

Mike was rewriting the Hinkel book, but now unable ... this is a finished Chapter that might be useful for students and schools. Best Wishes, Mike Bono

# Chapter I

# Causes of Unwanted Hair

This chapter reviews the biological causes of hair growth. Electrologists must be able to explain the origins of hair growth, and why excess hair is seen as a problem. Additionally, some of your clients are experiencing accelerated hair growth because of a hormone imbalance. Therefore, you should be able to recognize some signs of a hormone imbalance and direct your client to an appropriate physician or endocrinologist (hormone specialist).

## Proper Terminology

There are several terms that electrologists use to define hair growth. The term *hirsute* simply means hairy, and there is no medical connection to the term. The term *hypertrichosis* is a medical term that is usually associated with an endocrine (hormone) problem. Some electrologists use the term *superfluous* hair. Superfluous means unnecessary, extra and surplus. Electrologists, whatever the underlying cause, deal with unwanted hair growth. The terms *unwanted hair*, and *excessive hair* are good terms to use in any situation.

In most cases, a female client's hair problem develops during puberty, pregnancy or menopause. These events may or may not produce unwanted hair. Women frequently experience some hair growth during menopause. However, in all cases, having unwanted hair is not an illness or disease. Unwanted hair might be a symptom of an illness, but having hair alone is not an illness. Because unwanted hair is not an illness, it's mistaken to call our clients "patients who are suffering from *hypertrichosis*." Let's see how the experts define hypertrichoses.

"Hypertrichosis is the [medical] term used to denote *excessive and abnormal* growth of hair, on any part of the body that is more than typically seen in individuals of the same sex, age and race as the person under consideration."

Lee McCarthy, MD, *Diagnosis and Treatment of Diseases of the Hair*

**Hypertrichosis, or excess/unwanted hair?** Because hair growth is predictable at certain times in a person's life, calling *all* unwanted hair "hypertrichosis" is incorrect. *Unwanted, superfluous* or *excess* hair are better terms. Your client may have excess hair that is completely normal for her race and age, however she just wants the hair removed for personal reasons. These reasons might be based on self-image, or the pressure of cultural norms.

Note from Bono: I think that using the term *hypertrichosis* is appropriate if the hair growth is, by definition, "excessive and abnormal" based on a medical evaluation. However, there is no good reason to use the term with your client. "He/she just wants the hairs removed!" Using a medical term that implies an illness might unnecessarily alarm your client.

**Cosmetic or Medical?** In most State government jurisdictions, electrology is not considered the practice of medicine. Therefore, referring to clients as “patients” and talking about “cures” is inaccurate because no disease is being treated. *Electrologists treat cosmetic problems only!*

Even in cases where excessive hair growth was caused by a hormone imbalance, the job of the electrologist is not to cure the underlying medical problem, but to restore and improve the client’s appearance. There are, of course, cases where, say, ingrown hairs must be removed for health reasons. However, such cases are a small part of the profession. As an electrologist you are primarily concerned with the client’s appearance. Your manner of dealing with the public should reflect the non-medical nature of the profession.

## What Stimulates New Hair Growth?

Two factors, either together or individually, have the potential for starting or accelerating hair growth. These are: an increase in the blood supply and/or hormone stimulation.

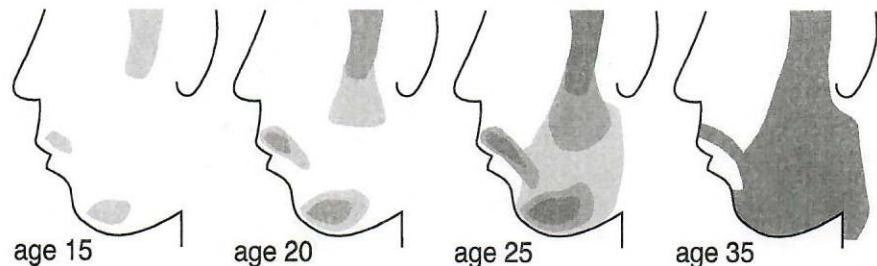
**Increased blood supply:** If a vellus hair (tiny, fine, colorless hair) is already growing from the lobe of a sebaceous gland (skin’s oil gland), an increase in the blood supply (more blood) to the area might stimulate the vellus hairs. Extra blood brings extra nutrients to the follicles and can turn the vellus hairs into so-called accelerating vellus hairs. An accelerating vellus hair is just beginning to acquire a bulb and pigmentation. At this point, the accelerating vellus hair is not yet a terminal hair. A terminal hair is a fully formed hair and follicle that has achieved its maximum potential ... terminal ... size. A plentiful supply of blood is necessary for the development of deeper/larger hairs. However, increasing the blood supply *alone* cannot create new hairs and follicles. The blood supply merely nourishes the existing follicles and hairs.

**Hormone stimulation:** Specific hormones can cause visible hair growth where none was previously seen. However, hormones *alone* cannot produce new follicles and hairs. Instead, hormones stimulate specific cells in the sebaceous glands. William Montagna, PhD calls these target cells *hair-germ cells*. When hormones react with the hair-germ cells in the sebaceous gland, the hair-germ cells are activated. With hormone stimulation, the hair-germ cells proliferate and create a vellus hair. A vellus hair is a tiny hair emerging from a sebaceous gland. With continued hormone stimulation, vellus hairs can grow larger-and-larger and finally become terminal hairs.

The potential for hair growth, on the face and body, is limited to specific areas. Consider the hair growth in a male adolescent. Even though male hormones have flooded his entire circulatory system, he does not grow hair “from nose to toes!” Instead, his hair growth follows a predictable pattern starting from axillary (underarm) and pubic (genital) areas; to his emerging beard, and eventually the chest, and possibly the back and shoulders. The areas prone to hair growth are said to be *hormone-sensitive areas*. Similarly with women experiencing a hormone imbalance, these identical areas are the first to show an increase in hair growth. Other areas, such as the forehead, palms of the hands and bottoms of the feet are devoid of follicles and will never grow hair; even with maximum hormone stimulation.

