Substantiating Claims for Hair Care Products

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The hair is a complex structure with many variations in coloration and texture, and the brittleness and susceptibility to mechanical injury which causes hair damage, is a common occurrence. Furthermore hair is very easily damaged through exposure to chemicals, the environment and daily styling. With the development of a plethora of innovative hair care products supporting a global multi-billion dollar industry, there is an increasing need for more sophisticated methods to meet the evolution in these product innovations and consumer understanding. Moreover, such methods are also important in light of the legislative requirements for marketing claims substantiation. Methods described herein have been developed, and evolve to ensure reproducibility, validity and relevance from both the clinical and average consumer perspectives.

Introduction

Throughout history, a woman’s hair has been seen as a manifestation of her femininity and desirability. Today hair and the obsession with it has generated a global industry worth more than 83 billion US dollars [1]. It not only addresses female concerns but those of men, children and babies, with brands offering an overwhelming array of shampoos and conditioners, hair dyes, styling products, wigs, accompanied by celebrity hairdressers and hairstyle media fashionistas. Today, with the pressures of keeping up-to-date with the latest hair fashion styles combined with the consequential need to maintain hair health and beauty, damage to hair is a common occurrence through exposure to chemicals, coloring, environment or daily hair drying. With the development of a continuous plethora of beauty products to maintain the hair, and to drive success in a highly competitive market, there is consequently pressure for more sophisticated methods to match the evolution in hair product development.

Hair Types

When developing hair care products the color and type (texture and ethnicity) of hair always need to be taken into consideration. Human hair structure varies from individual to individual as well as according to ethnicity. In addition to color differences, hair can be curly, wavy or straight and these characteristics can be further subdivided. A given human head of hair can also vary in color as well as texture. Color dyes, styling chemicals such as perm lotions and aging, will also affect the natural texture of the hair. All natural hair colors are the result of two types of hair pigments. Both of these pigments are melanin types, produced inside the hair follicle and packed into granules found in the fibers. Eumelanin is the dominant pigment in brown hair, and black hair, while pheomelanin is dominant in red hair. Blond hair is the result of having little pigmentation in the hair strand. Grey hair occurs when melanin production decreases or stops. Hair exists in a whole variety of textures. Three main aspects of hair texture are the curl pattern, volume, and consistency. The flatter the hair shaft becomes, the curlier hair gets, because the shape allows more cysteine residues to become compacted together resulting in a bent shape that, with every additional disulfide bond, becomes curlier in form. As the hair follicle shape determines curl pattern, the hair follicle size determines thickness. While the circumference of the hair follicle expands, so does the thickness of the hair follicle. An individual’s hair volume, as a result, can be thin, normal, or thick. The consistency of hair can almost always be grouped into three categories: fine, medium, and coarse. This trait is determined by the hair follicle volume and the condition of the strand. Fine hair has a small circumference in relation to medium and coarse strands; coarse hair having the largest circumference. Coarse hair has a more open cuticle than thin or medium hair causing it to be the most porous.

Few hair grading parameters have been published [2]. However, the most commonly understood typing system is that devised by Andre Walker [3] and is considered the most widely used to classify hair (Tab.1). According to this system there are four types of hair: straight, wavy, curly, kinky.

- Type 1 – straight hair, which reflects the most sheen and is the most resilient hair of all hair types. Hard to damage and immensely difficult to curl. Sebum easily spreads from the scalp to the ends without curls or kinks to interrupt its path – most oily hair texture of all types.
Type 2 – wavy hair, whose texture and sheen ranges somewhere between straight and curly hair. Wavy hair is also more likely to become frizzy than straight hair. While type A waves can easily alternate between straight and curly styles, type B and C wavy hair is resistant to styling.

Type 3 – curly hair known to have an S-shape. The curl pattern may resemble a lowercase “s,” uppercase “S,” or sometimes an uppercase “Z.” This hair type is usually voluminous, climate dependent (humidity = frizz), and damage prone. Lack of proper care causes less defined curls.

Type 4 – kinky hair.

