally about the size of a fist, during pregnancy it is capable of stretching to accommodate a fully developed fetus, which is typically about 50 cm (about 20 in) long and weighs about 3.5 kg (about 7.5 lbs). The uterine muscles also produce the strong contractions of labor.

At the top of the uterus are the pair of *fallopian tubes* that lead to the ovaries. The two *ovaries* produce eggs, or ova (the female sex cells that can become fertilized), and female sex hormones, primarily estrogens and progesterone. The fallopian tubes have fingerlike projections at the ends near the ovaries that sweep the egg into the fallopian tube after it is released from the ovaries. If sperm are present in the fallopian tube, fertilization (conception) may occur and the fertilized egg will be swept into the uterus by *cilia* (hairlike projections inside the fallopian tube).

B Male Sexual Organs

The external sex organs of men are the penis and the scrotum. The *penis* is a sensitive organ important to reproduction and urination and to sexual pleasure. At its tip is the *glans*, which contains the *urethral opening*, through which urine passes. The ridge that separates the glans from the body of the penis is called the *corona* (Latin for “crown”), or *coronal ridge*. The glans and the corona are the most sensitive parts of the penis. The glans is covered with a *foreskin* (prepuce) unless the man has been circumcised, in which case the foreskin has been surgically removed.

The penis contains three cylinders of tissue that run parallel to the urethra. During sexual arousal, these tissues become engorged with blood and expand, causing the penis to enlarge and become erect (erection or tumescence). Men do not have a penis bone or a muscle that causes erection, as do some other animals.

The *scrotum* is a pouch that hangs below the penis and contains the two *testes*, which produce *sperm* (the male sex cell responsible for fertilization) and are considered part of the internal genitalia. The testes also are the primary producers of *testosterone* (male sex hormone) in men. Inside the testes are about 1,000 *seminiferous tubules* that manufacture and store the sperm. The scrotum can pull up closer to the body when the surrounding temperature is low and can drop farther away when the temperature is hot in order to keep the testes at an optimal, constant temperature somewhat lower than body temperature.

After sperm are produced, they move out of each testis and into the *epididymis*, a long tube coiled against the testis, where the sperm are stored and mature. The *vas deferens* transports the

sperm from the epididymis through the prostate, after which the vas deferens becomes the ejaculatory duct. Here, fluids from the prostate and *seminal vesicles* (small sacs that hold semen) combine with the sperm to form *semen*, a thick, yellowish-white fluid. The average discharge of semen, called ejaculate, contains approximately 300 million sperm.

III SEXUAL DEVELOPMENT

There are two periods of marked sexual differentiation in human life. The first occurs prenatally and the second occurs at puberty. Although adult women and men may differ greatly in genital appearance and secondary sexual characteristics, they are almost identical during prenatal development. When an egg and a sperm unite during fertilization, they each bring to the new cell half the number of chromosomes (threadlike structures that contain genetic material) present in other cells. From fertilization through about the first six weeks of development, male and female embryos differ only in the pair of sex chromosomes they have in each cell—two X chromosomes (XX) in females and one X and one Y chromosome (XY) in males. At this stage, both male and female embryos have undifferentiated *gonads* (ovaries or testes), two sets of *ducts* (one set capable of developing into male internal organs and the other into female organs), and undifferentiated external genital folds and swellings. *See Embryology.*

A Prenatal Sexual Development

About six weeks after conception, if a Y chromosome is present in the embryo's cells (as it is in normal males), a gene on the chromosome directs the undifferentiated gonads to become testes. If the Y chromosome is not present (as in normal females), the undifferentiated gonads will become ovaries.

If the gonads become testes, they begin to produce *androgens* (male hormones, primarily testosterone) by about eight weeks after conception. These androgens stimulate development of the one set of the genital ducts into the epididymes, vas deferens, and ejaculatory ducts. The presence of androgens also stimulates development of the penis and the scrotum. The testes later descend into the scrotum. Males also produce a substance that inhibits the development of the

second set of ducts into female organs. In the absence of such hormonal stimulation, female structures develop.

