



HAIR BREAKAGE STUDY: DRY REPEAT GROOMING



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November 30, 2019

1. INTRODUCTION

WEN[®] by Chaz Dean is a cleansing conditioner that is applied to the head and scalp in place of shampoo or conditioner. The WEN Cleansing Conditioners product line includes multiple different products designed to treat various hair types. There have been consumer complaints of hair breakage related to WEN use. In order to evaluate if WEN Cleansing Conditioners protect against hair breakage during grooming, Cardno ChemRisk facilitated a dry repeated grooming study at TRI Princeton (Report- Appendix A). The three most popular WEN Cleansing Conditioners (e.g., Sweet Almond Mint, Pomegranate, Lavender) were used in this assessment.

Human hair is primarily composed of keratin (protein) as well as water, lipids, sugars, pigments, and nucleic acids (Mhkashr, 2011). Human hair is reactive to environmental factors, therefore, improper hair care, mechanical abrasion, solar radiation, and chemical treatment can affect hair characteristics (Mhkashr, 2011). For example, the tensile properties (stretching capabilities) can be reduced by the sun or hair treatments (e.g., bleaching, perming) (Evans et al. 2010). It has been suggested that grooming hair can cause stress on individual fibers and, over time, cause hair breakage.

Hair tensile strength, or resistance to breakage, can be measured in several ways including tensile test, fatigue test, hair breakage index and repeated grooming test. The repeated grooming test, as outlined in detail below, is likely a better simulation of how consumers evaluate the strength (or lack of breakage) of their hair than other tests (Evans et al. 2010). In this study, hair that was treated with WEN and repeatedly grooming was assessed for hair breakage in comparison to control.

2. METHODOLOGY

An outline of the methodology is provided below:

- Ten European medium brown hair tresses (9% bleached, 3.0 g, 8” length, 1” wide) were used in each treatment group. (n=10)
- The control hair was treated with 15% sodium lauryl ether sulfate (SLES) (control), 30 seconds lather, 30 seconds rinse
- The test hair was treated with Wen Cleansing Conditioner (Lavender, Pomegranate, or Sweet Almond Mint) at 0.15 ml/hair, leave in for 10 min, 30 seconds rinse
- After treatment, hair equilibrated overnight (60% RH)
- Hair was groomed using an automatic comber (Figure 1) for 2,000 cycles, broken hair fibers were collected every 200 cycles

The formula to calculate percentage in reduced breakage is shown below.

$$\% \text{ Reduction in Breakage} = \left(1 - \frac{\text{mean of broked fibers of treated samples}}{\text{mean of brokn fibers of control samples}} \right) \times 100$$



