



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification<sup>6</sup> : C05C 3/00, C05D 5/00, C05G 1/00, A61K 33/02, 33/06</p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 97/41082</b> (43) International Publication Date: 6 November 1997 (06.11.97)</p>
<p>(21) International Application Number: PCT/NZ97/00051 (22) International Filing Date: 29 April 1997 (29.04.97) (30) Priority Data: 280911 30 April 1996 (30.04.96) NZ (71) Applicant (for all designated States except US): COAST BIOLOGICALS LIMITED [NZ/NZ]; 260 Roscommon Road, Manukau City, Auckland 1701 (NZ). (72) Inventor; and (75) Inventor/Applicant (for US only): COURTNEY, William, John [NZ/NZ]; 56 Haseler Crescent, Howick, Auckland 1705 (NZ). (74) Agents: WELLS, Ceri, P., K. et al.; 29 Clarence Street, P.O. Box 759, Hamilton, 2001 (NZ).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p>	
<p>(54) Title: A TREATMENT FOR PASTURE COMPRISING APPLICATION OF NITROGEN AND MAGNESIUM CONTAINING COMPOUNDS TO INCREASE UPTAKE OF CALCIUM AND/OR MAGNESIUM IN GRAZING ANIMALS</p>		
<p>(57) Abstract</p> <p>A treatment for pasture is described, comprising a chemical composition including nitrogen and magnesium. Application of the treatment to pasture is described as increasing elemental uptake of calcium and/or magnesium in animals grazing on the pasture. A method of applying the treatment composition to pasture to be grazed during early lactation is also described.</p>		

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**A TREATMENT FOR PASTURE COMPRISING APPLICATION OF NITROGEN AND MAGNESIUM CONTAINING COMPOUNDS TO INCREASE UPTAKE OF CALCIUM AND/OR MAGNESIUM IN GRAZING ANIMALS**

**TECHNICAL FIELD**

This invention relates to a treatment for pasture.

More particularly, but not exclusively, this invention relates to a treatment that increases the levels of selected chemical elements in the pasture and the biological life forms, such as grazing animals, living off the pasture. However, it is to be understood that it is not to be limited as such. The prior art in possible applications of the invention as discussed below are therefore given by way of example.

**BACKGROUND ART**

It is well known that calcium (Ca) and magnesium (Mg) deficiencies lead to milk fever (Downer Cow) and grass staggers (tetany) respectively. These are common problems with grazing animals such as dairy herds, especially in New Zealand, due to national soil profiles and climatic conditions. Subclinical Mg deficiency is also known to cause up to a 10% reduction in milk production during early lactation and is thus economically undesirable as well as having adverse health effects on dairy herds.

Milk fever is most commonly due to a failure of the cow to maintain Ca homeostasis by absorbing more Ca or mobilising sufficient amounts from its ample bones Ca reserves, when there is a sudden increase in Ca requirements for milk or when calving.

After calving, Ca levels in pasture must accordingly be maintained or raised to avoid hypocalcaemia and milk fever in dairy herds post-calving.

One approach to solving the lack of Ca is to induce cows to excrete more Ca in urine before calving by feeding them certain anionic supplements. This procedure induces the cow to commence mobilising Ca from bones before calving. Again, this suffers from the drawback that each individual cow must be treated separately, if individual drenching is used.

Other possible pre-calving preventive measures attempting to reduce the incidence of milk fever include vitamin D injections and maintaining high Mg concentrations during the cow's dry period.

As with the above, all these remedies are labour intensive and can be expensive.

Grass staggers (or tetany) occurs mainly in early lactation but can be of concern at other times, even during the dry period. The main cause of this deficiency in New Zealand are the low Mg concentrations in rye grass and climatic effects which dictate that Mg is at its lowest concentrating during the winter and early spring periods. Low levels of both Mg and Ca are also induced by Potassium (K) fertilisers.

High K levels and a K to sodium (Na) imbalance also reduce Mg absorption by the animal.

All the solutions to increase the amount of, Ca and Mg in cattle are labour intensive.

Water trough treatment with soluble Mg salts may help to an extent but the amount a cow drinks per day is weather dependent. Cows have been known to become ill even though sufficient Mg was supplied in the drinking water.

It is an object of the present invention to address the foregoing problems or at least to provide the public with the useful choice.