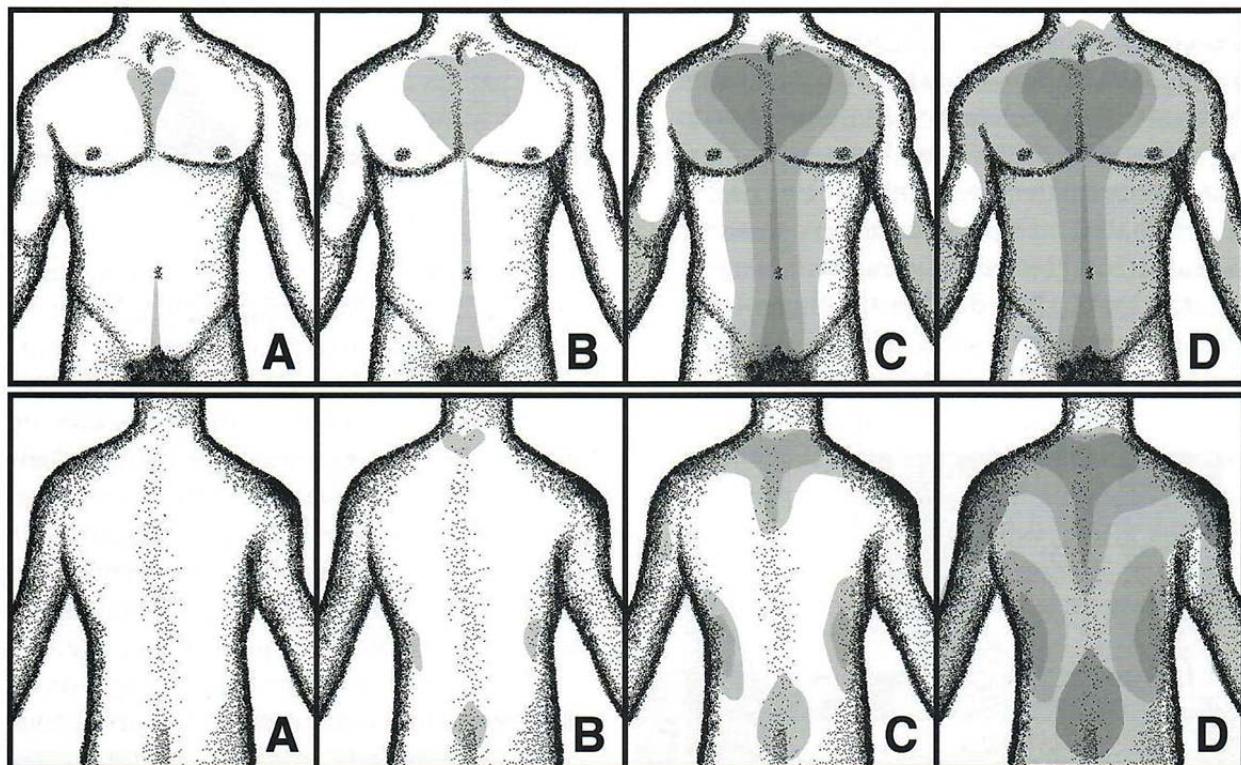
## Male Beard Development:

A woman's hair pattern, undergoing hormone stimulation, follows the same hair pattern as men.



## Male Body Hair Development

A woman's hair pattern, undergoing hormone stimulation, follows the same hair pattern as men.



Photomicrographs (photographs taken through a microscope) of any hairy area show that each hair-growing follicle is surrounded by sebaceous glands that have no hair. Apparently, some unidentified factor makes one set of germ-cells in a sebaceous gland more hormone-sensitive than in other sebaceous glands.

Photomicrographs also show that in areas of heavy hair growth, say, the beard or underarm, there are still large numbers of vellus hairs. Many of these fine hairs are *hormone-insensitive* and will never become large terminal hairs. Transgender beard removal, once

completed, sometimes reveals a substantial amount of very fine colorless hair. A softer and more natural appearance is created by the fine hairs.

## Congenital, Topical and Systemic causes of excess hair

**Congenital Causes:** Everyone is born with a pre-existing pattern for hair growth. These patterns are inherited from your parents and ancestors. Congenital growth patterns may also be a characteristic of your race. The combination of both parent's congenital patterns can create modified hair patterns in their descendants. The way a person's hair pattern naturally grows is called a *congenital hair growth pattern*. This is a "born with" ability for growing hair, and does not come about from any outside influences. Abnormal hair growth, called *inherent hypertrichosis* (a medical term), can likewise be inherited.

Normal growth patterns on various parts of the body serve as protection from the environment. Hair also helps maintain body temperature, reduce friction, add sensory perception (your sense of touch) and stimulate sexual attraction. The following are normal hair patterns seen on all humans:

**Cilia** (eyelashes) prevent dust and dirt from entering the eyes and shade the eyes.

**Supercilia** (eyebrows) filter dust and dirt to a minor degree, and help shade the eyes from sunlight. Eyebrows channel sweat away from the eyes and form a protective cushion for the ridges of the eye sockets.

**Vibrissae** (nostrils) filter dust and particles that might otherwise collect in the lungs.

**Capilli** (scalp) provides some protection from head injury and retains body heat by shielding the head from cold weather. Head hair is also a focus of beauty, health and sexual attraction.

**Body hair** including **hirci** (underarms) and **pubes** (pubic) protects against friction. Patches of hair are located in places where the skin is frequently irritated.

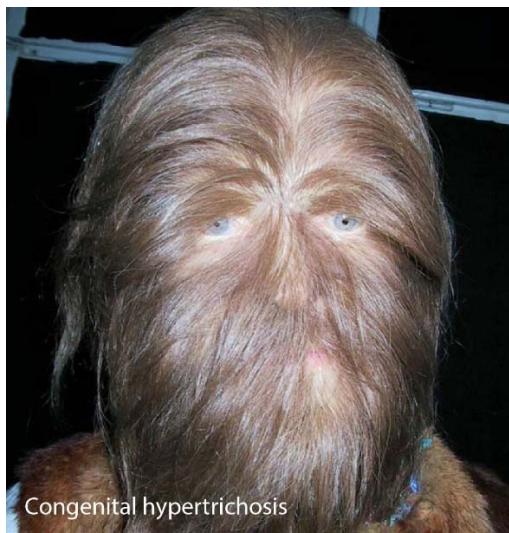
**Barba** (beard) hair on the face.

Some anthropologists have speculated that, through evolution, prehistoric humans were covered with hair to provide warmth. If this evolutionary adaptation were true, why is it that people from warm Mediterranean areas are more hirsute (hairy) than cold-weather Scandinavians? It's difficult to conclude that body hair is intended for warmth. Indeed, hair distribution varies from one ethnic group to another with no apparent correlation to climate. Nordic and Anglo-Saxon ethnicities (Scandinavians, Germans, and British) are less hairy than the Mediterranean and Semitic peoples (Syrians, Hebrews, North Africans, Greeks, Italians and Spaniards). In general, Europeans (Whites) are hairier than people of African descent (Blacks). Least hairy of all are Asians and Native Americans.

The concept of beauty depends on cultural norms. The facial hair on Mediterranean women is not terribly bothersome to their male counterparts. For example, before the 1960s, a Spanish or Italian woman with some delicate upper lip hair was not a problem ... some say even seen as "sexy!" In the United States a woman's hairy legs are seen as unattractive. In other cultures, a woman's hairy legs or unshaven underarms is acceptable.

Thus, whether one's hairiness is considered an adornment or an eyesore depends on the culture. It's only in a society with diversity and many ethnicities, such as the United States, that a normally hirsute person can become embarrassed or even ashamed of a natural condition that might be attractive in the person's place of origin. This is another reason why you should not consider yourself a medical practitioner who treats abnormal conditions or illnesses. Many of your clients will have hair patterns which are perfectly normal for their heredity and ethnicity.

Very rarely, you might encounter a case of *congenital hypertrichosis* (inherited extreme hairiness). This condition afflicts a person who inherited a tendency to grow excessive hair. Congenital hypertrichosis may appear at birth, or it may emerge later in life. Sometimes, although very rare, a person with congenital hypertrichosis is covered from head-to-toe with a heavy growth; lacking hair only in those areas that normally have no hair at all, such as the palms of the hands and bottoms of the feet. Surprisingly, researchers who study these extreme cases find no unusual hormone imbalance. The excessive hair is the result of an abnormal genetic defect. Such cases require years of treatment. In certain cases, laser would be a better option.



