HAIR RESTORATION INSTITUTE

HAIR LOSS

Hair shedding is part of a normal hair-growth cycle. At any given time, 90% of scalp hair is in a 2 to 6 year growth phase; 10% is in a 2 to 6 month dormant phase. When the dormant phase ends, hair is shed. New hair subsequently emerges from these follicles. Throughout a normal growth cycle, many hairs are shed. Loss of 50 to 100 hairs daily is not cause for alarm. Noticeable thinning indicates significant hair loss or balding. Hair loss and balding are not life-threatening but can cause emotional distress.

Hair loss results from numerous factors such as aging, genetic pre-disposition, thyroid imbalance, eating disorders, illness, hormonal effects of birth control pills, pregnancy, or menopause, and certain medications. The most common cause of hair loss is a hereditary condition known as androgenetic alopecia (AGA). Male pattern hair loss tends to run in families.

Hair loss caused by AGA in men and women is characterized by a gradual shrinking of hair follicles, which shortens the life cycle of hair. As the growth cycle phase progressively shortens, newly grown hair is shorter and thinner until new hair growth eventually ceases entirely. Hair-thinning conditions can be treated. Early intervention is important for retaining and restoring the hair.

Genetic or hereditary hair loss does not discriminate between sexes or races. Approximately 40 million men or 2 out of 3 men in the United States have significant hair loss. About 25% have some form of balding by age 30, and 65% begin to bald by age 60. In women, the number affected by pattern-type hair loss is slightly less: about 30 million or 1 in 4. Thinning hair can occur anytime between ages 25 to 45, but most commonly hair loss presents after age 40. Hair loss occurs in about 25% of pre-menopausal women and in 38% of post-menopausal women.
Types of Hair Loss

Male-Pattern Baldness
Male-pattern balding, the most common type in men, usually starts at the temples and gradually recedes to form an “M” shape. Hair on the top of the head thins. Over time, hair takes on a horseshoe-shaped pattern. Some males have only a receding hairline or bald spots at the crown. Hair remaining in balding areas is long, thick, and pigmented and then changes into fine, non-pigmented hair that grows at a slow rate. Men losing hair during the mid-teen years are more likely to become completely bald on top of their heads in the future.

Androgenetic alopecia (AGA) is a major factor in male-pattern baldness. AGA is attributed to androgens, hormones that are responsible for male characteristics. AGA has three causal factors: advanced age, an inherited tendency to early baldness, and overabundance of DHT (dihydrotestosterone, the most potent androgen in the hair follicle which is derived from testosterone). Testosterone is metabolized into DHT by 5-alpha-reductase, an enzyme produced in the prostate, adrenal glands, and scalp. DHT (and perhaps other androgens) causes hair follicles to shrink and enter a permanent dormant state. DHT triggers synthesis of transforming growth factor-beta2 (TGF-beta2), which suppresses epithelial cell proliferation and eventually leads to apoptotic cell death. TGF-beta2 is directly responsible for significant hair loss on a cellular level. Combating the effects of TGF-beta2, using combination therapy with current DHT and androgen inhibitors, may have a significant role in treating hair loss.

Female-Pattern Baldness
Female-pattern baldness (or diffused thinning) is caused by aging, genetic susceptibility, and androgen. Female-pattern baldness usually begins about age 30. It becomes more noticeable by age 40 and can be quite evident following menopause. Female-pattern hair loss usually causes hair to thin all over the head. It rarely progresses to near or total baldness.

Telogen Effluvium
Telogen effluvium is an abnormal loss of hair caused by alteration of a normal hair cycle. In telogen effluvium, a large proportion of hair enters the dormant phase and hair shedding is greater than normal. Telogen effluvium can follow a case of flu or emotional stress or can occur after a pregnancy. Hormonal changes in pregnancy can cause increased numbers of hair follicles to remain in a growth phase. After pregnancy, an increased proportion of these hairs enter a dormant phase, a temporary self-correction that increases hair shedding. This condition is also seen when birth control pills are stopped.
Chemotherapeutic Hair Loss
Cancer chemotherapy may cause hair cells to stop dividing, which is typically a transient condition. Hair can fall out for 3 to 4 months before growing back. When a drug is prescribed, ask your physician if a side effect is hair loss. Side effects of all prescription drugs are listed in the Physicians' Desk Reference. Pharmacists also have this information.