**Claim Substantiation and Legislation Requirements**

Claims for hair products are required for successful marketing, sales, and promotion. Such statements need to be substantiated by an appropriate test method and the test method employed will be dependent on the desired claim. For marketing purposes, claims are categorized as either low risk, where challenge is unlikely such as “eases combing,” for a hair conditioner, or high risk where challenge is very probable, such as denigrating a competitor through a product comparison claim.

With the enforcement of the EU claims legislation [4] of July 2013, much of it still causing confusion within the cosmetics industry with many brand owners still struggling with their obligations and the lengths they need to go to reach compliance.

The Claims legislation applies to all cosmetics, including hair care, and requires that, “In the labelling, making available on the market and advertising of cosmetic products, text, names, trade marks, pictures and figurative or other signs shall not be used to imply that these products have characteristics or functions which they do not have. Furthermore, it shall apply to any claim, irrespective of the medium or type of marketing tool used, the product functions claimed, and the target audience. When gathering “evidence”, it needs to be remembered that substantiation testing is required when the claim refers to the effectiveness of a product or a benefit or improvement in a skin/hair/nail attribute as a result of using that product. Making a claim does not mean that a product is effective. Efficacy indicates product performance (not necessarily related to the desired claim, nor necessarily correlating with any other data), while communicating efficacy is making a claim which needs to be proved. In other words, generated data only provides the information from which to develop an acceptable claim.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Type</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Straight (Fine/Thin)</td>
<td>Hair tends to be very soft, shiny, oily, poor at holding curls but difficult to damage.</td>
</tr>
<tr>
<td>1b</td>
<td>Straight (Medium)</td>
<td>Hair characterised by volume and body.</td>
</tr>
<tr>
<td>1c</td>
<td>Straight (Coarse)</td>
<td>Hair tends to be dead-straight and difficult to curl. Common in Asians.</td>
</tr>
<tr>
<td>2a</td>
<td>Wavy (Fine/Thin)</td>
<td>Hair has definite “S” pattern and is usually receptive to a variety of styles.</td>
</tr>
<tr>
<td>2b</td>
<td>Wavy (Medium)</td>
<td>Can tend to be frizzy and a little resistant to styling.</td>
</tr>
<tr>
<td>2c</td>
<td>Wavy (Coarse)</td>
<td>Frizzy or very frizzy with thicker waves; often more resistant to styling.</td>
</tr>
<tr>
<td>3a</td>
<td>Curly (Loose)</td>
<td>Curly hair that usually presents a definite “S” pattern and tends to combine thickness, fullness, body and/or frizziness.</td>
</tr>
<tr>
<td>3b</td>
<td>Curly (Tight)</td>
<td>As 3a but with tighter curling.</td>
</tr>
<tr>
<td>4a</td>
<td>Kinky (Soft)</td>
<td>Hair tends to be very fragile, tightly coiled and can feature curly patterning.</td>
</tr>
<tr>
<td>4b</td>
<td>Kinky (Wiry)</td>
<td>As 4a but with less visible (or no) curly patterning.</td>
</tr>
</tbody>
</table>

*Tab. 1* Walker Hair Grading System. Hair is classified into 4 categories and each category sub-classified according to hair thickness.
Of the six common criteria laid down by the EU Commission [4] for the justification of cosmetic claims (legality, fairness, truthfulness, honesty, evidential support, and informed decision making), “evidential support” is specific in that “Claims for cosmetic products, whether explicit or implicit, shall be supported by adequate and verifiable evidence regardless of the types of evidential support used to substantiate them, including where appropriate, expert assessments. This evidence is relevant to the product and to the benefit claimed, shall follow well-designed, well-conducted methodologies (valid, reliable and reproducible) and shall respect ethical considerations. In fact, this requirement summarizes the main principles of good clinical practice (GCP) as well as good laboratory practice (GLP).