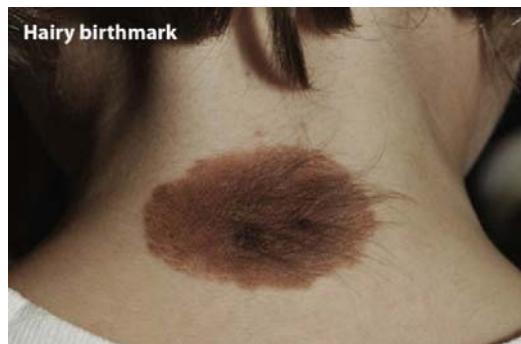
**Topical Causes:** Increased hair growth can occur when an irritant is applied to the *top* of the skin. Such irritants include: rubbing, a burn, abrasion, and a chemical reaction (cosmetics or medications). Irritation from these agents causes inflammation. The inflammation process brings fresh blood to the affected area. When the blood supply increases, follicles receive more nourishment from the blood and consequently grow deeper and coarser. Apparently, the hairs increase in size to protect the skin from the on-going irritation.



We all have microscopic vellus hairs on the top of our noses. Frequent sunburn can cause those nose hairs to grow larger. People who work outdoors often have repeated sunburn on the nose. The sunburn causes inflammation and more blood flow. After years of sun exposure and inflammation, the vellus hairs can become much larger. This hairy nose condition is sometimes called *construction worker's nose*. It's safe to perform electrolysis on the *external* skin of the nose; but avoid treating the area until the sunburn subsides.

Bandaging or having a cast (e.g., broken leg) commonly causes local hair growth. The rubbing of the cast or bandage causes irritation, inflammation, increased blood-flow and nourishes the follicles. Usually, the growth disappears after the cast or bandage is removed. Electrolysis on this temporary growth is not necessary unless the hairs don't diminish. Healing wounds and the growth of scar tissue increases blood flow. Thus, the healing process itself can generate hair growth. This growth may be temporary, but if not, these areas are safe for electrolysis.

Moles (Nevus) and birthmarks typically have clusters of coarse hairs. Although moles and birthmarks are not something *applied* to the skin, they're sometimes classified as topical causes. Moles and birthmarks have a dense network of blood vessels. The extensive network of blood vessels, in the mole or birthmark, causes increased hair growth. The main classifications of moles and birthmarks are vascular (blood vessels) and pigmented (color). Within these two main classifications there are many sub-sets and types of moles and birthmarks.



Moles and birthmarks are a special concern for electrologists. So far, there are no documented cases of electrolysis *causing* cancer in a mole or birthmark. However, most authorities caution against working on moles and birthmarks without a physician's written authorization. Even with authorization, many insurance companies exclude treatment of moles, warts and similar structures from their electrolysis liability coverage. Certain types of pigmented moles ... usually hairless moles ... can become cancerous. Still, it's probably best to leave this hair removal procedure to medical specialists and avoid the potential liability.

Tweezing (or plucking) hairs sometimes causes *increased* hair growth. Typical areas where women tweeze are the eyebrows, chin and upper lip. Tweezing is popular because the hairs stay away longer than from shaving. However, the long-term effects of tweezing often make matters worse. Repeated tweezing eventually causes hairs to regrow darker, coarser, distorted and more firmly rooted in the follicle.

Note from Bono: We have all heard reports of some eyebrow hairs being permanently removed by tweezing. This might actually be the case. However, to date I have found no published studies on this subject.

An increased blood supply is the cause of the accelerated growth of tweezed hairs. Each time a hair is tweezed out of its follicle, a good portion of the follicle is torn out. The damage is not sufficient to prohibit future growth but it is enough to cause the follicle to reconstruct itself a little sturdier and with better developed blood vessels (capillaries and venules). With each tweezing, a better blood supply is created. Also, a tiny bit of scar tissue forms in the follicle. Eventually what may have been a few annoying small hairs can eventually become full-grown terminal hairs. Occasionally when a hair is tweezed, the resulting hole becomes infected with microorganisms; usually staphylococci (bacteria), that normally inhabits the follicle pore. Deep infections can result in pitted scars.

Shaving has no effect whatsoever on hair growth. Shaved hairs look and feel coarser because they present a sharp blunt tip. As far back as 1928, Dr. Mildred Trotter conducted experiments testing the effect of shaving various parts of the body in adults of both sexes, ("Hair Growth and Shaving," *Anatomical Record*, 1928). She tested identical areas on each side of the patient. Dr. Trotter made measurements and hair counts of both identical areas before and during the time of testing. The test areas were shaved every day. After several months, she detected no difference in the amount, length, diameter or pigmentation of either vellus, small terminal or large terminal hairs on the shaved or unshaved sides. Similar tests have been conducted that confirm that shaving has no effect on hair growth. Dr. Peereboom, Rotterdam University, The Netherlands, conducted similar studies in the 1980s with identical results. *Shaving does not alter hair growth in any way whatsoever!*

Regrettably, some people insist that shaving causes hair growth. They speculate that if a young man were never to shave, he would never develop a beard. That of course is not the case; the beard will develop no matter what! Some people believe that irritation from shaving causes inflammation, increased blood flow and thus accelerated hair growth. There is no evidence to support that idea. In every case of topically stimulated hair growth, a long period of substantial irritation is necessary to induce stronger hair growth. If shaving actually grew hair, a bald man would only have to shave his head every day to regain his hair. *It's been tried ... it doesn't work!*



Waxing, sugaring and threading, are forms of mass tweezing. These commonly-used esthetician methods tweeze whole sections of hair from the skin. Most estheticians use a heated wax system. The heated wax is applied to the hairy area, a cloth or paper strip is placed on the wax and allowed to cool and harden. The strip is then quickly pulled off along with the hair and the "hair root." Sugaring is a similar technique that places a sticky product on the skin that is then torn-off along with the hairs. There are also popular commercial depilation (hair removal) products that are a gummy material and work like waxing. Threading is an ancient technique. The esthetician manipulates threads with her fingers to pull-out the hairs. *All of these techniques and products are the same: they tweeze-out whole sections of hairs from the skin.*

Certain areas, such as the legs, seem to handle waxing well. However, waxing sensitive areas, such as the bikini area, often causes ingrown hairs and potential bacterial infections. Waxing the genitals is *discouraged by medical authorities* because the torn-out follicles, in the moist area, is a perfect breeding-ground for bacterial growth and infection. The torn-out follicles also increase the risk of contracting a sexual transmitted disease STD.

Many estheticians claim that continued waxing reduces and eventually eliminates hair growth. This is not the case. Indeed, women notice diminished hair growth on the legs from waxing, but hair on the legs of both men and women diminish and eventually disappear with age. On the face, as with tweezing, continued waxing leads to darker, coarser and more firmly rooted hairs. *One guarantee: if you wax a man's back or chest, it will be the last time he submits himself to the torture and the resulting pimples and ingrown hairs!*

Depilatory (hair removal) creams are a chemical shave. Depilatory creams dissolve the hair shaft but do not affect the follicle or anything below the skin's surface. The hairs always grow back. However, the depilatory usually leaves smoother skin because the hair shaft is dissolved just below the skin's surface. The depilatory cream is applied to the skin and left on for several minutes as the hair shaft dissolves in the chemical. If left on too long, the cream will start dissolving the skin! After the appropriate time, the depilatory and hairs are washed off, and a protective lotion is applied to calm the skin. Individuals with sensitive skin sometimes develop dermatitis (inflammation of the skin), dry skin, and even "weeping" follicles from the depilatory. With simple care, these adverse conditions seldom last longer than 24-hours. Depilatory creams, like shaving, do not increase or accelerate hair growth.

