



STOP HAIR LOSS NOW

by Misti Barnes
Trichologist, Physician Trainer

Disclaimer

The information contained in this publication is not intended to and does not replace the services of a physician, and reading or receiving this publication does not create a doctor-patient relationship. This publication is intended as information for making cosmetic choices, and is not intended to substitute for decisions you make with your doctor.

Nothing in this report is intended to diagnose or treat a disease.

you're not alone...

If you're losing your hair, you're not the only one. With all the ongoing changes in lifestyle - health, diet and medications, which can contribute to hormonal and thyroid imbalances - more people, young and old, male and female are losing their hair. In fact, 50 million Americans are suffering from hair loss.

While losing some hair is natural and not anything to worry about, when you begin seeing patches of hair missing on your head, it's frightening! Your quality of life is affected. Hair loss is a part of our body, and when we lose hair, we lose a part of ourselves. That loss affects your self-esteem, confidence, and your relationships. The impact is felt physically, sexually, socially, and emotionally;

Let's Face it. Hair loss sucks. It's horrible losing your hair.

In this digital world, with so much information at our fingertips, you'd think treatment would be simple and easy to access. But there is so much misinformation and snake oil options out there, it's impossible to know who and what to trust.

Even those who study the causes and treat hair loss, don't completely understand how it can impact the quality of a person's life. Strangely, some doctors and professionals have no clue how it feels.

"It's not that bad," they'll say, as they throw a pill at you, without much concern for the long-term impact it might have. But, one thing is certain...it **is** painful when it's happening to you.



contents

01

What is Hair, anyway?

02

Types of hair loss

03

The truth about women

04

The truth about men

05

Scalp conditions

06

Current treatments

07

A new approach

08

Calcification

09

Diet

10

Lifestyle

11

Microbiome

12

Cellustrious

Misti Barnes - Author

Misti Barnes is an author, trainer, a certified Trichologist (WTS), physician trainer, collagen restoration therapist, medical micropigmentation artist and esthetician. Cellustrious® Hair Follicle Rejuvenation was developed by Misti Barnes, who began her career by providing treatments to restore skin, post- surgical scars and acne scars. Barnes trained with one of the developers of microneedling, while working with burn survivors, in concert with the Grossman Burn Center.

Misti worked with a prominent LA cosmetic surgeon when she began developing anti-aging treatments for A-list celebrities and executives to treat wrinkles, sun damage, acne, stretchmarks and ultimately, hair loss.

After several years of research with her clients, Misti teamed up with a leading biochemist with a background in hair science to help her develop Cellustrious®, a patent-pending, vegan treatment and home product line to treat hair thinning and loss, using plant-derived peptides and growth factors to target hair follicles. Studies with Cellustrious® over the past six months have produced very consistent and predictable results, with males and females (90% with 30-50% new hair growth).

She has presented her hair loss research at the Boston Biolife Medical Conference, AmSpa, A4M, the World Trichology Society and Aesthetics Everything.

She is the author (Hazelden Publishing) She has appeared on Fox Health News, Boston Biolife, and The Marilu Henner Show. She has been published in Plastic Surgery Practice Magazine, and served as a contributing editor to THE Aesthetic Guide, published by MedicalInsight.

Misti also serves as a health and wellness speaker. Her practice is located in Lakewood Ranch, FL.

Hair loss is NOT a diagnosis.

Hair loss is a symptom.

We'll start with the more well-known causes, then discuss more recent ideas and new science around hair loss. We urge you to read the whole guide - it contains non-traditional approaches to hair loss and new ways to approach it. Things that are in your control - including diet, lifestyle and non-invasive options that you may benefit from.

The truth is, the more you know, the better. You must be well-informed if you want to take charge of your health and make sure you get the best care available. Whether it's you or someone you love that is experiencing hair loss, you're probably aware of how difficult it is. Not only does it affect your health, but losing your hair can really damage one's self-esteem.

It's important to understand that hair loss is a SYMPTOM, not the PROBLEM. That, and the reasons for hair loss is complex, so this isn't a one size fits all approach. Instead, think of this as a guide that will help you gain some perspective on what's happening.

You should see a medical professional if you've recently noticed a great change in your hair, if you don't know the cause of your loss, or have additional symptoms.

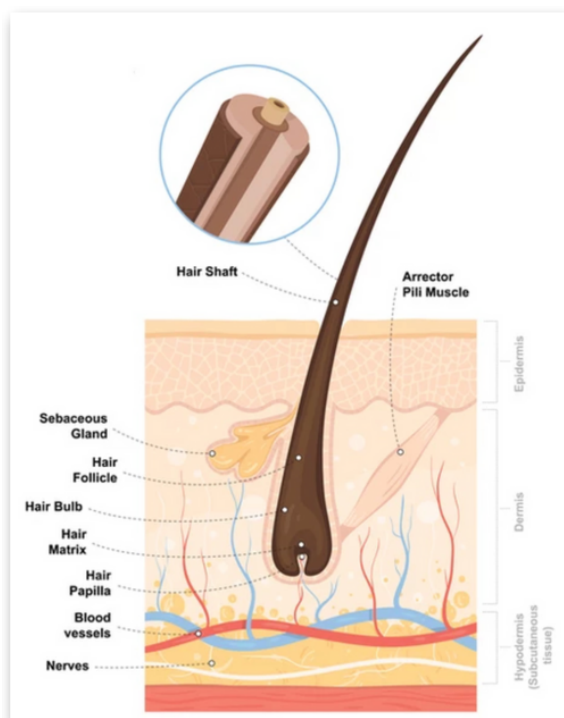


A close-up, high-resolution photograph of long, flowing hair. The hair is split into two main sections: a lighter, golden-blonde section on the left and a darker, rich brown section on the right. The strands are fine and appear to be moving, creating a sense of texture and flow. The lighting is warm, highlighting the natural sheen of the hair.

**What is
hair,
anyway?**

HAIR DEVELOPMENT

The structure of hair is surprisingly complex. It is that complexity that makes hair loss such an enigma. The structures that compose the follicle are the papilla, matrix, root sheath and the bulge. These structures all play important roles in the cycle of hair degeneration, rest and regeneration.



ANATOMY OF A HAIR FOLLICLE

The papilla regulates the growth and development of the hair follicle. The matrix is a rapidly proliferating area around the papilla that transfers pigment to the cells - which gives the hair fiber color.

The root sheath has two layers - inner and outer - which acts as an outer cover for the hair follicle. The root sheath contains immune cells which play a role in detecting, as well as fighting infections in the skin. The bulge is the part of the follicle that contains stem cells which can differentiate and grow into new hair cells. The bulge is situated at the base of the hair follicle.

Hair is created from the reproduction of cells of the dermal papilla layers of skin and their movement up the hair follicle. This is when the cells harden (keratinize), forming the hair shaft. The embedded hair in the dermis, the “root,” which together with its covering, forms the hair follicle – a pouch-like tube that extends from the epidermis (top) layer, to the dermis (middle) layer, and, in scalp hair, into the subcutaneous (bottom) layer of skin.

3 LAYERS OF THE HAIR SHAFT

Medulla - Only present in thicker hair. The innermost layer of your hair, consists of a soft, thin core of transparent cells and spaces.

Cortex - The main bulk and pigment of hair, consisting of long keratin filaments, held together by disulphide and hydrogen bonds.

Cuticle – Composed of overlapping cells - like roof tiles - it gives hair shine and protects the inner layers from damage. It maintains the hair's hydration balance and flexibility.

**The average person has
100,000 to 150,000
hairs on their scalp
at any given time.**

HAIR FOLLICLE CYCLE

The life cycle of a hair follicle can be divided into 3 phases; anagen, catagen & telogen.

Human hair does not grow continuously. Every hair follicle undergoes phases of growth, during which hair lengthens, followed by a period of rest (telogen phase). During telogen, the hair is shed and replaced by a new hair.

At any point in time different hair follicles are at different stages of the growth cycle. So, it is normal to have some ongoing continuous hair loss, which usually is balanced by new hair growth.

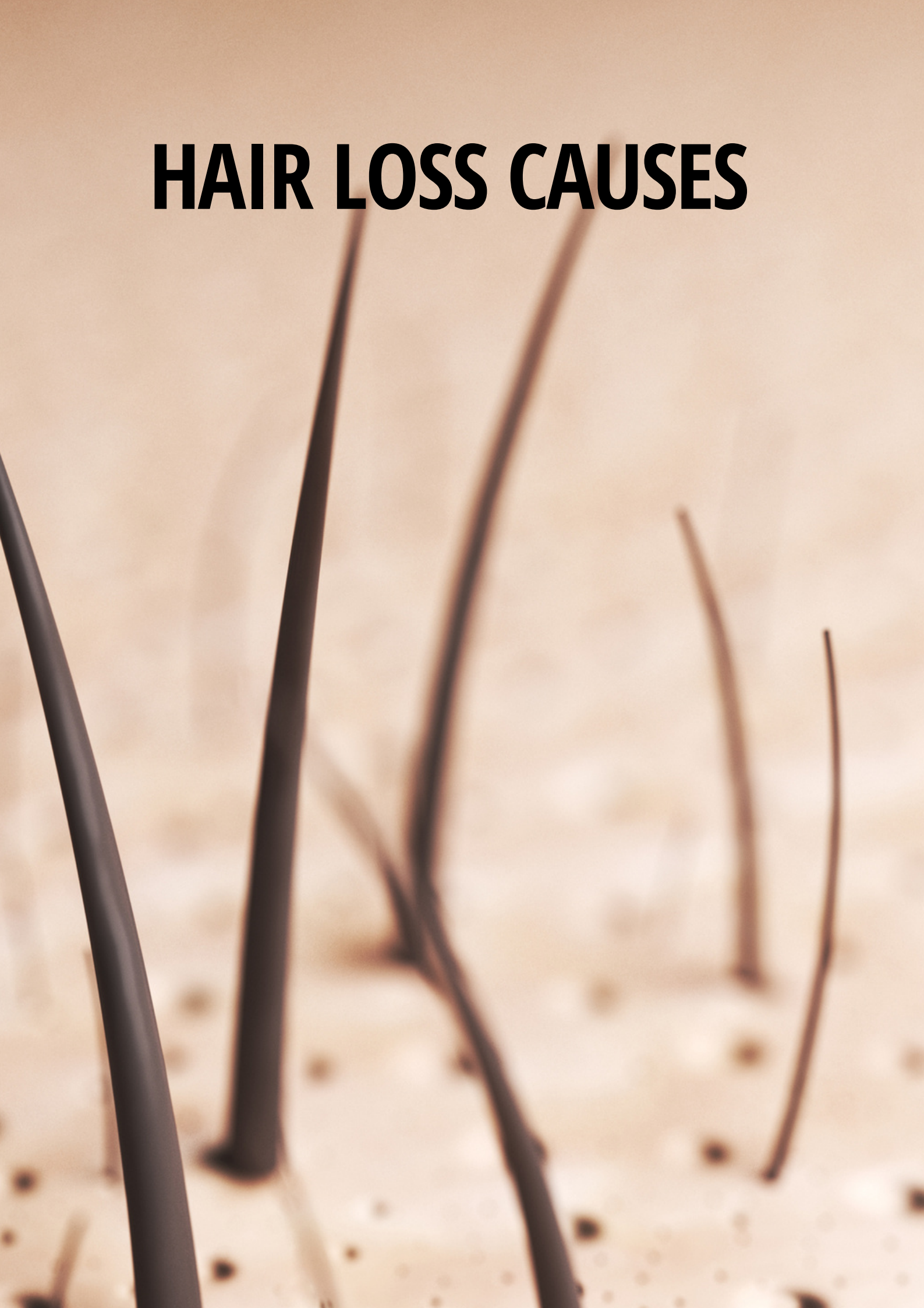
THERE ARE THREE PHASES IN THE LIFE CYCLE OF A HAIR FOLLICLE:

1. Anagen Phase - This is the beginning of cell division, and the initial growth of the dermal papilla. The most active phase of the hair follicle: A follicle may remain In the Anagen Phase for 2 - 7 years (an average of 1,000 days).
2. Catagen Phase - 1 - 2 week phase when the follicle transitions into the. This phase marks the transition point where the hair has stopped growing, the root sheath begins to break down, and follicular regression occurs. This phase lasts one to three weeks.
3. Telogen Phase - This is the resting phase, where the cells near the papilla layer are fully hardened (keratinized) and the production of a club or bulbous end is completed. This phase lasts 3 - 4 months, and has two sub-phases: Exogen and Kenogen.

In the Exogen Phase - the follicle shrinks away from the papilla and releases/sheds- the hair. The follicle will move back and rejoin with the papilla, and the whole cycle begins again. With genetic, and other types of hair loss, the follicle can go into the Kenogen Phase - a latent stage where the follicle remains dormant/inactive. The Exogen and Kenogen phases can last an indeterminate amount of time.

At any one time...
80-90% of scalp hairs are
in the Anagen phase,
1-2% are in the Catagen phase &
5-10% are in the Telogen phase.

HAIR LOSS CAUSES



Prevailing wisdom is that hair loss is strongly influenced by ethnicity and genetic heritage, which dictates degree of loss and age of onset. To date the major cause of hair loss in both sexes is considered to be androgenetic alopecia, reportedly comprising 71% of all Alopecia cases.

Because the primary baldness gene is found on the “x” chromosome, inheritance, especially in men, it has been thought that hair loss was strongly influenced by the maternal parent’s family. However, hair loss is “polygenic,” meaning, it can come from either side of the gene pool.

More recent research shows that a person is more likely to inherit similar hair loss tendencies to the family member whose hair characteristics he/she most resembles: color, type [coarse/fine], and distribution [thick/thin].

There are many people who complain of losing their hair in a genetic-like pattern, yet no one in their family on either side is bald or even thinning.

There are many instances where both the mother and father have hair loss and the adult son and daughter do not.

Studies indicate that 15-20% of people exhibiting "genetic hair loss" don't have any family members with hair loss.

TYPES OF HAIR LOSS

3 major categories of hair loss.

TYPE 1: ANDROGENETIC ALOPECIA (AGA)

AGA: common baldness, androgenic alopecia, androgenetic dependent alopecia, diffuse alopecia, diffuse hair loss, male pattern baldness, male pattern alopecia, female pattern baldness, (FPHL) is a physiological event initiated by the action of androgens on the hair follicle. It occurs in both men and women.

AA is not completely understood. But most scientists see the cause as dihydrotestosterone (DHT), a derivative hormone of testosterone that occurs when acted upon by the 5-alpha-reductase enzyme. DHT shortens the growth (anagen) phase of the hair cycle and pushes them into a resting (telogen) phase. Testosterone can bind to the androgen receptor of the hair follicle or can be converted to, dihydrotestosterone, before binding.

Ultimately, the affected follicles shrink in both diameter and length with each hair cycle. This causes the hair to become thinner and wispy. Eventually, the follicle may disappear altogether – but we believe that the follicle is not dead, merely dormant - more about dormancy, later...

We don't know what exact substance(s) cause miniaturization, but, the theory is that DHT sensitivity triggers a collagen build-up around the hair follicle thus shrinking its size, and miniaturizing the hair.

Testosterone:

Testosterone is a male steroid hormone from the androgen group produced by the testes. The average adult male produces 10 times more testosterone than an adult female body, but women are more sensitive to the hormone. This may be why females suffer androgenic alopecia though they have lower T levels.

DHT affects people in different ways, which may be due to:

- An increase in DHT receptors at the follicle.
- A greater local DHT production.
- Higher androgen receptor sensitivity.
- More DHT produced elsewhere in the body, arriving through circulation. More circulating testosterone which acts as a precursor for DHT.

TYPE 2: ALOPECIA AREATA

Alopecia Areata (AA) occurs when the hair enters the anagen phase from the telogen phase. It's a non-scarring, inflammatory condition characterized by round patches of scalp hair loss, usually affecting pigmented hair - rather than non-pigmented hair - thus re-grown hairs often lack color.

The main types of AA include:

Alopecia Barbae: Patchy loss of the beard hair.

Diffuse Alopecia Areata: Diffuse hair loss without distinct patches. Hair fibers entering anagen are 'pushed' into telogen in a diffuse, rather than patchy, manner.

Alopecia Totalis: Hair loss of the whole scalp, often eyelash and eyebrows.

Alopecia Universalis: The most severe form of loss, including all of the head and body, eyelashes, eyebrows, underarm hair, nose hair, ear hair and pubic hair.

Alopecia Ophiasis: Affects the temporal and occipital regions of the scalp. The bald area usually runs from ear to ear at the back of the scalp.

The cause of AA has still not been established, however, genetics and autoimmune malfunctions are factors. Experts believe the body's immune system attacks the hair follicle, and disrupts the hair cycle due to the immune systems inability to distinguish between "self" and "non-self" tissues. Thyroid disease, celiac disease, vitiligo, arthritis, atopic dermatitis, asthma and those with bacterial or fungal infections and HIV are susceptible to AA. Scars after surgery - frequently cosmetic surgery - as well as emotional and physical stress are factors. Emotional and physiological stress has long been thought to be a trigger for AA. Cumulative, chronic stress can cause AA years after the stress began.

