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## GELATIN AND COPPER CHELATE NAIL BODY- ING COMPOSITIONS AND METHODS

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The present invention deals with an improved method for adding body to the nails for the purpose of increasing resistance of human or animal nails to cracking, splitting, etc.

Fingers or toenails may tend to harden and crack, split or the like for various reasons. On addition to the natural brittleness which occurs as one ages, various duties may involve extensive wetting of the hands with materials which have a deleterious effect on the nails, such as strong detergents, cosmetics or the like. Additionally special physiological conditions may give the nails of the fingers or toes undue brittleness with consequent excessive cracking or splitting.

In accordance with the present invention means are taught for the treatment of nails so as to improve their body and give them a firm but healthily resilient structure. Nails treated with the present composition show improved smoothness and full body. More specifically, nails are treated with an aqueous solution containing a relatively large amount of protein, (gelatin), e.g., over 3.5 percent, a hydrolyzing agent for the gelatin, preferably trypsin, and a copper chelating agent, normally a copper coordinate compound of ethylene diamine or an ethylene diamine derivative.

In preferred aspects of the present invention the solution may also contain a solution of keratin, preferably cystine in an ammoniacal solution, as well as a minor amount of a peroxide to increase the penetration ability of the solution. An innocuous acidifying agent such as citric or tartaric acid may be added to maintain a substantially neutral pH.

While the theory behind the efficacy of the present composition is not completely understood, it appears that the gelatin, in properly hydrolyzed form, permeates through the nail structure and deposits on or among the natural materials making up the nail. Further it appears that the copper chelating agent reacts with the metals contained by the nail to further enhance its body, thereby increasing its strength. The presence of cystine further enhances these effects, the cystine being a strong keratin constituent which also appears to become part of the nail.

In general the present composition will have the following proportions of ingredients.

TABLE I  
PERCENTAGES OF INGREDIENTS

Ingredients	Broad Range	Preferred Range
Gelatin	3.5 to 16	6 to 8.
Hydrolyzing Agent for gelatin, e.g., trypsin.	0.02 to 0.15	0.04 to 0.06.
Copper Chelating Agent	0.10 to 1.5	0.20 to 0.40.
Peroxide	0 to 10	0.5 to 2.0.
Cystine	0 to 1.2	0.3 to 0.7.
Ammonia (in solution) for Cystine	Sufficient to dissolve the cystine employed.	
Acidifying agent	0 to 0.5	0.04 to 0.05.
Water	Add to make 100 percent.	

All of the above percentages are weight percent.

The gelatin constituent may be obtained from any conventional source thereof and various types of gelatin such as animal, bone, chinese, etc., gelatin may be employed.

The hydrolyzing agent for the gelatin is normally trypsin, an alkali proteinase. Normally this is obtained as a natural enzyme of pancreatic juice, but the present invention contemplates the use of synthetic trypsin-like in-

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gredients as well. Other enzymes for hydrolyzing proteins may be used. Trypsin is sold commercially under the tradename Protease by the Miles Chemical Company of Clifton, New Jersey.

With respect to the chelating agent, it is found to be critical that it be a copper chelate material. Apparently the copper is able to react with the constituents of the nail in a manner distinct from that which occurs by the use of other metals. Of particular value are coordinate compounds of metal with ethylene diamine or ethylene diamine derivatives. An example thereof is sold under the tradename Sequestrene NA 2 and is a disodium cupric ethylenediaminetetraacetate dihydrate.

Similar ethylenediamine structures coordinated at least in part with copper can be employed.

When employed in the preferred embodiment of the present invention, a solution of a keratin in a suitable solubilizing medium is incorporated. Preferably cystine is dissolved in an aqueous ammonia solution for this purpose. The solution will normally be an approximately 25 to 30 percent ammonia solution containing about 5 to 15, e.g., 9 percent cystine (based on ammonia solution).

The peroxide penetration agent can be any of a variety of peroxides although normally hydrogen peroxide is preferred.

Generally in order to insure that the ultimate composition has a substantially neutral pH, e.g., of the order of 5.5 to 8.5, preferably about 6, various acidifying agents may be added in minor amounts. Organic acids with hydroxyl groups are particularly preferred such as citric, tartaric, lactate, etc., although inorganic acids such as phosphoric or hydrochloric or acid salts such as potassium or sodium acid citrate, tartrate or phthalate can similarly be employed.

It has been found to be quite important that the various materials be incorporated in a composition in a particular manner in order to obtain a clear stable ultimate composition.

First, the gelatin should be admixed with water which has been heated to temperatures above 200° F. or so, e.g., to its boiling point, in order to dissolve the gelatin. Thereafter the resulting solution is cooled and the gelatin hydrolyzing agent, e.g., trypsin, is added thereto to keep the proteins hydrolyzed. The hydrolyzing agent is normally incorporated in the solution while it is still relatively hot, e.g., at temperatures above 40° C. The solution may then be further cooled to a luke-warm temperature range, e.g., about 35° C. and the copper chelating agent added thereto. The resulting composition contains hydrolyzed gelatin and sequestering agent and is relatively clear and quite stable.

In the preferred embodiments of the present invention, additional ingredients are subsequently added. Thus an aqueous solution of peroxide may be added to the composition after addition of copper chelating agent, and the composition warmed to a temperature of 60° C. for a period of 10 to 15 minutes. This is desirable in order to complete the reaction of the peroxide before adding the cystine-ammonia solution. The solution then may be allowed to cool to room temperature, and cystine dissolved in ammonia added thereto. The mixture may be allowed to stand overnight in order to complete the solution of the cystine and any inter-reaction with the other components of the mixture. In order to maintain a relatively neutral pH an acidifying agent may thereafter be added to the composition prepared in the above manner in order to give it a pH of about 5.5 to 8.0.

