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MUCIN SOLVENT AGENT

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This invention relates to an agent for dissolving mucin from various surfaces of the body and the invention is more particularly adapted for dissolving the mucinous secretions adhering to the teeth, although the invention is not limited to this application.

Mucin is a glyco-proteid secreted by various glands and deposited upon surfaces of the body. The mild alkaline character of the secretions normally holds the mucin in solution. The alkalinity sufficient to hold mucin in solution however, is insufficient to redissolve it once it has been deposited as a thin film or plaque and a particularly striking example of the difficulties which may result from this physiological condition is the depositing of mucin plaques on the surfaces of the teeth. The saliva is sufficiently alkaline to carry mucin into solution in the salivary glands, but once the mucin is deposited on the teeth, the saliva is incapable of redissolving the film. The films which may be deposited on the interproximal surfaces of the teeth, serve both as a foundation for tartar deposits, and to protect those micro-organisms which secrete this lactic acid which is responsible for breaking down the tooth enamel. Due to the difficulty of mechanically removing films deposited in these and other protected surfaces, such plaques remain untouched in the inaccessible places and either act as nuclei for tartar deposits or harbor the germs causing decay of the teeth. It is highly desirable to remove these deposits, but it is difficult to do it mechanically and the saliva will not normally do it chemically since it lacks sufficient alkalinity to redissolve a mucin film once it has been deposited.

There are other surfaces of the body which are subject to mucinous secretions which should be cleansed and for various reasons it is not desirable to effect the removal of accumulations or secretions containing mucin by means other than solutions. By the very nature of the inaccessibility of various passages, it is impracticable if not impossible to do it otherwise. For example, the mucinous catarrhal discharge of nasal membranes should be washed from the nasal tissues and the washing solution cannot be wholly effective unless the mucinous deposits are redissolved, thus allowing access of the solution to the surfaces of the membranes.

I have found that certain types of organic compounds which produce in water a degree of alkalinity equal to or greater than a pH value of 9 may be used to redissolve mucinous deposits on the teeth and mucinous secretions from other parts of the body such, for example, as the vaginal or urethral membranes. I have found that a degree of alkalinity of pH 9 or more is sufficient to change mucin which is insoluble in water into soluble mucinates and thereby render mucinous deposits and secretions soluble in water. The particular structure of the organic compound is apparently not controlling, but it is in the first place essential that the compound shall produce a sufficient degree of alkalinity to dissolve mucinous substances.

I am aware that certain organic compounds, which are solvents for fats, have been used to dissolve mucin, but these compounds do not produce a strongly alkaline reaction in water solution and do not react with the acid mucin nor are they employed in water solution. It is my intention that the dissolving of the acid mucin deposits shall be by water solution subsequent to changing the acid mucin into water soluble mucinates by the action of the mucin solvent.

The free acid mucin or acid mucinates precipitated and deposited from mucinous secretions are, I find, most advantageously rendered soluble and dissolved by solutions of organic compounds which are not only capable of producing a degree of alkalinity of about pH 9 or more in water solution but also have the effect of reducing the surface tension of the solution materially. They are easily distinguished from soap solutions which are colloidal and viscous and are consequently substantially ineffective in inaccessible places where mechanical agitation to dislodge the precipitated mucinates is not possible. My invention produces a fluid non-colloidal solution which will penetrate to those less accessible places not readily attained by colloidal solutions of a more or less viscous character such as soap solutions, and will, by reason of the greatly reduced surface tension, effect a distribution not heretofore obtainable with solvents used for mucinates.

The organic solvents which I prefer are all capable of reducing the surface tension of the solution materially below the surface tension of water. In fact all of them are excellent emulsifying agents.

I prefer to use substituted ammonium or ammonia compounds such as the ethanol amines or tetraethyl ammonium hydroxide. As stated before, the particular structure of the compound does not seem to control its efficiency. The amines in which the hydrogen of ammonia is substituted either partially or completely by organic radicals such as methanol, ethanol, propanol, etc.,

are effective. The ethanol amines are compounds in which one, two or three of the hydrogen atoms of ammonia have been substituted by the ethanol group, CH_2CH_2OH, and are called mono, di or tri ethanol amine according to the number of substituted groups. The commercial grade of tri-ethanolamine which serves admirably as a mucin solvent when dissolved in water contains 75–80% tri-ethanolamine, 20–25% di-ethanolamine and 0–5% mono-ethanolamine. This is my preferred mucin solvent agent but any one of these compounds alone or combinations of any two or all three in any proportions will do equally well. The essential factor is that the combination will produce an alkalinity of approximately pH 9 or above in water solution. Water soluble amines containing other primary alcohol groups such as methanol, propanol and the like can also be used as mucin solvent agents. It is desirable, however, that the solution produced should be non-poisonous, particularly, of course, in the case of dentifrices, and non-irritating if used in contact with any membranes. The substituted ammonia compounds mentioned have the added advantage that they have an odor which is not difficult to mask. They do not have an unpleasant flavor or odor in themselves, and the addition of a small amount of essential oils such as peppermint or wintergreen or of substituted phenols such as menthol, thymol or eucalyptol easily masks the odor and flavor and imparts certain desirable germicidal qualities as well as preserving the solution in a sterile condition. Specific germicides which destroy the acid producing bacteria in the mouth may also be added without injury to the mucin solvent properties.