Alopecia Areata
Alopecia areata is a highly unpredictable, autoimmune skin condition that causes loss of scalp hair, facial hair, and hair elsewhere on the body. It affects approximately 1.7% of individuals (over 4.7 million people) in the United States. In alopecia areata, affected hair follicles are mistakenly attacked by an individual’s immune system (white blood cells) and the hair growth stage is arrested. Alopecia areata typically begins with one or more small, round, smooth bald patches on the scalp. It can progress to total scalp hair loss (alopecia totalis) or total body hair loss (alopecia universalis). Alopecia areata affects males and females of all ages and races. Onset often begins in childhood when it can be emotionally devastating. Alopecia areata is not life threatening, but is most certainly life-altering. Its sudden onset, recurrent episodes, and unpredictable course have profound psychological impact. Dr. Steven Ringler has shown promising results in the treatment of alopecia areata with Hair Prescriptives, botanical hair oil treatment.

Trichotillomania
Trichotillomania is a psychological disorder (an impulse control disorder). Impulse control disorders are characterized by an uncontrollable urge (or impulse) to do something that harms one’s self or others. Trichotillomania patients repetitively pull their hair out at the root from the scalp, eyebrows, or eyelashes or chronically scratch or brush their hair. Trichotillomania affects 1 to 2% of the population, primarily children. Girls are more likely to be affected than boys.

Scarring Alopecia
Scarring alopecia describes skin scarred by burns, X-ray therapy, skin cancer, or severe injury resulting in hair loss.

Other Causes of Hair Loss
Hair loss can occur from damage caused by hair styling processes and products and from twisting and pulling hair. Certain skin conditions cause hair loss and baldness. Hair loss can be caused by oral medications, including cholesterol-lowering drugs, Parkinson’s medications, ulcer drugs, anticoagulants, anti-arthritis, drugs derived from vitamin A, epilepsy anticonvulsants, antidepressants, beta-blockers for hypertension, anti-thyroid agents, and anabolic steroids.
ANATOMY AND PHYSIOLOGY (STRUCTURE AND FUNCTION)
Each hair originates in a deep pouch-like structure in the epidermis, which penetrates the dermis. A hair root extends down into the hair follicle and widens into an indented bulb at its base. Extending into the indentation is the papilla (the center of hair growth), which contains capillaries and nerves that supply a hair. Newly dividing cells at the base of the hair multiply, forcing cells above them upward. As cells move upward, they gradually die and harden into a hair shaft. A hair shaft has two layers: cuticle and cortex. The cuticle (outer layer) consists of flat, colorless, overlapping cells; the cortex is the inner layer. The cortex contains pigment and keratin, a tough protein. The cortex forms the bulk of a hair shaft. Coarse hair such as scalp hair contains an additional inner core (medulla). Hair is lubricated by sebaceous glands located in hair follicles. Illness or stress can lessen pigment secretion and cause hair shafts to whiten. Age-related whitening is genetically determined. Hair color is determined by pigment and air spaces in the cortex and medulla. Hair color and texture are inherited characteristics. Humans scalp hairs generally shed every 2 to 4 years; body hairs are shed more frequently.

PATHOPHYSIOLOGY
In the scalp, a hair growth cycle has three main phases: anagen, catagen, and telogen. The anagen phase is the growth cycle typically lasts 3 to 5 years. On a healthy scalp, hair numbers approximately 100,000 and 90% of the follicles are continually in the anagen phase of hair growth. The catagen stage follows the end of the growth period when a follicle begins to become dormant. The telogen stage is a dormant or resting period that lasts 3 to 4 months. When the dormant phase ends, an old hair falls out. A hair follicle then returns to the anagen stage and a new hair begins to grow. An average rate of hair growth is about half an inch per month depending on hair follicles and age of an individual. On average, 50 to 60 scalp hairs are lost daily in a normal hair growth cycle and new hairs begin to grow from these follicles. Hair loss begins when less new hair begins the re-growth stage.

