SPECIFICATION

Galenical compositions

The invention provides a galenical compositions for oral application of ergot alkaloids which are characterised by a prolonged effect and a good bioavailability of the active agent.

It is undisputed amongst medicinal specialists, that under many circumstances it is preferred to apply a drug once a day instead of more times a day. This may be achieved in so-called "retard systems" by retarding and delaying the release of the active agent, with the aim of producing a longer duration of the therapeutic effect. In the field of the ergot therapy, a retardation with classical systems, e.g. with a matrix system or with the aid of micro-encapsulation, induces each time an important decrease of the total bioavailability.

It is also known, that ergot alkaloids are stable in the presence of acids, which means that they do not disintegrate in the gastric juices, and that the resorption of ergot alkaloids takes place mainly in the intestinal tract. Enteric coated drugs containing an ergot alkaloid are therefore not expected to provide an improved bioavailability.

It is therefore surprising that with the aid of an enteric coating one observes that the duration of action of an ergot alkaloid is not only significantly prolonged but that, moreover, the total bioavailability is notably improved when the coated core contains, in addition to the ergot alkaloid, a polyalkoxyalkylene sterol ether.

The invention therefore provides, more specifically, a solid enteric-coated composition for oral application, the core of the composition containing an ergot alkaloid and a polyalkoxyalkylene sterol ether.

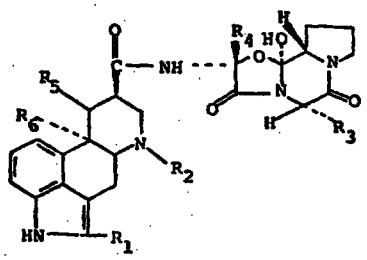
The invention also provides a process for the production of compositions according to the invention, by enteric coating a core comprising an ergot alkaloid and a polyalkoxyalkylene sterol ether (hereinafter designated sterol ether).

The term "core" comprises any mixture of an ergot alkaloid and a sterol ether, if desired in admixture with further physiologically acceptable material, that can be surrounded by a enteric-coating. The term "core" comprises, in a wide sense, not only tablets, pellets or granules but also capsules, e.g. soft or hard gelatine capsules filled with a liquid or waxy mixture of an ergot alkaloid, a sterol ether and optionally pharmaceutically acceptable material. Such capsules may then be enteric-coated, e.g. in conventional manner. When tablet cores are used they have preferably a hardness of from ca 10 to ca 70N.

The pellets or granules may, after application of the enteric-coating, be used as such or to fill capsules, e.g. hard gelatine capsules. Suitable applications of the compositions according to the invention are therefore tablets, pellets, granules or capsules.

The term "ergot alkaloids" comprises natural ergot alkaloids such as ergotamine, ergocristine, α-ergocryptine, β-ergocryptine and ergocornine, synthetic or semi-synthetic derivatives thereof such as ergovaline, dihydroergotoxine (also known as co-dergocrine) and dihydroergotamine in free base form or in the form of an acid addition salt with pharmaceutically acceptable organic or inorganic acids such as methanesulphonic, maleic, tartaric or hydrochloric acid.

The active agents which are of special interest for use in the invention, are compounds of formula I



I

wherein

R_1 is hydrogen or halogen,
R_2 is hydrogen or C_{1-4} alkyl,
R_3 is isopropyl, *sec.*-butyl, isobutyl or benzyl,
R_4 is methyl, ethyl or isopropyl, and

either

R_5 is hydrogen and
R_6 is hydrogen or methoxy

or

R_5 and R_6 together are an additional bond, or mixtures thereof.

When R_1 is halogen, it is preferably bromine.

Especially preferred compositions of the invention contain dihydroergotoxine, bromocryptine or dihydroergotamine in free base form or, preferably, in acid addition salt form as active agent.