Some electrologists speculate that electrolysis itself increases hair growth. Yes, electrolysis causes inflammation and an increase in blood to the area. But does electrolysis *cause* hair growth? The simple answer is: no, it does not! In order to topically stimulate the skin and cause hair growth, the stimulation and resulting inflammation must be on-going and substantial. Electrolysis is a short-term wound. Like electrolysis, when you have a cut or a minor injury, the irritation is not long enough to cause hair growth. However, major injuries or surgeries that result in deep scar formation can cause hair growth because of the many months of inflammation in the healing process. It's safe to remove hairs from scar tissue.

A woman's hair growth sometimes seems to accelerate after she starts electrolysis. Let's say your client has just started menopause and hairs are now being stimulated ... but the hairs don't all grow in at the same time; it's a gradual accumulation. Alarmed, she immediately visits your office. Hairs start to sprout where they'd not been seen before. To both you and your client

it may seem that the treatment is causing hair growth. *In reality, the hair growth was not caused by electrolysis; it was caused by hormonal changes.*

### **Introduction to the Endocrine System**

*Endocrinology is a distinct part of the medical profession. Those who practice endocrinology have spent years at school and have completed many thousands of hours of reading, experimenting and working with patients. Therefore, this chapter cannot offer you anything more than a “snap-shot” of this important field of medicine. Additionally, the endocrine system (glands and hormones) is still not fully understood. Read this chapter but don’t let it overwhelm you! Don’t attempt to memorize all the hormones and functions of the endocrine system! You can’t do it! You don’t need to! You aren’t going to practice endocrinology. Indeed, this chapter highlights important glands and hormones but does not go into great detail because doing that would fill several large textbooks.*

**Systemic Causes: The Endocrine System:** All hair growth that is not *congenital* or *topical* is called systemic hair growth, i.e., from the body’s internal system. All systemic hair growth is *caused* by changes in the endocrine system. The endocrine system’s glands produce chemicals called hormones. The term *hormone* is from the Greek word ὄρμων, meaning “to set in motion.” *And, setting in motion is exactly what hormones do.*

The endocrine system is not a single system with only one function as, for example, the heart. Instead, hormones from all the various endocrine glands work together to form an interconnected system. Hormones modify and control all the systems and processes in the body. Growth and aging, sexual and reproductive functions, mental fitness and metabolism\* are among the principles of life over which the endocrine glands hold complete control. (\**Metabolism is the name given to several processes that the body uses to create energy from the food you eat.*)

Endocrine glands secrete (release) hormones directly into the bloodstream. Each endocrine gland is composed of millions of cells, each of which is a miniature hormone factory. In most cases, the hormones pass from these individual cells directly into the bloodstream. Some glands, such as the thyroid, stockpile their hormones in special holding sacs and release their hormones into the bloodstream as needed.

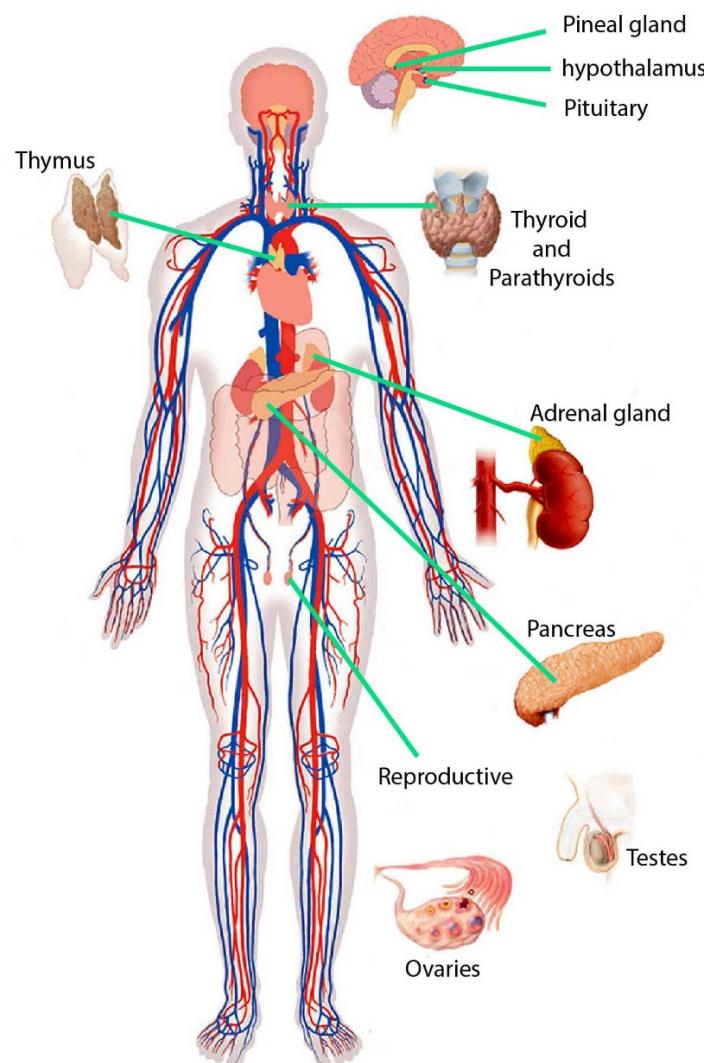
Once hormones enter the bloodstream, they travel throughout the body and flow through every artery, arteriole, capillary, venule and vein (all the blood vessels) in the circulatory system. Some hormones, such as thyroid hormone, appear to act on almost every cell in the body. Other hormones limit their activity to certain types of tissues. The tissues responding to specific hormones are called *target organs*. Special hormones target hair follicles and encourage or diminish hair growth. *Thus, all hairs are target organs for specific hormones.*

Likewise, all other organs in our body are targeted and affected by an array of hormones. The results of hormone activity can be classified into three main groups: 1) regulating growth, physical changes and sexual development, 2) regulating the autonomic (automatic) processes of the body, like breathing and heart rate, and patterns of behavior, 3) regulating digestion, electrolytes\* and water within the body. (\**Electrolytes are various ions, such as sodium, potassium, or chloride, required by cells to regulate the electric charge and flow of water molecules across cell membranes.*)

Exactly how hormones produce their effects on the body is not completely understood. However, hormones act as a catalyst\* for all body functions. In this way, hormones slow-down or speed-up body functions. Hormones also interact with other hormones. Certain hormones may assist one hormone function and slow-down the action of other hormones. Hormones secreted by specific endocrine glands can inhibit or enhance the function and production of hormones in other endocrine glands. (\**Catalyst: a substance that modifies and increases the rate of another reaction.*)

Hormones also act indirectly by increasing the local concentration of certain enzymes\* that cause changes in the body. Thus, hormones control and modify the effectiveness of other hormones. A normal endocrine system achieves balanced body functions and good health. (\**Enzymes: Any of numerous proteins produced by living organisms and functioning as biochemical catalysts.*)

## Location of the endocrine glands



## Endocrine glands and basic functions

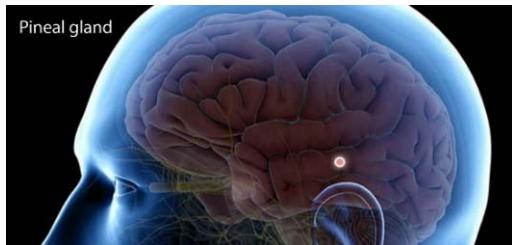


**Pituitary gland:** The pituitary gland looks like a cherry hanging from the base of the brain. The pituitary is made up of three lobes. The anterior (front) lobe of the pituitary gland is called the “master gland” because it controls the entire endocrine system. The hormones secreted from this gland are essential for normal growth, sexual development and reproduction. These hormones modulate other organs such as the heart, liver and

kidneys. *The entire pituitary gland and all the lobes are generally called the master gland.*