ETIOLOGY AND MECHANISMS OF ACTION
In male-pattern baldness, scalp hair in affected areas becomes shorter, finer, and less pigmented with successive growth cycles. This type of hair loss, androgenic alopecia, is thought to be associated with the presence of dihydroxytestosterone (DHT), a metabolite of testosterone. Eunuchs have low levels of testosterone and do not lose scalp hair and men with genetic deficiency of 5-alpha-reductase (the enzyme that converts testosterone to DHT) do not have male-pattern baldness.
PHARMACOLOGY

Traditional Approaches
A biopsy may be required to determine baldness type. A biopsy ascertains if hair follicles are normal. Conventional choices can be used to treat hair loss: taking better care of the scalp, use of minoxidil (Rogaine®) and/or Proscar®, surgical hair transplants or a scalp reduction, or non-surgical hair replacement. Successful prevention and treatment of accelerated hair loss necessitates treating factors that are involved in contributing to the hair-loss process (excluding the genetic component).

Anti-Androgens
DHT (the male hormone dihydrotestosterone) is associated with premature hair loss. A wide variety of anti-androgens are used to prevent or reverse premature hair loss: progesterone, spironolactone (Aldactone®), flutamide (Eulexin®), finasteride (Proscar®), cimetidine (Tagamet®), Serenoa repens (Permixon® and cyproterone acetate (Androcur/Diane®). The most effective anti-androgens are oral finasteride (Propecia®, Proscar®). Some patients prefer not to use these products due to potential side-effects associated with the hormones.

In hair-loss, an immune reaction caused by male hormones (e.g., DHT) has perhaps the most significant role. Stimulated by androgens, the immune system targets hair follicles in genetically susceptible areas and causes premature hair loss characteristic of male-pattern baldness.

Growth Stimulators
Topical oxygen free-radical scavengers (e.g., superoxide dismutases, SODs, enzymes that counter excessive free-radical activity) are potent hair-growth stimulators. SODs inhibit oxygen radicals and may inhibit a localized immune response implicated in hair loss and offset damage and inflammation. Unless immunologic factors involved in hair loss process are effectively treated, potential for significant hair re-growth may be very limited. Available agents (e.g., Rogaine®) stimulate some degree of hair growth in some individuals, but cannot by themselves produce healthy hair and cosmetic benefits. A multi-modal approach is required that combines anti-androgens, autoimmune system protective agents, oxygen free-radical inhibitors, and other hair-growth stimulators to halt hair loss and generate hair re-growth.

Finasteride
Finasteride (Proscar®) was originally developed to treat benign prostatic hyperplasia (BPH). It is available by prescription in 5-mg tablets. Finasteride (Propecia®) is FDA-approved for hair loss treatment. It is available by prescription in 1-mg tablets for
men at $45 to $50 per month. Propecia should not be taken by women. Finasteride was once thought to be useless for androgenic alopecia treatment because it primarily affected 5-alpha-reductase, the type 2 DHT-producing enzyme. However, finasteride in doses as low as 0.2 mg daily maximally decrease scalp, skin, and serum DHT levels. Finasteride can produce visible hair growth in most men with mild-to-moderate alopecia and can stop hair loss in a majority of patients. Finasteride (1 mg daily over 5 years) was well tolerated, produced durable improvement in scalp hair growth, and slowed further hair loss progression that occurred with no treatment. The most common side effect is decreased sexual desire or lowered amount of ejaculate (less than 2%, although men receiving placebo experienced the same side effects). Initial results of the Prostate Cancer Prevention Trial, produced concerns that finasteride might promote prostate cancer; finasteride was thought to reduce incidence of prostate cancer in men over 55 by one researcher; trial participants who developed prostate cancer had slightly more high-grade tumors.

**Dutasteride**

Dutasteride (GG745), similar to Propecia®, blocks enzymatic conversion of testosterone to DHT. Unlike finasteride, dutasteride blocks two enzymes that create DHT rather than one and may be a more potent treatment for hair loss.

**Azulfidine**

Azulfidine is an anti-inflammatory sulfa drug used to treat autoimmune disorders (e.g., rheumatoid arthritis and Crohn’s disease). It is used in alopecia areata. Azulfidine completely reverses alopecia areata in 23% of participants. Although some re-growth occurred in other participants, the majority had no effect.

