Amino Acid Analysis of Damaged Hair from Chemical "Relaxers"

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As a follow-up to our blog about the relationship between ceramic flat iron use and trichorrhexis nodosa, we wanted to focus on the use of chemical relaxers and their association with hair damage.

Chemical relaxers have maintained their popularity over the years to make curly hair straight, especially in the African-American community. A relaxer is a chemical compound applied to curly hair to permanently break hydrogen disulfide bonds along the hair shaft to release the tight curl pattern. Typically, it is re-applied at varying intervals as new growth of unrelaxed hair occurs (Semin. Cutan. Med. Surg. 2009;28:103-8).

Relaxers have evolved from containing unusual ingredients such as lard, boiled eggs, and sodium hydroxide or lye (which is also found in many household cleaning products), to no-lye relaxers which contain guanidine hydroxide. These chemicals—whether made with or without lye—can result in hair breakage, particularly at points along the hair shaft where a new relaxer is applied to hair that has already been chemically treated.

In a recently published study, investigators performed a biochemical analysis on the hair of 30 women of African decent from Cape Town, South Africa. Of the women, 10 had natural hair (never used chemical treatments), 10 had asymptomatic relaxed hair, and 10 had symptomatic (brittle, breaking, or damaged) relaxed hair (J. Am. Acad. Dermatol. 2010; 62:402-8).

Cysteine levels were expected to be lower in chemically relaxed hair because it is estimated that 35% of cysteine changes to lanthionine during hydrolysis of the disulfide bonds (Clin. Dermatol. 1988;6:71-82).

The study found that cysteine levels were similar in proximal and distal natural hair. Levels were reduced in all relaxed hair, but were lowest in distal relaxed hair. Cysteine levels in distal and symptomatic relaxed hair were consistent with fragile, damaged hair such as that found in trichothiodystrophy.

In addition, arginine and citrulline levels were decreased, and glutamine levels were increased, in all relaxed hair when compared with natural hair. The authors noted that a decrease in arginine and citrulline has been associated with inflammation elsewhere, particularly in critically ill children, thus, relaxer use may also be associated with scalp inflammation.
However, Dr. Zoe Draelos wrote in an accompanying editorial that while cysteine levels were expected to be decreased, and this study validly confirms that, the association between decreased arginine and citrulline levels and scalp inflammation has not been as well elucidated.

Dr. Draelos, a dermatologist in High Point, N.C., also noted that prior amino acid analyses have failed to demonstrate that constituents of the body are accurately translated into the hair shaft composition in normal health. Further research is needed to elucidate whether or not relaxer use is also associated with amino acid deficiencies, which may be related to scalp inflammation, she concluded (J. Am. Acad. Dermatol. 2010;62:409-10).

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