Prenatal hormones also play a role in the sexual differentiation of the brain. For example, prenatal hormones direct the development of sex differences in some cells and the neural pathways in the hypothalamus (the part of the brain that controls the endocrine system). Beginning at puberty, based on prenatal sexual differentiation, the hypothalamus directs either the cyclic secretion of sex hormones that controls the female menstrual cycle or the relatively continuous production of male sex hormones. Other brain differences may be related to differences in sexual and aggressive behavior or in cognitive and perceptual characteristics. Most of the research on sexual differentiation of the brain has been performed with animals or with biased human samples, and there is much debate about the nature and behavioral relevance of these differences in humans.

B Childhood

After birth, the process of sex-role socialization begins immediately. There may be small, physiologically-based differences present at birth that lead girls and boys to perceive the world or behave in slightly different ways. There are also well-documented differences in the ways that boys and girls are treated from birth onward. The behavioral differences between the sexes, such as differences in toy and play preference and in the degree of aggressive behavior, are most likely the product of complex interactions between the way that the child perceives the world and the ways that parents, siblings, and others react to the child. The messages about appropriate behavior for girls and boys intensify differences between the sexes as the child grows older.

It is not uncommon for children to touch or play with their genitals or to play games, such as “doctor” or “house,” that include sexual exploration. Such experiences are usually not labeled sexual by the children. Adults will often discourage such behavior and respond negatively to it. Generally by the age of six or seven, children develop a sense of privacy and are aware of social restrictions on sexual expression.

As the first bodily changes of puberty begin, sometime from the age of 8 to the age of 12, the child may become self-conscious and more private. During this period, more children gain experience with masturbation (self-stimulation of genitals). Surveys indicate that about one-third of all girls and about half of all boys have masturbated to orgasm by the time they reach the age of 13, boys generally starting earlier than girls. Because preadolescents tend to play with others of their own sex, it is not at all uncommon that early sexual exploration and experience may happen with other members of the same sex.

C Puberty

Puberty marks the second stage of physical sexual differentiation—the time when both primary and secondary sexual characteristics as well as adult reproductive capacity develop, and when sexual interest surges. Puberty typically begins in girls from 8 to 12 years of age, whereas boys start about two years later. The hypothalamus initiates pubertal changes by directing pituitary growth hormones and *gonadotropins* (hormones that control the ovaries and testes).

A girl's breasts grow, her pubic hair develops, and her body grows and takes on the rounded contours of an adult woman. This is followed by the first menstrual period (menarche) at about age 12 or 13 (although ages of onset range from 10 to 16.5), underarm-hair growth, and increased secretions from oil- and sweat-producing glands. It may take a year or two before menstruation and ovulation occur regularly. The hormones primarily responsible for these changes in young girls are the adrenal androgens, estrogens, progesterone, and growth hormone.

During puberty, a boy's testes and scrotal sac grow, his pubic hair develops, his body grows and develops, his penis grows, his voice deepens, facial and underarm hair appear, and secretions from his oil- and sweat-producing glands increase. Penile erections increase in frequency, and first ejaculation (thorarche) typically occurs sometime from the age of 11 to the age of 15. For a boy who has not masturbated, a nocturnal emission, or so-called wet dream, may be his first ejaculation. The ability to produce sperm may take another year or two and typically begins at about age 14. Growth hormone and androgens, particularly testosterone, are responsible for these pubertal changes in boys.

The fact that boys tend to develop more slowly than girls can cause some social awkwardness. Girls who have grown earlier may find themselves much taller than their dates, for example, and they may be more physically and psychologically mature than their male peers.