Because many genes re responsible (remember, polygenic inheritance?), and all of those genes have to be in "place" and activated for AA to happen, however, it can skip generations. Identifying the carriers of these AA gene is difficult. And, AA doesn't affect all family members in the same way, so it is unpredictable.

The disease can appear at any age, but often ages 12-30, affecting both sexes. It has a rapid onset but tends to spontaneously reverse. There is no universally accepted treatment for AA, and it is unpredictable, so it can reoccur. The sooner treated, the better. chances for improvement.

TYPE 3: TRICHOTILLOMANIA

Trichotillomania is the loss or damage of scalp hair through repeated pulling or twisting, due to irresistible compulsive impulses. It tends to be chronic, causing severe discomfort and social problems. It is generally categorized along with obsessive-compulsive disorders. Trichotillomania is more common among children than adults and occurs more than twice as frequently in women than men.

It often occurs with bulimia nervosa in teenage girls. It has been classified as a “disturbance of impulse control” by the Diagnostic and Statistical Manual of Mental Disorders: DSM-IV, however, it is generally categorized with obsessive-compulsive disorders. Behaviorists compare the condition to other habits, such as thumb sucking and nail biting.

Other types of hair loss

TELOGEN EFFLUVIUM (TE)

Telogen Effluvium can be difficult to identify, and it's important to differentiate from genetic hair loss.

A diffuse, non-scarring, temporary alopecia, TE is caused when the anagen hairs prematurely enter the telogen phase, causing the club hairs in a normal, resting phase to be pushed out during the anagen phase. It occurs when the re-growth does not happen and there's a reduction in the number of follicles growing hair. The hair usually falls out and thins evenly throughout the scalp.

Not normally affected by hereditary factors, TE is usually due to a disturbance in the hair cycle, coming from a multitude of reasons: chronic illness, hormonal irregularities, postpartum, stress, diet, medication, surgery or metabolic changes. Drugs are known to prematurely accelerate the hair follicles into the resting state.

The hair cycle is long, so the loss may not be apparent for several months, by which time the person has recovered from their illness. Because the loss coincides with new hair regrowth, the hair loss is transient. The main characteristics of TE include: thick hair fibers, even thinning of the hair, and up to 25% of the hair being in the telogen phase. Sometimes there may be major regrowth.

Acute TE is rarely permanent. Once the causes for the loss have been solved, the hair usually grows back to its previous thickness - usually 3-6 months after treatment. If it lasts over six months, it can lead to chronic TE, and permanent loss.

Anagen Effluvium (AE)

In Anagen Effluvium, the hair is released by the follicle while still in the growth phase, causing premature, excessive shedding when the hair is prematurely forced into the resting (telogen) phase of the hair cycle. Anagen Effluvium, is a temporary form of hair loss, in which the hair falls and thins out evenly across the scalp.

AE generally occurs when there is an insult or an upset to the system, interrupting the active cellular division that normally occurs during hair growth. AE is commonly caused by patients undergoing radiation or chemotherapy, in addition to certain toxins. Drugs interfere with the hair growth cycle. Certain autoimmune diseases: Rheumatoid arthritis, Graves disease,



THYROID DISEASE

While it is unusual for mild hypothyroidism or hyperthyroidism, or short-lived thyroid problems to cause hair loss, prolonged, severe hypothyroidism and hyperthyroidism can cause diffuse hair loss. It usually involves the whole scalp in a uniformly sparse pattern.

Due to the long hair cycle, hair loss caused by thyroid disease will become apparent months after the onset of the disease. In many cases, the hair loss follows the thyroid treatment, and the medication is blamed for the loss, leading to the withdrawal of treatment, which in turn, worsens the hair loss. However, with successful treatment of a thyroid disorder, the hair will regrow over several months, but may be incomplete.

ANTI-THYROID TREATMENTS

Anti-thyroid drugs can, in rare cases, cause diffuse hair loss. It's often difficult to tell whether the loss is a result of the thyroid overactivity, or the anti-thyroid drugs. Most likely, the anti-thyroid drugs are not the cause.

AUTOIMMUNE THYROID DISEASE

Most people with one autoimmune disease are likely to develop other autoimmune conditions. Some autoimmune conditions cause hair loss through scarring. Polycystic ovarian syndrome is one of the conditions associated with autoimmune thyroid disease and may manifest as diffuse hair loss.



MEDICATIONS

Many medications halt the process of cell division and disrupt the hair cycle, causing hair loss. Drug-induced hair loss depends on the type of drug, the dosage, and how susceptible a person is. The condition is usually reversible, once the drug is discontinued.

In certain instances, the loss can be permanent, including: tuberculosis, cancer, gout, certain blood thinners, and HIV medication. Radiation therapy to the brain, head and neck may also cause permanent stem cell damage.



acquired hair loss conditions

TRACTION ALOPECIA (TA)

Traction alopecia, damage to, or absence of the outside layer of the hair (cuticle), presents as patches of hair loss in areas where the follicles have been put under excessive strain. It can occur anywhere on the scalp, but it's usually along the hair line. Although Traction Alopecia is hair loss through breakage, and not technically loss from the scalp, it will cause thinning and slow growth, exacerbating any genetic condition that causes structural defects to the hair shaft, making the fibers weaker.

Traction Alopecia can be easily induced in people with genetic hair loss, because the telogen hairs, which make up a high proportion of the total, are more easily extracted than anagen hairs.

In the early stages of TA, the affected follicles are pushed' into the telogen stage as a result of the hair fibers being forcibly pulled out. Short term, Traction Alopecia and it is generally non-scarring, non-inflammatory and is reversible if diagnosed early, and the contributing hairstyle is stopped. Even with removal of the cause, it will take up to three months for the hair to recover.

However, prolonged tension, i.e., hair styles involving traction over three years, can induce follicular changes, leading to irreversible scarring and destruction of follicles. Once destroyed, the hair will not regrow, producing Central Centrifugal Cicatricial Alopecia.

Although it may seem insignificant, hair styles are the leading contributor and cause of TA, including: hair extensions and weaves, tight ponytails, braids, chemical over-processing and hair dyes, incorrect styling, hair relaxers and straightening treatments, and excessive heat. With more people using hair extensions for hair fullness, Traction Alopecia cases are increasing.

THE TRUTH ABOUT WOMEN'S HAIR LOSS



FAST FACTS ABOUT FEMALE HAIR LOSS

1. Women make up 40% of Americans suffering from hair loss in the U.S.
2. By age sixty, 80% of women will have noticeable hair loss. By age fifty, one half of women will notice hair thinning.
3. 60% of those suffering from hair loss say they would rather have “more hair than money or friends.”
4. Only 20% of women with hair loss within 20 - 29 years of age have sought a hair restoration procedure. Studies show that women are more likely to underestimate the severity of their hair loss, despite their clinicians thinking otherwise.
5. The top reasons for hair loss in women include: stress, styling, nutritional deficiencies, endocrine and hormonal imbalances. Female pattern baldness due to genetic - caused by androgenic alopecia (AGA) - is commonly over-diagnosed.
6. Among younger women, birth control medication is the leading causes for hair loss.
7. Tightly pulled on strands can tear the hair out by the roots. With the use of hair extensions and weaves on the rise, so is the occurrence of Traction Alopecia.
8. For women over 40, the most likely the cause of hair loss or thinning hair occurs is due to the post- menopausal hormone imbalances.
9. Women generally don't get receding hairlines. They get diffuse thinning right on top of their heads, with the pattern ultimately looking like a Christmas tree.
10. While Biotin does help strengthen your hair if you're having breakage problems,, there's not a lot of evidence showing that taking Biotin supplements can do much for hormone-related hair loss.

FEMALE PATTERN BALDNESS

While Female Pattern Hair Loss may be caused by DHT acting upon the hair follicle, causing miniaturization, there is still a lot of uncertainty as to the cause.

Research also suggests that a reduction in the activity or amount of the enzyme aromatase - which converts certain male hormones (testosterone) in the scalp into female hormones (estradiol) - may contribute to FPHL, accounting for the difference in clinical appearances between MPB and FPHL. FPHL occurs with normal systemic androgen levels about 30% of the time, while the rest of the time, it is thought that the circulating androgens, (DHEA and DHEA-S), as well as a Testosterone and DHT are the cause. The impact of increased output of the ovarian and/or adrenal androgens can be associated with hair loss; unknown growth factors may also contribute.

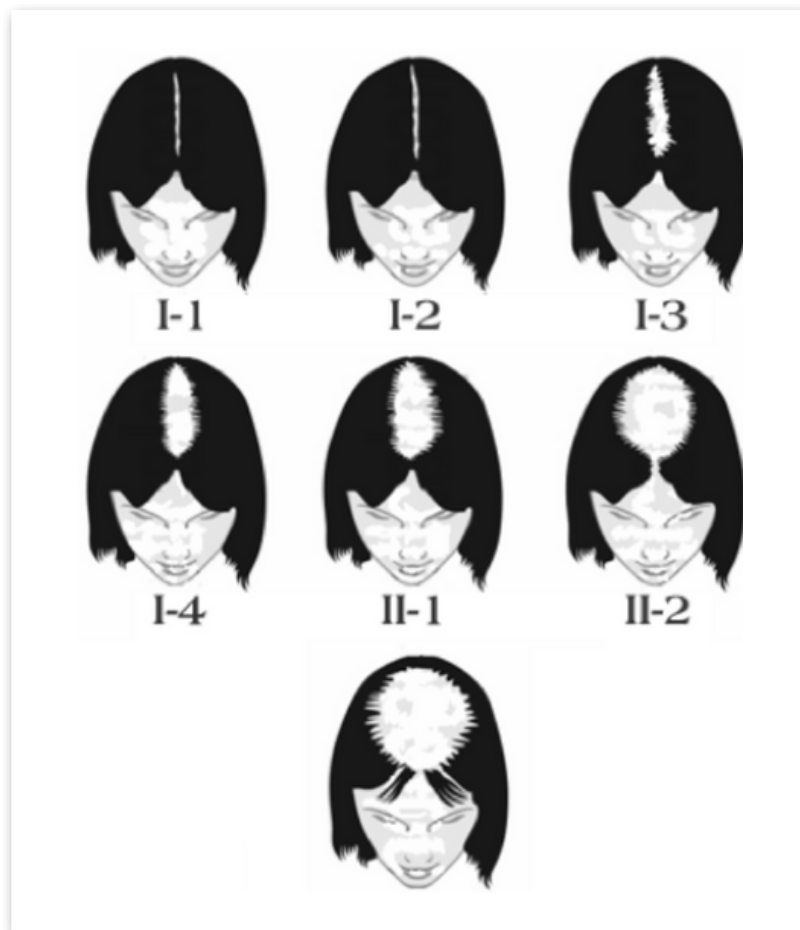
Women can be affected by genetic hair loss at any age after puberty. However, if there is no underlying hormonal problem, hair loss usually is caused by and begins around menopause, due to changes in the female-to-male hormone ratio.

Other causes for hair loss, not related to FPHL, in women include:

1. Hormone imbalances
2. Stress
3. Nutritional deficiencies
4. Birth control
5. Medication
6. Thyroid/endocrine imbalances
7. Styling procedures, chemicals

In women, the male-type pattern of hair loss, with marked temporal or vertex recession, is infrequent. Hair loss is usually diffuse, affecting the frontal and vertex areas with similar severity.

Often a 1-2 centimeter band of denser hair remains along the front hair line.



The Ludwig Scale categorizes FPHL into 3 grades

Grade I: A mild thinning on the top and crown (front- vertex) areas. Longer, thicker terminal hairs are intermingled with short, fine, vellus hairs. The part is wider, with a well preserved front fringe of hair.

Grade II: Advanced stage, with a pronounced thinning of the hair on the top and crown area. The part becomes wider, making the scalp more apparent. More vellus hair is present in between longer, terminal hairs. A well-preserved front fringe is present.

Grade III: The final stage of FPHL. Almost total hair loss from the top and crown area of the scalp has occurred. Many vellus hairs are present, with few terminal hairs; the front fringe is smaller.

A close-up photograph of a person's dark, wavy hair. A hand with light-colored, manicured nails is gently touching the hair near the scalp. The skin is a warm, light brown tone. The text "THE TRUTH ABOUT MEN'S HAIR LOSS" is overlaid in white, bold, sans-serif capital letters on the left side of the image.

THE TRUTH ABOUT MEN'S HAIR LOSS

FAST FACTS ABOUT MALE HAIR LOSS

1. In the U.S. alone, 50 million American men have Male Pattern Baldness.
2. The incidence of Male Pattern Baldness matches your decade of life. Men in their 20's, have a 20% occurrence, men in their 30's face a 30% occurrence and so on, up until their 90's.
3. One in seven men have genetic variants that raise their balding risk. Two genome-wide association studies of men with MPB uncovered a pair of previously unknown genetic variants on one of the chromosomes that raises a man's risk, sevenfold.
4. Men cite hair loss as the No. 1 concern. Balding affects every aspect of a man's life.
5. 40% of guys are misinformed, and still believe that hair loss comes from the mother's side. Science has mostly debunked this assertion; we know now that thinning hair can be inherited through either parent.
6. Two-thirds of all men will experience some hair loss by the time they hit age 35. By age 50, a full 85% of guys will have some thinning hair.
7. Of all the men who will experience the familiar M or U shape unfold on their heads, one-quarter of them will begin the process before the age of 21.
8. Hair loss is progressive. The sooner you act, the more options you'll have.
9. Researchers link hair loss to prostate conditions and coronary problems. In one study, baldness was linked to a 70% higher risk of developing heart disease.
10. 50% of a man's hair is already gone before it becomes visible. When MPB begins, it shrinks the secondary hairs, so follicles on the scalp only produce one terminal hair, rather than a tuft of hair. It's only when the primary (the last fiber from the tuft) disappears that the scalp is seen.

MALE PATTERN BALDNESS

Male Pattern Baldness affects two-thirds of American men, who have some degree of loss by age thirty-five, and it will affect 85% of men by age of fifty. By age twenty-one, 25% of men begin showing signs of MPB.

The onset of MPB is linearly related to age. For example, 20% of men experience some hair loss by age twenty; 30% of men experience hair loss by age 30, and on up until the age of 90's. In men, the typical pattern loss begins at the temples and the mid-anterior scalp, with the pattern ultimately progressing into a horseshoe pattern of remaining hair.



The Hamilton-Norwood Scale is used to classify the stages of Male Pattern Baldness:

Type I: “Normal” adult male hair distribution. No hair loss and little frontal hairline or temple recession.

Type II: The earliest stage of male pattern alopecia, with a mild/moderate recession at the temples. Finer, shorter hairs, some without pigment (vellus) have replaced thicker, (terminal) darker hairs. The crown has lost very little, if any, hair.

Type III: The first stage of apparent hair loss. The temples continue to recede, and, as with Type II, vellus hairs replace terminal hairs at the temples. Very little hair loss occurs on the crown area, although the mid-frontal area between the temples is thinning.

Type III-V: V for vertex or crown is when the temples have thinned similar to Type III; the crown hair starts to thin. Hair is shorter and finer. Thinning between the temples occurs.

Type IV: Recession of frontal and temple areas, and thinning in the crown. The hair between the temples is thinning, and hair is losing pigment, making it more obvious.

Type V: Frontal recession in both the temple and mid-frontal areas that meets with the thinning crown area. Vellus hairs are smaller, taking on a downy appearance.

Type VI: The mid-frontal, temple, and crown areas have very few terminal hairs; most are now vellus or downy hairs.

Type VII: Existing hair is a horseshoe-shaped fringe on the sides and rear of the head. Only downy-looking hairs are present on the crown. Most are too fine to see.

A 3D illustration of a hair follicle on a pink, wavy background. Several dark, textured hair shafts are shown. A magnifying glass with a black handle is positioned over the hair bulb, which is filled with a yellowish-orange liquid. The text "SCALP CONDITIONS" is centered in white, bold, sans-serif font.

SCALP CONDITIONS

While not all medical professionals or dermatologists agree that the two are unrelated, our anecdotal research has shown that scalp conditions can contribute to inflammation, which plays a part in the hair loss problem. When the scalp is inflamed or unhealthy, the hair follicle's ability to thrive is impaired.

PITYRIASIS CAPITIS (DANDRUFF)

A common condition among adolescents and adults, its peak incidence and severity occur around twenty (affecting about 50% of the population), becoming less frequent after age fifty. The most accepted cause of dandruff is that the yeast *Malassezia ovalis* triggers the condition.

In a normal scalp, the horny layer consists of 25-35 fully keratinized cells; in pityriasis capitis there are fewer than ten layers of cells, which move up to the skin surface more rapidly, causing the skin cells to clump together and appear as white flakes. The overgrowth of yeast can be caused by stress, hormones, too much oil on the scalp, or immune system abnormalities.

PITYRIASIS STEATOIDES (GREASY DANDRUFF)

The dandruff binds with scalp oil to become a greasy paste. The flakes no longer shed, but accumulate in small yellow mounds. Both Pityriases "capitis" and "steatoides" are chronic conditions, primarily due to stress and an abundance of fats in the diet (particularly chocolate and cheese).

