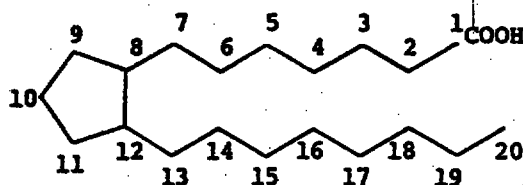


Description

This invention relates to novel compositions of certain PGE-type prostaglandins; a method for preparing stable compositions of such PGE-type compounds and to such compositions dispensed e.g. for oral administration.

Prostaglandins have classically been described as chemically related 20 carbon chain hydroxy fatty acids having the basic skeleton of prostanoic acid:



this structure is the basis for prostaglandin numbering and nomenclature.

Naturally occurring prostaglandins are derivatives of prostanoic acid. For descriptive purposes, four types are recognized. The type distinction is based primarily on pentane ring substituents and structural orientation.

Although they can be named as derivatives of prostanoic acid, they are conventionally referred to by the letters A, B, E and F. Prostaglandins having an hydroxyl group at the C—11 position and a keto group at the C—9 position are known as PGE or PGE-type compounds. Those having hydroxyl groups at C—9 and C—11 are known as the PGF series and are further designated by an α or β suffix to indicate the configuration of the hydroxyl group at said position. Series A and B have a keto group at C—9 and a double bond between C—10 and C—11 or C—8 and C—12 respectively. The natural compounds are the α -hydroxy substituted compounds. Prostaglandins may contain different series of unsaturation in the molecule, particularly at C—5, C—13 and C—17. The unsaturation is also indicated by a suffix. Thus, for example, PGF₁ and PGE₁ series refer to prostanoic acids having a trans-olefin bond at the C—13 position, while the PGF₂ and PGE₂ series refer to prostadienoic acids having a cis-olefin bond at the C—5 position and a trans-olefin bond at the C—13 position. For a review on prostaglandins and the definition of primary prostaglandins, see for example, S. Bergstrom, Recent Progress in Hormone Research 22, pp. 153—175 (1966) and Science 157, p. 382 (1967) by the same author.

Prostaglandins generally act to stimulate gastrointestinal and reproductive smooth muscles, affect relaxation and contraction of respiratory smooth muscle, are hypotensives, and inhibit lipolysis of fatty acids, gastric acid secretion and blood platelet aggregation. There is not a precise structure-activity relationship in the prostaglandin family as much cross-activity is evident.

A great number of studies have been undertaken to enhance, extend and otherwise modify the activity of naturally occurring prostanoic acids. The majority of these studies have focused on modification of two areas, the two side chains and substituents attached to the cyclopentane moiety [see, for example, U. Axen et al, Synthesis Vol. 1, John Wiley and Sons Inc., New York, NY 1973 and P. H. Bently, Chem. Soc. Reviews, 2, 29 (1973)].

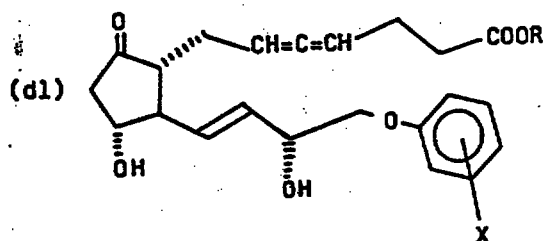
Of special interest to this invention is that group of prostaglandins which are labile in most standard pharmaceutical compositions, particularly PGE compounds and PGE-type compounds. In many instances the cyclopentane ring substituents substantially affect the prostaglandin's level of activity. Compounds which lose an oxygen from either C—9 or C—11 on the cyclopentane ring or which have these positions altered show altered levels of activity. For instance PGE₂ α , which has a carbonyl group at C—9 and an hydroxyl group at C—11 stimulates smooth muscle tissue but loss of the C—11 hydroxyl group to give a double bond in the cyclopentane ring, the PGA or PGB forms, show little or no such activity. This conversion is chemically facile because of the presence of the carbonyl group at C—9 in the PGE and PGE-type compounds which makes the hydroxyl group at C—11 labile to either base or acid dehydroxylation. The product of this dehydroxylation is a double bond conjugated with the carbonyl group of C—9, a stable chemical entity. Under acid conditions PGE-type compounds convert readily to the PGA form. Basic conditions cause PGE-type compounds to dehydroxylate and rearrange to the PGB form. In the case of PGE₂ type compounds this latter form is particularly stable because the C—9 carbonyl is now conjugated with the C—8/C—12 and C—13/C—14 double bonds. Similar degradation patterns have been observed in most compounds which have PGE-type cyclopentane ring substituents.

