AMERICAN SOCIETY FOR REPRODUCTIVE MEDICINE

Formerly The American Fertility Society

Hirsutism and Polycystic Ovarian Syndrome

A Guide for Patients

PATIENT INFORMATION SERIES

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A glossary of italicized words is located at the end of this booklet.

INTRODUCTION

Hirsutism, which is the excessive growth of coarse dark hair on the face, chest, lower abdomen, back, upper arms, or upper legs of women, is a symptom of a medical disorder associated with the hormones called *androgens*. *Polycystic ovarian syndrome (PCOS)*, in which the ovaries produce excessive amounts of androgens, is the most common cause of hirsutism. Hirsutism is very common and often improves with medical management. Prompt medical attention is important, because delaying treatment makes the treatment more difficult and may have long-term health consequences.

OVERVIEW OF NORMAL HAIR GROWTH

Understanding the process of normal hair growth will help you understand hirsutism. Each hair grows from a *follicle* deep in your skin. As long as these follicles are not completely destroyed, hair will continue to grow even if the shaft, which is the part of the hair that appears above the skin, is plucked or removed. Hair follicles cover every surface of your body surface except the soles of your feet and the palms of your hands. Of the approximately 50 million hair follicles covering your body, one-fifth are located on your scalp. The number of hair follicles you have does not increase after birth but slowly begins to decrease at around age 40.

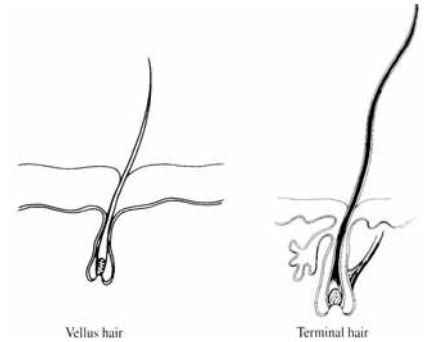
Hair density varies by ethnic origin. Men and women of the same ethnic group have the same number of hair follicles and similar hair patterning. People of Mediterranean descent, for example, generally have much more hair than Asians

and American Indians. Excessive hair that is due to genetic and ethnic disposition rather than hormonal causes is typically located on the arms, hands, legs, and feet, whereas hirsutism typically affects the face, abdomen, chest, inner thighs, and back.

Adults have two types of hair, *vellus* and *terminal* (Figure 1). Vellus hair is soft, fine, generally colorless, and usually short. Terminal hair is long, coarse, dark, and sometimes curly. In most women, vellus hair covers the face, chest, and back and gives the impression of "hairless" skin. In most men, terminal hair covers the face and body. Terminal hair grows on the scalp, pubic, and armpit areas in both men and women. A mixture of vellus and terminal hair covers the lower arms and legs in both men and women. If excessive hair growth is present only on your lower legs and forearms, it is not considered hirsutism and will not respond to hormonal therapy.

Hair growth occurs in cycles. While some grow, others rest, and still others are shed. Hormonal changes, such as those associated with oral contraceptives (birth control pills) or pregnancy, may synchronize hair growth and make it appear to grow and shed more than usual. However, hair growth patterns usually return to normal within six to 12 months.

Figure 1.



Terminal hair is longer, coarser, and darker than vellus hair.

Effects of Androgens on Hair Growth

Excess facial and body hair is usually the result of excess androgens in your body. Androgens are present in both men and women, but men have much higher levels. In men, androgens are produced primarily by the *testes* and the *adrenal glands*. In women, androgens are produced by the *ovaries* and the adrenal glands. To some degree, *estrogen* reduces the effect of androgens in women.

If your hair follicles are sensitive, androgens may cause some vellus hairs to change to terminal hairs and cause the terminal hairs to grow faster and thicker (Table 1). Once a vellus hair has changed to a terminal hair, it usually does not change back.

Androgens increase sebum production, which results in oily skin and acne. Excess androgens can cause irregular or absent *ovulation* and *menstruation*. Extremely high androgen levels, such as when a tumor is present, may cause male-like balding, deepening of the voice, increased muscle mass, enlargement of the clitoris, and decreased breast size. These effects of excess androgens are called virilization and occur rarely.

Table 1
Androgen sensitive sites of hair growth

More Common	Less Common
Upper lip	Chest and sternum
Beard area	Upper abdomen
Breasts	Upper back
Lower abdomen	
Inner thighs	
Lower back	

Diagnosing Hirsutism

Physicians trained to treat hirsutism and related problems generally include reproductive and medical *endocrinologists*. Some gynecologists, dermatologists, and general practitioners have also acquired the necessary expertise. During your initial medical consultation, your physician will first try to make a distinction between terminal hairs growing in a masculine pattern indicating hirsutism, and hair growth due to genetic or ethnic predisposition rather than a hormone disorder. If you are diagnosed with hirsutism, your physician may perform blood tests, *ultrasound*, special x-rays, and hormone suppression or stimulation tests to evaluate the function of your ovaries and adrenal glands. After identifying the causes of hirsutism, your physician can recommend appropriate treatment. Any unwanted hair remaining after treatment may be removed by a variety of cosmetic treatments including laser and electrolysis.