It has been found that the above sequence of steps are necessary in order to obtain the best product. When the order of addition has been changed, or other substantial deviations from the process practiced, the resulting product is less stable.

Generally the treatment of the nail involves wetting the nail thoroughly with the present aqueous solution containing gelatin, gelatin hydrolyzing agent and copper chelating compound. The nail treating solution is most usually applied at ambient temperature although it can be applied at higher temperatures which the body can comfortably tolerate. The nails are wetted or painted with the solution which is left to stand until they are dry, e.g., after about 3 to 5 minutes. The treatment may be repeated as often as desired depending on the stage of treatment and the severity of the case.

Various modifications of the present invention will be made more clearly apparent by reference to the following example.

#### Example

All weight percentages indicated below are based on the total mixture.

7.1 weight percent of gelatin was mixed with 87.26 percent of water (distilled) and heated to the boiling point of water to dissolve the gelatin. Thereafter the solution was cooled to a temperature of about 40° C., and Protease (trypsin) was added thereto in an amount so as to be 0.04 weight percent of the final solution. The solution was then stirred, the Protease serving to keep the protein hydrolyzed. The solution may be further allowed to cool and then a copper chelating agent added thereto. In this example Sequestrene NA 2 supplied by the Miles Chemical Company of Clifton, New Jersey, was utilized in amounts so as to give ultimately 0.3 weight percent in the final composition. Sequestrene NA 2 is a disodium copper ethylenediaminetetraacetate dihydrate.

In a preferred embodiment of the present invention, thereafter 4 weight percent of a 35 percent hydrogen peroxide solution was added to the solution which was then warmed to a temperature of about 60° C. The solution was allowed to cool to room temperature and then an ammoniacal solution of cystine (containing 28 percent ammonia) was added. The amount of cystine and ammonia solution in the final product therefor were 0.5 weight percent and 0.7 weight percent, respectively.

In order to bring the composition to a relatively neutraline pH, 0.1 weight percent of critic acid was then added in order to neutralize the composition to a pH of about 6.

The composition thus prepared was a clear yellow liquid having the consistency of water.

The composition thus formed is applied on the nail and left thereon for a period of 3 to 10 minutes at room temperature. This treatment may be repeated once a day the first week, then once or twice a week, depending on the case. It is found that the nail assumes improved bodying texture and has reduced tendency to crack.

The composition may be applied to the nails by painting with a few drops of the solution, immersing in the solution, dabbing with a wet compress containing the solution, or treated in any other conventional manner.

Various modifications to the present invention will suggest themselves to one skilled in the art. Having described the present invention, that which is sought to be protected is set forth in the following claims.

I claim:

1. A nail bodying composition comprising an aqueous solution containing 3.5 to 16 weight percent gelatin, 0.02 to 0.15 weight percent of a protein hydrolyzing enzyme for said gelatin and 0.1 to 1.5 weight percent of an ethylenediamine-copper chelate complex.

2. A solution for treating nails which comprises an

aqueous solution containing 3.5 to 16 weight percent gelatin, 0.02 to 0.15 weight percent trypsin, and 0.1 to 1.5 weight percent of an ethylenediamine-copper chelate complex.

3. The composition of claim 2 wherein said copper chelating agent is disodium copper ethylenediamine tetraacetate dihydrate.

4. The composition of claim 2 which further contains from about 0.3 to about 0.7 percent by weight of cystine.

5. The composition of claim 2 which further contains from about 0.5 to about 2.0 percent by weight of hydrogen peroxide.

6. The composition of claim 2 which further contains an acidifying agent compatible with the skin in an amount sufficient to give said solution a pH in the range of 5.5 to 8.5.

7. An aqueous solution for the treatment of nails which comprises 6 to 8 percent gelatin, 0.04 to 0.06 percent trypsin, 0.2 to 0.4 percent of an ethylenediamine-copper chelate complex, 0.5 to 2.0 percent hydrogen peroxide, 0.3 to 0.7 percent cystine, and an acidifying agent compatible with the skin in an amount sufficient to give said solution a pH in the range of 5.5 to 8.5.

8. The composition of claim 7 wherein said copper chelating agent is disodium copper ethylenediamine tetraacetate dihydrate.

9. The method of hardening finger and toenails which comprises wetting the nails with an aqueous solution containing 3.5 to 16 weight percent of gelatin, 0.02 to 0.15 weight percent of a protein hydrolyzing enzyme for the gelatin and 0.1 to 1.5 weight percent of an ethylenediamine copper chelate complex.

10. The method of claim 9 wherein said hydrolyzing agent is trypsin.

11. The method of claim 9 wherein said copper chelating agent is copper disodium ethylenediamine-tetraacetate dihydrate.

12. The method of hardening finger and toenails which comprises wetting the nails with an aqueous solution containing, on a weight basis, 6 to 8 percent gelatin, 0.04 to 0.06 percent trypsin, 0.2 to 0.4 percent and ethylenediamine-copper chelate complex and 0.3 to 0.7 percent cystine.

13. The method of claim 12 wherein said solution further contains 0.5 to 2.0 percent hydrogen peroxide and an acidifying agent compatible with the skin in an amount sufficient so that the solution has a pH in the range of 5.5 to 8.5.

14. The method of hardening finger and toenails which comprises wetting the nails with an aqueous solution containing, on a weight basis, 6 to 8 percent gelatin, 0.04 to 0.06 percent trypsin, 0.2 to 0.4 percent disodium copper ethylenediaminetetraacetate dihydrate, 0.5 to 2.0 percent hydrogen peroxide, 0.3 to 0.7 percent cystine and an acidifying agent compatible with the skin in an amount sufficient to give the aqueous solution a pH in the range of 5.5 to 8.5.

#### References Cited by the Examiner

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