Initial efforts at providing easily dispensible dose formulations of prostaglandins, particularly for PGE-type compounds, met with difficulty. Aqueous PGE solutions were found to undergo rapid loss of activity when stored at temperatures above 0°C at any pH, but particularly under alkaline conditions. Hydrous solutions adjusted to pH 5—7 were found to be most stable but loss of activity was still so rapid, drug concentrations after several months were very uncertain. Even in neutral or neat solutions there was found gradual degradation. Similar rapid degradation under these conditions have been observed in most compounds which have PGE-type cyclopentane ring substituents.

Various attempts have been made to formulate stable solutions of PGE-type compounds. Stabilisation of these compounds has been observed in some solutions and in solid form at -20°C or lower. More practical and usable alternative methods for stabilizing these prostaglandins have been developed and are described, for example, in US—A—3,749,800; 3,826,823; 3,829,579; 3,851,052; 3,833,725; and 4,221,793. These patents teach the use of such solvents as lower molecular weight alcohols, polyalkylene glycols, dialkylated polyalkylene glycols, triacetin, dimethylacetamide and triethylcitrate. All these disclosures contain the limitation that the solvent and the resulting drug solution must be anhydrous, i.e. contain less than 0.5% water, in order to achieve stable formulations. The dialkylated polyalkylene glycols are excepted from this particular limitation, but preferred formulations using these solvents contain less than 0.5% water.

It has now been found that certain PGE-type prostaglandin compounds can be prepared into stable pharmaceutical solution by dissolving them in 1,2-propylene carbonate. It has also been discovered that the presence of water in such a solution will not significantly affect drug stability even when water is present in an amount up to the solubility limit of water in said solvent. The prostaglandins stabilized by 1,2-propylene carbonate are particularly adaptable for oral administration of therapeutic doses thereof.

Accordingly, the present invention is concerned with a novel stable pharmaceutical composition of a PGE-type compound represented by the formula



wherein R is hydrogen, an alkyl group of 1 to 4 carbon atoms, and X is hydrogen, o-, m- or p-halo, o-, m- or p-methyl or o-, m- or p-methoxy; or the pharmaceutically acceptable, non-toxic salts of a compound in which R is hydrogen, which composition comprises a solution of said PGE type compound in 1,2-propylene carbonate which may contain water in an amount up to the solubility limit of water in 1,2-propylene carbonate and said PGE type compound is present in an amount between 0.001 mg to 100 mg per ml of 1,2-propylene carbonate.

Said pharmaceutically acceptable salts may be prepared from pharmaceutically acceptable non-toxic bases, including inorganic and organic bases. Salts derived from inorganic bases include, preferably, ammonium, potassium, sodium, calcium and magnesium salts. Preferred organic bases are isopropylamine, diethylamine, ethanolamine, piperidine, tromethamine, choline and caffeine.

For the purposes of this invention, it is intended to include racemic mixtures as well as resolved enantiomers of the PGE-type compounds defined above.

The lines shown in the above formula as "≡" indicate that the substituents are in a configuration, i.e., below the plane of the cyclopentane ring.

The double bond at C-13 has the same configuration as in natural prostaglandins of the PGE and PGF series, that is the trans configuration.

These novel compounds possess asymmetric centers and thus can be produced as racemic "(dl)" mixtures or as individual 8R-antimers. The racemic mixtures can be resolved if desired at appropriate stages by methods known to those skilled in the art, to obtain the respective individual antimers.

According to another aspect of the present invention, said compositions may be prepared by dissolving at least one of said PGE-type compounds in said amounts of 1,2-propylene carbonate which may contain water in an amount up to the solubility limit of water in 1,2-propylene carbonate and optionally encapsulating the mixture in a soft-shelled gelatin capsule.

