

# HAIR DAMAGE: IT'S CAUSES, PREVENTION AND CURES

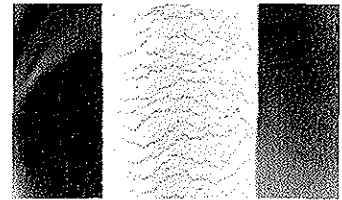
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## Hair Damage: Its Definition

Hair damage is essentially any condition whereby one or more of the hair structures, (cuticles, cortex, medulla, etc.), are physically or chemically altered to the extent that they are unable to return to their original state. Examples of damage are:

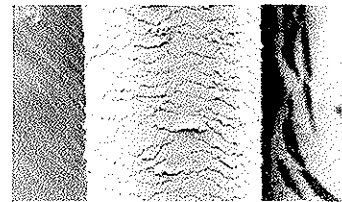
### Cuticle Loss and/or Erosion

Cuticles were designed by nature to protect the delicate inner structures of the hair, retain moisture and reflect light. They are configured like partially overlapping roof shingles, and on healthy hair, they are very tightly aligned.



Healthy Cuticle

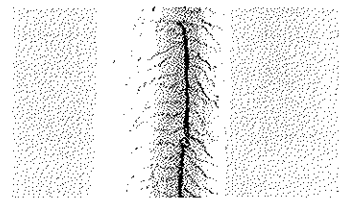
When damaged, cuticles can become cracked and frayed. Some of the keratin material, (of which cuticles are composed), can dissolve and disintegrate, making the hairshaft thinner. In severe cases, entire portions of the cuticle layer can be removed altogether.



Damaged Cuticle

### Longitudinal Rupturing

With extreme damage, the hair shaft can experience a massive crack along its length, damaging the cortex and medulla. The rupture leaves the hair fiber open and unprotected.



Longitudinal Rupturing

### Fibril Disintegration

With excessive damage, the strong proteinaceous fibers of the cortex are weakened and often disintegrate. The fibers fray and give the hairshaft a ragged, unstable alignment.



Fibril Disintegration

## **EVIDENCES OF HAIR DAMAGE**

The by-products of hair damage include the following:

### ***Loss of Elasticity & Tensile Strength***

Elasticity is a measure of a hairs' ability to stretch and recover, without breaking. On average, untreated excessively curly hair should be able to stretch about 50% of its length before reaching its breaking point. When hair cannot be extended to this degree without snapping, it has lost some elasticity and tensile strength.

### ***Breakage***

Breakage is closely related to loss of elasticity. It occurs as weakened hair experiences mechanical manipulations. Even simple combing and brushing can cause significant breakage on a damaged head of hair.

### ***Porosity/Moisture Loss***

Porosity and moisture loss are close relatives. Porosity is a measurement of the ease to which the hair accepts and releases moisture and other substances. For instance, the more porous the hair, the easier it is to "take up" coloring solutions and the easier it is to air-dry. The healthier the hair, the more difficult it is for chemical solutions to penetrate and the longer it takes to air-dry the hair.

Moisture loss occurs because the hair is more ready and willing to let the natural moisture escape from the inner fiber into the atmosphere. Healthy hair is well able to maintain its moisture levels. Both porosity and moisture loss are a result of cuticle damage. Simply put, the cuticle layer is no longer tightly aligned and is no longer providing adequate coverage to the inner hairshaft.

### ***Dullness***

On healthy hair, shine reflects upon a tightly aligned cuticle layer. Hair damage results in a dismantled cuticle surface, making it difficult, if not impossible, for hair to shine.

### ***Brittleness***

Hair becomes brittle when it has lost a significant degree of moisture. Cuticle and cortex damage and the porosity that results from such damage are the fundamental reasons that hair loses pliability and becomes straw-like in feel and appearance.

