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(54) Title: CALCIUM CHLORIDE CONTAINING PREPARATION FOR THE PREVENTION OR THE TREATMENT OF HYPOCALCEMIA IN RUMINANTS

(57) Abstract

A preparation for the prevention or the treatment of hypocalcemia in ruminants which preparation has been produced by solidification of a mixture of $CaCl_2$, $2H_2$ and $CaSO_4$, $1/2H_2O$, and water, where the weight ratio of $CaCl_2$, $2H_2O$ to $CaSO_4$, $1/2H_2O$ is from 1:0.05 to 1:2.4 and the water content is sufficiently high for making the mixture pumpable but constituting no more than the amount required to convert any $CaCl_2$, $2H_2O$ present into $CaCl_2$, $6H_2O$ and $CaSO_4$, $1/2H_2O$ into $CaSO_4$, $2H_2O$.

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Calcium chloride containing preparation for the prevention or the treatment of hypocalcemia in ruminants

The present invention relates to a calcium containing preparation for the prevention or the treatment of hypocalcemia in ruminants.

During the period pending calving when the cow's milk production has normally stopped completely its calcium mobilisation has also stopped.

Calving sets off a high milk production and consequently a considerable need for calcium arises. In order to compensate for this sudden need the body tries to provide calcium from the blood thus causing the calcium ion content of the blood to decrease drastically. This causes the cow to lose control of its muscles, to lie down and become increasingly apathetic. Unless treated the cow goes into a coma and dies. The condition thus occurred is referred to as milk fever. Older cows are particularly prone to milk fever.

It is known to treat milk fever by oral administration to the sick animal of an aqueous calcium chloride solution. The dosage is typically 400 ml solution corresponding to a total amount of about 500 g and this dosage is typically administered at 12 hours' intervals. Aqueous calcium chloride solutions are very unpleasantly tasting and therefore the sick animal must be force-treated. This may cause the calcium chloride solution to enter the lungs which may be fatal to the animal.

In normal practise the calcium chloride solution is replaced with a calcium chloride containing gel to prevent the therapeutic preparation from entering the lungs. This course of action is only followed for lack of a better one since the use of a gel poses dosage problems due to the difficulties associated with the discharge of the gel from the container in which it is packed. The use of a gel does not eliminate the taste problem either.

Attempts have also been made to treat animals suffering from milk fever with capsules containing a powdery calcium compound, such as calcium acetochloride. However, the calcium content of such capsules

is relatively low and consequently a considerable number of capsules (e.g. 16) should be administered to the sick animal at two hours' intervals thus rendering the preparation unsuitable for practical use.

Surprisingly it has now been found that a solid and easily doseable preparation having a high calcium content may be produced from an aqueous mixture of calcium chloride ($CaCl_2$) and calcium sulphate ($CaSO_4$).

Thus the preparation according to the invention is characterized in that it has been produced by solidification of a mixture of $CaCl_2,xH_2O$ and $CaSO_4,yH_2O$, wherein x is a number equal to or higher than 0 but lower than or equal to 6 and y is a number equal to or higher than 0 but lower than or equal to 2, and water, the weight ratio of $CaCl_2,xH_2O$ to $CaSO_4,yH_2O$ being from 1:0.05 to 1:2.4 and preferably from 1:0.11 to 1:2.4 and the water content being sufficiently high for making the mixture pumpable but constituting no more than the amount required to convert any $CaCl_2,xH_2O$ present into $CaCl_2,6H_2O$ and $CaSO_4,yH_2O$ into $CaSO_4,2H_2O$.

The term "pumpable" denotes that at a temperature of 40°C the mixture is capable of flowing through a funnel having a neck-diameter of 10 mm.

Immediately upon manufacture a mixture as described above has a typical viscosity like that of double cream. In this state the mixture may readily be enclosed in capsules, e.g. gelatine capsules. After a while, typically 1-2 hours, the mixture solidifies and a solid substance is produced.

The use of the above mixture for the production of calcium containing gelatine capsules provides the particular advantage that the gelatine is not attacked by the mixture and that a substantially larger amount of Ca (in the form of Ca^{++}) may be added to the capsules as compared to the known capsules described above.

The production of the above mixture is preferably carried out by admixing the calcium chloride and the calcium sulphate in their dry

state to form a homogeneous mixture. Water is then added and mixing is continued until a pumpable mass is produced. This mass is preferably encapsulated in gelatine capsules in an amount of e.g. 80-100 g per capsule. The filled gelatine capsules are allowed to stand at a suitable temperature, e.g. at room temperature, for a sufficient period for the mixture to solidify. The solidification is a result of the bonding of the water in the form of crystal water.

Instead of being encapsulated in gelatine capsules the mixture may be cast to form suitable dosage units. It may also be cast in the form of a coherent mass which may then be disintegrated and ground to form a powder for therapeutic use or for pelleting.

The preparation according to the invention is particularly suitable for the treatment of milk fever but it is also suitable for the treatment of hypocalcemia in other ruminants, e.g. sheep.

The invention will now be described in further detail with reference to the following example.