It is a further object of the present invention to provide a novel treatment composition for applying to pasture that increases the level of Ca and Mg in the biological entities grazing on the pasture. The biological entities shall hereinafter be referred to as grazing animals, and specifically dairy cows.

It is a further object of present invention to provide a composition for treating pasture that is effective, easy to administer and does not require significant labour expenditure.

It is yet a further object of the present invention to provide a method of preparation of the composition and a method of treatment of pasture.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

### **DISCLOSURE OF INVENTION**

According to one aspect of the present invention there is provided a chemical composition for application to substrate, thereby increasing the level of calcium and/or magnesium in animals grazing thereon; the composition including a combination of nitrogen and magnesium containing compounds.

Substrate shall hereinafter be referred to as pasture.

According to another aspect of the present invention the composition need not contain calcium.

Application of the composition to pasture and subsequent uptake by same induces the grazing animals to increase their uptake of magnesium and calcium from their surroundings. In this way, the amount of magnesium that the grazing animal gains may be over 100% of that which is delivered to the pasture in the composition. The amount of calcium in the grazing animal also increases, even though calcium may not be in the composition. If calcium is in the composition, then, again, the increase in calcium levels in the grazing animal are over 100% of the amount calcium the animal received.

The composition may comprise any combination of nitrogen and magnesium containing compounds as long as it achieves the desired result of increasing the levels of calcium and/or magnesium in a grazing animal.

The magnesium and nitrogen may each be in the form of ions that are combined to produce a salt. In particular, the magnesium and nitrogen may be in the form of cations that are combined with anions to produce two different salts, one containing magnesium, the other nitrogen. These salts may be then mixed together.

In this case, the anions may be chosen so they also improve the quality of the pasture, as long as this function does not interfere with the object of increasing the calcium and magnesium levels in the entity.

In an alternative embodiment, the nitrogen may be in the form of an anion that is mixed with a cation to produce a salt. In this embodiment, the cation may include minerals that also improve the quality of the pasture, eg phosphorus, sodium, copper, calcium, cobalt, zinc, selenium, iodine, and boron.

The salts may be mixed together while in solid form. They may then be dissolved in a suitable solvent, such as water, and applied to the grazing animals.

In an alternative embodiment, the salts may be dissolved in a solvent separately, and the two solutions then mixed together.

According to another aspect of the present invention, the composition may comprise a combination of magnesium chloride and ammonium sulphate. It is found that the mixture of these two salts provide the desired result. Also, the inclusion of chloride and sulphate help to provide a more anionic diet to help balance the diets of animals such as cows.

The exact mix of magnesium chloride to ammonium sulphate may be any that provides desired results. Preferably, the mix may be between 55 to 70% weight for weight (w/w) magnesium chloride and 45 to 30% w/w ammonium sulphate. In particular, it has been found that the mix of 60 to 70% w/w magnesium chloride and 40 to 30% w/w ammonium sulphate works particularly well.

In one preferred embodiment of the present invention, a mix of 66 % w/w of magnesium chloride and 34% w/w of ammonium sulphate may be used.

It will be apparent that the composition need not be applied directly, e.g. as a drench or salt lick to the grazing animals in which it is desired to increase the level of calcium or magnesium. The composition is instead applied to entities lower down the food chain - plant material such as clover, rye or other crops suitable for grazing.

For instance, the composition is accordingly applied to pasture to increase the amount of calcium and magnesium in same. However, the actual entity in which it is desired to increase the calcium and magnesium are animals, such as cattle, sheep, or goats grazing on the pasture.

Because the pasture has increased levels of magnesium and calcium, the animals thereby increase their own levels of magnesium and calcium by eating the pasture.

A result of increasing calcium and magnesium levels in dairy cows is a reduction in the incidence of milk fever or grass staggers.

In one embodiment of the present invention the composition may be combined with foliar fertilisers and/or other aqueous carriers. This embodiment significantly reduces the amount of labour required to maintain a pasture as both the treatment and fertilising can be done simultaneously.

In one embodiment of the present invention, the composition may be applied to the pasture to coincide with certain life cycles of the cattle. For instance, it is very desirable to increase the calcium and magnesium levels in dairy cows during early lactation. To do this, the composition is applied to pasture to be consumed after calving.

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only.