### ***Splitting of Ends***

Split ends are essentially longitudinal ruptures at the end of the hairshaft. Once split, these ruptures tend to travel up the hairshaft. And, because they expose the inner structures, split ends are typically dry and quite brittle.

### ***Excessive Tangling***

Hair that has suffered cuticle injury and damage to inner structures may be very difficult to comb. The frayed fibers interact-- snagging, tugging and pulling one another. Both wet and dry combing is impeded.

### ***Fly-Away Fibers***

Damaged hair carries a more negative electrostatic charge than does healthy hair. Negatively-charged hairstrands repel one another, producing fly-away strands, and makes hair difficult to manage overall.

### ***Limpness/Lack of Body***

Hair that has been damaged often won't hold curls well and does not have the fullness and volume known as "body".

## **CAUSES OF DAMAGE**

The sources of hair damage are many, and range from very ordinary practices and procedures to very extreme ones.

### ***Ultraviolet Exposures***

Everyday exposure to the sun affects the hair, even though it is seldom attributed to the damage of excessively curly hair textures. Ultraviolet rays from the sun can fuse the cuticle layers together, and this fusion causes the hair to be less elastic and more prone to mechanical breakage.

### ***Mechanical Manipulations***

Mechanical damage can occur when hair is combed, brushed, blown dry or styled. In fact, virtually any physical manipulation of the hair that entails even minimal tugging and pulling can damage hair. The damage caused, however, can range from slight to extreme depending on how carefully the hair is handled.

### ***Chemical Processing***

Chemical straightening, permanent waving and permanently coloring all *irretrievably* alter the bond structure of hair. Whenever the bonds are affected in this way, the hair loses a degree of its tensile strength. Also, hair becomes prone to moisture loss since chemical processes lift and penetrate the cuticle. Once the cuticle layer is penetrated in this manner, some degree of moisture loss is typical.

### ***Thermal Styling***

The high temperatures of modern-day blow dryers, curling irons, flat irons, crimpers, straightening combs, can easily deplete hair of moisture. When coupled with chemical relaxing, heat styling may result in extreme hair dryness.

### ***Shampoo***

For many, the fact that simple shampooing can damage the hair is still a difficult one to accept. Nevertheless, it's true. A shampoo with a pH level higher than 5.5 will cause a pH imbalance and "rough-up" the cuticle layer. It will also strip much, if not all, of the natural oils from the hair. This sets the stage for mechanical damage because a stripped, rough cuticle layer sets the stage for considerable combing and styling damage.

Additionally, the natural intercellular cement, (which tightly binds the fibers of the cortex layer and accounts for much of hair's strength), can be dissolved by shampoo detergents to some extent. With repeated shampoos with a high pH, strong detergent formula, the breakdown the intercellular cement progresses. Under these circumstances, the cortex may be damaged cortex and the hair is weakened.

## **Hair Damage: Its Preventions**

### **Ultraviolet Exposures**

To prevent the sun's ultraviolet rays from fusing cuticle layers together, avoid exposing hair to intense sunlight. Hats or scarves should be worn when out in sunlight for extended periods of time. Also, when selecting conditioning and finishing products formulated for excessively curly hair, look for those that contain

sunscreen ingredients. Such an ingredient is para Amino Benzoic Acid, (PABA).

### **Mechanical Manipulations**

Excessively curly hair is relatively fragile, so great care should always be taken when handling it. Some suggestions are:

- Use only detangling/conditioning-formula shampoos for cleansing excessively curly hair.
- Comb hair gently, especially when it is wet. To detangle, a wide-tooth plastic or rubberized comb is the only choice.
- Deep condition the hair after shampooing, without fail. When time is of the essence, you may use a leave-in conditioner, but only one formulated specifically for African-American hair textures.
- Avoid using hair-tightening barrettes and rubberized elastic bands. Minimize the use of curling irons/heated rollers, especially when hair is not really clean. Also, ask clients to sleep in a silky cap, scarf or on a satiny pillowcase to avoid damage caused by abrasion. A silky scarf is also a good idea to prevent abrasion when wearing wool coats and jackets. Ask your stylist to prescribe the hair care products you should use between salon visits.