Methods for Claim Substantiation

When employing methods to measure the efficacy of hair care products, it should be understood that such methods including instrumental measurements, whilst being reproducible, are likely to vary to a certain degree between testing laboratories, the batch of hair tresses used in the investigation, and notably, product batches under test. Furthermore, although many of these investigative methods are published [5–17], the cosmetic industry has set no common testing standards, guidelines or recommendations, and so it falls to the test institute to ensure reproducibility, validity and relevance of each test method. In order to reproduce test results, all study conditions i.e. climatic, environmental, technical equipment employed, type of hair tresses, product application, and performance of the actual measurements used have to be exactly identical, and the definition and objectives of the study design must always be in alignment to the desired claim(s) and the claims criteria of the legislation. The advantage of these in vitro biophysical methods is their sensitivity toward discrimination between products under test with both high precision and reliability.

Combing Forces

The biophysical measurements of combing forces on hair tresses objectively enable measurable results on how products such as shampoos, conditioners, masks, hair dyes and other hair products perform with regard to conditioning and detangling efficacies [5, 6]. This method determines the efficacy and conditioning properties of rinse-off products by measurement of wet combing forces on hair tresses. All measurements are performed on bleached European natural human hair tresses. Pre-wetted tresses with defined water content are mounted in a comb element. With a slow constant movement, the instrument pulls the tress across the combing element. Combing forces are continuously recorded. As a result of well-performed measurements, the mean initial combing forces of each group of tresses will be comparable for all test products (Fig. 1). In this pre-post design, the reduction of wet or dry combing forces is determined to substantiate the claims such as combability, conditioning, detangling, easy-to-comb, etc.

Combing – Out Forces

Hair styling products with claims such as a “maximum hold” effect should easily comb out of dry hair. By measuring the combing strength, the quality of such a claim can be quantified. Examination is normally carried out on tresses of European natural human hair treated with a standardized quantity of styling product. After drying, every tress is combed through with a comb segment of a universal test machine. Measurements of combing out forces provide an objective indication on how products such as hair styling products perform with regards to their ability to be combed out and the remaining hold afterwards. In comparison with references, the combing out force is determined to help substantiate these types of claims.

Bending Forces for Style Hold

Style-hold claims for products such as styling foams, gels or sprays, need to demonstrate performance and efficacy with regard to differences in different types of “style hold.” In comparison with references, bending forces are determined with three different options to substantiate such claims. Single bending determines the maximum bending force needed.
to break the hold-providing film (Fig. 2). Hysteresis bending forces are measured by bending once, return to initial start point and bend again to evaluate the remaining hold. The elastic bending is performed for a large number of bending cycles to evaluate the flexibility of the hold. Good discrimination between investigated products with high precision and reliability is achieved.

Hair Shine-Gloss

Shine assessments are applied to determine how products like hair shampoos, conditioners, hair dyes, hair styling products and other hair products perform with regards to providing shine. The assessment of hair shine is performed by visual assessment of an expert panel. Hair tresses are treated with products and fixed on roll holders. Tresses are presented to expert assessors in a light box with standard illumination (Fig. 3). With such a setup, rating of shine under conditions comparable to daylight is possible. Assessors evaluate on which tress the gloss is stronger or identical as a ranking assessment. Alternatively, the experts perform the rating on a visual analogue scale to obtain data about the shine intensity.

Although other methods exist for shine evaluation of hair, the visual assessment by experts is the method that is closest to the perception of the end consumer.

Volume

Claims for hair volume and volume longevity are a key requirement for many brands. Products, especially shampoos and conditioners, need to meet the consumer need for product lightness in terms of the style “not-weighing-down” or falling-out due to “weight”. The volume of a hair tress can be determined using a silhouette technique followed by image analysis (Fig. 4). Multiple pictures of the shadow-outline of a rotating hair tress are taken in front of a light source. The silhouette is then reconstructed, and the corresponding area, calculated by automated image analysis, gives a measure for the volume of the hair tress [13, 14]. Modifications for shampoos, rinses and also for styling products are available. Different relative humidities can be chosen to meet the claim specifications, like “long-lasting hold,” “humidity resistance”, “volume longevity”.

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**Fig. 2** Measurement of bending force (a) and example results (b)

**Fig. 3** Evaluation of shine (a) and example results (b)

**Fig. 4** Measurement of volume (a) and example results (b)
Anti-Frizz

The silhouette technique can further be employed to determine the efficacy of hair product performance in terms of “anti-frizz” efficacy and the efficacy of products to retain “reduced frizz.” In a pre-post design and in comparison with a reference, the changes in frizziness are determined by hair volume changes and image analysis [16]. Variations in the method such as humidity can also be included.