**Minoxidil**

Originally used to treat high blood pressure, minoxidil is now widely used as a topical solution applied twice daily to treat male-pattern baldness. It may improve hair growth in 10 to 20% and slow hair loss in 90% of users. How minoxidil acts is unclear, but when effective, minoxidil appears to prolong the growing phase in the hair growth cycle, enlarge follicles, and cause dormant follicles to grow. Minoxidil may take 4 months or longer to produce results. Treatment is relatively expensive and must be continued indefinitely. When minoxidil is stopped, re-grown hair falls out. Newly grown hair may not be as long or thick as normal hair. Minoxidil is more effective in young men and men with recent-onset hair loss.

**Hair Transplantation**

Early hair-grafting techniques were somewhat crude, often leaving a “patchwork” appearance. Newer techniques, including micrografting, involve transplanting productive hair follicles from a donor area on the scalp to a balding area. Hair follicles are commonly taken in plugs of one or two hairs (micrografts) from the sides or back of the head and moved to the front and/or top, slowly reconstructing a hairline. Donor sites with full hair produce more successful transplants. Transplanted follicles can be permanent or last only a few years.
**Scalp Reduction**
Balding scalp areas can be surgically removed to decrease an appearance of baldness. Scalp reduction is usually used in conjunction with grafts or flaps. Prior to reduction, the scalp may be stretched to expand areas where hair is growing. Effectiveness of scalp reduction depends on degree of hair loss and scalp elasticity. This technique is now somewhat dated and is rarely utilized.

**NUTRITIONAL THERAPY**
A healthy diet, low in fat and high in fiber, fresh fruit, and vegetables, can have a major role in inhibiting hair loss associated with aging and genetics. In Asian countries, where vegetables are prevalent in standard dietary practices, pattern-type hair loss is rarely observed. Botanically based nutrients may prevent hair follicles from entering a permanent dormant state. Nutritional supplements can provide some benefit.

**L-Lysine**
A United States patent has been issued for L-lysine for treatment of various types of hair loss, including androgenetic alopecia. L-lysine (an amino acid) inhibits 5-alpha-reductase.

**L-Arginine**
Hair follicles use nitric oxide to maintain and promote new hair growth. L-arginine is required to produce nitric oxide.

**Saw Palmetto**
Saw Palmetto (Serenoa repens) is a palm-like plant that is native to North America. An extract derived from saw palmetto berries contains fatty acids and sterols. Saw palmetto is commonly used to treat benign prostatic hyperplasia because it inhibits testosterone’s action on the prostate. Extracts of Saw Palmetto block 5-alpha-reductase, reduce DHT uptake by follicles, and block binding of DHT to androgen receptors. The liposterolic extract of saw palmetto combined with beta-sitosterol (a phytosterol common to many plants and grains) produced marked improvement.

**Green Tea Extract**
Topical agents such as finasteride inhibit type II 5-alpha-reductase in hair follicles. Agents from tea (catechins, (-) epigallocatechin-3-gallate and (-) epicatechin-3-gallate) affect type I 5-alpha-reductase activity responsible for converting testosterone to DHT. All tea is derived from the same plant species, but types and varieties differ according to where and how the plants are grown and how the tea is produced. Catechins in green tea leaves are more potent. Black pekoe is allowed to dry and ferment, but green tea is not, thereby preserving catechin integrity.
**Complementary Topical Treatment**

**HAIR PRESCRIPTIVES**
Dr. Steven Ringler has been involved in the study of hair loss and restoration for over 20 years. Dr. Ringler has developed a proprietary botanical hair oil hair formula for thinning hair that requires no prescription. When used on a regular basis, Dr. Ringler’s Hair Prescriptives botanical oil treatment has been shown to improve the thickness, health and quality of hair.

**SUMMARY**
Several factors lead to hair loss in men and women, most notably androgenic alopecia, an inherited condition. Treatment is available. Early treatment produces better results. Balding and thinning hair is a cosmetic condition, usually resulting from genetic influences, aging, skin conditions, or certain medications. The most common forms of balding are male- and female-pattern baldness. Oral prescription drugs such as Propecia® and Proscar® are available by prescription and over-the-counter preparations which contain minoxidil have been shown to have some benefits, but also some risk factors. Most hair-growth drugs prevent hair loss better than they re-grow hair. Taking aggressive steps today helps main a healthy head of hair.