Preferred sterol ethers for use in the compositions of the invention have a hydrophilic-lipophilic balance value (HLB group number) of from about 10 to about 20, especially from 12 to 16. They preferably are ethers of lanosterol, dihydrocholesterine and, particularly, of cholesterine or mixtures of such ethers. Especially suitable sterol ethers are sterols etherified with an average of 8 to 75, preferably 9 to 30 alkylene oxide units. The hydroxy group in the end alkylene unit of such sterol ethers may be partially or completely acylated, e.g. by acyl radicals of aliphatic carboxylic acids, such as acetyl. Especially preferred are sterol ethers etherified with ethylene oxide and/or propylene oxide units.

The sterol ethers may be obtained by conventional manner by etherifying the sterol with the corresponding amount of epoxide and optionally acylating the so obtained alcohols. They are in general available on the market and are e.g. offered for sale by the firm Amerchol under the trade name Solulan ®. Examples of Solulan ® types which are available on the market and are suitable for use in the compositions according to the invention are such obtainable by alkoxylation of e.g.

a) 1 mol cholesterin with about 24 mol ethylene oxide (Solulan ® C-24)
b) 1 equivalent of lanolin alcohols with about 16 equivalents ethylene oxide (Solulan ® 16)
c) 1 equivalent of lanolin alcohols with about 25 equivalents ethylene oxide (Solulan ® 25)
d) 1 equivalent of lanolin alcohols with about 75

equivalents ethylene oxide (Solulan ® 16)

e) 1 equivalent of lanolin alcohols with about 10 equivalents propylene oxide (Solulan ® PB-10) and also the

f) partially acetylated derivative of 1 equivalent of lanolin alcohols ethoxylated with about 10 equivalents ethylene oxide (Solulan ® 98) and the

g) completely acetylated derivative of 1 equivalent of lanolin alcohols ethoxylated with about 9 equivalents ethylene oxide (Solulan ® 97)

The term "about" in the above paragraphs a) to g) indicates that the given number of ethylene oxide or propylene oxide equivalents involved is a mean value, i.e. that some sterol ethers bear more and others less ethyleneoxy- or propyleneoxy-groups.

Lanolin alcohols are also known as wool fat alcohols (Handbuch der Kosmetika und Riechstoffe, 2. Ed. 1950, Vol. I, page 1101 (Janistyn)) and are a mixture of i.e. cholesterin, dihydrocholesterin and lanosterol.

The term "enteric coating" comprises any pharmaceutically acceptable coating preventing the release of the active agent in the stomach and sufficiently disintegrating in the intestinal tract (by contact with approximately neutral or alkaline intestinal juices) to allow the resorption of the active agent through the walls of the intestinal tract. Various *in vitro* tests for determining whether or not a coating is classified as an enteric coating have been published in the pharmacopoeia of various countries.

More specifically, the term "enteric coating" according to the invention refers to a coating which remains intact for at least 1 hour, e.g. 2 hours, in contact with artificial gastric juices such as HCl of pH 1.2 at 36 to 38°C and thereafter disintegrates within 30 minutes in artificial intestinal juices such as a KH_2PO_4 buffered solution of pH 6.8.

The thickness of the coating may vary and depends *inter alia* on its permeability in water and acids and the desired retard effect. In general satisfactory results are obtained with a coating of 5-100 μm, preferably 20-80 μm, thickness. The coating is suitably selected from macromolecular polymers. Suitable polymers are listed in e.g. Hagers Handbuch der pharmazeutischer Praxis, 4th Ed. Vol. 7a, pages 739 to 742 and 776 to 778, (Springer Verlag, 1971) and Remington's Pharmaceutical Sciences, 13th Ed., pages 1689 to 1691 (Mack Publ. Co., 1970) and comprise e.g. cellulose ethers, and acrylic resins, such as methylacrylate copolymers.

The preferred films are made from cellulose acetate phthalate; copolymers derived from methylacrylic acid and esters thereof, and especially hydroxypropyl methylcellulose phthalate. An example of an appropriate cellulose acetate phthalate is the marketed product CAP (Eastman Kodak, Rochester N.Y., USA). Examples of suitable hydroxypropyl methyl cellulose phthalates are the marketed products HP 50 and HP 55 (Shinetsu, Tokyo, Japan).

