To explore the effect of different hydrolyzed keratin on the leave-on hair masks

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Abstract

Background: Keratin is the main ingredient of hair fiber, with more than 80% of content As keratin with different molecular weights contributes differently to sensory and repairing effect, it is very important to maximize repairing effect but choose right sensorial keratin. Therefore, in this paper, the effects of different molecular weights of keratin on the repairing and sensory effects of leave-on hair masks were investigated.

Method :

Experiment 1: Hydrolyzed keratin solutions with different molecular weights were added to the formulation of same leave-on hair mask to investigate the repairing effect of the different solutions on the hair and the sensory evaluation after using the product.

Experiment 2: 0.5 g of the corresponding hair mask was applied evenly to each hair bunch, and then keep for 8h to observe the hair mask's repairing effect on the hair scales with a 1000x microscope.

Experiment 3. Testing of hair diameter and pulling strength.

Experiment 4. Sensory evaluation: 6 bunches of hair from the same batch were taken and evaluated by 20 people based on the untreated hair bunch.

Results: The smoothing and repairing effect on hair scales from the microscopic results, D=E>A>C>B;the pulling strength: E>D>C>A>B.Overall score of sensory effect: D>E>A>C>B.

Conclusion: Therefore, the compound of hydrolyzed keratin with molecular weight 400 and hydrolyzed keratin with molecular weight 10,000 is the best choice in leave-on hair mask .

Key words: Hydrolyzed keratin, molecular weight, sensory effect, leave-on, repairing effect Introduction

Keratin is the main structure of hair fiber, and its content accounts for more than 80% [1-4]. Hydrolyzed keratin has a good effect on hair repair, which has been reported in many literatures. In the past, hydrolyzed keratin actives were mainly used in rinse-off products, and were rarely used in leave-on products. Many hair repair actives are used in rinse-off hair care products and are not suitable for use in leave-on hair care products. It is mainly because of the characteristics and mechanism of action of such products, such as amino-terminated silicone oil, which tends to harden the hair after using a leave-on product, resulting in a poor use feeling. Panthenol and polyquaternium-10 also have a repairing effect, but the effect is not obvious. Among the leave-on hair care products, there are few relevant reports on the use of both the feeling of use and the simultaneous achievement of a good repair effect, so it has research significance. In this study, the effects of different molecular weights of keratin on the repair and feel of leave-on masks were explored.

Materials and Methods.

Experiment 1: Set up different formulas for below experiments to investigate the repair performance and use feeling of the following formula combinations. Hydrolyzed keratin solutions of different molecular weights were added to the base formulation of the same leave-on mask.

Formula A: 0.25% hydrolyzed keratin with a molecular weight of 1800-2000;

Formula B: 0.25% hydrolyzed keratin with a molecular weight of 1000;

Formula C: 0.25% hydrolyzed keratin with a molecular weight of 10,000;

Formula D: 0.125% hydrolyzed keratin with a molecular weight of 400 is compounded with 0.125% hydrolyzed keratin with a molecular weight of 10,000;

Formula E: 0.375% hydrolyzed keratin with a molecular weight of 10,000.

In experiment 2： 5 bunches of homologous hair bunches were taken and treated in the same way.

1. Observe the hair condition with a 1000x microscope before using the hair mask.

2. Evenly apply 0.5g of the corresponding hair mask on each bunch of hair, and then let it stand for 8 hours;

3. Use a 1000 times microscope to observe the condition of the hair scales before and after use, so as to investigate the repairing effect of the hair mask on the scales.

Experiment 3. Sensory evaluation: 6 bunches of homologous hair were taken, and 10 individuals were selected for evaluation based on the hair bunches without hair mask treatment. Refers to finger comb, smoothness, freshness, moisturizing, strong elasticity, softness and preference. Proceed as follows:

Asian hair, about 2g, 15cm, hair root only

Pretreatment: high concentration bleaching once

<Processing method>

1.1% SLES treatment (40°C, 10min, shaking, solution ratio 1:10)

2. Wash (40°C), dry with a towel

3. Apply 1g of each hair mask (40°C, 10min, set aside)

4. Wash (40°C, 1min), towel dry

5. Dry with a hair dryer

6. Sensory evaluation (n=10, based on the hair bunch that has not been treated with hair mask, it is evaluated on a score of -2 to 2)

Experiment 4. In order to verify the results of the sensory test of Experiment 3, three formulations A, C, and D were screened to test the hair diameter and pulling strength: after the same treatment, the cross-sectional area and pulling strength of each hair were measured.

1. Use an airtight constant temperature and humidity box (25°C, 53%) to store the hair bunches (deep decolorization pretreatment once), and use it after the hair condition is stable (24 hours).