One of the novel aspects of this invention is the use of 1,2-propylene carbonate for formulating the above mentioned prostaglandins which use has not been previously disclosed.

1,2-Propylene carbonate is known by various other names, for example, 4-methyl-1,3-dioxolan-2-one, 1-methylethylene carbonate, and 1,2-propanediol carbonate, to give a few of the most commonly used names. Its CAS number is 108-32-7. It has a molecular weight of 102.09, a boiling point of 241.7°C and a melting point of -55°C . For the purposes of this invention anhydrous propylene carbonate is that propylene carbonate material which contains less than 0.02% water by Karl Fischer titration. Propylene carbonate is readily available from various manufacturers.

The limitation being placed on the selection of a solvent for pharmaceutical compositions is that the solvent itself has no deleterious or untoward effects on the subject to which it is administered in the course of a particular treatment regime. For example, gelatin capsules containing a mentioned PGE-type compound dissolved in 1,2-propylene carbonate may be administered orally with no resultant adverse pharmacodynamic effects on the subject.

As noted above, while the novelty of this invention lies first in the use of 1,2-propylene carbonate as solvent for preparing stable solutions of the prostaglandins specified above, a second, and equally important discovery, is the fact that water may be present in said solvent in an amount up to the solubility limit of water therein without significant effect on prostaglandin stability in that solution.

It is normally preferred to prepare and maintain an anhydrous composition where PGE or PGE-type prostaglandin compounds are concerned because of their expected susceptibility to degradation in the presence of water, particularly cyclopentane ring dehydroxylation. However, most organic solvents in which prostaglandin acids and even esters are soluble, and which are pharmaceutically acceptable, usually contain a trace amount of water, in the range of up to 0.2% and sometimes as high as 0.5%. Further, initially anhydrous solvents may take up water during the formulation stage or during storage. For example, a water miscible solvent fill of soft gelatin capsules can retain up to 5% water by weight depending upon the nature of the fill material. This is because of the nature of the encapsulation process wherein the prepared gelatin shell mix usually contains up to 30% water at the time the drug containing solution is filled into the encapsulating gelatin. The final capsule form is achieved by drying the prepared capsule at an elevated temperature to remove excess water. During the drying process the encapsulated solution can absorb water from the gelatin and retain all or part of that water in spite of the drying process. Thus, while the prostaglandin solution may be initially prepared in an anhydrous form, after soft gelatin capsules have been prepared therefrom several percent of water may be retained by the encapsulated solution even after extended capsule drying. For example, encapsulated 1,2-propylene carbonate typically retains about 1% water at ambient temperature and about 2% at 37°C at 80% relative humidity. The solvents described in the above mentioned patents all specify that water is to be excluded or limited to an amount less than 0.2% in order to obtain a stable prostaglandin solution, a requirement which may be difficult when the above described soft gelatin capsule formulation is prepared.

The solvent of this invention is not faced with the limitations on the amount of water which may be present in a particular solution because it has been found that water may be present in 1,2-propylene carbonate without significant effect on PGE-type compound stability. While it may be considered desirable to prepare anhydrous 1,2-propylene carbonate/PGE-type compounds solutions because of the widely reported stability problems with these compounds in the presence of any protic solvent, anhydrous compositions using this solvent are not required or necessarily needed. Anhydrous 1,2-propylene carbonate solutions of the PGE-type compounds mentioned above have shown no loss of parent drug when stored for 80 days at room temperature. Solutions of these PGE-type compounds in a 10% water/1,2-propylene carbonate solvent at 45°C for 28 days have shown less than 1% degradation within the limits of experimental error.

The amount of water which may be present in these solutions is limited only by the solubility of water in 1,2-propylene carbonate. The solubility is a function of temperature. For instance, the solubility of water in 1,2-propylene carbonate at 20°C is 8.3%. At 45°C it is approximately 15%. Such a water-1,2-propylene carbonate solvent, it has been found, will not effect significant degradation of the PGE-type compounds dissolved therein, even when water is present in an amount up to its solubility limit in 1,2-propylene carbonate.

