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An Insight Into the Hormones of Life

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Human sexual response begins virtually from the moment of birth. An evident manifestation of sexuality occurs during breast feeding, when the newborn child takes pleasure and comfort from the sheer physical proximity of the mother. It has also been recorded that newborn babies have displayed all the visible and somatic signs of orgasm: tumescence, increased rates of blood circulation and heartbeat, changes in breathing, and flushing of the skin.

I guess the best advice I can give is: If you just relax, everything will turn out o.k. Everyone goes through the same changes sooner or later, so you're not alone.

This unit, An Insight Into the Hormones of Life, is developed to provide an environmental challenge in the area of Home Economics. Sixth, seventh, eighth, and learning center students will be exposed to this unit.

The unit will consist of the following areas: The background of hormones, how hormones work, a few of the scientist who have contributed to the structure of hormones; the major glands in the human body affected by hormones, the diseases affecting the hormones; and the molecular structure of the hormones. Also, how do the hormones work. A specific area will be developed on classroom activities. A list of resources will be included for the teacher and students.

This unit is designed to last approximately six to seven weeks and will include the viewing of filmstrips, visual aids, and an area of listening skills will be developed from experts in the field pertinent to the materials discussed. There will be open forums by teens on sex and its relationship to others of the same or different peer age.

Questions that are considerably important to teachers and students are the following:

1. On what points do you introduce the human anatomy to students? How much do you expose them to?
2. Compare the various backgrounds of the students involved. What clues do they offer which help you to access their backgrounds and individuals views?
3. At which point in the unit should I begin to expose the students to visual aids of the human anatomy?
4. What programs are available for the students to discuss the hormones in secrecy?

5. Are parents going to be receptive to this unit? Should letters go home and alert the parents? Why?
6. Is love the only satisfactory answer to the problem of human existence?
7. Assuming good health for yourself and others, what is the one situation that you would least like to encounter in life?
8. To biologically discuss the male and female, how blunt are the tools of psychology and sociology going to be understood?
9. What is the age of puberty in males and females? How is this determined?
10. Do we have all of the information to discuss diseases of the hormones?

The objectives of this unit are the following:

a. name the glands of the endocrine system,
b. distinguish between endocrine and exocrine glands,
c. explain the function of hormones,
d. describe the effects of specific hormones found in the body,
e. explain conditions resulting from improper functioning of certain glands,
f. provide relevant material and information for the students achievement,
g. use the excitement of sex education as a catalyst for our youth of today and tomorrow,
h. and, provide teachers with current updated curriculum materials which can be infused into their home economics curriculum.

The Brain

From our experience, we know that the brain plays an important role in our sexuality. Our thoughts, emotions, and memories are all mediated through its complex mechanisms. Sexual arousal can occur without any sensory stimulation: it can be produced by the process of fantasy (in this case, thinking of erotic images or sexual interludes), and some individuals may even reach orgasm during a fantasy experience.
(figure available in print form)
We know that specific events can cause us to become aroused. Less apparent is the role of individual experience and cultural influence, both of which are mediated by our brains. Clearly, we do not all respond similarly to the same stimuli. Some people may be highly aroused if the partner uses explicit sexual language.

Others may find such words to be threatening or a sexual turnoff. Similarly, the smell of genital secretions may be more arousing to many Europeans than to members of our own deodorant-conscious society. The brain is the storehouse of our memories and cultural values and, consequently, its influence over our sexual arousability is profound.

Strictly mental events like fantasies are the product of the cerebral cortex, the “gray matter” that controls higher functions like reasoning and language abilities.

But the cortex represents only one level of functioning at which the brain influences human sexual arousal and response. At a subcortical level, the limbic system seems to play an important part in determining sexual behavior, both in humans and in other animals.

In the diagram of the brain, it shows some key structures in the limbic system. These include the cingulate gyrus, the septal area, the amygdala, the hippocampus, and parts of the hypothalamus, which plays a regulating role. There is evidence linking various sites in this system with sexual behavior. For instance, several animal studies have implicated the hypothalamus in sexual functioning. Researchers have reported increased sexual activity in rats, including erections and ejaculations, triggered by stimulation in both anterior and posterior regions of the hypothalamus. When certain parts of the hypothalamus are surgically destroyed, there may be a dramatic reduction in the sexual behavior of both males and females of several species.