Example

Calcium containing gelatine capsules were produced as follows from solid $CaCl_2,2H_2O$ and $CaSO_4,\frac{1}{2}H_2O$:

The solids were mixed in the amounts given in Table 1 below in a Björn mixer. Water was added to the mixture and mixing was continued for another 10-20 minutes until the mixture was homogeneous and easy-flowing. The mass thus obtained was then enclosed in gelatine capsules and the filled capsules were allowed to stand for 24 hours at room temperature in an airtight compartment.

The capsules were then packed in an airtight package.

Table 1

Test	$CaCl_2,2H_2O$ gm	$CaSO_4,\frac{1}{2}H_2O$ gm	H_2O gm	$CaCl_2:CaSO_4$ Mixture ratio
a:	1000	0	520	1:0
b:	900	100	180	1:0.11
c:	800	200	170	1:0.25
d:	700	300	150	1:0.43
e:	600	400	150	1:0.67
f:	500	500	150	1:1.00
g:	400	600	170	1:1.50
h:	300	700	220	1:2.33
i:	200	800	350	1:4.00
j:	100	900	630	1:9.00
k:	0	1000	1200	1:∞

Testing of the capsules produced yielded the results given in Table 2.

Table 2

Test	Solidification time, h	"Pumpability"	Compatibility with gelatine capsule	Ca^{++} in filled capsule (gm)
a:	partial solidification, 1/2	poor	incompatible	14.6
b:	1/2	moderate	moderate	19.6
c:	1-2	good	"	20.1
d:	3-6	"	good	20.6
e:	6-12	"	"	21.1
f:	12-18	"	"	21.4
g:	12-18	"	"	21.2
h:	18-24	"	moderate	20.6
i:	>24	"	incompatible	19.0
j:	>24	"	"	16.1
k:	>24	"	"	12.3

As will appear from Table 2 only tests b-h employing the

preparations according to the invention yields satisfactory results as regards both solidification time, compatibility with the gelatine capsule and the Ca content of the capsules.

The above results show the surprising synergistic effect of the simultaneous use of calcium chloride and calcium sulphate in admixture with water both as regards the compatibility of the mixture with gelatine capsules, pumpability and solidification time.

The surprising effect may be illustrated by comparative tests using (1) a mixture of 50 parts by weight of $CaCl_2,2H_2O$, 50 parts by weight of $CaSO_4,\frac{1}{2}H_2O$ and 15 parts by weight of water, (2) a mixture of 50 parts by weight of $CaCl_2,2H_2O$ and 15 parts by weight of water and (3) a mixture of 50 parts by weight of $CaSO_4,\frac{1}{2}H_2O$ and 15 parts by weight of water.

Whereas mixture (1) provides the desired compatibility with gelatine capsules and a satisfactory pumpability and solidification time mixture (2) forms a paste of crystals which is unpumpable and solidifies too quickly and which is also incompatible with gelatine capsules, and mixture (3) forms a mass with is neither pumpable nor castable.

Claims

1. A calcium chloride containing preparation for the prevention or the treatment of hypocalcemia in ruminants and, characterized in that it has been produced by solidification of a mixture of $CaCl_2,xH_2O$ and $CaSO_4,yH_2O$, wherein x is a number equal to or higher than 0 but lower than or equal to 6 and y is a number equal to or higher than 0 but lower than or equal to 2, and water, the weight ratio of $CaCl_2,xH_2O$ to $CaSO_4,yH_2O$ being from 1:0.05 to 1:2.4 and the water content being sufficiently high for making the mixture pumpable but constituting no more than the amount required to convert any $CaCl_2,xH_2O$ present into $CaCl_2,6H_2O$ and $CaSO_4,yH_2O$ into $CaSO_4,2H_2O$.

2. A preparation according to claim 1, characterized in that it has been produced by solidification of a mixture of $CaCl_2,2H_2O$, $CaSO_4,\frac{1}{2}H_2O$ and water.

3. A preparation according to claim 1 or 2, characterized in that the weight ratio of $CaCl_2,xH_2O$ to $CaSO_4,yH_2O$ is from 1:0.11 to 1:2.4.

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK88/00220

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

A61K 33/06, 33/14

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	A61K

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	DE,C, 365 554 (CALCION-GESELLSCHAFT M.B.H) 16 March 1923, see especially lines 1-9	1 - 3
A	US,A, 3 996 351 (K. BAUER et al) 7 December 1976, see especially column 1, lines 36-68	1 - 3
A	US,A, 4 346 077 (D.G. BRAUND et al) 24 August 1982, see especially column 2, lines 11-35	1 - 3
A	Chemical Abstracts, Vol. 34 (1940), abstract No. 3875, Rev. farm. (Buenos Aires) 81, 15-22, 40-54 (1939)	1 - 3
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1989-07-24	1989 -07- 28
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Martin Hjälmdahl

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	Chemical Abstracts, Vol. 104 (1986), abstract No. 219148d, Jpn. Kokai Tokkyo Koho JP 61 36, 222 /86 36, 222/	1 - 3
A	"Remington's Pharmaceutical Sciences", 15 Ed., published 1975, by Mack Publishing Company (Easton, Pennsylvania), see page 1258 (Calcium Sulfate NF)	1 - 3