The first menstruation and first ejaculation are often considered the most important events of puberty, particularly for the individual. However, it is the development of the secondary sexual characteristics that serve as more apparent signals to others that the person is becoming a man or a woman. These signals lead to increasingly differential treatment of adolescent girls and boys by parents or other adults. The changes in hormone levels that occur during puberty may cause boys and girls to perceive the world in different ways, leading them to react differently to situations. Thus, puberty augments behavioral sex differences between young men and women. In some cultures and religions, puberty is recognized with rituals that mark the transition into adulthood.

D Adolescence

Whereas the term *puberty* refers to the period of physical maturation, the term *adolescence* typically refers to the socially defined period during which a person adjusts to the physical, emotional, and social changes associated with the transition from childhood to adulthood. Adolescence, which occurs from about the age of 12 to the age of 17 or older, is a period marked by increased sexual behavior. By the end of adolescence, two-thirds of young women and almost all young men have masturbated to orgasm. In recent decades, surveys indicate that more adolescents have begun engaging in intercourse at a younger age. However, studies of college students often find that 20 to 30 percent of these students have not had sexual intercourse. Adolescence can be particularly difficult for teens who feel different from their peers. Sexually active adolescents may wonder if their peers are abstinent, while sexually inactive adolescents may believe that their peers are sexually active. Others may struggle with same-sex attractions.

Sexual orientation may become a question during puberty or adolescence. The term *sexual orientation* refers to a person's erotic, romantic, or affectional attraction to the other sex, the same sex, or both. A person who is attracted to the other sex is labeled *heterosexual*, or sometimes *straight*. A person attracted to the same sex is labeled *homosexual*. The word *gay* may

be used to describe homosexuals and is most often applied to men, whereas the term *lesbian* is applied to homosexual women. A person who is attracted to both men and women is labeled *bisexual*. A *transsexual* is a person whose sense of self is not consistent with his or her anatomical sex—for example, a person whose sense of self is female but who has male genitals. Homosexuality is not synonymous with *transsexuality*. Homosexual men's sense of self is male and lesbian women's sense of self is female.

E Adulthood

In adulthood, more permanent relationships, in the form of marriage or cohabitation, become prevalent. The frequency of sexual activity is different for different individuals. People in monogamous relationships often engage in sexual activity more frequently than those who have several partners. It is not unusual for some new couples to have sexual intercourse almost every day, but in general, among married or cohabiting couples, the frequency of sexual intercourse tends to decline the longer the two people are together.

Many individuals remain sexually active throughout their older years. According to *Love, Sex, and Aging* (1984), by American social historian Edward Brecher, a book about sex among older people in the United States, 33 percent of women 70 years of age and older and 43 percent of men in the same age range report that they still masturbate, and 65 percent of married women and 59 percent of married men in that age range report that they still have sexual intercourse with their spouses.

As people age, they may experience physical changes, illnesses, or emotional upheavals, such as the loss of a partner, that can lead to a decline in sexual interest and behavior. In women, there is a gradual decline in the function of the ovaries and in the production of estrogen. The average age at which *menopause* (the end of the menstrual cycle) occurs is about 50. Decreased estrogen leads to thinning of the vaginal walls, shrinking of the vagina and labia majora, and decreased vaginal lubrication. These conditions can be severe enough to cause the woman pain during intercourse. Women who were sexually active either through intercourse or through masturbation before menopause and who continue sexual activity after menopause are less likely to experience vaginal problems. Women can use hormone-replacement therapy or hormone-containing creams

to help maintain vaginal health. In men, testosterone production declines over the years, and the testes become smaller. The volume and force of ejaculation decrease and sperm count is reduced, but viable sperm may still be produced in elderly men. Erection takes longer to attain, and the time after orgasm during which erection cannot occur (the refractory period) increases. Medications and vascular disease, diabetes, and other medical conditions can cause erectile dysfunction.

