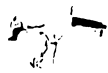


**(12) PATENT**  
**(19) AUSTRALIAN PATENT OFFICE**

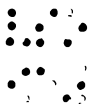
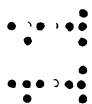
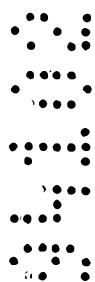
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- (54) Title  
**Method and composition for the treatment and prevention of hyperuricemia**
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- (71) Applicant(s)  
**Sankyo Company Limited**
- (72) Inventor(s)  
**Toshihiko Fujiwara; Koichi Iwasaki; Hiroyoshi Horikoshi**
- (74) Agent/Attorney  
**DAVIES COLLISON CAVE, 1 Little Collins Street, MELBOURNE VIC 3000**
- (56) Related Art  
**US 4572912**  
**BERGER ET AL(1996) ENDOCRINOLOGY 137:1984**  
**KUMAR ET AL (1996) DIABETOLOGIA 39:701**



## ABSTRACT

Insulin sensitivity enhancers, such as troglitazone, have the ability to treat and/or prevent hyperuricemia and may thus be used for the therapy or prophylaxis of such diseases as gout, urinary calculus, hyperuricemic nephropathy and Lesch-Nyhan syndrome.



**AUSTRALIA**  
**PATENTS ACT 1990**  
**COMPLETE SPECIFICATION**

**NAME OF APPLICANT(S):**

**Sankyo Company Limited**

**ADDRESS FOR SERVICE:**

**DAVIES COLLISON CAVE**  
Patent Attorneys  
1 Little Collins Street, Melbourne, 3000.

**INVENTION TITLE:**

**Method and composition for the treatment and prevention of hyperuricemia**

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

**Background to the Invention**

The present invention relates to a composition and method for the treatment or  
5 prevention of hyperuricemia, in which the active agent is an insulin-resistance  
improving substance, commonly referred to as "insulin sensitivity enhancers".

Hyperuricemia is a disease characterized by an abnormally high level of uric acid  
in the plasma. Plasma is saturated with uric acid at 7.0 mg/dl, and, if the level of uric  
acid in the blood reaches or exceeds this level because of a metabolic disorder  
10 involving uric acid, the resulting condition is called "hyperuricemia". When the  
concentration of uric acid in the blood exceeds a certain level, uric acid precipitates as  
monosodium urate and may deposit in various tissues, such as the cavitas articulare or  
kidney. This deposition may cause gout, renal disorders or angiopathy.  
Hyperuricemia may be caused by reduced excretion of uric acid, by its excessive  
15 production or by a combination of both. It may also result from other diseases, such as  
an enzymatic abnormality in the purine metabolism. These are all so-called "primary  
causes". Other diseases, such as disorders of the hemocytopoietic organs and renal  
disorders, and administration of a medicament, such as pyrazinamide or thiazide, may  
also result in hyperuricemia, and are "so-called secondary causes".

20 Examples of diseases caused by hyperuricemia include gout (including acute  
gouty arthritis and chronic tophaceous arthritis), urinary calculus, hyperuricemic  
nephropathy (chronic gouty nephropathy, acute hyperuricemic nephropathy) and  
Lesch-Nyhan syndrome.

Initial treatment of the symptoms of hyperuricemia, particularly gout, may be by  
25 the administration of an analgesic agent, such as colchicine, and/or an analgesic anti-  
inflammatory, such as indomethacin. It is common practice to treat the longer term  
problem of hyperuricemia by control of the diet, for example by limiting the intake of  
alcohol or by controlling intake of calories. However, if this dietetic treatment does

not work sufficiently well, the disease may be treated by the administration of drugs, for example by the prophylactic administration of an analgesic agent, such as colchicine, or by means of a uric acid excretion stimulator, such as probenecid, sulfinpyrazone, ketophenylbutazone, bucolome or benzbromarone, or a uric acid synthesis inhibitor, such as allopurinol.

In recent years, insulin sensitivity enhancers have been developed for the prevention or treatment of diabetes. The term "insulin sensitivity enhancer" as used herein means a compound which can bring about an improvement in the impaired action of insulin in spite of the existence of endogenous insulin. A wide range of compounds is embraced by the term "insulin sensitivity enhancer". Typical examples include various thiazolidinedione compounds, oxazolidinedione compounds, isoxazolidinedione compounds and oxadiazolidinedione compounds. They are described, for example, in:

WO 94/01433 (= Japanese Patent Application Kokai No. Hei 6-80667), Japanese Patent Application Kokai No. Hei 4-69383, WO 92/02520 (= Japanese Language Kokai Publication (PCT) No. Hei 6-500538), WO 91/07107 (= Japanese Patent Application Kokai No. Hei 3-170478 = Japanese Patent Publication No. Hei 7-8862), U.S. Patent No. 5 132 317 (= Japanese Patent Application Kokai No. Hei 3-90071), U.S. Patent No. 4 897 405 (= Japanese Patent Application Kokai No. Hei 2-292272), WO 89/08651 (= Japanese Patent Application Kokai No. Hei 1-272574), U.S. Patent Nos. 5 061 717, 5 120 754, 5 223 522 (= Japanese Patent Application Kokai No. Hei 1-272573), U.S. Patent Nos. 5 002 953, 5 194 443, 5 232 925, 5 260 445 (= Japanese Patent Application Kokai No. Hei 1-131169), U.S. Patent No. 4 918 091 (= Japanese Patent Application Kokai No. Sho 64-13076), U.S. Patent Nos. 4 897 393, 4 948 900 (= Japanese Patent Application Kokai No. Sho 64-56675 = Japanese Patent Publication No. Hei 5-5832), U.S. Patent No. 4 873 255 (= Japanese Patent Application Kokai No. Sho 64-38090), U.S. Patent No. 4 703 052 (= Japanese Patent Application Kokai No. Sho 61-271287 = Japanese Patent Publication No. Hei 5-86953), U.S. Patent No. 4 687 777 (= Japanese Patent Application Kokai No. Sho 61-267580 = Japanese Patent Publication No. Hei 5-31079), U.S. Patent No. 4 725 610 (= Japanese Patent

Application Kokai No. Sho 61-85372 = Japanese Patent Publication No. Hei 5-66956),  
U.S. Patent No. 4 572 912 (= Japanese Patent Application Kokai No. Sho 60-51189 =  
Japanese Patent Publication No. Hei 2-31079), U.S. Patent No. 4 461 902 (= Japanese  
Patent Application Kokai No. Sho 58-118577 = Japanese Patent Publication No. Hei  
5 2-57546), U.S. Patent Nos. 4 287 200, 4 340 605, 4 438 141, 4 444 779 (= Japanese  
Patent Application Kokai No. Sho 55-22636 = Japanese Patent Publication No. Sho  
62-42903), EP 0 708 098A (Japanese Patent Application Kokai No. Hei 9-48779), EP  
0 676 398A (= Japanese Patent Application Kokai No. Hei 7-330728), WO 95/18125,  
EP 0 745 600A, EP 0 332 332A (= Japanese Patent Application Kokai No. Hei  
10 1-272574) and EP 0 604 983A (= Japanese Patent Application Kokai No. Hei  
6-247945).

For example, 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]-  
thiazolidine-2,4-dione (which will hereinafter be called "troglitazone") is a thiazolidine  
derivative having the ability to enhance the action of insulin and is known for the  
15 treatment and/or prevention of diabetes [Fujiwara *et al.*, "Diabetes", 37, 1459 (1988);  
Hofmann C.A. *et al.*, "Diabetes Care", 15, 1075 (1992)]. It has also been reported that  
the compound has an antioxidant action and is therefore useful as a treatment for  
insulin-dependent diabetes mellitus (Type I diabetes: IDDM) ["Tonyoby (Diabetes)",  
37(2), 127-129 (1994)].

20 It has not, however, previously been reported that any of the above compounds  
are useful for the treatment or prevention of hyperuricemia.

There is, for example, a report based on clinical examination values concerning  
the relationship between the administration of CS-045 (=troglitazone) and uric acid.  
According to this report, before the administration of troglitazone, the uric acid level is  
25  $4.7 \pm 1.7$ , which decreases slightly to  $4.4 \pm 1.4$  after administration. This decrease is  
within the normal changes to be expected, and there is no suggestion that the  
administration of troglitazone is effective for the treatment or prevention of  
hyperuricemia ["Rinsho Iyaku (Clinical Medicine)", 9, Suppl.3 (July issue), 14  
(1993)].

There have also been reports on the relationship between hyperuricemia and insulin resistance. They only suggest the relationship and do not make any suggestion that an insulin sensitivity enhancer is effective for the treatment or prevention of hyperuricemia ["Tonyoby (Diabetes)", 40, an extra number, 239, 2P041 (1997), "Sougo Rinsho (Clinic All-round)", 46(8), 2128-2130 (1997) and "Mebio", 14(9), 90-96 (1997)].

It has been reported, for example, that 1-(3-bromobenzo[b]furan-2-ylsulfonyl)-hydantoin (Japanese Patent Application Kokai No. Hei 6-211657) or benzopyran derivatives (Japanese Patent Application Kokai No. Sho 63-107971), such as ethyl {[5-chloro-3-(2-methylphenyl)-4-oxo-4H-1-benzopyran-7-yl]oxy}acetate, are effective for the prevention and treatment of hyperuricemia, but they are utterly different in structure from the compounds of the present invention.

We have now, most surprisingly, discovered that insulin sensitivity enhancers also have the ability to treat and/or prevent hyperuricemia.

#### 15 ***Brief Summary of the Invention***

Advantageously, at least one embodiment of the present invention provides a method for the treatment or prevention of hyperuricemia.

A further advantage of at least one embodiment of the present invention is that a composition for the treatment or prevention of hyperuricemia is provided.

20 Other advantages of the present invention will become apparent as the description proceeds.

The present invention thus provides a method for the treatment or prevention of hyperuricemia in a mammal suffering from hyperuricemia, which comprises administering to said mammal an amount of an insulin sensitivity enhancer effective to reduce or prevent hyperuricemia.



The invention also provides a composition for the treatment or prevention of hyperuricemia in a mammal suffering from hyperuricemia, which comprises an effective amount of an insulin sensitivity enhancer.

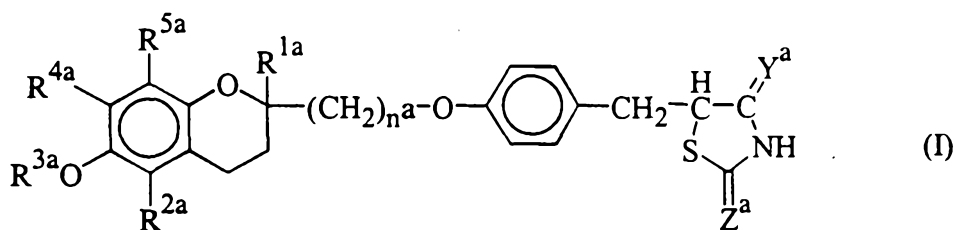
**Detailed Description of the Invention**

5 In particular, the insulin sensitivity enhancers employed in the present invention are preferably selected from the group consisting of thiazolidinedione compounds, iminothiazolidinone compounds, diiminothiazolidine compounds, thioxothiazolidinone compounds, iminotriazole compounds, oxazolidinedione compounds, isoxazolidinedione compounds and oxadiazolidinedione compounds, preferably the  
10 thiazolidinedione compounds. Also included are pharmaceutically acceptable salts of these compounds.

Examples of the insulin sensitivity enhancers which may be used in the present invention are as follows:

(I) Japanese Patent Application Kokai No. Sho 60-51189 (Japanese Patent Publication  
15 No. Hei 2-31079), U.S. Patent No. 4 572 912 and European Patent Publication No. 139421A describe:

(1) thiazolidine derivatives represented by the following formula (I):



wherein:

20 R<sup>1a</sup> and R<sup>2a</sup> are the same or different and each represents a hydrogen atom or an alkyl group having from 1 to 5 carbon atoms;

R<sup>3a</sup> represents a hydrogen atom, an aliphatic acyl group having from 1 to 6 carbon

atoms, a cycloalkylcarbonyl group having from 6 to 8 carbon atoms, a benzoyl or naphthoyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\chi$ , defined below, a heterocyclic acyl group in which the heterocyclic part has from 4 to 7 ring atoms of which from 1 to 3 are hetero-atoms selected from the group consisting of nitrogen, oxygen and sulfur atoms, a phenylacetyl group, a phenylpropionyl group, a phenylacetyl or phenylpropionyl group substituted with at least one halogen atom, a cinnamoyl group, an alkoxycarbonyl group having from 2 to 7 carbon atoms or a benzyloxycarbonyl group;

10 said substituent  $\chi$  is an alkyl group having from 1 to 4 carbon atoms, an alkoxy group having from 1 to 4 carbon atoms, a hydroxy group, a halogen atom, an amino group, a monoalkylamino group having from 1 to 4 carbon atoms, a dialkylamino group having from 1 to 4 carbon atoms in each alkyl group or a nitro group;

15  $R^{4a}$  and  $R^{5a}$  are the same or different and each represents a hydrogen atom, an alkyl group having from 1 to 5 carbon atoms or an alkoxy group having from 1 to 5 carbon atoms, or  $R^{4a}$  and  $R^{5a}$  together represent an alkylenedioxy group having from 1 to 4 carbon atoms;

20  $Y^a$  and  $Z^a$  are the same or different and each represents an oxygen atom or an imino group; and

$n^a$  represents an integer of from 1 to 3;

and pharmaceutically acceptable salts thereof.

In the compounds of formula (I), details, such as the definitions of  $R^{1a}$ ,  $R^{2a}$ ,  $R^{3a}$ ,  $R^{4a}$ ,  $R^{5a}$ ,  $Y^a$ ,  $Z^a$  and  $n^a$ , the kinds of pharmaceutically acceptable salt, the process for preparing the compounds of formula (I), examples of the compound and preparative examples are described in Japanese Patent Application Kokai No. Sho 60-

51189 (Japanese Patent Publication No. Hei 2-31079), U.S. Patent No. 4572912 and European Patent Publication No. 139421A, the disclosures of which are incorporated herein by reference.

More specifically, where R<sup>1a</sup>, R<sup>2a</sup>, R<sup>4a</sup>, or R<sup>5a</sup> represents an alkyl group, this  
5 may be a straight or branched chain alkyl group having from 1 to 5, carbon atoms, and examples include the methyl, ethyl, propyl, isopropyl, butyl, isobutyl, sec-butyl, t-butyl, pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 1-ethylpropyl and 2-ethylpropyl groups. Of these, we prefer those alkyl groups having from 1 to 4 carbon atoms, most preferably the methyl group.

10 Where R<sup>3a</sup> represents an aliphatic acyl group having from 1 to 6 carbon atoms, this may be a straight or branched chain group. Specific examples include the formyl, acetyl, propionyl, butyryl, isobutyryl, pivaloyl, valeryl, isovaleryl and hexanoyl groups.

Where R<sup>3a</sup> represents a cycloalkylcarbonyl group, this has from 6 to 8 carbon  
15 atoms (i.e. from 5 to 7 carbon atoms in the cycloalkyl group). Examples of such groups include the cyclopentylcarbonyl, cyclohexylcarbonyl and cycloheptylcarbonyl groups.

Where R<sup>3a</sup> represents a heterocyclic acyl group, this is a group in which a  
heterocyclic group is attached to a carbonyl group. The heterocyclic part has from 4 to  
20 7 ring atoms, more preferably 5 or 6 ring atoms, of which from 1 to 3, more preferably 1 or 2 and most preferably 1, are hetero-atoms selected from the group consisting of nitrogen, oxygen and sulfur atoms. Where there are 3 hetero-atoms in the heterocyclic group, these are preferably all nitrogen atoms or one or two are nitrogen atoms and, correspondingly, two or one are oxygen and/or sulfur atoms. The heterocyclic group is  
25 preferably aromatic. Examples of preferred heterocyclic acyl groups include the furoyl (more preferably 2-furoyl), thenoyl (more preferably 3-thenoyl), 3-pyridinecarbonyl (nicotinoyl) and 4-pyridinecarbonyl (isonicotinoyl) groups.

Where  $R^{3a}$  represents an alkoxycarbonyl group, this may be a straight or branched chain alkoxycarbonyl group having from 1 to 6 carbon atoms in the alkoxy part, i.e. having a total of from 2 to 7 carbon atoms, such as the methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, isopropoxycarbonyl, butoxycarbonyl, isobutoxycarbonyl, sec-butoxycarbonyl, t-butoxycarbonyl, pentyloxycarbonyl and hexyloxycarbonyl groups, of which we prefer those alkoxycarbonyl groups having from 2 to 4 carbon atoms and most prefer the ethoxycarbonyl group.

Where substituent  $\chi$  represents an alkyl group, this may be a straight or branched chain alkyl group having from 1 to 4 carbon atoms, and examples are included among the alkyl groups exemplified in relation to  $R^{1a}$  and  $R^{2a}$ .

Where substituent  $\chi$  represents an alkoxy group, this may be a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, and examples include the methoxy, ethoxy, propoxy, isopropoxy, butoxy, isobutoxy, sec-butoxy and t-butoxy groups, most preferably the methoxy group.

Where substituent  $\chi$  represents a halogen atom, this may be, for example, a fluorine, chlorine, bromine or iodine atom.

Where substituent  $\chi$  represents an alkylamino group having from 1 to 4 carbon atoms, this may be a straight or branched chain group, such as the methylamino, ethylamino, propylamino, isopropylamino, butylamino, isobutylamino, sec-butylamino or t-butylamino group, of which we prefer the methylamino group

Where substituent  $\chi$  represents a dialkylamino group having from 1 to 4 carbon atoms in each alkyl part, these may be straight or branched chain groups, such as the dimethylamino, diethylamino, dipropylamino, diisopropylamino, dibutylamino, diisobutylamino, di-sec-butylamino, di-t-butylamino, N-methyl-N-ethylamino, N-methyl-N-propylamino, N-methyl-N-isopropylamino, N-methyl-N-butylamino, N-methyl-N-isobutylamino, N-methyl-N-sec-butylamino, N-methyl-N-t-butylamino, N-ethyl-N-propylamino, N-ethyl-N-isopropylamino, N-ethyl-N-butylamino, N-ethyl-N-isobutylamino, N-ethyl-N-sec-butylamino, N-ethyl-N-t-butylamino, N-propyl-N-

isopropylamino, N-propyl-N-butylamino, N-propyl-N-isobutylamino, N-propyl-N-sec-butylamino, N-propyl-N-t-butylamino, N-isopropyl-N-butylamino, N-isopropyl-N-isobutylamino, N-isopropyl-N-sec-butylamino, N-isopropyl-N-t-butylamino, N-butyl-N-isobutylamino, N-butyl-N-sec-butylamino, N-butyl-N-t-butylamino, N-isobutyl-N-sec-butylamino, N-isobutyl-N-t-butylamino and N-sec-butyl-N-t-butylamino groups, of which we prefer the dimethylamino group.

Where R<sup>4a</sup> or R<sup>5a</sup> represents an alkoxy group, this may be a straight or branched chain alkoxy group having from 1 to 5 carbon atoms, and examples include the methoxy, ethoxy, propoxy, isopropoxy, butoxy, isobutoxy, sec-butoxy, t-butoxy and pentyloxy groups, of which we prefer those alkoxy groups having from 1 to 4 carbon atoms and most prefer the methoxy group.

Where R<sup>4a</sup> and R<sup>5a</sup> together represent an alkylenedioxy group, this has from 1 to 4 carbon atoms and examples include the methylenedioxy, ethylenedioxy, propylenedioxy, trimethylenedioxy and tetramethylenedioxy groups, of which the methylenedioxy and ethylenedioxy groups are preferred.

Preferred examples of compounds of formula (I) include:

- (2) Compounds in which R<sup>1a</sup> represents an alkyl group having from 1 to 4 carbon atoms.
- (3) Compounds in which R<sup>2a</sup> represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms.
- (4) Compounds in which R<sup>3a</sup> represents a hydrogen atom, an aliphatic acyl group having from 1 to 4 carbon atoms, an unsubstituted benzoyl or naphthoyl group or an alkoxycarbonyl group having from 2 to 4 carbon atoms.
- (5) Compounds in which R<sup>4a</sup> represents an alkyl group having from 1 to 4 carbon atoms.

(6) Compounds in which  $R^{5a}$  represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms.

(7) Compounds in which:

$R^{1a}$  represents an alkyl group having from 1 to 4 carbon atoms,

5  $R^{2a}$  represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms,

$R^{3a}$  represents a hydrogen atom, an aliphatic acyl group having from 1 to 4 carbon atoms, an unsubstituted benzoyl or naphthoyl group or an alkoxy carbonyl group having from 2 to 4 carbon atoms,

10  $R^{4a}$  represents an alkyl group having from 1 to 4 carbon atoms, and

$R^{5a}$  represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms.

(8) Compounds in which  $R^{3a}$  represents a hydrogen atom, an acetyl group, a benzoyl group or an ethoxy carbonyl group.

15 (9) Compounds in which:

$R^{1a}$  represents an alkyl group having from 1 to 4 carbon atoms,

$R^{2a}$  represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms,

20  $R^{3a}$  represents a hydrogen atom, an acetyl group, a benzoyl group or an ethoxy carbonyl group,

$R^{4a}$  represents an alkyl group having from 1 to 4 carbon atoms, and

$R^{5a}$  represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms.

(10) Compounds in which  $R^{1a}$  represents a methyl group.

(11) Compounds in which  $R^{2a}$  represents a hydrogen atom or a methyl group.

5 (12) Compounds in which  $R^{3a}$  represents a hydrogen atom, an acetyl group or an ethoxycarbonyl group.

(13) Compounds in which  $R^{4a}$  represents a methyl or t-butyl group.

(14) Compounds in which  $R^{5a}$  represents a hydrogen atom or methyl group.

(15) Compounds in which:

10  $R^{1a}$  represents a methyl group,

$R^{2a}$  represents a hydrogen atom or a methyl group,

$R^{3a}$  represents a hydrogen atom, an acetyl group or an ethoxycarbonyl group,

$R^{4a}$  represents a methyl or t-butyl group, and

$R^{5a}$  represents a hydrogen atom or a methyl group.