Since a coating consisting essentially of CAP disintegrates at a higher pH than e.g. a coating consisting essentially of HP 50 the release of the active agent from compositions provided with the former coating will be more delayed than from compositions provided with the latter coating. In such a way, one can, by suitable selection of the coating, obtain a retard effect that takes into account the properties of the active agent involved in an optimal way.

The process according to the invention may be carried out in a manner analogous to methods known for the application of an enteric-coating.

For the preparation of coated tablets, pellets of granules one proceeds e.g. by spraying the cores with a solution of the enteric-coating.

Suitable solvents for the enteric-coating are for example organic solvents, e.g. an alcohol such as ethanol, a ketone such as acetone, halogenated hydrocarbons such as CH_2Cl_2 or mixtures of such solvents, e.g. ethanol/acetone 1:1 (volume/volume). Conveniently a softener such as di-n-butylphthalate is added to such a solution.

Conveniently the cores are warmed up at 25° up to 40°C e.g. by means of warm air of 40° up to 70°C, before spraying. To avoid sticking of the cores the spray procedure is preferably interrupted at certain time intervals and the cores then warmed up again. The spray pressure may vary within wide ranges; in general satisfactory results are obtained with a spray pressure of from about 1 to about 1.5 bar. It is, however, also possible to proceed without interruption of the spray procedure, e.g. by automatic regulation of the spray amount in function of the temperature of exhaust air and/or cores.

The enteric-coated compositions of the invention have the advantageous property that, after p.o. administration to man the maximum concentration of the active agent in the blood plasma is obtained after about 4-6 hours, whereas the initial peak after administration of a normal composition e.g. a tablet, is already reached after 0.5-1 hour.

The sustained release effect of the compositions of the invention is also illustrated by determination of the concentration of active agent (and metabolites) in the secreted urine: the maximum concentration in the urine is found approximately 6 hours after administration whereas this maximum is obtained after about 2 hours when a normal composition is administered.

In addition, the plasma level after administration of the compositions according to the invention is between 6 and 24 hours after application, higher than after administration of a normal composition e.g. a tablet. This is illustrated by the area under the plasma concentration level (AUC and is a measure of the excellent bioavailability of the compositions of the invention.

Accordingly, the compositions of the invention show a therapeutically desirable retard effect together with an excellent bioavailability and allow consequently treatment with one unit dosage a day.

The compositions of the invention, especially the tablets may in addition be covered by an outer medicament layer. This outer layer may contain in addition to an active agent, such as an ergot alkaloid, carriers and/or fillers which are soluble or dispersible in the gastric juices such as talc, microcrystalline cellulose, magnesium stearate, mannitol, polyvinlypyrrolidone. Such compositions may for example be used when a rapid onset of the activity is required. The high initial concentration of the ergot

alkaloid in the blood is then maintained by its sustained release out of the core in the intestinal tract.

The optimal weight ratio in the core of ergot alkaloid: sterol ether depends to a great extent on the physical properties of the sterol ether involved, the adjuvants used and the type and the size of the composition, e.g. the amount of the abovementioned sterol ethers of the type Solulan ® 16, Solulan ® 25 and Solulan ® C-24 is limited in view of their waxy nature.

However, in general satisfactory results are obtained when a weight ratio ergot alkaloid : sterol ether from 1:1 to 1:25, preferably from 1:2 to 1:8, especially 1:4, is used. The range 1:2 to 1:8 is especially preferred when the cores are present in solid solution form of the ergot alkaloid and especially when polyvinylpyrrolidone is used as solid solvent.

The cores may be compounded with conventional excipients for example binding agents, lubricants, fillers and disintegrants. Suitable fillers for the preparation of tablet cores are e.g. silicagel, calcium carbonate, sodium carbonate, lactose, starch, talc; suitable granulating and disintegrating agents are e.g. starch and alginic acid; suitable binding agents are e.g. starch and gelatine and suitable lubricants, stearic acid and talc.

The use of cores in solid solution form is a special embodiment of the invention. Such cores may be prepared as follows.

An ergot alkaloid, a sterol ether and a pharmaceutically acceptable polymer which is at least partly soluble in an aqueous medium, especially a polyalkylene glycol, polyvinylpyrrolidone, a copolymer of vinylpyrrolidone and vinyl acetate or a mixture of these are mixed together.