Causes of Hirsutism

There are several causes of hirsutism. They are described below and summarized in Table 2.

Polycystic Ovarian Syndrome (PCOS)

PCOS is a form of *hyperandrogenism* in which hormonal imbalances cause the ovaries to overproduce androgens. It is a common cause of hirsutism and is frequently associated with irregular or absent ovulation and infertility. In patients with PCOS, multiple small cysts develop in the ovaries, hence the term “poly-

Table 2: Causes of Hirsutism

- Excessive production of androgens by the ovaries (polycystic ovarian syndrome, tumor)
- Excessive sensitivity of hair follicles to androgens (genetic)
- Excessive production of androgens by the adrenal glands (NCAH: Non-Classic Adrenal Hyperplasia, tumor)
- Insulin Resistance (HAIR-AN Syndrome: (Hyperandrogenism, Insulin Resistance, Acanthosis Nigricans)
- Excessive production of cortisol by the adrenal glands (Cushing's syndrome)
- Menopause
- Medications

cystic. These small cysts are actually immature ovarian *follicles* that failed to mature and ovulate. Menstrual periods may become irregular or cease due to lack of ovulation. Physicians can usually diagnosis PCOS by combining a detailed history and a physical exam with a few specific blood tests. PCOS is discussed in greater detail later in this booklet.

Unexplained Hirsutism

For unknown reasons, some women have hair follicles that are abnormally sensitive to androgens. Androgen levels are normal and menstrual periods occur regularly in these patients. This tendency to develop hirsutism is genetic but the cause is not known.

Non-Classic Adrenal Hyperplasia

The most common abnormality of the adrenal glands that can result in hirsutism is an inherited disorder called *non-classic adrenal hyperplasia (NCAH)*, which causes the adrenal glands to overproduce androgens. Like PCOS, NCAH is associated with irregular menstrual cycles. NCAH is a genetic disorder most commonly seen in certain ethnic groups including Ashkenazi Jews, Eskimos, and French-Canadians. Elevation of the hormone 17a-hydroxyprogesterone is characteristic of NCAH.

HAIR-AN Syndrome (Hyperandrogenism, Insulin Resistance, Acanthosis Nigricans)

Some women are born with insulin resistance, a severe defect in the ability of insulin to control blood sugar levels. To compensate, the pancreas produces

more insulin. Excessively high levels of insulin stimulate the ovaries to dramatically overproduce androgens, leading to hirsutism, acne, and irregular ovulation. Insulin resistance may lead to *diabetes mellitus*, high blood pressure, heart disease, and excessive growth and darkening of the skin (acanthosis nigricans), which generally occurs around the neck and crease areas of the skin. The majority of these severe cases are due to genetic abnormalities. HAIR-AN syndrome is not to be confused with the milder insulin resistance seen in PCOS and other forms of hyperandrogenism.

Cushing's Syndrome

Cushing's syndrome refers to over production of *cortisol* by the adrenal glands. Although hirsutism may be seen in Cushing's syndrome patients, it is not a primary feature of the disorder. Women with Cushing's syndrome are often obese with a red facial rash, rounded face, muscle weakness, diabetes, and irregular menses. Features of Cushing's syndrome may also be found in women who are taking chronic *steroid* therapy. Cushing's syndrome is a serious but rare disease.

Ovarian or Adrenal Tumors

On rare occasions, an androgen-producing tumor may develop in the ovaries or adrenal glands. This tumor may produce extremely high androgen levels. Symptoms, such as hirsutism, usually appear suddenly and progress quickly. Very high androgen levels may cause male-like balding, deepening of the voice, and increased muscle mass. Fortunately, most of these tumors are not cancerous.

Menopause

Around the time of menopause, the ovaries stop producing estrogen but continue to produce androgens. The decreased levels of estrogen may allow the androgens to have a greater impact, leading to an increase in the number of dark terminal hairs, especially on the face. For this reason, many menopausal women complain of new facial hair (moustache and whiskers) and mild balding.

Medication Side Effects

Drugs with characteristics of androgens may cause hirsutism. Anabolic steroids, used for increasing the muscle mass of chronically ill and debilitated people, and by some bodybuilders, are chemically related to androgens. Other medications associated with increased hair growth include danazol (Danocrine®), phenytoin (Dilantin™), minoxidil (Loniten®, Rogaine®), and diazoxide (Proglycem™). Patients on these medications develop acne more frequently than hirsutism. "Natural" supplements such as *dehyroepiandrosterone (DHEA)* and *androstenedione* may cause hirsutism.