15 (16) Compounds selected from:

i) 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione (troglitazone),

ii) 5-[4-(6-hydroxy-2-methyl-7-t-butylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

20 iii) 5-[4-(6-hydroxy-2-ethyl-5,7,8-trimethylchroman-2-ylmethoxy)benzyl]thiazolidine-

2,4-dione,

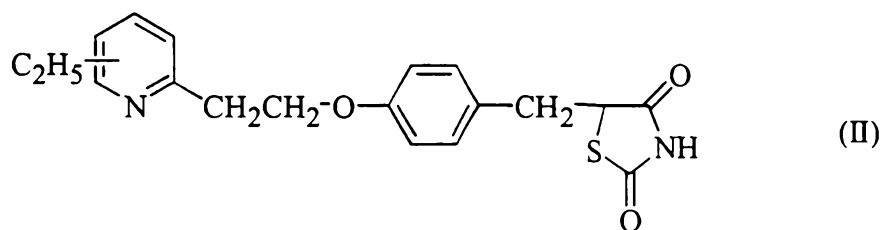
iv) 5-[4-(6-hydroxy-2-isobutyl-5,7,8-trimethylchroman-2-ylmethoxy)benzyl]-thiazolidine-2,4-dione,

v) 5-[4-(6-acetoxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione, and

vi) 5-[4-(6-ethoxycarbonyloxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]-thiazolidine-2,4-dione.

(II) Japanese Patent Application Kokai No. Sho 61-267580 (Japanese Patent Publication No. Hei 5-66956) and U.S. Patent No. 4 687 777 describe:

(1) thiazolidine derivatives of formula (II):



and pharmaceutically acceptable salts thereof.

In the compounds of formula (II), details, such as the kinds of pharmaceutically acceptable salt, the preparation process, examples of the compounds and preparative examples are described in Japanese Patent Application Kokai No. Sho 61-267580 (Japanese Patent Publication No. Hei 5-66956) and U.S. Patent No. 4 687 777, the disclosures of which are incorporated herein by reference.

Preferred examples of the compounds of formula (II) include:

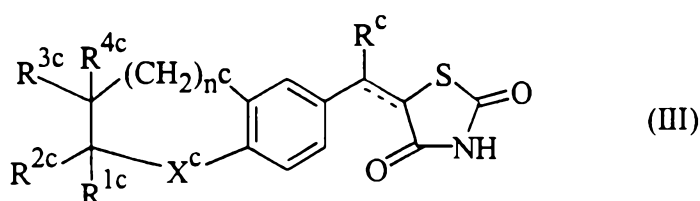
- (2) Compounds selected from
- i) 5-{4-[2-(3-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,
- ii) 5-{4-[2-(4-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

iii) 5-{4-[2-(5-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione (which will hereinafter be called "pioglitazone") and

iv) 5-{4-[2-(6-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione.

(III) Japanese Patent Application Kokai No. Sho 61-271287 (Japanese Patent Publication No. Hei 5-86953) and U.S. Patent No. 4 703 052 describe:

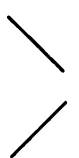
(1) compounds of formula (III):

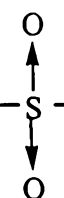


wherein:

— represents a single or double bond;

10  $n^c$  represents 0, 1 or 2;

$X^c$  represents an oxygen atom, a sulfur atom, a sulfinyl group (  ) or

a sulfonyl group (  );

$R^c$  represents a hydrogen atom, a methyl group or an ethyl group;

15  $R^{1c}$  represents a cycloalkyl group having from 5 to 7 carbon atoms, a cycloalkyl group having from 5 to 7 carbon atoms and substituted by a methyl group, a pyridyl group, a thienyl group, a furyl group, a naphthyl group, a p-biphenylyl group, a tetrahydrofuryl group, a tetrahydrothienyl group, a tetrahydropyranyl

group, a group of formula  $C_6H_4W^{2c}$

wherein  $W^{2c}$  represents a hydrogen atom, a hydroxy group, a halogen atom (for example a fluorine, chlorine or bromine atom), an alkyl group having from 1 to 4 carbon atoms, an alkoxy group having from 1 to 4 carbon atoms or an alkylthio group having from 1 to 4 carbon atoms

or a group of formula  $alk-W^{1c}$

wherein  $alk$  represents an alkylene group having from 1 to 6 carbon atoms, an ethylidene group or an isopropylidene group and  $W^{1c}$  represents a hydrogen atom, a hydroxy group, an alkoxy group having from 1 to 4 carbon atoms, an alkylthio group having from 1 to 4 carbon atoms, a pyridyl group, a furyl group, a thienyl group, a tetrahydrofuryl group, a tetrahydrothienyl group, a naphthyl group, a cycloalkyl group having from 5 to 7 carbon atoms or a group of formula  $C_6H_4W^{2c}$ , where  $W^{2c}$  is as defined above;

$R^{2c}$  represents a hydrogen atom or a methyl group;

$R^{3c}$  represents a hydrogen atom, an alkyl group having from 1 to 6 carbon atoms, a group of formula  $C_6H_4W^{2c}$

where  $W^{2c}$  is as defined above

or a benzyl group;

$R^{4c}$  represents a hydrogen atom,

or

$R^{1c}$  and  $R^{2c}$  together form an alkylene group having from 4 to 6 carbon atoms, and  $R^{3c}$  and  $R^{4c}$  both represent hydrogen atoms;

or

$R^{3c}$  and  $R^{4c}$  together form an alkylene group having from 4 to 6 carbon atoms,  
and  $R^{1c}$  and  $R^{2c}$  both represent hydrogen atoms;

or

5      $R^{2c}$  and  $R^{3c}$  together form an alkylene group having from 3 or 4 carbon atoms,  
and  $R^{1c}$  and  $R^{4c}$  both represent hydrogen atoms;

and pharmaceutically acceptable salts thereof.

In the compounds of formula (III), details, such as the definitions of  $R^{1c}$ ,  $R^{2c}$ ,  
 $R^{3c}$ ,  $W^{1c}$ ,  $W^{2c}$  and alk, the kinds of pharmaceutically acceptable salt, the process for  
10     preparing the compounds of formula (III) and preparative examples are described in  
Japanese Patent Application Kokai No. Sho 61-271287 (Japanese Patent Publication  
No. Hei 5-86953) and U.S. Patent No. 4 703 052, the disclosures of which are  
incorporated herein by reference.

For example, where  $R^{1c}$  or  $W^{1c}$  represents a cycloalkyl group, this may be a  
15     cyclopentyl, cyclohexyl or cycloheptyl group.

Where  $W^{2c}$  represents an alkyl group or an alkoxy group or  $W^{1c}$  represents an  
alkoxy group, this may be as defined and exemplified above in relation to substituents  
 $\chi$ .

Where  $W^{1c}$  or  $W^{2c}$  represents an alkylthio group, this may be a straight or  
20     branched chain alkylthio group having from 1 to 4 carbon atoms, and examples include  
the methylthio, ethylthio, propylthio, isopropylthio, butylthio, isobutylthio, sec-  
butylthio and t-butylthio groups, most preferably the methylthio group.

Where alk represents an alkylene group having from 1 to 6 carbon atoms, this  
may be a straight or branched chain group having from 1 to 6 carbon atoms, and

examples include the methylene, methylenemethylene, ethylene, ethylidene, propylene, isopropylidene, propylidene, trimethylene, tetramethylene, 1-methyltrimethylene, 2-methyltrimethylene, 3-methyltrimethylene, pentamethylene, hexamethylene, 1,1-dimethyltrimethylene, 2,2-dimethyltrimethylene, 1,1-dimethyltetramethylene and 2,2-dimethyltetramethylene groups, of which we prefer the straight or branched chain alkylene groups having from 1 to 4 carbon atoms, more preferably the methylene or ethylene group.

Where  $R^{3c}$  represents an alkyl group having from 1 to 6 carbon atoms, this may be a straight or branched chain group having from 1 to 6, preferably from 1 to 4, carbon atoms, and examples include the methyl, ethyl, propyl, isopropyl, butyl, isobutyl, sec-butyl, t-butyl, pentyl, isopentyl, neopentyl, 2-methylbutyl, 1-ethylpropyl, hexyl, 4-methylpentyl, 3-methylpentyl, 2-methylpentyl, 1-methylpentyl, 3,3-dimethylbutyl, 2,2-dimethylbutyl, 1,1-dimethylbutyl, 1,2-dimethylbutyl, 1,3-dimethylbutyl, 2,3-dimethylbutyl and 2-ethylbutyl groups. Of these, we prefer those alkyl groups having from 1 to 4 carbon atoms, particularly the methyl, ethyl, propyl, isopropyl, butyl and isobutyl groups, and most preferably the methyl group.

Where  $R^{1c}$  together with  $R^{2c}$  or  $R^{2c}$  together with  $R^{3c}$  or  $R^{3c}$  together with  $R^{4c}$  represents an alkylene group having from 4 to 6 carbon atoms, this may be a straight or branched chain group, and examples include the tetramethylene, 1-methyltrimethylene, 2-methyltrimethylene, 3-methyltrimethylene, pentamethylene, hexamethylene, 1,1-dimethyltrimethylene, 2,2-dimethyltrimethylene, 1,1-dimethyltetramethylene and 2,2-dimethyltetramethylene groups.

Where  $W^{1c}$  or  $W^{2c}$  represents an alkoxy group having from 1 to 4 carbon atoms or where  $W^{2c}$  represents a halogen atom or an alkyl group having from 1 to 4 carbon atoms, these may be as exemplified above in relation to substituent  $\chi$ .

Preferred examples of the compounds of formula (III) include:

(2) The compound described in (1), wherein  $R^c$  represents a hydrogen atom,  $\text{---}$

represents a single bond and  $n^c$  represents 0 or 1.

- (3) The compound described in (2), wherein  $R^{2c}$ ,  $R^{3c}$  and  $R^{4c}$  all represent hydrogen atoms,  $R^{1c}$  represents a hydrogen atom, a cyclohexyl group, a group of formula  $C_6H_4W^{2c}$  (wherein  $W^{2c}$  represents a hydrogen atom, a fluorine atom, a chlorine atom, a bromine atom, a methyl group or a methoxy group) or a group of formula alk- $W^{1c}$  (wherein alk represents an alkylene group having from 1 to 4 carbon atoms, an ethylidene group or an isopropylidene group, and  $W^{1c}$  represents a hydrogen atom, a hydroxy group, an alkoxy group having from 1 to 4 carbon atoms, a cyclohexyl group or a group of formula  $C_6H_4W^{2c}$  where  $W^{2c}$  is as defined above).

- 10 (4) The compound described in (3), wherein  $X^c$  represents an oxygen atom,  $R^{1c}$  represents a cyclohexyl group, a cyclohexylmethyl group, a benzyl group, a fluorobenzyl group, an alkyl group having from 1 to 4 carbon atoms, a hydroxymethyl group, a methoxymethyl group or an ethoxyethyl group.

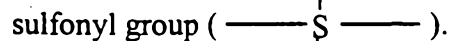
(5) The compound described in (4), wherein  $R^{1c}$  represents a benzyl group.

- 15 (6) The compound described in (5) which is 5-[(2-benzyl-2,3-dihydrobenzofuran-5-yl)methyl]thiazolidine-2,4-dione or 5-[(2-benzyl-3,4-dihydro-2H-benzopyran-6-yl)methyl]thiazolidine-2,4-dione (englitazone) or a salt, preferably a sodium salt, thereof.

- (7) The compound described in (2), wherein  $R^{2c}$  and  $R^{3c}$  together form a tetramethylene group,  $R^{1c}$  and  $R^{4c}$  each represents a hydrogen atom and  $X^c$  represents an oxygen atom.
- 20

(8) The compound described in (2), wherein (a)  $R^{1c}$  and  $R^{2c}$  together form a pentamethylene group,  $R^{3c}$  and  $R^{4c}$  each represents a hydrogen atom and  $X^c$  represents an oxygen atom; or (b)  $R^{3c}$  and  $R^{4c}$  together form a pentamethylene group,

(9) The compound described in (3), wherein n<sup>c</sup> represents 0, R<sup>1c</sup> represents a hydrogen atom, a methyl group or a benzyl group and X<sup>c</sup> represents a sulfur atom or a



(1) compounds of formula (IV):



$A^{1d}$  represents a substituted or unsubstituted aromatic heterocyclic group,  
 $R^{1d}$  represents a hydrogen atom, an alkyl group, an acyl group, an aralkyl group (the aryl moiety of said aralkyl group may be substituted or unsubstituted) or a substituted or unsubstituted aryl group,  
 $R^{2d}$  and  $R^{3d}$  each represents a hydrogen atom or together form a bond,  
 $A^{2d}$  represents a benzene ring which has at most a total of 5 substituents; and  
 $n^d$  represents an integer of from 2 to 6;

and pharmaceutically acceptable salts thereof.

In the compounds of formula (IV), details, such as the definitions of  $A^{1d}$ ,  $R^{1d}$ ,  $R^{2d}$ ,  $R^{3d}$ ,  $A^{2d}$  and  $n^d$ , the kinds of pharmaceutically acceptable salt, the process for preparing the compounds of formula (IV), preparative examples and preferred compounds are described in Japanese Patent Application Kokai Hei 1-131169 or U.S. Patent Nos. 5 002 953, 5 194 443, 5 232 925 or 5 260 445, the disclosures of which are incorporated herein by reference.

For example, where  $A^{1d}$  represents a substituted or unsubstituted aromatic heterocyclic group, this may be a single aromatic ring which has from 5 to 7 ring atoms, of which from 1 to 3 atoms are hetero-atoms selected from the group consisting of nitrogen, oxygen and sulfur atoms, or may be a fused ring system in which at least one of the rings is an aromatic heterocyclic group as defined above and the or each other ring is such an aromatic heterocyclic group or a carbocyclic aryl group. Where there are 3 hetero atoms in the aromatic heterocyclic group, these are preferably all nitrogen atoms or one or two are nitrogen atoms and, correspondingly, two or one are oxygen and/or sulfur atoms.

Examples of such single ring aromatic heterocyclic groups include the furyl, thienyl, pyrrolyl, azepinyl, pyrazolyl, imidazolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, 1,2,3-oxadiazolyl, triazolyl, tetrazolyl, thiadiazolyl, pyranyl, pyridyl, pyridazinyl, pyrimidinyl and pyrazinyl groups. Preferred groups are 5- to 7-membered aromatic heterocyclic groups which have at least one nitrogen atom and optionally one additional nitrogen, oxygen or sulfur atom. Examples of such groups include the pyrrolyl, azepinyl, pyrazolyl, imidazolyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, 1,2,3-oxadiazolyl, triazolyl, tetrazolyl, thiadiazolyl, pyridyl, pyridazinyl, pyrimidinyl and pyrazinyl groups. Of these, the pyridyl, imidazolyl, oxazolyl, pyrazinyl and thiazolyl groups are more preferred.

Various of the aromatic heterocyclic groups referred to above may form a fused ring with another cyclic group, and examples of such fused ring systems include the indolyl, benzofuryl, benzothienyl, benzoxazolyl, benzoimidazolyl, isoquinolyl,

quinolyl and quinoxalyl groups.

These aromatic heterocyclic groups may be unsubstituted or they may be substituted by one or more substituents selected from the group consisting of substituents  $\pi$  defined exemplified below. There is no particular restriction on the number of substituents, except, such as may be imposed by the number of substitutable positions, and sometimes by steric constraints. However, in general, where the group is substituted, we prefer from 1 to 3 substituents.

Substituents  $\pi$  are selected from the group consisting of:

halogen atoms, such as fluorine, chlorine, bromine or iodine atoms;

10 alkyl groups having from 1 to 6 carbon atoms, such as those defined and exemplified above in relation to  $R^{3c}$ ;

haloalkyl groups having from 1 to 6 carbon atoms, in which any of the alkyl groups defined and exemplified above in relation to  $R^{3c}$  is substituted by one of more of the above halogen atoms, for example the fluoromethyl, chloromethyl, bromomethyl, iodomethyl, trifluoromethyl, trichloromethyl, 2-fluoroethyl, 2-chloroethyl, 2-bromoethyl, 2-iodoethyl, 2,2,2-trifluoroethyl, 2,2-difluoroethyl, 2,2,2-trichloroethyl, 2,2-dichloroethyl, 2,2-dibromoethyl, 3-fluoropropyl, 4-chlorobutyl, 5-fluoropentyl and 6-fluorohexyl groups;

20 alkoxy groups having from 1 to 6 carbon atoms, which may be straight or branched chain groups having from 1 to 6, preferably from 1 to 4, carbon atoms, and examples include the methoxy, ethoxy, propoxy, isopropoxy, butoxy, isobutoxy, sec-butoxy, t-butoxy, pentyloxy, isopentyloxy, neopentyl-oxy, 2-methylbutoxy, 1-ethylpropoxy, hexyloxy, 4-methylpentyloxy, 3-methylpentyloxy, 2-methylpentyloxy, 1-methylpentyloxy, 3,3-dimethyl-butoxy, 2,2-dimethylbutoxy, 1,1-dimethylbutoxy, 1,2-dimethylbutoxy, 1,3-dimethylbutoxy, 2,3-dimethylbutoxy and 2-ethylbutoxy groups, of which we prefer those alkoxy groups having from 1 to 4 carbon atoms, particularly

the methoxy, ethoxy, propoxy, isopropoxy, butoxy and isobutoxy groups, and most preferably the methoxy group;

aliphatic carboxylic acyl groups having from 1 to 6 carbon atoms, such as those defined and exemplified below in relation to R<sup>1d</sup>;

5 alkanesulfonyl groups having from 1 to 6 carbon atoms, such as the methanesulfonyl, ethanesulfonyl, propanesulfonyl, isopropanesulfonyl, butanesulfonyl, isobutanesulfonyl, sec-butanesulfonyl, t-butanesulfonyl, pentanesulfonyl, isopentanesulfonyl, neopentanesulfonyl, 2-methylbutane-  
sulfonyl, 1-ethylpropanesulfonyl, hexanesulfonyl, 4-methylpentanesulfonyl,  
10 3-methylpentanesulfonyl, 2-methylpentanesulfonyl, 1-methylpentanesulfonyl, 3,3-dimethylbutanesulfonyl, 2,2-dimethylbutanesulfonyl, 1,1-dimethyl-  
butanesulfonyl, 1,2-dimethylbutanesulfonyl, 1,3-dimethylbutanesulfonyl, 2,3-dimethylbutanesulfonyl and 2-ethylbutanesulfonyl groups;

haloalkanesulfonyl groups having from 1 to 6 carbon atoms, for example the  
15 fluoromethanesulfonyl, chloromethanesulfonyl, bromomethanesulfonyl, iodomethanesulfonyl, trifluoromethanesulfonyl, trichloromethanesulfonyl, 2-  
fluoroethanesulfonyl, 2-chloroethanesulfonyl, 2-bromoethanesulfonyl, 2-  
iodoethanesulfonyl, 2,2,2-trifluoroethanesulfonyl, 2,2-difluoroethanesulfonyl,  
2,2,2-trichloroethanesulfonyl, 2,2-dichloroethanesulfonyl, 2,2-dibromo-  
20 ethanesulfonyl, 3-fluoropropanesulfonyl, 4-chlorobutanesulfonyl, 5-  
fluoropentanesulfonyl and 6-fluorohexanesulfonyl groups;

hydroxy groups, carboxy groups;

alkoxycarbonyl groups having from 1 to 6 carbon atoms in the alkoxy part,  
such as the methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, isopropoxy-  
25 carbonyl, butoxycarbonyl, isobutoxycarbonyl, sec-butoxycarbonyl, t-butoxy-  
carbonyl, pentyloxycarbonyl, isopentyloxycarbonyl, neopentyloxycarbonyl, 2-methylbutoxycarbonyl, 1-ethylpropoxycarbonyl, hexyloxycarbonyl,  
4-methylpentyloxycarbonyl, 3-methylpentyloxycarbonyl, 2-methylpentyloxy-

carbonyl, 1-methylpentyloxycarbonyl, 3,3-dimethylbutoxycarbonyl, 2,2-dimethylbutoxycarbonyl, 1,1-dimethylbutoxycarbonyl, 1,2-dimethylbutoxycarbonyl, 1,3-dimethylbutoxycarbonyl, 2,3-dimethylbutoxycarbonyl and 2-ethylbutoxycarbonyl groups, of which we prefer those alkoxycarbonyl groups having from 2 to 5 carbon atoms, particularly the methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, isopropoxycarbonyl, butoxycarbonyl and isobutoxycarbonyl groups, and most preferably the methoxycarbonyl group;

acylamino groups having from 1 to 6 carbon atoms, in which the acyl part may be any of those acyl groups having from 1 to 6 carbon atoms included in the groups represented by R<sup>1d</sup>;

alkanesulfonylamino groups having from 1 to 6 carbon atoms, in which the alkanesulfonyl part may be any of those alkanesulfonyl groups exemplified above;

haloalkanesulfonylamino groups having from 1 to 6 carbon atoms, in which the haloalkanesulfonyl part may be any of those haloalkanesulfonyl groups exemplified above;

amino groups, cyano groups, and

alkylenedioxy groups, such as those defined and exemplified above in relation to R<sup>4a</sup>;

alkylene groups having from 1 to 8 carbon atoms (to form a cycloalkyl group fused with the aryl or heterocyclic ring) which may be any of the alkylene groups defined and exemplified above in relation to alk, and higher groups, such as the hexamethylene and octamethylene groups.

Where R<sup>1d</sup> represents an alkyl group, this preferably has from 1 to 6 carbon atoms, and may be any one of those groups defined and exemplified above in relation to R<sup>3c</sup>.

