United States Patent Office 3,579,632 Patented May 18, 1971

3,579,632

HAIR AND SCALP TREATMENT WITH A PRINCIPALLY SODIUM CHLORIDE THICK VISCOUS AQUEOUS SLURRY

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No Drawing. Filed Aug. 2, 1965, Ser. No. 476,640
Int. Cl. A61k 7/06
U.S. Cl. 424—70 14 Claims

ABSTRACT OF THE DISCLOSURE

A hair conditioner composition, useful in reducing the drying time of the hair after washing and causing the hair to become more manageable, and also having dandruff alleviating properties, is provided comprising 30–76 parts by weight of a salt of at least 60% NaCl having a particle size preferably in the range of 0.00025 to 0.00125 inch and 70–24 parts by weight of water. The composition may also include thickening agents, a fatty alcohol, detergent, lanolinic material, perfume and dye.

The present invention relates to a hair conditioner and, more particularly, to an agent which provides more manageable hair.

It is an object of the present invention to provide a chemical treatment of the hair and scalp which will tend to alleviate the symptoms of seborrheic dermatitis of the scalp, commonly called dandruff.

It is a further object of the present invention to provide a hair rinse which may be used after the hair has been cleaned with conventional soap, shampoo, or detergent.

It is a still further object of the present invention to provide a treatment of the hair which will cause the hair to become more manageable than would normally be the case immediately after washing and drying the hair.

It is still another object of the present invention to provide a hair conditioner agent which will shorten the drying time of the hair after the hair has been cleaned and rinsed with conventional shampoos.

The use of this hair conditioner is of great importance in any beauty salon in that it provides a saving of a considerable amount of time which is normally wasted drying the hair with heated ventilated air.

The following specific examples of formulations in accordance with this invention are illustrative only and should not be construed as limiting the scope of the invention.

These objects of the present invention are provided by treating the hair with the following formulation:

	Parts by weight
Salt (at least 60% NaCl) having a particle size less than 0.005 inch	30–76
Water	70–24
Thickening agent	0–20
Fatty alcohol	0–0.2
Detergent	0–3
Lanolin or derivative	0–2

Trace of perfume.
Trace of dye.

At room temperature the above mixture forms a thick viscous slurry containing about 26 parts by weight of the salt as a saturated solution with the remainder in the form of fine particles suspended therein.

It has been discovered that a brief treatment of the hair and scalp with the very concentrated salt slurry improves the condition of the hair and scalp. It is not presently known whether the concentrated salt acts as an antiseptic or whether the concentrated electrolyte conditioner extracts water and water soluble impurities from the hair and scalp; the exact mechanism may be a combination of the above or something else. At any rate, applicant does not wish to be limited by these theories but offers them as a possible explanation of the phenomena observed.

The use of the concentrated salt slurry on unwashed dry hair and scalp is feasible and will accomplish similar results to those described above. In most instances, however, it is more convenient to wash the hair before using the electrolyte hair conditioner. Use of the slurry described herein will be effective even on wet hair because the finely divided salt particles apparently dissolve readily and quickly thereby rendering the water in the hair into a very concentrated of saturated salt solution.

One of the essential features of the present invention resides in the use of finely divided salt particles. The use of large salt particles is not satisfactory although the exact reason for this is not known. It may be that the smaller particles in the slurry are able to reach the scalp and all portions of the hair more easily than larger particles. In addition, the finely divided salt particles dissolve readily in water, thereby providing the concentrated salt solution required to condition the hair and scalp. Another advantage of the finely divided salt described lies in storage stability. The finely divided salt is far less prone to undesirable settling out of a thickened salt solution than is unground salt.

Generally it has been found that a particle dimension of 0.00025 to 0.00125 inch is optimum for the purposes of the present invention, although a particle size as coarse as 0.005 inch can be utilized. Many of the particles are odd shaped; reference is to the average distance across the particle in its smallest direction, it being understood that, on the average, the largest dimension will also be less than 0.005 inch.

Generally, ballmilling has been found effective for the purpose of comminuting salt particles to provide the particles useful in the present invention. Sandmills and other grinding machines may be utilized; also the salt may be procured in a finely divided state.

Thickener is preferably used with the salt and water. Finely ground dry salt can be added to a thickened water solution with agitation of the water, or the thickener may be stirred in last. In some instances, coarse salt crystals, thickener and water may be ground together.