Suitable polyalkylene glycols include polyethylene glycol and polypropylene glycol and their copolymers having a molecular weight of 200 to 20,000, preferably 4000 to 15,000, more preferably 6000 to 13,000. By "polyvinylpyrrolidone" is meant uncrosslinked poly (N-vinyl) pyrrolidone-2, suitably of molecular weight between 10,000 and 100,000, preferably 11,500 to 40,000, more preferably 20,000 to 30,000. The copolymer of vinylpyrrolidone and vinyl acetate preferably contains 60% by weight vinylpyrrolidone and 40% by weight vinyl acetate and preferably has a molecular weight of 30,000 to 100,000, more preferably 40,000 to 90,000.

When desired stabilizers such as acids, preferably methanesulphonic acid, maleic acid or tartatic acid are added to adjust the pH of the composition. The preferred pH range for the composition is pH 4-6, preferably pH 4-5.

The weight ratio ergot alkaloid : sterol ether : pharmaceutically acceptable polymer may vary between wide ranges; however, in general, satisfactory results are obtained with ratios varying in the range 1 : 1-10 : 0.1-10, especially 1 : 2-8 : 0.1-10 and more preferably 1 : 2-5 : 0.1-5.

For the preparation of the solid solutions according to the invention the polymers are employed in solid form. In the case one of the polymers used is liquid at room temperature, e.g. a polyalkylene glycol having a molecular weight of about 200, then it is obvious that such a polymer is not used alone, but in conjunction with a polymer which is solid at room temperature.

The abovementioned constituents are dissolved by stirring in a suitable solvent, for example in a lower alcohol such as ethanol or methanol, or in chloroform, at a temperature of from 30 to 70°C, preferably 40 to 60°C, and the solvent may be removed by evaporation under vacuum at the same temperature. In the preparation of the solution it is also possible to add only a part of the polymer and the additional ingredients, if any, and to add the remainder during the evaporation of the solvent. The resulting clear solution is left to solidify at room temperature (15 to 25°C) and the solid solution or dispersion may then be ground to a fine powder and dried, suitable under vacuum at 30°C, to remove all traces of the solvent.

The solid solution (core of the composition) obtained according to the above process is then compounded in known manner with pharmaceutically acceptable diluents or carriers, optionally with an additional amount of a sterol ether and the total content of sterol ether in the core should preferably lie in the above given ranges.

The following examples illustrate the invention. All temperatures are in degrees Celsius.

EXAMPLE 1

Tablet cores consisting of 3 g dihydroergotamine, 75 g cholesterin which is ethoxylated with about 24 ml ethylene oxide (Solulan ® (C-24)) and 22g dispersed silicagel are heated to 30° during 10 minutes with the aid of warm air of 50° in a coating pan which is repeatedly rotated. The tablet cores are then sprayed, with the aid of a spray pistol, with a solution of 5.4 g hydroxylpropyl methylcellulose phthalate (HP50) and 1.35 g di-n-butylphthalate in a 1:1 (volume/volume) ethanol/acetone mixture, at a spray pressure of 1-1.5 bar using conventional interval spray coating procedures, and the so obtained coated tablets are then dried.

EXAMPLE 2

One proceeds analogous to Example 1, using, however, 75 g lanolin alcohols ethoxylated with about 25 equivalents ethylene oxide (Solulan ® 25) instead of 75 g cholesterin ethoxylated with about 24 mol ethylene oxide.

EXAMPLE 3 — Coated tablets with cores in solid solution form

15 g Dihydroergotoxine methanesulphonate, 1.05 g (Solulan ® C-24), 33.95 g polyvinylpyrrolidone (average molecular weight 25,000) and 250 ml methanol are charged into a 1 litre round-bottomed flask. The flask is attached to a rotary evaporator and rotated at a bath temperature of 60° until the flask contents reach 60°, by which time a clear solution is obtained.