Where R<sup>1d</sup> represents an acyl group, this may be, for example:

- an aliphatic acyl group, preferably: an alkanoyl group having from 1 to 25 carbon atoms, more preferably from 1 to 20 carbon atoms, still more preferably from 1 to 6 carbon atoms, and most preferably from 1 to 4 carbon atoms, (such as the formyl, acetyl, propionyl, butyryl, isobutyryl, pivaloyl, valeryl, isovaleryl, hexanoyl, heptanoyl, octanoyl, lauroyl, myristoyl, tridecanoyl, palmitoyl and stearoyl groups, of which the acetyl group is most preferred); a halogenated alkanoyl group having from 2 to 6 carbon atoms, especially a halogenated acetyl group (such as the chloroacetyl, dichloroacetyl, trichloroacetyl and trifluoroacetyl groups); a lower alkoxyalkanoyl group in which the alkoxy part has from 1 to 5, preferably from 1 to 3, carbon atoms and the alkanoyl part has from 2 to 6 carbon atoms and is preferably an acetyl group (such as the methoxyacetyl group); or an unsaturated analog of such a group, especially the alkenoyl or alkynoyl groups having from 3 to 6 carbon atoms [such as the acryloyl, methacryloyl, propioloyl, crotonoyl, isocrotonoyl and (*E*)-2-methyl-2-butenoyl groups];
- an aromatic acyl group, preferably an arylcarbonyl group, in which the aryl part has from 6 to 14, more preferably from 6 to 10, still more preferably 6 or 10, ring carbon atoms and is a carbocyclic group, which is unsubstituted or has from 1 to 5, preferably from 1 to 3 substituents, selected from the group consisting of substituents  $\pi$ , defined above, preferably: an unsubstituted group (such as the benzoyl,  $\alpha$ -naphthoyl and  $\beta$ -naphthoyl groups); a halogenated arylcarbonyl group (such as the 2-bromobenzoyl and 4-chlorobenzoyl groups); a lower alkyl-substituted arylcarbonyl group, in which the or each alkyl substituent has from 1 to 5, preferably from 1 to 4, carbon atoms (such as the 2,4,6-trimethylbenzoyl and 4-toluoyl groups); a lower alkoxy-substituted arylcarbonyl group, in which the or each alkoxy substituent preferably has from 1 to 5, preferably from 1 to 4, carbon atoms (such as the 4-anisoyl group); a nitro-substituted arylcarbonyl group

(such as the 4-nitrobenzoyl and 2-nitrobenzoyl groups); a lower alkoxy carbonyl-substituted aryl carbonyl group, in which the or each alkoxy carbonyl substituent preferably has from 2 to 6 carbon atoms [such as the 2-(methoxy carbonyl)benzoyl group]; or an aryl-substituted aryl carbonyl group, in which the aryl substituent is as defined above, except that, if it is substituted by a further aryl group, that aryl group is not itself substituted by an aryl group (such as the 4-phenylbenzoyl group);

an alkoxy carbonyl group, especially such groups having from 2 to 7, more preferably 2 to 5, carbon atoms and which may be unsubstituted (such as the methoxy carbonyl, ethoxy carbonyl, t-butoxy carbonyl and isobutoxy carbonyl groups) or substituted with a halogen atom or a tri-substituted silyl group, e.g. a tri(lower alkylsilyl) group (such as the 2,2,2-trichloroethoxy carbonyl and 2-trimethylsilylethoxy carbonyl groups);

an alkenyloxy carbonyl group in which the alkenyl part has from 2 to 6, preferably from 2 to 4, carbon atoms (such as the vinyloxy carbonyl and allyloxy carbonyl groups); and

an aralkyloxy carbonyl group, in which the aralkyl part is as defined and exemplified below, and in which the aryl ring, if substituted, preferably has one or two lower alkoxy or nitro substituents (such as the benzyloxy carbonyl, 4-methoxybenzyloxy carbonyl, 3,4-dimethoxybenzyloxy carbonyl, 2-nitrobenzyloxy carbonyl and 4-nitrobenzyloxy carbonyl groups).

Where  $R^{1d}$  represents an aralkyl group this is preferably a group in which an alkyl group having from 1 to 6 carbon atoms is substituted by at least one, and preferably from 1 to 3, aryl groups, which may themselves be substituted by one or more, preferably from 1 to 3 substituents selected from the group consisting of substituents  $\pi$ , defined above. Preferred examples of aralkyl groups include alkyl groups having from 1 to 4, more preferably from 1 to 3 and most preferably 1 or 2, carbon atoms which are substituted with from 1 to 3 aryl groups, which may be

unsubstituted (such as the benzyl, phenethyl, 1-phenylethyl, 3-phenylpropyl,  $\alpha$ -naphthylmethyl,  $\beta$ -naphthylmethyl, diphenylmethyl, triphenylmethyl,  $\alpha$ -naphthyl-diphenylmethyl and 9-anthrylmethyl groups) or substituted on the aryl part with a lower alkyl group, a lower alkoxy group, a nitro group, a halogen atom, a cyano group, or an alkylenedioxy group having from 1 to 3 carbon atoms, preferably a methylenedioxy group, [such as the 4-methylbenzyl, 2,4,6-trimethylbenzyl, 3,4,5-trimethylbenzyl, 4-methoxybenzyl, 4-methoxyphenyldiphenylmethyl, 2-nitrobenzyl, 4-nitrobenzyl, 4-chlorobenzoyl, 4-bromobenzyl, 4-cyanobenzyl, 4-cyanobenzyldiphenylmethyl, bis(2-nitrophenyl)methyl and piperonyl groups].

Where  $R^{1d}$  represents a substituted or unsubstituted aryl group, this is a carbocyclic aryl group having from 6 to 14, more preferably from 6 to 10, and most preferably 6 or 10, ring carbon atoms. The group may have a single aromatic ring or it may have two or more fused aromatic rings. The group may be unsubstituted or it may be substituted by one or more substituents selected from the group consisting of substituents  $\pi$ , defined above. There is no particular restriction on the number of substituents, except, such as may be imposed by the number of substitutable positions, and sometimes by steric constraints. However, in general, where the group is substituted, we prefer from 1 to 3 substituents. Examples of the unsubstituted groups include the phenyl, 1-naphthyl, 2-naphthyl, indenyl, phenanthrenyl and anthracenyl groups, of which the phenyl and naphthyl groups are preferred, the phenyl group being most preferred.

Examples of substituted groups include the 2-methoxyphenyl, 3-methoxyphenyl, 4-methoxyphenyl, 2,4-dimethoxyphenyl, 2,3-dimethoxyphenyl, 2,5-dimethoxyphenyl, 3,4-dimethoxyphenyl, 3,5-dimethoxyphenyl, 2,6-dimethoxyphenyl, 3,4,5-trimethoxyphenyl, 2,4,5-trimethoxyphenyl, 2,3,4-trimethoxyphenyl, 2,3,5-trimethoxyphenyl, 2,3,6-trimethoxyphenyl, 2,4,6-trimethoxyphenyl, 2-ethoxyphenyl, 3-ethoxyphenyl, 4-ethoxyphenyl, 2-isopropoxyphenyl, 3-isopropoxyphenyl, 4-isopropoxyphenyl, 2-methylphenyl, 3-methylphenyl, 4-methylphenyl, 2,4-dimethylphenyl, 2,3-dimethylphenyl, 2,5-dimethylphenyl, 3,4-dimethylphenyl, 3,5-dimethylphenyl, 2,6-dimethyl-

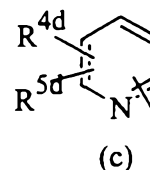
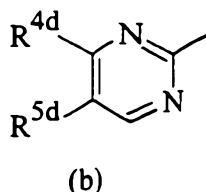
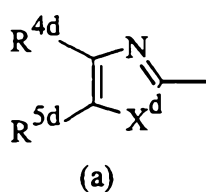
phenyl, 3,4,5-trimethylphenyl, 2,4,5-trimethylphenyl, 2,3,4-trimethylphenyl, 2,3,5-trimethylphenyl, 2,3,6-trimethylphenyl, 2,4,6-trimethylphenyl, 2-chlorophenyl, 3-chlorophenyl, 4-chlorophenyl, 2,4-dichlorophenyl, 2,3-dichlorophenyl, 2,5-dichlorophenyl, 3,4-dichlorophenyl, 3,5-dichlorophenyl, 2,6-dichlorophenyl, 3,4,5-trichlorophenyl, 2,4,5-trichlorophenyl, 2,3,4-trichlorophenyl, 2,3,5-trichlorophenyl, 2,3,6-trichlorophenyl, 2,4,6-trichlorophenyl, 2-fluorophenyl, 3-fluorophenyl, 4-fluorophenyl, 2,4-difluorophenyl, 2,3-difluorophenyl, 3,4-difluorophenyl, 3,5-difluorophenyl, 2,6-difluorophenyl, 3,4,5-trifluorophenyl, 2,4,5-trifluorophenyl, 2-trifluoromethylphenyl, 3-trifluoromethylphenyl, 4-trifluoromethylphenyl, 2,4-bis(trifluoromethyl)phenyl, 2,3-bis(trifluoromethyl)phenyl, 3,4-bis(trifluoromethyl)phenyl, 3,5-bis(trifluoromethyl)phenyl, 2,6-bis(trifluoromethyl)phenyl, 3,4,5-tris(trifluoromethyl)phenyl, 2,4,5-tris(trifluoromethyl)phenyl, 2-acetamidophenyl, 3-acetamidophenyl, 4-acetamidophenyl, 2-methoxycarbonylphenyl, 3-methoxycarbonylphenyl, and 4-methoxycarbonylphenyl groups.

Where  $A^{2d}$  represents a benzene ring which has at most a total of 5 substituents, these are preferably selected from the group consisting of substituents  $\pi$ , defined above.

Preferred examples of compounds of formula (IV) include:

(2) The compounds described in (1), wherein  $A^{1d}$  represents a substituted or unsubstituted, single ring or fused ring aromatic heterocyclic group which has 4 or less heteroatoms selected from oxygen, sulfur and nitrogen atoms.

(3) The compounds described in (1) or (2), wherein  $A^{1d}$  represents a group of formula (a), (b) or (c):

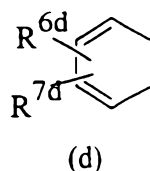


wherein  $R^{4d}$  and  $R^{5d}$  each independently represents a hydrogen atom, an alkyl group or a substituted or unsubstituted aryl group; or  $R^{4d}$  and  $R^{5d}$ , together with carbon atoms to which they are attached, form a benzene ring and each of the carbon atoms of the benzene ring may be substituted or unsubstituted; and, in the group of formula (a),

5  $X^d$  represents an oxygen or sulfur atom.

(4) The compounds described in (3), wherein  $R^{4d}$  and  $R^{5d}$  each independently represents a hydrogen atom, an alkyl group or a substituted or unsubstituted phenyl group.

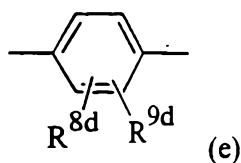
(5) The compounds described in (3), wherein  $R^{4d}$  and  $R^{5d}$  together form a group of  
10 formula (d):



wherein  $R^{6d}$  and  $R^{7d}$  each independently represents a hydrogen atom, a halogen atom, a substituted or unsubstituted alkyl group or an alkoxy group.

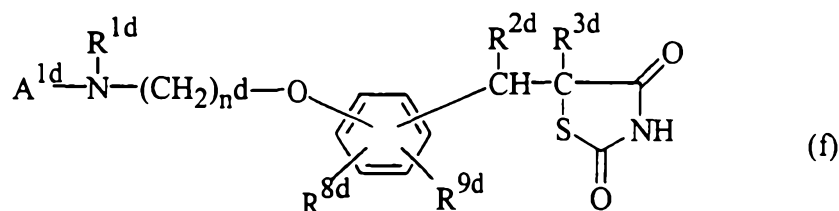
(6) The compounds described in (5), wherein  $R^{6d}$  and  $R^{7d}$  each represents a hydrogen  
15 atom.

(7) The compounds described in any one of (1) to (6), wherein  $A^{2d}$  represents a group of formula (e):



wherein  $R^{8d}$  and  $R^{9d}$  each independently represents a hydrogen atom, a halogen atom,  
20 a substituted or unsubstituted alkyl group or an alkoxy group.

(9) The compounds described in (1) which are of formula (f):



5 [wherein A<sup>1d</sup>, R<sup>1d</sup>, R<sup>2d</sup>, R<sup>3d</sup> and n<sup>d</sup> are as defined in formula (IV) of (1) and R<sup>8d</sup> and R<sup>9d</sup> are as defined in the formula (e) of (7)] and pharmaceutically acceptable salts thereof.

(10) The compounds described in any one of (1) to (9), wherein  $n^d$  represents an integer of 2 or 3.

10 (11) The compounds described in any one of (1) to (10), wherein R<sup>1d</sup> represents a methyl group.

(12) The compounds described in (1) which are selected from:

i) 5-(4-{2-[N-methyl-N-(2-benzothiazolyl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

15 ii) 5-(4-{2-[N-methyl-N-(2-pyrimidinyl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

iii) 5-(4-{2-[N-methyl-N-(4,5-dimethylthiazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

iv) 5-{4-[2-(N-methyl-N-thiazol-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

v) 5-(4-{2-[N-methyl-N-(4-phenylthiazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-  
20 dione,

vi) 5-(4-{2-[N-methyl-N-(4-phenyl-5-methylthiazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

vii) 5-(4-{2-[N-methyl-N-(4-methyl-5-phenylthiazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

5 viii) 5-(4-{2-[N-methyl-N-(5-phenyloxazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

ix) 5-(4-{2-[N-methyl-N-(4,5-dimethyloxazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

x) 5-{4-[2-(2-pyrimidinylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

10 xi) 5-{4-[2-(N-acetyl-N-pyrimidin-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

xii) 5-{4-[2-(N-benzothiazol-2-yl-N-benzylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

xiii) 5-{4-[3-(N-methyl-N-benzoxazol-2-ylamino)propoxy]benzyl}thiazolidine-2,4-dione, and

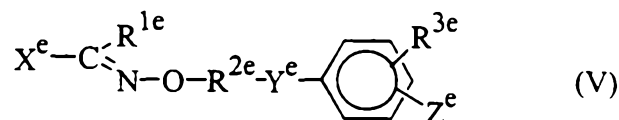
15 xiv) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione (which will hereinafter be called "rosiglitazone").

(13) The compound described in (1) which is 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)-ethoxy]benzyl}thiazolidine-2,4-dione (rosiglitazone).

20 In (2) to (11), details of the definitions of  $R^{4d}$ ,  $R^{5d}$ ,  $R^{6d}$ ,  $R^{7d}$ ,  $R^{8d}$  and  $R^{9d}$  are described in Japanese Patent Application Kokai Hei 1-131169 or U.S. Patent Nos. 5 002 953, 5 194 443, 5 232 925 or 5 260 445, the disclosures of which are incorporated herein by reference.

(V) Japanese Patent Application Kokai No. Hei 9-48779 and European Patent Publication No. 708098A describe:

(1) oxime derivatives of formula (V):



and pharmaceutically acceptable salts thereof;

wherein:

5  $\text{R}^{1e}$  represents a hydrogen atom or a straight or branched chain alkyl group having from 1 to 6 carbon atoms,

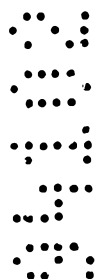
$\text{R}^{2e}$  represents a straight or branched chain alkylene group having from 2 to 6 carbon atoms,

10  $\text{R}^{3e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 6 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a halogen atom, a nitro group, an amino group, a straight or branched chain monoalkylamino group having from 1 to 4 carbon atoms, a straight or branched chain dialkylamino group in which each alkyl group has from 1 to 4 carbon atoms, an aryl group having from 6 to 10 carbon atoms or an aralkyl group having from 7 to 12 carbon atoms,

15  $\text{X}^e$  represents an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by from 1 to 3 of substituents  $\alpha$ , defined below, or a heteroaromatic group which is unsubstituted or is substituted by from 1 to 3 of substituents  $\alpha$ , defined below,

20 said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain acyloxy group having from 1 to 4 carbon atoms, (v)

- a straight or branched chain alkoxy group having from 1 to 4 carbon atoms,  
(vi) a straight or branched chain alkylendioxy group having from 1 to 4  
carbon atoms, (vii) an aralkyloxy group having from 7 to 12 carbon atoms,  
(viii) a straight or branched chain alkylthio group having from 1 to 4 carbon  
atoms, (ix) a straight or branched chain alkylsulfonyl group having from 1 to 4  
carbon atoms, (x) a halogen atom, (xi) a nitro group, (xii) an amino group,  
(xiii) a straight or branched chain monoalkylamino group having from 1 to 4  
carbon atoms, (xiv) a straight or branched chain dialkylamino group in which  
each alkyl group has from 1 to 4 carbon atoms, (xv) an aralkyl group having  
from 7 to 12 carbon atoms, (xvi) an aryl group having from 6 to 10 carbon  
atoms which is unsubstituted or is substituted by at least one substituent  
selected from the group consisting of substituents  $\beta$ , defined below, (xvii) an  
aryloxy group having from 6 to 10 carbon atoms which is unsubstituted or is  
substituted by at least one substituent selected from the group consisting of  
substituents  $\beta$ , defined below, (xviii) an arylthio group having from 6 to 10  
carbon atoms which is unsubstituted or is substituted by at least one substituent  
selected from the group consisting of substituents  $\beta$ , defined below, (xix) an  
arylsulfonyl group having from 6 to 10 carbon atoms which is unsubstituted or  
is substituted by at least one substituent selected from the group consisting of  
substituents  $\beta$ , defined below, (xx) an arylsulfonylamino group having from 6  
to 10 carbon atoms which is unsubstituted or is substituted by at least one  
substituent selected from the group consisting of substituents  $\beta$ , defined below,  
and in which the nitrogen atom of the amino moiety is unsubstituted or is  
substituted by a straight or branched chain alkyl group having from 1 to 6  
carbon atoms, (xxi) a heteroaromatic group, (xxii) a heteroaryloxy group,  
(xxiii) a heteroarylthio group, (xxiv) a heteroarylsulfonyl group or (xxv) a  
heteroaromatic sulfonylamino group in which the nitrogen atom of the amino  
moiety is unsubstituted or is substituted by a straight or branched chain alkyl  
group having from 1 to 6 carbon atoms;  
said substituent  $\beta$  representing a straight or branched chain alkyl group having



from 1 to 6 carbon atoms, a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom or a straight or branched chain alkylenedioxy group having from 1 to 4 carbon atoms;

5         $Y^e$  represents an oxygen atom, a sulfur atom or group of formula  $>N-R^{4e}$  (wherein  $R^{4e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 6 carbon atoms or a straight or branched chain acyl group having from 1 to 8 carbon atoms); and

10         $Z^e$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl or 3,5-dioxooxadiazolidin-2-ylmethyl group.

15        In the compounds of formula (V), details, such as the definitions of  $R^{1e}$ ,  $R^{2e}$ ,  $R^{3e}$ ,  $R^{4e}$ ,  $\alpha$ ,  $\beta$ ,  $X^e$ ,  $Y^e$  and  $Z^e$ , the kinds of pharmaceutically acceptable salt, the process for preparing the compounds of formula (V), examples of the compounds and preparative examples are described in Japanese Patent Application Kokai No. Hei 9-48779 and European Patent Publication No. 708098A, the disclosures of which are incorporated herein by reference.

20        For example, where  $R^{3e}$ , substituent  $\alpha$  or substituent  $\beta$  represents an alkoxy group having from 1 to 4 carbon atoms or a halogen atom, or where  $R^{3e}$  or substituent  $\alpha$  represents a mono- or di- alkylamino group, these may be as defined and exemplified above in relation to substituent  $\chi$ .

Where  $R^{3e}$ , substituent  $\alpha$  or substituent  $\beta$  represents an alkylenedioxy group, this may be as defined and exemplified above in relation to  $R^{4a}$  and  $R^{5a}$ .

25        Where  $R^{3e}$  or substituent  $\alpha$  represents an alkylthio group, this may be as defined and exemplified above in relation to  $W^{2c}$ .

Where  $R^{3e}$ , substituent  $\alpha$ , substituent  $\beta$  or  $R^{4e}$  represents an alkyl group having from 1 to 6 carbon atoms, this may be as defined and exemplified above in relation to  $R^{3c}$ .

Where  $X^e$  or substituent  $\alpha$  represents a heteroaromatic group, this may be as defined and exemplified above for the heterocyclic aromatic groups in relation to  $A^{1d}$ .

Where  $R^{3e}$  or substituent  $\alpha$  represents an aralkyl group, or  $R^{3e}$ ,  $X^e$  or substituent  $\alpha$  represents an aryl group, these may be as defined and exemplified above in relation to  $R^{1d}$ .

Where  $R^{2e}$  represents a straight or branched chain alkylene group having from 2 to 6 carbon atoms, this may be selected from the alkylene groups defined and exemplified above in relation to alk.

Where substituent  $\alpha$  or substituent  $\beta$  represents a haloalkyl group, the alkyl part may be a straight or branched chain group having from 1 to 6, preferably from 1 to 3, carbon atoms. There is no restriction on the number of halogen atoms, except that imposed by the number of substitutable positions; however, in general, from 1 to 3 halogen atoms are preferred. Examples of such groups include the trifluoromethyl, trichloromethyl, difluoromethyl, dichloromethyl, dibromomethyl, fluoromethyl, chloromethyl, bromomethyl, iodomethyl, 2,2,2-trichloroethyl, 2,2,2-trifluoroethyl, 2-bromoethyl, 2-chloroethyl, 2-fluoroethyl, 2-iodoethyl, 2,2-dibromoethyl, 3-bromopropyl, 3-chloropropyl, 3-fluoropropyl, 3-iodopropyl, 4-bromobutyl, 4-chlorobutyl, 4-fluorobutyl, 4-iodobutyl, 5-bromopentyl, 5-chloropentyl, 5-fluoropentyl, 5-iodopentyl, 6-bromohexyl, 6-chlorohexyl, 6-fluorohexyl and 6-iodohexyl groups, of which we prefer the trifluoromethyl, 2-bromoethyl, 2-chloroethyl and 2-fluoroethyl groups.

Where substituent  $\alpha$  represents an acyloxy group, this has from 1 to 4 carbon atoms and may be a straight or branched chain aliphatic group. Examples of such groups include the formyloxy, acetoxy, propionyloxy, butyryloxy and isobutyryloxy groups.

Where substituent  $\alpha$  represents an aralkyloxy, aryloxy, arylthio, arylsulfonyl, arylsulfonylamino, heteroaryloxy, heteroarylthio, heteroarylsulfonyl or heteroaryl-sulfonylamino group, the aralkyl, aryl or heteroaryl part may be as defined and exemplified above.