As a specific example of my invention, the commercial tri-ethanolamine is dispensed as a dilute solution in water. However, the solution may range from 1% to 50% without affecting its value as a solvent for mucinous material. I prefer about a 3% solution. This solution has substantially the same osmotic pressure as the blood stream and is consequently non-irritating to any sensitive tissues. The solution may, of course, be sold in concentrated form to be diluted as used, if desired, and the practical applications are such as would readily suggest themselves to those skilled in the art of making pharmaceutical preparations.

The mucin solvent organic compounds may also be combined with the usual ingredients found in a tooth paste without in any way interfering with their effectiveness. These compounds are compatible with massing agents such as the soaps and glycerine, the glycols and with flavoring and antiseptic materials. A typical formula is soap 50 gr., glycerine 40 gr., water 20 gr., precipitated chalk 75 gr., ethanolamines 10 gr., flavoring and antiseptics q. s. A suitable soap which may also be used as a substitute for the soap above mentioned is tri-ethanolamine stearate which is well adapted for use in a dentifrice. It can be used in the above formula in the same proportions as other soaps. This soap is made by neutralizing tri-ethanolamine with stearic acid and can be made readily or can be obtained on the open market. It is obvious that the mucin solvent action may also be obtained by using an ethanolamine soap in which the ethanolamine has not been completely neutralized by the fatty acid. In this case the unneutralized ethanolamine acts as solvent in a manner entirely similar to that of ethanolamine added to an ordinary soap or an ethanolamine soap. Since no salting out effect is had by use of my mucin dissolving agent the problem of making a soap dentifrice is simplified and the organic compounds can be incorporated in a soap paste without difficulty.

My invention operates in accordance with the chemical law that a more active agent is necessary to redissolve a precipitate than is required to hold the precipitated substances in solution prior to precipitation. It goes further, however, in securing a better distribution effect than has been possible heretofore with mucin dissolving agents by materially reducing the surface tension of the solvent. Moreover, the solvent is fluid and non-viscous in its preferred form so that surfaces inaccessible or difficultly accessible to brushing or polishing are cleaned.

The invention is not limited to a dentifrice, although it has been specifically described in connection with dental purposes for removing mucin plaques from the teeth. It will be understood that the invention may be employed for general physiological purposes since it is nonirritating and may be used wherever it is desired to dissolve or wash away mucin containing accumulations from surfaces of the body.

While I have described my invention with particular reference to specific chemical substances in certain preparations, it will be understood that the illustration set forth is the preferred embodiment but the invention may be otherwise embodied and practiced within the scope of the following claims.

I claim:

1. A mucin dissolving agent containing an ethanolamine and capable of producing a water soluble mucinate.

2. A mucin dissolving dentifrice containing an ethanolamine soap and an effective amount of free ethanolamine to yield in water solution an alkalinity of not less than a pH value of approximately 9, being capable of producing a water soluble mucinate and being substantially free from mucin precipitants.

3. A mucin dissolving dentifrice containing a tri-ethanolamine soap and an effective amount of free tri-ethanolamine to yield in water solution an alkalinity of not less than a pH value of approximately 9, being capable of producing a water soluble mucinate and being substantially free from mucin precipitants.

4. A mucin dissolving medicinal agent for removing mucinous secretions adhering to surfaces of the body or teeth, containing an organic compound capable of reacting with water to form a substituted ammonium hydroxide and producing an alkalinity of not less than a pH value of approximately 9 in water solution, being capable of producing a water soluble mucinate and substantially free from mucin precipitants and coagulants.

5. A mucin dissolving agent for removing mucinous secretions adhering to surfaces of the body or tooth structure, containing an organic compound forming in water solution a substituted ammonium hydroxide including a primary alcohol group, capable of producing a water soluble mucinate, and producing an alkalinity of not less than a pH value of approximately 9 in water solution.

6. A mucin dissolving agent for removing mucinous secretions adhering to surfaces of the body or tooth structure, containing an organic compound forming in water solution a substituted ammonium hydroxide capable of producing a water soluble mucinate and reducing the surface

tension of the solution below the surface tension of water.

7. A mucin dissolving agent for removing mucinous secretions adhering to surfaces of the body or tooth structure, containing a non-poisonous organic compound yielding in water solution a substituted ammonium hydroxide including a primary alcohol group, capable of producing a water soluble mucinate, and producing a substantially stable water solution having an alkalinity of not less than a pH value of approximately 9.

8. A mucin dissolving agent for removing mucinous secretions adhering to the surfaces of the body or teeth, comprising an alkaline nitrogen-containing organic compound capable of producing a water soluble mucinate and yielding an alkalinity of not less than a pH value of approximately 9 in water solution.

9. A mucin dissolving agent for removing mucinous precipitates adhering to the surfaces of the body or teeth, comprising an alkaline nitrogen-containing organic compound capable of producing a water soluble mucinate and reducing the surface tension of water in which it is dissolved.

10. A mucin dissolving agent for removing mucinous precipitates adhering to surfaces of the body or teeth, containing an organic substituted ammonia compound yielding in water solution a substituted ammonium hydroxide capable of producing a water soluble mucinate and producing an alkalinity of not less than a pH value of approximately 9 and being substantially free from mucin precipitants and coagulants.

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