The PGE-type compounds specified above exhibit prostaglandin-like biological activity and thus are useful in the treatment of mammals where the use of prostaglandins is indicated. These compounds are useful for the control of asthmatic attack because they are bronchodilators and they also exhibit antiallergic properties by inhibition of mediator release. In addition, they are also useful for treating mammals for bronchial spasm or wherever bronchodilator compounds also exhibit vasodilator properties and are useful in controlling palpitating hypertension in mammals. They further exhibit central nervous system depressant activity in mammals, and are useful as sedatives. Most particularly, compounds of this formula have been found to be potent inhibitors of the gastric secretion and ulcer induction and thus are extremely useful in the treatment and prevention of gastric and duodenal ulcers. The compounds are the subject of US-A-4 178 457.

In the practice of this invention, prostaglandin concentrations range from 0.001 to 100 mg/ml of 1,2-propylene carbonate. While the particular concentration for a given prostaglandin will depend on its inherent level of activity and the therapeutic dose to be administered at a particular time and by a particular route, a preferred concentration range will be between 0.01 mg/ml and 20 mg/ml. The most preferred concentration range is 0.01 mg/ml to 5.0 mg/ml, particularly for the compound represented by the above formula wherein R is methyl and X is hydrogen.

If a dosage form suitable for oral administration is desired, the prostaglandin solvent composition may be encapsulated by art recognized methods in a pharmaceutically acceptable water dispersible material suitable for oral administration, for example, gelatin. Herein, soft gelatin capsules are the preferred dose form for oral administration.

In the general case, the compositions of this invention are prepared by adding the prostaglandin to 1,2-propylene carbonate at the desired concentration and stirring the admixture at room temperature until a homogenous solution is obtained. Such procedure provides an effective method for stabilizing the PGE-type compound compositions. This procedure also acts as the first step in the process for dispensing for oral administration the PGE-type compound, the subsequent steps being to encapsulate the solution in a pharmaceutically acceptable water dispersible material suitable for oral administration and administering

said vehicle in such a manner so as to administer a therapeutic dose to the subject.

The following examples set out general descriptions of means for practicing the invention as described herein.

Example 1

To 10 ml of anhydrous 1,2-propylene carbonate at 25°C is added from 0.01 to 10 mg of (dl)-9-keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-trienoic acid methyl ester. The mixture is stirred with a blade type stirrer for 15 minutes until a homogenous solution is obtained.

Example 2

Following the procedure of Example 1, a solution of the same prostaglandin at the same concentrations was dissolved in propylene carbonate containing 5% water by weight.

Example 3

The methyl ester of the trienoic acid methyl ester set out in Example 1 was prepared as a stable composition by adding 0.01 to 10 mg of the compound to 10 ml of propylene carbonate containing 8.3% water by weight and stirring with a blade-type mixer until a homogenous solution was obtained.

Example 4

The products of Examples 1, 2 or 3 may be utilized in an oral dosage form by adding the homogenous propylene carbonate/trienoic acid methyl ester mixture to a soft-shelled gelatin capsule prepared by art recognized methods. The above mentioned compounds, in a variety of concentrations, are then typically administered for the reduction of gastric secretion and the prevention or healing of peptic ulcers in humans, or for other prostaglandin therapeutic uses.

Example 5

Table I sets out study results wherein an E-type prostaglandin, (dl)-9-keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-trienoic acid methyl ester, at a concentration of 0.5 mg/ml, was dissolved in 0.1% water-propylene carbonate and stored at several elevated temperatures for up to 90 days. The same amount of trienoic acid methyl ester was dissolved in propylene carbonate containing 5.0% and 10.0% water and these solutions stored at 45°C for 60 days. The results demonstrate good drug stability in all of these solutions. These results are in comparison to a T_{90} of 8 days at 25°C in an aqueous solution at pH = 3, the most stable pH for this compound.