Many thickening agents retard the grinding operation, although both organic and inorganic thickeners can be employed successfully. Hydroxyethyl and carboxymethyl substituted cellulosics are preferable thickening agents. Zero to 2% high molecular weight carboxymethyl cellulose, 0.65 to 0.85 carboxyl per cellulose unit, is particularly effective. Carboxylated polymers such as polyacrylic acid; polymethacrylic acid; maleicvinyl methyl ether copolymer; simple amides such as polyacrylamide, polyvinyl pyrrolidone; and seed and exuded natural gums such as guar seed and gum tragacanth (astragulus extrudate) are useful. Colloidal inorganic thickeners such as colloidal alumina; and Cab-O-Sil (0.05 micron silica) have also been found to be satisfactory thickeners. Adjuvant materials such as ethylene oxide adducts of nonyl phenol assist the thickening action of the silica.

Certain other thickening materials have been found to be unsatisfactory, the high salt concentration tending to destroy the thickening action. Polyvinyl alcohol, polyethylene oxide, and methyl cellulose were found to be unsatisfactory, salt-incompatible, thickening agents. The amount of thickening agent utilized depends on the nature of the agent, the molecular weight of organic thickening agent (or particle size and adjuvant for inorganic agents), and size and concentration of salt particles as shown in the table. The range of thickening agent utilized in the

table was 1.2 to 24% of the water content. While the thickening agent is not required at the maximum salt content of 76% (Example 19), it is generally preferred. Although the #6 spindle 10 r.p.m. Brookfield (Brookfield Engineering Laboratories, Stoughton, Mass.) viscosity is only 8,000 centipoise with 76% salt and no thickening agent, the packing of the salt crystals is such that a water layer does not rise to the surface. With lesser quantities of salt than 76%, a salt water layer separates unless a thickening agent is present and the slurry must then be mixed prior to use. Generally a 10 r.p.m. Brookfield viscosity of 15,000 cp. is the minimum required to retard or prevent separation of a salt water layer. Too high a viscosity, i.e., greater than 75,000 cp. (centipoise), is undesirable because the preparation becomes difficult to rinse out of the hair. Generally the preferred viscosity is 25,000 to 45,000 cp. (Brookfield, 10 r.p.m.).

The table which follows gives the results of a number of examples of thickening agents utilized with 120 parts of NaCl and 100 parts of water after tumbling for 15 hours in a jar mill:

TABLE

[Thickening agents with 120 parts NaCl and 100 parts water—after tumbling 15 hours]

	Parts by weight in 100 parts of water	Thickening agent	Viscosity cp., #6 spindle 10 r.p.m. Brookfield	Settling	Comment
Example:					
1	1.2	Hercules CMC 7 HP—high M.W. carboxymethyl cellulose of 0.65–0.85 CH_2COOH per cellulose unit.	43,100	No	
2	2.4	WSR 301 (Union Carbide) predissolved high M.W. polyethylene oxide.	1,300	Yes	Salts out of solution.
3	3.3	Methocel 4000 (Dow) predissolved high M.W. methylated cellulose.	2,800	Yes	Do.
4	7.0	Baymal (Du Pont) colloidal alumina	21,600	V.V.Sl	
5	8.0	Cab-O-Sil MS-5 (Cabot) 0.05 micron silica.	13,000	Slight	
6	2.5	Natrosol 250 HR (Hercules) hydroxyethylated cellulosic.	83,200	No	No grinding.
7	15.0	K–704 (Goodrich) polyacrylic acid	13,600	Yes	Do.
8	11.0	Polyacrylamide 100 (Cyanamid) polyacrylamide.	21,600	V. Sl	
9	24.0	PVP K90 (GAF) polyvinyl pyrrolidone.	185,000	Yes	No grinding.
10	1.0	Type A high M.W. gelatin	Thin Gels	Yes	
11	15.0	Elvanol 50–42 (Du Pont) predissolved —88% hydrolyzed polyvinyl alcohol.			
12	3.0	Gum tragacanth XXX SA (Stein Hall) galactomannan polysaccharide.	37,600	No	
13	4.0	CMC 4 HP (Hercules) High M.W. carboxymethyl cellulose, 0.38–0.48 CH_2COOH per cellulose unit.	25,500	Trace	

In the foregoing table, the thickening agents referred to by trademark are further identified as follows:

Hercules CMC 7HP has a viscosity (centipoises at 25° C.) of 1.2% solution in water of 4500 at 10 r.p.m. Brookfield.