SEBORRHEA OLEOSA

Characterized by an excessive oiliness of the skin, due to an excessive secretion of sebum by the sebaceous glands. It may occur as a result from an underlying disease (called "secondary seborrhea"), such hormonal issues. While secondary seborrhea oleosa clears up when the underlying disease is cured, primary seborrhea is a chronic disease that may be controlled, but not cured.

SEBORRHEIC DERMATITIS

A common skin disorder causing Inflammation and red patches on the scalp, causing scaly, itchy, red skin and dandruff on the scalp, eyebrows, or beard. It doesn't affect overall health, but can be uncomfortable. Stress reduction, a reduction of fats is important.

PSORIASIS

A genetically determined skin disorder which frequently involves the scalp, featuring pink, inflamed skin, covered in thick silvery scales. Though severe hair loss is rare, increased shedding of telogen hairs and reduction in hair density is common. It may appear suddenly or slowly, and is most commonly seen between ages of 15 and 35. The condition is not contagious.

Psychological and emotional stress are often associated with the onset of psoriasis, due to the role neuropeptides plays on the skin. Many believe stress plays an important role in the onset and severity of psoriasis.

Psoriatic patients are reported to be more susceptible to stressful situations, both mentally (e.g., an inability to cope with their disease) and physically (e.g., higher urinary adrenaline and lower serum cortisol levels), although this is associated with the pathophysiology of such diseases as: pruritus, atopic dermatitis, hyperhidrosis, rosacea, lichen ruber planus, lupus erythematosus, and chronic urticaria.

FOLLICULITIS

Folliculitis is a contagious inflammation of the hair follicles, caused by the yeast, *Malassezia furfur*. The main trigger is damage to a hair follicle. Once a follicle has been damaged, bacteria, fungus and mites can invade the follicles. An excessively oily scalp can exacerbate scalp folliculitis.

MILD FOLLICULITIS

The infection occurs within the portion of the hair follicle closest to the skin, appearing as small, itchy whiteheads along the hairline, forehead or ears.

SEVERE FOLLICULITIS

Develops deep within the pore, often appearing as hardened, red bumps that are tender to the touch. Severe folliculitis can lead to scars in the form of rough blemishes or dark patches of skin. Severe folliculitis can damage the follicle to the point where the hair no longer grows.

Other possible causes include: diabetes, a compromised immune system, HIV, long-term cancer treatments, chronic skin conditions, eczema or dermatitis, acute or long-term antibiotic acne treatments, obesity, warm or very humid environments.



CURRENT TREATMENTS

Although science has brought us Artificial Intelligence, driverless cars, and soon to be flights to Mars, the options for hair loss aren't nearly as advanced. The treatment options for alopecia patients only until recently included extensions, hairpieces, surgery, or transplants.

Oral or topical medicines, though highly prescribed, provide temporary relief, and the discontinuation of medication may result in immediate loss.

NON-PRESCRIPTION TREATMENT OPTIONS

MINOXIDIL

Minoxidil (Rogaine®) was originally developed as a treatment for hypertension, to help promote blood flow. It was the first FDA-approved medicine for hair regrowth and approved for OTC use in the late 90's. It may inhibit 5-alpha-reductase activity, swell the hair shaft, dilate the blood vessels, darken hair fibers, and open potassium channels - which may increase production of cellular energy.

Minoxidil promotes hair shedding during telogen, acceleration into anagen, which it prolongs. It's only claim is that it helps the hair on the crown, but some see improvement on the frontal hair. Minoxidil is used for retaining hair, not regrowth.

LLLT (LOW-LEVEL LASER THERAPY)

Low-intensity phototherapy is administered through wearables: caps, stationary panels, hand-held wands/brushes, employing red-light emitting diodes. It's said to encourage hair growth and improve the strength of the hair fiber - due to increased microcirculation, and enhancing the hair papilla's ability to produce cellular energy (ATP). Patients with male and female pattern hair loss, alopecia areata, and chemotherapy-induced alopecia have shown improvements..

The first FDA cleared device was the Laser Comb. Others have been ‘cleared’ and ‘approved’ as effective and safe for stimulation of growth.

COOLING THERAPIES

Patients undergoing chemotherapy for malignancies usually develop alopecia, which affects all of the hairy surfaces. Cooling caps are worn during exposure to cytotoxic drugs to acutely lower the scalp temperature, constrict the blood vessels and reduce the exposure of the follicle to drugs.

PRESCRIPTION TREATMENT OPTIONS

PROPECIA / FINASTERIDE

Introduced in 1997, Propecia (generic: finasteride), was FDA approved for men only, requiring a prescription from a medical doctor. Developed to treat benign enlarged prostate, it is a pill which inhibits 5-alpha-reductase (type II), the enzyme that converts testosterone to DHT.

Propecia has claimed an 80% efficacy for male patients, with 3% of men may experience side effects - a reduction in sex drive and sperm count, and/or erectile dysfunction. If the medication is stopped, these side-effects should be reversed.

Women who are or may be pregnant must not use or even handle Propecia tablets because the active ingredient may cause abnormalities of a male baby’s sex organs. Pregnant women cannot take it.

Propecia has being used for FPHL, but is linked to breast cancer. Many lawsuits have been filed against its makers. Propecia is better at retaining hair than re-growing it. Topical finasteride is available but not FDA approved.

DUTASTERIDE /AVODART

Dutasteride, or, is a medicine usually prescribed for an enlarged prostate. It inhibits all three types of the 5-alpha reductase enzymes that convert testosterone to DHT. Some studies have shown Dutasteride to be more effective in treating male pattern alopecia than Propecia. Dutasteride has not been studied in women.

FLUTAMIDE/ EULEXIN

Flutamide an anti-androgen often prescribed for prostate cancer, has been shown in studies to help improve hair growth in women with FPHL.

SPIRONOLACTONE/ALDACTONE

Spironolactone appears capable of arresting the course of female pattern hair loss. It is a potassium sparing diuretic which has androgen blocking properties and has had success in treating FPHL, when combined with minoxidil.

PROGESTERONE

Used topically - in men and women - or systemically in women - progesterone may help reduce the amount of DHT that is converted from testosterone. Reports of the success of this treatment are limited. One of the problems in treating genetic hair loss with anti-androgen therapy is the difficulty in predicting what dosage is needed. The levels of circulating male hormones don't necessarily provide reliable information regarding the rate of change occurring in scalp hair.



MEDICAL TREATMENTS

TYPE 1: FOLLICULAR UNIT HAIR TRANSPLANTATION (FUT)

A strip of DHT “resistant” donor hair is harvested and dissected from the back of the head, and the individual follicle from that strip is implanted via small stab incisions in the bald areas. It leaves a scar which can be visible. Hair may go through a “shock loss,” where the grafted hairs and adjacent hairs shed, leaving you looking like you have less hair than from before the transplant. FUT is a reliable option, but the surgeon is a glorified farmer, using “4 acres of seed” to cover “10 acres of potential land” – often without enough donor hair. Most transplants last 3-7 years, at which point, another surgery will be needed.

TYPE 2. FOLLICULAR UNIT EXTRACTION (FUE)

Individual hair units are removed from the donor area using a micro-punch. Each follicle is removed individually, and transplanted into the thinning scalp areas. Robotic technologies with optical sensors harvest hair follicles in a “scattered” manner from an area of permanent hair, eliminating scarring and long recovery associated with the strip removal. They are usually successful with few complications. The problem is there is a fixed amount of good hair that can be “robbed from Peter to pay Paul.” In an effort to meet patient goals, surgeons may fill cavity after cavity until they run out of good genetic hair.

TYPE 3. HAIR STEM CELL TRANSPLANT (HST)

This involves transplanting part of a follicle from which multiple hairs emerge, enabling part of the donor follicle - with its component stem cells - to remain in place, making it possible for the donor and the transplanted parts of the same follicle to produce hair. The number of hair producing follicles increases because the donor follicle continues to function as a separate unit. Aside from being very expensive, results are not always reliable. A few months after the transplant. “shock loss” caused by the surgical trauma with hair transplants.

TYPE 4. PRP /PLATELET RICH PLASMA

A patient's blood is drawn, and "centrifuged" (separating the red blood cells from the white blood cells, or, the plasma, so that only the enriched cells remain. The platelet-rich plasma, which contains essential proteins and growth factors, are injected into the scalp with medical needles. PRP is more of a "shot gun" approach, and trauma from injection treatments, can cause "shock loss." PRP can be very painful, and alone it doesn't stop pattern hair loss, however it can help slow progression and thicken hair. There hasn't been enough research to prove PRP as an effective hair loss treatment.

JAK INHIBITORS

JAK inhibitors are drugs used to suppress the immune system, making it unable to attack the follicles and stop hair growth. They are only FDA approved for psoriatic and rheumatoid arthritis, but some clinical trials have shown promise for alopecia patients wanting hair regrowth. For patients seeking JAK inhibitors, clinical trials may be the only option. There are downsides to the drugs as well, as they may increase a person's risk of infection and even some cancers. Once the drugs are stopped, the hair that is likely to fall out again.



A NEW APPROACH



MICRONEEDLING WITH GROWTH FACTORS

A new approach to hair loss is Cellustrious®, which combines scalp microneedling - a minimally invasive procedure that uses fine needles to lightly puncture the skin - along with plant-derived peptides and growth factors. Growth factors are proteins capable of stimulating cellular growth, proliferation, healing, and cellular differentiation. Used medically for years to treat blood diseases and cancers, they have a strong history for wound healing, and now, to target hair follicles.



Re-thinking hair loss

Hair loss is progressive - it develops gradually, in stages, getting worse over time.

The main reason people lose their hair is because they're not as healthy as they should be. When we remove the triggers that cause, we can stop the procession of the hair loss.

THE MINI-ORGAN

A hair follicle is a complicated mini-organ, and one of the most sensitive to small shifts in the efficiency with which energy is generated. When compared to a muscle cell, the energy metabolism in hair follicles is "inefficient," converting more glucose to lactic acid, which explains why changes in hair growth and appearance manifest quickly, especially during times of stress.

Scientific research shows that while we might have genes that predispose us to hair loss, we also have the power to turn those genes on and off. Leading us to answer the question:

WHAT'S A GENE GOT TO DO WITH IT?

Up until twenty years ago, medical professionals believed our genes determined all of biology, from our height to how much hair we had. New discoveries have proven that our genes aren't "one dimensional," with single-purpose relationships - say for instance to metabolism or cancer development.

Epigenetics, is the field of study which explores the study of the changes in organisms caused by the modification of gene expression rather than alteration o the genetic code itself. When we identify the factors that influence gene expression, we have the potential to prevent and reverse disease, affecting the pathology, treatment. Everything from our air we to the food we eat affects the genes we express. While we might carry the gene for a rare cancer, if we live in ways that never activate that gene, we don't have to develop that cancer.

Genes serve multiple functions, and if we delete one disease-linked gene, we might not develop that disease, but we may impair our brain function, or even immunity.

WHAT WE CAN CONTROL

Research now believe disease development has less to do with our genes, than with which genes our body activates or deactivates. When it comes to hair loss, the theory is, we should minimize our exposure to things that trigger hair loss, and increase our exposure to things which promote hair growth.

While hair loss is chronic and progressive, and contains a genetic component to it, we don't have to express the genes associated with hair loss. We can influence our gene expression to activate the genes associated with hair growth and deactivate the genes associated with hair loss.

Gene expression - and our ability to affect it – contributes considerably in our treatment protocol. There are four parts to this approach that can affect the gene expression and reverse the conditions that precede hair loss, and regrow hair. The most important factors we have CONTROL over are our diets, lifestyles, and microbiome. Not necessarily.

Let's look at the 5 most important issues when it comes to hair loss. They are:

- 1. Fibrosis. Scalp fibrosis and calcification is one of the most overlooked contributors to hair loss.**
- 2. Diet. Food can help hair recovery and may prevent future loss from happening.**
- 3. Lifestyle. Thyroid, inflammation, hormones balance are integral to hair recovery.**
- 4. Gut Health. The intestines influence gene expression, systemic inflammation, preventing future hair loss.**
- 5. Microbiome.**

Misunderstanding hair loss

WHAT ARE WE MISSING?

For reasons not totally understood, pattern hair loss begins when DHT accumulates in the scalp. As the scalp's hair follicles become sensitive to DHT, they begin shrinking. Over time, the DHT makes the hair thinner, until it appears to disappear. The result is pattern baldness.

Most experts agree DHT is causing the baldness. The theory is that DHT is higher in men with thinning hair, and men who can't produce DHT never go bald.

THE HISTORY

The premise of the DHT argument for hair loss has primarily been based upon several studies* done between 1900-1940. These studies found that when a male has been castrated their testosterone and DHT levels plummet forever. Men who were castrated before puberty - before DHT levels spike - didn't go bald later in life. Men who have this genetic condition never develop pattern hair loss.

Based upon these findings, the drug Propecia/finasteride were created to reduce the body's DHT levels to hopefully regrow hair. And while Propecia helps slow and may stop hair loss, it rarely results in much hair regrowth. the basis for nearly every hair loss drug that's gone to market. So, if DHT is the cause of hair loss, then taking away DHT should help reverse it. Not so fast...

Of the only 3 FDA-approved hair-growth drugs: Finasteride / Propecia which prevents DHT Conversion via the type II 5-alpha reductase inhibitor. Dutasteride / Avodart prevents DHT Conversion. Dutasteride is a 5-alpha reductase inhibitor that was developed to reduce the size of enlarged prostate glands. After realizing Dutasteride also reduced DHT levels in the scalp and possibly arrested hair loss, it was rebranded as a hair loss treatment. Minoxidil / Rogaine No one is quite sure how Minoxidil works. It's believed to increase blood flow to the hair follicles.

When applied twice daily, the added circulation may help reduce/stop hair loss, and sometimes encourage hair growth. Minoxidil isn't a DHT inhibitor.

SIDE EFFECTS

Type II 5-alpha reductase plays a number of hormonal roles in the body - many not fully understood.

Men who don't produce II 5-alpha reductase never lose their hair. However, a type II 5-alpha reductase deficiency doesn't just stop hair loss... It also stops DHT production during prenatal development. Boys born with this condition have under- developed or ambi-guous genitalia. Of those who eventually develop functioning genitalia, most are infertile.

Type II 5-alpha reductase and DHT are critical to male development, but Finasteride and Dutasteride aren't drugs men take when they're developing, they're taken as adults.

In some men, taking Finasteride for only a few weeks resulted in unresolved erectile dysfunction. For many men, symptoms resolve after discontinuing the drug. For others, low libido and e.d. continue for years after discontinuing the prescription, sometimes never resolving at all. Prostate Cancer In 2007, researchers found that Finasteride and Dutasteride reduced total sperm count by ~30% after six months of use. Sperm volume, concentration, and motility were also reduced. In 2011, Finasteride and Dutasteride (ie: anything branded as Propecia, Proscar, Avodart, or Jalyn) were forced by the FDA to amend their warning labels after research suggested that prolonged use increased the risk of high-grade prostate cancer.

Men can't donate blood until they've stopped using Finasteride for one month. For Dutasteride, that waiting period is 6 months.

Women are not prescribed 5-alpha inhibiting drugs. But pregnant women are advised to not even touch its capsules. This is because Finasteride and Dutasteride can potentially mutate and inhibit the development of male fetus genitalia. While DHT is critical to proper development and sexual function, these drugs can have long-lasting, dangerous consequences.

While higher DHT leads to hair loss in the scalp, it increases hair growth in the body and face.

ROGAINE

Some of the ingredients in Rogaine foam are banned outside of the US because they are considered carcinogenic and tumor- promoting. With each application, the likelihood of cell mutation is increased. Response and Regrowth If elevated DHT causes hair loss, and DHT inhibitors like Finasteride reduce scalp DHT by 50-70%, then how effective are Finasteride and Dutasteride at reversing pattern hair loss?

Finasteride and Dutasteride's response rate (users who notice the hair loss has slowed down, stop or , saw signs of growth) is estimated AT 80-90%. A majority of users notice their hair loss slow, stop, or even reverse. Most evidence points to just a 10% increase in hair count, along with some thickening of existing hair. Most research shows that Finasteride is more effective at slowing or arresting hair loss, but not reversing it. In short- term trials, about 60% of men believed Rogaine helped them maintain or regrow some hair. In multiple year studies, that response rate was less than 30%. With satisfaction ratings in one 5-year study, only 20-30% of users said they were even satisfied with the drug's results. Rogaine might help many men early on, but its effectiveness seems to fade.

Once a person stops using Finasteride, Dutasteride, or Minoxidil, any hair gained will fall out within four to twelve months. They will have to take these drugs for life. Why is it that Finasteride, Dutasteride, and other drugs that inhibit DHT production merely result in slower hair loss, slight regrowth, but rarely (if ever) in full recoveries?

Types of DHT

There are two major categories of DHT:

1. Tissue based. This type of DHT binds to tissues like the skin and scalp. DHT tissue is higher in the scalps of balding men. This is why we must address fibrosis when it comes to treating hair loss.

2. Serum DHT: This type circulates in the blood. One study suggests that serum DHT has no correlation with pattern hair loss. Another shows that serum DHT is higher in young men without hair loss. That's the opposite of scalp tissue DHT, and the opposite of what hair loss experts say. Based on this evidence, serum DHT is either uncorrelated to or protective against baldness.

