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PHARMACEUTICAL COMPOSITION COMPRISING ENTACAPONE OR NITECAPONE AS WELL AS A CROSS-LINKED CELLULOSE DERIVATIVE

BACKGROUND OF THE INVENTION

The present invention relates to a new pharmaceutical composition comprising a catechol derivative and a cross-linked cellulose derivative as a dissolution enhancing agent. Accordingly, the present invention relates to an oral compacted composition comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof, and a cross-linked cellulose derivative as a dissolution enhancing agent. Particularly, the invention relates to an oral compacted composition comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof and a cross-linked cellulose derivative, wherein the amount of the cross-linked cellulose derivative in the composition is at least 6 % by weight, more preferably from about 8 % to about 16 % by weight, especially from about 10 % to 14 % by weight. Preferably the cross-linked cellulose derivative is cross-linked carboxymethylcellulose or a pharmaceutically acceptable salt thereof, and particularly croscarmellose sodium (i.e. cross-linked carboxymethylcellulose sodium, Ac-Di-Sol). Preferably the oral compacted composition is in the form of a tablet. Further, the present invention relates to a method of preparing an oral compacted composition comprising entacapone, nitecapone, or pharmaceutically acceptable salt thereof, and a cross-linked cellulose derivative. The present invention also relates to the use of a cross-

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linked cellulose derivative in the manufacture of an oral compacted composition comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof.

The chemical names of entacapone and nitecapone are (E)-2-cyano-3-(3,4-dihydroxy-5-nitrophenyl)-N,N-diethyl-2-propenamide and 3-(3,4-dihydroxy-5-nitrobenzylidene)-2,4-pentanedione, respectively. Entacapone and nitecapone are described in U.S. Patent No. 5,446,194 as catechol-O-methyltransferase (COMT) inhibitors. Enteral and parenteral routes of administration are discussed in U.S. Patent No. 5,446,194.

It is desirable that entacapone, nitecapone, or a pharmaceutically acceptable salt thereof, is released from the oral composition as soon as possible after ingesting it. This can normally be achieved by using a dissolution enhancing agent in the pharmaceutical composition. The dissolution enhancing agent may be a disintegrant or any other agent that enhances the dissolution. There is a vast selection of different dissolution enhancing agents, including disintegrants, on the market, which have different chemical and physical characteristics. When selecting the best dissolution enhancing agent to be used in a pharmaceutical composition in combination with an active agent, numerous factors have to be considered, e.g., the chemical and physical characteristics of the active agent and the dissolution enhancing agent, the chemical and physical characteristics of the auxiliary agents, such as diluents and binders, the method of preparing the composition, etc.

A cross-linked cellulose derivative means unmodified or modified polymer of cellulose which is cross-linked in a manner generally known in the field of poylmer chemistry. Such cross-linked cellulose derivatives are well known as excipients in the field of pharmaceutical technology and as an example cross-linked carboxymethylcellulose or a pharmaceutically acceptable salt thereof can be mentioned. For instance croscarmellose sodium is a cross-linked polymer of carboxymethyl-cellulose sodium. According to the Handbook of Pharmaceutical Excipients (Ainley Wade and Paul J. Weller, Second Edition, The Pharmaceutical Press, London, 1994), it is used in oral pharmaceutical formulations as a disintegrant for tablets, capsules, and granules. Typically, concentrations from 0.5 to 5 % w/w are used as a tablet disintegrant.

Neither the above-cited patent nor any other patent or publication of which applicants are aware describes an oral compacted composition comprising entacapone, nitecapone, or pharmaceutically acceptable salt thereof, and a cross-linked cellulose derivative.

SUMMARY OF THE INVENTION

Applicants have discovered that a cross-linked cellulose derivative is a superior disintegrant to be used in an oral compacted composition comprising entacapone, nitecapone, or pharmaceutically acceptable salt thereof. Accordingly, the present invention provides an oral compacted composition comprising a pharmaceutically effective amount of entacapone, nitecapone, or a pharmaceutically acceptable salt thereof and a cross-linked cellulose derivative.