IV PHYSIOLOGY OF SEX

Understanding the processes and underlying mechanisms of sexual arousal and orgasm is important to help people become more familiar with their bodies and their sexual responses and to assist in the diagnosis and treatment of sexual dysfunctions. Nevertheless, it was not until the work of American gynecologist William H. Masters and American psychologist Virginia Johnson that detailed laboratory studies were conducted on the physiological aspects of sexual arousal and orgasm in a large number of men and women. Based on data from 312 men and 382 women and observations from more than 10,000 cycles of sexual arousal and orgasm, Masters and Johnson described the human sexual response cycle in four stages: excitement, plateau, orgasm, and resolution.

In men who are unaroused, the penis is relaxed, or flaccid. In unaroused women, the labia majora lie close to each other, the labia minora are usually folded over the vaginal opening, and the walls of the vagina lie against each other like an uninflated balloon.

A Excitement

The excitement stage of sexual arousal is characterized by increased blood flow to blood vessels (vasocongestion), which causes tissues to swell. In men, the tissues in the penis become engorged with blood, causing the penis to become larger and erect. The skin of the scrotum thickens, tension increases in the scrotal sac, and the scrotum is pulled up closer to the body. Men may also experience nipple erection.

In women, vasocongestion occurs in the tissue surrounding the vagina, causing fluids to seep through the vaginal walls to produce vaginal lubrication. In a process similar to male erection,

the glans of the clitoris becomes larger and harder than usual. Muscular contraction around the nipples causes them to become erect. However, as the excitement phase continues, vasocongestion causes the breasts to enlarge slightly so that sometimes the nipples may not appear erect. Vasocongestion also causes the labia majora to flatten and spread apart somewhat and the labia minora to swell and open. The upper two-thirds of the vagina expands in a “ballooning” response in which the cervix and the uterus pull up, helping to accommodate the penis during sexual intercourse.

Both women and men may develop “sex flush” during this or later stages of the sexual response cycle, although this reaction appears to be more common among women. Sex flush usually starts on the upper abdomen and spreads to the chest, resembling measles. In addition, pulse rate and blood pressure increase during the excitement phase.

B Plateau

During the plateau stage, vasocongestion peaks and the processes begun in the excitement stage continue until sufficient tension is built up for orgasm to occur. Breathing rate, pulse rate, and blood pressure increase. The man's penis becomes completely erect and the glans swells. Fluid secreted from the Cowper's gland (located near the urethra, below the prostate) may appear at the tip of the penis. This fluid, which nourishes the sperm, may contain active sperm capable of impregnating a woman. In women, the breasts continue to swell, the lower third of the vagina swells, creating what is called the orgasmic platform, the clitoris retracts into the body, and the uterus enlarges. As the woman approaches orgasm, the labia majora darken.

C Orgasm

Orgasm, or climax, is an intense and usually pleasurable sensation that occurs at the peak of sexual arousal and is followed by a drop in sexual tension. Not all sexual arousal leads to orgasm, and individuals require different conditions and different types and amounts of stimulation in order to have an orgasm. Orgasm consists of a series of rhythmic contractions in the genital region and pelvic organs. Breathing rate, pulse rate, and blood pressure increase

dramatically during orgasm. General muscle contraction may lead to facial contortions and contractions of muscles in the extremities, back, and buttocks.

In men, orgasm occurs in two stages. First, the vas deferens, seminal vesicles, and prostate contract, sending seminal fluid to the bulb at the base of the urethra, and the man feels a sensation of ejaculatory inevitability—a feeling that ejaculation is just about to happen and cannot be stopped. Second, the urethral bulb and penis contract rhythmically, expelling the semen—a process called ejaculation. For most adult men, orgasm and ejaculation are closely linked, but some men experience orgasm separately from ejaculation.

In women, orgasm is characterized by a series of rhythmic muscular contractions of the orgasmic platform and uterus. These contractions can range in number and intensity. The sensation is very intense—more intense than the tingling or pleasure that accompany strong sexual arousal.