Lesson Plan—The Brain—Pituitary Gland

Student Objective

The student will be able to describe the functions of the parts of the brain.
The student will be able to explain the action of a reflex.

Preparation
Much interesting research has been done on right- and left-brain dominance. Have students research the

phenomenon and share the descriptions.

Draw the brain on the chalk board. Have students come up, label a part, and explain to the rest of the class what it does.

(figure available in print form)
The physical self-exploration that children carry on throughout early childhood indicates that a considerable degree of pleasure is obtained by means of the sense of touch. Sexual exploration of other children also begins at this stage. Young children manifest a high level of curiosity about, and a developing awareness of, the anatomy of other persons—adults as well as children.

This alertness also extends to words, gestures, and other cues that have Sexual connotations. Instead of using this innate curiosity and taking advantage of the opportunity the home environment provides for imparting information, many parents, following tradition, chastise the child.

Increased sexual awareness and exploration, together with a number of other experiences during the middle years of childhood, combine to form the child's sense of gender identity. Most children are gradually programmed for sex-role identification through selected clothing and toys, teachings, confrontations, and parental models.

The developmental stage of puberty is significant in all respects, and the appearance of the secondary sex characteristics perhaps most Significant of all. (Hormonal changes during puberty will be discussed throughout this paper.) The capacity to produce reproductive cells first occurs during this stage. On the average, girls experience the onset of menstruation at about age 12, but ovulation does not begin until approximately one year later. At about age 13 or 14, boys normally begin to be capable of ejaculation, although a number of them have already been experiencing satisfying Sexual play.

Any distinctive departure from the norm regarding the size of the adolescent breasts or penis may cause an individual acute embarrassment and suffering. Adolescent boys and girls prefer to remain inconspicuous at this stage of development and to appear as much like their companions as possible. Although today's youth are often considered to be more worldly and precocious than their counterparts in the decades before the 1960's, adolescence, nevertheless, continues to be a period of confusion, embarrassment, and sometimes fear. Some young females are kept in such total ignorance about their sexual development that the first menstrual period becomes a surprising, if not terrifying, event.

The Senses

It has been said that the brain is the most important sense organ for human sexual arousal. This observation implies that any sensory event, if properly interpreted by the psyche, can serve as an effective sexual stimulus. The resulting variety in the sources of erotic stimulation helps to explain the tremendous sexual complexity of humans.

Of the major senses, touch tends to predominate during sexual sharing. However, all of the senses have the potential to become involved, and sights, smells, sounds, and tastes all may be important contributions to erotic arousal. There are no blueprints for the what and how of sensory Stimulation. Each of us is unique with our own individual triggers of arousal. There can be a special joy in discovering these "magic buttons" in

ourselves or a sexual partner.

(figure available in print form)

Touch. Stimulation of the various skin surfaces is probably a more frequent source of human sexual arousal than any other type of sensory stimulus. The nerve endings that respond to touch are distributed unevenly throughout the body, and this explains why certain areas are more sensitive than others. Those locations that are most responsive to tactile pleasuring are commonly referred to as the erogenous zones. A distinction is often made between primary erogenous zones—those areas that contain dense concentrations of nerve endings—and secondary erogenous zones, which include other areas of the body that have become endowed with erotic significance through several conditioning.

A list of primary erogenous zones generally includes the genitals, buttocks, anus, perineum, breasts (particularly the nipples), inner surfaces of the thighs, armpits, navel, neck, ears (especially the lobes), and the mouth (lips, tongue, and the entire oral cavity).

It is important to remember, however, that just because a given area qualifies as a primary erogenous zone, there is no guarantee that stimulating it will produce arousal in a sexual partner. What is intensely arousing for one person may produce no reaction in another; it may even be irritation to people.

