Color Protection Assay-Microscopy Imaging

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Tradename: AC Violet'Blond Toner

Code: 21026

CAS #: 90131-47-8 & 84012-42-0 & 68333-16-4 (or) 92128-79-5 & 90082-41-0

Test Request Form #: 10060

Lot #: N221011A

Sponsor: *Active Concepts, LLC – 107 Technology Drive, Lincolnton, North Carolina 28092*
Study Director: *Maureen Drumwright*
Principal Investigator: *Hannah Duckett*

Test Performed:
Color Protection Assay-Microscopy Imaging

Introduction

Hair is colored for various reasons leading to several different tones, shades, and types of dye available for consumers. However, colored hair is prone to rapid fading and most color protection products do not live up to expectation. These products typically optimize a shampoo surfactant system to reduce the harsh cleansing and subsequent dye diffusion out of the hair shaft, or coat the hair with polymers, silicones, actives, or add a UV filter. Oxidative hair dyes permanently change hair color, however permanently dyed hair is susceptible to color fade and damage via wash-out, UV irradiation, and heat styling appliances. These cause shifts in the dyed-hair color tone resulting in dull, flat, and brassy hair.

Accordingly, an *ex vivo* Color Protection Assay was performed to determine qualitative and quantitative color fade benefits of **AC Violet'Blond Toner** on hair.

Assay Principle

Brunette human hair tresses were bleached blonde as this shade shows the greatest level of brassiness from wash-out and UV irradiation. Tresses were treated with test materials for a determined number of wash cycles followed by UV exposure. Throughout the experiment, microscopy images were taken for photographic comparison.

Materials

A. **Hair Sample:** Virgin Brunette Human Hair Tresses Bleached Blonde
B. **Product:** Base Shampoo and Conditioner (Table 1)
C. **Other:** 3 mL syringes

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Table 1. Base Shampoo and Base Conditioner Compositional Breakdowns

Base Shampoo Formulation	
INCI	%
Water	41.0
Guar Hydroxypropyltrimonium Chloride	1.0
Sodium Methyl 2-Sulfolaurate (and) Disodium 2-Sulfolaurate	35.0
Cocamidopropyl Betaine	15.0
Lactobacillus Ferment & Lactobacillus & Cocos Nucifera (Coconut) Fruit Extract	4.0
Polysorbate 20	2.0
Fragrance	2.0

Base Conditioner Formulation	
INCI	%
Water	76.0
Polyquaternium-10	1.0
Glycerin	3.0
Water & Centrimonium Chloride	2.0
Behentrimonium Methosulfate & Cetearyl Alcohol & Butylene Glycol	8.0
Hydrogenated Ethylhexyl Olivate (and) Hydrogenated Olive Oil Unsaponifiables	5.0
Lactobacillus Ferment	4.0
Fragrance	1.0

Methods

Brunette hair tresses were bleached blonde as this is the shade which shows the greatest level of brassiness. Five tresses were collected and each was assigned to a condition described in Table 2. Two tresses were treated with the Base Shampoo and Conditioner, two with 10.0% **AC Violet'Blond Toner** in base shampoo and conditioner, and one was left as an untreated control. This study was conducted using a blind protocol.

The hair tresses were washed, and air dried 7 or 14 times dependent on conditions and associated treatments (Table 2).

Using a Xenon-Arc Test for color fastness to light, the tresses were exposed to 0, 10, 20, or 30 hours of UV irradiation using the AATCC accelerated fading units (AFUs) model (1.10 W/m^2 total radiant energy). The Xenon-Arc lamp was used for accelerated light exposure as it has been shown to simulate the spectral characteristics of daylight better than any other artificial light source. Microscopic examination of the hair tresses was then conducted on the HIROX 3D Imaging Digital Microscope.

Table 2. Descriptions of the Conditions and Treatments for each Set of Hair Tresses.

Condition	Treatment Description
Untreated Control	0 Washes; 0, 10, 20, 30 Hours UV Exposure
Base Shampoo and Conditioner	7 Washes; 0, 10, 20, 30 Hours UV Exposure
Base Shampoo and Conditioner	14 Washes; 0, 10, 20, 30 Hours UV Exposure
10.0% **AC Violet'Blond Toner** in Base Shampoo and Conditioner	7 Washes; 0, 10, 20, 30 Hours UV Exposure
10.0% **AC Violet'Blond Toner** in Base Shampoo and Conditioner	14 Washes; 0, 10, 20, 30 Hours UV Exposure

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Results

The data obtained from this study met criteria for a valid assay and the Untreated Control performed as anticipated. Compared to the Untreated Control, the tresses treated with the Base Shampoo and Conditioner demonstrated visible color change after both 7 and 14 washes which was further exacerbated by cumulative UV exposure. The tresses treated with 10.0% **AC Violet'Blond Toner** in base shampoo and conditioner provided color protection and reduced visible brassiness compared to the Base Shampoo and Conditioner.