D Resolution

During resolution, the processes of the excitement and plateau stages reverse, and the bodies of both women and men return to the unaroused state. The muscle contractions that occurred during orgasm lead to a reduction in muscular tension and release of blood from the engorged tissues.

The woman's breasts return to normal size during resolution. As they do, the nipples may appear erect as they stand out more than the surrounding breast tissue. Sex flush may disappear soon after orgasm. The clitoris quickly returns to its normal position and more gradually begins to shrink to its normal size, and the orgasmic platform relaxes and starts to shrink. The ballooning of the vagina subsides and the uterus returns to its normal size. Resolution generally takes from 15 to 30 minutes, but it may take longer, especially if orgasm has not occurred.

In men, erection subsides rapidly and the penis returns to its normal size. The scrotum and testes shrink and return to their unaroused position. Men typically enter a refractory period, during which they are incapable of erection and orgasm. The length of the refractory period depends on the individual. It may last for only a few minutes or for as long as 24 hours, and the length generally increases with age. Women do not appear to have a refractory period and, because of this, women can have multiple orgasms within a short period of time. Some men also experience

multiple orgasms. This is sometimes related to the ability to have some orgasms without ejaculation.

V SEXUAL RISKS

There are a number of pressing sexually related public health and social policy issues facing countries around the world today. According to the United States Centers for Disease Control and Prevention, in the United States a teen becomes pregnant every 30 seconds, and every 13 seconds a teen contracts a sexually transmitted infection (STI). For most people in the United States, engaging in heterosexual intercourse without the use of a condom is the behavior that puts them at greatest risk for infection with human immunodeficiency virus (HIV), which can lead to acquired immunodeficiency syndrome (AIDS) and is often ultimately fatal. Although there is currently no cure for AIDS, there are medications that can help delay the onset of symptoms. Another serious sexually transmitted disease is syphilis, which if left untreated for many years, can lead to paralysis, psychiatric illness, and death. Gonorrhea and chlamydia may produce no obvious symptoms in a woman, but they can lead to sterility if she is not treated. Sexually transmitted diseases should be diagnosed and treated by qualified medical practitioners, and all sexual partners must be treated in order to avoid reinfection.

Individuals can reduce their exposure to such sexual risks by practicing abstinence, using appropriate methods of contraception to avoid unwanted pregnancies, and using safer sex practices. Such practices include using condoms to avoid exchanging bodily fluids, limiting the number of sexual partners, and restricting sexual behaviors to those with less risk, such as manual stimulation and massage.

VI SEXUAL DYSFUNCTIONS

Sexual dysfunctions are problems with sexual response that cause distress. *Erectile dysfunction* (impotence) refers to the inability of a man to have or maintain an erection. *Premature ejaculation* occurs when a man is not able to postpone or control his ejaculation. *Inhibited male orgasm*, or *retarded ejaculation*, occurs when a man cannot have an orgasm despite being highly aroused.

Female orgasmic dysfunction (anorgasmia, or inhibited female orgasm) refers to the inability of a woman to have an orgasm. Orgasmic dysfunction may be primary, meaning that the woman has never experienced an orgasm; secondary, meaning that the woman has had orgasms in the past but cannot have them now; or situational, meaning that she has orgasms in some situations but not in others. *Vaginismus* refers to a spastic contraction of the outer third of the vagina, a condition that can close the entrance of the vagina, preventing intercourse.

Dyspareunia refers to painful intercourse in either women or men. *Low sexual desire* is a lack of interest in sexual activity. *Discrepant sexual desire* refers to a condition in which partners have considerably different levels of sexual interest. These dysfunctions may be caused by physical problems such as fatigue or illness; the use of prescription medications, other drugs, or alcohol; or psychological factors, including learned inhibition of sexual response, anxiety, interfering thoughts, *spectatoring* (observing and judging one's own sexual performance), lack of communication between partners, insufficient or ineffective sexual stimulation, and relationship conflicts. In such cases, a qualified sex therapist can work with a physician, if necessary, to determine the cause and best treatment options.