The secondary erogenous zones include virtually all other regions of the body. For example, if your lover tenderly kissed and stroked your upper back during each sexual interlude, it is distinctly possible that this area would soon be transformed into a powerful erogenous zone. These secondary locations become eroticized because they are touched within the context of Sexual intimacies.

Vision. In our society we seem to be preoccupied with visual stimuli. Prime evidence is the importance we often place on physical appearance, including such activities as personal grooming, wearing the right clothes, and the extensive use of cosmetics. Therefore, it is not surprising that vision is second only to touch in the hierarchy of stimuli that most people view as sexually arousing.

The popularity of sexual explicit men’s magazines in our society suggests that the human male is more aroused by visual stimuli than the female. Early research seemed to support this conclusion. Kinsey found that more men than women reported being sexually excited by visual stimuli such as pinup erotica and stag shows.

Smell. A person’s sexual history and cultural conditioning often influence what smells he or she finds arousing. We typically learn through experience to view certain odors as erotic and others as offensive. From this perspective there may be nothing intrinsic to the fragrance of genital secretions that might cause them to be perceived as either arousing or distasteful. We might also argue the contrary—that the Smell of genital secretions would be universally exciting to humans were it not that some people learn to view them as offensive. This latter interpretation is supported by the fact that Some societies openly recognize the value of genital smells as a sexual stimulant. For example, on the European continent, where the deodorant industry is less persuasive, some women use the natural bouquet of their genital secretions, strategically placed behind an ear or in the nape of the neck, to induce arousal in their sexual partners.

Taste. As with smell, taste seems to play a relatively minor role in human sexual arousal. This is no doubt influenced, at least in part, by an industry that promotes breath mints and flavored vaginal sprays. In addition to making many individuals extremely self-conscious about how they taste or smell, such as commercial products may mask any natural tastes that relate to sexual activity. Nevertheless, some people are still able

to detect and appreciate certain tastes they learn to associate with sexual sharing.

Hearing. Whether people make sounds during Sexual sharing is highly variable; so is their partner's response. Some people find words, moans, and orgasmic cries to be highly arousing; others prefer that theirs lover keep silent during sex play.

Some people may make a conscious effort to suppress spontaneous noises during sex play. If this is a result of the silent, stoical image accepted by many males, it may be exceedingly difficult for men to talk, cry out, or groan during arousal. In one research study many women reported that their male partner's silence hindered their own sexual arousal. Female reluctance to emit sounds during sex play may be influenced by the belief that "nice" girls are not supposed to be so passionate that they make noises.

Sensory stimulation will usually not be effective unless the appropriate emotional conditions are also present. Feelings of trust, of being wanted and cared for, and affection for one's partner often enhance our sexual response; in fact, they may be necessary ingredients. In contrast, feelings of being used, lack of emotional rapport, or negative emotions like guilt and anxiety often eliminate or restrain our capacity for erotic arousal.

Lesson—The Five Senses

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1. Name the parts of the eye, ears, etc.
    a. What is the disease affecting the eye
2. What glands and hormonal effect do the senses formulate and function for the body?
3. Where are they located?
4. Name the glands (hormones) found in the five senses.

Foods and Chemicals

Up to this point we have considered the impact of hormones, brain processes, and sensory input on human sexual arousal. There are other factors, though, that may affect a person's arousability in a particular situation. Some of these directly affect the physiology of arousal; other can have a strong impact on a person's sexuality through the power of belief. In the paragraphs that follow, I will examine the effects of a number of products people use to attempt to heighten or reduce sexual arousal.

Aphrodisiacs: Do They Work? An aphrodisiac (named after Aphrodite, the Greek goddess of love and beauty) is a substance that supposedly arouses sexual desire or increases a person's capacity for sexual activities.

Almost from the beginning of time, people have searched for magic potions and other agents able to revive flagging erotic interest or produce Olympic sexual performances. That many have reported finding such

sexual stimulants bears testimony, once again, to the powerful role played by the mind in human Sexual activity. I will just consider a variety of foods that have been held to possess aphrodisiac qualities, then turn our attention to other alleged sexual stimulants, including alcohol and an assortment of chemical substances.