#### **BEST MODES FOR CARRYING OUT THE INVENTION**

In a preferred embodiment there is provided a chemical composition, including magnesium chloride and ammonium sulphate, for increasing



the levels of Mg and Ca in biological entities such as grazing animals. No calcium is provided in the composition .

To manufacture the presently claimed composition, the above two salts are mixed together, with the ratios being 66% w/w magnesium chloride ( $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ ) and 34% w/w ammonium sulphate. Ammonium sulphate does not have any water of crystallisation. These salts are in solid form, either being granulated or crystallised.

The composition may then be dissolved in sufficient water, foliar fertiliser or other aqueous carrier to fully dissolve the salts, and prevent the grass, which it is to be sprayed over, being burnt. The exact amount of water used can vary depending on the pasture conditions. For instance, if the pasture is particularly wet, only sufficient water to dissolve the composition is required. However, if there has been a lack of rain and the pasture is particularly dry, the amount of water can be significantly increased so as to water the grass at the same time. It is important, however, not to use so much water on the pasture that the composition drains off the pasture into nearby streams.

The chemical composition stimulates the grass to absorb calcium and magnesium from the soil as well as absorbing Mg from the composition. The grazing animals then consume the grass, thus gaining more Ca and Mg than they would otherwise, using conventional methods. Also, as the grazing animals are receiving relatively small "doses" of Ca and Mg over the entire day, their digestive systems can absorb the extra minerals. This is opposed to most dietary supplements where most of the minerals are filtered out by the kidneys and excreted due to the mineral levels being too high.

By using an aqueous solution, pastures can be easily treated with existing irrigation systems.

Table 1 shows the influence of the composition on Mg and Ca concentrations in pasture compared to pasture without any additives, and pasture having only magnesium chloride applied. It can be easily seen that the mixture increases both calcium and magnesium levels significantly with respect to a normal pasture.

**Table 1**

Salts used	Rate (kg/ha)	Ca Mg	
		(g/kg DM)	
Mixture	7.5	4.9	2.0
Control	-	4.4	1.7
Mixture	7.5	6.4	2.4
Magnesium Chloride	5	5.1	2.2
Control	-	5.3	1.8

Table 2 shows the effect of the mixture on the health problems of cattle. It can be easily seen that the mixture improve the health of grazing animals, in this case dairy cows, when it is applied on the pasture.

**Table 2**

	Mixture	Control
<u>Clinical parameters</u>		
Milk fever	-/20	1/20
Ketosis	-/20	1/20
Assisted calving	-/20	2/20
<u>Subclinical parameters (after calving)</u>		
Hypocalcaemia - First 12 days	3/20	8/20
Hypomagnesaemia - Day 12	8/20	12/20
Ketosis - Day 12	-/20	1/20

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

WHAT WE CLAIM IS:

1. A composition including the elements nitrogen and magnesium for application to a substrate, thereby increasing elemental uptake of calcium and/or magnesium in biological life forms supported thereon.
2. A composition as claimed in claim 1 wherein the composition does not contain calcium.
3. A composition as claimed in either claim 1 or claim 2 wherein magnesium and nitrogen are in cationic form and are combined with anions to produce a magnesium salt and a nitrogenous salt.
4. A composition as claimed in claim 3 wherein the anions are chlorides and/or sulphates.
5. A composition as claimed in claim 4 wherein the salt products are magnesium chloride and ammonium sulphate.
6. A composition as claimed in claim 1 or claim 2 wherein nitrogen is in anionic form and is combined with a cation to form a salt.
7. A composition according to the above claim wherein the cation is selected to improve pasture quality and may include any one or more of phosphorous, sodium, calcium, copper, cobalt, zinc, copper, selenium, iodine and boron.
8. A composition as claimed in any one of the above claims wherein the ratio of the magnesium containing compound is substantially 55-70%: 45-30%.
9. A composition as claimed above wherein the ratio is 66:34.

10. A method of increasing calcium and/or magnesium levels in animals, thereby preventing or reducing health problems therein, comprising applying a composition including nitrogen and/or magnesium to a substrate upon which said animals feed.
11. A method as claimed in claim 10 wherein said animals are dairy cows.
12. A method as claimed in claim 10 or 11 wherein said composition is applied to pasture to be consumed after the animals giving birth and operates to increase calcium and magnesium levels in the animal.
13. A method as claimed in any one of claims 10-12 wherein said health problems are milk fever and/or grass staggers.
14. A method according to any one of claims 10-13 wherein the application of the compound is foliar application in liquid solution.
15. A composition substantially as described or claimed herein with reference to any example thereof.
16. A method of increasing calcium and/or magnesium levels in animals substantially as described or claimed herein with reference to any example thereof.
17. Any invention claimed or described herein.