Finasteride and Dutasteride block tissue and serum DHT. Serum DHT is not only uncorrelated with hair loss, but it's critical for male development and sexual function. If we reduce serum DHT to nothing, we will experience sexual side effects.

We know serum DHT is not correlated with pattern hair loss, but tissue DHT in our scalps is correlated with pattern hair loss. By this logic, tissue DHT in other locations - like our bodies or face - must also cause hair loss.

SCALP TISSUE DHT VS. BODY TISSUE DHT

DHT appears to function differently depending on its location in our bodies. Higher scalp tissue DHT is associated with pattern hair loss. But higher body tissue DHT is linked to more body hair growth. The same is true for facial hair.

More tissue DHT in the body and face, leads to a hairier body and face.

How can tissue DHT encourage both hair growth and hair loss, depending on its location? In the scalp, there must be another factor at play. High DHT plus something else must explain why men and women lose their hair.

There are several factors that some physicians and hair loss drugs completely ignore.

Drugs that block DHT don't reverse most hair loss. They merely slow or arrest it. Even worse, these drugs lower both tissue and serum DHT, which is critical to sexual health.

While tissue DHT in the scalp is linked to hair loss, tissue DHT in the body is linked to body hair growth. DHT promotes hair loss in the scalp, but hair growth in the body. This suggests that DHT alone doesn't cause hair loss. It has to be DHT plus at least one other factor.

SCALP ENVIRONMENT

The balding scalp's environment, shows us what we might be missing.

By the end, we'll understand why drugs like Finasteride, Dutasteride, and Rogaine don't reverse hair loss, how the DHT paradox actually makes sense, and which conditions we need to target to not only stop our hair loss, but also regrow our dormant follicles.

BALDING REGIONS

Tend to have thicker, tighter skin. In balding sites, the skin is less pliable, and significantly less elastic.

In men's balding areas, the scalp has a certain "shine" to them. In advanced stages, some balding regions even look swollen. Balding skin is tighter, thicker, and shinier due to excess collagen.

Thicker, Less Pliable, Swollen Skin, Looser, More Elastic, Less Swollen Skin

Men with pattern hair loss have four times the amount of collagen fibers at the temples and vertex than men with no hair loss, which leads us to the conclusion that the skin contains scar tissue. An over-accumulation of collagen is known as fibrosis.

And while balding scalps are ridden with excess collagen, the thinning follicles are also surrounded by it – known as perifollicular fibrosis. Where there's hair loss, there's fibrosis...

When we study scleroderma, the autoimmune condition where collagen and fibrosis accumulate - we discover the body overproducing collagen - sometimes in the lungs, hands, and the scalp. This results in the same visual symptoms we see in balding scalps: tighter, thicker, shinier-looking skin. And for those who develop scleroderma in the scalp, hair loss soon follows.

This is a critical piece of information - confirming that excess collagen and fibrosis occur before hair loss starts. Excess collagen and fibrosis accumulate first, hair loss comes later.

RESTRICTED BLOOD FLOW TO HAIR FOLLICLES

Body tissues wrought with excess collagen and fibrosis have lower blood flow. As documented in balding regions, blood flow is restricted in thinning areas of the scalp. It's no surprise that most scleroderma sufferers have poor circulation of the extremities... less blood flow means less oxygen. Blood carries oxygen to our tissues. If our tissues have lower blood flow, they also have lower oxygen levels. Low tissue oxygen is also known as hypoxia. Studies confirm that balding scalp regions are hypoxic...

If a tissue is chronically suffering from low blood flow and low oxygen, hair cannot grow. In one study, men's balding regions had just 60% the oxygen levels of non-balding areas. Men with no hair loss had oxygen levels nearly the same all across their entire scalp.

Excess collagen (fibrosis) decreases blood flow and oxygen, "choking out" the hair follicles leads to hair loss.

ARTERIAL CALCIFICATION

Beneath our scalp skin is another contributing factor, calcification. Calcification is "when calcium salts build up in body tissue, calcium can be deposited abnormally in soft tissue, causing it to harden," usually in places where it doesn't normally appear, like the coronary arteries or brain.

If an artery is calcified, blood flow is significantly restricted. Dr. Frederick Hoelzel in the AMA, published the connection between scalp calcification, restricted blood flow, and hair loss 70 years ago. When removing the brains of cadavers, he discovered the scalp bones and blood vessels supporting the follicles were calcified in balding regions.

Peptides

A growth factor is a naturally occurring polypeptide that is capable of stimulating the growth, proliferation, healing and differentiation of many cell types. Growth factors can be localized to target specific areas (eg. Hair and skin).

The hair growth cycle, as well as hair follicle growth and morphogenesis are coordinated and complex processes that are dependent on the interaction of different signals and stimuli developing within specialized cells of the epithelium and mesenchyme or stroma. The hair follicle is a highly organized epithelial structure that is subject to cyclical alterations following its development. The extended anagen phase is characterized by massive cell proliferation and terminal differentiation and involves epithelial growth of the hair follicle into the dermis with regeneration of the matrix, inner root sheath, and formation of the hair shaft. The catagen phase is induced with rapid involution of the hair follicle and proceeds to the telogen phase of follicular quiescence that awaits the next signals for anagen.

The biological activity on cells that make hair follicles have been tested in vitro (lab) mice and humans for years, and Different growth factor families including the epidermal growth factor (EGF)-related ligands, fibroblast growth factors (FGF), transforming growth factor-beta (TGF-beta), insulin-like growth factor (IGF), hepatocyte growth factor/scatter factor (HGF/SF), and platelet-derived growth factor (PDGF) have been shown to be crucial for the regulation of the hair cycle and hair growth.

A stylized illustration of a blood vessel. The vessel's interior is a deep red, with concentric, swirling lines suggesting the flow of blood. Several red blood cells, depicted as biconcave discs in shades of red and pink, are scattered throughout the vessel. On the right side, a large, yellow, textured mass representing a plaque or atherosclerotic lesion is shown, partially obstructing the vessel's lumen. The overall style is graphic and medical, emphasizing the concept of calcification in the cardiovascular system.

CALCIFICATION

WHAT IS CALCIFICATION?

Researchers thought calcification was part of normal aging, since elderly people often have more of it. It turns out the relationship between age and calcification doesn't really exist. Calcification doesn't have to increase with age. It can be rampant in young adults and nearly absent in older ones.

Research suggests calcification and fibrosis can occur in the same areas, but are likely independent of each other. While some scleroderma patients also suffer from soft tissue calcification, others simply suffer from an overproduction of collagen. Calcification does not have to happen before fibrosis and vice-versa.

So, why is it that men are twice as likely as women to develop calcified arterial lesions? Researchers have long suspected that testosterone and DHT (androgens) might be the cause. Finally, it looks like DHT is coming into play...

ANDROGENS, CALCIFICATION, AND FIBROSIS

Men and women who take androgens (steroids) significantly increase their risk of arterial calcification. And in mice, DHT and testosterone injections increase arterial calcification lesions by 200-400%. The more DHT or testosterone injected, the greater the calcification.

Paradoxically, in studies done in vitro, increased androgens didn't cause calcification. In these tests, androgens protected against calcification. This suggests two things: Androgens alone don't cause calcification. 1. Androgens alone don't cause calcification. 2. In vitro studies are missing at least one variable. It must be that increased androgens plus at least one "mystery variable" leads to calcification - not androgens by themselves. When it comes to our scalps. DHT is the main androgen associated with pattern hair loss. Scalp DHT is higher in men with thinning hair. Men who can't produce DHT never go bald. So in the scalp, increased DHT plus these "mystery variables" precede both calcification and fibrosis.

What are the mystery variables?

1. An increase in androgen receptors.
2. An imbalance of calcification regulators.

Studies suggest together, increased DHT, androgen receptors, and imbalanced calcification regulators lead to calcification and fibrosis.

Androgen receptors (AR) These are the places inside cells where androgens - DHT - attach themselves. Androgen receptors often turn on or off depending on whether androgens are near. In order for calcification and fibrosis to occur, an increase in androgens (DHT) and an increase in androgen receptors must occur.

There must also be an imbalance of calcification regulators: a set of molecules, enzymes, and proteins that control whether our tissues store calcium.

There are two categories:

1. (promoters)
2. (suppressors)

If body tissues activate too many inducers and too few inhibitors, calcification will accumulate. Imbalanced calcification regulators explain the DHT paradox - why DHT encourages hair loss in the scalp but hair growth in the body and face. These regulators stay balanced in hair-bearing body and facial tissues. These don't calcify. But in the scalp, more inducers than inhibitors activate, resulting in scalp calcification and fibrosis. In order to induce calcification and fibrosis, we need a combination of all three factors:

- 1) Increased DHT
- 2) Increased Androgen Receptors
- 3) Imbalanced Calcification Regulators

The increase of DHT is caused by. Increased androgen receptors + Imbalanced calcification regulators = chronic inflammation, hormonal imbalance.

Chronic Inflammation Inflammation is our bodies' natural reaction to stressors: injury, infection, or toxic chemicals. When we cut our finger, our bodies recognize the injury as a "threat". They activate the enzymes, proteins, and hormones to start the healing process. These molecules assess the damage and determine how much our finger should swell (pro-inflammatory response) and when to activate repair proteins (anti-inflammatory response). This is normal and healthy.

CHRONIC INFLAMMATION OCCURS when inflammation never resolves - like a virus that won't go away, or an ulcer that won't heal. In these cases, inflammation is always present, so the tissues never fully repair. This is the inflammation associated with autoimmunity and cancer – and it often leads to scarring (fibrosis). Increased DHT isn't just found in balding scalps... It's also found in inflamed body tissues. There's evidence that DHT actually helps regulate inflammation, and in some tissues, DHT is anti-inflammatory. This suggests increased DHT is a part of the inflammatory process. DHT binds to tissues after inflammation occurs. And in our balding regions, if DHT is chronically elevated, our scalps are probably chronically inflamed. Studies show calcification and fibrosis are both the end-result of chronic inflammation. Chronic inflammation is the gun. The DHT-Androgen Receptors-calcification regulator imbalance is the trigger.

Hormonal Imbalances Since scalp DHT is higher in those with thinning hair, DHT is often considered the cause of hair loss in men and women. Many think "If DHT is made from testosterone and I have high DHT, it must mean my body's producing too much testosterone, so my hair is falling out." The idea that all men with thinning hair have high testosterone doesn't hold validity.

1. Studies show balding and non-balding men have similar testosterone levels.
2. Aging males often have lower levels of testosterone, but higher incidences of hair loss.
3. Male pattern loss has been observed in both high and low-testosterone males.

If we look beyond DHT, in both sexes, hair loss is closely connected to a hormonal imbalance. Specifically, the testosterone: estrogen ratio. In women, thinning hair has been linked to higher testosterone: estrogen ratios than non-thinning women. Estrogen, Progesterone and HairIn women, estrogen is normally produced in monthly surges during ovulation or pregnancy, inducing a temporary loss of coherence within the organism. The monthly estrogen surge inhibits "efficient" oxidative mitochondrial metabolism and stimulates cell division. In good health, this intense but brief stimulation is useful in situations that require rapid growth (i.e., for growing the uterus, breasts, and pituitary or for tissue repair following injury), but in other situations, can become degenerative if unopposed by large amounts of progesterone. Progesterone acts as an

anti-estrogen, supporting oxidative mitochondrial respiration and resolving the temporary growth-state induced by estrogen.

However, if the factors needed to produce progesterone – such as thyroid hormone and vitamin A – are deficient, as they typically are in advanced age, estrogen can accumulate in the tissues to lower the metabolic rate and the efficiency which energy is generated. The anti-respiratory, pro-inflammatory nature of estrogen has many anti-hair qualities. One of the best examples of how estrogen and progesterone affect hair growth is during pregnancy, when there is an increase in hair growth rate, hair diameter, and ratio of growing hairs to resting hairs - resulting in a “lush head of hair.” In some cases, pregnancy reverses “male-pattern” baldness in women.

In contrast, post-partum women routinely experience dramatic hair loss. But after giving birth, when progesterone levels fall sharply and estrogen and prolactin (the “lactation hormone”) levels increase, the lush hair that had developed during pregnancy – when progesterone levels were soaring – disappears.

Professionals often proclaim menopause as an “estrogen deficiency”—as if there were no doubt about it—it is very clear, instead, that an elevated ratio of estrogen to progesterone is involved. Estrogen concentrations in tissues correlate positively with aging and with body fat levels. There is much misunderstanding, but blood levels of estrogen do not necessarily reflect tissue concentrations of estrogen. Increased by estrogen, prolactin often becomes excessive around menopause, slows the metabolic rate, and inhibits the production of progesterone. There is no denying that supplemental estrogen is sometimes “helpful” during menopause, but this may be due estrogen’s suppression of the pituitary “menopausal” gonadotropins, which in excess can cause many problems associated with menopause. In fact, P.W. Wise found that regulatory nerves in the brain responsible for releasing these “menopausal” hormones were “desensitized” in relation to their exposure to estrogen. Estrogen and prolactin tend to cause hair loss in animals too.

In one study, administering estrogen to rodents caused hair loss, while an antiestrogen drug renewed hair growth. Similarly, prolactin treated rodents experience hair loss, and both estrogen and prolactin work together to initiate molting in birds. The influence of pregnancy, post-pregnancy and menopause on hair growth has now been revealed by the properties of estrogen, prolactin and progesterone:

Estrogen and prolactin both suppress thyroid function and interfere with the “efficient” production of energy, while progesterone opposes both hormones and supports respiration. Not surprisingly, estrogen and prolactin were increased in those with pattern baldness.

ESTROGEN, PROLACTIN OSTEOPOROSIS

Estrogen’s “anti-hair” “anti-respiratory” qualities are supported by what is considered its greatest strength: bone health. Estrogen is said to help prevent osteoporosis by decreasing the production of cells that destroy bone - “osteoclasts.” While estrogen does slow osteoclast production, it also decreases the rate of bone renewal and promotes the deposition of calcium in soft tissue. Perhaps the most striking anti-bone quality of estrogen is that it stimulates the secretion of the pituitary hormone prolactin. A well-known function of prolactin is to break down bone to provide calcium for milk production during lactation. Lactating mothers are high at risk for osteoporosis, as well as depression and hair loss. A hormone that tends to increase with prolactin (and vice versa) and also removes calcium from the bones is parathyroid hormone (PTH). While the increased secretion of parathyroid hormone is adaptive in the short-term (normalizing blood calcium levels when they fall below normal), low levels of parathyroid hormone are essential for maintaining bone health. Parathyroid hormone has also been shown to influence hair growth in animal experiments.

Estrogen, prolactin, and parathyroid hormone tend to suppress thyroid function, reduce the concentration of carbon dioxide, promote “inefficient” respiratory energy, and the production of lactic acid, all of which lead to an increased reliance on the stress hormone cortisol. Cortisol is secreted from the adrenal glands during stress, and degrades the body’s proteins before turning them into glucose so to provide large amounts of glucose to cells to deal with the stressors. When energy metabolism is inhibited, as it is in diabetes, cortisol rises despite high blood glucose levels. Because the exposure to cortisol is increased in age-related bone loss and in pattern baldness, cortisol is thought to at least contribute to those conditions. Progesterone’s opposition towards estrogen, prolactin, cortisol, and parathyroid hormone helps clarify the complex relationships among the endocrine factors involved in bone loss.

Revisiting Androgen When we look at the research which, focused on the castrated males which were the basis for the DHT-hair loss connection, we recall

They did not go bald.

There was a marked reduction in sebaceous gland activity, producing less oiliness in the face, hair, scalp, no acne 3. Dandruff was only seen in very small amounts or absent altogether.

When analyzing the hormones of a castrate, they found, them absent of testosterone, and deficient in estrogen and prolactin. These hormones influence sebaceous glands; prolactin activates the formation of sebum by the skin. In fact, the anti-prolactin drug Bromocriptine has been successfully used to treat acne. Vitamin A, which opposes the action of estrogen, is also commonly used to treat acne. Aspirin not only reduces estrogen, is also useful in situations involving acne. While progesterone levels were not measured in the castrates and pseudohermaphrodites cases, they exhibited feminized characteristics (e.g., reduced beard growth, higher voices, and reduced pubic hair growth), all but confirming the notion that the groups had either higher than normal levels of progesterone, an anti-androgen, or unusually low levels of estrogen in relation to the adrenal androgens and progesterone, as the estrogens can be masculinizing. Similarly, Finasteride may have progesterone-like qualities. Chemically similar to progesterone, Finasteride is helpful for the types of hair loss that are arbitrarily deemed to be “androgen independent”.

For instance, in a study of eight females with normal levels of androgens, Finasteride arrested the progression of hair loss for half of the women who used it. Another piece of evidence shows that Finasteride has progesterone-like qualities came in the form of an observation that younger men respond better to Finasteride than older men do. Because estrogen tends to accumulate with aging at the same time testosterone, an anti-estrogen, declines, the “estrogenized” aging male may have more difficulty experiencing the full force of Finasteride’s feminizing effects, provided Finasteride did, in fact, have progesterone-like qualities. According to its most recent package insert, Finasteride is so potently feminizing in some males that it has been shown to induce breast development, reduce beard growth, and eliminate libido— all confirming Finasteride’s progestogenic qualities. Anything but the “female hormone”, estrogen is involved in the genesis of stress, aging, and pattern baldness. Its effects on hair growth are most clearly seen in pregnancy and menopause.