Color Protection

Coloring hair is both, a popular at-home or salon treatment, for many consumers. Coloring the hair provides for coverage of grayness development as well as changing ones style. Whilst the coloring process has to perform in terms of the dyeing process, the resulting color needs to last and not fade nor change in color appearance e.g. brassiness of blonde dyed hair when exposed to sunlight. In this method, changes in color and color longevity are measured in a pre-post design with comparison to a reference and/or comparison between different products. The process can involve repeated applications and washes of European hair tresses as well as exposure to UV radiation. Color is measured using a colorimeter (Chromameter) and the color protection of anti-color fade products as well as the longevity of color-dyed hair can be measured to provide substantiation for such claims as “color fade effect”, “color protection”, “effective against color fade”.

Heat Protection

Heat blow-drying and the straightening the hair using a hot flat iron are popular methods of hair styling to achieve a “sleek look”. Styling with flat irons can easily exceed temperatures of 200 °C and, therefore, cause severe damage to the hair keratin especially the cuticle scales. The protective effects of cosmetic pre-treatment of ethnically varied hair tresses against heat damage can be assessed by high-pressure differential scanning calorimetry (HP-DSC) [11]. In comparison with an untreated non-damaged and an untreated thermally damaged reference, the point at which the hair structure is destroyed due to the increasing measurement temperature is characterized by both, peak temperature and enthalpy. Different designs to perform the heat damage with a flat iron in several cycles are available. Using this method, claims such as “heat protection” can be accomplished. As a further evolution into repairs the hair from heat damage the method can be further expanded to include reflection electron microscopy (REM) of the hair strands. Both methods can also be used to assess damage caused by UV, hair chemicals and color dyes [12].
Breakage Resistance to Combing

The process of combing hair either wet or dry will result in varying degrees of hair breakage. The degree of breakage through combing is increased if the hair has been treated with dyes, chemicals, harsh detergents. Biophysical measurements of hair breakage by multiple combing on hair tresses enable objective measurements on how effective products such as hair shampoos, conditioners, masks, hair dyes, perform with regards to protection or resistance to hair damage caused by combing [8, 9, 10]. In a pre-post design and comparison to reference, the amount of broken hair fragments is determined to help provide substantiation for claims such as “strand saver”, “anti-breakage”.

Suppleness & Flexibility

Improving softness, suppleness or flexibility of hair is a very desirable consumer need. The ability of products, such as shampoos, conditioners, to achieve these properties can be measured [6, 7, 8]. In a pre-post design, the reduction of forces needed to pull the tress along a number of metal bars is determined to substantiate claims such as “makes hair softer”, “hair is more supple”, “dreamy soft and smooth”.

Curl Retention

The continuing fashion for curly hair, as well as addressing the needs of naturally curly hair, has meant the development of an increasing number of sprays and fixatives in order to ensure that curls last throughout the day [17]. In this test method, curls are made by wetting hair tresses with water, applying the product and rolling them around a curler. When the tress is dried, the curler is carefully removed and the curled tress is then placed in a climatic chamber at high relative humidity (≥ 75 %) (Fig. 5). The curl retention is then measured at set time periods. In a comparison with references over time, the curl droop after styling is determined over the required period of time to substantiate the claims. Different relative humidities can be chosen to meet claim requirements. Claims include “curl retention”, “long-lasting curls”.

Conclusion Remarks

The development of new products that alter the hair, such as condition, shape, and color requires a number of technical and scientific disciplines working together to generate novel consumer-meaningful product benefits, and effective solutions to consumers’ different hair concerns and desires. The diversity of hair types across the globe and the inevitable changes that occur with age such as damage, thinning and graying demands a continual stream of innovation. Combined with the complexity of the EU claims and regulatory environment, means there is an increasing need for both significant scientific and consumer understanding to generate acceptable claims, as well as more sophisticated methods to match the development of those claims in the evolution of hair product development.

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References


