Hair Curl Retention Assay

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Tradename: AC Curezyme

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Test Request Form #: 12606

Lot: N251124B

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Study Director: *Daniel Shill*
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Test Performed:
Hair Curl Retention Assay

Introduction

Hair styling, especially curling, is a popular trend in consumer hair care. Heated curling irons have been the popular choice for obtaining voluminous curls, but heatless curlers promise the same consistent waves with reduced heat damage and less hands-on time. While obtaining perfect curls is one challenge, maintaining them throughout the day is equally difficult. Intrinsic factors like genetics and natural curl patterns play a role in the style holding capabilities of hair. Additionally, environmental and mechanical stressors further disrupt curl retention over time, leading to frizzy, lifeless curls. Therefore, cosmetic applications for hair styling are of particular importance as they will enhance the longevity of curls.

Accordingly, a Hair Curl Retention Assay was performed to assess the style holding capability of **AC Curezyme** on hair.

Assay Principle

Human hair tresses were tested to understand the style holding capability of a cosmetic product. Test materials were applied to tresses, and tresses were styled using heatless curlers. Heatless curlers provide identical curls between all tresses as opposed to heat styled curls making them an optimal choice for replicable results. Curled tresses were imaged at various time points to assess curl retention under high humidity conditions.

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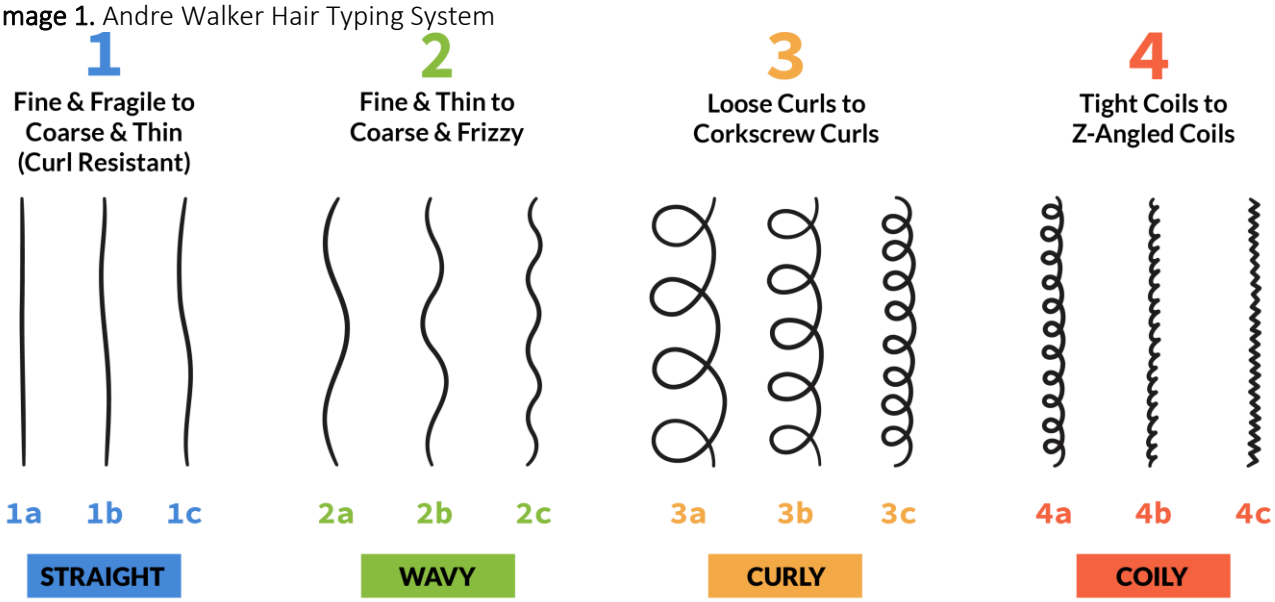
Materials

A. Hair Samples: Human Virgin 2B Wavy Brunette Hair Tresses
B. Incubation Conditions: Ambient Temperature 25°C; High Humidity > 90% RH
C. Equipment: HOBO Onset temp/RH logger; Canon EOS Rebel Digital Camera; Retention Scale Paper; Heatless Hair Curlers

Methods

Six virgin hair tresses were collected and utilized for this assay. Each tress was straightened and trimmed to eight inches. Images were taken to document the initial uncurled length. All hair tresses were then dampened with deionized (DI) water and treated with respective treatments. Three tresses received only DI Water and three received 2.0% **AC Curezyme** diluted in DI water. Each hair tress was evenly soaked in its designated treatment, towel dried, and placed in a heatless hair curler to dry overnight. After drying, tresses were removed from the curlers and initial curled images were taken.

Image 1. Andre Walker Hair Typing System



All six tresses were fastened to the lid of a humidity chamber to determine the curl retention capabilities under high environmental stress. Tresses were hung to obtain a natural hanging position and space in between each tress. A beaker of boiling water was placed into the humidity chamber and changed periodically to maintain a humidity level of > 90% RH.