WSR 301 indicates a water soluble resin at 1% by weight concentration in water to give an average viscosity of 3000 centipoises. Typical properties are as follows:

Appearance: white or off-white granules
Softening point: 65° C.–70° C.
Brittle temp.: —50° C.
Ash content, max. (calculated as CaO): 2.0 weight percent.

Methocel 4000 indicates that the viscosity of 2% solution at 20° C. is 4000 centipoises.

Natrosol 250 HR has a viscosity at 25° C. of 1% concentration of 1500–2500. The H indicates high molecular weight. The R indicates that it has a fast dispersion. Its properties are as follows:

Ash content, percent (Calculated as Na_2SO_4): 4.0 max.
Bulk density, g./ml.: 0.55–0.75
Color: white to light tan
pH in solution: 6.5–8.5

K–704 has a Brookfield viscosity in centipoises at 78° F. of 4% concentration of 15; at 8% concentration of 90; and at 12% concentration of 600.

Polyacrylamide 100 has a viscosity in centipoises at 25° C. of 2% concentration of 40–50.

PVP K90 has an average molecular weight of 360,000.

Elvanol 50–42 had a viscosity in cps. of a 4% aqueous solution at 20° C. of 35–45. The mole percent hydrolysis on a dry basis is 87.2–89.2. The pH is 5.0–7.0, volatiles are 5% max. and ash is 0.75% max. (calculated as Na_2O).

CMC 4HP has a viscosity at 1% concentration of 1300–2200 centipoises at 25° C. and a range of substitution of 0.38 to 0.48.

To prevent a hard crust from forming at the air interface, if the formulation is left for more than 1 hour without a closure or cap, it has been found advisable to include approximately 0.03% of a fatty alcohol such as cetyl or lauryl alcohol in the formulation. The fatty alcohol $CH_3(CH_2)_{9-21}OH$ retards water evaporation, hence crust formation. Generally a range of 0.01 to 0.3% is preferable. The fatty alcohol is not necessary for aerosol packaging.

For some purposes, such as softening the hair, it may be desirable to include a lanolin or lanolin derivative in the formulation. Generally a level of about 1% lanolin is desirable, although a range of 0.3 to 3% is useful.

If foaming and spreading action is desired, a detergent, or surface active agent such as a sulfated fatty alcohol (e.g., lauryl alcohol sulfate, decyl alcohol sulfate), a sulfated alkylphenol-ethylene oxide (e.g. ethoxylated nonyl phenol sulfate), amphoteric detergents (e.g., N-lauryl-myristyl-β-aminopropionic acid; disodium N-lauryl β-imino-dipropionate), or an alkanol amide (e.g., lauryl diethanolamide) may be added to the formulation, preferably 0.5 to 3% of the entire formulation. For cosmetic purposes, perfume and dye may be added as required.

The salt utilized in the present invention is principally sodium chloride; however, relatively non-toxic mixtures of 60% sodium chloride with up to 40% other salts, such as KCl, MgCl may be employed. Sea salt (96% NaCl) for example, is suitable despite the high content of magnesium, calcium, and the presence of a wide variety of metals.

EXAMPLE 14

180 grams of sodium chloride, (table salt crystals)
150 grams of water
1.8 grams Hercules (Hercules Powder Co., Wilmington, Del.) 7 HP CMC, (carboxymethyl cellulose 0.65 to 0.85–COOH per cellulose unit. A 1.2% solution of the polymer in water at 25° C. possesses a viscosity of 4,500 cp. at 10 r.p.m. Brookfield).

The above ingredients were charged into a one liter capacity jar mill half filled with approximately ¾ inch flintstones and tumbled 15 hours at 45 r.p.m. The resulting slurry was then drained free of the stones. A Brookfield viscosimeter fitted with a #6 spindle was immersed in the slurry. At 10 r.p.m. the viscosity was found to be 43,000 cp. Microscopic examination revealed crystals of salt ranging from 0.00025 to 0.00125 inch. Average crystal size was approximately 0.0005 inch. The thick viscous slurry did not settle on standing one month. When applied to freshly washed hair and permitted to remain in contact with the hair and scalp for two to five minutes before rinsing out the salt with fresh water, the formulation was found to have effected the following changes in the condition of the hair and scalp of several patients:

(1) The hair was more easily dried than usual. The drying time was reduced by about 50%.

(2) The hair was much more manageable than is normally freshly washed hair; i.e., it can be combed and held in place without application of an oil or grease hair tonic.

