

## Balding

### 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 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. Baldness has no cure. Oral prescription drugs such as Propecia® and Proscar® are available by prescription and over-the-counter preparations which contain minoxidil have benefits. Most hair-growth drugs prevent hair loss better than they re-grow hair. Taking aggressive steps today helps maintain healthy hair.

### Nutritional Recommendations

Hair loss has many causes, including aging, genetic pre-disposition, thyroid imbalance, eating disorders, illness, hormonal effects of birth control pills, pregnancy, menopause, and certain medications and medical treatments. There is no single “cure” for baldness. A product that is effective for one individual may provide only limited results for another. Combining traditional treatments with nutritional supplements and natural topical solutions improves chances of inhibiting pattern hair loss.

### Conventional Therapy

- At the first sign of thinning hair, consult a dermatologist to determine the cause.
- Ask your physician if any prescription drug you take causes temporary hair loss.
- Ask your physician about drugs that may revive hair growth.

### Lifestyle Modification

- Maintain a healthy diet that is low in fat and rich in whole foods.

### Nutritional Supplements

- L-lysine: 700 mg daily
- L-arginine: 900 mg two times daily
- Saw palmetto: 160 mg two times daily
- Green tea extract: 725 mg daily
- Grape seed extract: 100-200 mg daily
- Life Extension Mix: Tablets, capsules or powder. Follow suggested dosage as listed on bottle

### Product Availability

Life Extension Mix, L-lysine, L-arginine, saw palmetto, green tea extract, grape seed extract, Dr. Proctor's Hair Shampoo and Advanced Hair Formula may be ordered by calling (800) 544-4440. European Prescription Hair Formula is available by prescription from a compounding pharmacy. Call (713) 960-1616 for details.

### Table of Contents

#### OVERVIEW

#### EPIDEMIOLOGY AND GENETICS

- Types of Hair Loss
- Other Causes of Hair Loss

#### ANATOMY AND PHYSIOLOGY (STRUCTURE AND FUNCTION)

#### PATHOPHYSIOLOGY

#### ETIOLOGY AND MECHANISMS OF ACTION

#### PHARMACOLOGY

- Traditional Approaches

- Anti-Androgens
- Growth Stimulators
- Hair Transplantation
- Scalp Reduction

#### **NUTRITIONAL THERAPY**

- Life Extension Mix
- L-Lysine
- L-Arginine
- Saw Palmetto
- Green Tea Extract
- Proanthocyanidins and Procyanidins
- Complementary Topical Treatment

#### **SUMMARY**

##### **LIFE EXTENSION'S INTEGRATED PROTOCOL**

- Conventional Therapy
- Lifestyle Modification
- Nutritional Supplements

#### **REFERENCES**

# BALDING

## OVERVIEW

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 even 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 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). Balding runs in families.<sup>1</sup>

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. Consult a physician or dermatologist for an evaluation to determine the cause of thinning hair.<sup>2</sup>

## EPIDEMIOLOGY AND GENETICS

- Types of Hair Loss
- Other Causes of Hair Loss

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. Males losing hair during the mid-teen years are likely to become completely bald on top of their heads.<sup>3</sup>

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.<sup>4</sup> 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.<sup>5</sup>

#### **Female-Pattern Baldness**

Female-pattern baldness (or diffused thinning) is caused by aging, genetic susceptibility, and androgen.<sup>5</sup> Female-pattern baldness usually begins about age 30. It becomes more noticeable by age 40 and can be quite evident following menopause. Female-pattern baldness usually causes hair to thin all over the head. It rarely progresses to near or total baldness. Female-pattern baldness causes permanent hair loss.

#### **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.<sup>6</sup> Telogen effluvium can follow a case of flu or emotional

stress<sup>7</sup> 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.<sup>8</sup> This condition is seen when birth control pills are stopped.<sup>9</sup>

### **Chemotherapeutic Hair Loss**

Cancer chemotherapy cause hair cells to stop dividing, a usually transient condition.<sup>10</sup> 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.<sup>11</sup> 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).<sup>12</sup> 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.

### **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 which results 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,<sup>13</sup> ulcer drugs,<sup>14</sup> anticoagulants,<sup>15</sup> anti-arthritis,<sup>16,17</sup> drugs derived from vitamin A,<sup>18</sup> epilepsy anticonvulsants,<sup>19</sup> antidepressants,<sup>20</sup> beta-blockers for hypertension, anti-thyroid agents,<sup>21</sup> and anabolic steroids.

## **ANATOMY AND PHYSIOLOGY (STRUCTURE AND FUNCTION)**

Each hair originates in a deep pouch-like structure in the epidermis (a hair follicle) 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.<sup>22</sup>

## **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.<sup>23</sup>

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 baldness, 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.<sup>24</sup>

## PHARMACOLOGY

- Traditional Approaches
- Anti-Androgens
- Growth Stimulators
- Hair Transplantation
- Scalp Reduction

### ***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: take better care of the scalp, use minoxidil (Rogaine®) and/or Proscar®, have hair transplants or a scalp reduction, or have hair replaced non-surgically.

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®).

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.<sup>25</sup>

### ***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 inhibits oxygen radicals and may inhibit a localized immune response implicated in hair loss and offset damage and inflammation.<sup>26</sup> 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 cannot 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.<sup>27</sup>

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.<sup>28</sup> 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.<sup>29</sup>

### **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.<sup>30</sup>

### **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.<sup>31</sup>

### **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.<sup>32</sup>

### ***Hair Transplantation***

Early hair-grafting techniques were somewhat crude, often leaving a “patchwork” appearance. Newer techniques transplant 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. Larger plugs of up to 10 hairs can be used. Donor sites with full hair produce more successful transplants. The flap technique transplants larger areas of hair from the sides and back of the scalp to the top of the head. Some scarring at the donor site may result. 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.

