"Heat protection – a sophisticated approach to assess protective efficacy against mild damage by blow-drying"

Introductions

Blow-drying after hair washing is a frequent habit in the daily hair grooming routine. However, repeated contact to hot air leads to perceptible hair damage. The cosmetic industry offers hair care products with the aim to protect from such damage and requires methods to prove the efficacy. When flatironing became popular in Europe in the recent decades, methods to measure heat-damage-protection were developed. In case of flatironing, the temperature insult to the hair is much higher than that of blow-drying [1, 2]. In blow-drying a maximum heat of approx. 80° C is reached and heat is only transmitted over the air, not over metal contact. Flatirons often are used at temperatures of 200° C and above and produce clearly measurable heat damage even in the hair cortex. The more superficial heat damage from blow-drying cannot easily be measured by use of methods as differential scanning calorimetry (HP-DSC) which is mainly assessing damage of the cortex. Therefore, there is a demand to develop more appropriate methods to assess blow-drying damage. It was our aim to set up and validate a method that is specifically suitable to evaluate the heat protection efficacy against the damage induced by blow-drying.

Methods & Results

The well-known method of measuring dry combing forces was chosen as a promising candidate, because it is sensitive to changes of the hair cuticle, which is the hair structure most prone to heat damage.

While single blow drying does not lead to visible hair damage repeated blow drying does (Figure 3). Human hair grows with 1 cm per month. The tips of hairs e.g. 24 cm long therefore are 2 years old and have typically have suffered from more than 600 blow dryings. Assuming that the drying time of a hair tress (Figure 2) takes only 10 seconds the hairs of our example have received 100 minutes of blow drying. In our blow drying model five hair tresses of European bleached human hair were washed with reference shampoo, conditioned at standard climatic conditions, and the baseline measurements of dry combing force were performed. Afterwards, the tresses were washed and dried with a blow-dryer at maximum heat (which was corresponding to 80°C) for 10 minutes at close distances. The washing and blow-drying cycle was repeated for 10 times in total, so that the hair tresses received at total of 100 minutes of blow drying.

As can be seen in Figure 3, the damage induced by the described heat cycles is visible when comparing the look of the complete tresses. Measured results are displayed in Figure 4. While dry combing forces were found to be quite sensitive to indicate heat damage from blow-drying, the blow-drying procedure itself was found to be very exhausting for the technician and difficult to standardize. In a further step, we, therefore, compared the damage induced by manual blow-drying to a simulated method using an oven with air circulation. In the oven, a high number of tresses can be treated simultaneously in a highly standardized environment with defined heat and air flow.

While results at mean were comparable to the blow-drying by hand, the scatter of results of the manual blow-drying could be further reduced by the oven method. With the newly developed method, we investigated the protective efficacy of marketed products that claimed to protect against blow-drying damage. The product was applied according to the instructions to five hair tresses (European bleached hair), which were then dried in the oven as described above. Application cycles were repeated 10 times.

The treatment with the product showed significantly lower dry combing forces than the reference tresses. A product-related protection could successfully be measured.

Conclusion

We conclude that the measurement of dry combing forces after simulated blow-drying in an oven by use of specific air circulation and temperature is a valid method to measure the low heat damage to hair by blow-drying. Claims like “provides heat protection from blow-drying” can successfully be substantiated with this method.

Literature