The bath temperature is maintained at 60° and the solvent evaporated under reduced pressure until the residue has a syrupy consistency. The residue is decanted into an evaporating basin and left to solidify for 2 hours at room temperature.

The solid residue is dried in a vacuum oven at 30°, ca. 1 Torr for ca. 12 hours, ground to a fine powder and dried again.

26.8 g of the so obtained solid solution are then

mixed with the following adjuvants:

silicon dioxide (Aerosil® 200, Degussa)	1.0 g
polyvinylpyrrolidone (crosslinked)	8.0 g
corn starch	20.0 g
Talc	30.0 g
Solulan ® C-24	30.0 g
cellulose granules (Elcema G 250)	42.0 g
lactose	122.0 g

until an homogenous mixture is obtained and then pressed, in conventional manner, to tablet cores of 140.0 mg (hardness 10-32N).

The so obtained cores are then, analogous to Example 1, sprayed with a solution of

cellulose acetate phthalate (CAP)	90.0 g
di-n-butylphthalate	22.5 g
acetone	240.0 g
ethanol	21.0 g
dichloromethane	526.5 g
	900.0 g

until the cores are coated with ca. 10 mg of the cellulose acetate phthalate/di-n-butylphthalate mixture per core.

The so obtained coated tablets are resistant against the gastric juices since the cores remain intact after a treatment of 1 hour with artificial gastric juices of pH = 1.2. The disintegration time in artificial intestinal juices is at pH 5.5 longer than 1 hour, and lies at pH 6.0 between 23-28 minutes and at pH 6.8 between 12 and 16 minutes.

EXAMPLE 4

One proceeds analogous to Example 3, spraying, however, the tablet cores of 140 mg with a solution of 140.0 g hydroxypropyl methylcellulose phthalate (HP 50) and 28 g di-n-butylphthalate in a mixture of 616 g ethanol and 616 g acetone, until the cores are coated with ca. 9 mg of the hydroxypropyl methylcellulose phthalate/di-n-butylphthalate mixture (ratio 10:2) per core.

EXAMPLE 5

Analogous to Example 3 is obtained a solid solution of 4 g dihydroergotoxine methanesulphonate, 0.3 g Solulan ® 16 and 9.1 g polyvinylpyrrolidone (average mol weight 2000).

This solid solution is then mixed with

silicon dioxide	0.5 g
polyvinylpyrrolidone (average mol weight 2000)	4.0 g
corn starch	10.0 g
talc	15.0 g
Solulan ® 16	15.0 g
cellulose granules (Elcema G 250)	21.0 g
lactose	61.1 g

and this mixture pressed to tablets of 140.0 mg.

The so obtained tablet cores are then sprayed, analogous to Example 4, until each core is coated either with ca 10 mg or with ca 15 mg of the mixture : hydroxypropyl methylcellulose phthalate/di-n-butylphthalate.

Analogous to the procedure described in the above Examples are obtained the tablets as listed below in Table I.

In cases Ib and Ic (see table) are used, the tablet cores are in solid solution form.

TABLE I

	EXAMPLE	6	7	8	9	10	11	12	13
Ia	Dihydroergot-oxinemesylate	4.0	4.0	4.0	4.0	4.0	4.0		
	Dihydroergot-oxinemesylate							6.0	6.0
Ib	Solulan ® C24	0.3	0.3	0.3	0.3	0.3			0.4
Ic	Polyvinyl-pyrrolidone	9.1	9.1	9.1	9.1	9.1			13.5
II	Solulan ® C24	15.0	15.0	31.7	7.3	23.7	15.3	22.9	22.5
	Silicion dioxide	2.4	2.4	0.5	0.5	0.5	0.5	3.6	3.6
	corn starch	24.0	24.0	10.0	10.0	10.0	10.0	36.0	36.0
	Cellulose	72.0	72.0	21.0	21.0	21.0	21.0	108.0	108.0
	lactose	110.8	110.8	44.4	68.8	52.4	61.1	166.4	166.4
	Magnesium stearate	2.4	2.4					3.6	3.6
	Kollidon CE 5050			4.0	4.0	4.0	4.0		
	Polyvinyl-pyrolidone (25)						9.1	13.5	
	talc				15.0	15.0	15.0		
	HPMCP *	26.0	7.0	7.2	9.0	9.0	9.0	7.2	7.2
	Di-n-butylphthalate			1.8	—	—	—	1.8	1.8
								(1)	(1)
	total weight (mg)	266.0	247.0	149.0	149.0	149.0	149.0	369.0	369.0