The composition

is premised on the discovery that the cross-linked cellulose derivative essentially increases the release rate of entacapone or nitecapone from an oral compacted composition. Particularly, an object of the invention is to provide an oral compacted composition comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof and a cross-linked cellulose derivative, wherein the amount of the cross-linked cellulose derivative in the composition is at least 6 % by weight, more preferably from about 8 % to about 16 % by weight, especially from about 10% to 14 % by weight.

Preferably, the cross-linked cellulose derivative is cross-linked carboxymethylcellulose or a pharmaceutically acceptable salt thereof, more preferably croscarmellose sodium (Ac-Di-Sol). Preferably, the oral compacted composition is in the form of a tablet and, therefore, an object of the invention is to provide a tablet comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof and a cross-linked cellulose derivative.

A further object of the invention is to provide a tablet comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof and a cross-linked cellulose derivative, wherein the amount of the cross-linked cellulose derivative is at least 6 % by weight, more preferably from about 8 % to about 16 % by weight, especially from about 10 % to about 14 % by weight.

An object of the invention is also to provide a method for preparing an oral compacted composition comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof, and a cross-linked cellulose derivative, wherein said method comprises mixing a pharmaceutically effective amount of

entacapone, nitecapone, or a pharmaceutically acceptable salt thereof, one or more auxiliary agents, and a cross-linked cellulose derivative to obtain a first mixture; compacting and crushing the first mixture one or more times to obtain a plurality of granules; adding a lubricant, a glidant or a mixture thereof to the granules to obtain a second mixture; and compressing the second mixture into a plurality of tablets.

An object of the invention is to provide a method of inhibiting catechol-O-methyltransferase by administering to a patient in need thereof an oral compacted composition comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof.

A further aspect of the invention relates to the use of a cross-linked cellulose derivative in the manufacture of an oral compacted composition comprising entacapone, nitecapone, or a pharmaceutically acceptable salt thereof.

Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the effect of different dissolution enhancing agents on the dissolution of compacted entacapone 200 mg tablet formulations.

Figure 2 shows the effect of croscarmellose sodium on the dissolution of compacted entacapone 200 mg tablet formulations.

DETAILED DESCRIPTION OF THE INVENTION

Applicants have surprisingly discovered that the cross-linked cellulose derivative is effective for increasing the disintegration rate of an oral compacted composition comprising entacapone, nitecapone or a pharmaceutically acceptable salt thereof.

An oral compacted composition is a composition wherein a mixture of an active agent, one or more auxiliary agents and a dissolution enhancing agent is first compacted, then crushed into granules, and further the granules are tabletted or enclosed in a capsule. The best dissolution enhancing agent is the one that releases the active agent from the composition as fast as possible.

Applicants found that when compacting nitecapone, entacapone or a pharmaceutically acceptable salt thereof together with dissolution enhancing agents to an oral compacted composition, the cross-linked cellulose derivative is unexpectedly more efficient in releasing entacapone, nitecapone or a pharmaceutically acceptable salt thereof from the compacted composition than other common dissolution improving agents, such as starch, pregelatinized starch, micro-crystalline cellulose, mannitol, sodium starch glycolate, or sodium

lauryl sulphate. The dissolution test of Example 1 shows that 90.1 % of entacapone is dissolved from a tablet comprising croscarmellose sodium as a disintegrant in 5 minutes (see Figure 1). This result is far superior when compared to 69.3 %, 55.4 %, 41.3 %, and 8.4 % for sodium lauryl sulphate, sodium starch glycolate, pregelatinized starch, and mannitol containing tablets, respectively.

Moreover, with the cross-linked cellulose derivative it is possible to compact nitecapone, entacapone or a salt thereof to a formulation which is both small in size (which is highly desirable in the treatment of certain conditions, e.g. in the treatment of Parkinson's disease) and also superior in releasing nitecapone or entacapone or a salt thereof.