### **Chemical Processing**

- See your stylist for chemical straightening, permanent waving and permanent coloring treatments.
- The next time you see your stylist for a relaxer treatment, ask for Affirm® FiberGuard™ Conditioning relaxer system. It has been proven to help maintain the tensile strength and elasticity of hair during chemical processing:

### **Thermal Styling**

To prevent extensive damage to the hair and significant moisture loss,

- Air dry chemically-treated hair if it is possible to do so and still achieve the desired style. It is best for the hair.
- If you must blow-dry, do so only after excess moisture has air-dried or been blotted from the hair. Blow drying from a soaking-wet stage stretches the hair

severely and can result in extensive fibril damage, including breakage.

- Thermal style *only* after hair has been treated with an intensive conditioner, preferably one rich in moisturizers.
- Apply a light coating of a good thermal styling product before heat styling. A very small amount of a silicone laminate is excellent for thermal styling; it helps the styling comb/brush glide through the hair easily, seals cuticles to reduce interfiber snagging, and produces a great shine.
- Use only the degree of heat necessary. Implements with thermostatic controls should *a/ways* be used. And, remember, properly relaxed hair requires minimal heat to achieve smooth, sleek styles.

### **Shampoo**

- Cleanse only with high-quality conditioning/detangling shampoos, formulated especially for excessively curly hair. Make sure that the pH of the shampoo is properly balanced, within the range of 5.5 and 6.5.

Avoid detergent formulas that strip the hair of its natural oils. Ingredients like those in the alkyl sulfates group, such as sodium lauryl sulfate, are harsh detergents. Shun shampoos containing such harsh detergents.

- While shampooing, try not to tangle the hair. Massage the shampoo into a rich lather throughout the hair and scalp, using the pads of your fingertips, not your fingernails. Be sure to rinse the hair *thoroughly* to remove all traces of shampoo.

## **HAIR DAMAGE: ITS TREATMENTS**

As indicated earlier, once hair is damaged there is no real way to completely restore it. Cutting is the only means of ridding hair of damaged areas. There are ways, however, to make hair look, feel and handle more like healthy hair. Conditioners play a key role in this pursuit.

The most widely-used categories of conditioners are as follows:

### **1. Leave-In Conditioners**

These conditioners are applied sparingly after shampooing and left on the hair. Some provide effective UV protection. Modern-day versions are lotion-like in consistency and are quite excellent. They can moisturize dry hair, detangle, help protect against thermal and mechanical damage, impart sheen and give hair a soft texture.

## **2. Deep Penetrating Conditioners**

Commonly known as substantive or intensive conditioners, this category of products penetrates the hairshaft to deposit moisturizing and/or proteinaceous substances. They typically are left on the hair 20-30 minutes for the deepest penetration, and work to repair damaged areas, moisturize, detangle and eliminate static charge.

## **3. Reconstructors**

Reconstructors are heavy-duty conditioners designed specifically for severely damaged hair. They typically contain micro- and macro-proteins to fill in cracks and ruptured areas on and within the hairshaft. Reconstructors may also contain polymeric agents to tightly bind the structures of the hairshaft together for the purposes of fortification and combability.

## **4. Moisturizers**

Moisturizing Conditioners hydrate dry brittle hair and correct moisture imbalances.

## **5. Laminates**

This category of conditioners is designed to: a) seal the cuticle layer for a glossy sheen, b) ease combing and c) ward off the style-wrecking affects of high humidity.

## **6. Thermal Styling/Blow Drying Lotions**

Used prior to heat styling, these conditioners help protect the hair from heat damage, reduce the force required to comb or brush the hair during blow-drying, provide sheen and eliminate static charge.