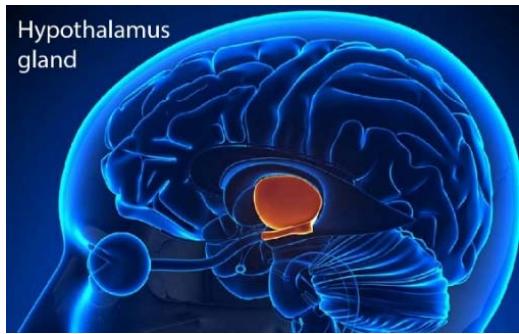
The posterior (back) lobe of the pituitary releases hormones that influence the biological processes of childbirth, and regulates the kidneys. The middle lobe secretes a hormone that brings about a deepening of skin pigment. The pituitary also produces hormones that stimulate and regulate the thyroid gland. Amazingly, the pituitary itself is affected by hormones produced by the *same* endocrine glands that the pituitary gland targets and controls. This biological interaction is like one-hand-washing-the-other. This is a two-way communication; working together ... one endocrine gland “talking with” and influencing the others.

The pituitary gland produces adrenocorticotrophic hormone (ACTH). The release of ACTH causes your adrenal glands to produce cortisol, and androgens (sex hormones). Thus, the pituitary has an *indirect* effect on hair growth because it stimulates the adrenal glands and the gonads (sex organs: ovaries and testis) that are the primary sources of hair-stimulating hormones. *An excess of the pituitary hormones can result in excess hair growth.*



**Pineal gland:** The pineal gland is a tiny gland in the brain. This gland is also called the pineal body or epiphysis cerebri. The pineal gland is shaped like a tiny pinecone, which is how it got its name (“pine”-al gland). However, it’s pronounced “pin-ee-uhl.” The pineal gland is the least understood gland of the endocrine system and was the last part of the endocrine

system to be discovered. The pineal gland produces melatonin. Melatonin regulates our sleep patterns and affects your heart and blood pressure. The pineal gland influences female hormone levels, fertility and the menstrual cycle. *Although not directly documented, there might be a connection between the pineal gland and hair growth.*

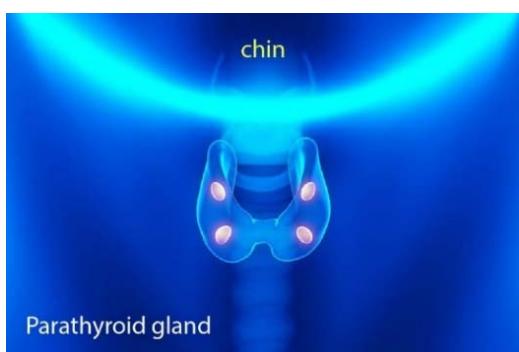


**Hypothalamus:** Located deep in the brain, the hypothalamus gland keeps your body in a stable condition called homeostasis ... almost like an automatic thermostat. The hypothalamus is the main link between your endocrine system and your nervous system. The hypothalamus hormones regulate and communicate with your autonomic nervous system. Your autonomic nervous system is a network of nerves throughout your body that control unconscious

processes such as digestion, breathing and your heart. Your hypothalamus receives chemical messages from nerve cells in your brain and from nerve cells in your body's peripheral nervous system, which is also responding to signals outside your body. *There is yet no known direct correlation between the hypothalamus and hair growth.*



**Thyroid gland:** The thyroid gland has two lobes that are located on either side of the trachea (windpipe in the neck). Thyroid hormone regulates metabolism, and indirectly effects growth and digestion. Because of the complex interrelationship between the thyroid, the pituitary and the ovaries and testes, *an abnormal amount of thyroid hormone might cause the production of excess hair-stimulating hormones.*



**The parathyroid glands** are four tiny glands located on the thyroid gland itself. They regulate how the body utilizes calcium and phosphorus. Parathyroid activity seems to be unrelated to the function of other endocrine glands, and *it's doubtful that parathyroid glands would have a significant influence on hair growth.*



**The thymus** is a small gland located in the chest cavity behind the sternum (breastbone). The thymus is part of the lymphatic system. The thymus gland produces special white blood cells called T-cells to fight infection and strengthen the immune system. The thymus produces most of your T-cells before birth and is most active during childhood. After puberty the gland starts to shrink and is very small in older adults. Most experts believed that adults don't really need a

thymus. Until the advent of HIV, it was believed that the thymus could not produce more T-cells in adults. HIV specifically attacks T-cells. However, several studies show that therapy with growth hormone (GH) stimulates the production of new T-cells by increasing the mass of the

thymus and doubling the number of newly made T-cells. *Presently, there seems to be no direct connection between the thymus and hair growth.*



**Pancreas:** The pancreas is located behind your stomach and in front of your spine. The pancreas is an organ that produces enzymes that help with digestion. The pancreas contains about a million groups of cells called the islands of Langerhans. These “islands” (or islets) are endocrine cells that produce the hormones glucagon and insulin. Insulin helps blood sugar gain entrance to the body cells and provide energy. Diabetes can result if these hormones are not properly produced. The diabetic

client poses special treatment problems for the electrologist because proper healing is weakened in patients with diabetes.



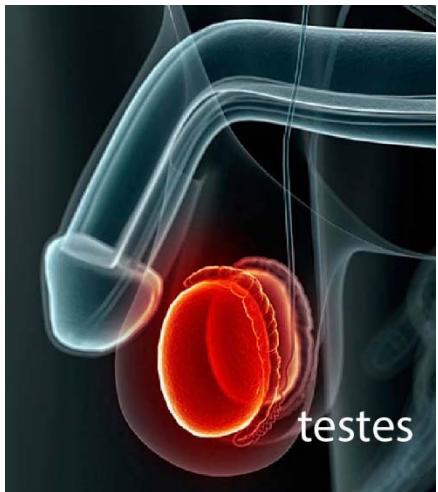
**Adrenal glands:** You have two adrenal glands, one on top of each kidney. Your kidneys sit just below your ribcage. The adrenal gland resembles the size and shape of a fortune cookie. Adrenal glands manage metabolism, the immune system, blood pressure, response to stress and development of sexual characteristics. The adrenal glands are composed of two parts: the medulla (in inner part) and the cortex (the outer part).

The cortex takes up 85% of adrenal gland tissue. The adrenal glands produce a variety of important hormones.