The cross-linked cellulose derivative is in the oral compacted composition in an amount to enhance the dissolution of the active agent. Applicants have surprisingly discovered that the best dissolution results for the oral compacted compositions of the invention are achieved when the amount of the cross-linked cellulose derivative is far more than what is suggested in the art. Accordingly, it has been found that the amount of the cross-linked cellulose derivative in the oral compacted composition is preferably at least 6 % by weight. More preferably, the amount of the cross-linked cellulose derivative is from about 8 % to about 16 % by weight, especially from about 10 % to 14 % by weight.

The amount of entacapone, nitecapone or a pharmaceutically acceptable salt thereof in the oral compacted composition is dependent on numerous factors known to one skilled in the art, such as, the type of mammal, the condition to be

treated, the desired duration of use, etc. The compacted composition of the invention may also contain one or more other pharmaceutically active agents. The amount of entacapone in a tablet according to the invention can be about 5-400 mg, preferably about 100-200 mg, more preferably 200 mg.

Entacapone and nitecapone can be prepared, for example, as described in U.S. Patent No. 5,446,194.

An oral compacted composition according to the invention can be prepared by mixing a pharmaceutically effective amount of entacapone, nitecapone, or a pharmaceutically acceptable salt thereof, one or more auxiliary agents and a cross-linked cellulose derivative and further compacting and crushing the mixture to form granules. The compacting and crushing can be proceeded one or more times. The granules are then mixed with a lubricant, a glidant or a mixture thereof and the mixture is compressed into tablets. The tablets may be coated after tabletting. The granules may also be encapsulated to form capsules. The auxiliary agent may be a diluent, a binder or a mixture of different diluents and/or binders. Preferably at least one of the auxiliary agents is water soluble. Suitable diluents and binders include, e.g., microcrystalline cellulose, hypromellose (HPMC), povidone, starch, lactose, sucrose, mannitol, sorbitol, etc. Suitable lubricants and glidants include, e.g., magnesium stearate, calcium stearate, hydrogenated vegetable oil, talc, colloidal silicon dioxide, etc.

One skilled in the art would recognize other suitable auxiliary agents, lubricants and glidants that can be used in the composition of the present invention.

The invention will be further clarified by the following examples, which are intended to be purely exemplary of the invention.

EXAMPLE 1

The dissolution of entacapone 200 mg tablet formulations containing different disintegrants were tested. The tablets were prepared by mixing, compacting, crushing and compressing as described above. The formulations were as described in Table 1. The dissolution of each formulation was tested using the basket method with a 100 rpm speed and 900 ml medium of phosphate buffer pH 5.8.

The amount of entacapone released was determined by a spectrophotometric method using a UV/VIS spectrophotometer. The detection wavelength was 313 nm. The results, which are presented in Figure 1, show that the formulation containg croscarmellose sodium (Formul. 5) releases entacapone fastest.

TABLE 1

Entacapone 200 mg tablet formulations containing different dissolution enhancing agents used in the dissolution test.

Compound	Formul. 1 (mg)	Formul. 2 (mg)	Formul. 3 (mg)	Formul. 4 (mg)	Formul. 5 (mg)
Entacapone	200	200	200	200	200
Microcryst.cellulose	50	210	410	420	370
Mannitol	400	0	0	0	0
Pregelatinized Starch	0	180	0	0	0
Sodium Starch Glycolate	0	0	40	0	0
Sodium Lauryl Sulphate	0	0	0	30	0
Croscarmellose Sodium	0	0	0	0	80
Magnesium Stearate	10	10	10	10	10

EXAMPLE 2

The effect of croscarmellose sodium on the dissolution of compacted entacapone 200 tablet formulations was tested according to the method described in Example 1. The different formulations, i.e., Formul. 6-Formul. 10, are described in Table 2. The results of the dissolution test are shown in Figure 2. The formulation containing the most croscarmellose sodium (100 mg) released entacapone the fastest.

TABLE 2

Compacted entacapone 200 mg tablet formulations containing different amounts of croscarmellose sodium.