- 5           Where substituent  $\alpha$  represents an acyl group having from 1 to 8 carbon atoms, this is preferably an aliphatic or carbocyclic aromatic group, and examples include:

- 10           aliphatic acyl groups, preferably: alkanoyl groups having from 1 to 8 carbon atoms, more preferably from 1 to 6 carbon atoms, and most preferably from 1 to 4 carbon atoms, such as the formyl, acetyl, propionyl, butyryl, isobutyryl, pivaloyl, valeryl, isovaleryl, hexanoyl, heptanoyl and octanoyl groups, of which the acetyl group is most preferred; halogenated alkanoyl groups having from 2 to 6 carbon atoms, especially halogenated acetyl groups, such as the chloroacetyl, dichloroacetyl, trichloroacetyl and trifluoroacetyl groups; lower alkoxyalkanoyl groups in which the alkoxy part has from 1 to 5, preferably from 1 to 3, carbon atoms and the alkanoyl part has from 2 to 6 carbon atoms and is preferably an acetyl group, such as the methoxyacetyl group; and unsaturated analogs of such groups, especially alkenoyl or alkynoyl groups having from 3 to 6 carbon atoms, such as the acryloyl, methacryloyl, propioloyl, crotonoyl, isocrotonoyl and (E)-2-methyl-2-butenoyl groups; and
- 15           aromatic acyl groups, preferably arylcarbonyl groups, such as the benzoyl,  $\alpha$ -naphthoyl and  $\beta$ -naphthoyl groups; halogenated arylcarbonyl groups, such as the 2-bromobenzoyl and 4-chlorobenzoyl groups; lower alkyl-substituted arylcarbonyl groups, such as the 4-toluoyl group; lower alkoxy-substituted arylcarbonyl groups, such as the 4-anisoyl group; nitro-substituted
- 20           arylcarbonyl groups, such as the 4-nitrobenzoyl and 2-nitrobenzoyl groups; and lower alkoxy-carbonyl-substituted arylcarbonyl groups, such as the 2-(methoxycarbonyl)benzoyl group.
- 25

Preferred examples of compounds of formula (V) include:

(2) The compounds described in (1), wherein  $R^{1e}$  represents a hydrogen atom or a straight or branched chain alkyl group having from 1 to 4 carbon atoms.

(3) The compounds described in (1), wherein  $R^{1e}$  represents a hydrogen atom or a straight or branched chain alkyl group having from 1 to 3 carbon atoms.

5 (4) The compounds described in (1), wherein  $R^{1e}$  represents a hydrogen atom, a methyl group or an ethyl group.

(5) The compounds described in (1), wherein  $R^{1e}$  represents a methyl or ethyl group.

(6) The compounds described in (1), wherein  $R^{2e}$  represents a straight or branched chain alkylene group having from 2 to 5 carbon atoms.

10 (7) The compounds described in (1), wherein  $R^{2e}$  represents a straight or branched chain alkylene group having 2 or 3 carbon atoms.

(8) The compounds described in (1), wherein  $R^{2e}$  represents an ethylene, trimethylene or methylethylene group.

(9) The compounds described in (1), wherein  $R^{2e}$  represents an ethylene group.

15 (10) The compounds described in (1), wherein  $R^{3e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a methoxy group, an ethoxy group, a methylthio group, an ethylthio group or a halogen atom.

(11) The compounds described in (1), wherein  $R^{3e}$  represents a hydrogen atom.

20 (12) The compounds described in (1), wherein  $X^e$  represents an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$  or a heteroaromatic group which has from 5 to 10 ring atoms (and which may have one or two rings) of which from 1 to 3 are hetero-atoms selected from the group consisting of nitrogen,

oxygen and sulfur atoms and which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

- 5 said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain acyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a straight or branched chain alkylendioxy group having from 1 to 4 carbon atoms, (vii) an aralkyloxy group having from 7 to 12 carbon atoms, (viii) a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, (ix) a straight or branched chain alkylsulfonyl group having from 1 to 4 carbon atoms, (x) a halogen atom, (xi) an aralkyl group having from 7 to 12 carbon atoms, (xii) a phenyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xiii) a phenoxy group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xiv) a phenylthio group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xv) a phenylsulfonyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xvi) a phenylsulfonylamino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$  and in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (xvii) a furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy, pyridylthio or pyridylsulfonyl group, (xviii) an imidazolyl group in which the nitrogen atom is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms and/or (xix) a pyridylsulfonylamino group in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms; and

said substituent  $\beta$  representing a straight or branched chain alkyl group having from 1

to 6 carbon atoms, a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom or a straight or branched chain alkylenedioxy group having from 1 to 4 carbon atoms.

- 5 (13) The compounds described in (1), wherein  $X^e$  represents an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$  or a heteroaromatic group which has from 5 to 10 ring atoms (and which may have one or two rings) of which from 1 to 3 are hetero-atoms selected from the group consisting of nitrogen,  
10 oxygen and sulfur atoms and which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

- 15 said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain alkanoyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a straight or branched chain alkylenedioxy group having from 1 to 4 carbon atoms, (vii) an aralkyloxy group having from 7 to 12 carbon atoms, (viii) a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, (ix) a straight or branched chain alkylsulfonyl group  
20 having from 1 to 4 carbon atoms, (x) a fluorine, chlorine or bromine atom, (xi) an aralkyl group having from 7 to 12 carbon atoms, (xii) a phenyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xiii) a phenoxy group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of  
25 substituents  $\beta$ , (xiv) a phenylthio group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xv) a phenylsulfonyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xvi) a phenylsulfonylamino group which is unsubstituted or is substituted by at least one substituent selected from

- the group consisting of substituents  $\beta$  and in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (xvii) a furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy, pyridylthio or pyridylsulfonyl group, (xviii) an imidazolyl group
- 5 in which the nitrogen atom is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms) and/or (xix) a pyridylsulfonylamino group in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms; and
- 10 said substituent  $\beta$  representing a straight or branched chain alkyl group having from 1 to 6 carbon atoms, a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom or a straight or branched chain alkylenedioxy group having from 1 to 4 carbon atoms.
- 15 (14) The compounds described in (1), wherein  $X^e$  represents a phenyl, naphthyl, imidazolyl, oxazolyl, pyridyl, indolyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,
- said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group
- 20 having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain alkanoyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a methylenedioxy group, (vii) an aralkyloxy group having from 7 to 12 carbon atoms, (viii) a straight or
- 25 branched chain alkylthio group having from 1 to 4 carbon atoms, (ix) a straight or branched chain alkylsulfonyl group having from 1 to 4 carbon atoms, (x) a fluorine, chlorine or bromine atom, (xi) an aralkyl group having from 7 to 12 carbon atoms, (xii) a phenyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of methyl, trifluoromethyl, methoxy, fluoro and

- methylenedioxy groups, (xiii) a phenoxy group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of methyl, trifluoromethyl, methoxy, fluoro and methylenedioxy groups, (xiv) a phenylthio group which is unsubstituted or is substituted by at least one substituent selected from the
- 5 group consisting of methyl, trifluoromethyl, methoxy, fluoro and methylenedioxy groups, (xv) a phenylsulfonyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of methyl, trifluoromethyl, methoxy, fluoro and methylenedioxy groups, (xvi) a phenylsulfonylamino group which is unsubstituted or is substituted by at least one substituent selected from the group
- 10 consisting of methyl, trifluoromethyl, methoxy, fluoro and methylenedioxy groups and in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by at least one substituent selected from the group consisting of straight or branched chain alkyl groups having from 1 to 6 carbon atoms, (xvii) a furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy, pyridylthio or pyridylsulfonyl group, (xviii)
- 15 an imidazolyl group in which the nitrogen atom is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms or (xix) a pyridylsulfonylamino group in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms.
- 20 (15) The compounds described in (1), wherein  $X^e$  represents a phenyl, naphthyl, imidazolyl, oxazolyl, pyridyl, indolyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,
- 25 said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain alkanoyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a methylenedioxy, benzyloxy, phenethyloxy or naphthylmethoxy group, (vii) a straight or branched chain

alkylthio group having from 1 to 4 carbon atoms, (viii) a straight or branched chain alkylsulfonyl group having from 1 to 4 carbon atoms, (ix) a fluorine, chlorine or bromine atom, (x) a benzyl group, (xi) a phenyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of methyl, trifluoromethyl, methoxy, fluoro and methylenedioxy groups, (xii) a phenoxy group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of methyl, trifluoromethyl, methoxy, fluoro and methylenedioxy groups, (xiii) a phenylthio, phenylsulfonyl, phenylsulfonylamino, N-methylphenylsulfonylamino, furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy, pyridylthio, pyridylsulfonyl, pyridylsulfonylamino or N-methylpyridylsulfonylamino group and/or (xiv) an imidazolyl group in which the nitrogen atom is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms.

(16) The compounds described in (1), wherein  $X^e$  represents a phenyl, naphthyl, pyridyl, indolyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 3 carbon atoms, (ii) a trifluoromethyl, difluoromethyl, fluoromethyl, hydroxy, formyloxy or acetoxy group, (iii) a straight or branched chain alkoxy group having from 1 to 3 carbon atoms, (iv) a methylenedioxy, benzyloxy, methylthio, ethylthio, methylsulfonyl or ethylsulfonyl group, (v) a fluorine, chlorine or bromine atom, (vi) a benzyl, phenyl, 4-methylphenyl, 4-trifluoromethylphenyl, 4-methoxyphenyl, 4-fluorophenyl, 3,4-methylenedioxyphenyl, phenoxy, phenylthio, phenylsulfonyl, phenylsulfonylamino, N-methylphenylsulfonylamino, furyl, thienyl, oxazolyl, thiazolyl, imidazolyl, N-methylimidazolyl, pyridyl, pyridyloxy, pyridylthio, pyridylsulfonyl, pyridylsulfonylamino and/or N-methylpyridylsulfonylamino group.

(17) The compounds described in (1), wherein  $X^e$  represents a phenyl, naphthyl, pyridyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from

1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing a methyl, ethyl, isopropyl, trifluoromethyl, hydroxy, acetoxy, methoxy, ethoxy, isopropoxy, methylenedioxy, benzyloxy, methylthio, ethylthio, methylsulfonyl, ethylsulfonyl, chlorine, benzyl, phenyl,

5 phenoxy, phenylthio, phenylsulfonyl, phenylsulfonylamino, N-methylphenylsulfonylamino, pyridyl, pyridyloxy, pyridylthio, pyridylsulfonyl, pyridylsulfonylamino and/or N-methylpyridylsulfonylamino group.

(18) The compounds described in (1), wherein  $X^e$  represents a phenyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group  
10 consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing a methyl, hydroxy, acetoxy, chlorine, benzyl, phenyl, phenoxy, phenylthio, phenylsulfonyl, phenylsulfonylamino, N-methylphenylsulfonylamino, pyridyl, pyridyloxy, pyridylthio and/or pyridylsulfonyl group.

(19) The compounds described in (1), wherein  $X^e$  represents a pyridyl group which is  
15 unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing a methoxy, ethoxy, isopropoxy, benzyloxy, methylthio, ethylthio, methylsulfonyl, ethylsulfonyl, benzyl, phenyl, phenoxy, phenylthio, phenylsulfonyl, phenylsulfonylamino and/or N-methylphenylsulfonyl-  
20 amino group.

(20) The compounds described in (1), wherein  $Y^e$  represents an oxygen atom, a sulfur atom or a group of formula  $>N-R^{4e}$  (wherein  $R^{4e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 3 carbon atoms or a straight or branched chain alkanoyl group having from 2 to 5 carbon atoms).

25 (21) The compounds described in (1), wherein  $Y^e$  represents an oxygen atom.

(22) The compounds described in (1), wherein  $Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl or 3,5-dioxooxadiazolidin-2-ylmethyl group.

(23) The compounds described in (1), wherein  $Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl or 2,4-dioxooxazolidin-5-ylmethyl group.

(24) The compounds described in (1), wherein  $Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

(25) The compounds described in (1), wherein  $R^{1e}$  represents a hydrogen atom or a straight or branched chain alkyl group having from 1 to 4 carbon atoms,

10  $R^{2e}$  represents a straight or branched chain alkylene group having from 2 to 5 carbon atoms,

$R^{3e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a methoxy group, an ethoxy group, a methylthio group, an ethylthio group or a halogen atom,

15  $X^e$  represents an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$  or a heteroaromatic group which has from 5 to 10 ring atoms (and which may have one or two rings) of which from 1 to 3 are hetero-atoms selected from the group consisting of nitrogen, oxygen and sulfur atoms and which is unsubstituted or is  
20 substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched  
25 chain acyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain

alkoxy group having from 1 to 4 carbon atoms, (vi) a straight or branched chain  
alkylenedioxy group having from 1 to 4 carbon atoms, (vii) an aralkyloxy group  
having from 7 to 12 carbon atoms, (viii) a straight or branched chain alkylthio group  
having from 1 to 4 carbon atoms, (ix) a straight or branched chain alkylsulfonyl group  
5 having from 1 to 4 carbon atoms, (x) a halogen atom, (xi) an aralkyl group having from  
7 to 12 carbon atoms, (xii) a phenyl group which is unsubstituted or is substituted by at  
least one substituent selected from the group consisting of substituents  $\beta$ , (xiii) a  
phenoxy group which is unsubstituted or is substituted by at least one substituent  
selected from the group consisting of substituents  $\beta$ , (xiv) a phenylthio group which is  
10 unsubstituted or is substituted by at least one substituent selected from the group  
consisting of substituents  $\beta$ , (xv) a phenylsulfonyl group which is unsubstituted or is  
substituted by at least one substituent selected from the group consisting of  
substituents  $\beta$ , (xvi) a phenylsulfonylamino group which is unsubstituted or is  
substituted by at least one substituent selected from the group consisting of  
15 substituents  $\beta$  and in which the nitrogen atom of the amino moiety is unsubstituted or  
is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon  
atoms, (xvii) a furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy,  
pyridylthio or pyridylsulfonyl group, (xviii) an imidazolyl group in which the nitrogen  
atom is unsubstituted or is substituted by a straight or branched chain alkyl group  
20 having from 1 to 6 carbon atoms and/or (xix) a pyridylsulfonylamino group in which  
the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or  
branched chain alkyl group having from 1 to 6 carbon atoms; and

said substituent  $\beta$  representing a straight or branched chain alkyl group having from 1  
to 6 carbon atoms, a straight or branched chain haloalkyl group having from 1 to 4  
25 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon  
atoms, a halogen atom or a straight or branched chain alkylenedioxy group having  
from 1 to 4 carbon atoms,

$Y^e$  represents an oxygen atom, a sulfur atom or a group of formula  $>N-R^{4e}$  (wherein  
 $R^{4e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from

1 to 3 carbon atoms or a straight or branched chain alkanoyl group having from 2 to 5 carbon atoms), and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl or 3,5-dioxooxadiazolidin-2-ylmethyl group.

5 (26) The compounds described in (1), wherein:

$R^{1e}$  represents a hydrogen atom or a straight or branched chain alkyl group having from 1 to 4 carbon atoms,

$R^{2e}$  represents a straight or branched chain alkylene group having from 2 to 5 carbon atoms,

10  $R^{3e}$  represents a hydrogen atom,

$X^e$  represents an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$  or a heteroaromatic group which has from 5 to 10 ring atoms (and which may have one or two rings) of which from 1 to 3 are hetero-atoms selected from the group consisting of nitrogen, oxygen and sulfur atoms and which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

15 said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain alkanoyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a straight or branched chain alkylendioxy group having from 1 to 4 carbon atoms, (vii) an aralkyloxy group having from 7 to 12 carbon atoms, (viii) a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, (ix) a straight or branched chain alkylsulfonyl group having from 1 to 4

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- carbon atoms, (x) a fluorine, chlorine or bromine atom, (xi) an aralkyl group having from 7 to 12 carbon atoms, (xii) a phenyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xiii) a phenoxy group which is unsubstituted or is
- 5 substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xiv) a phenylthio group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xv) a phenylsulfonyl group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$ , (xvi) a
- 10 phenylsulfonylamino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\beta$  and in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms,
- (xvii) a furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy, pyridylthio or pyridylsulfonyl group, (xviii) an imidazolyl group in which the
- 15 nitrogen atom is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms and/or (xix) a pyridylsulfonylamino group in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6
- 20 carbon atoms; and
- said substituent  $\beta$  representing a straight or branched chain alkyl group having from 1 to 6 carbon atoms, a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom or a straight or branched chain
- 25 alkylenedioxy group having from 1 to 4 carbon atoms,

$Y^e$  represents an oxygen atom, and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl or 2,4-dioxothiazolidin-5-ylmethyl group.

(27) The compounds described in (1), wherein:

$R^{1e}$  represents a hydrogen atom or a straight or branched chain alkyl group having from 1 to 3 carbon atoms,

5  $R^{2e}$  represents the straight or branched chain alkylene group having 2 or 3 carbon atoms,

$R^{3e}$  represents a hydrogen atom,

$X^e$  represents a phenyl, naphthyl, imidazolyl, oxazolyl, pyridyl, indolyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

10 said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain alkanoyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a methylenedioxy group, (vii) an aralkyloxy group having from 7 to 12 carbon atoms, (viii) a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, (ix) a straight or branched chain alkylsulfonyl group having from 1 to 4 carbon atoms, (x) a fluorine, chlorine or bromine atom, (xi) an aralkyl group having from 7 to 12 carbon atoms, (xii) a phenyl group (which may be substituted with a methyl, trifluoromethyl, methoxy, fluoro or methylenedioxy group), (xiii) a phenoxy group (the phenyl moiety may be substituted with a methyl, trifluoromethyl, methoxy, fluoro or methylenedioxy group), (xiv) a phenylthio group (the phenyl moiety may be substituted with a methyl, trifluoromethyl, methoxy, fluoro or methylenedioxy group), (xv) a phenylsulfonyl group (the phenyl moiety may be substituted with a methyl, trifluoromethyl, methoxy, fluoro or methylenedioxy group), (xvi) a phenylsulfonylamino group (the phenyl

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moiety may be substituted with a methyl, trifluoromethyl, methoxy, fluoro or methylenedioxy group and the nitrogen atom of the amino moiety may be substituted with a straight or branched chain alkyl group having from 1 to 6 carbon atoms), (xvii) a furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy, pyridylthio or pyridylsulfonyl group, (xviii) an imidazolyl group in which the nitrogen atom is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms and/or (xix) a pyridylsulfonylamino group in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms;

$Y^e$  represents an oxygen atom, and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

(28) The compounds described in (1), wherein:

$R^{1e}$  represents a hydrogen atom, methyl group or ethyl group,

$R^{2e}$  represents an ethylene, trimethylene or methylethylene group,

$R^{3e}$  represents a hydrogen atom,

$X^e$  represents a phenyl, naphthyl, imidazolyl, oxazolyl, pyridyl, indolyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain alkanoyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a methylenedioxy, benzyloxy, phenethyloxy or

naphthylmethoxy group, (vii) a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, (viii) a straight or branched chain alkylsulfonyl group having from 1 to 4 carbon atoms, (ix) a fluorine, chlorine or bromine atom, (x) a benzyl group, (xi) a phenyl group (which may be substituted with a methyl, trifluoromethyl, methoxy, fluoro or methylenedioxy group), (xii) a phenoxy group (the phenyl moiety may be substituted with a methyl, trifluoromethyl, methoxy, fluoro or methylenedioxy group), (xiii) a phenylthio, phenylsulfonyl, phenylsulfonylamino, N-methylphenylsulfonylamino, furyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, pyridyl, pyridyloxy, pyridylthio, pyridylsulfonyl, pyridylsulfonylamino, N-methylpyridylsulfonylamino group and/or (xiv) an imidazolyl group in which the nitrogen atom is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms;

$Y^e$  represents an oxygen atom, and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

(29) The compounds described in (1), wherein:

$R^{1e}$  represents a hydrogen atom, a methyl group or an ethyl group,

$R^{2e}$  represents an ethylene, trimethylene or methylethylene group,

$R^{3e}$  represents a hydrogen atom,

$X^e$  represents a phenyl, naphthyl, pyridyl, indolyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 3 carbon atoms, (ii) a trifluoromethyl, difluoromethyl, fluoromethyl, hydroxy, formyloxy or acetoxy group, (iii) a straight or

branched chain alkoxy group having from 1 to 3 carbon atoms, (iv) a methylenedioxy, benzyloxy, methylthio, ethylthio, methylsulfonyl or ethylsulfonyl group, (v) a fluorine, chlorine or bromine atom, (vi) a benzyl, phenyl, 4-methylphenyl, 4-trifluoromethylphenyl, 4-methoxyphenyl, 4-fluorophenyl, 3,4-methylenedioxyphenyl, phenoxy, phenylthio, phenylsulfonyl, phenylsulfonylamino, N-methylphenylsulfonylamino, furyl, thienyl, oxazolyl, thiazolyl, imidazolyl, N-methylimidazolyl, pyridyl, pyridyloxy, pyridylthio, pyridylsulfonyl, pyridylsulfonylamino and/or N-methylpyridylsulfonylamino group;

10  $Y^e$  represents an oxygen atom, and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

(30) The compounds described in (1), wherein:

$R^{1e}$  represents a hydrogen atom, a methyl group or an ethyl group,

$R^{2e}$  represents an ethylene group,

15  $R^{3e}$  represents a hydrogen atom,

$X^e$  represents a phenyl, naphthyl, pyridyl, quinolyl or isoquinolyl group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

20 said substituents  $\alpha$  each representing (i) a methyl, ethyl, isopropyl, trifluoromethyl, hydroxy, acetoxy, methoxy, ethoxy, isopropoxy, methylenedioxy, benzyloxy, methylthio, ethylthio, methylsulfonyl, ethylsulfonyl group, chlorine atom, benzyl, phenyl, phenoxy, phenylthio, phenylsulfonyl, phenylsulfonylamino, N-methylphenylsulfonylamino, pyridyl, pyridyloxy, pyridylthio, pyridylsulfonyl, pyridylsulfonylamino and/or N-methylpyridylsulfonylamino group;

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$Y^e$  represents an oxygen atom, and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

(31) The compounds described in (1), wherein:

$R^{1e}$  represents a methyl or ethyl group,

5  $R^{2e}$  represents an ethylene group,

$R^{3e}$  represents a hydrogen atom,

$X^e$  represents a phenyl group which is unsubstituted or is substituted by from  
1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

10 said substituents  $\alpha$  each representing a methyl, hydroxy, acetoxy, a chlorine  
atom, benzyl, phenyl, phenoxy, phenylthio, phenylsulfonyl, phenylsulfonyl-  
amino, N-methylphenylsulfonylamino, pyridyl, pyridyloxy, pyridylthio  
and/or pyridylsulfonyl group;

$Y^e$  represents an oxygen atom, and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

15 (32) The compounds described in (1), wherein:

$R^{1e}$  represents a methyl or ethyl group,

$R^{2e}$  represents an ethylene group,

$R^{3e}$  represents a hydrogen atom,

20  $X^e$  represents a pyridyl group which is unsubstituted or is substituted by from  
1 to 3 substituents selected from the group consisting of substituents  $\alpha$ ,

said substituents  $\alpha$  each representing a methoxy, ethoxy, isopropoxy, benzyloxy, methylthio, ethylthio, methylsulfonyl, ethylsulfonyl, benzyl, phenyl, phenoxy, phenylthio, phenylsulfonyl, phenylsulfonylamino and/or N-methylphenylsulfonylamino;

5  $Y^e$  represents an oxygen atom, and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

(33) The compounds described in (1) which are selected from:

i) 5-(4-{2-[(1-biphenyl-4'-ylethylidene)aminooxy]ethoxy}benzyl)thiazolidine-2,4-dione,

10 ii) 5-[4-(2-{[1-(4-phenylsulfonylphenyl)ethylidene]aminooxy}ethoxy)benzyl]-thiazolidine-2,4-dione,

iii) 5-[4-(2-{[1-(4-pyrid-2'-ylphenyl)ethylidene]aminooxy}ethoxy)benzyl]thiazolidine-2,4-dione (which will hereinafter be called "Compound A"),

15 iv) 5-[4-(2-{[1-(4-pyrid-3'-ylphenyl)ethylidene]aminooxy}ethoxy)benzyl]thiazolidine-2,4-dione,

v) 5-[4-(2-{[1-(4-pyrid-4'-ylphenyl)ethylidene]aminooxy}ethoxy)benzyl]thiazolidine-2,4-dione,

vi) 5-[4-(2-{[1-(2-phenyl-5-pyridyl)ethylidene]aminooxy}ethoxy)benzyl]thiazolidine-2,4-dione,

20 vii) 5-[4-(2-{[1-(2-methoxy-5-pyridyl)ethylidene]aminooxy}ethoxy)benzyl]-thiazolidine-2,4-dione,

viii) 5-[4-(2-{[1-(2-ethoxy-5-pyridyl)ethylidene]aminooxy}ethoxy)benzyl]-thiazolidine-2,4-dione,

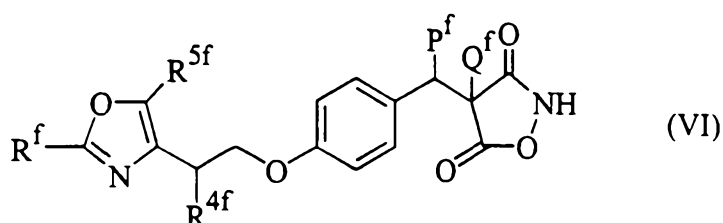
ix) 5-[4-(2-{[1-(2-isopropoxy-5-pyridyl)ethylidene]aminooxy}ethoxy)benzyl]-

thiazolidine-2,4-dione, and

x) 5-[4-(2-{{1-(2-benzyl-5-pyridyl)ethylidene}aminoxy}ethoxy)benzyl]thiazolidine-2,4-dione.

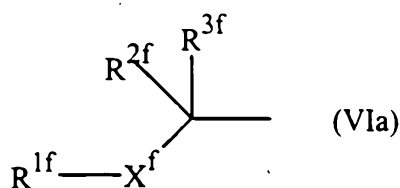
(VI) WO95/18125 describes:

5 (1) an isoxazolidinedione derivative of formula (VI):



wherein:

$R^f$  represents an aromatic hydrocarbon group which may be substituted, a cyclic aliphatic hydrocarbon group which may be substituted, a heterocyclic group which may be substituted, a fused heterocyclic group which may be substituted or a group of formula (VIa):



(wherein  $R^{1f}$  represents an aromatic hydrocarbon group which may be substituted, a cyclic aliphatic hydrocarbon group which may be substituted, a heterocyclic group which may be substituted or a fused heterocyclic group which may be substituted,  $R^{2f}$  and  $R^{3f}$  are the same or different and each represents a hydrogen atom or a lower alkyl group,  $X^f$  represents an oxygen atom, a sulfur atom or a secondary amino group);

$R^{4f}$  represents a hydrogen atom or a lower alkyl group;

$R^{5f}$  represents a lower alkyl group;

$P^f$  and  $Q^f$  each represents a hydrogen atom or together form a bond;

and pharmaceutically acceptable salts thereof.

In the compounds of formula (VI), details, such as the definitions of  $R^f$ ,  $R^{1f}$ ,  
5  $R^{2f}$ ,  $R^{3f}$ ,  $R^{4f}$ ,  $R^{5f}$ ,  $P^f$  and  $Q^f$ , the kinds of pharmaceutically acceptable salt, the  
process for preparing the compounds of formula (VI), examples of the compounds and  
preparative examples are described in WO95/18125, the disclosure of which is  
incorporated herein by reference.

More specific examples of the aromatic hydrocarbon groups which may be  
10 represented by  $R^f$  and  $R^{1f}$  include the aryl groups defined and exemplified above in  
relation to  $R^{1d}$ .

Where  $R^f$  or  $R^{1f}$  represents a heterocyclic group or a fused heterocyclic group,  
this may be any of the aromatic heterocyclic groups or fused heterocyclic groups  
defined and exemplified above in relation to  $A^{1d}$ . Alternatively,  $R^f$  or  $R^{1f}$  may  
15 represent a non-aromatic (preferably saturated) heterocyclic group, this may have from  
5 to 7 ring atoms, of which from 1 to 3 may be hetero-atoms selected from the group  
consisting of nitrogen, oxygen and sulfur atoms, at least one preferably being nitrogen.  
Examples of such groups include the pyrrolidinyl, piperidinyl, piperazinyl,  
N-methylpiperazinyl, morpholinyl, thiomorpholinyl, oxazolidinyl, thiazolidinyl,  
20 diazolidinyl, oxolanyl, thiolanyl and perhydropyridyl groups.

Where  $R^f$  or  $R^{1f}$  represents a cyclic aliphatic hydrocarbon group, this is  
preferably a cycloalkyl group, preferably having from 3 to 8 ring carbon atoms, and  
examples include the cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl  
and cyclooctyl groups, of which the cyclopentyl and cyclohexyl groups are preferred.  
25 Alternatively, it may be a cycloalkenyl group, preferably having from 5 to 8 ring  
carbon atoms, for example a cyclopentenyl, cyclohexenyl, cycloheptenyl or

cyclooctenyl group.

Any of the above groups represented by  $R^f$  or  $R^{1f}$  may be substituted or unsubstituted. If substituted, the group may be substituted by any group commonly used in the field, for example, those defined and exemplified above in relation to  
5 substituents  $\alpha$ .

Where  $R^{2f}$ ,  $R^{3f}$ ,  $R^{4f}$ , or  $R^{5f}$  represents an alkyl group, this is a lower alkyl group preferably having from 1 to 6 carbon atoms, more preferably having from 1 to 4 carbon atoms, and may be as defined and exemplified above in relation to  $R^{3c}$  and substituents  $\chi$ .

10 Preferred examples of compounds of formula (VI) include:

(2) The compound described in (1), wherein  $R^{4f}$  represents a hydrogen atom and  $R^{5f}$  represents a lower alkyl group.

(3) The compound described in (2), wherein  $R^f$  represents a phenyl group which may be substituted, a 5- or 6-membered aromatic heterocyclic group which may be  
15 substituted and has 1 or 2 hetero atoms selected from the group consisting of sulfur, oxygen and nitrogen atoms, or a fused aromatic heterocyclic group which may be substituted and is formed by fusing the above-described aromatic heterocyclic ring with a benzene ring.

(4) The compound described in (3), wherein  $R^f$  represents a phenyl group, a 5- or 6-  
20 membered aromatic heterocyclic group having 1 to 2 hetero atoms selected from the group consisting of sulfur, oxygen and nitrogen atoms, or a fused aromatic heterocyclic group formed by fusing the above-described aromatic heterocyclic ring with a benzene ring.

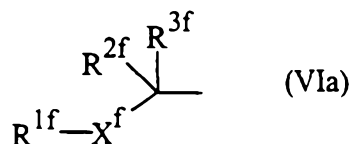
(5) The compound described in (3), wherein  $R^f$  represents a phenyl group or a fused  
25 aromatic heterocyclic group formed by fusing a benzene ring with a 5- or 6-membered

heterocyclic ring having a sulfur atom.

(6) The compound described in (2), wherein  $R^f$  represents a phenyl, benzothienyl or 1-methyl-1-(2-pyridylthio)methyl group.

(7) The compound described in (2), wherein  $R^f$  represents a phenyl group.

5 (8) The compound described in (2), wherein  $R^f$  represents a group of formula (VIa):



10 (9) The compound described in (8), wherein  $R^{1f}$  represents a phenyl group which may be substituted or a 5- or 6-membered aromatic heterocyclic group which has 1 to 2 hetero atoms selected from the group consisting of sulfur, oxygen and nitrogen atoms and which may be substituted.

(10) The compound described in (8), wherein  $R^{1f}$  represents a 5- or 6-membered aromatic heterocyclic group which has 1 to 2 hetero atoms selected from the group consisting of sulfur, oxygen and nitrogen atoms.

15 (11) The compound described in (8), wherein  $R^{1f}$  represents a 5- or 6-membered aromatic heterocyclic group having a nitrogen atom.

(12) The compound described in (8), wherein  $R^{1f}$  represents a pyridyl group.

(13) The compounds described in (1) which are selected from:

i) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidinedione,

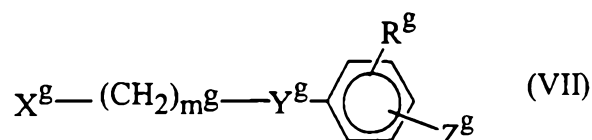
20 ii) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzylidene}-3,5-isoxazolidinedione,

iii) 4-{4-[2-(2-benzothienyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidine-dione and

iv) 4-[4-(2-{5-methyl-2-[1-(2-pyridylthio)ethyl]-4-oxazolyl}ethoxy)benzyl]-3,5-isoxazolidinedione.

5 (VII) Japanese Patent Application Kokai No. Hei 7-330728 or European Patent Publication No. 676398A describes:

(1) a heterocyclic compound of formula (VII):



wherein:

10  $X^g$  represents an indole, indoline, azaindole, azaindoline, imidazopyridine or imidazopyrimidine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

$Y^g$  represents an oxygen or sulfur atom;

15  $Z^g$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl, 3,5-dioxooxadiazolidin-2-ylmethyl or N-hydroxyureidomethyl group;

20  $R^g$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms;

said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms; and

$m^g$  represents an integer of from 1 to 5,

said substituent  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined above, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ ;

said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group or an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined above;

and pharmaceutically acceptable salts thereof.

In the compounds of formula (VII), details, such as the definitions of  $R^g$ ,  $X^g$ ,

$Y^g$ ,  $m^g$  and  $Z^g$  and substituents  $\delta$ ,  $\epsilon$  and  $\phi$ , the kinds of pharmaceutically acceptable salt, the process for preparing the compounds of formula (VII), examples of the compounds and preparative examples are described in Japanese Patent Application Kokai No. Hei 7-330728 or European Patent Publication No. 676398A, the disclosures of which are incorporated herein by reference.

For example, where  $R^g$ , substituent  $\delta$  or substituent  $\phi$  represents an alkyl or alkoxy having from 1 to 4 carbon atoms, this may be as defined and exemplified above in relation to substituent  $\chi$ . Where  $R^g$  or substituent  $\epsilon$  represents an aralkyl group, this may be as defined and exemplified above in relation to  $R^{1d}$ . Where substituent  $\delta$  represents an alkylthio group, this may be as defined and exemplified above in relation to  $W^{2c}$ . Where substituent  $\delta$  or substituent  $\epsilon$  represents an aryl group, this may be as defined and exemplified above in relation to  $R^{1d}$ . Where substituent  $\epsilon$  represents a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms, these may be selected from the corresponding groups defined and exemplified above in relation to  $R^{1d}$ .

Preferred examples of the compounds of formula (VII) include:

(2) The compounds described in (1), wherein  $X^g$  represents an indole, indoline, azaindole, imidazopyridine or imidazopyrimidine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

said substituents  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group

consisting of substituents  $\epsilon$ , defined below, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted  
5 by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below;

said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a  
10 trifluoromethyl group or an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below;

said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon  
15 atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms;

(3) The compounds described in (1), wherein  $X^E$  represents an indole, indoline,  
20 imidapyridine or imidazopyrimidine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

said substituents  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon  
25 atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group

consisting of substituents  $\epsilon$ , defined below, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below.

said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group or an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below;

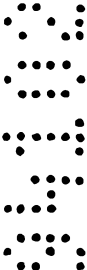
said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms.

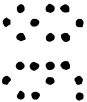

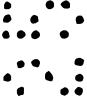
(4) The compounds described in (1), wherein  $X^g$  represents an indole, indoline or imidazopyridine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

said substituents  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below, an aryl group having from 6 to 10 carbon

atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\phi$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\phi$ ,  
5 defined below;

said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group or an amino group which is unsubstituted or is substituted by at  
10 least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below;

 said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain  
15 aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms.

  
  
 (5) The compounds described in (1), wherein  $X^g$  represents an indoline or imidazopyridine ring group which is unsubstituted or is substituted by from 1 to 3  
20 substituents selected from the group consisting of substituents  $\delta$ , defined below;  
said substituent  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group or a  
25 phenyl group.

(6) The compounds described in (1), wherein  $X^g$  represents an imidazopyridine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from

the group consisting of substituents  $\delta$ , defined below;

said substituent  $\delta$  represents a methyl, ethyl, isopropyl, methoxy, ethoxy, propoxy, isopropoxy, benzyloxy, fluorine, chlorine, phenylthio, methylthio, ethylthio or a phenyl group.

- 5 (7) The compounds described in (1), wherein  $R^G$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms or a halogen atom.

(8) The compounds described in (1), wherein  $R^G$  represents a hydrogen atom, a methoxy group, an ethoxy group, a fluorine atom or a chlorine atom.

- 10 (9) The compounds described in (1), wherein  $R^G$  represents a hydrogen atom or a methoxy group.

(10) The compound described in (1), wherein  $R^G$  represents a hydrogen atom.

(11) The compound described in (1), wherein  $Y^G$  represents an oxygen atom.

- 15 (12) The compound described in (1), wherein  $Z^G$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl or 2,4-dioxooxazolidin-5-ylmethyl group.

(13) The compound described in (1), wherein  $Z^G$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl or 2,4-dioxothiazolidin-5-ylmethyl group.

- 20 (14) The compound described in (1), wherein  $Z^G$  represents a 2,4-dioxothiazolidin-5-ylmethyl group.

(15) The compounds described in (1), wherein:

$X^G$  represents an indole, indoline, azaindole, imidazopyridine or

imidazopyrimidine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

$Y^g$  represents an oxygen or sulfur atom;

5  $Z^g$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl, 3,5-dioxooxadiazolidin-2-ylmethyl or  $N$ -hydroxyureidomethyl group;

10  $R^g$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms or a halogen atom, and

$m^g$  represents an integer of from 1 to 5;

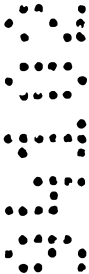
15 said substituent  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below;

25 said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having


from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below;

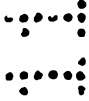
- 5        said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or  
10        an aromatic acyl group having from 7 to 11 carbon atoms.<sup>7</sup>

(16) The compounds described in (1), wherein:

  $X^g$  represents an indole, indoline, imidazopyridine or imidazopyrimidine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

- 15         $Y^g$  represents an oxygen atom;

  $Z^g$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl or 2,4-dioxooxazolidin-5-ylmethyl group;

-   $R^g$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms or halogen atom; and  
20

  $m^g$  represents an integer of from 1 to 5;

- 25        said substituent  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain

alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\phi$ , defined below;

10 said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or  
15 an aromatic acyl group having from 7 to 11 carbon atoms;

said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group or an amino group which is  
20 unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined above.

(17) The compounds described in (1), wherein:

$X^B$  represents an indole, indoline or imidazopyridine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the  
25 group consisting of substituents  $\delta$ , defined below;

$Y^B$  represents an oxygen atom;

$Z^B$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl or 2,4-

dioxothiazolidin-5-ylmethyl group;

$R^g$  represents a hydrogen atom, a methoxy group, an ethoxy group, a fluorine atom or a chlorine atom; and

$m^g$  represents an integer of from 1 to 5;

5 said substituent  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a  
10 nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined below, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\phi$ , defined below, or a straight or branched  
15 chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\phi$ , defined below;

said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a  
20 straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms;

said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a  
25 phenyl group, a trifluoromethyl group or an amino group which is

unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\epsilon$ , defined above.

(18) The compounds described in (1), wherein:

5  $X^g$  represents an indoline or imidazopyridine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

$Y^g$  represents an oxygen atom;

$Z^g$  represents a 2,4-dioxothiazolidin-5-ylmethyl group;

$R^g$  represents a hydrogen atom or a methoxy group; and

10  $m^g$  represents an integer of from 1 to 5;

said substituent  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group or a phenyl group.

15

(19) The compounds described in (1), wherein:

$X^g$  represents an imidazopyridine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

20  $Y^g$  represents an oxygen atom;

$Z^g$  represents a 2,4-dioxothiazolidin-5-ylmethyl group;

$R^g$  represents a hydrogen atom; and

$m^g$  represents an integer of from 1 to 5;

said substituent  $\delta$  represents a methyl group, an ethyl group, an isopropyl group, a methoxy group, an ethoxy group, a propoxy group, an isopropoxy group, a benzyloxy group, a fluorine atom, a chlorine atom, a phenylthio group, a methylthio group, an ethylthio group or a phenyl group.

5

(20) The compounds described in (1) which are selected from:

i) 5-{4-(3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

ii) 5-{4-(5-chloro-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

10 iii) 5-{4-(5-methoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-thiazolidine-2,4-dione,

iv) 5-{4-(5-hydroxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-thiazolidine-2,4-dione,

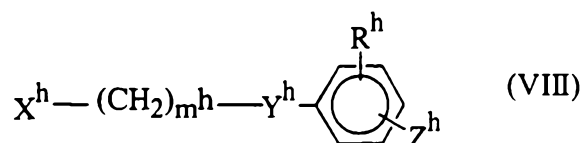
15 v) 5-{4-(5-ethoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

vi) 5-{4-(5-isopropoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-thiazolidine-2,4-dione, and

vii) 5-[4-(1-methylindolin-2-ylmethoxy)benzyl]thiazolidine-2,4-dione.

(VIII) European Patent Publication No. 745600A describes:

20 (1) a fused heterocyclic compound of formula (VIII):



wherein:

$X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below,

5  $Y^h$  represents an oxygen or sulfur atom,

$Z^h$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl, 3,5-dioxooxadiazolidin-2-ylmethyl or N-hydroxyureidomethyl group;

10  $R^h$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\eta$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, and

15  $m^h$  represents an integer of from 1 to 5;

20 said substituent  $\gamma$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\eta$ , defined below, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\lambda$ , defined below, or a straight or branched chain  
25 aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\lambda$ , defined

below;

said substituent  $\eta$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain  
5 aliphatic acyl group having from 1 to 11 carbon atoms, a aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms.

said substituent  $\lambda$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon  
10 atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group or an amino group which is unsubstituted or is substituted by at least one substituent selected from the group consisting of substituents  $\eta$ , defined above;

and pharmaceutically acceptable salts thereof.

15 In the compounds of formula (VIII), details, such as the definitions of  $R^h$ ,  $X^h$ ,  $Y^h$ ,  $Z^h$  and substituents  $\gamma$ ,  $\eta$  and  $\lambda$  and  $m^h$ , the kinds of pharmaceutically acceptable salt, the preparation process for the compounds of formula (VIII), examples of the compounds and preparative examples are described in European Patent Publication No. 745600A, the disclosure of which is incorporated herein by reference.

20 Where  $R^h$ , substituent  $\gamma$  or substituent  $\lambda$  represents an alkyl or alkoxy group, this has from 1 to 4 carbon atoms, and may be any of the corresponding groups defined and exemplified above in relation to substituent  $\chi$ . Where  $R^h$ , substituent  $\gamma$  or substituent  $\eta$  represents an aralkyl group, this may be as defined and exemplified above in relation to  $R^{1d}$ . Where substituent  $\gamma$  or substituent  $\eta$  represents a halogen atom, this may be as  
25 defined and exemplified above in relation to substituent  $\chi$ . Where substituent  $\gamma$  represents an alkylthio group, this may be as defined and exemplified above in relation to  $W^{2c}$ . Where substituent  $\gamma$  represents an aryl group, this may be as defined and

exemplified above in relation to  $R^{1d}$ . Where substituent  $\eta$  represents a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms, these may be selected from the corresponding  
5 groups defined and exemplified above in relation to  $R^{1d}$ .

Where substituent  $\eta$  represents an alkyl group having from 1 to 8 carbon atoms, this may be a straight or branched chain group, and examples include the methyl, ethyl, propyl, isopropyl, butyl, isobutyl, sec-butyl, t-butyl, pentyl, isopentyl, neopentyl, 2-methylbutyl, 1-ethylpropyl, hexyl, 4-methylpentyl, 3-methylpentyl, 2-methylpentyl,  
10 1-methylpentyl, 3,3-dimethylbutyl, 2,2-dimethylbutyl, 1,1-dimethylbutyl, 1,2-dimethylbutyl, 1,3-dimethylbutyl, 2,3-dimethylbutyl, 2-ethylbutyl, heptyl and octyl groups. Of these, we prefer those alkyl groups having from 1 to 4 carbon atoms, particularly the methyl, ethyl, propyl, isopropyl, butyl and isobutyl groups, and most preferably the methyl group.