EXAMPLE 15

A formulation similar to Example 14 was tumbled for varying times in the jar mill:

Tumbling time, hours	Comment
1	⅔ to ¾ unground salt crystals.
2	Approximately ½ particles unground.
3	Approximately ⅓ particles unground.
5	Particle sizes range substantially from 0.00025 to 0.0025 inch.
7	Do.
15	Particle range substantially 0.00025 to 0.00125 inch.

This example shows that for the apparatus of Example 14 it is necessary to grind for at least 5 hours to obtain satisfactory particle size.

EXAMPLE 16

180 grams finely divided salt (0.0005 to 0.0025 inch crystals) was stirred into a solution of 1.8 Hercules 7 HP CMC in 150 grams of water. The resultant slurry viscosity (Brookfield #6 spindle) was

R.p.m.:	Cp.
10	15,800
20	11,200
50	7,000

Final particle size of the salt ranged from 0.00025 to 0.0025 inch. The formulation did not settle on standing.

EXAMPLE 17

	Gm.
NaCl	180
Water	150
Cab-O-Sil MS-5 [(Cabot)—0.05 micron silica]	12

The ingredients were mixed and were ballmilled 15 hours.

Resultant viscosity at r.p.m.	Cp.
10	13,000
20	8,200
50	3,460

Some settling occurred on standing. General Aniline and Film Igepal CO-630 (2.4 grams—nonyl phenol ethylene oxide detergent) was stirred into the slurry. The slurry became very thick and no settling on storage was noted.

Viscosity at r.p.m.	Cp. (approx.)
10	40,000
20	33,600
50	13,000

EXAMPLE 18

The formulation:

	Gm.
Salt	180
Water	150
CMC 7 HP	1.8
Cetyl alcohol	0.1

The mixture was ballmilled for 15 hours. The formulation was very resistant to surface encrustation if permitted to stand without a cover.

EXAMPLE 19

	Gm.
Salt	240
Water	90

The mixture was ballmilled 15 hours. The slurry was drained from the stones and permitted to stand for two days. A small quantity of salt water separated and was removed. The remaining slurry did not settle on standing and was found to consist of 76% salt.

Viscosity at r.p.m.	Cp.
10	8,200
20	3,500
50	1,560

EXAMPLE 20

The formulation of Example 14 was prepared and 3.3 grams "Ethoxylan 100" (Malmstrom Chemical Co., Newark, N.J., ethoxylated water soluble lanolin which is a water and alcohol soluble emollient material having skin softening characterisics. It has the following characteristics):

Color: Yellow
Odor: Faint, pleasant
Acid value (USP): 1.2 max.
Saponification value (USP modified): 12–20
Hydroxyl value (A.O.C.S. Cd. 13–60): 25–55
Iodine value (USP Hanus): 7–12

was stirred into 330 gm .of the Example 14 formulation. Hair treated with this formulation was softer and more pliant than when the formulation of Example 14 was used without the lanolin.

EXAMPLE 21

	Gm.
Sea salt crystals	180
Water	150
CMC 7 HP (Hercules)	1.8

The ingredients were ballmilled 15 hours.

Viscosity at r.p.m.	Cp.
10	41,300
20	26,000
50	14,000

No settling was noted on standing.

EXAMPLE 22

	Gm.
Salt	200
Water	150
CMC 7 HP	2.3

The ingredients were ballmilled 15 hours. Then 7.0 gm. Deriphat 170C General Mills (50% solution of N-lauryl-myristyl-β-amino-propionic acid in water) was mixed in.

Viscosity at r.p.m.	Cp.
10	31,000
20	20,000
50	11,000

This formulation lathers readily when rubbed into wet hair. The formulation leaves the hair relatively free of

snarls and excessive entanglement after rinsing and drying the hair.

It will be obvious to those skilled in the art that various changes may be made without departing from the spirit of the invention and therefore the invention is not limited to what is described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. A composition for the treatment of hair and scalp to condition the hair and to alleviate the symptoms of seborrheic dermatitis of the scalp comprising a thick slurry consisting essentially of:
   (a) 30–76 parts by weight of at least one salt consisting essentially of NaCl present in a minimum quantity of 60% by weight of the total salt content, and any remaining salts being selected from the group consisting of chlorides, potassium, magnesium and calcium, and having a particle size less than 0.005 inch;
   (b) 70–24 parts by weight of water, and
   (c) a salt-compatible thickening agent in an amount up to 20 parts by weight, said slurry having a viscosity of 15,000–75,000 cp. at 10 r.p.m. Brookfield.