## **7. Finishing Conditioners**

This category includes natural oils, cremes, mineral oil-based hairdressings, oil sheen sprays and laminate sprays. Such products are used to enhance sheen,

manageability, and the oil-based products are sometimes used to lubricate the scalp.

#### **8. Pre-Chemical Conditioners**

Pre-chemical Conditioners are sold as integral parts of some relaxer systems. These conditioners are especially formulated to deep condition and repair the hair during chemical processing. Depending upon the brand, a Pre-Chemical Conditioner will also leave hair with an extraordinarily silky texture and luster.

#### **9. Post-Chemical Conditioners**

Post-chemical Conditioners are also sold as integral parts of some relaxer systems. They work to sustain and augment the deep conditioning treatment that the Pre-Conditioner effected. Post-chemical Conditioners also help normalize and re-balance the pH of the hair.

On the chart that follows, the various types and evidences of damage are listed. Specific treatments are recommended. While these listings are not exhaustive, they provide a good starting point for addressing the special needs of damaged hair.



## HAIR DAMAGE AND ITS TREATMENTS

Type/Evidence of Damage	Description	Prescribed Treatment
Cuticle Loss and/or Erosion	Cuticles become cracked and frayed; keratin material, (of which they are composed), can dissolve and disintegrate, making the hairshaft thinner; or entire portions of the cuticle layer can be removed altogether	<b>Conditioning:</b> Deep Penetrating Conditioner and Moisturizer used in combination or alternately <b>Styling:</b> Laminates and/or Blow Drying Lotion
Longitudinal Rupturing	In extreme cases, the hair shaft experiences massive cracks along its length, damaging the cortex and medulla. This fissure leaves the hair fiber open and unprotected.	<b>Conditioning:</b> Reconstructor followed by Moisturizer <b>Styling:</b> Laminates Blow-Drying Not Recommended
Fibril Disintegration	The strong proteinaceous fibers of the cortex are weakened and may disintegrate. The fibers fray and give the hairshaft a ragged, unstable alignment	<b>Conditioning:</b> Reconstructor followed by Moisturizer <b>Styling:</b> Laminates. With severe damage, Blow-Drying Not Recommended
Loss of Elasticity & Tensile Strength	Hair is unable to stretch and recover adequately, and easily reaches its breaking point.	<b>Conditioning:</b> Deep Conditioner Weekly and Reconstructor Monthly. <b>Styling:</b> Laminates and/or blow-dry Lotion
Breakage	Hair breaks easily when mechanically manipulated. Simple combing and brushing results in significant breakage	<b>Conditioning:</b> Reconstructor followed by Moisturizer. <b>Styling:</b> Roller or Gel Sets. BlowDrying and Thermal Curling not recommended until hair condition improves.
Porosity/Moisture Loss	Hair too easily admits and remits moisture and other substances. Coloring solutions and chemical treatments process quickly. Hair air-dries fast. Natural moisture escapes from the inner fiber into the atmosphere, causing dryness. Both porosity and moisture loss are a result of cuticle damage. The cuticle layer is no longer tightly aligned and is no longer providing adequate protection to the inner hairshaft.	<b>Conditioning:</b> Deep Conditioner and Moisturizer used in combination. Reconstructor Monthly. Instant Conditioner may be used occasionally. <b>Styling:</b> Laminates and/or blow-drying Lotion. Finishing Conditioners.
Dullness	Hair lacks shine. Sebum is not properly distributed along the hairstrand due to a misaligned cuticle layer. Dullness is typically a function of a dismantled cuticle surface.	<b>Conditioning:</b> Deep Penetrating Conditioner and Moisturizer used in combination or alternately. <b>Styling:</b> Laminates and/or blow-dry Lotion. Finishing Conditioners.
Brittleness	Hair has lost a significant degree of moisture. Cuticle and cortex degradation and the resultant porosity are the fundamental reasons that hair loses pliability and becomes straw-like in feel and appearance.	<b>Conditioning:</b> Deep Penetrating Conditioner and Moisturizer used in combination or alternately. Instant Conditioner may be used occasionally. <b>Styling:</b> Laminates and/or blow-dry Lotion. Finishing Conditioners.
Splitting of Ends	Split ends are essentially longitudinal ruptures at the end of the hairshaft. Once split, these ruptures tend to travel up the hairshaft. And, because they expose the inner structures, split ends are typically dry and quite brittle.	<b>Conditioning:</b> Deep Conditioner. Instant Conditioner may be used occasionally. <b>Styling:</b> Laminates and/or blow-dry Lotion. Hair Trim recommended.
Excessive Tangling	Hair has suffered cuticle injury and fibril disintegration, and may be very difficult to comb. The frayed fibers interact -- snagging, tugging and pulling one another. Both wet and dry combing is impeded.	<b>Conditioning:</b> Deep Conditioner every other week, and Instant Conditioner on alternate basis. <b>Styling:</b> Laminates and/or blow-dry Lotion. Finishing Conditioners.
Fly-Away Fibers	Hair carries a relatively high electrostatic charge causing hairstrands to repel one another, and producing fly-away fibers. Hair is highly unmanageable.	<b>Conditioning:</b> Instant Conditioner. Deep Conditioner every other week. <b>Styling:</b> Laminates and/or blow-dry Lotion.
Limpness/Lack of Body	Hair won't hold curls well and does not have the fullness and volume known as "body".	<b>Conditioning:</b> Deep Conditioner. Instant Conditioner occasionally. <b>Styling:</b> Laminates and/or blow-dry Lotion

