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2,949,402

TABLET COATING

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This invention relates to an improvement in the art of coating pharmaceutical tablets. The invention includes the method of coating the tablets, the new coating composition employed therein as well as tablets coated with the novel composition.

Coating pharmaceutical tablets containing therapeutically active substances has been practiced in the art for many years. The most common coating for pharmaceutical tablets has been sugar which is applied as an aqueous syrup to the pressed tablets as they are tumbling in a rotating coating pan while they are being dried by a current of air blown over their surface. While sugar-coated tablets have been known and used for many years, they are subject to a number of disadvantages. An effective coating over the sharp edges of the pressed tablets is difficult to obtain, and a large number of individual coats is required. Because of the aqueous nature of the sugar syrup, drying of the tablets while being coated is a very slow operation; and several days are required to obtain satisfactory coating. This, of course, adds greatly to the expense of the finished product. A number of other disadvantages associated with sugar coating of pharmaceutical tablets could be mentioned, but it is sufficient to say that there is a very definite need for an improved method of coating tablets containing medicinal substances.

Medicinal tablets are coated for a number of different reasons—to disguise the taste and the odor of the medicinal substances, to protect the contents of the tablet from the action of the atmosphere and other external factors, to improve their appearance, to give them added strength, to reduce dusting, to delay their rate of disintegration, and many other reasons.

A coating for pharmaceutical tablets must possess a number of distinct and important properties to be acceptable for this purpose. The coating must be nontoxic and otherwise physiologically acceptable. It should be sufficiently flexible to withstand the tumbling action of the coating operation and in subsequent handling of the coated tablets. It must, of course, be film forming so as to completely cover the tablet to be coated. It should have the property of forming a thin film. The film should be tasteless and colorless. It should mix easily with coloring and flavoring agents. It should be comparatively hard and non-tacky and non-hygroscopic. It should be capable of covering the sharp edges of the tablets as well as indentations thereon which may be pressed into the tablet to provide lines of breakage or identification marks. These and other requirements of an acceptable pharmaceutical tablet coating are difficult to obtain.

The desirability of avoiding aqueous tablet coating

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compositions and the development of coatings which can be applied in a short period of time have been appreciated for some time and a number of efforts have been made to provide coatings for medicinal tablets which have more desirable properties than those previously available. Film-forming substances when dissolved in highly volatile organic solvents and applied to tablets by conventional coating procedures are not generally satisfactory because they do not meet one or more of the above-indicated requirements of a satisfactory tablet-coating material. Generally it is necessary to include in the coating composition a hydrophilic component which will enable the stomach fluids to penetrate the film provided by the film-forming component of the composition. Unfortunately, however, the film-forming substances and the hydrophilic component of the coating are often incompatible and as a result the coating soon cracks or disintegrates and presents a very undesirable appearance and may even separate completely from the pressed tablet.

The present invention is predicated upon our discovery that hydroxypropylglycerol, a viscous, almost colorless liquid, made by reacting glycerin and propylene oxide so that the resulting compound has an available hydroxypropyl substitution of about 2.5, can be used in coating compositions of the kind just discussed to provide compatibility of the hydrophilic component with the film-forming component whereby an almost perfect coating of medicinal tablets can be achieved and which will remain in this perfect condition on handling and over a long period of time.

The film-forming component of the coating composition of the present invention is preferably a cellulose dicarboxylic acid ester such as cellulose acetate phthalate, as is disclosed in United States Patent No. 2,093,462, issued September 21, 1937, to Malm et al. Other film-forming cellulose esters of dicarboxylic acid such as are disclosed in this patent and United States Patent No. 2,093,464 may also be used in practicing the coating process of the present invention. The hydrophilic component of our coating composition is preferably one of the polyalkylene glycols such as polyethylene glycol or polypropylene glycol having a molecular weight of about 6000 or more.

In practicing the coating process of the present invention, the film-forming substance such as cellulose acetate phthalate is dissolved in a suitable organic solvent together with the hydroxypropyl glycerol to form a solution or dispersion. Small amounts of a dispersing agent, such as sorbitan monooleate, to facilitate mixing of the essential components of the solution are usually added. Another solution containing the polyalkylene glycol is also prepared in a suitable organic solvent to form a solution which is compatible with the first-described solution. The two solutions are then mixed to form a coating dispersion which is then used to coat the medicinal tablets in a conventional coating pan. Usually the coating solution is first applied as a dilute solution for the first few coats and thereafter is added to the coating pan in a more concentrated form.