Adrenal glands produce hormones categorized as catecholamines and steroids. These hormones are so important that you cannot live without them. Catecholamine hormones produced by the adrenal glands include adrenalin and epinephrine. Adrenalin and epinephrine are released when you become frightened, angry, or excited. These hormones ... *that you feel immediately ... enhance energy and strength, and can make you jittery.*

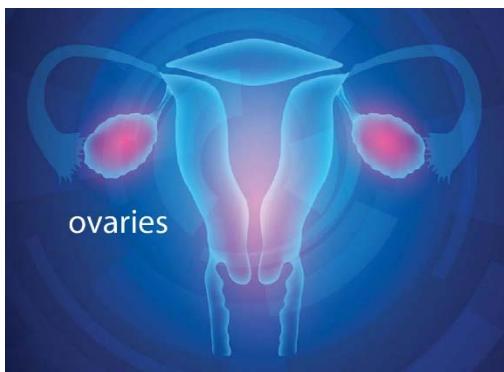
There are more than thirty known steroid hormones produced by the adrenal glands that can be grouped as follows: Sex hormones: androgens (male), estrogens (female) and progesterone (female). Sex hormones determine an individual's sexual development. The adrenal cortex produces a small amount of both male hormones (androgens) and female hormones (estrogens and progesterone). Because the adrenal cortex produces these sex hormones, each of us have a combination of both sexes hormonally. It is the predominance of one set of sex hormones over the other that ultimately determines an individual's secondary sex characteristics.

The adrenal gland (adrenal cortex) also produces corticosteroids such as the hormone aldosterone. Aldosterone (ALD) is a hormone that helps regulate your blood pressure by managing the levels of sodium (salt) and potassium in your blood; and impacting blood volume. Cortisone and hydrocortisone are also produced by the adrenals. These hormones help the body adjust to stress. *A deficiency in cortisone can cause the pituitary to stimulate an overproduction of adrenal androgens, thereby creating a medical condition of hypertrichosis.*



The **gonads** (testes/testicles and ovaries) produce hormones needed for reproduction. The testes and ovaries also produce steroids similar to those produced by the adrenal cortex.

**Testes:** The male testes/testicles produce androgens. However, some estrogens have also been found in the testes. The most potent androgen produced by the testes is called testosterone. Testosterone is the cause of physical changes during puberty such as the growth of the beard, the deepening of the voice and the enlarging of the genitals. These changes are regarded as secondary sex characteristics. Loss or malfunction of the testes prior to puberty will leave the individual without masculine characteristics.



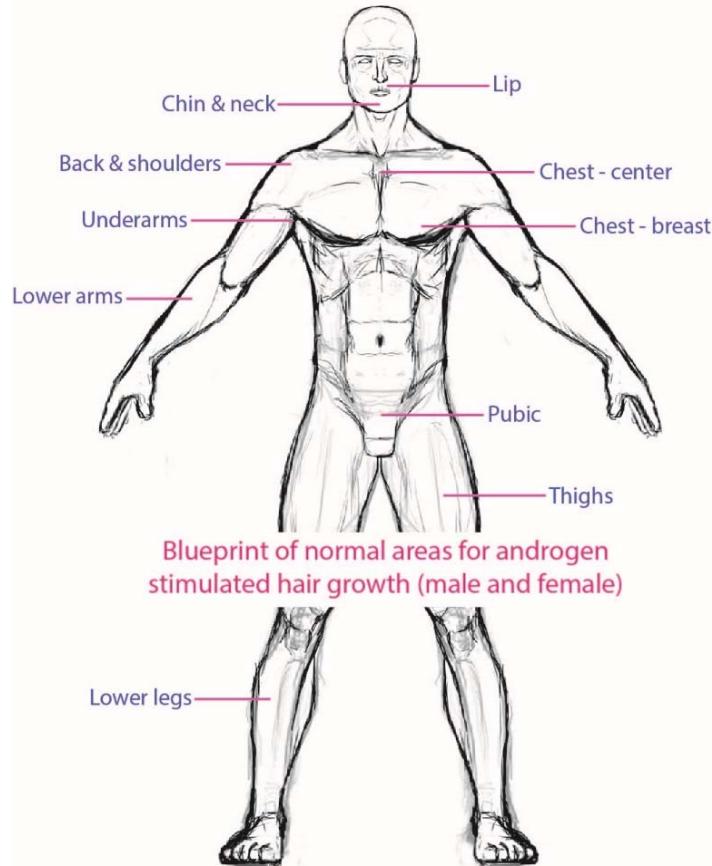
**The ovaries** are the female counterparts of the male testes. Ovaries direct the reproductive life of a woman. First, they produce the female sex cell, the ovum (the “egg”). Secondly, they secrete a group of hormones called estrogens, which are instrumental in the fertilization of the ovum by male sperm. Estrogens are also responsible for female secondary characteristics. Thirdly, the ovaries manufacture other hormones such as progesterone and relaxin; these are important hormones for the reproductive process.

Like the male sex glands, the ovaries have been found to produce hormones similar to those put out by the testes. There is some speculation that because the male and female glands originate from the same undifferentiated mass of cells in the fetus, the eventual sex differentiation of these glands is not always complete. Thus, a small amount of androgen-producing tissue sometimes persists in the ovary. Whether or not this conjecture is true, it is nevertheless widely known that certain ovarian tumors can lead to an unusual output of testosterone-like androgens. *This condition can cause excess hair growth.*

As you can see, different glands of the endocrine system can stimulate hair growth. This can be *indirect* stimulation as in the case of the pituitary gland, or *directly* as in the case of the adrenals and gonads. Only androgen hormones are known to *directly* stimulate hair growth on the face and/or body. *Thus, any spontaneous appearance of hair is usually a systemic imbalance or an increase of androgen hormones.*

## Normal Systemic Changes

There are specific areas on the face and body that are normally sensitive to androgen hormone stimulation and hair growth. These areas are identical in both men and women. These areas represent a blueprint (diagram) of potential hair growth patterns. Women have less potential for hair growth than men, because women produce less androgen hormone. Nevertheless, for women, during puberty, pregnancy or menopause, hairs can proliferate and become coarser and darker in these blueprint areas.



For each person, the blueprint of hair patterns will vary depending on the hormone sensitivity they inherited. Inherited hair growth patterns differ greatly depending on one's racial background. Because of heredity, hair patterns on each person will be different and are not entirely predictable. Some women develop body hair without any hair on the face. Other women may develop lip or chin hair without changes elsewhere. In all cases of spontaneous hair growth, the change was triggered by an increase in androgen hormones.

**Puberty:** Puberty is the process of physical changes through which a child's body matures into an adult body capable of sexual reproduction. Puberty starts when the pituitary (anterior lobe) ...

the “master gland” … secrets hormones that target and stimulate the gonads (testes and ovaries). In males, the testes (also called testicles) are stimulated. In females, the ovaries are stimulated. In both males and females, the adrenal cortex is also stimulated. The gonads, and the adrenal glands produce and release *steroid hormones* into the bloodstream. The steroid hormones that control puberty are the androgens (male), estrogens (female) and progesterone (female). “Androgens” is a general term for male sex hormones. Testosterone is an important androgen hormone.

The testes and the ovaries produce various androgens. Both males and females produce androgens, but males produce more. In males, the body changes are dominated by the androgen hormones from the testes. In females, the body changes are dominated by estrogen hormones from the ovaries. The hormonal changes during puberty result in hair growth in specific areas of the face and body. In women the increase in androgens is responsible for the appearance of pubic and axillary hair. The appearance of hair in other regions depends on the woman's hereditary sensitivity to androgens and the amount of androgen hormones produced.

Likewise in men, androgens control the appearance of pubic and axillary hair. But specifically, testosterone (an androgen), the principal hormone of the testes, is responsible for all other male hair patterns. For example, even though pubic hair is generally stimulated by various androgens, the characteristic linear extension of the male pubic hair towards the umbilicus (belly button) is due to the action of testosterone. Testosterone also influences the growth of the beard, converting the soft down of a boy into a man's beard. Hair on the body, arms and legs is another result of testosterone. One unfortunate effect of testosterone is male pattern baldness, generally beginning when a man is 35 years-old, in cases where there is an inherited tendency to baldness.