## References:

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### About the Author

**Ali N. Syed** is a master chemist, with a wealth of experience in the formulation of hair care products. He successfully served as a research chemist for a number of major companies, and has 10 published patents to his credit, with 2 patents pending.

Mr. Syed has written numerous articles on the Chemistry of Hair and related topics in leading trade and scientific journals, including 4 scientific papers published in *Cosmetics & Toiletries* and *American Chemical Society Journals*. He has presented scientific papers at the Advanced Technical Conference sponsored by the *Cosmetics & Toiletries Magazine* for chemists from all over the world. Also, he has been a guest speaker at the London College of Hair & Fashion in England. Mr. Syed has conducted numerous lectures on chemistry of hair for other organizations like Chicago Cosmetology Association, Illinois Cosmetology Association, Ohio Vocational Cosmetology Association, and has been a Guest Artist at the Midwest Beauty Show. In addition to hair care, Mr. Syed is experienced in formulating skin care, cosmetics, fragrances, and OTC products.

Since 1984, Ali Syed has been president of his own international corporation: Avlon Industries, a manufacturer of professional hair care products sold exclusively to the salon trade. His winning strategy for formulating Avlon's own Affirm, Ferm and KeraCare lines is to use no ingredient that can have a negative effect upon hair and skin. The Avlon product line consists of relaxers, permanent waves, shampoos, conditioners, and finishing products.

With an abiding affinity for chemistry, Mr. Syed personally manages each and every research & development project undertaken by Avlon's expert team of chemists. Equal to his regard for chemistry, is the respect he holds for the professional hairstylist. Always positive towards the ideas and opinion of stylists, Ali Syed considers his company to be part of a team with cosmetologists. His on-going goal is to provide the very best products that advanced research and innovative thinking can offer, and always with an eye towards continual upgrading.

"An innovative chemist must be a dreamer," says Ali Syed. "One must persist in dreaming to accomplish that which seems difficult or yet to be done ... New Methods ... New Techniques...New Formulations. In chemistry, there's a lot of room for creativity".

Ali N. Syed holds a Bachelor of Science with honors, and a Masters Degree in Chemistry. He also has an MBA in Marketing/Management and additional postgraduate credits in Research Chemistry. He is currently studying to obtain his Ph.D. in Management.