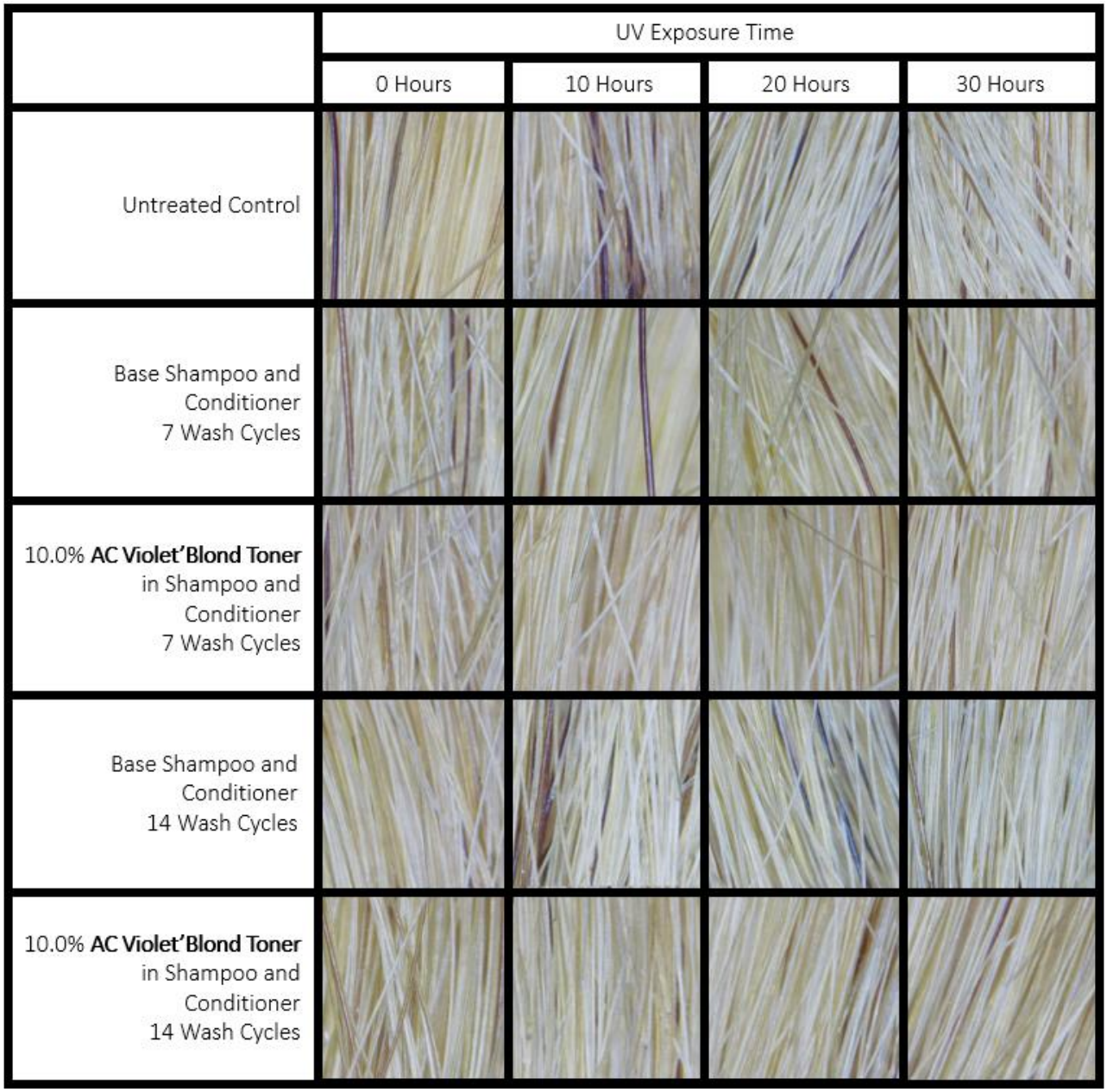

Figure 1. Representative Microscopy Images of Color Fade Demonstrating the Influence of UV Exposure and Number of Wash Cycles on Hair Colorfastness.

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Discussion

A color protection assay was performed to determine the color-fade benefits of **AC Violet'Blond Toner** on hair. The results from this study indicated 10.0% **AC Violet'Blond Toner** provides color protection against repeated washes and UV exposure.

As shown in Figure 1, the Untreated Control hair tresses demonstrated perceivable brassiness after exposure to various UV irradiation. Similarly, hair washed 7 times and 14 times with Base Shampoo and Conditioner alone appeared brassy compared to initial and brassiness was further exacerbated by UV exposure. These data indicate both washing and UV exposure accelerate color fade and brassiness in blonde hair.

Conversely, hair tresses washed 7 and 14 times with 10.0% **AC Violet'Blond Toner** appeared visibly less brassy than the Base Shampoo and Conditioner equivalents and did not change compared to baseline. Additionally, the tresses maintained their color after UV exposure.

Collectively, these results indicate **AC Violet'Blond Toner** attenuates the loss in color and development of brassiness in blonde hair associated with repeated washing and UV exposure. When added to personal care applications at recommended use levels **AC Violet'Blond Toner** demonstrates a protective effect against the color fade process which improves hair health and contributes to the appearance of more vibrant and brighter blonde hair for a longer period of time.