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## HAIR STRAIGHTENING PREPARATION

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This invention relates to a hair straightening preparation, the process of employment of this preparation, and the means for compounding the preparation.

It has been known to straighten hair by using alkali metal hydroxides such as sodium and potassium hydroxide. These alkali metal hydroxides have proved very effective in application but they also have the disadvantage of developing undesired allergic responses. These strong alkali metal hydroxides have a leaching effect on the naturally occurring hair oils which protect the hair and scalp from the deteriorative effects of salts, alkali metal hydroxides, etc. Strong alkali metal hydroxides, however, quickly penetrate the film of natural hair oil and if in sufficient concentration, they can produce pyrolysis of the scalp, gelatinization of the hair and numerous undesirable allergic responses which occur with sufficient incidence to have warranted the exclusion of strong alkali softening agents in hair straightening preparations.

It is one of the objects of the present invention to provide a hair straightening preparation which utilizes the previously unsatisfactory strong alkali metal hydroxides but in combination with suitable emollients and protective inert hydrocarbon agents which shield the scalp from alkali pyrolysis and over-softening or dissolution of the hair.

It is a further object of the invention that the protective ingredients of the preparation also impart a cohesiveness to the hair mass to "set" the hair in its modifiable state after it has been softened by the alkali.

What is desired of a hair straightener is that de-curling of the hair be accomplished without removing the natural suppleness or resilience of the hair. If the hair has been gelatinized or reduced to an unnaturally flaccid state, then this obviously detracts from the value of the process. Accordingly, it is intended that the present invention will accomplish a straightening of the hair without destroying or materially altering its other properties, such as sheen, resilience, etc.

Other objects and features of the invention will become apparent from a consideration of the following description which proceeds with reference to certain specific, selected formulations and processes.

### Composition ingredients

The constituents of the hair straightening composition comprise the following materials which are grouped into categories and will be discussed as such.

**A. Hair softening agent.**—Alkali metal hydroxides, such as sodium hydroxide and potassium hydroxide. It is known from the physiological makeup of human hair that the outermost layer is a transparent sheath of protective cuticle which is made up of keratin having a number of cystine bonds which resist modification of the hair. It is this outermost layer which is theorized to be reacted upon by the softening agent during the hair straightening process. Human hair consists mostly of a number of elongated cells comprising the cortex which is formed in a layer next adjacent the cuticle. It is the cortex portion of the hair which must be re-formed by setting the hair in its new position.

The present invention purports to react only upon the shaft of the hair or that portion extending out of the follicle of the scalp so that the hair even though once straightened, will tend to return to its original state after

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a period of time. It might be stated in passing that the natural state of the hair, whether it be curly or straight, is thought to be determined by the shape of the follicle which forms the root of the hair to a predetermined shape as it grows downwardly to the papilla and outwardly above the base of the scalp. In regards the function of the hair softener agent, the present invention proposes to utilize the alkali hydroxide so that it will soften the cuticle sufficiently to permit re-forming the hair (principally the cortex) but without gelatinizing the hair or permeating the follicle or scalp epidermis to produce pyrolysis or undesirable allergic responses.

**B. Emollient.**—In order to soften the effect of the hydroxide upon the scalp tissue and the hair cells, there is provided an emollient in the form of a modified lanolin which is described at length in Product Bulletin No. 46, entitled "Lanogels," published by Robinson, Wagner Company, Inc. The material is described as polyoxyalkylene lanolin. This ingredient is considered to be a protective agent for the skin, preventing any of the previously mentioned undesirable side reactions oftentimes associated with the use of a strong alkali in hair treatment preparations. Of the products described under the broad generic designation Lanogels, we have prepared acceptable hair treatment products with any one of the three materials described as Lanogel No. 21, Lanogel No. 31, and Lanogel No. 41 (Lanogel No. 41 being described in supplement A, to Product Bulletin 46, issued April 1955, supplement B, Product Bulletin 49, issued May 1955, supplement B, Product Bulletin 46, revised April 2, 1956). These materials are modified lanolin prepared by reaction with ethylene oxide or its polymeric derivatives to introduce polyoxyethylene chains into the molecule. The Lanogels have the following physical constants:

Specific gravity, 50/4° C. -----	1.01–1.04
Saponification No. -----	8–16
Iodine No. (Hanus) -----	4–12

**C. Emulsifying agent.**—The function of the emulsifying agent is to obtain a uniform dispersion of the ingredients and to insure their suspension and proper distribution so that they are in effective proportions when the preparation is used. Any one of a number of acceptable emulsifying agents can be employed. In general, the requirements of the emulsifying agent are that it be non-reactive with the other ingredients and have no toxic effect on the skin of the user. An example of one suitable emulsifying agent is a fatty alcohol sodium sulfate, such as sodium lauryl sulfate. One source of this material which is available in commercial quantities is known as "Duponol" WA paste, a trademarked product sold by E. I. du Pont de Nemours.