15 Preferred examples of the compounds of formula (VIII) include:

(2) The compound described in (1), wherein  $R^h$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms or a halogen atom.

(3) The compound described in (1), wherein  $Y^h$  represents an oxygen atom.

20 (4) The compound described in (1), wherein  $Z^h$  represents a 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxothiazolidin-5-ylidenylmethyl or 2,4-dioxooxazolidin-5-ylmethyl group.

(5) The compound described in (1), wherein:

25  $R^h$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms or a halogen atom,

$Y^h$  represents an oxygen atom, and

$Z^h$  represents a 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxothiazolidin-5-ylidenylmethyl or 2,4-dioxooxazolidin-5-ylmethyl group.

5 (6) The compound described in (1), wherein  $Z^h$  represents a 2,4-dioxothiazolidin-5-ylmethyl or 2,4-dioxothiazolidin-5-ylidenylmethyl group.

(7) The compound described in (1), wherein  $R^h$  represents a hydrogen atom, a methyl group, a methoxy group, an ethoxy group, a fluorine atom or a chlorine atom.

(8) The compound described in (1), wherein  $m^h$  represents an integer of from 1 to 3.

(9) The compound described in (1), wherein:

10  $Y^h$  represents an oxygen atom,

$Z^h$  represents a 2,4-dioxothiazolidin-5-ylmethyl or 2,4-dioxothiazolidin-5-ylidenylmethyl group,

$R^h$  represents a hydrogen atom, a methyl group, a methoxy group, an ethoxy group, a fluorine atom or a chlorine atom, and

15  $m^h$  represents an integer of from 1 to 3.

(10) The compound described in (1), wherein  $X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below;

20 said substituent  $\gamma$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a

hydroxy group, an acetoxy group, a benzyl group or a phenyl group.

(11) The compound described in (1), wherein  $Z^h$  represents a 2,4-dioxooxazolidin-5-ylmethyl group.

(12) The compound described in (1), wherein  $R^h$  represents a hydrogen atom, a methyl group or a methoxy group.

(13) The compound described in (1), wherein:

$X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below;

10 said substituent  $\gamma$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a hydroxy group, an acetoxy group, a benzyl group or a phenyl group,

$Y^h$  represents an oxygen atom,

$Z^h$  represents a 2,4-dioxooxazolidin-5-ylmethyl group,

$R^h$  represents a hydrogen atom, a methyl group or a methoxy group, and

$m^h$  represents an integer of from 1 to 3.

20 (14) The compound described in (1), wherein  $X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below;

said substituent  $\gamma$  represents a methyl group, an ethyl group, an isopropyl group, a

methoxy group, an ethoxy group, a propoxy group, an isopropoxy group, a benzyloxy group, a fluorine atom, a chlorine atom, a phenylthio group, a methylthio group, an ethylthio group, a hydroxy group, an acetoxy group, a benzyl group or a phenyl group.

(15) The compound described in (1), wherein  $R^h$  represents a hydrogen atom.

5 (16) The compound described in (1), wherein  $m^h$  represents 1 or 2.

(17) The compound described in (1), wherein:

$X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below;

10 said substituent  $\gamma$  represents a methyl group, an ethyl group, an isopropyl group, a methoxy group, an ethoxy group, a propoxy group, an isopropoxy group, a benzyloxy group, a fluorine atom, a chlorine atom, a phenylthio group, a methylthio group, an ethylthio group, a hydroxy group, an acetoxy group, a benzyl group or a phenyl group;

15  $Y^h$  represents an oxygen atom;

$Z^h$  represents a 2,4-dioxothiazolidin-5-ylmethyl group;

$R^h$  represents a hydrogen atom; and

$m^h$  represents 1 or 2.

20 (18) The compound described in (1), wherein  $X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below;

said substituent  $\gamma$  represents a methyl, methoxy, hydroxy, acetoxy or benzyl group.

(19) The compound described in (1), wherein  $m^h$  represents 1.

(20) The compound described in (1), wherein:

5  $X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below;

said substituent  $\gamma$  represents a methyl group, a methoxy group, a hydroxy group, an acetoxy group or a benzyl group,

$Y^h$  represents an oxygen atom,

$Z^h$  represents a 2,4-dioxothiazolidin-5-ylmethyl group,

10  $R^h$  represents a hydrogen atom, and

$m^h$  represents 1.

(21) The compounds described in (1) which are selected from:

i) 5-[4-(1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

15 ii) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione (which will hereinafter be called "Compound B"),

iii) 5-[4-(5-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

iv) 5-[4-(1-benzylbenzimidazol-5-ylmethoxy)benzyl]thiazolidine-2,4-dione,

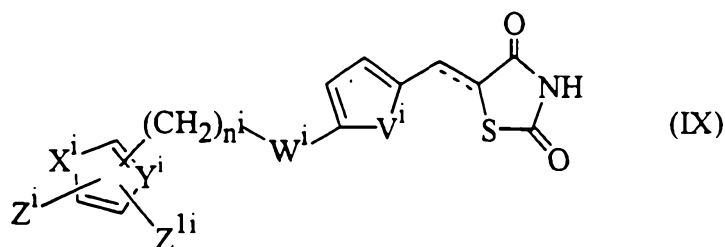
20 v) 5-[4-(5-hydroxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione, and

vi) 5-[4-(5-acetoxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]-

thiazolidine-2,4-dione.

(IX) Japanese Patent Application Kokai No. Hei 1-272574 and European Patent Publication No. 332332A describe:

(1) A compound of formula (IX):



wherein:

$\text{---}$  represents a single or double bond;

$V^i$  represents a group of formula  $-\text{CH}=\text{CH}-$ ,  $-\text{N}=\text{CH}-$  or  $-\text{CH}=\text{N}-$  or a sulfur atom;

$W^i$  represents a group of formula  $>\text{CH}_2$ ,  $>\text{CHOH}$ ,  $>\text{CO}$ ,  $>\text{C}=\text{NOR}^i$  or  $-\text{CH}=\text{CH}-$ ,

$X^i$  represents a sulfur or oxygen atom or a group of formula  $>\text{NR}^{1i}$ ,  $-\text{CH}=\text{N}-$  or  $-\text{N}=\text{CH}-$ ,

$Y^i$  represents a group of formula  $=\text{CH}-$  or a nitrogen atom,

$Z^i$  represents a hydrogen atom, an alkyl group having from 1 to 7 carbon atoms, a cycloalkyl group having from 3 to 7 carbon atoms, a phenyl group, a naphthyl group, a pyridyl group, a furyl group, a thienyl group or a phenyl group substituted with one or two substituents selected from the group consisting of alkyl groups having from 1 to 3 carbon atoms, trifluoromethyl groups, alkoxy groups having from 1 to 3 carbon atoms, fluorine atoms,

chlorine atoms and bromine atoms,

$Z^{1i}$  represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms,

$R^i$  and  $R^{1i}$  each independently represents a hydrogen atom or a methyl group, and

$n^i$  represents 1, 2 or 3;

and pharmaceutically acceptable salts thereof.

In the compounds of formula (IX), details, such as the definitions of  $V^i$ ,  $W^i$ ,  $X^i$ ,  $Y^i$ ,  $Z^i$ ,  $Z^{1i}$ ,  $R^i$ ,  $R^{1i}$  and  $n^i$ , the kinds of pharmaceutically acceptable salt, the process for preparing the compounds of formula (IX), examples of the compounds and preparative examples are described in Japanese Patent Application Kokai No. Hei 1-272574 and European Patent Publication No. 332332A, the disclosures of which are incorporated herein by reference.

For example, where  $Z^i$  represents an alkyl group having from 1 to 7 carbon atoms or  $Z^{1i}$  or the substituent on the phenyl group represented by  $Z^i$  represents an alkyl group having from 1 to 3 carbon atoms, these may be selected among the corresponding groups defined and exemplified above in relation to substituents  $\eta$ .

Where  $Z^i$  represents a cycloalkyl group having from 3 to 7 carbon atoms, this may be a cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl or cycloheptyl group.

Preferred examples of the compounds of formula (IX) include:

(2) The compounds described in (1), wherein the broken line is no bond and  $W^i$  represents a group of formula  $>CO$  or  $>CHOH$ .

(3) The compounds described in (2), wherein  $V^i$  represents a group of formula

-CH=CH- or -CH=N- or a sulfur atom, and  $n^i$  represents 2.

(4) The compounds described in (3), wherein  $X^i$  represents an oxygen atom,  $Y^i$  represents N which forms an oxazol-4-yl group,  $Z^i$  represents the (2-thienyl), (2-furyl), phenyl, substituted phenyl or naphthyl group and  $Z^{1i}$  represents the 5-methyl group.

5 (5) The compounds described in (4), wherein  $V^i$  represents a group of formula -CH=N- or a sulfur atom, and  $Z^i$  represents a 2-phenyl group.

(6) The compounds described in (1), wherein  $V^i$  represents a group of formula -CH=CH-,  $W^i$  represents a group of formula  $>CO$ , and  $Z^i$  represents a 2-(2-furyl), 2-phenyl, 2-(4-methylphenyl) or 2-(2-naphthyl) group.

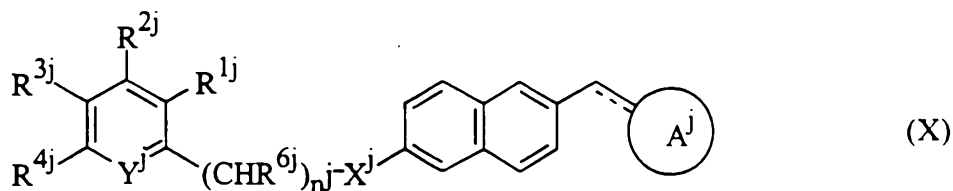
10 (7) The compounds described in (3), wherein  $X^i$  represents an oxygen or sulfur atom, and  $Y^i$  represents a nitrogen atom, which forms an oxazol-5-yl group, a thiazol-4-yl group or a thiazol-5-yl group.

(8) The compounds described in (3), wherein  $X^i$  represents a group of formula -CH=N- and  $Y^i$  represents CH which forms a pyrid-2-yl; or  $X^i$  represents an oxygen atom and  
15  $Y^i$  represents CH which forms a fur-2-yl group.

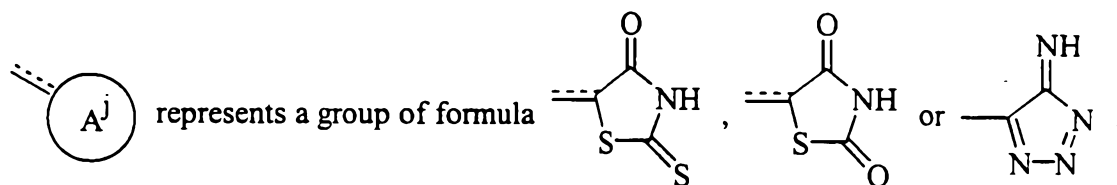
(9) The compound described in (1), which is 5-{4-[3-(5-methyl-2-phenyloxazol-4-yl)propionyl]benzyl}thiazolidine-2,4-dione.

(X) Japanese Patent Application Kokai No. 6-247945 and European Patent Publication No. 604983A describe:

20 (1) a naphthalene derivative of formula (X):



wherein:



$-X^j$  represents an oxygen or sulfur atom;

5  $=Y^j$  represents  $=N-$  or a group of formula  $=CR^{5j}-$ ;

10  $R^{1j}, R^{2j}, R^{3j}, R^{4j}$  and  $R^{5j}$  each independently represents a hydrogen atom, a halogen atom, an alkyl group, an aryl group, an alkoxy group, an alkoxyalkoxy group, an aryloxy group, an alkanoyloxy group, an arylcarbonyloxy group, a carboxyl group, an alkoxycarbonyl group, an aryloxycarbonyl group, a carbamoyl group, an alkylaminocarbonyl group, an arylaminocarbonyl group, an amino group, an alkylamino group, an alkanoylamino group, an arylcarbonylamino group, an ethylenedioxymethyl group, a formyl group, a cyano group, a nitro group or a trihalomethyl group,

15  $R^{6j}$  represents a hydrogen atom, an alkyl group which may be substituted or an aryl group which may be substituted; and

$n^j$  represents 0 or an integer of from 1 to 3;

and  $\text{---}$  may represent a single or double bond;

and pharmaceutically acceptable salts thereof.

In the compounds of formula (X), details, such as the definitions of  $A^j$ ,  $X^j$ ,  $Y^j$ ,  $R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$ ,  $R^{5j}$ ,  $R^{6j}$  and  $n^j$ , the kinds of pharmaceutically acceptable salt, the process for preparing the compounds of formula (X), examples of the compounds and preparative examples are described in Japanese Patent Application Kokai No. 6-  
5 247945 and European Patent Publication No. 604983A, the disclosures of which are incorporated herein by reference.

Where  $R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$  or  $R^{5j}$  represents a halogen atom, an alkyl group, an aryl group or an alkoxy group, these may be as defined and exemplified above in relation to substituent  $\chi$ ,  $R^{3c}$  or  $R^{4a}$ , respectively. Where  $R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$  or  $R^{5j}$   
10 represents an alkoxyalkoxy group, an aryloxy group, an alkanoyloxy group, an arylcarbonyloxy group, an alkoxycarbonyl group, an aryloxycarbonyl group, an alkylaminocarbonyl group, an arylaminocarbonyl group, an alkanoylamino group or an arylcarbonylamino group, the respective parts of these groups may be as defined and exemplified above.

15 Where  $R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$  or  $R^{5j}$  represents an alkylamino group, this may be a mono- or di- alkylamino group as defined and exemplified above in relation to substituent  $\chi$ .

Where  $R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$  or  $R^{5j}$  represents a trihalomethyl group, this may be a trifluoromethyl, trichloromethyl, tribromomethyl or triiodomethyl group, preferably a  
20 trifluoromethyl group.

Preferred examples of compounds of formula (X) include:

(2) The compounds described in (1), wherein  $R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$  and  $R^{5j}$  each independently represents a hydrogen atom, a halogen atom, an alkyl group having from 1 to 8 carbon atoms, an aryl group having from 6 to 12 carbon atoms, an alkoxy group  
25 having from 1 to 8 carbon atoms, an alkoxyalkoxy group having from 2 to 6 carbon atoms, an aryloxy group having from 6 to 12 carbon atoms, an alkanoyloxy group

having from 2 to 9 carbon atoms, an arylcarbonyloxy group having from 7 to 13 carbon atoms, a carboxyl group, an alkoxycarbonyl group having from 2 to 9 carbon atoms, an aryloxy carbonyl group having from 7 to 13 carbon atoms, a carbamoyl group, an alkylaminocarbonyl group having from 2 to 9 carbon atoms, an  
5 arylaminocarbonyl group having from 7 to 13 carbon atoms, an amino group, an alkylamino group having from 1 to 8 carbon atoms, an alkanoylamino group having from 2 to 9 carbon atoms, an arylcarbonylamino group having from 7 to 13 carbon atoms, an ethylenedioxymethyl group, a formyl group, a cyano group, a nitro group or a trihalomethyl group, and R<sup>6j</sup> represents a hydrogen atom, an alkyl group having  
10 from 1 to 8 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of phenyl groups, halogen atoms, nitro groups and cyano groups or an aryl group having from 6 to 12 carbon atoms which is unsubstituted or is substituted by at least one substituent selected from the group consisting of alkyl groups having from 1 to 8 carbon atoms, halogen atoms, nitro  
15 groups and cyano groups.

(3) The compounds described in (1), wherein:

R<sup>1j</sup>, R<sup>2j</sup>, R<sup>3j</sup>, R<sup>4j</sup> and R<sup>5j</sup> each independently represents a hydrogen atom, a halogen atom, an alkyl group having from 1 to 8 carbon atoms, an alkoxy group having from 1 to 8 carbon atoms, an alkoxyalkoxy group having from 2  
20 to 6 carbon atoms, an alkanoyloxy group having from 2 to 9 carbon atoms, an arylcarbonyloxy group having from 7 to 13 carbon atoms, a carboxyl group, an alkoxycarbonyl group having from 2 to 9 carbon atoms, a carbamoyl group, alkylaminocarbonyl group having from 2 to 9 carbon atoms, an arylaminocarbonyl group having from 7 to 13 carbon atoms, an amino group,  
25 an alkylamino group having from 1 to 8 carbon atoms, an alkanoylamino group having from 2 to 9 carbon atoms, an arylcarbonylamino group having from 7 to 13 carbon atoms, an ethylenedioxymethyl group, a formyl group, a cyano group, a nitro group or trihalomethyl group; and

$R^{6j}$  represents a hydrogen atom, an alkyl group having from 1 to 8 carbon atoms or an aryl group having from 6 to 12 carbon atoms which may be substituted with a halogen atom.

(4) The compounds described in (1), wherein:

5             $-X^j-$  represents an oxygen atom;

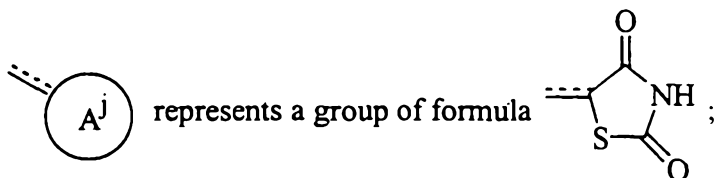
$Y^i$  represents a group of formula  $=CR^{5j}-$ ;

10             $R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$  and  $R^{5j}$  each independently represents a hydrogen atom, a halogen atom, an alkyl group having from 1 to 5 carbon atoms, an alkoxy group having from 1 to 5 carbon atoms, an alkoxyalkoxy group having from 2 to 6 carbon atoms, an alkanoyloxy group having from 2 to 6 carbon atoms, a carboxyl group, an alkoxy carbonyl group having from 2 to 6 carbon atoms, an arylaminocarbonyl group having from 7 to 13 carbon atoms, an amino group, an alkanoylamino group having from 2 to 6 carbon atoms, an ethylenedioxymethyl group, a formyl group, a cyano group, a nitro group or a trihalomethyl group; and

$R^{6j}$  represents a hydrogen atom, an alkyl group having from 1 to 5 carbon atoms or an aryl group having from 6 to 12 carbon atoms which may be substituted with a halogen atom.

(5) The compounds described in (1),

20



$-X^j-$  represents an oxygen atom,  $Y^j$  represents a group of formula  $=CR^{5j}-$ ;

$R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$  and  $R^{4j}$  each independently represents a hydrogen atom or a

halogen atom;

$R^{5j}$  represents a hydrogen atom;

$R^{6j}$  represents a hydrogen atom;

$n^j$  represents 1; and

5         $\text{---}$  represents a single bond.

(6) The compound described in (1) which is 5-[6-(2-fluorobenzyloxy)-2-naphthyl-methyl]thiazolidin-2,4-dione.

Where any of the compounds of formula (I) to (X) or a pharmaceutically acceptable salt thereof can exist in the form of various isomers, for example, as  
10 stereoisomers based on an asymmetric carbon atom [for example, the carbon atom at the 2-position of the chroman ring or at the 5-position of the thiazolidine ring of compounds of formula (I) is an asymmetric carbon atom], stereoisomers based on such an asymmetric carbon atom and mixtures thereof in any ratio are all represented by the same formula. The present invention therefore embraces all of these isomers and  
15 mixtures thereof.

In each of the compounds of formula (I) to (X) and the pharmaceutically acceptable salts thereof, the 2,4-dioxothiazolidin-5-ylmethyl ring, for example, has various tautomers. In formulae (I) to (X), these tautomers and mixtures thereof in any ratio are all represented by the same formula. The present invention therefore  
20 embraces all of these isomers and mixtures thereof.

In the present invention, when any of the compounds of formulae (I) to (X) or the pharmaceutically acceptable salts thereof forms a solvate (for example a hydrate), they are also embraced by the present invention. For example, each of the compounds of formulae (I) to (X) and pharmaceutically acceptable salts thereof will form hydrates  
25 when left in the air or when recrystallized in the presence of water, and will absorb water. The present invention also embraces such solvents.

The present invention also embraces all the prodrugs, that is, compounds which are derivatives of compounds of formulas (I) to (X) and are converted under physiological conditions into the compounds of formulas (I) to (X) or into pharmaceutically acceptable salts thereof.