How is Hirsutism Treated?

Medical Therapy

There are a variety of specific medical and surgical treatments that your physician may recommend based on your diagnosis and severity of hirsutism (Table 3). Most medications used to treat hirsutism are approved by the Food and Drug Administration, but not for this specific indication. Nevertheless, research has documented their effectiveness.

Table 3: Treatment of Hirsutism

Medications	Cosmetic treatments
Birth control pills	Shaving
Androgen receptor blockers	Eflornithine cream
Spironolactone	Waxing
Flutamide	Bleaching
Glucocorticoids (steroids)	Plucking
Dexamethasone	Depilatory agents
Prednisone	Electrolysis
Methylprednisolone	Laser
Enzyme inhibitors	
Finasteride	
GnRH analogs	

Birth control pills (oral contraceptives)

Birth control pills are the most commonly suggested hormonal treatment for hirsutism. They prevent ovulation and decrease the production of androgens by the ovaries. Estrogen in the pills causes the liver to produce and release more of a protein (sex hormone-binding globulin) that binds to androgens and reduces their action. In addition to slowing excessive hair growth, the pills provide the added advantages of regulating the menstrual cycle and protecting against unwanted pregnancies.

Antiandrogen medications

Spironolactone (Aldactone®), a *diuretic* or "water pill," is often prescribed in combination with birth control pills. It has been found to directly block the effects of androgens in hair follicles and has been used to treat hirsutism. Side effects may include dry skin, heartburn, headaches, irregular vaginal bleeding, and fatigue. About two-thirds of the women on high-dose spironolactone will have a significant decrease in hirsutism. Other antiandrogen medications are presently undergoing clinical testing and may be in common use within the next several years. These include *flutamide* (Eulexin®)which blocks androgen receptors, and *finasteride* (Propecia®, Proscar®) which blocks the conversion of testosterone to more active androgens.

Steroid medications

Low doses of steroids may be prescribed for overactive adrenal glands. Some women taking them experience dizziness during the day or have difficulty falling asleep, although these complaints generally improve after the first few days. These drugs may have serious side effects, including weight gain, thinning of the skin and bones, and decreased defense against infection. However, these side effects are seldom seen at the low doses used for treating hirsutism.

GnRH analogs

Severe forms of hyperandrogenism may be treated by medications called *GnRH analogs* (Lupron®, Synarel®, and Zolodex®). These medications treat hirsutism by suppressing ovarian androgens to very low levels. They also suppress estrogen and may cause menopausal-like symptoms. GnRH antagonists are also effective and may be approved for use for this purpose in the future.

Cosmetic Therapy

Cosmetic removal of hair in women with hormonally associated hirsutism should always be accompanied by medical therapy in order to be successful.

Temporary Hair Removal

For temporary treatment of mild hirsutism, many women pluck unwanted hairs. However, plucking tears the hair from its living follicle and can irritate sensitive skin. If the hair follicle or shaft becomes infected, the hair may curl into the skin and cause pimples or acne. Waxing carries the same risks of irritation and infection, especially in androgen sensitive areas. Depilatories, chemicals that dissolve the hair shafts, may cause irritation to sensitive facial skin. Bleaching can be used in small areas of the body, particularly the upper lip, to make excessive hair less noticeable, but excessive bleaching may lead to irritation and skin damage.

Although not satisfying to many women, shaving is probably the simplest and safest way to temporarily remove hair. Because of the continued growth of the hair, shaving is required frequently and may result in irritating stubble, but an electric razor may produce less skin irritation than a blade. Shaving seldom has medical side effects.

A facial cream containing *eflornithine hydrochloride* (Vaniqa™) may be used in combination with the previously mentioned cosmetic therapies to slow the growth of excessive facial hair. Its safety in pregnancy or effectiveness on other body parts has not been established.

Permanent Hair Removal

There are two types of permanent hair removal: electrolysis and laser treatment. During electrolysis, a very fine needle is inserted into the hair follicle. A mild electric current is sent through the needle to permanently destroy the hair follicle's ability to produce hair. Since follicles are treated one at a time, it is somewhat impractical to use electrolysis to treat very large areas of the body.

Laser treatments may be used on large areas of the body, although their long-term effectiveness is not as well documented as electrolysis. During laser hair treatment, a beam of light is passed through the skin to the hair follicle to destroy it. People with light skin and dark hair usually achieve the best results with laser hair removal.

Both methods of hair reduction are moderately painful, depending on the area of skin being treated, and multiple treatments are usually required. Nevertheless, electrolysis and laser are very effective ways to remove unwanted hair. Without concurrent medical treatment, however, new hair will grow. It is best to delay laser or electrolysis treatment for at least six months after beginning medical treatment so that the growth of new terminal hairs will be reduced. Physicians can often refer patients to a reputable electrologist or laser specialist. Home electrolysis kits rarely work because the follicle is so deep within the skin that it is difficult to treat.