Foods. almost any food that resembles the male external genitals has, at one time or another, been viewed as an aphrodisiac. Many of us have heard the jokes about oysters, although, for some a belief in the special properties of this particular shellfish is no joking matter. One wonders to what extent the oyster industry profits from this persuasive myth. Other foods sometimes considered aphrodisiacs include bananas, celery, tomatoes, and potatoes. Particularly in Asian countries, there is a widespread belief that the ground-up horns of animals such as rhinoceros and reindeer are powerful sexual stimulants. Have you ever used the term "horny" to describe a sexual state? Now you know its origin.

A number of drugs are also commonly thought to have aphrodisiac properties. Some of these are discussed in the appendix.

Alcohol. More has been written about the supposed stimulant properties of alcohol than about any other presumed aphrodisiac substance. In our culture there is widespread belief in the erotic enhancement properties of alcoholic beverages.

A recent study has revealed that alcohol consumption may inhibit a person's ability to consciously suppress sexual arousal. In this investigation, male college students were told to try as hard as they could to suppress sexual arousal while listening to an audiotape that describe an explicit sexual experience. some of the subjects were sober and some were under the influence of alcohol when they listened to the tape.

Drugs and other chemicals. Perhaps the most famous drug to be an aphrodisiac is cantharides, also known as "Spanish fly." This substance is derived from the ground-up bodies of a species of beetle found in southern Europe. Taken internally, it travels to the bladder and is excreted in the urine. It acts as a powerful irritant, causing acute inflammation of the lining of the bladder and urethra as it passes our of the body. This stimulation of genital structures has resulted in the widespread reputation of cantharides as an aphrodisiac. In reality, "Spanish fly" can be extremely painful to people of both sexes, producing effects ranging from mild irritation to extensive tissue destruction and even death, depending on the dose. It is completely useless as a sexual stimulant, and its dangerous side effects make it a substance to be avoided.

Marijuana has also been widely extolled for its sexual enhancement properties. It acts similarly to alcohol to reduce inhibitions. In addition, marijuana may increase empathy with others, distort time perception (often with the resulting illusion of prolonged arousal and orgasm), and increase suggestibility—all of which may act independently or in combination to produce a sense of heightened sexual ecstasy. A number of studies have revealed that a majority of males and females who have combined marijuana use with sexual expression report that the drug enhances their sexual pleasure.

Cocaine, a drug extracted from the leaves of the coca shrub, is a powerful central nervous system stimulant reputed by some to be an aphrodisiac. It is usually taken either by injection or sniffing ("snorting"). Some users claim it induces an immediate "orgasm-like rush." Others report that orgasms increase in frequency and intensity while a person is under its influence. However, as with all drugs previously discussed, there is no legitimate biological evidence establishing cocaine as an aphrodisiac. Any reported improvements generally belong to the "loosening of inhibitions" or "enhancement of well-being" categories. Recent evidence suggests that frequent use of cocaine may have a number of negative effects upon sexual function, including reduced vaginal lubrication, inhibited erectile response, and diminished sexual interest.

Barbiturates (commonly called “barbs” or “downers”), used in the treatment of a variety of mental and physical conditions, may subjectively enhance sexual pleasure in some individuals by lessening inhibitions in a way similar to alcohol.

In view of the evidence many of the commonly held beliefs about aphrodisiacs, why do so many people around the world swear by the effects of a little powdered rhino horn, that special meal of oysters and banana salad,, or the marijuana cigarette before an evening’s dalliance? The answer lies in faith and suggestion—these are the ingredients frequently present when aphrodisiac claims surface. If a person believes something will improve his or her own life, this faith is often translated into the subjective enhancement of sexual pleasure. From this perspective, literally anything has the potential of serving as a Sexual stimulant.

Lesson Plan—Drugs affecting the Glands

Name some aphrodisiacs.

What are the affects of them.

Give the street name for them.

What side effects do they have on the hormones.

Study Questions

TEST YOURSELF ON CRACK

Directions: Fill in the blanks below using Some of the vocabulary words and information from this issue.