2. A composition according to claim 1 further comprising
   (d) 0.001 to 0.3% of a fatty alcohol;
   (e) 0.5 to 3% of a surface active agent, and
   (f) 0.3 to 3% of an emollient selected from the group consisting of lanolin and ethoxylated lanolin, the percentages all being based on the entire formulation.

3. A composition in accordance with claim 2 wherein the particle size of said salt lies between 0.00025 and 0.00125 inch.

4. A composition in accordance with claim 2 wherein the viscosity of said slurry lies between 25,000 and 45,000 cp. at 10 r.p.m. Brookfield.

5. A composition in accordance with claim 2 wherein said fatty alcohol is of the formula $CH_3(CH_2)_{9-21}OH$.

6. A composition in accordance with claim 5 wherein said fatty alcohol is selected from the group consisting of cetyl alcohol and lauryl alcohol.

7. A composition in accordance with claim 2 wherein said surface active agent is N-lauryl-myristyl-β-aminopropionic acid.

8. A composition according to claim 1 wherein said thickening agent is up to 2 parts by weight of carboxymethyl cellulose having a viscosity of a 1.2% solution in water at 25° C. of 4500 cp. and having 0.65–0.85 carboxyl groups per cellulose unit to provide a resulting slurry viscosity of between 25,000 and 45,000 cp. at 10 r.p.m. Brookfield and said salt has a particle size of between 0.00025 and 0.00125 inch.

9. A method of treating hair and scalp to condition the hair and to alleviate the symptoms of seborrheic dermatitis of the scalp comprising applying an effective amount of a slurry of:
   (a) 30–76 parts by weight of at least one salt consisting essentially of NaCl present in a minimum quantity of 60% by weight of the total satlt content, and any remaining salts being selected from the group consisting of chlorides, potassium, magnesium and calcium, and having a particle size less than 0.005 inch; and
   (b) 70–24 parts by weight of water, said slurry having a viscosity of 9000–75,000 cp. at 10 r.p.m. Brookfield, to the hair and scalp for a period of at least 2 minutes followed by rinsing the hair and scalp with water.

10. A method in accordance with claim 9 wherein said slurry further includes
   (c) sufficient salt-compatible thickening agent to provide a slurry viscosity of 15,000–75,000 cp. at 10 r.p.m. Brookfield.

11. A method according to claim 9 wherein said slurry contains 76% of said salt content.

12. A method according to claim 10 wherein said thickening agent is up to 2 parts by weight of carboxymethyl cellulose having a viscosity of a 1.2% solution in water at 25° C. of 4500 cp. and having 0.65–0.85 carboxyl groups per cellulose unit to provide a resulting slurry viscosity of between 25,000 and 45,000 cp. at 10 r.p.m. Brookfield and said salt has a particle size of between 0.00025 and 0.00125 inch.

13. A composition for the treatment of hair and scalp to condition the hair and to alleviate the symptoms of seborrheic dermatitis of the scalp comprising a thick slurry consisting essentially of:
   (a) 200 grams of salt consisting essentially of NaCl present in a minimum quantity of 60% by weight of the total salt content, and any remaining salt being selected from the group consisting of chlorides of potassium, magnesium and calcium, and having a particle size less than 0.005 inch;
   (b) 150 grams of water;
   (c) 2.3 grams of carboxymethyl cellulose having a viscosity of a 1.2% solution in water at 25° C. of 4500 cp. and having 0.65–0.85 carboxyl groups per cellulose unit; and
   (d) 7 grams of a 50% aqueous solution of N-lauryl-myristyl-β-aminopropionic acid; said slurry having a viscosity of 31,000 cp. at 10 r.p.m. Brookfield.

14. A method of treating hair and scalp to condition the hair and to alleviate the symptoms of seborrheic determatitis of the scalp comprising applying thereto an effective amount of a slurry of:
   (a) 200 grams of salt consisting essentially of NaCl present in a minimum quantity of 60% by weight of the total salt content, and any remaining salt being selected from the group consisting of chlorides of potassium, magnesium and calcium, and having a particle size less than 0.005 inch;
   (b) 150 grams of water;
   (c) 2.3 grams of carboxymethyl cellulose having a viscosity of a 1.2% solution in water at 25° C. of 4500 cp. and having 0.65–0.85 carboxyl groups per cellulose unit; and
   (d) 7 grams of a 50% aqueous solution of N-lauryl-myristyl-β-aminopropionic acid; said slurry having a viscosity of 31,000 cp. at 10 r.p.m. Brookfield.

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U.S. Cl. X.R.

132—7; 424—47, 77, 80, 81, 153