TABLE I
STABILITY OF AN E-TYPE* PROSTAGLANDIN
IN PROPYLENE CARBONATE (0.5 mg/ml)

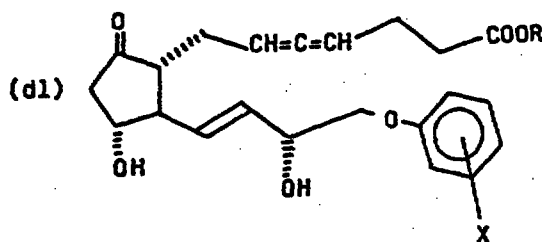
% DRUG REMAINING						
DAYS	0.1% H ₂ O				5% H ₂ O	10% H ₂ O
	40°C	50°C	60°C	80°C	45°C	45°C
0	100	100	100	100	100	100
7	—	—	—	98.3	104	103
14	—	—	100	97.6	103	99.0
21	—	99.3	—	97.4	—	—
28	—	—	96.7	96.2	98.6	102
60	99.6	97.9	94.8	92.5	97.3	88.6
90	—	—	92.8	90.4	—	—

* (dl)-9-keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-trienoic acid methyl ester



Claims for the Contracting States: BE CH DE FR GB IT LI LU NL SE

1. A stable pharmaceutical composition of a PGE type compound represented by the formula:



wherein R is hydrogen, an alkyl group of 1 to 4 carbon atoms, and X is hydrogen, o-, m- or p-halo, o-, m- or p-methyl or o-, m- or p-methoxy; or the pharmaceutically acceptable, non-toxic salts of a compound in which R is hydrogen, which composition comprises a solution of said PGE type compound in 1,2-propylene carbonate which may contain water in an amount up to the solubility limit of water in 1,2-propylene carbonate and said PGE type compound is present in an amount between 0.001 mg to 100 mg per ml of 1,2-propylene carbonate.

2. The stable pharmaceutical composition according to claim 1, wherein said PGE type compound is present in an amount between 0.01 mg to 20 mg per ml of 1,2-propylene carbonate.

3. The stable pharmaceutical composition according to claim 2 wherein said PGE type compound is (dl)-9-keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-trienoic acid methyl ester which is present in an amount between 0.01 mg to 5 mg per ml of 1,2-propylene carbonate.

4. A stable pharmaceutical composition according to claim 1 which is encapsulated in a soft-shelled gelatin capsule.

5. The stable pharmaceutical composition according to claim 4, wherein said PGE type compound is present in an amount between 0.01 mg to 20 mg per ml of 1,2-propylene carbonate.

6. The stable pharmaceutical composition according to claim 5, wherein said PGE type compound is (dl)-9-keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-trienoic acid methyl ester which is present in an amount between 0.01 mg to 5 mg per ml of 1,2-propylene carbonate.

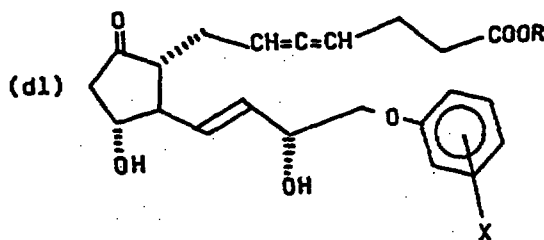
7. A method for preparing a stable pharmaceutical composition of PGE type compounds according to claims 1 to 4, which method comprises dissolving at least one of said PGE-type compounds in said amounts in 1,2-propylene carbonate which may contain water in an amount up to the solubility limit of water in 1,2-propylene carbonate and optionally encapsulating the mixture in a soft-shelled gelatin capsule.

8. The method according to claim 7 wherein said PGE type compound is present in an amount between 0.01 mg to 20 mg per ml of 1,2-propylene carbonate.

9. The method according to claim 7, wherein said PGE type compound is (dl)-9-keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-trienoic acid methyl ester which is present in an amount between 0.01 mg to 5 mg per ml of 1,2-propylene carbonate.

Claims for the Contracting State: AT

1. A method for preparing a stable pharmaceutical composition of PGE type compounds, represented by the formula:



wherein R is hydrogen, an alkyl group of 1 to 4 carbon atoms, and X is hydrogen, o-, m- or p-halo, o-, m- or p-methyl or o-, m- or p-methoxy; or the pharmaceutically acceptable, non-toxic salts of a compound in which R is hydrogen, which method comprises dissolving at least one of said PGE type compounds in an amount between 0.001 mg to 100 mg per ml in 1,2-propylene carbonate which may contain water in an amount up to the solubility limit of water in 1,2-propylene carbonate and optionally encapsulating the mixture in a soft-shelled gelatin capsule.