* HPMCP = Hydroxypropyl methylcellulose phthalate

(1) the cores of these tablets were pressed to possess a hardness of 50-60N

EXAMPLE 14: Tablet with an outer medicament layer (Mantle tablet)

a) The cores are prepared analogous to Example 3 by mixing 26.8 g of a solid solution (consisting of 8.0 g dihydroergotamine mesylate, 0.6 g Solulan ® C-24 and 18.2 g polyvinylpyrrolidone) together with 1.0 g highly disperse silicagel, 8.0 g crosslinked polyvinylpyrrolidone, 20 g corn starch, 47.4 g Solulan ® C-24, 42.0 g cellulose granules, 104.8 g lactose and 30.0 g talc until the mixture is homogenous. The mixture is then pressed to cores of 140.0 mg.

b) The so obtained cores are sprayed with a solution of 140.0 g hydroxypropyl methylcellulose phthalate and 28.0 g di-n-butylphthalate in a mixture of 616 g ethanol and 616 g acetone, until the cores are coated with ca. 10 mg per tablet.

c) The outer medicament layer is prepared by mixing 4.0 g dihydroergotamine mesylate with 4.0 g dispersed silica-gel, 6.0 g magnesium stearate, 166.8 g cellulose powder, 40.0 g talc, 191.2 g corn starch and 348.0 g calcium hydrogen phosphate until the mixture is homogeneous. This mixture is then pressed with the coated tablets (according to Example 14b) to prepare tablets with an outer medicament layer, having a total weight of 530.0 mg per tablet.

EXAMPLE 15

One proceeds analogous to any one of Examples 1 to 14, using 4 mg bromocryptine, 4 mg dihydroergovaline or 4 mg dihydroergonine instead of dihydroergotoxine or dihydroergotamine, and obtains tablets containing the corresponding ergot alkaloid as active agent.

EXAMPLE 16: Clinical trial

The composition according to Example 4 was compared with a solid solution of dihydroergotoxine mesylate (composition A) and a conventional composition of dihydroergotoxine mesylate (composition B).

Each person treated obtained 4 mg dihydroergotoxine mesylate.

The result is listed in the following table.

Composition	Example 4	A	B
Concentration in Plasma after			
20'	0.047±0.012	0.376±0.078	0.215±0.064
40'	0.092±0.039	0.472±0.070	0.506±0.049
Max. conc. in plasma ($ng.ml^{-1}$)	0.615±0.077	0.507±0.071	0.538±0.037
Time (in hours) after which max. is reached	3.33±0.48	0.64±0.06	0.78±0.12
Bioavailability			
AUC (0-24 hours) (ng, ml^{-1})	4.778±0.415	3.875±0.279	3.754±0.171
% eliminated by urine (0.96 hours)	1.010±0.154	0.787±0.121	0.740±0.081

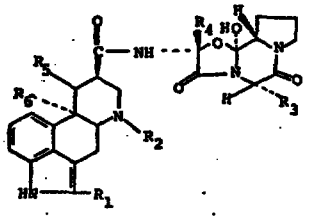
The good retarding effect and the excellent bioavailability of the composition according to the invention is clearly illustrated by the figures in the above table. On the other hand, we found a clearly inferior bioavailability (60-70% of composition B) when testing a marketed composition of dihydroergotoxin retarded according to conventional manner.

Analogous test with other compositions according to the invention give similar good results. Additionally, a marketed composition of dihydroergotamine retarded according to conventional manner, showed a bioavailability that was about 30 to 40% inferior to that found with the corresponding unretarded reference composition and inferior to compositions according to the invention.

CLAIMS

1. A solid enteric-coated composition for oral application, the core of the composition containing an ergot alkaloid and a polyalkoxyalkylene sterol ether.