PREGNANCY, CHILDBIRTH, AND MENOPAUSE

With women, when there is an elevation of androgens or a decrease in estrogen, it can lead to alopecia. During pregnancy, childbirth, and menopause, there is a fluctuation of hormones in a person, and the rise and fall of estrogen can bring about hair loss. However, during pregnancy there can also be increased hair growth due to the prolongation of anagen phase via estrogen. After childbirth, the drop in high estrogen levels is also a cause for hair loss during the six weeks to four months following delivery.

Additionally, during menopause, hair loss is sometimes observed as estrogen levels plummet compared with high androgen levels. This can also happen when estrogen-dominant birth control pills are discontinued.

Similarly, during menopause—also an estrogen dominant state—women often experience “male-pattern baldness”. For example, estrogen and prolactin promote the energetically inefficient non-oxidative metabolism, while progesterone supports the creation of thyroid hormones and, therefore, the energetically efficient oxidative metabolism. So, it’s all but fair to suppose that because an interference in energy metabolism induces temporary hair loss, when estrogen and prolactin are activated chronically, pathological changes in the scalp develop, ultimately leading to permanent pattern baldness by way of hypoxia, soft tissue calcification, poor blood flow, nutrient loss, oxidative stress, and so forth. In younger balding men, elevated estrogen levels are also common. Even if testosterone levels stay constant, higher estrogen will imbalance the ratio, which is associated with male pattern hair loss.

For women, even if estrogen levels stay the same, higher testosterone will imbalance the ratio, which is associated with female pattern hair loss. With the current state of first world living, men’s testosterone levels today are 22% lower than men of the same age 30 years ago. For women who experience hair loss after menopause, estrogen levels post-menopause drop by up to 90%. It looks like there is a T:E-hair loss connection. Evidence shows that this T:E imbalance happens before calcification and fibrosis.

THE T:E-CALCIFICATION CONNECTION

The T:E ratio may actually control which calcification regulators the body activates. If too many calcification inducers and too few calcification inhibitors are active, calcification happens. The body's T:E ratio helps "regulate" the calcification regulators. If the T:E ratio is imbalanced, a person is at a higher risk of calcification.

This explains why an imbalanced T:E is strongly associated with heart disease. In men, lower testosterone levels are associated with higher rates of calcification and stroke. Low testosterone men have a near two-fold increase risk in morbidity. They suffer from higher arterial stiffness, and men with higher estrogen levels are more likely to develop arterial calcification. Women with low estrogen levels have higher arterial calcification. Women with polycystic ovary syndrome (POS) and high testosterone also have higher rates of arterial calcification. The same for women receiving testosterone injections after menopause - the time when their estrogen levels plummet. This points to the thyroid which is in charge of regulating testosterone and estrogen production.

Thyroid The endocrine system is a network of glands in our bodies that produce and secrete hormones which are distributed through the bloodstream to various tissues. They send the signals to tell the tissues what to do. These control different body functions, including: respiration, metabolism, reproduction, sensory perception, movement, sexual development and growth. In humans, the major endocrine glands are the thyroid gland and the adrenal gland. The thyroid is the body's center for hormone production and regulation. People with underperforming thyroids (hypothyroidism), often have cold hands/feet, poor circulation, nagging fatigue, irritability, low body temperature, and imbalanced hormone levels.

Another external symptom of a suppressed thyroid is a decrease in eyebrow hair thickness on the outside of the brows.

Thyroid disease is a serious, under-diagnosed condition in the U.S., and an estimated 12% of Americans will develop a thyroid disorder in their lifetime. Consistent lack of energy, depression, irritability, infertility, bags under eyes, hair loss, and general sluggishness are all symptoms of hypothyroidism. Poor thyroid function is also associated with a host of other diseases.

Various adaptive “stress” substances that suppress thyroid function may explain the changes seen in pattern baldness. For example, a characteristic of low thyroid is the accumulation of mucopolysaccharides – combinations of proteins and sugars that deposit in the area between cells called the extracellular space. Evidence suggests that mucopolysaccharides, a hallmark of low thyroid, accumulate in the scalps of those men with pattern baldness and can act as a matrix for calcification.

Unfavorable changes in mitochondrial function can be traced back to the interference in either the production of thyroid hormone, transport of thyroid hormone, activation of thyroid hormone, or by any combination of these three processes. Thyroid hormone greatly affects mitochondrial health by stimulating the production of ATP, regulating oxygen consumption via carbon dioxide, and by reducing the production of reactive oxygen species.

Since the thyroid regulates our hormones, it is closely tied to our T:E ratios. An imbalanced T:E ratio often means that our thyroid is underperforming. And if we want to balance our T:E ratio, we need to optimize our thyroid. Although there are thousands of factors that contribute to chronic inflammation, imbalanced T:E ratios, and the conditions that cascade into hair loss, there are four main ones we address:

1. Diet
2. Lifestyle
3. Microbiome
4. Scalp Environment

This chart is logic-checked against the scientific literature on DHT, hair loss, calcification, fibrosis, and everything in between. It’s a pretty far step from what most say: “DHT causes hair loss.

MINOXIDIL VERSUS OUR FLOWCHART

Minoxidil works by providing more blood flow to the follicles. Why is it ineffective? Calcification and fibrosis are chronic, progressive conditions. They don’t go away on their own and they tend to get worse over time. Increased blood flow helps our follicles temporarily. But because Minoxidil doesn’t reverse the calcified, fibrotic conditions in

scalps, it provides a temporary boost to hair follicles. As calcification and fibrosis worsen, Minoxidil's effectiveness fades.

FINASTERIDE VERSUS OUR FLOWCHART

Finasteride prevents the conversion of free testosterone into DHT. It prevents tissue DHT from accumulating in a scalp. This occurs right before calcification and fibrosis. Since Finasteride reduces DHT in the scalp, it helps stop the cascade of events that trigger calcification, fibrosis, and eventually hair loss... But because calcification and fibrosis are further downstream to DHT, and because calcification and fibrosis are chronic progressive conditions, reducing DHT won't reverse these conditions. It'll only slow or stop their progression. This is why Finasteride can arrest hair loss, but not regrow much hair.

SPIRONOLACTONE VERSUS OUR FLOWCHART

Spironolactone, a "caffeine" topical, blocks androgen receptors so that DHT can't accumulate in the scalp. This might help arrest hair loss, but since it doesn't address pre-existing calcification or fibrosis, it's limited in completely reversing the condition. Caffeine topicals help boost blood flow to follicles. But decreased blood flow is the result of calcification and fibrosis buildup, and unless we reverse those conditions and their triggers, the benefits of boosted blood flow will be short-lived.

TRANSPLANTS VERSUS OUR FLOWCHART

Hair transplants work by transplanting healthy hair follicles from the back of the head to thinning regions. But since thinning regions are ridden with calcification and fibrosis, transplanted hairs may eventually thin too – which is why so many hair transplants fail. Every treatment's biggest hurdle is calcification and fibrosis. Without reversing these two chronic progressive conditions, any drug, supplement, topical, or therapy targeting hair loss will only be mildly effective. If we want to regrow lost hair, we need to restore the environment of the scalp back to its original state - reversing calcification and fibrosis - and restoring blood flow to dormant follicles so they can turn terminal once again.

HAIR LOSS IS THE SYMPTOM....

Calcification and fibrosis are NOT just happening on top of the scalp. Calcification and fibrosis can happen in vessels and soft tissues everywhere in the body. In fact, pattern

baldness is closely associated with heart disease. As an article from Harvard states: “Calcium can accumulate in the arterial plaque that develops after injury to the vessel wall. The plaque is usually soft to begin with, but eventually hardens and becomes calcified.” By reducing or eliminating the triggers of calcification and fibrosis, we’re not just targeting hair loss, we’re targeting better health. And the conditions that precede it - calcification and fibrosis - are also chronic and progressive. To reverse hair loss, and potentially gain back what has been lost, we need to reverse calcification and fibrosis. Doing so allows for the return of proper blood, oxygen, and nutrient flow to dormant follicles.

A REVERSING SCALP CALCIFICATION AND FIBROSIS

When researchers compared balding vs. non-balding scalps, they found that balding scalps produced finer, less pigmented hairs that were much less obviously vascularized. However, when they exposed balding scalp cultures to a supplemental blood supply, the growth rate of the balding scalp cultures increased by about 80%. In another study, biopsies of balding regions of scalp were accompanied by vascular thrombosis, the formation of a blood clot inside a blood vessel that obstructs the flow of blood and nutrients to the hair follicle. In the final stages of pattern baldness, the tissue surrounding the hair follicle gradually lost their capillaries until the skin appeared to be almost deprived of blood vessels. Similarly, reduced scalp oxygenation was noted (Goldman et al. in 1996), whose group stated that there was vascular insufficiency in regions of the scalp that lose hair during male pattern baldness. Later on, Freund and Schwartz (2010) demonstrated that injections of botulinum toxin (botox) resulted in increased oxygen delivery to the frontal areas of the scalp, resulting in reduced hair loss and new hair growth among men with pattern baldness.

Chronic Inflammation Because of chronic inflammation and hormonal imbalances, our vessels and soft tissues have been slowly calcifying and becoming more fibrotic. Some people express calcification and fibrosis through hair thinning (scalp calcification), others express it in heart disease, others might not express it at all.

ADDRESSING CALCIFICATION AND FIBROSIS

Reversing scalp calcification and fibrosis done by energetic/mechanical stimulation - through modulated acute injury, or both - is the best scientifically validated method.

The most promising and effective stimulation technique to date we have found is through microneedling. Microneedling Therapy Evidence on Wound Healing And Hair Regrowth Microneedling was originally developed to rejuvenate skin and reduce the visibility of scars and abnormal pigmentation.

The procedure uses an electrical oscillating device that creates very shallow perforations in the skin. In hair loss treatments, needle lengths vary from very short (0.05 mm) to moderately long (2.25 mm). In skin treatments, improvement occurs because of the body's natural healing response to trauma – even to minor, superficial trauma. Aside from the minor trauma created, the numerous shallow perforations greatly enhance the penetration of products applied to the skin immediately after treatment.

In the case of hair restoration, we are interested in the trauma as being helpful in:

1. Reducing fibrosis and scarring
2. Increasing localized blood flow
3. Enhanced penetration of bio-signals

Microneedling not only creates localized trauma, it produces thousands of microchannels that will allow for greatly enhanced penetration of topically applied substances. A 2014 study confirmed micro-wounding's benefits on hair regrowth with Androgenetic Alopecia, using 1.5 mm on humans. In this study, every participant cited hair improvement of +2 and +3 grades on a 7-point scale in just six months.

(Note: the tests were used applying Rogaine. Participants were told to apply the Rogaine 24 hours after microneedling. In twelve weeks of daily Rogaine use and once-weekly dermarolling, participants saw hair thickening and regrowth that was four times greater than Rogaine use alone.

While we have discussed our opinion about Rogaine here, the impact of the effect that the microneedling had cannot be discounted. As evidenced by wounding's regrowth of hair and improvement in skin scars, if we "acutely" injure areas already ridden with calcification and fibrosis, the healing process seems to resolve much of that calcification and fibrosis. When we injure a tissue, our bodies generate an acute inflammatory response that allows the body to repair that injury.

If an injury is too severe - like a deep cut - our bodies repair the wound imperfectly, and the results in scar tissue. However, when an injury is minor - like the acute inflammation generated from microneedling - our bodies can better control the healing process and achieve perfect wound healing.

Acute inflammation is different from chronic inflammation. Acute inflammation is temporary and often caused by injury. Chronic inflammation - the kind that results in hair loss - is prolonged and often results in calcification and fibrosis.

MICRONEEDLING CALCIFICATION REGULATION

Acute wounding appears to down regulate calcification inducers - like transforming growth factors, while up-regulating calcification inhibitors that promote scarless healing. We can say that this “acute inflammation generation” promotes the right balance of calcification regulators. We need all three factors - increased androgens, increased androgen receptors, and imbalanced calcification regulators - for pattern hair loss to occur. Acute wounding addresses that third variable. In doing so, it also reverses some of the calcification and fibrotic tissue already present.

Acute wounding promotes angiogenesis - also known as the formation of new blood vessels and capillary networks that provide oxygen and nutrients to our follicles. Calcification and fibrosis reduce hair follicles' blood flow and oxygen levels. This contributes to slow and steady thinning. However, if we create new blood vessels around thinning follicles, these new blood vessels provide thinning follicles with more blood and oxygen. By re-establishing blood flow and oxygen, we can encourage hair thickening and even regrowth. And in addition to these mechanisms, mechanical stimulation upregulates genes associated with hair regrowth and downregulate genes associated with hair loss. Mechanical stimulation targets what DHT blockers can't: calcification and fibrosis.

COMMON HAIR LOSS MYTHS

MYTH #1: Bald guys have more testosterone.

FACT #1: Bald guys have a higher percentage of follicles that are genetically susceptible to DHT, which causes shrinkage and miniaturization of hair follicles.

MYTH #2: Hair loss is passed down from your mother's side.

FACT #2: Genetic Hair Loss is polygenic, meaning many genes are involved in the condition. These genes can be inherited from the mother's or father's side of the family, or, both sides equally.

MYTH #3: Rogaine works for men and women.

FACT #3: Rogaine is only effective for androgenetic alopecia, (male pattern baldness). It doesn't work for immune based disorders, lupus, syphilis, menopause, pregnancy, chemotherapy. The jury is out when it comes to its effectiveness for women.

MYTH #4: Hair loss doesn't affect our emotions.

FACT #4: Patients with alopecia are seen to be affected with major depression and generalized anxiety disorder. Also, patients with alopecia had higher rates of psychiatric illnesses, such as anxiety disorders, depression, and social phobia, when compared to the general population.

diet



Food, Hormones, And Inflammation Chronic inflammation and a hormonal imbalance encourage calcification and fibrosis in the body and in the scalp. Diet plays a critical role in resolving both factors.

Thyroid is at the core of a healthy, hormonally balanced body is optimal health. A suppressed thyroid gland means a weaker immune system, increased susceptibility to hormonal imbalances, and a higher propensity for calcification and fibrosis accumulation. The four biggest dietary problems are: 1) Grains, 2) Certain vegetable oils, 3) Raw cruciferous vegetables, and a 4) A methionine:glycine imbalance. We'll look at how each contribute to the hair loss cascade.

Grains The first (and maybe biggest) culprit of chronic inflammation and suppressed thyroid function is grains. To make crops more resilient to herbicides, pesticides, and insects, many agricultural companies insert altered genetic coding into foods like corn, wheat, soy, and other widely sold high-yield crops.

By genetically modifying the crop, companies reduce the total yield lost from chemical damage and insects. In 2011, 88% of corn and 94% of soy sold in the US was genetically modified. It's getting more difficult to track GMO foods because of labeling legislation. It's to the detriment of our health. The grains we eat today aren't what they ate 10,000 years ago. In fact, they're not even the same grains from 20 years ago.

GMO's and Fertility Genetic modification allows for grains and foods like soy to have their own insecticides built into them. Current research estimating that the average American eats 193 pounds of genetically modified food each year. One recent long-term GMO study from Russia researched hamsters being fed genetically modified food for two years over three generations. By the third generation, most of the hamsters were infertile, grew more slowly, and had alarmingly high infant mortality rates.

Another study showed that rats on a GMO-corn diet developed early-life liver and breast cancer, with 70% of the female rats dying prematurely (versus 20% in the control group). But, hair loss has been around for thousands of years, and GMO's really took off around 1996.

GMO's GMO's and Inflammation Genetically modified foods have altered protein structures. Modified soy and corn contain proteins can evoke a toxic or allergenic-like response in humans. When we ingest anything toxic or allergenic, our body's first response is usually inflammation of the affected areas, which means GMO's can partially drive low-level systemic inflammation.

Studies show that overconsumption of GMO's can - through tumor generation - disrupt hormonal balance, resulting in reproductive disorders and infertility. These are failures of the endocrine system, largely powered by the thyroid. A large source of GMO's in our diet come from grains. Eliminate them. But don't stop there.

It's estimated that 75% of processed foods contain genetically modified ingredients. Eliminate processed foods, soy, and sugar beets from your diet. Eating these foods from U.S. sources are just not worth the risks. GMO's are not the only issue with grains. Other offenders - gluten, lectins, and phytates - make grains a less-than-optimal food source.

Gluten We've all heard the hype around gluten, which is a type of protein found in wheat, barley, and rye. Gluten intolerance was once thought to be rare, but it turns out that 35% of the population may be gluten-sensitive.

Gluten and Thyroid Gluten consumption can lead to an attack on the thyroid. It begins with a component of gluten – gliadin. Gliadin is a set of proteins which closely resemble the thyroid gland. When we digest grains, the fibrous parts of the grains rake against our intestinal walls. This creates micro-tears along the cell lining, allowing certain nutrients and minerals to leach into our bloodstream. This “raking” is a normal part of the digestive process. When we consume fiber within a normal range, that fiber not only feeds our gut bacteria, but it also creates small tears in our intestinal walls to allow for some permeability of nutrients and minerals into our bloodstream.