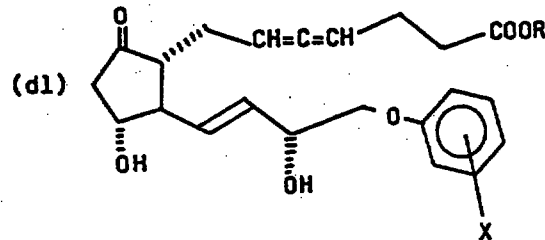
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2. The method according to claim 1 wherein said PGE type compound is present in an amount between 0.01 mg to 20 mg per ml of 1,2-propylene carbonate.

3. The method according to claim 1, wherein said PGE type compound is (dl)-9-keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-trienoic acid methyl ester which is present in an amount between 0.01 mg to 5 mg per ml of 1,2-propylene carbonate.

Patentansprüche für die Vertragsstaaten: BE CH DE FR GB IT LI LU NL SE

1. Stabile pharmazeutische Zusammensetzung einer Verbindung des PGE-Typs mit der Formel



worin R Wasserstoff, eine Alkylgruppe mit 1 bis 4 Kohlenstoffatomen ist und X Wasserstoff, o-, m- oder p-Halogen, o-, m- oder p-Methyl oder o-, m- oder p-Methoxy ist; oder der pharmazeutisch annehmbaren, nicht-toxischen Salze einer Verbindung, in welcher R Wasserstoff ist, dadurch gekennzeichnet, daß sie eine Lösung dieser Verbindung des PGE-Typs in 1,2-Propylencarbonat, die Wasser in einer Menge bis zur Löslichkeitsgrenze des Wassers in 1,2-Propylencarbonat enthalten kann, umfaßt und die Verbindung des PGE-Typs in einer Menge von 0,001 bis 100 mg/ml 1,2-Propylencarbonat anwesend ist.

2. Stabile pharmazeutische Zusammensetzung nach Anspruch 1, in welcher die Verbindung des PGE-Typs in einer Menge von 0,01 bis 20 mg/ml 1,2-Propylencarbonat anwesend ist.

3. Stabile pharmazeutische Zusammensetzung nach Anspruch 2, in welcher die Verbindung des PGE-Typs (dl) - 9 - Keto - 11 α ,15 α - dihydroxy - 16 - phenoxy - 17,18,19,20 - tetranorprosta - 4,5,13 - trans - triensäure - methylester ist, der in einer Menge von 0,01 bis 5 mg/ml 1,2-Propylencarbonat anwesend ist.

4. Stabile pharmazeutische Zusammensetzung nach Anspruch 1, die in einer weichen Gelatine kapsel eingekapselt ist.

5. Stabile pharmazeutische Zusammensetzung nach Anspruch 4, in welcher die Verbindung des PGE-Typs in einer Menge von 0,01 bis 20 mg/ml 1,2-Propylencarbonat anwesend ist.

6. Stabile pharmazeutische Zusammensetzung nach Anspruch 5, in welcher die Verbindung des PGE-Typs (dl) - 9 - Keto - 11 α ,15 α - dihydroxy - 16 - phenoxy - 17,18,19,20 - tetranorprosta - 4,5,13 - trans - triensäure - methylester ist, der in einer Menge von 0,01 bis 5 mg/ml 1,2-Propylencarbonat anwesend ist.

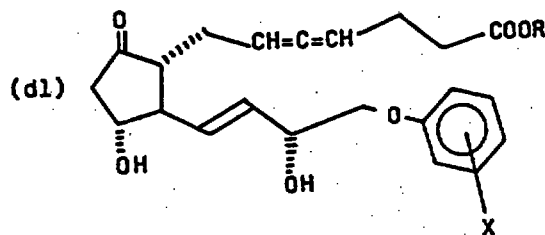
7. Verfahren zur Herstellung einer stabilen pharmazeutischen Zusammensetzung von Verbindungen des PGE-Typs nach Anspruch 1 oder 4, dadurch gekennzeichnet, daß man mindestens eine dieser Verbindungen des PGE-Typs in den genannten Mengen in 1,2-Propylencarbonat, das Wasser in einer Menge bis zur Löslichkeitsgrenze des Wassers in 1,2-Propylencarbonat enthalten kann, löst und gegebenenfalls die Mischung in einer weichen Gelatine kapsel einkapselt.