What to Expect From Treatment of Hirsutism

Hormone treatment generally prevents new terminal hairs from developing and may slow the growth rate of existing hairs. Generally about six months of hormone therapy is required before the rate of hair growth decreases significantly. Once a hormone treatment has proven to be effective, it may be continued indefinitely. Electrolysis or laser can remove any hair remaining after hormone therapy. Because it is usually not possible to cure the hormonal problem that causes hirsutism, ongoing medical treatment is required to manage it. Hirsutism will frequently return if medical treatment is stopped.

Polycystic Ovarian Syndrome

The most common cause of hirsutism is polycystic ovarian syndrome. PCOS is a term used to describe a group of conditions that cause the ovaries to produce excessive amounts of androgens. The ovaries may become enlarged with many small cysts (fluid-filled sacs) (Figures 2 and 3). Symptoms of PCOS include hirsutism; acne; irregular, absent, or heavy menstrual periods; lack of ovulation; and infertility. Many PCOS patients are also obese. Other names for PCOS are polycystic ovarian disease or Stein-Leventhal syndrome. Despite persistent questions surrounding the cause of PCOS, many advances have been made in treating this disorder.

Normal Menstrual Function

In order to understand PCOS, it is important to understand how hormones control normal ovarian function. The *pituitary gland*, located at the base of the brain, controls egg and hormone production by releasing two hormones, *follicle-stimulating hormone (FSH)* and *luteinizing hormone (LH)*. As the menstrual

Figure 2

The dark circular areas are cysts on the ovary.

Ultrasound picture of polycystic ovary.

period begins, FSH stimulates a *follicle* in the ovary to begin growing. The follicle produces the hormone estrogen and contains a maturing egg. LH stimulates the cells surrounding the follicle to produce significant amounts of androgens. The enlarging ovarian follicle, not to be confused with a hair follicle, appears as a small cyst on the surface of the ovary that can often be detected by ultrasound.

About two weeks before the onset of the next menstrual period, the follicle ruptures and releases (ovulates) the egg. The cells lining the collapsed follicle begin to produce the hormone *progesterone* and develop a yellow color. The follicle is now known as a *corpus luteum*, a term which literally means a "yellow body." The corpus luteum secretes estrogen and large quantities of progesterone throughout the second half of the menstrual cycle, which is called the *luteal phase*.

After ovulation, the egg is picked up by the fallopian tube. If the egg is fertilized, it remains in the fallopian tube for three or four days and then enters the uterus. The estrogen and progesterone secreted during the luteal phase have caused the lining of the uterus to fill with extra blood in anticipation of receiving a fertilized egg (embryo). This blood will provide a nourishing environment for the embryo. If the egg is not fertilized or fails to implant in the uterus, the secretion of estrogen and progesterone declines about two weeks after ovulation, and the extra blood in the lining of the uterus is shed. This results in menstruation, and the cycle begins again.

Abnormal Menstrual Function

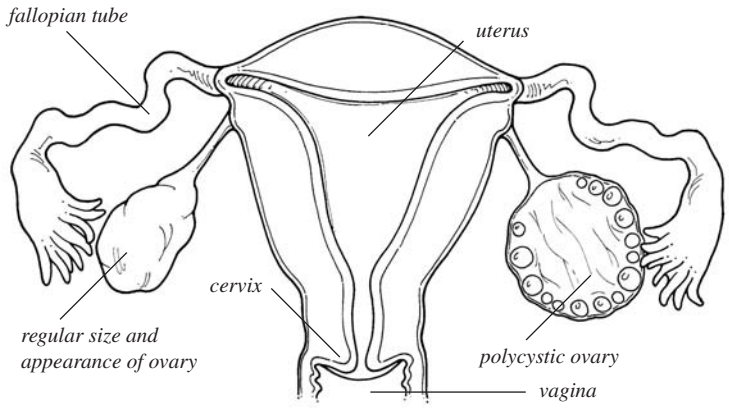
The ovulatory cycle is easily affected by hormonal abnormalities. Overproduction or underproduction of certain hormones can have devastating results.

Excess LH or insulin may cause the ovaries to overproduce androgens. Ongoing high levels of androgens may result in hirsutism, acne, lack of menstruation, anovulation (lack of ovulation), and in extreme cases, virilization.

Insufficient FSH may impair ovarian follicle development and prevent ovulation, resulting in infertility. Eventually, the multiple small cysts formed in the ovary from follicles that failed to mature and ovulate result in PCOS.

Lack of ovulation in PCOS results in continuous high levels of estrogen and insufficient progesterone. Unopposed by progesterone, ongoing estrogen exposure may cause the endometrium to become excessively thickened, which can lead to heavy and/or irregular bleeding (dysfunctional uterine bleeding). Over many years, endometrial cancer may result due to continuous stimulation by high levels of estrogen unopposed by progesterone.