When we eat too much fiber, and thereby damage our intestinal walls beyond normal ranges, vitamins and minerals still get through to our blood... but so do unwanted bacteria, viruses, parasites, and larger protein molecules that would've otherwise stayed in our digestive tract. Gliadin is one of those proteins.

Excessive grain consumption increases the permeability of our gut and intestines, which means more interaction between the blood stream and the foods we digest. When we eat gluten-containing foods, gliadin can (and will) enter the blood stream. Because gliadin is not supposed to be there, our body reads gliadin as an invader, and produces antibodies to attack it.

Because gliadin is so structurally similar to the thyroid gland, our body inadvertently also attacks our thyroid tissue. These events suppress the thyroid, lead to a type of hypothyroidism called Hashimoto's, which is classified as an autoimmune disorder since the thyroid is being attacked by your own antibodies. It's estimated Hashimoto's is responsible for 90% of U.S. hypothyroid cases. Gliadin antibodies (the same our bodies produce which attack our thyroid) have also been implicated in type 1 diabetes. The only way to stop gliadin from entering our bloodstream is to completely cut out gluten. New testing methods suggest that gluten's effects on the immune system can last up to six months after we stop eating it. So, keep gluten out forever. If gliadin makes its way to the bloodstream, it attacks the thyroid, increases hormonal imbalance, and likely contributes to the calcification and fibrosis that precedes hair loss.

Aside from the 1% of people with celiac disease, gluten is only an issue if our intestinal lining is damaged enough to allow for gliadin to enter our bloodstream.

Grains can also damage our intestinal lining beyond normal ranges through lectins. Lectins are natural protein toxins that are mostly indigestible to humans. They're found in the seeds of fruits. From an evolutionary standpoint, they serve to protect the seed from digestion when an animal eats an entire fruit, so that it can pass through the digestive track unharmed and have a chance to sprout one day. Lectins are also abundant in grains and legumes.

Lectins Damage Lectins contribute to damaging the lining of the intestines in a different way than fiber does. Whereas fiber physically damages the cells of our intestinal wall, lectins prevent those cells from healing. This prolonged damage can lead to "leaky gut" - an overly permeable intestinal tract.

Leaky gut not only causes the vitamins and nutrients from the foods make their way into the bloodstream, but so too will the unwanted bacteria, viruses, parasites, and indigestible proteins that our gut, in normal permeability, keeps out.

A high lectin, high fiber diet can often result in higher gut permeability, chronic systemic inflammation, more autoimmunity, and the hormonal imbalances that trigger the calcification and fibrosis cascades of hair loss. High lectin intake is also associated with a handful of other inflammatory GI tract diseases. Once lectins are in our bloodstream, they create even more problems. Once in the bloodstream, lectins bind to Thyroid Stimulating Hormone receptors and block the production of thyroid hormones. This suppresses the thyroid, contributes to hormonal imbalance, and spurs chronic systemic inflammation. Lectins are associated with both suppressed thyroid function and systemic inflammation.

A suppressed thyroid and chronic systemic inflammation means more calcification and fibrosis, which likely means more hair loss. The only way to address lectins is to significantly reduce them in your diet. That means removing grains (and legumes too). Phytates Phytates (phytic acid) inhibit mineral absorption. Phytates are found primarily in grains, nuts, and cocoa. When a food with phytic acid is eaten, phytic acid binds to a variety of minerals inside that food that our bodies would otherwise absorb in the absence of phytic acid. By binding to these minerals, they're rendered indigestible.

Phytic acid has been shown to significantly reduce the mineral absorption of manganese, zinc, chromium, and iron in the gastrointestinal tract. Proper mineral absorption is vital to thyroid health. Weakened zinc metabolism or a zinc deficiency is closely associated with hypothyroidism, and a weakened thyroid is closely linked to hair loss. This isn't suggesting we supplement with zinc. It means we should avoid foods (like grains) that promote high gut permeability, inhibit nutrient absorption, attack the thyroid, and generate chronic systemic inflammation.

There's evidence that grain fortification (vitamins and minerals added to refined grains) may be linked to higher incidences of disease. Fortified grains are stripped of their germ and bran, then fortified with B-vitamins, iron, and other nutrients that the grain loses when the germ and bran are removed. For the last twenty years, the U.S. has mandated that refined, white grains be fortified. Evidence suggests when a country introduces fortification, obesity heart disease

If there is only one dietary change, the reduction or cutting out grains and gluten is the most important.

FATS

As re-evaluate our consumption of grains, we must also reconsider how certain fatty acids generate chronic inflammation within the body.

Saturated Fat Isn't the Enemy

For years, people looked at heart disease and blamed saturated fats. These assumptions were driven from the research of Ancel Keys, a professor and scientist of human nutrition and public health.

Keys published an infamous research paper (the Seven Countries Study), which found an association with increased heart disease and an increase in saturated fat consumption from dairy and animals. The study gained significant amounts of traction, and Keys' findings went on to drive the USDA dietary recommendations that stand today.

Unfortunately, his original study was composed of 22 countries, not seven. Keys actually omitted the countries that would have made the study's findings inconclusive. He cherry-picked his data points and drew misguided conclusions about the dangers of saturated fats. This led to the dissemination of bad information, which eventually culminated into the widespread belief that saturated fats are - for lack of a better term - evil.

Saturated fats are actually really good for the body, the thyroid, and the hair.

POLYUNSATURATED FATS

Polyunsaturated fats - the oils in the form of cold-pressed flax seed oil, hemp seed oil, or fish oil - are often revered as healthy.

The most well-known polyunsaturated fats are omega 3's and omega 6's, considered essential fatty acids because your body can't produce them, so they must be incorporated into the diet. They're required for certain functions of the body, such as proper cognitive performance, nerve function, and bodily development. Many plant foods have at least some trace amounts of essential fatty acids.

Scientists used to think high amounts of these fats were healthy. Recent research suggests differently. The ratio of polyunsaturated omega-6:3 consumed is what matters more than the total amount of polyunsaturated fats. Studies from PubMed found that an excess of omega-6 fatty acids promotes the “pathogenesis of many diseases, including cardiovascular disease, cancer, and inflammatory and autoimmune diseases. Increased levels of omega-3 PUFA (a low omega-6/omega-3 ratio) exert suppressive effects.”

“In the U.S. the average person’s tissue concentration of highly unsaturated [omega]-6 fat is 75%. Since we get close to 10% of our calories from [omega]-6, our tissue contains about as much [omega]-6 as it possibly could. This creates a very inflammatory environment and goes a long way towards explaining why 4 in 10 people who die in the U.S. each year die of heart disease.” - Chris Kresser, health researcher The optimal ratios of omega 6:3 is suggested to be somewhere between 4:1 and 1:1. The average ratio of the standard American diet is somewhere between 10:1 and 20:1, with many Americans showing ratios as high as 25:1. That’s too much omega-6!

The spike in omega-6 consumption came from the widespread emergence of cooking oils in the form of soy, olive, safflower, canola, and other vegetable oils. (sesame, flax, grapeseed, soybean, safflower, sunflower). It turns out that 75% of arterial plaque comes from polyunsaturated fats. The kind of fat our bodies don’t create. The only way we can get it is to eat it. Excess omega-6 fatty acids promotes systemic inflammation. Inflammation precedes calcification and fibrosis. In order to reduce inflammation and prevent future hair loss, we need to reduce omega-6 consumption.

One might look at the omega 6:3 ratio on flaxseed oil and think it’s a good oil because the ratio looks balanced. That’s only partially true. Flaxseed oil can cause inflammatory problems. Because by the time it’s ingested, its polyunsaturated fats will likely be oxidized. Oils that are liquid at room temperature oxidize with cooking heat. Oxidation occurs when unstable fatty acid molecules - polyunsaturated fats - are exposed to oxygen. Polyunsaturated fats have a unique molecular structure - a carbon-carbon double bond. And, saturated fats have a carbon-carbon single bond. A single bond is much more stable in the presence of oxygen.

When enough oxygen is present in polyunsaturated fat, the carbon-carbon double bond degrades and becomes a carbon-oxygen bond.

A byproduct of this reaction is free radicals - highly unstable molecules that bind with anything in sight. They are believed to accelerate the progression of cancer, arterial calcification, and age-related disease. T

he more polyunsaturated fats, the more likely an oil will become oxidized. And the more oxygen present, the more free-radicals generated during that process.

Unfortunately, UV light and high temperatures catalyze this entire process and can increase oxidation of vegetable oils by 10-fold. Even vegetable oils that have never been cooked can be problematic, as oxidation is impossible to prevent unless an oil is never exposed to oxygen. Even cold-pressed oils high in polyunsaturated fats - like flaxseed – can be an issue. While cold-pressing improves the quality of the oil, it doesn't prevent oxidation. That oil still has to be shipped from far away, in large containers with fluctuations in heat and storage. By the time it's ingested, the chance of it being oxidized is high, so it's best to avoid it all together. Oxidized oils generate free radicals inside our bodies, which accelerate aging, form carcinogenic compounds, and damage DNA. In fact, new research speculates that free radicals are what causes the injury (inflammation) that eventually becomes atherosclerosis and arterial calcification. The problem with many omega 3 supplements - like fish oil – is that by the time the supplement is ingested, it's already rancid and dangerous.

EAT FISH, ELIMINATE VEGETABLE OILS

Oxidized polyunsaturated fats are highly inflammatory. At this point, we know Inflammation is associated with atherosclerosis, calcification, and hormonal imbalance. Minimizing omega-6, get the 6:3 ratio between 1:1 and 4:1, and stop consuming rancid oils and supplements, and we can stop chronic, systemic inflammation. Eliminating vegetable oil and consuming a 4-6 ounces of shellfish, mackerel, sardines, and wild salmon 2-3 times a week will help the omega 6:3 ratio tremendously.

Cooking Oils Red palm oil and coconut oil are recommended, as they are high in saturated fats, low in omega 6, and solid at room temperature. We need not fear saturated fats, because they are far more resistant to oxidation and are also very necessary for the human body. They make up 50% of our cell membrane structures, they increase immune functionality, and help synthesize polyunsaturated fats allowing for the proper absorption of the fat-soluble vitamins A, D, E, and K.

Goitrogens Goitrogens are chemical compounds found in cruciferous vegetables like kale, broccoli, or brussels sprouts. They are also found in soy and in the skin of peaches, strawberries, and a few other fruits. Goitrogenic compounds compete with the thyroid gland by inhibiting iodine absorption. Iodine is classified as an essential nutrient and is naturally found in soil, seawater, fish, and some dairy. Without iodine, the thyroid can't generate the hormones necessary for optimal health. Almost 40% of the world is at risk of an iodine deficiency - associated with Hashimoto's, hypothyroidism, and reproductive diseases and cancers – mainly because of its impact on thyroid functionality.

Goitrogenic compounds inhibit the absorption of iodine from the thyroid, and in scenarios of iodine deficiency, the thyroid underperforms. This culminates into hypothyroidism and/or hormonal imbalances. An inhibited thyroid eventually manifests the cascade that causes hair loss. It's almost impossible to completely remove goitrogens. Some foods that contain goitrogens are also nutrient dense and worth eating semi-occasionally. However, significantly minimizing goitrogens will have a big impact.

The best way to minimize their ingestion is to stop chronically consuming raw cruciferous vegetables. Steaming or boiling cruciferous vegetables helps deactivate many goitrogenic compounds, though too much heat exposure destroys the nutrients that make cruciferous vegetables healthy. For this reason, keep cruciferous vegetables to a minimum. Supplements Nutrients in multivitamins and supplements behave differently in concentrated forms and when separated from their adjuncts in the foods that contain them. With iodine specifically, evidence points in the direction that supplementation might not be a good idea. To safely increase iodine levels, instead eat quality seafood and decrease overall goitrogen consumption.

PROTEIN BALANCE

Consuming adequate amounts of protein is critical for health. However, the types of protein and an overload of certain proteins can lead to chronic systemic inflammation. Most people believe, "All protein is equal, just be sure to get enough." But this isn't true. For instance, every cut from an animal has its own specific amino acid profile. Not all profiles are created equal. In the U.S., animal meat is the major source of protein – mostly from one meat - muscle. Ground beef, rib-eye steak, t-bone cuts, filet mignon, and chicken breast.

Rarely - if ever - do people eat liver, kidneys, brains, and bones. When we consume one type of amino acid profile (specifically, muscle meat), and consume it often, we're laying the groundwork for systemic inflammation.

Muscle meats are high in the amino acid methionine (an essential amino acid our body can't create). Once inside our bodies, methionine can convert into an amino acid known as homocysteine. High levels of homocysteine are associated with elevated blood coagulation, atherosclerosis, and heart disease. Many physicians use serum homocysteine to gauge a patient's risk for heart attack. The more methionine ingested, the more gets converted into homocysteine, and the higher risk for heart disease. High consumption of methionine also depletes glycine – an amino acid present in skin, bones, and other body tissues.

GLYCINE

Glycine exerts the opposite effect of excess methionine. Glycine helps control inflammation by suppressing free radicals and other triggers of arterial inflammation. Glycine is also an amino acid we rarely consume. By balancing out methionine and glycine ratios, we reduce diet-driven inflammation within the body, helping reduce calcification and our hair in the process. We decrease our methionine:glycine ratio by eating glycine-rich foods. Glycine is found in bone broths/stocks, gelatin, collagen, connective tissues, and animal skins. If you're eating muscle meats, you should absolutely eat these, as well. The importance of methionine:glycine plays out in nearly every "animal protein is bad for you" study.

With research that finds a correlation between meat consumption and heart disease or cancer, we almost always find that the individuals studied ate mostly muscle meats and rarely - (if ever - ate organs, bones, or other glycine-rich animal parts. In essence, these studies would be better off in stating that chronic, excess methionine consumption is associated with disease - something we already know. Eating nose-to-tail means rotating our animal foods to include muscles, bone broths, skins, and organ meats. Doing so will decrease arterial inflammation, increase your odds of living longer, decrease your risk for calcification and fibrosis, and increase your chances of keeping, and regaining, hair.

ANTI-INFLAMMATORY DIET

To prevent continued hair loss, we must optimize our body's hormone production and minimize or eliminate foods that contribute to chronic, systemic inflammation. This means eating an anti-inflammatory, thyroid-conscious diet. The diet eliminates most grains, significantly reduces the consumption of goitrogens, provides a balanced omega-6:3 ratio, corrects amino acid imbalances due to over-consuming muscle meats, and gives us all the micro and macronutrients we need to live a healthy life. The objective is to ingest adequate amounts of the fat-soluble vitamins A, D, E, and K, consume the right kinds of fat to properly process these vitamins, take in a good amount of protein with an anti-inflammatory amino acid profile, and provide healthful amounts of the water-soluble vitamins and trace minerals.

Surprisingly, white rice a few times per week is recommended, as it is the least problematic in regards to the issues we've discussed, and it tastes great if cooked using bone broths and stocks.

If we wish to minimize inflammation, increase thyroid function, and prevent the calcification-fibrosis cascade that precedes hair loss, we should:

- 1. Eliminate (most) grains from our diet.**
- 2. Reduce Omega 6: and increase Omega 3 ratios by removing vegetable oils and eating more fish.**
- 3. Minimize goitrogens by minimizing raw cruciferous vegetables.**
- 4. Eat "nose-to-tail" to balance our glycine and methionine ratios.**

Suggestions Eat only organic, pasture-raised, grass-fed animals. The quality of meat, dairy, and eggs matters. Pasture-raised, grass-fed animals have lower levels of inflammation and their meat has better omega 6:3 ratios. If you consume these animals, you'll be consuming a better ratio in your own diet. Organic-certified farms don't use genetically modified ingredients, antibiotics, or hormones when raising the animals, which helps ensure you're not consuming substances that are thyroid-inhibiting. Opt for them whenever possible. Avoid fruits and meats at the same meal. Fruit and meat are great foods, but should be kept separated from the same meal.

The vitamin C in fruit increases iron absorption from meats, and high iron-accumulation can interfere with thyroid health and inflammation.

DAIRY

Dairy consumption really depends on your tolerance. People's digestive disagreements with dairy often lead them to point the finger at a casein allergy or lactose intolerance, both of which are valid. If you think you have a dairy intolerance, take it out of your diet for a week and reintroduce it. See if you feel better. If you can tolerate them, raw full-fat dairy products are extremely nutritious and worth eating. Low fat and fatfree products are high in sugar, and so people with Candida are sensitive to the protein casein, which is found in milk. Cutting dairy will make a significant difference if you have Candida symptom.

If you can't stomach dairy, don't do it. You'll contribute to the inflammation you're trying to minimize. 35% of human beings that is lactose tolerant, If you don't suspect a casein allergy, dairy is a great source of fat-soluble vitamins and micronutrients. Raw dairy is substantially different than pasteurized/homogenized dairy. Pasteurized/ homogenized dairy is altered in its protein structures. Homogenization of milk alters the ways in the body processes dairy fat. Eliminate processed dairy from your diet when possible. Cutting dairy will make a significant difference if you have Candida symptoms.