Puberty sometimes accelerates vellus hairs. Longer accelerating vellus hairs can appear on the face or body, depending on the susceptibility of the area to hormone stimulation. In adolescent girls, the accelerating vellus hairs are usually temporary. Once hormones are in balance, after puberty, the long vellus hairs gradually disappear. Rather than perform electrolysis on the accelerating vellus hairs, it's best to wait and see if they return to tiny vellus hairs. *However, if the hairs advance to terminal, then electrolysis is appropriate.* Only in cases of extreme anxiety about appearance is there any necessity for treating youngsters. Tweezing (waxing, etc.) should be discouraged because tweezing will eventually cause those fine hairs to become coarse hairs.

**Pregnancy:** Pregnancy is a time of unusual endocrine activity, and occasionally excess androgens are produced. Often a growth of hair will appear on the upper lip, chin and sides of the face and abdomen. Seldom, however, do these become terminal hairs. Not long after the woman has given birth, the endocrine balance is restored and the unwanted crop of hair disappears. *Treatment is therefore unnecessary.*

**Menopause:** Menopause marks the end of a woman's reproductive ability. Menopause takes place over a period of years, usually beginning at around 40 years-of-age. Menopause is a time of great stress for most women; and the emergence of a new crop of hair is hardly a comforting addition to the problems menopause often brings. The basic cause of this change is a decline in the secretion of estrogens by the ovaries.

Unfortunately, excessive hair is a frequent “companion” of menopause, because the ovaries aren’t producing sufficient estrogen. Since hormones produced by the ovaries have an inhibiting effect on the anterior pituitary, the lack of estrogen means lack of proper control over this master gland … which then begins to produce stimulating hormones. This results in a hyperstimulation by pituitary hormones of the adrenal cortex which in turn produces, among other things, an excess of hair-producing androgens. Thus, many women whose ovary activity is slowly declining, usually after age thirty-five, gradually develop some face and body hair.

At the beginning of a woman's menopause, she may acquire accelerating vellus hairs and a few bristles. Often the chin hairs increase one-by-one over a period of years until tufts of coarse dark hairs are formed; especially on both sides of the chin. The majority of your clients will be women in or beyond their menopause. You can be of great service to these women since many of the hairs developed during this time are permanent.

Some clients will ask you to remove all the “potentially large” vellus hairs from the area. This is not a good idea. Only a small percentage of vellus hairs will ever become terminal hairs, and treating them is only a needless expense. You should concern yourself only with those hairs that have already become accelerating vellus or terminal hairs. If treatment is begun late in menopause or after menopause is complete, you will seldom find any heavy *new* growths of terminal hair; just an occasional appearance of scattered bristles.

## Abnormal Systemic Changes

Sometimes an endocrine imbalance will result from abnormal circumstances. Often, this involves a disorder that requires treatment by a qualified endocrinologist. You should be able to recognize these disorders to wisely counsel your clients. In such cases hypertrichosis must first be treated through correction of the underlying cause, i.e., the hormone imbalance itself. Then, once medical treatment has started, you can deal directly with the hair problem.

The wisest advice you can give a client suffering from an endocrine disorder is that he or she report to a specialist as quickly as possible. *Do not attempt to diagnose the client's problem yourself!* A thorough examination by a physician is the only sure method of determining the true nature of a client's problem. As a matter of policy, you should refuse to treat any client who manifests serious symptoms until the client has visited a physician or endocrinologist and received permission to proceed with electrolysis treatment.

The outline of abnormal endocrine conditions offered here should be used *only* as a guide for noticing pathological conditions. Pathology/pathological is a medical term that means the study of the origin, nature, and course of a disease. The term “pathological” is intended here to indicate those disorders which involve some form of disease, and that are not the result of *surgery, medication or emotional circumstances*. Pathological endocrine disorders arise out of 1) a glandular defect inherited from either parent, 2) an acquired disease or infection, 3) a tumor, or 4) a dietary deficiency. Listed below are several common pathological disorders which result in hypertrichosis.



**Cushing's Syndrome:** A syndrome is a group of symptoms and signs, which, when considered together, characterize a disease. Cushing's syndrome involves a collection of symptoms brought on by a prolonged excess of androgen hormones. Hirsutism is one of its signs. Cushing's syndrome is characterized by rapidly developing obesity of the face, neck and trunk, whereas the arms and legs are unaffected. Subjects become round shouldered. Women cease to menstruate. Skin is pale, acquires purplish lines, and bruises easily. Backache and abdominal pain are also common.

There are many possible causes of Cushing's syndrome: Hyperplasia (excessive cell development) of the adrenal cortex, tumors of the adrenal cortex, tumors of the pituitary, or prolonged medication with doses of adrenocorticotrophic hormone (ACTH), cortisone or hydrocortisone. In short, any kind of condition that causes the adrenal cortex to produce excessive amounts of hormones, including androgens, can produce Cushing's syndrome.

**Adrenogenital Syndrome:** This syndrome, which is somewhat rare, arises when the adrenal cortex becomes unable to utilize the chemical materials needed for manufacturing cortisone. Instead, it transforms cortisone into androgens. Since the pituitary puts out adrenal-stimulating hormones in proportion to the amount of cortisone circulating in the system, the lack of cortisone causes the pituitary to encourage the cortex to work even harder. But all the cortex can produce is androgens, which it secretes in even larger quantities.

If the adrenogenital syndrome exists in a female fetus it produces a "false hermaphroditism." The girls retain their ovaries but their external genitalia tend toward masculine development. Later, the girls may develop a beard and moustache, a deep voice, and an athletic muscular development, as well as other male secondary sex characteristics. Young boys with adrenogenital syndrome develop sexually and acquire all the secondary characteristics associated with puberty. This condition, if it appears in childhood or in its less extreme form in adulthood, is often called "adrenal virilism." The causes of the adrenocortical syndrome usually involve an abnormality of the adrenal cortex, or a tumor in the adrenal cortex.



**Achard-Thiers Syndrome:** "Diabetes of bearded women," as it is sometimes called, is a rare condition in which features of the adrenogenital and Cushing's syndrome are combined. Achard-Thiers syndrome occurs primarily in postmenopausal women and is characterized by type 2 (insulin-resistant) diabetes mellitus and signs of androgen excess such as excess hair. This syndrome appears to be transmitted within families. Approximately 50% of the sisters of women with PCOS have some form of this syndrome. The mechanism of genetic transmission is unknown. The exact cause of Achard-Thiers syndrome is unknown.

**Stein-Leventhal syndrome, now called polycystic ovary syndrome (PCOS):** This disorder affects the reproductive health of women. Common symptoms include excess body hair, a lack of menstrual cycle, absence of menstruation, and infertility. This disease is characterized by lack of menstruation and/or abnormal uterine bleeding, frequent hirsutism, occasional obesity and retarded breast development. The ovaries contain multiple cysts, which are probably the cause of the disorder. *PCOS is now a major focus of the electrology profession and will have its own category at the end of this chapter.*



**Acromegaly:** Excessive pituitary hormones, when they are produced by the anterior pituitary gland early in life, lead to gigantism, which is a disease marked by the rapid growth of the whole body to extremely large proportions. If, however, the excess hormones do not begin to flow until the body has so matured that it is not capable of further symmetrical development, the abnormal growth causes acromegaly. At that time only those portions of the body capable of responding to the hormone stimulation can continue to grow and develop.