Figure 3



The polycystic ovary may become enlarged with many small cysts.

DIAGNOSING PCOS

You should describe all of your symptoms to your physician as specifically as possible. PCOS may be diagnosed by your medical history and physical examination alone. To confirm the diagnosis and exclude certain other conditions, your physician may measure your blood hormone levels and perform an *endometrial biopsy* to make sure no pre-cancerous cells are present in your uterus. Because PCOS is not fully understood, it is often difficult to determine why it occurs.

Early Diagnosis

If you have had menstrual irregularity and/or progressive hirsutism since puberty, you should be evaluated for PCOS. If you are diagnosed with PCOS and you have female children, you should watch them for symptoms and inform them that they are at risk, since there is a genetic tendency to inherit the syndrome. Early treatment of PCOS may decrease the development of acne and hirsutism.

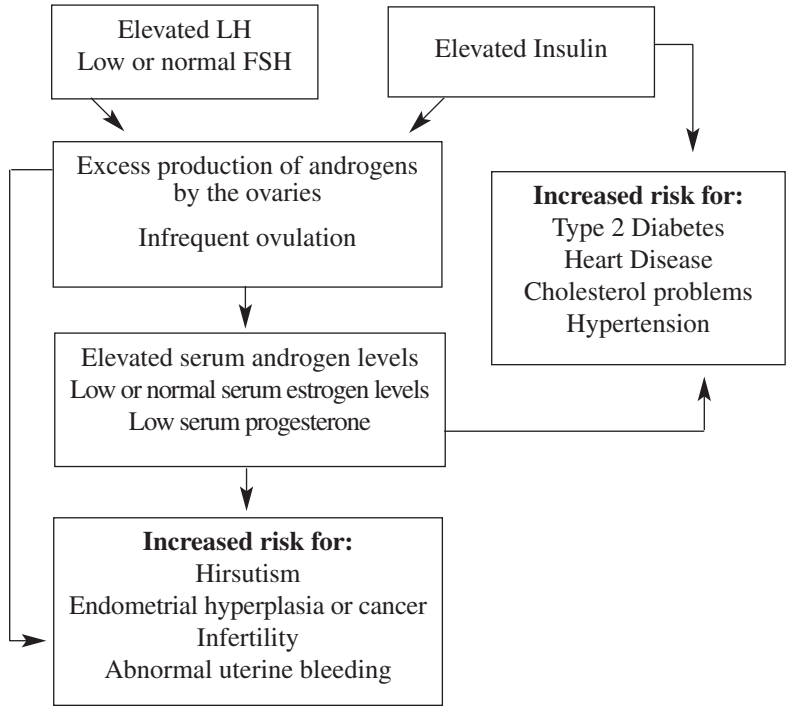
Long-term Considerations

Women with PCOS, particularly those with insulin resistance, may be at an increased risk for diabetes, heart disease, cholesterol abnormalities, and endometrial cancer (Figure 4). If you are diagnosed with PCOS, you and your physician should discuss the long-term health consequences and any additional testing that should be done.

PCOS Treatment

If you are diagnosed with PCOS, treatment will depend upon your goals. Some patients may be concerned primarily with fertility, while others are more concerned about menstrual cycle regulation, hirsutism, or acne. Regardless of your primary goal, PCOS should be treated because of the long-term health risks such as heart disease and endometrial cancer.

Figure 4



Potential consequences of PCOS

Weight Loss

Obesity is commonly associated with PCOS. Fatty tissues produce excess estrogen, which in turn contributes to insufficient FSH secretion by the pituitary gland. Insufficient FSH prevents ovulation and may worsen PCOS. In addition, obesity is associated with the development or worsening of insulin resistance, which may further increase androgen production by the ovaries.

Weight loss improves the hormonal condition of many PCOS patients. If you are overweight, ask your physician to recommend a weight control plan or clinic. Area hospitals and support groups are also helpful. Although tempting, fad diets and diet pills are usually not effective and in many cases cause additional health problems.

Increasing physical activity is an important step in any weight reduction program. Start slowly with an aerobic activity such as walking or swimming. Increase speed and distance gradually. Regular activity improves state of mind as well as aiding in weight reduction. Extreme cases of obesity, unresponsive to medical management and behavioral modification, may be treated with surgery. However, surgical treatment for obesity is not always successful and carries significant risks.

Hormonal Treatment

Hormonal treatment is frequently successful in temporarily correcting the problems associated with PCOS. If treatment is stopped, however, symptoms usually reappear. If you are not trying to conceive, birth control pills may be your best hormonal treatment. Birth control pills decrease ovarian hormone production and help reverse the effects of excessive androgen levels. However, birth control pills are not recommended if you smoke and are over age 35. If you also have hirsutism, your physician may prescribe spironolactone, alone or combined with birth control pills. Rarely, GnRH analogs may be needed to decrease ovarian androgen production.