## **NUTRITIONAL THERAPY**

- Life Extension Mix
- L-Lysine
- L-Arginine
- Saw Palmetto
- Green Tea Extract
- Proanthocyanidins and Procyanidins
- Complementary Topical Treatment

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.

### ***Life Extension Mix***

Life Extension Mix™ contains 92 unique vegetable, fruit and herbal extracts, amino acids, vitamins, minerals, and special antioxidants. Life Extension Mix™ formula is fortified with botanical extracts that help to maintain healthy cells via physiological

processes separate from traditional antioxidants. Consumption of these types of plants is based on research from prestigious medical centers.

### ***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.<sup>33</sup>

### ***L-Arginine***

Hair follicles use nitric oxide to maintain and promote new hair growth. L-arginine is required to produce nitric oxide.<sup>34</sup>

**Note:** See Appendix C for Cautions and Contraindications

### ***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.<sup>35</sup>

### ***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.<sup>36</sup>

**Note:** See Appendix For Cautions and Contraindications

### ***Proanthocyanidins and Procyanidins***

Proanthocyanidins and procyanidins (specifically OPCs, oligomeric proanthocyanidins) are a class of flavonoids found in woody plants. Two common sources of OPCs are grape seeds (*Vitis vinifera*) and white pine (*Pinus maritima*, *P. pinaster*). Procyanidin B-2 and procyanidin B-3, which directly stimulate epithelial cell growth and check the growth-inhibiting effect caused by TGF-beta2, are of specific interest. Supplementing with 100 to 200 mg proanthocyanidins daily in the form of OPC Grape Seed Extract is suggested for adults.<sup>37</sup>

### ***Complementary Topical Treatment***

#### **Dr. Proctor's Hair Formulas**

Dr. Peter Proctor has developed a unique, multi-ingredient hair formula for balding that requires no prescription. Dr. Proctor's Hair Shampoo includes 3-carboxylic acid pyridine-N-oxide (NANO, known as "natural" minoxidil). This product can be used as a shampoo.

Dr. Proctor's Advanced Hair Formula includes NANO with natural hair protection and hair growth agents: endothelium-derived relaxing factor (EDRF) enhancers, SODs, and free-radical scavengers. Zinc sulfate and copper peptides are anti-androgens enhancing production of EDRF.<sup>38,39</sup> This product is a liquid which can be applied to the scalp using eight to ten drops once or twice daily on thinning areas.

## **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 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. Baldness has no cure. Oral prescription drugs such as Propecia® and Proscar® are available by prescription and over-the-counter preparations which contain minoxidil have benefits. Most hair-growth drugs prevent hair loss better than they re-grow hair. Taking aggressive steps today helps maintain healthy hair.

## **LIFE EXTENSION'S INTEGRATED PROTOCOL**

- Conventional Therapy
- Lifestyle Modification
- Nutritional Supplements

Hair loss has many causes, including aging, genetic pre-disposition, thyroid imbalance, eating disorders, illness, hormonal effects of birth control pills, pregnancy, menopause, and certain medications and medical treatments. There is no single "cure" for baldness. A product that is effective for one individual may provide only limited results for another. Combining traditional treatments with nutritional supplements and natural topical solutions improves chances of inhibiting pattern hair loss.

### ***Conventional Therapy***

- At the first sign of thinning hair, consult a dermatologist to determine the cause.
- Ask your physician if any prescription drug you take causes temporary hair loss.
- Ask your physician about drugs that may revive hair growth.

### ***Lifestyle Modification***

- Maintain a healthy diet that is low in fat and rich in whole foods.

### ***Nutritional Supplements***

- L-lysine: 700 mg daily
- L-arginine: 900 mg two times daily
- Saw palmetto: 160 mg two times daily
- Green tea extract: 725 mg daily
- Grape seed extract: 100-200 mg daily
- Life Extension Mix: Tablets, capsules or powder. Follow suggested dosage as listed on bottle

### ***Product Availability***

Life Extension Mix, L-lysine, L-arginine, saw palmetto, green tea extract, grape seed extract, Dr. Proctor's Hair Shampoo and Advanced Hair Formula may be ordered by calling (800) 544-4440. European Prescription Hair Formula is available by prescription from a compounding pharmacy. Call (713) 960-1616 for details.

### ***For More Information***

The National Alopecia Areata Foundation, P.O. Box 150760, San Rafael, CA 94915, (415) 456-4644.

The American Hair Loss Council, 401 North Michigan Avenue, Chicago, IL.

This Protocol was written by Karyn Siegel-Meier is a freelance writer and book author with an expertise in healing with herbs, alternative medicine, nutrition, general health, and new-age issues. Her work appears in many industry and consumer publications in the U.S., Canada, and the U.K.

Sections were written and edited by Randall Lee Kohl, Ph.D., R.Ph., F.C.P., Senior Editor for LE Publications, Inc. Address your comments only to: rkohl@lef.org. Direct your questions to the Life Extension Health Advisory staff at (800) 544-4440.

These statements have not been evaluated by the FDA. These products are not intended to diagnose, treat, cure or prevent any disease. The information provided on this site is for informational purposes only and is not intended as a substitute for advice from your physician or other health care professional or any information contained on or in any product label or packaging. You should not use the information on this site for diagnosis or treatment of any health problem or for prescription of any medication or other treatment. You should consult with a healthcare professional before starting any diet, exercise or supplementation program, before taking any medication, or if you have or suspect you might have a health problem. You should not stop taking any medication without first consulting your physician.