Figure 1: Automated Repeat Groomer

3. RESULTS AND DISCUSSION

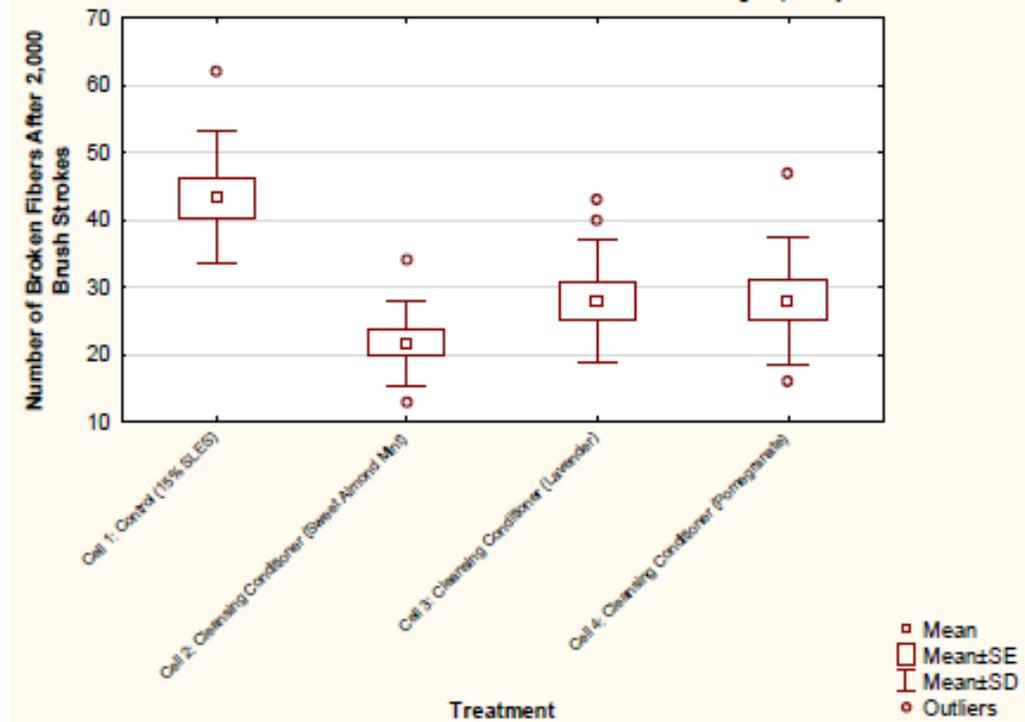
In this experiment, the number of broken fibers is monitored during repeated combing. Hair treated with WEN Cleansing Conditioners exhibited reduced breakage in comparison to control. A summary of the number of broken hair fibers after 2,000 cycles is provided (Table 1, Figure 2). Raw data including the number of broken hairs after each set of 200 cycles and for each tress (10 tresses per a treatment group) is included in the laboratory report (Appendix A).

Table 1: Number of Broken Hair Fibers after 2,000 Brush Strokes

Treatment	Mean number of broken fibers (n=10)	Std. Deviation	Percent Reduction of Broken Fibers
Control	43	10	-
Lavender	28*	9	35%
Pomegranate	28*	9	35%
Sweet Almond Mint	22*	6	49%

*Significantly different from control, based on laboratory's statistics (student's t-test at 95% confidence level)

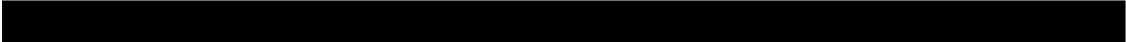
Figure 2: Box Plot of Number of Broken Fibers After 2,000 Brush Strokes



Hair care products that reduce snags, entanglements, and abrasion will reduce the amount of broken fibers. Further, repeated grooming tests the fatiguing process wherein each hair has repeated exposure to external stimulus and there a gradual proposition of flaws until breakage occurs (Evans et al. 2010). Evans et al. (2010) noted, “It has been suggested that grooming gives rise to a combination of bending, torsion, and interfiber friction that can result in localized stresses sufficient to cause breakage or lead to the weakening of fibers such that breakage occurs more readily.” Thus, the likelihood of breakage depends on the extent of the repeated stress and the properties of the hair. Conditioners have been found to have beneficial effects in repeated grooming experiments (Evans et al. 2010). Conditioners act as surface lubricants that reduce groom stress, thus, reducing hair breakage (Evans et al. 2010; Evans 2013). Under the conditions of this experiment, Wen Cleansing Conditioners reduce breakage from repeated grooming likely from conferring the benefit of surface lubrication.

4. CONCLUSIONS

Cardno ChemRisk facilitated a repeated grooming experiment on three WEN Cleansing Conditioner products. Treatment with Lavender, Pomegranate, and Sweet Almond Mint Cleansing Conditioners reduced the amount of hair breakage compared to control. Conditioners are thought to act as surface lubricants reducing groom stress and, thus, reducing hair breakage.



5. REFERENCES

- Evans, T. 2013. Evaluating Hair Conditioning With Instrumental Combing. July 30, 2013. Retrieved from: <https://www.cosmeticsandtoiletries.com/testing/sensory/premium-Evaluating-Hair-Conditioning-with-Instrumental-Combing-217611571.html>. Carol Stream, IL: Cosmetics & Toiletries-Allured Business Media
- Evans, T.A., and K. Park. 2010. A statistical analysis of hair breakage. II. Repeated grooming experiments. *J Cosmet Sci* 61 (6):439-55.