SPEAKING OF CANDIDA...

It's estimated that one in three people have an overgrowth of Candida. In small amounts, Candida, a yeast that lives in your mouth, your gut and on your skin, is fine. But when the environment is compromised, the yeast can multiply and grow out of control. Sugar is one of the biggest culprits behind Candida. Sugar feeds the yeast in your body, allowing it to multiply quickly, causing things like fatigue, gastrointestinal problems, and chronic pain. Refined sugars are in a majority of off the shelf foods, so read labels carefully. You'll have to cut out baked goods, ketchup, and anything with obvious sugars, and too many carbohydrates produce pro-inflammatory eicosanoids and insulin.

KETOGENIC

Ketosis is highly effective for weight loss, and is the basis of the Atkins Diet, lowcarbohydrate Paleolithic diets.

For reasons not fully understood, longer-term ketosis can also result in hypothyroidism, causing hair shedding, low temperature and underactive thyroid. And still, ketogenic diets engender some health benefits and have been successfully used to fight certain types of cancer, reverse epilepsy, and even manage Alzheimer's disease. A lot of research is still needed, but until things are better understood, a long-term ketogenic doesn't appear to be good for hair health.

LIVER, SHELLFISH, BONE BROTH

Liver is high in vitamin A, B-12, and K-2. It's also touted as one of the world's most nutritionally dense foods. A five-ounce serving of oysters gives you enough zinc for an entire week. And a few cups of bone broth has enough glycine to keep any methionine-induced inflammation at bay. If you skip out on these foods, you're most likely going to miss out on vitamins and nutrients that are critical to this diet's success. Eat a few ounces of liver and shellfish once a week. A minimum of bone broth cups or collagen / gelatin supplements with each muscle meat- heavy meal are recommended.

Most importantly! Liver, shellfish, and bone broth are all high in vitamins, nutrients, and amino acids associated with proper calcification regulation. Imbalanced calcification regulators are one of the prerequisites to the hair loss cascade. These foods help balance these regulators because they are excellent sources of:

1. Vitamin A (as retinol)
2. Vitamin K-2
3. Taurine
4. Glycine
5. Zinc

These vitamins, nutrients, and amino acids - along with vitamin D and magnesium - are critical to keeping calcification under control. If you skip out on these foods, there's a good chance you won't reap much of the diet's benefits. Don't forget them.

LIFESTYLE

A close-up, profile shot of a woman with long brown hair tied in a ponytail. She is smiling broadly, showing her teeth, and holding a bright green apple in her right hand. She is wearing a light blue tank top and a small stud earring. The background is blurred, showing what appears to be a balcony railing and some foliage, with warm, golden light suggesting a sunset or sunrise.

Our lifestyle choices are major contributors to the poor thyroid function, hormonal imbalance, and the chronic systemic inflammation that precedes hair loss. The four biggest lifestyle issues are:

1. Stress
2. Chronic shampooing
3. Regular hot baths and showers
4. Vitamin D3 deficiency
5. Iron overaccumulation
6. Antibiotics

Stress In 1947, Hungarian physiologist Hans Selye – pioneer of the stress concept of aging and disease - noted that prolonged or excessive exposure to a stressor would lead to physiological imbalance, to which the body would mount an adaptive response, in effort to restore balance.

He suggested that the more numerous and severe the stressors, the greater the physiological imbalance would be, and the likelihood of mounting an effective adaptive response would become less likely over time. This mismatch – between the magnitude of the stressor and the adaptive response – would lead to only a partial restoration of balance and excessive strain on the adaptive mechanisms. Selye saw a characteristic pattern of signs manifest that included hemorrhaging, shrinkage of the thymolymphatic tissue, inflammation and bleeding of the gastrointestinal tract, and enlargement of the adrenal cortex. Although details of the science of stress is more speculative than concrete, Selye made clear that the stressors encountered by an individual in his lifetime not only accelerate the aging process, but also damage the mechanisms that respond to those stressors. When subsequent stressors are encountered, the stress hormones are released in larger amounts and stay in the blood longer than they did in youth. The stress hormone cortisol was the focus of Selye's research. Normally, when a stressor is encountered, cortisol is secreted and shortly after, cleared from the blood, operating on the principle of negative feedback, executed at the hypothalamus.

In old age, this negative feedback mechanism becomes less effective, and allows cortisol to stay in the blood longer, presumably by damaging the cortisol “receptors” in the hypothalamus.

And, cortisol is secreted in larger amounts, meaning that the body has lost the ability to measure the amount of cortisol needed to deal with stressors, or that cortisol is acting less efficiently on its target tissues. Excessive cortisol is a destructive hormone, causing conditions like skin aging and muscle wasting to diabetes and cancer. Part of the way cortisol does this is by interfering with the proper delivery, use, and storage of glucose. Selye incorrectly believed every organism had a finite amount of physiological reserve, or “adaptive energy,” to mount an effective response to counteract the physiological disturbances caused by stressors of any kind.

What’s likely happening is the stress hormones an individual is exposed to in their lifetime is cumulatively damaging the mechanisms that the body responds to stressors, leading to inefficient energy generation, and chronically elevated levels of stress hormones. This accelerates the aging process, and contributes further to the malfunctioning of the body’s stress response mechanisms. In an effort to keep us alive, these mechanisms are sustained at the expense of the whole body until balance, the main concern, is reestablished. When we’re unable to reestablish the balance, fragility and death occur.

The process of regeneration and the ability to avoid the ravages of stress correspond to the degree of metabolic intensity, and the ability to sufficiently deliver glucose and oxygen to cells. Youth is associated with an uncanny ability to regenerate and a resiliency to stressors, whereas adulthood is deemed a declining state of imperfect repair and associated with an impaired ability to bounce back from those same stressors.

Anything that interferes with the ability to generate sufficient quantities of energy interferes with the repair and renewal processes of cells, leading to atrophy, infirmity, and complete loss of functioning of tissues and organs. A lack of energy has a “ripple-effect” throughout the entire organism, as cells form tissues, tissues form organs, and organs form whole organisms. A complex “mini-organ,” the hair follicles in people with pattern baldness show signs of maladaptation and stress – just like other aging organs do. By paying attention to the interaction among stress, energy, and aging can help better understand the pathology underlying pattern baldness.

While medical culture sees the organism a ridged piece of non-renewable machinery preprogrammed with an inherited genetic destiny, Albert Szent-Györgyi, Hans Selye,

Gilbert Ling, and others have a very different ‘energetic’ view of life, where an organism’s structural resilience and ability to regenerate is based on its respiratory intensity – influenced predominantly by the environment. Focusing on the energetic state of the smallest unit of life, the cell, will lead us to discover an unexplored realm of science, the “flow” of energy through an organism (i.e., bioenergetics) and the mechanisms underlying the growth of hair, forming a heretical bioenergetic view of pattern hair loss.

REBALANCING TESTOSTERONE:ESTROGEN LEVELS THROUGH LIFESTYLE

Our skin is the largest organ of the body, and like every other organ, it’s trying to manage and regulate itself. Our body deals and manages over a million or so toxins per day, and 1/3 of those toxins are “estrogenic” –meaning, they have the same properties to, and resemble estrogen – and they have an impact our body. We unwittingly get synthetic estrogens - endocrine disrupters - from our water systems, swimming pools, they’re found in plastics like BPA, petroleum based products, detergents, cosmetics, furniture, carpeting, thermal receipts and on our food from agriculture chemicals like pesticides, herbicides and fungicides. We get a lot of “natural” estrogens from foods we eat.

All of these toxins actually cause our body to produce LESS estrogen and cause a testosterone imbalance. A healthy thyroid is vital to restoring testosterone:estrogen ratios. We can achieve this through the dietary recommendations made in the previous section. And we can do better. Here are a few life changes that can help support healthy hormonal ratios, improve thyroid function, and help prevent future hair loss:

- 1. Shampoo hair with paraben free, sulfate free, cleansing shampoo no more than 2-3 times per week**
- 2. Take cold showers, or finishing with a cold rinse**
- 3. Get some sun exposure**
- 4. Donate blood**

SHAMPOO LESS

While hair might feel clean after washing, shampoos should be used minimally. Shampooing increases sebum. The scalp produces sebum to keep hair healthy, shiny, and smooth. At a certain point, the scalp and hair reach homeostasis – enough oil is

produced to keep the hair intact, not too dry, and healthy. Shampoos strip the hair of natural oils, and replace them with something synthetic. Our scalps, aware of the fact that they've been stripped of sebum, work on overdrive to produce more sebum to make up for what's lost and keep the hair healthy. This cycle reinforces itself when we shampoo a lot. The scalp churns out more sebum than normal to keep up with the sebum its lost from shampooing. Excess sebum production is reported by many men and women who are losing their hair. While cause-and-effect hasn't been established, it's no surprise that androgens (testosterone and DHT) are suspected to increase sebum production at puberty. We also know that trapped sebum is potentially related to the thickening of the scalp skin in balding regions. The evidence suggests we want low-normal levels of sebum production, but we are constantly shampooing and sending sebum production into overdrive. This reinforcing cycle of shampooing and sebum production is why some can't go more than a few days without shampooing. If they skip one lather, the scalp becomes wildly oily.

Stop over shampooing. The process takes adjusting, but we need shampoo only 2-3 times per week with a cleansing shampoo. After 4-6 weeks, the sebum production will return to normal and hair will look much healthier. Look into the shampoo's ingredients - many of the ingredients can imbalance the testosterone:estrogen ratio.

EPA research suggests parabens disrupt the endocrine system. An endocrine disruptor is any kind of chemical that interferes with the endocrine system. Our bodies have androgen receptors that act as landing pads our circulating free androgens (testosterone and DHT) attach to in order to bind to our cells.

Endocrine disruptors look molecularly similar to our androgens. So similar, they inadvertently bind to our androgen receptors instead of our hormones - changing the way cells behave. These are chemical compounds, not our own hormones. If enough endocrine disruptors bind to tissue cells in our endocrine system – the result will be an impaired immune system, hormonal imbalance, or even cancer.

Parabens - a common shampoo ingredient - are endocrine disruptors. Parabens get stored in the body's fat tissue and accumulate over time. With enough chronic long-term exposure (through shampooing or otherwise), parabens can often find their way to your

endocrine system and bind to tissue cells. The endocrine system (which is composed of the thyroid, pancreas, adrenals, testes, and ovaries) is absolutely critical to our health. Without a properly functioning endocrine system, hormonal balance is literally impossible.

Phthalates – abundant in many shampoos – also damage the thyroid and endocrine system. They can be disguised on labels as “fragrance,” but they can decrease testosterone levels in males and have also been linked with breast cancer in women. Sulfates, formaldehydes, propylene glycol, and a handful of other toxic ingredients are in most store-brand shampoos.

Even if we’re using a great shampoo with quality ingredients, it’s still stripping the hair of its naturally produced oils. At the end of the day, shampooing less frequently is the healthiest option. Your endocrine system (thyroid) and hair will thank you.

COLD WATER

Hydrotherapy. Consistent exposure to cold water regularly activates the mammalian diving reflex – an evolutionary adaptation that exists in cold water mammals, and to a certain degree, humans. Generally, this reflex reacts the moment cold water contacts our skin. Our breathing deepens, our heart rates spike (then drop), and the blood rushes from our extremities to our most vital organs.

The benefits of cold water have profound effects on immunity, endocrine function, and hormone balance. Research suggests that when we are regularly exposed to cold water, not only do we avoid hormonal imbalances, but we also benefit from an uptick in depression relief and increased immune functionality.

Depression and lower immunity are touted as a symptom of hypothyroidism. Cold water exposure helps restore hormonal imbalances for both sexes by stimulating the lymphatic and endocrine systems, flushing blood from our extremities to our organs, releasing endorphins. The result is better thyroid health, more balanced t:e ratios, and hair health. Ocean swimming is infinitely better. But any cold water exposure helps correct the testosterone:estrogen imbalances in men and women, and carry over to the skin and hair.

Hot showers can decrease testosterone. A study from 2003 showed that male rats, when exposed to hyperthermic baths - hot water baths - three times daily showed a 70% decrease in testicular testosterone levels. A study of men exposed to 30 minutes of wet heat (eg: hot tubs) each week showed a significant drop in sperm count... Then a spike in sperm count of 491% after stopping the hyperthermic exposure. Hot water exposure - through baths or showers – can negatively impact the endocrine system, which then decreases their t:e ratios, affecting the thyroid, and finally the hair.

VITAMIN D FOR HORMONE SYNTHESIS AND IMMUNE FUNCTION

Something often overlooked in health is the importance of sun exposure. Our bodies naturally produce vitamin D when we are exposed to the sun. We can also find vitamin D in food sources like dairy or in supplements. Because of the established connection between skin cancer and sunburns, people often stay out of the sun more than they actually should. The truth is, while individual tolerance varies from person-to-person, sun exposure is central to thyroid function, hair health, and longevity. It turns out that sunlight may also stimulate the production of nitric oxide - a known vasodilator - in our blood vessels, which significantly lowers our blood pressure and improves blood flow.

Vitamin D Deficiencies In premenopausal women, insufficient sun exposure - thereby low vitamin D - is associated with an increased risk of autoimmune thyroid disorder. Research shows the lower the vitamin D, the worse the thyroid disorder. That same study reveals that 92% of Hashimoto's sufferers - the autoimmune form of hypothyroidism - have significantly low serum vitamin D markers. Low levels of vitamin D have also been associated with decreased immunity, osteoporosis, heart disease, and certain cancers.

I recommend supplementation with D3 - discussed further - If you decide to make only one change in your lifestyle, take a vitamin D3 supplement. Research reveals vitamin D3 requires a number of vitamin and mineral adjuncts to prevent toxicity, three of which are vitamin A, vitamin K2, and magnesium. If you're supplementing with vitamin D3 and not also receiving proper amounts of vitamin A, vitamin K2, and magnesium, your risk for arterial calcification may actually increase.

DONATE BLOOD RIDDING THE BODY OF EXCESS IRON IS IMPORTANT.

Iron is an important trace mineral in the body, but too little or too much iron can have devastating effects on your health and hair. Part of the reason women often begin losing their hair after menopause is likely because of their decline in their estrogen levels, which imbalance their t:e ratio. However, there's also something to be said about iron accumulation.

Women's menstrual cycles not only serve a reproductive function, but they also result in low-level blood loss over the course of their period. With this blood loss, excess iron and calcium that have made their way into the bloodstream via diet are also excreted. A woman's cycle helps keep her iron levels low. Interestingly, women with healthy menstrual cycles also have a significantly lower risk of heart disease. This makes sense when we consider the menstrual cycle's effects on iron and calcium release. But the menstrual cycle stops with menopause. This means that any excess iron that would've been excreted during a woman's period now stays inside the bloodstream. Research speculates that it's not just t:e ratios that are a problem for menopausal women, but also the sudden wave of iron overload they experience.

Iron overload in both men and women negatively affects the endocrine system and is linked to infertility, hypothyroidism, diabetes, liver disease, osteoporosis, and hair loss. Excess iron has also been linked to higher cancer rates because it is believed to increase free radical damage.

In men, iron overload is much more common because men have no natural mechanism to rid their bodies of its excess. With the standard American diet chock full of fortified grains - which contains added iron- iron overload has become a significant problem.

One study found that 13% of older men and women had dangerously high levels of iron in their systems. While the age ranges were 67-96, the study is important because it focuses on – the incidence of iron overload in American's. There's a chance that medically established "normal" ranges of iron could be too high - their testing base is people on a standard American diet - which would mean that iron overload could be more prevalent than it already is.

Because excess iron has such widespread effects on fertility, thyroid health, and endocrine function, it is also a significant underlying culprit in hair loss. By reducing iron levels, we help our endocrine system giving the thyroid a chance to get the t:e ratios back on track, and helps arrest further hair loss, as well as preventing the calcification-fibrosis cascade contributing to many diseases.

Blood Donations Help Correct Iron Overload. Donating blood slowly reduces iron levels and helps prevent further accumulation.

Microbiome



The microbiome is the genetic material of all the microbes - bacteria, fungi, protozoa and viruses - that live on and inside the human body. The number of genes in all the microbes in one person's microbiome is 200 times the number of genes in the human genome. The microbiome may weigh as much as five pounds.

The microbiome is the community of microorganisms - bacteria, archaea, fungi, as well as viruses - that inhabit an ecosystem or organism. Microorganisms dominate life everywhere, including the human body, the Earth's soils and sediments, the oceans and fresh waterways, and the atmosphere. Scientists also use the term microbiome to refer to all these genes associated with these lifeforms. Microbiome consists of microbes that are both helpful and potentially harmful. Most are symbiotic (where both the human body and microbiota benefit). Some, in smaller numbers, are pathogenic (promoting disease). In the first world, the absence of certain microbes could explain why our populations have more allergies, autoimmunity, and chronic conditions than those in the third world. In a healthy body, pathogenic and symbiotic microbiota coexist without problems. But if there is a disturbance in that balance—brought on by infectious illnesses, certain diets, or the prolonged use of antibiotics or other bacteria-destroying medications—dysbiosis occurs, stopping these normal interactions.