Images were taken 30 minutes, one hour, two hours, four hours, and eight hours after humidity exposure began. Curl length was measured using retention scale paper placed behind the tresses. Percent curl retention for each tress was calculated as follows:

$$Percent\ Curl\ Retention\ (\%) = \frac{(Length_{Uncurled} - Length_{t=x})}{(Length_{Uncurled} - Length_{Initial\ Curl})}$$

Averages within each treatment group were calculated and used to determine curl retention over time. Data was analyzed using a one-way ANOVA with statistical significance accepted at $p \leq 0.05$.

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Results

The data obtained from this study met criteria for a valid assay and the control performed as anticipated. The tresses treated with 2.0% **AC Curezyme** provided style holding capabilities and improved curl retention compared to hair treated with DI Water.

Figure 1. Representative Images of Curl Retention at High Humidity over time.

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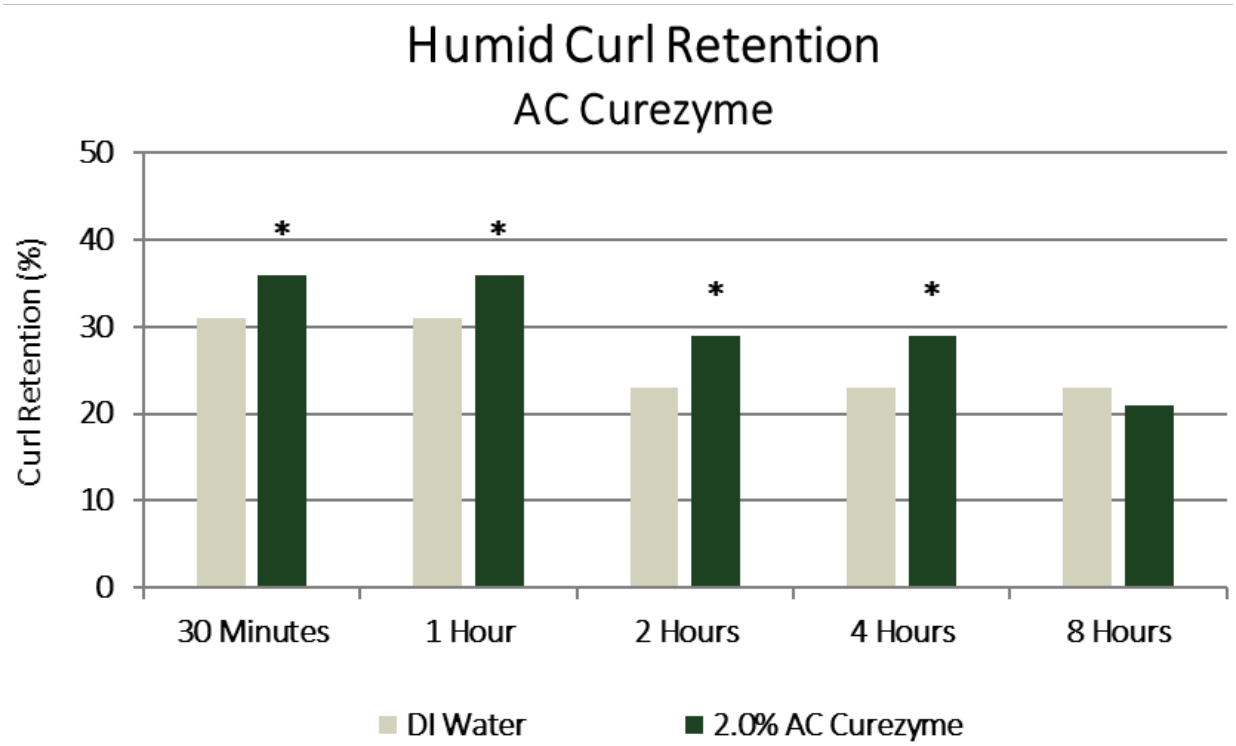

Figure 2. Percent Curl Retention of Tresses at High Humidity over time. * indicates significance ($p \leq 0.05$) between the two treatments at each time point.

Table 1. Results from one-way ANOVA Statistical Analysis of High Humidity Curl Retention between DI Water and **AC Curezyme** at each time point. * indicates significance ($p \leq 0.05$) between the two treatments at each time point.

	30 Minutes	One Hour	Four Hours	Eight Hours	24 Hours
P-Value	0.029*	0.027*	0.029*	0.022*	> 0.05

Discussion

As shown in Figures 1 and 2, tresses treated with DI water alone at high humidity experienced drastic reductions in curl retention over time. After 30 minutes, the hair only maintained 31% of the curl and after four hours the curl was only 23% intact compared to the initial curl. Conversely, the hair tresses treated with 2.0% **AC Curezyme** at high humidity maintained curl definition significantly better than DI Water alone (Table 1). After 30 minutes, the tresses treated with **AC Curezyme** exhibited curl retention of 36% and after four hours the curl retention was 29% compared to the initial curl. This data indicates **AC Curezyme** exerts style holding capabilities in high humidity environments better than water alone.

Taken together, these results indicate **AC Curezyme** imparts style protection abilities when added to hair care applications at recommended use levels. Collectively, **AC Curezyme** protects and maintains hair styles from high humidity environments.