**D. Base.**—The major ingredient of the mixture is cetyl alcohol having the chemical formula  $\text{CH}_3(\text{CH}_2)_{15}\text{OH}$ . It is not known with any certainty what the function of the fatty alcohol is in the hair straightening process. It is quite possible that the alcohol will react with the sodium hydroxide or other alkali metal to form an alcoholate so that the action of the alkali is either modified to reduce its pyrolysis effect or the alcohol might possibly catalyze the hair softening reaction in some manner or other. As expected, other fatty alcohols can provide the same function, and these equivalents are intended to be included within the terms of the following claims. From a weight standpoint, the cetyl alcohol is the major constituent and is sometimes thought of as a "vehicle" of the preparation, it being known that at least some of the ingredients are soluble in this alcohol and can also be suspendable therein.

**E. Inert hydrocarbon fraction.**—Both petroleum jelly (Protopet) and mineral oil (Saybolt 70 viscosity) are provided to form a protective lamination over the epidermis of the scalp and also to provide a sufficient coating

of the hair strands to retard the rate of reaction of the alkali, to prevent excessive softening of the hair, and to prevent any undesirable depilation. As to be expected, other ingredients which function similarly to these may be substituted for the two specifically listed ingredients.

*Method of preparation of the hair straightening solution*

The hair straightening solution is provided as an aqueous solution which is stabilized against settling and separation and is not noticeably subject to deterioration while being stored in suitable containers. For example, it is not necessary to include any stabilizing agent to minimize or prevent the breakdown of any of the active ingredients of the solution.

It is a relatively simple matter to prepare the solution, and it is most convenient to prepare the solution in 100 lb. quantities and then package the solution in suitable amounts and containers according to customer preference. A 100 lb. quantity of the material is prepared as follows:

(1) The ingredients are provided in the following quantities:

Cetyl alcohol $\text{CH}_3(\text{CH}_2)_{15}\text{OH}$ -----	Lbs.	
Protopet (petroleum jelly) -----	16½	
Polyoxyalkylene lanolin -----	4	25
Mineral oil (weight 70 viscosity) -----	1	
"Duponol" (sodium lauryl sulfate) -----	8	
Caustic soda -----	4	
Water -----	4	
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(2) Mix the cetyl alcohol, petroleum jelly, polyoxyalkylene lanolin, and mineral oil together and heat to 130° F. to form a uniformly dispersed mixture.

(3) Mix the sodium lauryl sulfate emulsifier (Duponol) and 51 lbs. of water and heat to 120° F. to form a solution.

(4) After the mixture of item 2 has cooled to 120° F., add thereto item 3 which is also at 120° F. Then allow these additions to cool to room temperature.

(5) Dissolve the caustic soda in 12 lbs. of water and allow to cool to room temperature.

(6) Mix items 4 and 5 after they both have cooled to room temperature and there results 100 lbs. of finished product.

A variation which can be made according to the type of hair which is to be processed is a change in the quantity of the caustic soda. If the solution is to be used for fine, soft or thin hair and/or "over-processed permanents," then a 3% amount of sodium hydroxide is used.

If the solution is to be used for straightening coarse, naturally curly hair, then the caustic soda is usable in the amount of 4%.

Since variations in the amount of the caustic soda change the "strength" of the solution appreciably, we have found it advisable to make slight graduations in the amount of caustic soda in order to secure the desired "hair softening" effect.

*Method of application*

An amount of protective coating (comprising two parts mineral oil 70 Saybolt viscosity, and one part polyoxyalkylene lanolin) is manipulated through the hair by massaging thoroughly the protective coating until it covers the scalp and permeates the hair. There is no particular time limit; the only objective being to obtain the uniform dispersion necessary to adequately protect the scalp and coat the strands of hair.

Next, approximately 6 ounces of hair straightener is manipulated thoroughly throughout the hair.

When the main purpose of the process is to correct an over-processed permanent, then the hair straightener is worked through the hair by combing away from the scalp so as not to irritate the scalp. Usually 3 to 7 minutes are

required to effect the proper processing when using a 3% solution of caustic and the hair is fine textured.

Where the purpose is to straighten coarse, naturally curly hair, the 4% solution of caustic is manipulated through the hair by massaging and usually about 9 to 12 minutes are required.

In either of the noted instances, the process is terminated by washing the hair with warm water to dispel the preparation. A normal creme rinse is applied and an acid neutralizer is used to neutralize any residue in the hair.

If desired, a lanolin base creme oil may be finally used in conjunction with any conventional curling or hair-setting to achieve the final hair configuration and conditioning, lustre, etc.

It will be apparent from the description of the invention that substitutions and changes in relative proportions may be made of the ingredients without departing from the underlying principles of the invention. It is further possible to make modifications in the method of preparation of the solution and the method of application. It is our intention that such modifications of composition, preparation and usage of the invention that can be reasonably expected from those skilled in the art shall be included within the scope of the following claims.

We claim:

1. An aqueous hair treatment solution consisting essentially of alkali metal hydroxide having from about 3% to about 4% by weight of alkali metal hydroxide and the balance of the active ingredients consisting essentially of a combination of cetyl alcohol, petroleum jelly, mineral oil and sodium lauryl sulfate which are present in proportions respectively of about 4:1:2:1, said active ingredients comprising about 37% by weight of the aqueous solution.

2. The hair treatment solution in accordance with claim 1 and including polyoxyalkylene lanolin as an active ingredient in said preparation and present in the amount of approximately one part by weight of polyoxyalkylene lanolin to sixteen parts by weight of cetyl alcohol.

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