1. Crack is a chemically treated form of the drug. ___
2. Crack gets into the body when it is ___.
3. In the brain, crack blocks the neurotransmitters and ___ the nerve cells.
4. The extra blood flow to the brain creates a feeling of ___ , a sense of being able to do anything.
5. One hit of crack creates an intense high that lasts for ___ .
6. The feeling that comes right after the high is the ___ .
7. Crack users may become addicted in about a ___ .
8. What dangerous side effects can come from crack use?

   ___ ___

   ___ ___
9. What signs might tell you that a friend has started using crack?

   ___ ___

   ___ ___

10. Imagine that a friend of yours—someone you admire—invites you to try some crack, free of charge. In the space below, write your response and explain why you'd choose that response.

_____
_____
_____
_____.

Sexual Differentiation

Sexual differentiation is a sequential process beginning with the establishment of chromosomal sex at fertilization, followed by the development of gonadal sex, and culmination in the development of secondary Sexual characteristics, collectively termed the male and female phenotypes.

Chromosomal Sex

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Gonadal Sex

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Phenotypic Sex

The paradigm for sexual differentiation.

Development of Gonadal Sex

The gonadal ridges are formed during the third and fourth weeks of embryogenesis by a proliferation of the coelomic epithelium and condensation of the underlying mesenchyme on each side of the midline between the primitive kidney (mesomesenchyme) and the dorsal mesentery. Initially these gonadal primordia do not

contain germ cells; the germ cells are located in the endodum of the yolk sac near the allantoic evagination. During the fifth week of gestation the germ cells begin to leave the primitive gut and migrate through the mesentery to the gonadal ridges. During their migration, they increase in number by means of mitotic division.

By the sixth week of gestation, germ cell migration is completed and the gonads of the male and female embryo are indistinguishable. At this time they are composed of three distinct cell types: (1) germ cells, (2) supporting cells that are derived from the coelomic epithelium of the genital ridge and that will differentiate either into Sertoli cells of the testes or the granulosa cells of the ovary, and (3) stromal (interstitial) cells derived from the mesenchyme of the gonadal ridge. During the seventh week of gestation, the fetal testis begins to differentiate: The primitive seminiferous tubules form first, followed by differentiation of the interstitial cells and the onset of testosterone formation on the interstitial cell compartment at approximately eight weeks.

(figure available in print form)
The limiting of prenatal sexual differentiation in the human.

Male Development

The initial event in the virilization of the male urogenital tract the onset of miillerian duct regression, which coincides with the development of the spermatogenic cords in the fetal testis at approximately eight weeks of gestation.

The transformation of the wolffian ducts into the male genital tract begins after the onset of miillerian duct regression. The mesonephric tubules adjacent to the testis (the epigenital tubules) lose their primitive glomeruli and establish contact with the developing rete and spermatogenic tubules of the testis to form the efferent ductules of the testis. The portion of the wolffrain duct immediately caudal to the efferent ductules becomes elongated and convoluted to form the epididymis, and the middle portion of the duct develops thick muscular walls to become the vas deferens.

(figure available in print form)
At about the thirteenth week of gestation, the seminal vesicles begin to develop from the lower portions of the wolffian ducts near the urogenital sinus. The terminal portions of the ducts between the developing seminal vesicles and the urethra become the ejaculatory ducts and the ampullae of the vas deferens.

The prostatic and membranous portions of the male urethra develop from the pelvic portion of the urogenital sinus. At about 10 weeks of gestation prostatic buds begin to form in the mesenchyme surrounding the pelvic urethra. The budding is most extensive in the area surrounding the entry of the wolffian ducts (the ejaculatory ducts) into the male urethra. Although differentiation of the prostate occurs early in embryogenesis, growth and development of the gland continue into postnatal life.

(figure available in print form)

Female Development

The internal reproductive tract of the female is formed from the miillerian ducts, and the wolffian ducts for the most part degenerate. The cephalic ends of the miillerian ducts (the portions derived from coelomic epithelium) are the anlagen of the Fallopian tubes, and the caudal portions fuse to form the uterus. The cervix of the uterus can be recognized by nine weeks of development, and the formation of the muscular walls of the

uterus (myometrium) from the mesenchyme that surrounds the miillerian ducts is completed by approximately 17 weeks of age.