If you are not concerned with fertility or contraception, and hirsutism is not a problem, you can take progesterone at regular intervals to regulate your menstrual cycle and prevent the endometrial problems associated with excessive estrogen exposure.

Ovulation Induction

If fertility is your immediate goal, ovulation may be induced with *clomiphene citrate* (Clomid®, Serophene®). Clomiphene is simple to use, relatively inexpensive, and works well to induce ovulation in many patients. Clomiphene causes the pituitary gland to increase FSH secretion. Sometimes increasing the dosage or the length of treatment is necessary. Approximately 10% of pregnancies with clomiphene are twins; triplets or more are rare. Your physician may also recommend a steroid drug designed to suppress the adrenal gland to supplement clomiphene therapy. PCOS patients who are insulin resistant may ovulate when treated with metformin (Glucophage®), which increase the body's sensitivity to insulin.

If clomiphene does not induce ovulation, or you do not get pregnant within six ovulatory cycles, your physician may prescribe *gonadotropins*. There are many types of gonadotropins used alone or in combination for ovulation induction. They include hMG (human menopausal gonadotropin: Pergonal®, Humegon™, Repronex™); purified hFSH (human follicle stimulating hormone: Metrodin®, Fertinex™, Bravelle™); rFSH (recombinant follicle stimulating hormone: Gonal F™, Follistim™); and hCG (human chorionic gonadotropin: Profasi®, APL®, Pregnyl®, Novarel™, Ovidrel®). Gonadotropins are more expensive and have a higher incidence of side effects, such as hyperstimulation (excessive swelling) of the ovaries, and a higher rate of multiple pregnancy.

Your needs and response to therapy will determine the appropriate medication for ovulation induction. For additional information, consult the ASRM patient information booklet titled *Ovulation Drugs* and Patient Fact Sheet titled *Insulin Sensitizing Agents*.

In very rare cases, ovulation is not achieved with either clomiphene or gonadotropins, and ovarian surgery may be tried to stimulate ovulation. Surgical procedures such as *ovarian drilling* may be performed through *laparoscopy*. Although these procedures have helped some patients to ovulate, they may also have adverse effects on future fertility by causing adhesions (scar tissue) and are generally treatments of last resort.

Psychological Aspects of Hirsutism and PCOS

Dealing with hirsutism and PCOS can be emotionally difficult. You may feel unfeminine, uncomfortable, or self-conscious about your excessive hair growth or weight, as well as worry about your ability to have children. Even though you may be embarrassed to share these feelings with other people, it is very important that you talk to your physician as soon as possible to explore the medical and cosmetic treatments available to treat these disorders. It is also important for you to realize that these are very common problems experienced by many women.

Summary

Hirsutism is a common disorder that can usually be successfully treated with hormonal medication. Following medical treatment, electrolysis or laser treatment can be used to permanently remove any remaining unwanted hair. If your mother or grandmother experienced excessive hair growth, you should watch for early signs of hirsutism in yourself and your children, especially during adolescence. Hirsutism is frequently a result of PCOS. Both hirsutism and PCOS are easier to treat when diagnosed at a young age.

PCOS can cause hirsutism, acne, irregular or heavy menstrual periods, lack of ovulation, and infertility. It is also associated with an increased risk of diabetes,

uterine cancer, high cholesterol, and heart disease. Despite questions surrounding the causes of PCOS, advances have been made in both understanding and treating the condition. If you are diagnosed with hirsutism or PCOS, your goals and concerns can be addressed in a relatively short period of time, and treatment is often successful.

Let Us Know What You Think

Email your comments on this booklet to asrm@asrm.org. In the subject line, type "Attention: Patient Education Committee."

Glossary

Adrenal glands. Glands located on top of the kidneys, in the area of the back near the waistline, that produce hormones (cortisol, adrenaline, androgens, and other hormones) that help the body withstand stress and regulate metabolism. Altered function of these glands can disrupt menstruation.

Adrenal hyperplasia. An abnormal or unusual increase in the production of androgens by the adrenal glands. This disorder is the result of a genetic problem.

Androgens. Hormones produced by the testes, ovaries, and adrenal glands responsible for encouraging masculine characteristics. Often referred to as "male" hormones. Androgens are produced in males and females, but males have much higher levels.

Androstenedione. An androgenic hormone naturally made by the ovaries, testes, and adrenal glands. The body turns it into testosterone. Androstenedione sold as a "natural" supplement is made from plant chemicals and is not regulated by the FDA. It is often marketed as an athletic performance and muscle enhancer, but its safety and effectiveness are controversial.

Birth control pills. Also known as oral contraceptives. They contain a mixture of synthetic estrogens and progesterone. Proper usage suppresses ovulation and decreases the ovarian secretion of hormones, including androgens.