5 Preferred examples of the compounds of the present invention represented by each of formulae (I) to (X) include:

i) 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione (troglitazone),

10 ii) 5-[4-(6-hydroxy-2-methyl-7-t-butylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

iii) 5-[4-(6-hydroxy-2-ethyl-5,7,8-trimethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

iv) 5-[4-(6-hydroxy-2-isobutyl-5,7,8-trimethylchroman-2-ylmethoxy)benzyl]-thiazolidine-2,4-dione,

15 v) 5-[4-(6-acetoxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

vi) 5-[4-(6-ethoxycarbonyloxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]-thiazolidine-2,4-dione,

vii) 5-{4-[2-(3-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

20 viii) 5-{4-[2-(4-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

ix) 5-{4-[2-(5-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione (pioglitazone),

x) 5-{4-[2-(6-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

xi) 5-[(2-benzyl-2,3-dihydrobenzofuran-5-yl)methyl]thiazolidine-2,4-dione,

xii) 5-[(2-benzyl-3,4-dihydro-2H-benzopyran-6-yl)methyl]thiazolidine-2,4-dione  
(englitazone),

xiii) 5-(4-{2-[N-methyl-N-(2-benzothiazolyl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

5 xiv) 5-(4-{2-[N-methyl-N-(2-pyrimidinyl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

xv) 5-(4-{2-[N-methyl-N-(4,5-dimethylthiazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

xvi) 5-{4-[2-(N-methyl-N-thiazol-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

10 xvii) 5-(4-{2-[N-methyl-N-(4-phenylthiazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

xviii) 5-(4-{2-[N-methyl-N-(4-phenyl-5-methylthiazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

15 xix) 5-(4-{2-[N-methyl-N-(4-methyl-5-phenylthiazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

xx) 5-(4-{2-[N-methyl-N-(5-phenyloxazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

xxi) 5-(4-{2-[N-methyl-N-(4,5-dimethyloxazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

20 xxii) 5-{4-[2-(2-pyrimidinylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

xxiii) 5-{4-[2-(N-acetyl-N-pyrimidin-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

xxiv) 5-(4-{2-[N-(2-benzothiazolyl)-N-benzylamino]ethoxy}benzyl)thiazolidine-2,4-dione,

xxv) 5-(4-{3-[N-methyl-N-(2-benzoxazolyl)amino]propoxy}benzyl)thiazolidine-2,4-dione,

xxvi) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione (rosiglitazone),

5 xxvii) 5-(4-{2-[1-(4-biphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-2,4-dione,

xxviii) 5-(4-{2-[1-(4-phenylsulfonylphenyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxix) 5-(4-{2-[1-(4-pyrid-2'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)-  
10 thiazolidine-2,4-dione (Compound A),

xxx) 5-(4-{2-[1-(4-pyrid-3'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-2,4-dione,

xxxi) 5-(4-{2-[1-(4-pyrid-4'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

15 xxxii) 5-(4-{2-[1-(2-phenyl-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxiii) 5-(4-{2-[1-(2-methoxy-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxiv) 5-(4-{2-[1-(2-ethoxy-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-  
20 thiazolidine-2,4-dione,

xxxv) 5-(4-{2-[1-(2-isopropoxy-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxvi) 5-(4-{2-[1-(2-benzyl-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxvii) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidine-dione,

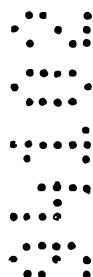
xxxviii) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzylidene}-3,5-isoxazolidinedione,

5 xxxix) 4-{4-[2-(2-benzothienyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidinedione,

x1) 4-[4-(2-{5-methyl-2-[1-(2-pyridylthio)ethyl]-4-oxazolyl}ethoxy)benzyl]-3,5-isoxazolidinedione.

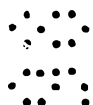
xli) 5-{4-(3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

10 xlii) 5-{4-(5-chloro-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

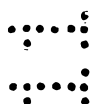


xlili) 5-{4-(5-methoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-thiazolidine-2,4-dione,

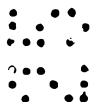
15 xliv) 5-{4-(5-hydroxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-thiazolidine-2,4-dione,



xlvi) 5-{4-(5-isopropoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-thiazolidine-2,4-dione,



20 xlvii) 5-[4-(1-methylindolin-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,



xlvi) 5-[4-(1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

xlix) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione (Compound B),

- 1) 5-[4-(5-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione.
- 1i) 5-[4-(1-benzylbenzimidazol-5-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- 1ii) 5-[4-(5-hydroxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]-  
thiazolidine-2,4-dione,
- 5 1iii) 5-[4-(5-acetoxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]-  
thiazolidine-2,4-dione,
- 1iv) 5-{4-[3-(5-methyl-2-phenyloxazol-4-yl)propionyl]benzyl}thiazolidine-2,4-dione,  
and
- 1v) 5-[6-(2-fluorobenzyloxy)-2-naphthylmethyl]thiazolidine-2,4-dione;
- 10 and pharmaceutically acceptable salts thereof.

Of these, the following compounds are more preferred:

- i) 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-  
dione (troglitazone),
- 15 ii) 5-[4-(6-acetoxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-  
dione,
- iii) 5-[4-(6-ethoxycarbonyloxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]-  
thiazolidine-2,4-dione,
- iv) 5-{4-[2-(5-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione (pioglitazone),
- v) 5-[(2-benzyl-3,4-dihydro-2H-benzopyran-6-yl)methyl]thiazolidine-2,4-dione  
20 (englitazone),
- vi) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione  
(rosiglitazone),
- vii) 5-(4-{2-[1-(4-pyrid-2'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-

2,4-dione (Compound A),

viii) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidinedione,

ix) 5-{4-(5-methoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

5 x) 5-[4-(1-methylindolin-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

xi) 5-[4-(1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

xii) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione (Compound B),

10 xiii) 5-[4-(5-hydroxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]-thiazolidine-2,4-dione,

xiv) 5-{4-[3-(5-methyl-2-phenyloxazol-4-yl)propionyl]benzyl}thiazolidine-2,4-dione, and

xv) 5-[6-(2-fluorobenzyloxy)-2-naphthylmethyl]thiazolidine-2,4-dione;

and pharmaceutically acceptable salts thereof.

15 Of these, the following compounds are most preferred:

i) 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione (troglitazone),

ii) 5-{4-[2-(5-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione (pioglitazone),

20 iii) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione (rosiglitazone),

iv) 5-(4-{2-[1-(4-pyrid-2'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-2,4-dione (Compound A) and

v) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione (Compound B);

and pharmaceutically acceptable salts thereof.

5 The level of uric acid in the blood of a patient may be measured in a conventional manner. Specifically, blood is collected before and after the administration, for a predetermined period, of a medicament to a patient suffering from hyperuricemia and then the blood uric acid level is measured, for example, by the uricase catalase method [Kageyama: Clin. Chim. Acta., 31, 421-426 (1971)]. A measuring kit employing the above method is commercially available ("Uricolor 400",  
10 trade name; product of Ono Pharmaceutical Co., Ltd.)

The insulin sensitivity enhancer to be used in the present invention may be administered in various forms. There is no particular limitation on the administration form, which will be determined depending on the formulation, as well as on the age, sex or other condition of a patient and/or the severity of the disease. For example, for  
15 oral administration, the compound may be employed in the form of a tablet, pill, powder, granule, syrup, solution, suspension, emulsion or capsule. For intravenous administration, the compound may be employed in the form of an injection, with or without a commonly used supplement, such as glucose or amino acid. It can be administered alone intramuscularly, intracutaneously, subcutaneously or  
20 intraperitoneally, if necessary. It can also be administered intrarectally as a suppository. Oral administration is generally preferred.

The various preparations described above can be formulated using known adjuvants which are normally employed in this field, such as excipients, binders, disintegrating agents, lubricants, solubilizing agents, corrigents, coating agents and the  
25 like.

For the formulation of a tablet, various carriers which are conventionally known in this field can be used. Examples include: excipients, such as lactose, saccharose, sodium chloride, glucose, urea, starch, calcium carbonate, kaolin, crystalline cellulose

and silicic acid; binders, such as water, ethanol, propanol, simple syrup, glucose solution, starch solution, gelatin solution, carboxymethyl cellulose, shellac, methyl cellulose, potassium phosphate and polyvinyl pyrrolidone sugar; disintegrating agents, such as dry starch, sodium alginate, agar powder, laminaran powder, sodium

5 bicarbonate, calcium carbonate, polyoxyethylene sorbitan fatty acid esters, sodium lauryl sulfate, stearic monoglyceride, starch and lactose; disintegration suppressants, such as saccharose, stearin, cacao butter and hydrogenated oil; absorption facilitators, such as quaternary ammonium bases and sodium lauryl sulfate; humectants, such as glycerin and starch, adsorbents, such as starch, lactose, kaolin, bentonite and colloid

10 silicic acid; and lubricants, such as purified talc, stearate, boric acid powder and polyethylene glycol. If necessary, the tablet can be coated, for example sugar-coated, gelatin-coated, enteric-coated or film-coated; the tablet can be formed as a double-layer or multi-layer tablet.

For the formation of a pill, various carriers known in this field can be used.

15 Examples include excipients, such as glucose, lactose, starch, cacao oil, hydrogenated vegetable oil, kaolin and talc; binders, such as gum arabic powder, tragacanth powder, gelatin and ethanol; and disintegrating agents, such as laminaran agar.

For the formation of a suppository, various carriers which are conventionally known in this field can be used. Examples include polyethylene glycol, cacao oil,

20 higher alcohols, esters of higher alcohols, gelatin and semi-synthetic glyceride.

When formulated as an injection, a sterilized solution or suspension which is isotonic with the blood is preferred. For the formation of a solution, emulsion or suspension, any diluent that is conventionally used in this field can be used. Examples include water, ethyl alcohol, propylene glycol, ethoxylated isostearyl alcohol,

25 polyoxylated isostearyl alcohol and polyoxyethylene sorbitan fatty acid ester. In this case, it is possible to include sodium chloride, glucose or glycerin in an amount sufficient to prepare an isotonic solution or to add a conventional adjuvant for solubilization, buffering agent, soothing agent and the like. Furthermore, a colorant, preservative, aroma chemical, flavoring agent, sweetening agent and/or another

medicament may be added if necessary.

There is no particular limitation on the amount of active compound to be incorporated in the above pharmaceutical preparation. The amount may be selected freely as needed, but we generally prefer to incorporate the compound in an amount of  
5 from 1 to 70% by weight, preferably from 1 to 30% by weight based on the whole composition.

The dosage of the insulin sensitivity enhancer may vary, depending on the symptoms, age, body weight and condition of the patient, as well as upon the route of administration and the like. In the case of oral administration, it is desirable to  
10 administer to an adult human patient at least 0.1 mg (preferably 1 mg) and preferably no more than 1000 mg (preferably 500 mg) per day, depending on the symptoms, which may be administered in a single dose or in divided doses. In the case of intravenous administration, an amount of 0.01 mg (preferably 0.1 mg) as a lower limit and 500 mg (preferably 200 mg) as an upper limit per adult per day is desirable,  
15 depending on the symptoms, which may be administered in a single dose or in divided doses.

The invention will be described in more detail by the following Example, which illustrates the activity of the compounds of the present invention, and the subsequent Formulation Examples.

20

### EXAMPLE

#### Improvement in hyperuricemia (H.U.)

4 adult human patients who had suffered from diabetes and hyperuricemia and whose blood uric acid level was not less than 7.0 mg/dl, were administered orally 200 mg of troglitazone twice a day (in the morning and in the evening). This  
25 administration was continued for 4 weeks. Both after and before administration, blood was collected and the blood uric acid level was measured.

The results are shown in the following Table.

Patient	Medical history of gout including complications	Concomitant use of another remedy for H.U.	Blood uric acid level (mg/dl)	
			Week 0	Week 4
1 (male)	None	None	7.2	5.2
2 (male)	None	None	7.6	5.3
3 (female)	None	None	7.9	5.6
4 (male)	None	None	7.2	5.2

As is apparent from the above Table, the administration of troglitazone to patients suffering from hyperuricemia, having a blood uric acid level as high as 7.0 mg/dl or greater, results in the blood uric acid level being reduced to 6.0 mg/dl or less which is in the normal range.

### TEST

#### Acute toxicity

The acute toxicity of troglitazone was measured in a conventional manner. Specifically, 300 mg/kg of troglitazone was administered orally to three ddY mice (male), which were then observed for 5 days. All of them survived.

### FORMULATION EXAMPLE 1

#### Powders

Powders can be obtained by mixing 5 g of troglitazone, 895 g of lactose and 100 g of corn starch in a blender.

## **FORMULATION EXAMPLE 2**

### **Granules**

- Granules can be obtained by mixing 5 g of troglitazone, 865 g of lactose and 100 g of low-substituted hydroxypropyl cellulose, adding to the mixture 300 g of a
- 5 10% w/v aqueous solution of hydroxypropyl cellulose, kneading the resulting mixture, granulating the kneaded mass using an extrusion granulator and then drying the granulated product.

## **FORMULATION EXAMPLE 3**

### **Capsules**

- 10 Capsules can be obtained by mixing 5 g of troglitazone, 115 g of lactose, 58 g of corn starch and 2 g of magnesium stearate in a V-shaped mixer and then filling the resulting mixture, in 180 mg portions, into No.3 capsules.

## **FORMULATION EXAMPLE 4**

### **Tablets**

- 15 Tablets can be obtained by mixing 5 g of troglitazone, 90 g of lactose, 34 g of corn starch, 20 g of crystalline cellulose and 1 g of magnesium stearate in a blender and then tableting the resulting mixture by a tableting machine.

## **FORMULATION EXAMPLE 5**

### **Powders**

- 20 Powders can be obtained by mixing 5 g of pioglitazone, 895 g of lactose and 100 g of corn starch in a blender.

### FORMULATION EXAMPLE 6

#### Granules

- Granules can be prepared by mixing 5 g of rosiglitazone, 865 g of lactose and 100 g of low-substituted hydroxypropyl cellulose, adding to the mixture 300 g of a
- 5 10% w/v aqueous solution of hydroxypropyl cellulose, kneading the resulting mixture, granulating the kneaded mass using an extrusion granulator and then drying the granulated product.

### FORMULATION EXAMPLE 7

#### Capsules

- 10 Capsules can be obtained by mixing 5 g of Compound A, 115 g of lactose, 58 g of corn starch and 2 g of magnesium stearate in a V-shaped mixer and then filling the resulting mixture, in 180 mg portions, into No.3 capsules.

### FORMULATION EXAMPLE 8

#### Tablets

- 15 Tablets can be obtained by mixing 5 g of Compound A, 90 g of lactose, 34 g of corn starch, 20 g of crystalline cellulose and 1 g of magnesium stearate in a blender and then tableting the resulting mixture by a tableting machine.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.



#### FORMULATION EXAMPLE 6

##### Granules

Granules can be prepared by mixing 5 g of rosiglitazone, 865 g of lactose and 100 g of low-substituted hydroxypropyl cellulose, adding to the mixture 300 g of a  
5 10% w/v aqueous solution of hydroxypropyl cellulose, kneading the resulting mixture, granulating the kneaded mass using an extrusion granulator and then drying the granulated product.

#### FORMULATION EXAMPLE 7

##### Capsules

10 Capsules can be obtained by mixing 5 g of Compound A, 115 g of lactose, 58 g of corn starch and 2 g of magnesium stearate in a V-shaped mixer and then filling the resulting mixture, in 180 mg portions, into No.3 capsules.

#### FORMULATION EXAMPLE 8

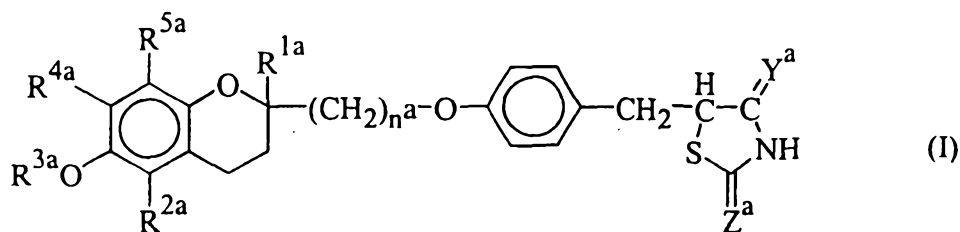
##### Tablets

15 Tablets can be obtained by mixing 5 g of Compound A, 90 g of lactose, 34 g of corn starch, 20 g of crystalline cellulose and 1 g of magnesium stearate in a blender and then tableting the resulting mixture by a tableting machine.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. The use of an insulin sensitivity enhancer for the manufacture of a medicament for the treatment or prevention of hyperuricemia.
2. The use according to Claim 1, in which said insulin sensitivity enhancer is selected from the group consisting of thiazolidinedione compounds, iminothiazolidinone compounds, diiminothiazolidine compounds, thioxothiazolidinone compounds, iminotriazole compounds, oxazolidinedione compounds, isoxazolidinedione compounds and oxadiazolidinedione compounds.
3. The use according to Claim 1, in which said insulin sensitivity enhancer is selected from the group consisting of thiazolidinedione compounds, iminothiazolidinone compounds, and diiminothiazolidine compounds.
4. The use according to Claim 1, in which said insulin sensitivity enhancer is selected from the group consisting of thiazolidinedione compounds.
5. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (I):



in which:

- R<sup>1a</sup> and R<sup>2a</sup> are the same or different and each represents a hydrogen atom or an alkyl group having from 1 to 5 carbon atoms;
- R<sup>3a</sup> represents a hydrogen atom, an aliphatic acyl group having from 1 to 6 carbon atoms, a cycloalkylcarbonyl group having from 6 to 8 carbon atoms, a benzoyl or naphthoyl group which is unsubstituted or is substituted by at least one of

substituents  $\chi$ , defined below, a heterocyclic acyl group in which the heterocyclic part has from 4 to 7 ring atoms of which from 1 to 3 are nitrogen and/or oxygen and/or sulfur hetero-atoms, a phenylacetyl group, a phenylpropionyl group, a phenylacetyl or phenylpropionyl group substituted with at least one halogen atom, a cinnamoyl group, an alkoxy carbonyl group having from 2 to 7 carbon atoms or a benzyloxycarbonyl group;

said substituent  $\chi$  is an alkyl group having from 1 to 4 carbon atoms, an alkoxy group having from 1 to 4 carbon atoms, a hydroxy group, a halogen atom, an amino group, a monoalkylamino group having from 1 to 4 carbon atoms, a dialkylamino group having from 1 to 4 carbon atoms in each alkyl group or a nitro group;

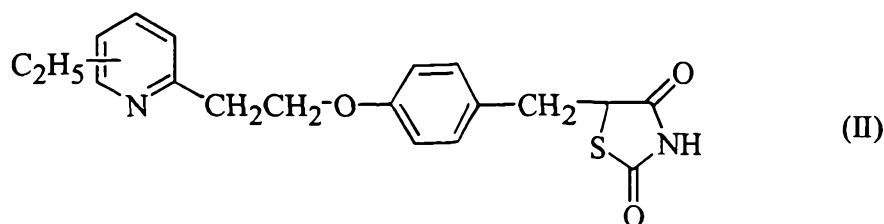
$R^{4a}$  and  $R^{5a}$  are the same or different and each represents a hydrogen atom, an alkyl group having from 1 to 5 carbon atoms or an alkoxy group having from 1 to 5 carbon atoms, or  $R^{4a}$  and  $R^{5a}$  together represent an alkylenedioxy group having from 1 to 4 carbon atoms;

$Y^a$  and  $Z^a$  are the same or different and each represents an oxygen atom or an imino group; and

$n^a$  represents an integer of from 1 to 3;

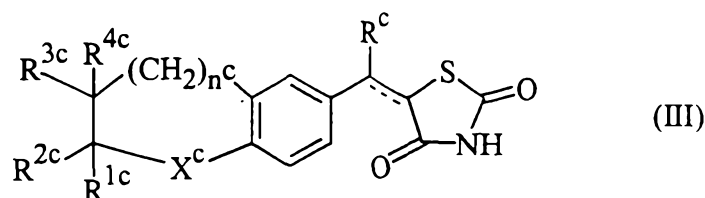
or a pharmaceutically acceptable salt thereof.

6. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (II):



or a pharmaceutically acceptable salt thereof.

7. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (III):



5 in which:

$\text{---}$  represents a single or double bond;

$n^c$  represents 0, 1 or 2;

$X^c$  represents an oxygen atom, a sulfur atom, a sulfinyl group or a sulfonyl group;

$R^c$  represents a hydrogen atom, a methyl group or an ethyl group;

10  $R^{1c}$  represents a cycloalkyl group having from 5 to 7 carbon atoms, a cycloalkyl group having from 5 to 7 carbon atoms and substituted by a methyl group, a pyridyl group, a thienyl group, a furyl group, a naphthyl group, a p-biphenyl group, a tetrahydrofuranyl group, a tetrahydrothienyl group, a tetrahydropyranyl group, a group of formula  $C_6H_4W^{2c}$

15 in which  $W^{2c}$  represents a hydrogen atom, a hydroxy group, a halogen atom, an alkyl group having from 1 to 4 carbon atoms, an alkoxy group having from 1 to 4 carbon atoms or an alkylthio group having from 1 to 4 carbon atoms

or a group of formula  $alk-W^{1c}$

20 in which  $alk$  represents an alkylene group having from 1 to 6 carbon atoms, an ethylidene group or an isopropylidene group and  $W^{1c}$  represents a

hydrogen atom, a hydroxy group, an alkoxy group having from 1 to 4 carbon atoms, an alkylthio group having from 1 to 4 carbon atoms, a pyridyl group, a furyl group, a thienyl group, a tetrahydrofuryl group, a tetrahydrothienyl group, a naphthyl group, a cycloalkyl group having from 5 to 7 carbon atoms  
5 or a group of formula  $C_6H_4W^{2c}$ , where  $W^{2c}$  is as defined above;

$R^{2c}$  represents a hydrogen atom or a methyl group;

$R^{3c}$  represents a hydrogen atom, an alkyl group having from 1 to 6 carbon atoms, a group of formula  $C_6H_4W^{2c}$

where  $W^{2c}$  is as defined above

10 or a benzyl group;

$R^{4c}$  represents a hydrogen atom,

or

$R^{1c}$  and  $R^{2c}$  together form an alkylene group having from 4 to 6 carbon atoms, and  $R^{3c}$  and  $R^{4c}$  both represent hydrogen atoms;

15 or

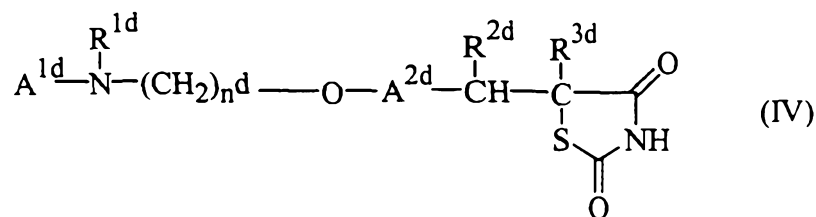
$R^{3c}$  and  $R^{4c}$  together form an alkylene group having from 4 to 6 carbon atoms, and  $R^{1c}$  and  $R^{2c}$  both represent hydrogen atoms;

or

$R^{2c}$  and  $R^{3c}$  together form an alkylene group having from 3 or 4 carbon atoms, 20 and  $R^{1c}$  and  $R^{4c}$  both represent hydrogen atoms;

or a pharmaceutically acceptable salt thereof.

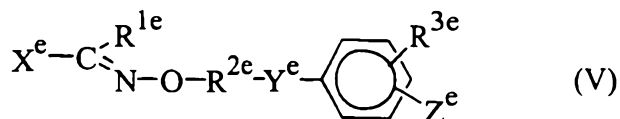
8. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (IV):



in which:

- 5       $\text{A}^{1d}$  represents a substituted or unsubstituted aromatic heterocyclic group,
- $\text{R}^{1d}$  represents a hydrogen atom, an alkyl group, an acyl group, an aralkyl group (the aryl moiety of said aralkyl group may be substituted or unsubstituted) or a substituted or unsubstituted aryl group,
- $\text{R}^{2d}$  and  $\text{R}^{3d}$  each represents a hydrogen atom or together form a bond,
- 10       $\text{A}^{2d}$  represents a benzene ring which has at most a total of 5 substituents; and
- $n^d$  represents an integer of from 2 to 6;
- or a pharmaceutically acceptable salt thereof.

9. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (V):



in which:

- $\text{R}^{1e}$  represents a hydrogen atom or a straight or branched chain alkyl group having from 1 to 6 carbon atoms,

$R^{2e}$  represents a straight or branched chain alkylene group having from 2 to 6 carbon atoms,

5  $R^{3e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 6 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a halogen atom, a nitro group, an amino group, a straight or branched chain monoalkylamino group having from 1 to 4 carbon atoms, a straight or branched chain dialkylamino group in which each alkyl group has from 1 to 4 carbon atoms, an aryl group having from 6 to 10 carbon atoms or an aralkyl group having from 7 to 12 carbon atoms,

$X^e$  represents an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by from 1 to 3 of substituents  $\alpha$ , defined below, or a heteroaromatic group which is unsubstituted or is substituted by from 1 to 3 of substituents  $\alpha$ , defined below,

15 said substituents  $\alpha$  each representing (i) a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (ii) a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, (iii) a hydroxy group, (iv) a straight or branched chain acyloxy group having from 1 to 4 carbon atoms, (v) a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, (vi) a straight or branched chain alkylendioxy group having from 1 to 4 carbon atoms, (vii) an aralkyloxy group having from 7 to 12 carbon atoms, (viii) a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, (ix) a straight or branched chain alkylsulfonyl group having from 1 to 4 carbon atoms, (x) a halogen atom, (xi) a nitro group, (xii) an amino group, (xiii) a straight or branched chain monoalkylamino group having from 1 to 4 carbon atoms, (xiv) a straight or branched chain dialkylamino group in which each alkyl group has from 1 to 4 carbon atoms, (xv) an aralkyl group having from 7 to 12 carbon atoms, (xvi) an aryl group having from 6 to 10 carbon

atoms which is unsubstituted or is substituted by at least one of substituents  $\beta$ , defined below, (xvii) an aryloxy group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\beta$ , defined below, (xviii) an arylthio group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\beta$ , defined below, (xix) an arylsulfonyl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\beta$ , defined below, (xx) an arylsulfonylamino group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\beta$ , defined below, and in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms, (xxi) a heteroaromatic group, (xxii) a heteroaryloxy group, (xxiii) a heteroarylthio group, (xxiv) a heteroarylsulfonyl group or (xxv) a heteroaromatic sulfonylamino group in which the nitrogen atom of the amino moiety is unsubstituted or is substituted by a straight or branched chain alkyl group having from 1 to 6 carbon atoms;

said substituent  $\beta$  representing a straight or branched chain alkyl group having from 1 to 6 carbon atoms, a straight or branched chain haloalkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom or a straight or branched chain alkylendioxy group having from 1 to 4 carbon atoms;

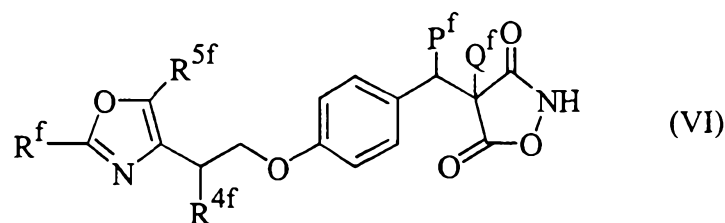
$Y^e$  represents an oxygen atom, a sulfur atom or group of formula  $>N-R^{4e}$

in which  $R^{4e}$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 6 carbon atoms or a straight or branched chain acyl group having from 1 to 8 carbon atoms; and

$Z^e$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl or 3,5-dioxooxadiazolidin-2-ylmethyl group;

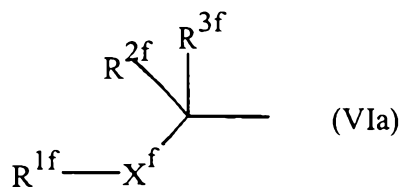
or a pharmaceutically acceptable salt thereof.

10. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (VI):



5 in which:

$R^f$  represents an aromatic hydrocarbon group which may be substituted, a cyclic aliphatic hydrocarbon group which may be substituted, a heterocyclic group which may be substituted, a fused heterocyclic group which may be substituted or a group of formula (VIa):



10

(in which  $R^{1f}$  represents an aromatic hydrocarbon group which may be substituted, a cyclic aliphatic hydrocarbon group which may be substituted, a heterocyclic group which may be substituted or a fused heterocyclic group which may be substituted,  $R^{2f}$  and  $R^{3f}$  are the same or different and each represents a hydrogen atom or a lower alkyl group,  $X^f$  represents an oxygen atom, a sulfur atom or a secondary amino group);

15

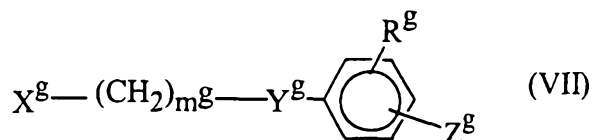
$R^{4f}$  represents a hydrogen atom or a lower alkyl group;

$R^{5f}$  represents a lower alkyl group;

$P^f$  and  $Q^f$  each represents a hydrogen atom or together form a bond;

or a pharmaceutically acceptable salt thereof.

11. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (VII):



in which:

$X^g$  represents an indole, indoline, azaindole, azaindoline, imidazopyridine or imidazopyrimidine ring group which is unsubstituted or is substituted by from 1 to 3 substituents selected from the group consisting of substituents  $\delta$ , defined below;

$Y^g$  represents an oxygen or sulfur atom;

$Z^g$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl, 3,5-dioxooxadiazolidin-2-ylmethyl or  $N$ -hydroxyureidomethyl group;

$R^g$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, an amino group which is unsubstituted or is substituted by at least one of substituents  $\epsilon$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms;

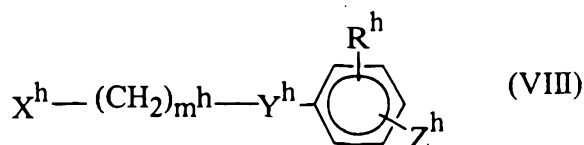
said substituent  $\epsilon$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or

branched chain aliphatic acyl group having from 1 to 11 carbon atoms, an aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms; and

$m^g$  represents an integer of from 1 to 5,

- 5 said substituent  $\delta$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group
- 10 which is unsubstituted or is substituted by at least one of substituents  $\epsilon$ , defined above, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\phi$ , or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\phi$ ;
- 15 said substituent  $\phi$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group or an amino group which is unsubstituted or is substituted by at least one of substituents  $\epsilon$ , defined above;
- 20 or a pharmaceutically acceptable salt thereof.

12. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (VIII):



in which:

$X^h$  represents a benzimidazole ring group which is unsubstituted or is substituted by from 1 to 5 substituents selected from the group consisting of substituents  $\gamma$ , defined below,

$Y^h$  represents an oxygen or sulfur atom,

5  $Z^h$  represents a 2,4-dioxothiazolidin-5-ylidenylmethyl, 2,4-dioxothiazolidin-5-ylmethyl, 2,4-dioxooxazolidin-5-ylmethyl, 3,5-dioxooxadiazolidin-2-ylmethyl or N-hydroxyureidomethyl group;

10  $R^h$  represents a hydrogen atom, a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, an amino group which is unsubstituted or is substituted by at least one of substituents  $\eta$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms, and

$m^h$  represents an integer of from 1 to 5,

15 said substituent  $\gamma$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a benzyloxy group, a halogen atom, a hydroxy group, an acetoxy group, a phenylthio group, a straight or branched chain alkylthio group having from 1 to 4 carbon atoms, a trifluoromethyl group, a nitro group, an amino group  
20 which is unsubstituted or is substituted by at least one of substituents  $\eta$ , defined below, an aryl group having from 6 to 10 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\lambda$ , defined below, or a straight or branched chain aralkyl group having from 7 to 11 carbon atoms which is unsubstituted or is substituted by at least one of substituents  $\lambda$ , defined below;

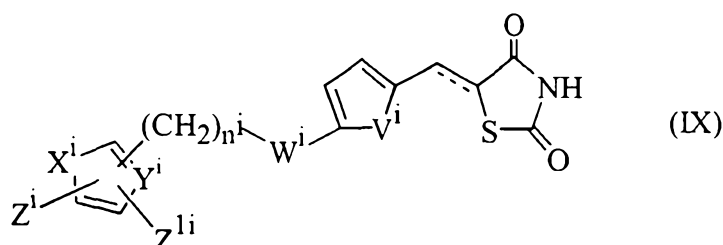
25 said substituent  $\eta$  represents a straight or branched chain alkyl group having from 1 to 8 carbon atoms, a straight or branched chain aralkyl group having from 7 to

11 carbon atoms, an aryl group having from 6 to 10 carbon atoms, a straight or branched chain aliphatic acyl group having from 1 to 11 carbon atoms, a aromatic aliphatic acyl group having from 8 to 12 carbon atoms or an aromatic acyl group having from 7 to 11 carbon atoms.

5 said substituent  $\lambda$  represents a straight or branched chain alkyl group having from 1 to 4 carbon atoms, a straight or branched chain alkoxy group having from 1 to 4 carbon atoms, a halogen atom, a hydroxy group, a nitro group, a phenyl group, a trifluoromethyl group or an amino group which is unsubstituted or is substituted by at least one of substituents  $\eta$ , defined above;

10 or a pharmaceutically acceptable salt thereof.

13. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (IX):



in which:

15  $\text{---}$  represents a single or double bond;

$V^i$  represents a group of formula  $-\text{CH}=\text{CH}-$ ,  $-\text{N}=\text{CH}-$  or  $-\text{CH}=\text{N}-$  or a sulfur atom;

$W^i$  represents a group of formula  $>\text{CH}_2$ ,  $>\text{CHOH}$ ,  $>\text{CO}$ ,  $>\text{C}=\text{NOR}^i$  or  $-\text{CH}=\text{CH}-$ ,

20  $X^i$  represents a sulfur or oxygen atom or a group of formula  $>\text{NR}^{1i}$ ,  $-\text{CH}=\text{N}-$  or  $-\text{N}=\text{CH}-$ ,

$Y^i$  represents a group of formula  $=CH-$  or a nitrogen atom,

$Z^i$  represents a hydrogen atom, an alkyl group having from 1 to 7 carbon atoms, a cycloalkyl group having from 3 to 7 carbon atoms, a phenyl group, a naphthyl group, a pyridyl group, a furyl group, a thienyl group or a phenyl group substituted with one or two substituents selected from alkyl groups having from 1 to 3 carbon atoms, trifluoromethyl groups, alkoxy groups having from 1 to 3 carbon atoms, fluorine atoms, chlorine atoms and bromine atoms,

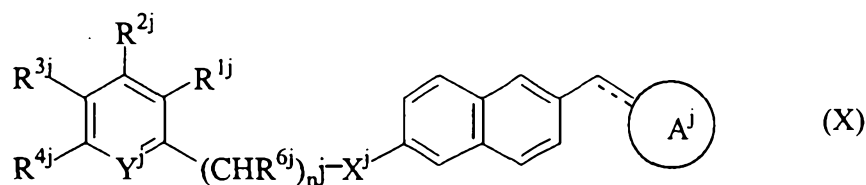
$Z^{1i}$  represents a hydrogen atom or an alkyl group having from 1 to 3 carbon atoms,

$R^i$  and  $R^{1i}$  each independently represents a hydrogen atom or a methyl group, and

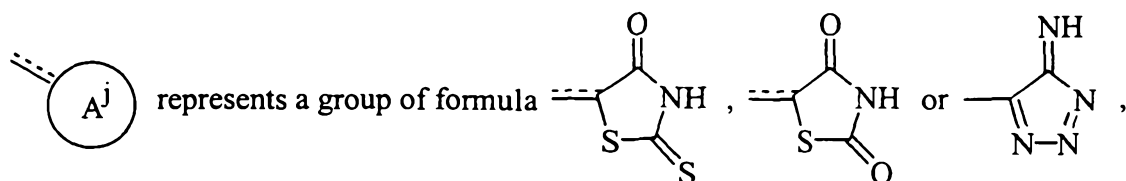
$n^i$  represents 1, 2 or 3;

or a pharmaceutically acceptable salt thereof.

14. The use according to Claim 1, in which said insulin sensitivity enhancer is a compound of formula (X):



in which:



$-X^j$ - represents an oxygen or sulfur atom;

$=Y^j$ - represents  $=N$ - or a group of formula  $=CR^{5j}$ -;

$R^{1j}$ ,  $R^{2j}$ ,  $R^{3j}$ ,  $R^{4j}$  and  $R^{5j}$  each independently represents a hydrogen atom, a halogen atom, an alkyl group, an aryl group, an alkoxy group, an alkoxyalkoxy group, an aryloxy group, an alkanoyloxy group, an arylcarbonyloxy group, a carboxyl group, an alkoxycarbonyl group, an aryloxycarbonyl group, a carbamoyl group, an alkylaminocarbonyl group, an arylaminocarbonyl group, an amino group, an alkylamino group, an alkanoylamino group, an arylcarbonylamino group, an ethylenedioxymethyl group, a formyl group, a cyano group, a nitro group or a trihalomethyl group,

$R^{6j}$  represents a hydrogen atom, an alkyl group which may be substituted or an aryl group which may be substituted, and

$n^j$  represents 0 or an integer of from 1 to 3;

and  $\text{---}$  may represent a single or double bond;

or a pharmaceutically acceptable salt thereof.

15. The use according to Claim 1, in which said insulin sensitivity enhancer is:

i) 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

ii) 5-[4-(6-hydroxy-2-methyl-7-t-butylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

iii) 5-[4-(6-hydroxy-2-ethyl-5,7,8-trimethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

iv) 5-[4-(6-hydroxy-2-isobutyl-5,7,8-trimethylchroman-2-ylmethoxy)benzyl]-

thiazolidine-2,4-dione,

v) 5-[4-(6-acetoxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

5 vi) 5-[4-(6-ethoxycarbonyloxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]-  
thiazolidine-2,4-dione,

vii) 5-{4-[2-(3-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

viii) 5-{4-[2-(4-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

ix) 5-{4-[2-(5-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

x) 5-{4-[2-(6-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,

10 xi) 5-[(2-benzyl-2,3-dihydrobenzofuran-5-yl)methyl]thiazolidine-2,4-dione,

xii) 5-[(2-benzyl-3,4-dihydro-2H-benzopyran-6-yl)methyl]thiazolidine-2,4-dione,

xiii) 5-(4-{2-[N-methyl-N-(2-benzothiazolyl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

15 xiv) 5-(4-{2-[N-methyl-N-(2-pyrimidinyl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

xv) 5-(4-{2-[N-methyl-N-(4,5-dimethylthiazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

xvi) 5-{4-[2-(N-methyl-N-thiazol-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

20 xvii) 5-(4-{2-[N-methyl-N-(4-phenylthiazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

xviii) 5-(4-{2-[N-methyl-N-(4-phenyl-5-methylthiazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

xix) 5-(4-{2-[N-methyl-N-(4-methyl-5-phenylthiazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

xx) 5-(4-{2-[N-methyl-N-(5-phenyloxazol-2-yl)amino]ethoxy}benzyl)thiazolidine-2,4-dione,

5 xxi) 5-(4-{2-[N-methyl-N-(4,5-dimethyloxazol-2-yl)amino]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxii) 5-{4-[2-(2-pyrimidinylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

xxiii) 5-{4-[2-(N-acetyl-N-pyrimidin-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

xxiv) 5-(4-{2-[N-(2-benzothiazolyl)-N-benzylamino]ethoxy}benzyl)thiazolidine-2,4-dione,

xxv) 5-(4-{3-[N-methyl-N-(2-benzoxazolyl)amino]propoxy}benzyl)thiazolidine-2,4-dione,

xxvi) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

xxvii) 5-(4-{2-[1-(4-biphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-2,4-dione,

xxviii) 5-(4-{2-[1-(4-phenylsulfonylphenyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxix) 5-(4-{2-[1-(4-pyrid-2'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

20 xxx) 5-(4-{2-[1-(4-pyrid-3'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-2,4-dione,

xxxi) 5-(4-{2-[1-(4-pyrid-4'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxii) 5-(4-{2-[1-(2-phenyl-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxiii) 5-(4-{2-[1-(2-methoxy-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

5 xxxiv) 5-(4-{2-[1-(2-ethoxy-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxv) 5-(4-{2-[1-(2-isopropoxy-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxvi) 5-(4-{2-[1-(2-benzyl-5-pyridyl)ethylideneaminoxy]ethoxy}benzyl)-thiazolidine-2,4-dione,

xxxvii) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidine-dione,

xxxviii) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzylidene}-3,5-isoxazolidinedione,

15 xxxix) 4-{4-[2-(2-benzothienyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidinedione,

x1) 4-[4-(2-{5-methyl-2-[1-(2-pyridylthio)ethyl]-4-oxazolyl}ethoxy)benzyl]-3,5-isoxazolidinedione.

xli) 5-{4-(3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

20 xlii) 5-{4-(5-chloro-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

xliii) 5-{4-(5-methoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-thiazolidine-2,4-dione,

xliv) 5-{4-(5-hydroxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-

thiazolidine-2,4-dione,

xliv) 5-{4-(5-ethoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,

xlvi) 5-{4-(5-isopropoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}-  
5 thiazolidine-2,4-dione,

xlvii) 5-[4-(1-methylindolin-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

xlvi) 5-[4-(1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

xliv) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

10 1) 5-[4-(5-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

1i) 5-[4-(1-benzylbenzimidazol-5-ylmethoxy)benzyl]thiazolidine-2,4-dione,

1ii) 5-[4-(5-hydroxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]-  
thiazolidine-2,4-dione,

1iii) 5-[4-(5-acetoxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]-  
15 thiazolidine-2,4-dione,

1iv) 5-{4-[3-(5-methyl-2-phenyloxazol-4-yl)propionyl]benzyl}thiazolidine-2,4-dione,  
or

1v) 5-[6-(2-fluorobenzyloxy)-2-naphthylmethyl]thiazolidine-2,4-dione;

or a pharmaceutically acceptable salt thereof.

20 16. The use according to Claim 1, in which said insulin sensitivity enhancer is selected from the group consisting of:

i) 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,

- ii) 5-[4-(6-acetoxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- iii) 5-[4-(6-ethoxycarbonyloxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- 5 iv) 5-{4-[2-(5-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,
- v) 5-[(2-benzyl-3,4-dihydro-2H-benzopyran-6-yl)methyl]thiazolidine-2,4-dione,
- vi) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,
- vii) 5-(4-{2-[1-(4-pyrid-2'-yl)phenyl]ethylideneaminoxy}ethoxy)benzylthiazolidine-2,4-dione,
- 10 viii) 4-{4-[2-(2-phenyl-5-methyl-4-oxazolyl)ethoxy]benzyl}-3,5-isoxazolidinedione,
- ix) 5-{4-(5-methoxy-3-methylimidazo[4,5-b]pyridin-2-ylmethoxy)benzyl}thiazolidine-2,4-dione,
- x) 5-[4-(1-methylindolin-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- xi) 5-[4-(1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- 15 xii) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- xiii) 5-[4-(5-hydroxy-1,4,6,7-tetramethylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- xiv) 5-{4-[3-(5-methyl-2-phenyloxazol-4-yl)propionyl]benzyl}thiazolidine-2,4-dione,
- 20 or
- xv) 5-[6-(2-fluorobenzyloxy)-2-naphthylmethyl]thiazolidine-2,4-dione;
- or a pharmaceutically acceptable salt thereof.

- 115 -

17. The use according to Claim 1, in which said insulin sensitivity enhancer is:

- i) 5-[4-(6-hydroxy-2,5,7,8-tetramethylchroman-2-ylmethoxy)benzyl]thiazolidine-2,4-dione,
- ii) 5-{4-[2-(5-ethyl-2-pyridyl)ethoxy]benzyl}thiazolidine-2,4-dione,
- 5 iii) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,
- iv) 5-(4-{2-[1-(4-pyrid-2'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-2,4-dione or
- v) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione;

10 or a pharmaceutically acceptable salt thereof.

18. A method for the treatment or prevention of hyperuricemia in a mammal suffering from hyperuricemia, which comprises administering to said mammal an amount of an insulin sensitivity enhancer effective to reduce or prevent hyperuricemia.

15 19. Use according to Claim 1, substantially as hereinbefore described with reference to the Examples.

20. A method according to Claim 18, substantially as hereinbefore described with reference to the Examples.

DATED this 7th day of January, 2002

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**Sankyo Company Limited**

By DAVIES COLLISON CAVE

Patent Attorneys for the Applicants

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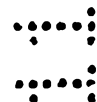
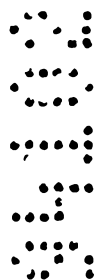


iii) 5-{4-[2-(N-methyl-N-pyrid-2-ylamino)ethoxy]benzyl}thiazolidine-2,4-dione,

iv) 5-(4-{2-[1-(4-pyrid-2'-ylphenyl)ethylideneaminoxy]ethoxy}benzyl)thiazolidine-2,4-dione or

v) 5-[4-(6-methoxy-1-methylbenzimidazol-2-ylmethoxy)benzyl]thiazolidine-2,4-dione;

5 or a pharmaceutically acceptable salt thereof.



22. A method for the treatment or prevention of hyperuricemia in a mammal suffering from hyperuricemia, which comprises administering to said mammal an amount of an insulin sensitivity enhancer effective to reduce or prevent hyperuricemia.

23. Use according to claim 1, a composition according to claim 18 or a method according to claim 22, substantially as hereinbefore described with reference to the Examples.

24. The steps, features, compositions and compounds disclosed herein or referred to or indicated in the specification and/or claims of this application, individually or collectively, and any and all combinations of any two or more of said steps or features.

DATED this TWENTY FIFTH day of NOVEMBER 1998

Sankyo Company Limited

by DAVIES COLLISON CAVE

Patent Attorneys for the applicant(s)