8. Verfahren nach Anspruch 7, in welchem die Verbindung des PGE-Typs in einer Menge von 0,01 bis 20 mg/ml 1,2-Propylencarbonat anwesend ist.

9. Verfahren nach Anspruch 7, in welchem die Verbindung des PGE-Typs (dl)-9-Keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tetranorprosta-4,5,13-trans-triensäure-methylester ist, der in einer Menge von 0,01 bis 5 mg/ml 1,2-Propylencarbonat anwesend ist.

Patentansprüche für den Vertragsstaat: AT

1. Verfahren zur Herstellung einer stabilen pharmazeutischen Zusammensetzung von Verbindungen des PGE-Typs mit der Formel



worin R Wasserstoff, eine Alkylgruppe mit 1 bis 4 Kohlenstoffatomen ist und X Wasserstoff, o-, m- oder p-

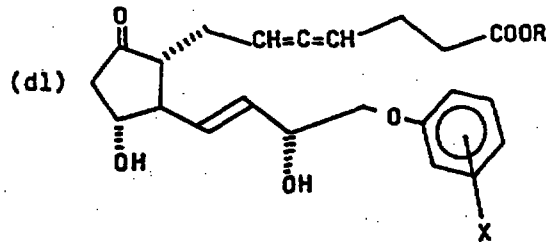
Halogen, o-, m- oder p-Methyl oder o-, m- oder p-Methoxy ist; oder der pharmazeutisch annehmbaren, nicht-toxischen Salze der Verbindungen, in welchen R Wasserstoff ist, dadurch gekennzeichnet, daß man mindestens eine dieser PGE Verbindungen in einer Menge von 0,01 bis 100 mg/ml in 1,2-Propylencarbonat, das Wasser in einer Menge bis zur Löslichkeitsgrenze des Wassers in 1,2-Propylencarbonat enthalten kann, löst und gegebenenfalls die Mischung in einer weichen Gelatinekapsel einkapselt.

2. Verfahren nach Anspruch 1, in welchem die Verbindung des PGE-Typs in einer Menge von 0,01 bis 20 mg/ml 1,2-Propylencarbonat anwesend ist.

3. Verfahren nach Anspruch 1, in welchem die Verbindung des PGE-Typs (dl)-9-Keto-11 α ,15 α -dihydroxy-16-phenoxy-17,18,19,20-tétranorprosta-4,5,13-trans-triénoïque-methylester ist, der in einer Menge von 0,01 bis 5 mg/ml 1,2-Propylencarbonat anwesend ist.

Revendications pour les Etats contractants: BE CH DE FR GB IT LI LU NL SE

1. Composition pharmaceutique stable d'un composé du type PGE représenté par la formule:



dans laquelle R désigne l'hydrogène, un groupe alkyle ayant 1 à 4 atomes de carbone, et X est l'hydrogène, un radical o-, m- ou p-halogéno, o-, m- ou p-méthyle ou o-, m- ou p-méthoxy; ou des sels non toxiques pharmaceutiquement acceptables d'un composé dans lequel R est l'hydrogène, composition qui comprend une solution dudit composé du type PGE dans du carbonate de 1,2-propylène qui peut contenir de l'eau en une quantité allant jusqu'à la limite de solubilité de l'eau dans le carbonate de 1,2-propylène et ledit composé du type PGE est présent en une quantité comprise entre 0,001 mg et 100 mg par ml de carbonate de 1,2-propylène.

2. Composition pharmaceutique stable suivant la revendication 1, dans laquelle ledit composé du type PGE est présent en une quantité comprise entre 0,01 mg et 20 mg par ml de carbonate de 1,2-propylène.