Development of the vagina begins at approximately nine weeks of gestation wit the formation of a solid mass of cells (the uterovaginal plate) between the caudal buds of the miillerian ducts and the dorsal wall of the urogenital sinus. The cells of the uterovaginal plate subsequently proliferate, thus increasing the distance between the uterus and urogenital sinus. At 11 weeks of development a lumen begins to from in the caudal end of the vaginal plate, and by 20 weeks gestation the vagina is completely canalized. It is currently believed that the upper one-third of the vagina is derived from the miillerian ducts and the remainder is derived from the urogenital sinus.

(figure available in print form)

The Background of Hormone

The endocrine glands, ductless glands which pour their secretions directly into the blood stream. The first scientific study of the endocrine glands was made by Berthold in 1849 when he observed that the hemlike changes in the body build and behavior which occurred in castrated cocks could be reversed by transplanting healthy testes into the operated animal. This effect resulted from the secretion of hormones from the transplanted tissues into the blood stream of the cock.

The endocrine system includes the pituitary gland, the thyroid, the adrenals, the ovaries, the testes, the parathyroids, the pancreas, and in pregnancy, the placenta (the afterbirth). While the structural features of these glands are different, they are all alike in having a large number of secretory cells, a well-developed blood supply, and no ducts.

The endocrine secretions, the hormones, are often aptly described as “chemical messengers,” since by their action they enable one part of the body to regulate the activity of another part. Hormones help control the pace of body activity, the rate of growth, the reproductive cycles, and the physical characteristics which distinguish men from women. The hormones are not usually stored to any great extent in the glands or the tissues and they must, consequently, be continuously produced. The exact mechanism of their action is not known, but it has been established that hormones alter the rate of metabolic reactions rather than initiate them. All hormones bind a receptor on their target cells. Some hormone receptor complexes effect enzyme reactions, while others act on the DNA in the cell nucleus or promote the release of packaged hormones. Hormones are generally effective in minute amounts. Comparatively small fluctuations in the supply of these substances can spell the difference between a normal individual and a dwarfed, deformed, or mentally retarded person.

As you can see from the diagram, the endocrine glands are pretty well scattered throughout the body. Location is unimportant because hormones can reach any part of the body in seconds, and only tiny amounts are needed. For example, the entire quantity of adrenalin in your blood, under emergency conditions, would be much less than 1/1,000,000th of an ounce. Other hormones circulate in larger amounts than this, but the amounts are still very tiny. Yet these hormones have a tremendous influence on the workings of the entire body.

Puberty is a time of growth and change for both boys and girls. The process of puberty begins when male and

female hormones are released into the bloodstream. Hormones are chemicals which cause body growth and change.

During puberty both boys and girls will:

Grow very quickly.

Sometimes feel clumsy.

Perspire more and have body odor.

Develop oily skin and some pimples.

Notice aching muscles and joints. (Yes, “growing pains” are real!)

Even though lots of the changes are the same, girls usually begin puberty a year or two before boys.

BOYS
Between the ages of 10 and 16, boys’ bodies begin these changes:

*Shoulders broaden.
*Muscles grow.
* Hair grows under arms; on arms, legs, chest and face; and around penis and testicles (pubic area).
* Penis and testiclesgrow larger. One testicle usually hangs lower than the other. This is normal.
*Sometimes boys breasts become very tender and grow a little. This is normal and will go away in a year or so
* Voice gets deeper.

GIRLS
Between the ages of 9 and 16, girls’ bodies begin these changes:

*Hips broaden.
* Waist narrows.
*Hair grows under arms and around vulva and vagina (pubic area).
*Vagina, vulva and clitoris grow slightly.
*Breasts grow and develop. Sometimes one breast grows larger than the other. This is normal.
*Vagina discharges white, sticky substance. This is the vagina’s way of cleaning itself and is normal.