2. A composition according to Claim 1 wherein the ergot alkaloid is a compound of formula I,



I

wherein

R_1 is hydrogen or halogen,

R_2 is hydrogen or C_{1-4} alkyl,

R_3 is isopropyl, *sec.*-butyl, isobutyl or benzyl,

R_4 is methyl, ethyl or isopropyl, and

either

R_5 is hydrogen and

R_6 is hydrogen or methoxy

or

R_5 and R_6 together are an additional bond, or mixtures thereof.

3. A composition according to Claim 1 or 2 wherein the ergot alkaloid is dihydroergotamine.

4. A composition according to Claim 1 or 2 wherein the ergot alkaloid is dihydroergotoxine.

5. A composition according to Claim 1 or 2 wherein the ergot alkaloid is bromocryptine.

6. A composition according to any one of Claims 1 to 5 wherein the polyalkoxyalkylene sterol ether has an hydrophilic-lipophilic balance of from 10 to 20.

7. A composition according to Claim 6 wherein the polyalkoxyalkylene sterol ether has a hydrophilic-lipophilic balance of from 12 to 16.

8. A composition according to any one of claims 1 to 7 wherein the sterol part of the polyalkoxyalkylene sterol ether is lanosterol, dihydrocholesterin and/or cholesterin.

9. A composition according to any one of Claims 1 to 8, wherein the polyalkoxyalkylene sterol ether is a sterol etherified with 8 to 75 alkylene oxide units.

10. A composition according to Claim 9, wherein the sterol is etherified with from 9 to 30 alkylene units.

11. A composition according to any of Claims 1 to 10 wherein the polyalkoxyalkylene sterol ether, is a sterol etherified with ethylene oxide or propylene oxide.

12. A composition according to any of Claim 1 to 11 wherein the enteric-coating is selected from a cellulose ether, an acrylic resin or a copolymer of maleic acid and phthalic acid derivatives.

13. A composition according to Claim 12 wherein the enteric-coating is of cellulose acetate phthalate.

14. A composition according to Claim 12 wherein the enteric-coating is of hydroxypropyl methylcellulose phthalate.

15. A composition according to Claim 12 wherein the enteric-coating is of methylacrylic acid and esters thereof.

16. A composition according to any one of Claims 1 to 15 wherein the enteric-coating contains a softener.

17. A composition according to Claim 16 wherein the softener is di-n-butylphthalate.

18. A composition according to any one of Claims 1 to 17 in the form of a tablet.

19. A composition according to any one of claims 1 to 17 in the form of granules or pellets.

20. A composition according to any one of claims

Composition	Example 4	A	B
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40'	0.092±0.039	0.472±0.070	0.506±0.049
Max. conc. in plasma ($ng.ml^{-1}$)	0.615±0.077	0.507±0.071	0.538±0.037
Time (in hours) after which max. is reached	3.33±0.48	0.64±0.06	0.78±0.12
Bioavailability			
AUC (0-24 hours) (ng, ml^{-1})	4.778±0.415	3.875±0.279	3.754±0.171
% eliminated by urine (0.96 hours)	1.010±0.154	0.787±0.121	0.740±0.081

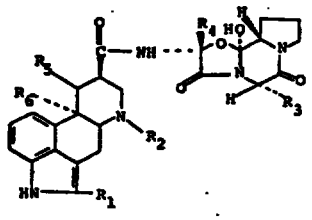
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Analogous test with other compositions according to the invention give similar good results. Additionally, a marketed composition of dihydroergotamine retarded according to conventional manner, showed a bioavailability that was about 30 to 40% inferior to that found with the corresponding unretarded reference composition and inferior to compositions according to the invention.

CLAIMS

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2. A composition according to Claim 1 wherein the ergot alkaloid is a compound of formula I,



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wherein

R_1 is hydrogen or halogen,

R_2 is hydrogen or C_{1-4} alkyl,

R_3 is isopropyl, *sec.*-butyl, isobutyl or benzyl,

R_4 is methyl, ethyl or isopropyl, and

either

R_5 is hydrogen and

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or

R_5 and R_6 together are an additional bond, or mixtures thereof.