Acromegaly is characterized by the coarsening of the features, due to the continued growth of tissue. Hands, feet and face show the greatest change. The enlargement gives rise to pressure symptoms in many areas. Defective vision and even blindness may result. Besides the effect on growth, many secondary changes in the function of other glands occur as the result of this disease of the master gland. Included among these changes is the production of androgens, which in many men and women results in extensive hypertrichosis, including heavy face and lip hair growth. The cause of acromegaly is usually a tumor in the pituitary.

**Anorexia nervosa:** Often referred to simply as anorexia, this is an eating disorder characterized by low body weight, food restriction, body image disturbance, fear of gaining weight, and an overpowering desire to be thin. Approximately 90 percent of people with anorexia are women between the ages of 12 and 25. This disorder was initially found mostly in upper- and middle-class families. However, anorexia is now known to affect both sexes and span all ages, socioeconomic, ethnic, and racial groups.



Anorexia is associated with profound decreases in reproductive hormones such as estrogen. The many hormonal changes that happen with this disorder often creates accelerating and abundant "silky" hair growth in certain areas of the body. This growth is sometimes called "lanugo hair growth." This uncommon hair growth is a symptom of starvation and malnutrition. Excessive hair growth is a sign that the body is trying to protect itself during the starvation process by trapping in heat that muscles and fat can no longer provide. Anorexia can also cause hair loss, especially from the scalp.

Not all women – or men – will develop excessive hair growth (or loss) from anorexia, but hair problems can be a psychologically troubling side effect of having an eating disorder. If you observe that your client is obviously under-weight and compulsive about his/her physical appearance, attempt to have your client consult with a physician *before* performing treatments.

You may have to be firm on this issue, because resistance to change is high in people suffering from anorexia. But your concern might be worth it ... *anorexia is a life-threatening disorder that requires immediate medical attention!*

**Summary:** There are other endocrine conditions besides those listed above believed to be responsible for excessive hair growth. For example, both hypothyroidism (not enough thyroid) and hyperthyroidism (too much thyroid) have been indicated at various times as the cause of excessive hair growth. But some specialists deny that this can be the case. The problem involved here, as in so many cases of hormonal disorders, is the complexity of the endocrine gland's interrelationships. The thyroid problem may only be the result of some other problem, which itself is stimulating excess androgens. High-level research is continuing in endocrinology. There seem to be daily updates on research and medical papers. As more information accumulates, a more detailed link between hair growth and hormones will be established.

**Surgical Changes:** The surgical removal of the ovaries in women after puberty causes an artificial menopause. Menstruation ceases and the woman becomes sterile. Because the normal control that estrogens have on the adrenal cortex is removed, androgens are produced in greater quantities. The frequent result is facial hair growth.

**Medication Changes:** Because of the complexity of the endocrine system, taking any hormone medication may lead to abnormal hair growth. Most hormone drugs have warnings on the label stating that hair growth may take place. Cortisone, used as an anti-inflammatory medication, is a common cause of symptoms that resemble Cushing's syndrome. Some women who have excess vellus hair, lose the vellus hairs because of using birth control pills. Other women who had no hair problem suddenly *grow* hair from using birth control pills. Because each woman has her own unique chemistry there is no way to accurately predict her reaction to hormone medications such as birth control pills. Ordinarily a hair condition will return to normal when the woman stops taking the medication. *However, if the stimulated hairs became terminal hairs, they will require electrolysis.*

**Emotional Changes:** People under extreme stress often develop heavier growths of hair. Women in concentration camps during World War II developed unusual hirsutism as the result of the intense and *prolonged* stress. Hair growth arises because the adrenal glands are highly active during stressful situations. In a crisis, the adrenal glands produce large amount of adrenalin and steroids. Adrenal-derived steroids act as precursors for the production of more potent androgens in target tissues such as hair follicles. Thus, abnormal adrenal activity leads to excess hair. This is not, however, a problem that confronts electrologists very often.

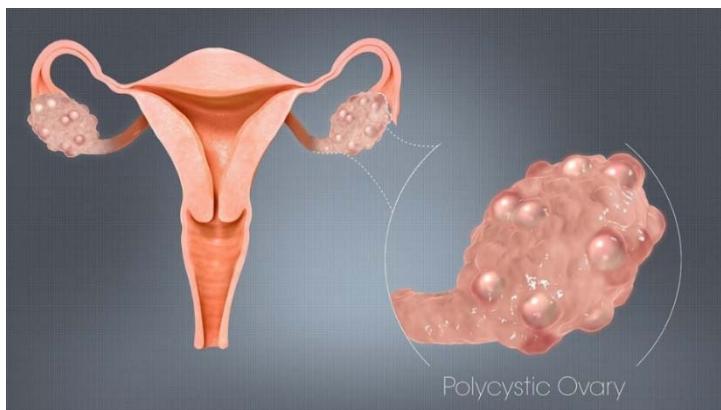
### **The following article is from the Mayo Clinic:**

**Polycystic ovary syndrome:** Polycystic ovary syndrome (PCOS) is a problem with hormones that happens during the reproductive years. If you have PCOS, you may not have periods very often. Or you may have periods that last many days. You may also have too much androgen hormone in your body.

With PCOS, many small sacs of fluid develop along the outer edge of the ovary. These are called cysts. The small fluid-filled cysts contain immature eggs. These are called follicles. The follicles fail to regularly release eggs. The exact cause of PCOS is unknown. Early diagnosis and treatment along with weight loss may lower the risk of long-term complications such as type 2 diabetes and heart disease. Symptoms of PCOS often start around the time of the first menstrual period. Sometimes symptoms develop later after you have had periods for a while. The symptoms of PCOS vary. A diagnosis of PCOS is made when you have at least two of these:

**Irregular periods.** Having few menstrual periods or having periods that aren't regular are common signs of PCOS. So is having periods that last for many days or longer than is typical for a period. For example, you might have fewer than nine periods a year. And those periods may occur more than 35 days apart. You may have trouble getting pregnant.

**Too much androgen.** High levels of the hormone androgen may result in excess facial and body hair. This is called hirsutism. Sometimes, severe acne and male-pattern baldness can happen, too.



**Polycystic ovaries.** Your ovaries might be bigger. Many follicles containing immature eggs may develop around the edge of the ovary. The ovaries might not work the way they should. An ultra sound examination can determine if the ovaries contain cysts.

PCOS signs and symptoms are typically more severe in significantly overweight people. See your health care provider if you're worried about

your periods, if you're having trouble getting pregnant, or if you have signs of excess androgen. These might include new hair growth on your face and body, acne and male-pattern baldness. The American Electrology Association (AEA) is doing outstanding work to make both electrologists and the public aware of PCOS. Go to the AEA website for more information on electrolysis and PCOS. [www.electrology.com](http://www.electrology.com)

**Summary:** Unwanted hair can be caused *congenital, topical or systemic* changes. Systemic changes are, by far, the most frequent reason for visits to the electrologist. For this reason, you should become acquainted with the symptoms of hormonal disorders. Ask your client who shows signs of a hormone imbalance whether she has been taking hormone preparations and whether her reproductive system is functioning properly. If her answers to these questions indicate a disorder, suggest that she discuss it with her own doctor. You must be satisfied that the causes of a hair problem are under proper care, if you expect to remedy the effects.