The body actually has two different coordination systems. One of them is the nervous system—the train, the spinal cord, and the network of nerves that runs through all parts of the body. The nervous system carries messages rapidly, somewhat like the network of telephone wires that criss-crosses a city. The other coordination system, the endocrine system, carries messages more slowly. For it takes longer for chemicals to be manufactured and carried through the bloodstream than it does for an electrical message to flash along as nerve. In this way, then, the endocrine system is more like the postal system of a city; letters take much longer to arrive than telephone calls, but they frequently carry very important information.

Often the body's two coordination systems work together. Messages sent along nerves may stimulate a gland to begin producing hormones. Or hormones may be carried to the brain or nerves and stimulate them to send out messages of their own. Adrenalin makes your heart beat faster and your hair stand on end when you are frightened. But at the same time, messages sent along certain nerves are helping produce the same affects and are also helping to stimulate your glands to make more adrenalin. Thus, both the nervous system and the endocrine system cooperate to help prepare your body for an emergency.

Tiny amounts of powerful drugs called hormones are manufactured daily inside your body. The chemical factories which do this are the endocrine glands. This name means "glands of internal secretion." They include the thyroid gland, the pituitary gland, the adrenal glands, and others.

Diseases Affecting the Hormones

As the blood flows through these glands, it picks up the hormones and carries them around the body. The hormones are needed to control the many complex chemical processes that go on inside your body. The chemistry of life would be impossible without them. If anything goes wrong with one of these glands, so that it produces too much or too little of one hormone or another, the body chemistry is upset and some diseases result.

One such disease is diabetes. The disease itself was known in ancient times. Its symptoms were described by Egyptian, Greek, and Roman doctors. But they did not have the slightest idea of what caused it. All they knew was that the victims of the disease began to waste away. They grew thinner and thinner and suffered constantly from a terrible thirst. Death ended their suffering.

The first important discovery about diabetes was made in the seventeenth century by an English doctor named Thomas Willis. He found that there was sugar in the urine of patients suffering from diabetes. A century later, another English doctor, Matthew Dobson, showed that in diabetes there was more sugar in the blood than is normal. But no one understood why these things were so.

Another century went by before a start was made toward clearing up the mystery. Strangely enough, this was done by doctors who had no thought of studying diabetes.

Toward the end of the nineteenth century, a German professor, Friedrich Naunyn, suggested that two of his assistants, Oscar Minkowski and Joseph von Mering, try to find out if the pancreas is necessary for life. The pancreas is a soft organ of pinkish-yellow color, about ten inches long, lying beside the stomach. It manufactures a digestive juice called the pancreatic juice, which flows into the small intestine. Minkowski and Von Mering operated on some dogs, removing their pancreas.

The mystery of diabetes was finally solved in our own century. The work of a number of medical scientists disclosed that the pancreas serves two purposes. It not only manufactures a digestive juice but also produces a hormone called insulin. It is produced by clusters of cells in the pancreas called the Islets of Langerhans.

The blood, as it flows through the pancreas, picks up insulin.

Klinefelter's Syndrome

Individuals with the Klinefelter syndrome typically have a 47,XXY karyotype and a predominantly male phenotype. Before puberty, patients have small testes with decreased numbers of spermatogonia, but otherwise they have a normal male phenotype. Most persons with the disorder come to the attention of physicians after the time of expected puberty because of infertility, breast enlargement (gynecolomastia), or incomplete virilization. Typical histologic changes in the testes include hyalinization of the spermatogenic tubules, absence of spermatogenesis, and normal Leydig cells. Bilateral, painless, gynecomastia usually appears during adolescence and may eventually become disfiguring. Most patients have a male psychosexual orientation and function physically and socially as men.

Endocrine findings include low to normal plasma testosterone and elevated levels of circulation estradiol. The precise source of the elevated plasma estradiol is not known but may be due to an increased testicular secretion, a decreased metabolic clearance rate, or an increased rate of testosterone conversion to estradiol in peripheral tissues. The net result of this imbalance in the androgen to estrogen ratio is varying degrees of insufficient virilization and enhanced feminization.

Circulating gonadotropins (especially follicle-stimulating hormone) are elevated as a consequence of the damage to the seminiferous tubule resulting in decreased feedback on the hypothalamic—pituitary system. Progressive sclerosis of the seminiferous tubules eventually leads to diminished testicular blood flow, diminished testosterone secretion, and enhanced levels of luteinizing hormone.