Because the coating solution is non-aqueous and contains solvents which are readily volatile, a single coating on the tumbling tablets is dried in a matter of minutes. As many coatings may be applied to the tablets as desired. As few as five individual coats may be sufficient

in some instances whereas as many as seventy-five or more individual coats can be applied to the tablets if desired. Since each coating operation takes only a few minutes, it will be seen that the entire coating operation can be completed in a matter of hours rather than days as is required in using an aqueous sugar syrup as the coating material.

In order that the coating process of the present invention may be more readily understood, a preferred embodiment of the invention will be given by way of example.

EXAMPLE I

Two solutions of the following composition were prepared:

Solution A

Cellulose acetate phthalate	grams	100
Hydroxypropylglycerol	do	35
Sorbitan monooleate	do	10
Acetone	milliliters	400
Ethyl alcohol, q.s. to	1000 milliliters.	

Solution B

Polyethylene glycol	grams	280
Ethyl alcohol	milliliters	1200

After the above solutions are prepared, they are then mixed.

1500 Standard convex scored medicated tablets having a trade name stamped thereon were placed on an 8-inch Colton coating pan and then tumbled. As the tablets were tumbling, a dilute solution of the hydroxypropylglycerol formulation (diluted with a 25 percent solution of a 50/50 mixture v./v. of acetone and ethyl alcohol) was poured into the tumbling pan in an amount sufficient to cover the tablets (in this case about 5 to 10 milliliters). These were tumbled for exactly two minutes, then a second portion of dilute coating solution was added while tumbling, and the tablets tumbled for another two minutes. Four or five additional coats were applied at two-minute intervals (a longer drying time is not harmful). Usually, the first few layers are applied with a dilute solution. Then the remainder of the layers required are applied with the concentrated formulation. Seventeen coats were applied in order to successfully mask the taste of the medicament. This required about fifty minutes. After the last coat was applied, tumbling was prolonged for about fifteen minutes to insure complete drying. The tablets were then ready for packaging. They possessed a high luster and were very uniformly coated. The markings on the original uncoated tablet could very conveniently be seen because of the clear nature of the coating material. The disintegrating time in water was five minutes.

For each 100 parts by weight of the film-forming component of the coating mixture, cellulose acetate phthalate of the above example, there may be used from about 100 to 400 parts by weight of the hydrophilic component, polyethylene glycol of the above. The proportions of

hydroxypropylglycerol are critical to achieve the maximum advantages of this component. The amount should be sufficient to form a compatible solution of the film-forming component and the hydrophilic component when solutions of these substances are prepared and mixed together and on drying the hydroxypropylglycerol tends to act as a plasticizer keeping the remaining components of the coating compatible, thus avoiding cracking and disintegrating of the film after it has been dried. The amount of the hydroxypropylglycerol will vary somewhat with the proportion of polyalkylene glycol in the composition but will normally range from about 25 to 50 parts by weight of the film-forming component.

The amounts of dispersing agent, sorbitan monooleate above, are not critical and likewise the organic solvents used to dissolve the essential components of the coating composition are not critical. They should, of course, be reasonably volatile in order that the coating operation may be carried out rapidly and serve as solvents for the several components of the composition. Various solvents and mixtures thereof will occur to those skilled in the art.

We claim:

1. A method of coating pharmaceutical tablets which comprises the steps of applying to said tablets, while they are tumbling in a tablet coating pan, a solution containing a cellulose ester of a dicarboxylic acid as a film-forming substance and for each hundred parts thereof from 100 to 400 parts by weight of a polyalkylene glycol and from 25 to 50 parts by weight of hydroxypropylglycerol.

2. A method of coating pharmaceutical tablets which comprises the steps of applying to said tablets a non-aqueous solution comprising a volatile organic solvent, a cellulose ester of a dicarboxylic acid as a film-forming substance, and for each hundred parts thereof, 100 to 400 parts by weight of polyethylene glycol and 25 to 50 parts by weight of hydroxypropylglycerol.

3. A method of coating pharmaceutical tablets which comprises the steps of applying to said tablets a non-aqueous solution containing cellulose acetate phthalate and for each hundred parts thereof, 100 to 400 parts by weight of polyethylene glycol and from 25 to 50 parts by weight of hydroxypropylglycerol.

4. A method of coating pharmaceutical tablets which comprises the steps of applying to said tablets a non-aqueous solution containing cellulose acetate phthalate and for each hundred parts thereof, 100 to 400 parts by weight of polyethylene glycol and about 35 parts by weight of hydroxypropylglycerol.

References Cited in the file of this patent

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