Clomiphene citrate. An anti-estrogen drug used to induce ovulation. Brand names are Clomid® and Serophene®.

Corpus luteum. Literally, a "yellow body." A mass of yellow tissue formed in the ovary from a mature follicle that has collapsed after releasing its egg at ovulation. The corpus luteum secretes estrogen and large quantities of progesterone, a hormone that prepares the lining of the uterus (endometrium) to support a pregnancy.

Cortisol. A hormone produced by the adrenal glands, which are located on top of the kidneys in the area of the back near the waistline. Cortisol is responsible for maintaining the body's energy supply, blood sugar, and control of the body's reaction to stress

Danazol. An androgen-like drug used to treat endometriosis. The brand name is Danocrine®.

Dehydroepiandrosterone (DHEA). A hormone naturally made by the adrenal glands. The body turns it into other hormones such as estrogen and testosterone. DHEA sold as a "natural" supplement is made from plant chemicals and is not regulated by the FDA. It is often marketed as an anti-aging medication, but its safety and effectiveness are controversial.

Diabetes mellitus. A condition due to a lack of insulin or lack of response to insulin, resulting in glucose (sugar) levels that are too high.

Diazoxide. A medication that is used to lower blood pressure. The brand name is Proglycem™.

Dilantin™. An anti-seizure medication. The generic name is phenytoin.

Diuretic. An agent that increases the loss of water from the body.

Eflornithine hydrochloride. A chemical that inhibits enzymes that affect hair growth. Available in a facial cream to reduce the growth of unwanted facial hair. The brand name is Vaniqa™.
Endocrinologist. A physician who specializes in endocrinology, which is the medical specialty concerned with hormonal secretions and their actions.
Endometrium. The lining of the uterus that is shed each month during menstruation. The endometrium provides a nourishing site for the implantation of a fertilized egg (embryo).
Endometrial biopsy. The removal of a small sample of endometrium (lining of the uterus) for microscopic examination.
Estrogen. Female hormone produced by the ovaries responsible for the development of female sex characteristics. Estrogen is largely responsible for stimulating the uterine lining to thicken during the first half of the menstrual cycle in preparation for ovulation and possible pregnancy. Estrogen is also important for healthy bones and overall health. A small amount of estrogen is also produced in the male when testosterone is converted to estrogen.
Fallopian tubes. A pair of tubes, attached one on each side of the uterus, where sperm and egg meet in normal conception.
Finasteride. An antiandrogen medication that blocks the conversion of testosterone to more active androgens. May be prescribed for enlarged prostate in men and to reduce hair loss associated with male pattern baldness. Brand names are Propecia® and Proscar®.
Flutamide. Flutamide is an antiandrogen medication that blocks androgen receptors, preventing the actions of androgens. Flutamide is used in the treatment of prostate cancer. The brand name is Eulexin®.
Follicle, hair. A tubular sheath that surrounds the lower part of the hair shaft, supplies the growing hair with nourishment, and gives life to new hairs.
Follicle, ovarian. A fluid-filled sac located just beneath the surface of the ovary, containing an egg (oocyte) and cells that produce hormones. The sac increases in size and volume during the first half of the menstrual cycle and at ovulation, the follicle matures and ruptures, releasing the egg. As the follicle matures, it can be visualized by ultrasound.
Follicle stimulating hormone (FSH). The pituitary hormone responsible for stimulating the follicle cells around the egg. FSH stimulates egg development and the production of the female hormone estrogen. FSH can also be given as a medication.
GnRH analogs. Synthetic hormones similar to the naturally occurring gonadotropin releasing hormones (GnRH) produced by the hypothalamus. GnRH analogs, when given in short pulses, stimulate the pituitary gland to produce FSH and LH. However, when given in more prolonged doses, they decrease FSH and LH production by the pituitary, which in turn decreases ovarian hormone production. Brand names are Lupron®, Synarel®, and Zolodex®.

Gonadotropins. Hormones including FSH and LH used for ovulation induction. Gonadotropins include hMG (human menopausal gonadotropin – Pergonal®, Humegon™, Repronex™); hFSH (human follicle stimulating hormone – Metrodin®, Fertinex™, Bravelle™); rFSH (recombinant follicle stimulating hormone – Gonal F™, Follistim™); and hCG (human chorionic gonadotropin – Profasi®, APL®, Pregnyl®, Novarel™, Ovidrel®.

HAIR-AN Syndrome (Hyperandrogenism, Insulin Resistance, Acanthosis Nigricans). A genetic disorder associated with very high circulating levels of insulin and androgens.

Hirsutism. The growth of long, coarse hair on the face, chest, upper arms, and upper legs of women in a pattern similar to that of men. Hirsutism may be due to ethnic background or to excess levels of androgens.