2. Measure the cross-sectional area of the hair (room temperature: 25±1.0°C, humidity: 50-60%).

3. Screen out hairs with a flat rate below 150% and a cross-sectional area of 3400-5600 μm2, 10 hairs in each group, and the average cross-sectional area of the 10 hairs is basically the same in each group.

4. Dip the hair into the hair mask solution diluted (dispersed) 3 times evenly (Control is deionized water) and shake it repeatedly (40°C, 3 minutes)
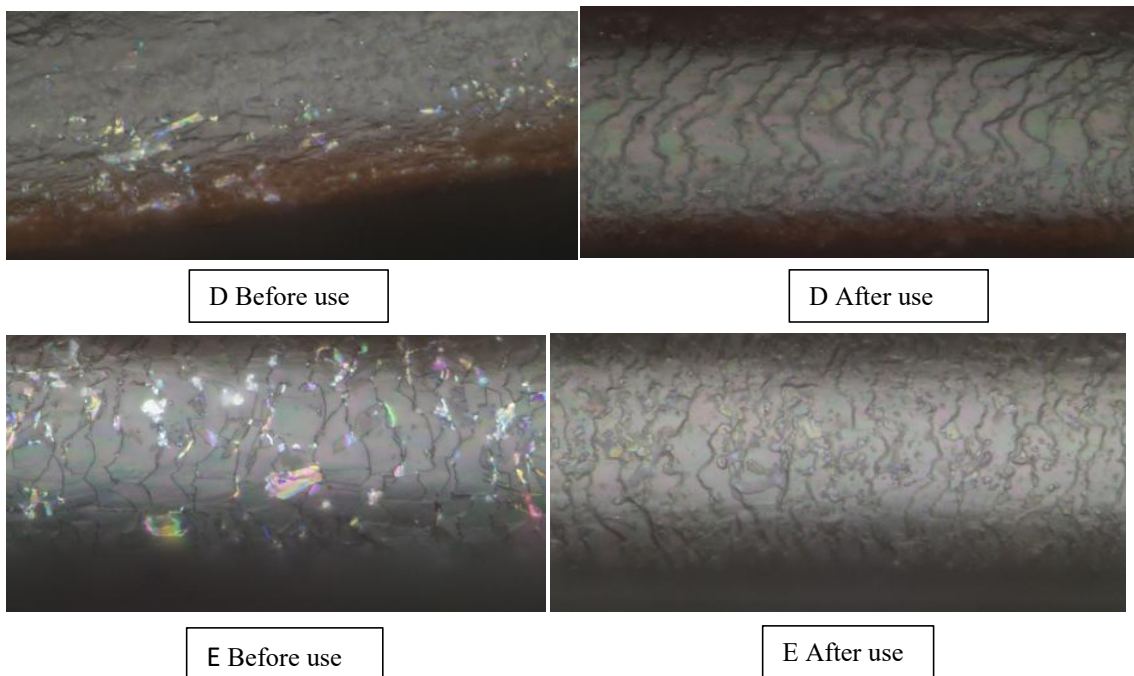
5. After towel dry, blow by hair dryer.

6. Repeat steps 4 to 6 three times.

7. Return the treated hair to the constant temperature and humidity box and keep it for 1 hour until the state is stable.

8. Measure the cross-sectional area of the hair again (room temperature: 25±1.0°C, humidity: 45-60%).

9. Measure the load weight when each hair is broken, divide the load weight by the cross-sectional area, and measure the load strength per unit area of the hair.
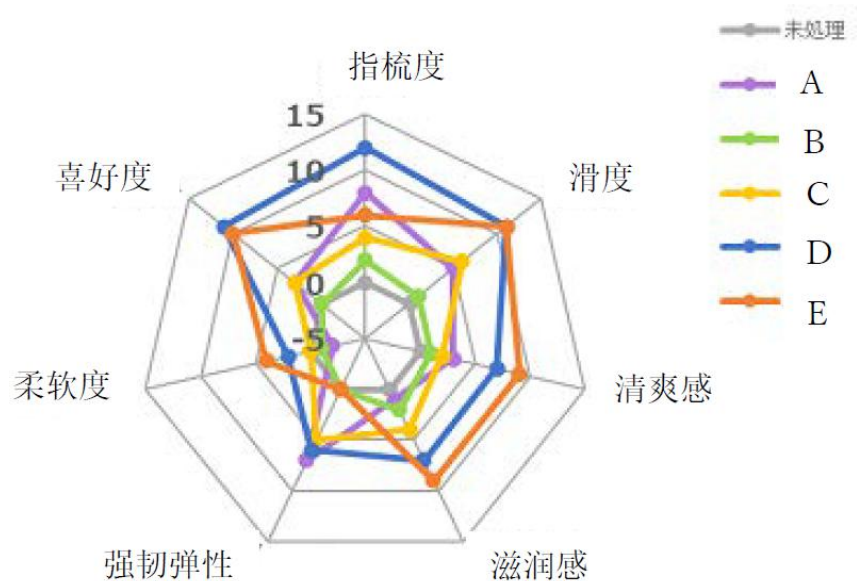
Results.