VII STUDIES OF HUMAN SEXUALITY

Sexuality and lovemaking techniques have been studied in various cultures since ancient times. The *Kama Sutra*, written in India in the 2nd century BC, is one of the best-known ancient sex manuals. It discusses the spiritual aspects of sexuality and presents many sexual positions and techniques for enhancing enjoyment of intercourse.

In Europe and the United States, the scientific study of human sexuality began in the late 19th century during the Victorian Age, a time of repressive sexual norms. German psychiatrist Richard von Krafft-Ebing focused on what he considered to be the psychopathological problems of sex. Viennese physician Sigmund Freud, founder of psychoanalysis, considered sexuality central to his psychoanalytic theory. Havelock Ellis, an English physician, collected a wealth of information on sexuality from case histories, medical research, and anthropological reports. The first work in his series *Studies in the Psychology of Sex* was published in 1896. His scientific objectivity foreshadowed modern sexology. Early in the 20th century, German physician

Magnus Hirshfeld founded the first sex-research institute in Germany. He conducted the first large-scale sex survey, collecting data from 10,000 men and women. He also initiated the first journal for publishing the results of sex studies, and started a marriage-counseling service. Most of his materials were destroyed by the Nazis during World War II (1939-1945).

In the early 1930s, American anthropologist Margaret Mead and British anthropologist Bronislaw Malinowski began collecting data on sexual behavior in other cultures. The most noted scientific studies of sexuality in the 20th century are those of American biologist Alfred Charles Kinsey and his colleagues and those of William H. Masters and Virginia Johnson. Kinsey began interviewing people about their sexual histories in 1938, and with his colleagues he published *Sexual Behavior in the Human Male* (1948) and *Sexual Behavior in the Human Female* (1953), based mostly on interviews with 5,300 white men and 5,940 white women. Masters and Johnson began their clinical studies of the physiology of sexual response and sexual dysfunctions in the 1950s. These observations were published in *Human Sexual Response* (1966) and *Human Sexual Inadequacy* (1970), among others. Smaller studies have confirmed many of the findings of these pioneering sex researchers and have challenged certain others. The AIDS crisis has prompted a number of contemporary surveys of sex, including the National Health and Social Life Survey, the results of which were published in the book *Sex in America* (1994). As in any area of science, particularly relatively new and sensitive areas such as sex research, these studies have been criticized, on the basis of their findings and methodologies, but each study brings us closer to a fuller understanding of human sexuality.

Contributed By:

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SYRINGE

Syringe, device used to eject or collect fluids. A syringe consists of a hollow barrel made of glass, plastic, or metal with a close-fitting plunger or a rubber bulb on one end. The other end of the barrel has a nozzle which may be designed to accept a needle or other attachment. The barrel

fills by suction when the plunger is pulled out, or when the bulb is compressed and subsequently allowed to inflate. Pushing in the plunger or squeezing the bulb forces the fluid out through the needle or nozzle.

Syringes come in many sizes and serve many purposes. The small syringe used in medicine to give hypodermic injections (forceful introduction of medication or fluid beneath the skin) has a plunger and a fine hollow needle. Its barrel is calibrated, featuring a set of equally spaced marks that measure the volume of its contents. The larger medical syringes used to cleanse wounds or body cavities, or to extract unwanted fluids from the body, have wider, flexible nozzles on one end and rubber bulbs on the other end.

Sharing unsterilized syringes can cause serious health problems. Human immunodeficiency virus (HIV), which may lead to acquired immunodeficiency syndrome (AIDS), has been spread by infected substance abusers who share the same syringe to inject intravenous drugs. The viruses that cause hepatitis A and hepatitis B, both of which inflame the liver, are also commonly transmitted through the use of shared needles and syringes.

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