Hormones. Substances formed in one organ of the body, such as the pituitary or adrenal glands, and carried by a body fluid to another organ or tissue where they have a specific effect.

Hyperandrogenism. A condition in which women have elevated levels of androgens (male hormones).

Laparoscopy. A surgical procedure in which a laparoscope, a thin, lighted viewing instrument with a telescopic lens, is inserted through a small incision in the navel to examine the female reproductive organs and abdominal cavity. Other long, slender instruments may be inserted through additional incisions.

Luteal phase. The second half of the ovarian cycle when the corpus luteum produces large amounts of progesterone. This progesterone is important in preparing the endometrium to receive a fertilized egg (embryo) for implantation.

Luteinizing hormone (LH). The pituitary hormone that triggers ovulation and stimulates the corpus luteum of the ovary to secrete progesterone and estrogen during the second half of the menstrual cycle.

Menstruation. The normal, cyclic shedding of the endometrial lining (lining of the uterus), which appears as a bloody discharge from the uterus.

Minoxidil. A medication used to lower blood pressure that was also found to promote hair growth. Loniten® and Rogaine® are brand names.

Non-classic adrenal hyperplasia (NCAH). An inherited disorder in which the adrenal glands do not produce enough of the hormone cortisol and overproduce androgens. Elevation of the hormone 17a-hydroxyprogesterone is characteristic of NCAH. NCAH is a genetic disorder most commonly seen in certain ethnic groups including Ashkenazi Jews, Eskimos, and French-Canadians.

Ovarian drilling. A laparoscopic procedure, using laser or electrocautery, to destroy the androgen-producing tissue in the ovaries. This procedure is usually a last resort for ovulation induction in PCOS patients who have not responded to hormonal treatments.

Ovaries. The two female sex glands in the pelvis that produce eggs, estrogen, and progesterone.

Ovulation. The release of a mature egg from its follicle in the outer layer of the

ovary. This usually occurs approximately 14 days before the next menstrual period (the 14th day of a 28-day cycle).

Pituitary gland. The small gland just beneath the hypothalamus that controls ovarian function by secreting follicle stimulating hormone (FSH) and luteinizing hormone (LH). Disorders affecting this gland may lead to irregular or absent ovulation.

Polycystic Ovarian Syndrome (PCOS). A condition in which the ovaries contain many cystic follicles associated with chronic anovulation (lack of ovulation) and overproduction of androgens (male hormones). The cystic follicles exist because the eggs are not expelled at the time of ovulation. Symptoms may include irregular menstrual periods, excessive growth of body hair in a male-like pattern (hirsutism), and infertility. Also called polycystic ovarian syndrome and Stein-Leventhal Syndrome.

Progesterone. A female hormone secreted by the corpus luteum after ovulation during the second half of the menstrual cycle (luteal phase). It prepares the lining of the uterus (endometrium) for implantation of a fertilized egg and also allows for complete shedding of the endometrium at the time of menstruation.

Spironolactone. A steroid hormone that directly blocks the effect of androgens on the skin. It initially was used as a diuretic or water pill to increase urine output. A brand name is Aldactone®.

Steroids. Hormones that are derived from cholesterol. Categories of steroids include sex steroids (estrogens, androgens, progestogens), glucocorticoids (hormones that closely resemble cortisol), and mineralcorticoids (hormones related to aldosterone and involved in fluid and electrolyte control). Man-made steroids closely resemble cortisol, a hormone naturally produced by the adrenal glands. Steroids decrease inflammation, reduce immune system activity, and are used to treat a variety of inflammatory diseases and conditions.

Terminal hair. The long, coarse, thick hairs that normally grow in the scalp, pubic, and armpit areas of men and women, and the face, chest, abdomen, upper arms, and upper thighs of men.

Testes. The two male reproductive glands located in the scrotum that produce testosterone and sperm.

Ultrasound. High-frequency sound waves that produce an image of internal organs on a screen. May be used to monitor growth of ovarian follicles or a fetus. Ultrasound can be performed either abdominally or vaginally.

Uterus. The hollow muscular organ in which the fetus develops during pregnancy.

Vellus hair. The soft, fine, usually short hairs that appear on the face, chest, and back of women, giving the impression of “hairless” skin.

For a list of additional reading materials, contact the ASRM administrative office at 1209 Montgomery Highway, Birmingham, Alabama 35216-2809, (205) 978-5000.

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Booklets available for purchase through the
American Society for Reproductive Medicine Patient Information Series:

____*Abnormal Uterine Bleeding (1996)*
____*Adoption (1996)*
____*Age and Fertility (2003)*
____*Assisted Reproductive Technologies (2003)*
____*Birth Defects of the Female Reproductive System (1993)*
____*Donor Insemination (1996)*
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____*Endometriosis (1995)*
____*Endometriosis (Spanish Translation) (2003)*
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