3. Composition pharmaceutique stable suivant la revendication 2, dans laquelle ledit composé du type PGE est l'ester méthylique d'acide (dl)-9-céto-11 α ,15 α -dihydroxy-16-phénoxy-17,18,19,20-tétranorprosta-4,5,13-trans-triénoïque qui est présent en une quantité comprise entre 0,01 mg et 5 mg par ml de carbonate de 1,2-propylène.

4. Composition pharmaceutique stable suivant la revendication 1, qui est encapsulée dans une capsule de gélatine à enveloppe molle.

5. Composition pharmaceutique stable suivant la revendication 4, dans laquelle ledit composé du type PGE est présent en une quantité comprise entre 0,01 mg et 20 mg par ml de carbonate de 1,2-propylène.

6. Composition pharmaceutique stable suivant la revendication 5, dans laquelle ledit composé du type PGE est l'ester méthylique d'acide (dl)-9-céto-11 α ,15 α -dihydroxy-16-phénoxy-17,18,19,20-tétranorprosta-4,5,13-trans-triénoïque qui est présent en une quantité comprise entre 0,01 mg et 5 mg par ml de carbonate de 1,2-propylène.

7. Procédé de préparation d'une composition pharmaceutique stable de composés du type PGE suivant les revendications 1 ou 4, procédé qui consiste à dissoudre au moins un desdits composés de type PGE dans lesdits composés de carbonate de 1,2-propylène qui peuvent contenir de l'eau en une quantité allant jusqu'à la limite de solubilité de l'eau dans le carbonate de 1,2-propylène et à encapsuler éventuellement le mélange dans une capsule de gélatine à enveloppe molle.

8. Procédé suivant la revendication 7, dans lequel ledit composé du type PGE est présent en une quantité comprise entre 0,01 mg et 20 mg par ml de carbonate de 1,2-propylène.

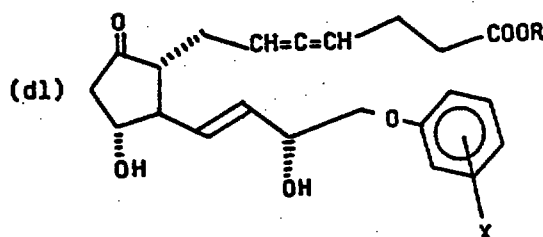
9. Procédé suivant la revendication 7, dans lequel ledit composé du type PGE est l'ester méthylique d'acide (dl)-9-céto-11 α ,15 α -dihydroxy-16-phénoxy-17,18,19,20-tétranorprosta-4,5,13-trans-triénoïque qui est présent en une quantité comprise entre 0,01 mg et 5 mg par ml de carbonate de 1,2-propylène.



Revendications pour l'Etat contractant: AT

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1. Procédé de préparation d'une composition pharmaceutique stable de composés du type PGE, représentés par la formule



dans laquelle R désigne l'hydrogène, un groupe alkyle de 1 à 4 atomes de carbone, X est l'hydrogène, un radical o-, m- ou p-halogéno, o-, m- ou p-méthyle ou o-, m- ou p-méthoxy ou des sels non toxiques pharmaceutiquement acceptables de composés dans lesquels R est l'hydrogène, procédé qui consiste à dissoudre au moins l'un desdits composés du type PGE en une quantité comprise entre 0,001 mg et 100 mg par ml dans du carbonate de 1,2-propylène qui peut contenir de l'eau en une quantité allant jusqu'à la limite de solubilité de l'eau dans le carbonate de 1,2-propylène, et à encapsuler éventuellement le mélange dans une capsule de gélatine à enveloppe molle.

2. Procédé suivant la revendication 1, dans lequel ledit composé du type PGE est présent en une quantité comprise entre 0,01 mg et 20 mg par ml de carbonate de 1,2-propylène.

3. Procédé suivant la revendication 1, dans lequel ledit composé du type PGE est l'ester méthylique d'acide (dl)-9-céto-11 α ,15 α -dihydroxy-16-phénoxy-17,18,19,20-tétranorprosta-4,5,13-trans-triénoïque qui est présent en une quantité comprise entre 0,01 mg et 5 mg par ml de carbonate de 1,2-propylène.