Compound	Formul. 6 (mg)	Formul. 7 (mg)	Formul. 8 (mg)	Formul. 9 (mg)	Formul. 10 (mg)
Entacapone	200	200	200	200	200
Microcryst. cellulose	445	405	220	200	180
Mannitol	0	0	170	170	170
Croscarmellose Sodium	0	40	60	80	100
Magnesium Stearate	15	15	12	12	12

EXAMPLE 3

Oral compact compositions according to the invention comprising entacapone as an active agent can include for instance those described in Table 3.

TABLE 3

Different oral compacted entacapone 200 mg tablet formulations.

Compound	Formul. 11 (mg)	Formul. 12 (mg)	Formul. 13 (mg)	Formul. 14 (mg)	Formul. 15 (mg)
Entacapone	200	200	200	200	200
Microcrystalline cellulose	290	230	160	190	120
Sucrose	10	0	100	60	190
Mannitol	90	160	80	140	50
Hypromellose (HPMC)	5	0	20	0	10
Croscarmellose Sodium	73	80	82	82	88
Hydrogenated vegetable oil	0	5	38	2	14
Magnesium Stearate	15	8	3	9	11

Those skilled in the art will recognize that while specific embodiments have been illustrated and described, various modifications and changes may be made without departing from the spirit and scope of the invention.

Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

The references discussed herein are specifically incorporated by reference in their entirety.

CLAIMS:

1. An oral compacted composition comprising a pharmaceutically effective amount of entacapone, nitecapone or a pharmaceutically acceptable salt thereof and a cross-linked cellulose derivative.

2. The composition according to claim 1, comprising entacapone or a pharmaceutically acceptable salt thereof and a cross-linked cellulose derivative.

3. The composition according to claim 1, wherein the amount of the cross-linked cellulose derivative in the composition is at least 6 % by weight.

4. The composition according to claim 3, wherein the amount of the cross-linked cellulose derivative in the composition is from about 8 % to about 16 % by weight.

5. The composition according to claim 4, wherein the amount of the cross-linked cellulose derivative in the composition is from about 10 % to about 14 % by weight.

6. The composition according to any one of claims 1 to 5, wherein the cross-linked cellulose derivative is cross-linked carboxymethylcellulose or a pharmaceutically acceptable salt thereof.

7. The composition according to any one of claims 1 to 6, wherein the cross-linked cellulose derivative is croscarmellose sodium.

8. The composition according to claim 1, wherein the composition is in the form of a tablet.

9. The composition according to claim 2, wherein the amount of entacapone is from about 5 mg to about 400 mg.

10. A method for preparing an oral compacted composition comprising entacapone, nitecapone or a pharmaceutically acceptable salt thereof, wherein the method comprises

a) mixing a pharmaceutically effective amount of entacapone, nitecapone, or a pharmaceutically acceptable salt thereof, one or more auxiliary agents and a cross-linked cellulose derivative to obtain a first mixture;

b) compacting and crushing the first mixture one or more times to obtain a plurality of granules;

c) adding a lubricant, a glidant, or a mixture thereof to the granules to obtain a second mixture; and

d) compressing the second mixture into a plurality of tablets.

11. The method according to claim 10, wherein the amount of the cross-linked cellulose derivative in the composition is at least 6 % by weight.

12. The method according to claim 11, wherein the amount of the cross-linked cellulose derivative in the composition is from about 8 % to about 16 % by weight.

13. The method according to claim 12, wherein the amount of the cross-linked cellulose derivative in the composition is from about 10 % to about 14 % by weight.

14. The method according to claim 10, wherein at least one of the auxiliary agents is water soluble.

15. The method according to claim 13, wherein the amount of entacapone is from about 5 to about 400 mg.

16. The method according to any one of claims 10 to 15, wherein the cross-linked cellulose derivative is cross-linked carboxymethylcellulose or a pharmaceutically acceptable salt thereof.

17. The method according to any one of claims 10 to 16, wherein the cross-linked cellulose derivative is croscarmellose sodium.