Gonadal Dysgenesis (Turner's Syndrome)

Gonadal dysgenesis a disorder in phenotypic females characterized by primary amenorrhea, lack of secondary sexual characteristics, short stature, multiple congenital anomalies, and bilateral streak gonads. The common chromosomal karyotype associated with this disorder is 45,X. Other affected individuals have mosaicism of this chromosomal complement with a 46,XX-containing cell line or structural abnormalities of one of the X chromosomes. The diagnosis is usually made in infancy or at the onset of puberty, when amenorrhea and failure of feminization are noted in conjunction with the other somatic abnormalities. The external genitalia are unambiguously female but remain immature. There is no spontaneous breast development . The internal genitalia consist of small but otherwise normal Fallopian tubes and uterus. Although primordial germ cells migrate to the gonads and are present transiently in embryogenesis, they disappear before birth. After the age of puberty the gonads are identifiable only as fibrous streaks in the broad ligament. Although individuals with gonadal dysgenesis differentiate as phenotypic females, the secondary sex characteristics do not develop properly due to lack of female sex hormones. Thus, it is apparent that normal ovarian development requires the presence of two functionally intact X chromosomes.

Disorders of Gonadal Sex

Disorders of gonadal sex occur when chromosomal sex is normal, but for one reason or another differentiation of the gonads is abnormal. Thus, depending on the time during embryogenesis when the gonadal defect is manifest, the chromosomal sex may or may not correspond to the phenotypic sex of the individual.

(figure available in print form)

The Molecular Structure of the Hormones

What has ACTH to do with the cortisone? Here we come to our first look at the complicated relations among the endocrine glands. Endocrines are the chemical bosses of the body. Their hormones regulate the body's activities. But each endocrine is regulated, too, and by hormones at that! Where do these hormones come from? They are secreted by the other endocrine glands and especially by the pituitary gland, which is sometimes called the master gland for this reason.

For example, among the many hormones secreted by the pituitary, there is one with the tongue-twisting name of adrenocorticotropic hormone. We get the name ACTH from the italicized letters. When ACTH reaches the adrenal cortex, it stimulates the secretion of corticoids, including cortisone.

(figure available in print form)

Appendix A

Vocabulary

Adrenocorticotropic Hormone (ACTH) —a hormone that triggers the manufacture and secretions of the outer layer of the adrenal glands.
Amenorrhea —the absence of menstruation.
Cortisone —a hormone that is produced by the adrenal cortex and works to control the metabolism of carbohydrates, fats, and proteins.
Dwarf —
Endocrine System—a system that works with the nervous system to regulate certain activities of the body.
Follicle-stimulatinq hormone—a hormonal substance released by the pituitary gland to stimulate the glands.
Gland —a cell, or group of cells, or an organ that secretes a substance.
Glucagon —a hormone secreted by the islets of Langerhans that stimulates the liver to convert a glycogen into glucose.
Gonadotropic hormones —pituitary secretions that stimulates the sex glands.
Gonad s—testes or ovaries; sex glands; the organs of reproduction.
Hormone —body chemicals that act as chemical regulators by stimulation a reaction in some part of the body, by producing changes in the body structures, and by regulating the rate of body metabolism.
Islets of Langerhans —small clusters of cells throughout the pancreas that secrete insulin and glucagon.
Menstruation —the expulsion of blood, mucous, and cells of the endometrium over a period of four to seven days at the end of the menstrual cycle.

Menopause —The female reproductive gland. It releases eggs and produces estrogen and progesterone.
Puberty — th e age when mature reproductive life begins, usually at about the twelfth year in the female and the fourteenth year in the male.
Simmond's disease —a rare disease that causes premature aging, muscle weakness, and a wasting away of the body.
Steroids —a group of chemical compounds secreted by the adrenal cortex that affect numerous bodily functions.
Thyroid-stimulating hormone (TSH) —a hormone that regulates both the size and activity of the thyroid gland.
Testes —males gonads; testicles.
Testosterone —the male sex hormone.

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