As a result, the body may become more susceptible to disease. Our gut flora - the organisms that live inside our intestines - make up at least as many cells as we have that are human. They influence gene expression, help us absorb vitamins and minerals, and constitute up to 70% of our entire immune system. Our gut health is largely neglected. Chronic antibiotic use and poor diet and lifestyle choices alter the composition of our guts, the bacteria that control the foods we crave and the hormones we produce, and the way we fight infection. Reversing this damage is key to minimizing systemic inflammation and preventing future hair loss.

The standard American diet, contains many grains – especially gluten. Wheat (both white and whole) is a staple of the American diet and is found in cereals, pastas, breads, beer, and even nutrition bars. From our section on diet, we know that if our guts are inflamed and overly permeable, gliadin (found in gluten) can enter the bloodstream and trigger an autoimmune response for our bodies to attack the thyroid.

Many third world nations don't use grains with gluten as a dietary staple. The absence of gluten help explain why these communities - particularly in East Asia – seem to have lower rates of baldness. Data is limited on grain consumption in the developing world. Americans eat more meat than almost all other countries. In the film *Forks Over Knives* (a documentary about “The China Study” and the benefits of a plantbased diet), the narrators anecdotally state that increased meat consumption is associated with hair loss. They suggest that with the introduction of Western foods in China also came an increase in pattern hair loss in China. They also suggest that current generations of Hawaiian men experience more hair loss now than before, allegedly, around the time they deviated from their original plant-based diet.

The American Lifestyle We already know that sitting in an office all day prevents sunlight exposure and the myriad benefits of vitamin D. We know that inactivity is dangerous to our health. And we know that steaming-hot showers throw our hormones out of balance and decrease our fertility.

It's not yet possible to determine exactly how much each lifestyle difference contributes to hair loss, but the differences in hair quality of the developed and developing world are undeniable. These lifestyle differences might contribute to the first world's higher incidences of hair loss.

If these things sound speculative, it's because they are. There is little research working toward answering this question. As such, we need to rely more heavily on anecdotes and related research to form a logical, rational theory. We can focus our attention on optimizing gut health and microbiome, and in doing so, prevent the chronic inflammation that contributes to hair loss.

Microbial Balance Beyond the presence of good and bad bacteria, there's something that matters more than your microbial make-up... It's your body's ability to keep bad bacteria out of the bloodstream, and good bacteria in your digestive tract. What regulates this ability? Your gut permeability.

Resolving Leaky Gut We've talked about leaky gut before... which is when the intestinal walls become so inflamed and torn, that large, unwanted protein molecules slip through the walls' cracks and make their way into the bloodstream. In the case of gliadin (from gluten), this creates an autoimmune attack on the thyroid.

We know that lectins in our bloodstream can bind to thyroid hormones and inhibit the ability for our endocrine system to function. But what about bacteria?

When our guts become too permeable, it's not just protein molecules that get through... It's also bacteria. There's mounting evidence of a connection between blood levels of bacteria and heart disease. Studies show that prolonged bacterial infections (and higher rates of bacteria in the blood) increase arterial plaque. Secondly, for certain blood bacterial infections, our bodies fight the infection by calcifying the bacteria.

Finally, there are bacterial strains that - once inside our bloodstream - can settle into our heart valves and cause a life-threatening heart infection. If we want to live long, keep our hair, and keep arterial calcification and fibrosis at bay, we have to maintain a healthy blood-gut barrier and keep good bacteria in and bad bacteria out. We do that by resolving leaky gut, and by doing so, optimize gut permeability. While it might seem daunting, it turns out that every recommendation in this manual isn't just about hair health, it's also about gut health. The recommended diet is relatively low in fiber versus a standard American diet. There's evidence that too much fiber can aggravate our intestinal tract and create conditions required for leaky gut to occur. The same is true for lectins.

New research suggests the more vitamin D deficient you are, the more susceptible your the intestinal wall is to damage. So, it's not surprising that vitamin D deficiency is implicated in most autoimmune conditions. The dietary and lifestyle changes here are also centered around resolving leaky gut, minimizing the entry of pathogenic bacteria into the bloodstream, and thereby reducing chronic systemic inflammation, the risk of calcification and fibrosis, and, hair loss. Making a few simple lifestyle changes, we can stop inflammation, optimize hormonal balance, and benefit our hair even further than with just diet alone. Antibiotics are among the most over-prescribed medications.

It seems that, no matter the problem, they are offered as the solution. Antibiotics affect the body and skin, and when we combine that with things like mercury, lead and arsenic that is in our food and water systems, we've got impeded immune cells that aren't functioning naturally. This, has a huge impact on the quality of our health and skin. The solution is to take a good, active probiotic, especially after a round of antibiotics. In general, a good probiotic is always important.

Biotin, vitamin B7, is found in mushrooms and soybeans. If we don't get enough of it, it can lead to skin disease and hair loss. Some of our gut bacteria can also produce biotin, while other bacteria break down accessible biotin and consume it. Biotin deficiency is most often seen in patients with serious conditions, such as celiac disease, but it can be common among pregnant women. Research has shown that bacteria-free mice lacking biotin in their diet, develop hair loss.

A team of Japanese scientists thought that the difference between biotin-producing and biotin-eating bacteria would reveal how much free biotin is available for the development of skin, hair, and nails. Their results were published in the scientific journal *Cell Reports*.

They gave laboratory mice a diet with and without biotin, and saw no impact on hair loss. They repeated the experiment, this time they also gave the mice a long course of antibiotics to destroy the balance of bacteria in their gut. This time they observed a mild hair loss, and as previously shown in bacteria-free mice. The scientists discovered that a particular type of lactic acid bacteria, *Lactobacillus murinus*, expanded after the antibiotic treatment. This bacteria couldn't produce biotin and was a clear candidate as the cause of biotin deficiency that led to hair loss.

To test the idea further, scientists repeated the original experiment with bacteria-free mice. Laboratory mice on a biotin-free diet and antibiotics saw an increase in a particular gut bacteria. When they fed the bacteria-free mice with *Lactobacillus murinus* they saw the hair loss became even worse and the mice became almost entirely bald. Scientists ran control tests, feeding regular mice and bacteria-free mice a diet with normal levels of biotin but added *Lactobacillus murinus*. These mice suffered no hair loss at all. They were also able to stop hair loss with direct injections of biotin. Although they couldn't rule out the possible influence of bacteria from their skin could also play a role. The mice, supplemented with probiotic *Lactobacillus reuteri* not only increased anagen hair follicle counts by a 106%, but, when compared to mice in the control group to mice in the probiotic group, researchers determined the probiotic-fed male mice had 74% of their hairs in the active, anagen phase, while the control group only had 36% (66% and 30%, respectively, for the female mice).

In fact, a full 64% of hairs on the mice in the nonprobiotic group were in the non-growth telogen phase.



My name is Misti Barnes, and I am a physician trainer, Trichologist, Collagen Restoration Therapist, Medical Micropigmentation Artist and licensed Esthetician. After beginning my career working for a prominent cosmetic surgeon in Santa Monica, I started my own business, Ideal Skin Clinic, where I began provided treatments to restore skin, post-surgical scars and acne scarring. I was trained by Susan Church, one of the first to use microneedling, while working with burn survivors, in concert with Dr. Richard Grossman, of the Grossman Burn Center.

The results of my scarring treatments were so successful in rejuvenating the skin, I started applying it to my clients with hair loss. My theory was that if the micro-wounding healing capabilities would work on scars, it might work on the scalp, and potentially revive hair follicles. After researching the impact and effectiveness of peptides, (in particular, the work of Dr. Loren Pickart, who discovered GHK and its biological and healing impact) I created a technique combining microneedling with collagen promoting and repairing polypeptides to treat hair loss clients. After treating 20 or so clients with inconsistent results, I began researching stem cells, specifically, stem cells derived from human bone marrow.

For over a year, I used human bone marrow cytokines to work with my clients with both skin and hair loss. In fact, the results I was getting with hair clients were superior to the results medical professionals were getting, so the manufacturer I was purchasing the stem cells from, reached out to me and requested I be part of their clinical trials.

The executives at the company asked if I would train their doctors, in the Orange County area. So I began formulating the reasons as to why my treatments were garnering better results, and I deduced it had to do with my technique. I wasn't yet sure that human derived bone marrow stem cells were the right solution. In the meantime, I was asked to participate in the 2018 Boston Biolife Medical Conference for Regenerative and Functional Medicine (the only non-medical pro to be asked – quite an honor!) to present the results of my work on the now 60 clients I had treated.

I had mastered the technique with stem cells, and although doctors were impressed with the work, I began having concerns about the stability and consistency with human derived stem cells. My growing concern led me to look at plant derived alternatives. Recent research shows that it is not the stem cells themselves that contain the regenerative power to revive the hair follicle, it is the exosomes and growth factors that

have the power to regenerate the follicles. I hired a leading biochemist - Geoffrey Hawkins, who holds multiple patents for hair growth - with a background in hair science (Revlon, Estée Lauder). Together we developed the Cellustrious® Hair Follicle Rejuvenation Serum, which utilizes plant-derived growth factors to target the triggers for hair loss, from cell differentiation, elongation, proliferation, to toxicity, calcification, inflammation and 5-alpha inhibition. *

Over time, I discovered that at-home maintenance, and continuing to trigger the follicles, would be critical to client success – especially in the beginning. I developed a leave-in conditioner with growth actives for hair strength., and a scalp replenisher to restore the natural oil balance to the scalp and hair. This, along with the at-home stamping device would complete the Cellustrious® protocol. In early client experience trials of Cellustrious® on a sample size of 10 people (4 females and 6 males), the results were highly successful with all 10 experiencing between 30-40% increase in growth. Before and after pictures consistently demonstrate growth ranging from significant to dramatic among men and women. Many of the pictures show significant improvement after even two treatments.

There are no side effects or down-time, and Cellustrious® is half the cost of other in-office treatments, such as PRP, transplants, and many drugs. It is a turn key, in-office treatment that can be performed by non-medical professionals (state dependent). There may be some doing procedures similar to Cellustrious®, but none with documented results. Note: Scientists still do not don't have absolute knowledge on the alpha-5 when it comes to hair loss, we include it in the serum, utilizing the most non-toxic formulation possible. As we continue to learn the 5- alpha's role in hair loss, we may alter the formulation. It is always under evaluation.

ADDRESSING THE WHOLE PROBLEM

Hair loss sufferers have the hair growth cycle disrupted by a combination of factors which have been discussed in this manual, including the loss of connective tissue integrity surrounding the hair follicle, and an increase of the inflammatory process and oxidative stress in the scalp, and dihydrotestosterone (DHT), With age, the decrease number and size of hair follicles in the scalp will also lead to thinner hair and an increase in hair loss.

However, the story doesn't end there. Toxicity, inflammation, lack of circulation, medications, and hormones play a part. What is required is a system to address the whole problem, not just one aspect of it. There is still so much we don't know. While I believe that Diet, Scalp Health, Gut Health, and Lifestyle are critical to prevention, it is important to address where people are now in the process.

Growth Factors are proteins that regulate cell division and tissue proliferation. Each growth factor has a specific cell-surface receptor. Binding of the growth factors to the receptor initiates, or, in some cases, blocks cell division. Most growth factors regulate only certain types of cells and tissues. The adult human has more than two hundred types of cells, whose numbers total in the trillions. All of them, except red blood cells, are constantly interacting by "speaking" with, or "listening" to, growth factors and cytokines. This highly complicated communication process is called "paracrine signaling." Used medically for years to treat blood diseases and cancers, growth factors have a strong history for wound healing.

We know that growth factors also play a pivotal role in skin and now, hair rejuvenation. A great deal of scientific work has been devoted to finding ways to stimulate the hair follicles using plant-derived active ingredients in the laboratory. Specifically, when it comes to hair, growth factors have proven effective. When we target the correct areas with the appropriate growth factor, we can support growth. For instance, when there's a disruption in the skin, cells that migrate to help healing must decide: do I make epidermis, or do I make hair? We use the growth factors to help the cells make hair. Topical application of cytokines and growth factors enhances paracrine signaling. Bio-signals applied to the skin augment what the body is already doing...or not doing. The bio-signals that "turn on" hair follicles, topically applied, can induce hair regrowth in dormant follicles. Scientists long thought people with hair loss had a depletion of hair follicles and follicle stem cells, necessary to grow hair.

We now know bald people have the same number of follicle stem cells as those with hair. They've gone dormant. It's the inability of stem cells in the scalp to develop into the type of cells that make hair follicles that may be an underlying cause of pattern baldness. Scientists know these follicle stem cells need bio-signals (biological signals) from within the skin to grow hair. Topical growth factors may be more efficacious since they address the physiologic bio-signaling that is in control of hair follicle function – a more natural and physiologic approach.

When growth factors are combined with microneedling - which supports the follicle by stimulating the epidermal stem cells in the hair follicle bulge, shifting the follicles into the anagen phase - we have an effective combination.

Cellustrious® uses a powerful combination of plant derived bio-signals that have been proven to be effective with hair loss, whether it be considered androgenetic alopecia, related to a medical condition, or menopause. We use 9 of the most powerful growth factors, formulated to reduce inflammation, target the dermal papilla layer, and stimulate hair follicle stem cells, and 20+ amino acids vital to hair follicle health, tri-peptides, red clover, rosemary, saw palmetto and biotin to support hair health, reduce atrophy and aging, and anti-oxidants and anti-Inflammatories to help prevent free-radicals. At a minimum, adhere to these concepts, for best results.

- **Vitamin D3 /Vitamin A/Vitamin K2/Magnesium**
- **Minimize Omega 6, increase Omega 3. Should be 1:1 to 4:1 (shellfish, wild salmon, mackerel)**
- **Eating Quality Fish (nose to tail or bone broths, gelatin) 3-4 times per week**
- **Avoid Grains/Gluten**
- **Avoid Antibiotics**
- **Avoid ALL GMO foods**
- **Avoid Vegetable Oils, lectins, raw cruciferous vegetables**
- **Exercise for stress reduction**
- **Probiotics for Gut Flora**
- **Paraben Free cleansing Shampoo – no more than 3 week**
- **Increase cold water- at least rinsing**
- **Avoid Refined Sugar**

Stress is another factor that is associated with hair loss. Not only can it contribute to the initial hair loss but continued stress results in slow growth of hair after the hair has fallen out.



According to one study, likelihood of hair loss was increased 11 times in women who experienced increased rates of stress when compared to those who did not. Additionally, animal studies have shown that psycho-emotional stress causes the active growth of hair follicles to stop, so the duration of hair growth is cut short.

Stressful life events can be triggers for alopecia. Studies delving further into the types of stressful events that were potential triggers in causing the onset and exacerbation of hair loss. Results show that more often than not, individuals who had alopecia had lost family members at a young age or felt emotionally neglected family members.

When a person's quality of life is affected, they may be alive but not be living life to its full potential. One of the reasons why the quality of life in patients with alopecia negatively impacts their self-awareness is because they have negative beliefs regarding their condition. Due to the strong association of alopecia and psychological symptoms, it is a good idea to consult your doctor and get a referral to a psych loss.

Educate yourself about the condition - get support and take what you can do. If you'd like more information about treatments that are available, reach out to us at Cellustrious® Hair Rejuvenation.

and so...

I hope you've found some pertinent information to may benefit you. Now it's up to you. By incorporating some of the various suggestions that we have provided, you may discover that you have halted some hair loss and even reversed some of the damage done.

The strategies outlined here will not only promote healthy hair growth and boost the volume of your mane; they may also prevent future hair loss. To successfully employ the preventative measures offered in this book, you first need to discover the source of your hair loss. So make an appointment with a trichologist or hair loss professional to get a handle on what is happening with your hair loss.

A professional assessment will go a long way towards understanding the best options available to you. Remember how important vitamins are when it comes to keeping your body performing at its optimum. Your hair craves them. So if you want to keep your hair thick and healthy, make sure your diet is providing you with the recommended daily intake of vitamins and minerals.



<https://.cellustrious.com>



References

Rob English, Perfect Hair Health eBook, 2nd edition

Hair castration studies Wu CP, Gu F-L. 1987 , Chinese Med J . 100:271–272.

Tougher SF. 1997 Byzantine eunuchs: an overview with special reference to their creation and origin. In: Smith L, ed, Women, men and eunuchs. Gender in Byzantium. London: Routledge; 168–184.

Rosenblum RE, Carlson WE, Tripp E. Simulating the structure and dynamics of human hair: modelling, rendering and animation. The Journal of Visualization and Computer Animation. 1991;2(4):141-8.

Stenn K, Paus R. Controls of hair follicle cycling. Physiological reviews. 2001;81(1):449-94.

Greco V, Chen T, Rendl M, Schober M, Pasolli HA, Stokes N, et al. A two-step mechanism for stem cell activation during hair regeneration. Cell stem cell. 2009;4(2):155- 69.

Ito M, Myung P. Dissecting the bulge in hair regeneration. The Journal of clinical investigation. 2012;122(2):448.

Paus R, Cotsarelis G. The biology of hair follicles. N Engl J Med. 1999;341(7):491-7.

Driskell RR, Clavel C, Rendl M, Watt FM. Hair follicle dermal papilla cells at a glance. Journal of cell science. 2011;124(8):1179-82.