3. A composition according to Claim 1 or 2 wherein the ergot alkaloid is dihydroergotamine.

4. A composition according to Claim 1 or 2 wherein the ergot alkaloid is dihydroergotoxine.

5. A composition according to Claim 1 or 2 wherein the ergot alkaloid is bromocryptine.

6. A composition according to any one of Claims 1 to 5 wherein the polyalkoxyalkylene sterol ether has an hydrophilic-lipophilic balance of from 10 to 20.

7. A composition according to Claim 6 wherein the polyalkoxyalkylene sterol ether has a hydrophilic-lipophilic balance of from 12 to 16.

8. A composition according to any one of claims 1 to 7 wherein the sterol part of the polyalkoxyalkylene sterol ether is lanosterol, dihydrocholesterin and/or cholesterin.

9. A composition according to any one of Claims 1 to 8, wherein the polyalkoxyalkylene sterol ether is a sterol etherified with 8 to 75 alkylene oxide units.

10. A composition according to Claim 9, wherein the sterol is etherified with from 9 to 30 alkylene units.

11. A composition according to any of Claims 1 to 10 wherein the polyalkoxyalkylene sterol ether, is a sterol etherified with ethylene oxide or propylene oxide.

12. A composition according to any of Claim 1 to 11 wherein the enteric-coating is selected from a cellulose ether, an acrylic resin or a copolymer of maleic acid and phthalic acid derivatives.

13. A composition according to Claim 12 wherein the enteric-coating is of cellulose acetate phthalate.

14. A composition according to Claim 12 wherein the enteric-coating is of hydroxypropyl methylcellulose phthalate.

15. A composition according to Claim 12 wherein the enteric-coating is of methylacrylic acid and esters thereof.

16. A composition according to any one of Claims 1 to 15 wherein the enteric-coating contains a softener.

17. A composition according to Claim 16 wherein the softener is di-n-butylphthalate.

18. A composition according to any one of Claims 1 to 17 in the form of a tablet.

19. A composition according to any one of claims 1 to 17 in the form of granules or pellets.

20. A composition according to any one of claims

1 to 17 wherein the enteric coating is on a capsule.

21. A composition according to Claim 18 in tablet form wherein the tablet additionally has an outer medicament layer surrounding the enteric-coating.

22. A composition according to any one of Claims 1 to 21 wherein the weight ratio ergot alkaloid polyalkoxyalkylene sterol ether is from 1:1 to 1:25.

23. A composition according to Claim 22, wherein the weight ratio ergot alkaloid : polyalkoxyalkylene sterol ether is from 1:2 to 1:8.

24. A composition according to any one of Claims 1 to 23 wherein the core is in solid solution form.

25. A composition according to Claim 24 wherein the core contains a polyalkylene glycol, polyvinylpyrrolidone and/or a copolymer of vinylpyrrolidone and vinyl acetate as solid solvent.

26. A composition according to Claim 25, wherein the weight ratio within the core of ergot alkaloid : polyalkoxyalkylene sterol ether : solid solvent lies in the range 1:1-10 : 0.1-10.

27. A composition according to Claim 26 wherein the weight ratio lies in the range 1:2-8 : 0.1-10.

28. A composition according to Claim 27 wherein the weight ratio lies in the range 1:2-5 : 0.1-5.

29. A composition according to any one of Claims 24 to 28 wherein the core contains a stabilizer.

30. A composition according to Claim 29, wherein the core is stabilised by adjusting its pH, with an acid, at pH 4-6.

31. Process for the production of a composition as defined in any one of the preceding claims characterised by enteric-coating a core comprising an ergot alkaloid and a polyalkoxyalkylene sterol ether.

32. Process according to Claim 31, wherein the enteric-coating is applied in conventional manner.

33. Process according to Claim 32 for enteric-coating tablets, pellets or granules wherein the cores are sprayed with a solution of the enteric-coating.

34. Process according to Claim 33, characterised in that the cores, before spraying, are warmed up at 25° up to 40°.

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