Thermal Protection Assay
Flexabrasian

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Tradename: AC Kerazyme® Protect

Code: 16824

CAS #: 69430-36-0 & 91771-32-3 & N/A

Lot #: NC140826-E

Test Request Form #: 978

Sponsor: Active Concepts, LLC – 107 Technology Drive, Lincolnton, North Carolina 28092
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Abstract

With an increase in the use of heat styling, hair coloring, environmental aggressors and stress our hair is subjected to extensive damage on a daily basis causing thinning, split ends, breakage and lack luster results. Ceramic straighteners and heat styling appliances operate at temperatures over 450°F which can cause significant damage to hair keratin. Protecting the hair is vital in order to prevent dry, brittle ends as well as permanent deformation.
AC Kerazyme® Protect is a product designed to maintain the structural integrity of the hair cuticle in order to reduce the damage caused by heat styling. The purpose of this study was to confirm whether **AC Kerazyme® Protect** is capable of providing these strengthening benefits.

An *ex-vivo* study was conducted on dyed human hair tresses to evaluate the ability of **AC Kerazyme® Protect** to provide perceivable benefits to the hair. 2.0% **AC Kerazyme® Protect** was tested in a base shampoo and conditioner against a control of the base shampoo and conditioner with no added actives. The dyed hair tresses were washed and air dried 14 times using the test and control products. The tresses were then heat styled using a ceramic straightener before being assessed for tenacity and modulus of elasticity. The results show that **AC Kerazyme® Protect** has the ability to improve hair strength therefore liming the damage caused by heat styling compared to that of the control products.

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Materials and Methods

Blonde hair tresses were dyed red. A control of dyed hair treated with a base shampoo and conditioner was compared to dyed hair treated with the same base shampoo and conditioner containing 2.0% **AC Kerazyme® Protect**. The study was conducted using a blind protocol in order to limit bias.

The dyed hair tresses were washed and air dried 14 times using the test and control products. The tresses were then heat styled using 20 passes of a Remington Ceramic Hair Straightener under standard conditions. The temperature applied was of the highest setting at 450°F.

A Flexabrasion method was used to evaluate the effect of **AC Kerazyme® Protect** on the integral structure and properties of the hair. Single fiber testing was performed via Favimat to assess the strength of the hair in terms of tenacity and elasticity. 25 hair strands from each tress were tested in order to achieve a mean result.

Tenacity gives the breaking strength of the hair where the lower strength needed indicates a weaker and more damaged fiber. Force is applied to the hair strands individually until each strand breaks.

The Modulus of Elasticity gives the hair's resistance to being deformed. This method indicates the strength needed to increase the fiber length. To calculate this a force is applied on the hair causing elongation. This is expressed as the ratio change in stress to change strain as a fraction of the original hair fiber length. The greater the stress needed the more elastic and stronger the hair.

Results

Mean			
	Dyed Untreated	**Dyed Untreated + Ceramic Straightener**	**Dyed Treated with 2.0% AC Kerazyme® Protect + Ceramic Straightener**
Tenacity (g/den)	1.85	1.59	1.76

Mean			
	Dyed Untreated	**Dyed Untreated + Ceramic Straightener**	**Dyed Treated with 2.0% AC Kerazyme® Protect + Ceramic Straightener**
Modulus of Elasticity 0..10% (g/den)	9.81	8.68	10.39

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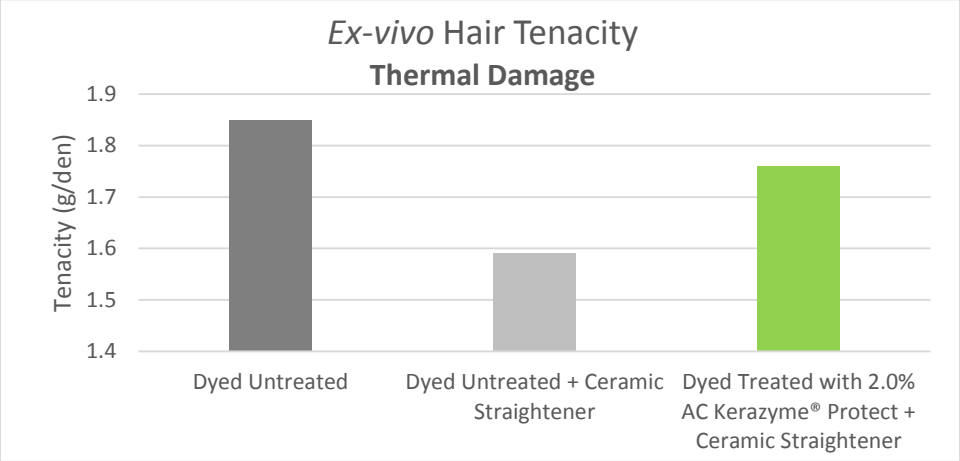

Figure 1. Tenacity of the hair to show the influence of thermal styling

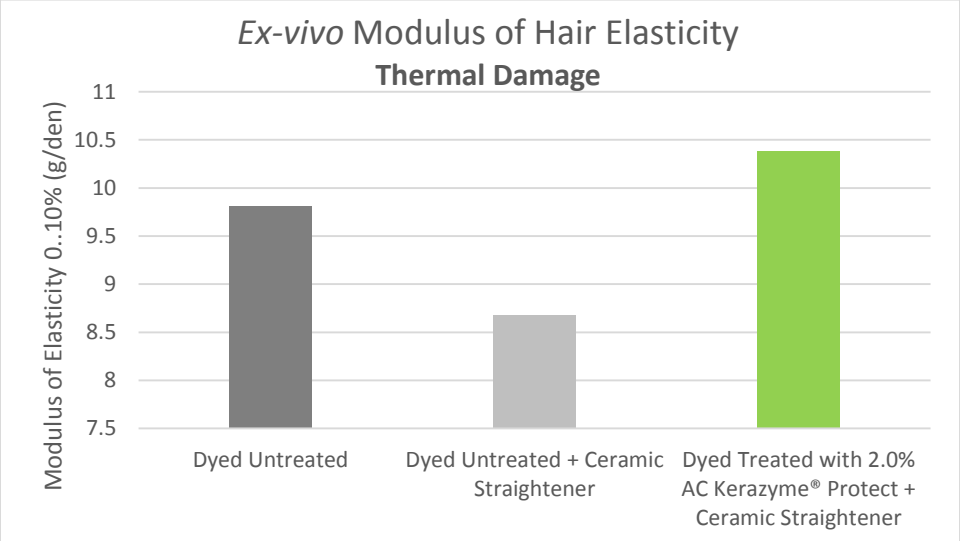

Figure 2. Elasticity of the hair to show the influence of thermal styling

Discussion

The results of the assessment indicate that when incorporated into a shampoo and conditioner, **AC Kerazyme® Protect** is capable of strengthening the hair more than the control products. From this comparison of the hair strands, it can be seen that heat styling exacerbates damage to the hair. However, with application of 2.0% **AC Kerazyme® Protect** the tenacity and modulus of elasticity is increased, indicating a decrease in the damage caused.

From these results it can be concluded that **AC Kerazyme® Protect** would be an ideal active to use in cosmetic applications designed for preventing damage caused to hair by thermal styling and to improve hair strength and condition.