The results of the second experiment showed that the hair mask has a certain repairing and smoothing effect on the damaged hair scales from the results of the microscope. It can be seen that for damaged scales, applying a leave-on hair mask has a great repairing effect. The best effect formulations are D and E. The picture below shows the effects of D and E with better smoothing effect before and after use. (Remarks: D and E represent the hair mask with formula D and the hair mask with formula E respectively) As can be seen from the figure below, the effect of D is better than that of E. Because the scales of the hair bunches of D will be more regular after repair.

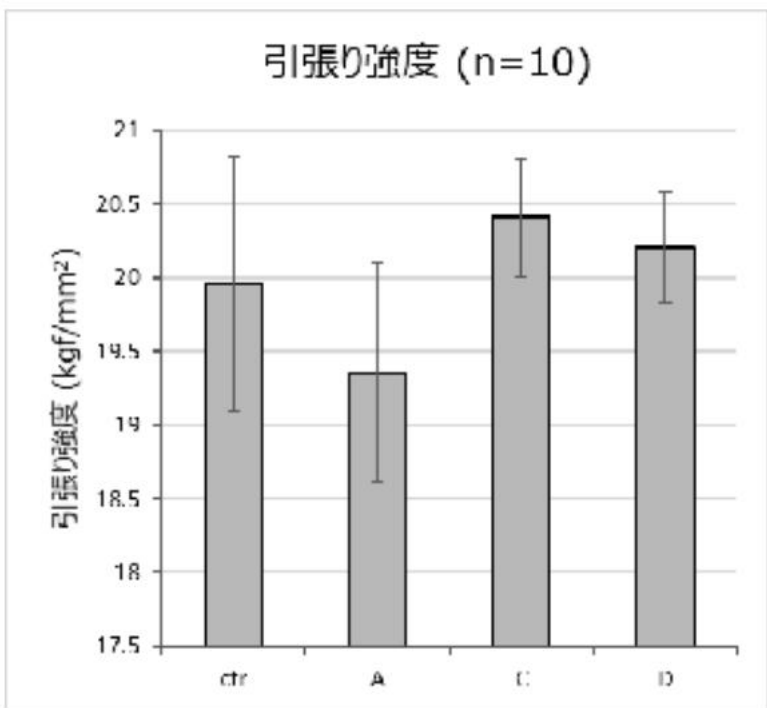| D Before use | D After use |

| E Before use | E After use |

The result of experiment 3, through the test, the effect of D via the finger comb is the best. A, C, and D are comparable in toughness, and B and E are close to untreated.

Comprehensive sensory use: D>E>A>C>B; E is much worse than D in finger comb and toughness. These two are the focus of the investigation, representing the key indicators of the feeling of use and the repair effect respectively.

The result of Experiment 4, showed that the pulling strength: C＞D＞CTR＞A

Discussion.

From the test of experiment 2 to experiment 4, it can be seen that hydrolyzed keratin has a certain repair effect on hair. For a stay-type hair mask, the repair effect is as important as the sensory experience, so the repair effect test and the sensory test were carried out. From the test results, it can be seen that the hydrolyzed keratin with a molecular weight of 400 is compounded with keratin with a molecular weight of 10,000 to repair the hair bunches and have the best feeling of use. This is mainly related to the molecular weight of the keratin. Hydrolyzed keratin with a molecular weight of 400 can penetrate well into the hair core and repair the hair. A molecular weight of 10,000 can form a protective film on the hair surface. However, increasing the amount of hydrolyzed keratin with a molecular weight of 10,000 will significantly affect the feeling of use. When the amount of addition is large, the smoothness will be significantly reduced. Therefore, in formula design, it is recommended to use small molecular keratins to compound macromolecular keratins. In addition, the article also examined the keratin with a molecular weight of 1000, but found that the effect was not good.

Conclusion.

In this paper, by examining the role of hydrolyzed keratins of different molecular weights in the leave-on hair mask, especially considering the importance of the feel of leave-on products. Therefore, it is most preferable to compound hydrolyzed keratin with a molecular weight of 10,000 with hydrolyzed keratin with a molecular weight of 400. Mainly because: Hydrolyzed keratin with a molecular weight of 400 can penetrate into the hair core well and repair the hair; with a molecular weight of 10,000, it can form a protective film on the hair surface. Therefore, this paper provides directions for leave-on hair care products, especially hair masks, in terms of both repair and feeling of use.

Conflict of Interest Statement. It is the responsibility of the corresponding author to ensure that any conflict of interest of any of the authors is disclosed. A declaration must be made, if there is no conflict of interest, write NONE.

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