# INTERNATIONAL SEARCH REPORT

International Application No.  
**PCT/NZ 97/00051**

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>												
Int Cl <sup>6</sup> : C05C 3/00; C05D 5/00; C05G 1/00; A61K 33/02, 33/06												
According to International Patent Classification (IPC) or to both national classification and IPC												
<b>B. FIELDS SEARCHED</b>												
Minimum documentation searched (classification system followed by classification symbols) IPC : C05B, C05C, C05D, C05F, C05G, A61K, A23K												
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched												
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) <b>DERWENT, WPAT : KEYWORDS (magnes, mg, nitr, ammoni)</b> <b>DIALOG, AGRI + MEDLINE : KEYWORDS (as above + milk fever, Downercow, grass staggers, tetany, hypocalcemia)</b>												
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>												
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.										
X	DIALOG File 50 : CAB Abstracts, 02115475, CAB Accession Number 891934381 "Magnesium in grassland production", L.G. Nilsson, Developments in Plant and Soil Sciences No. 29, 1987, pages 20-33.	1-17										
X	DIALOG File 50 : CAB Abstracts, 01308066, CAB Accession Number 830747721, "The influence of magnesium supplementation and fertilization on beef cows consuming tall fescue", R.J. Ritter, Dissertation Abstracts International, B, vol. 42(2), 1981, page 440	1-17										
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <span style="margin-left: 200px;"><input checked="" type="checkbox"/> See patent family annex</span>												
<p>* Special categories of cited documents:</p> <table style="width:100%; border:none;"> <tr> <td style="width:30%;">"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td style="width:30%;">"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E" earlier document but published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"I." document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E" earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"I." document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed	
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Date of the actual completion of the international search 12 August 1997		Date of mailing of the international search report <b>15 AUG 1997</b>										
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (06) 285 3929		Authorized officer  <b>GILLIAN JENKINS</b> Telephone No.: (06) 283 2252										

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DIALOG File 50 : CAB Abstracts, 01023182, CAB Accession Number 810718930, "Effects of fertilization and temperature on chemical composition of wheat in relation to grass tetany potential", K.S. Reddy, Dissertation Abstracts International, B, vol. 38(1), 1978, page 5129.	1-17
X	DIALOG File 50 : CAB Abstracts, 00752692, CAB Accession Number 790790482, "Magnesium effects on wheat forage components involved in the tetany syndrome", C.L. Harms, Dissertation Abstracts International, B, vol. 38(2), 1977, pages 447-448.	1-17
X	DIALOG File 50 : CAB Abstracts, 00626063, CAB Accession Number 780769208, "Mineral element composition of forages as related to animal requirements", G.A. Jung, US Reg. Pasture Res. Lab, USDA, USA, 1977.	1-17
X	DIALOG File 50 : CAB Abstracts, 00311200, CAB Accession Number 741909817, "Magnesium concentration in Agropyron desertorum fertilized with Mg and N", H. Mayland et al, Agronomy Journal, vol. 66(1), 1974, pages 79-82.	1-17
X	DIALOG File 50 : CAB Abstracts, 02654296, CAB Accession Number 930457018, "Prevention of parturient paresis in a Jersey herd by feeding anionic salts during the prepartum period", G.R. Oetzel et al, Bovine Practitioner No 26, 1991, pages 33-35.	1-17
X	US.A, 5199967 (D.C. Young) 6 April 1993 see claim 1, column 3 lines 14-51	1-9, 15, 17
X	Derwent Abstract Accession No. 84-304225/49, Class C04, JP,A, 9190288 (Showa Denko KK) 29 October 1984	1-9, 15, 17
X	Derwent Abstract Accession No. 18917D/11, Class D16B13, SU,A, 743645 (Shcherbakov AA) 30 June 1980.	1-9,17

**INTERNATIONAL SEARCH REPORT****Information on patent family members**

International Application No.

**PCT/NZ 97/00051**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member
US 519967	None
END OF ANNEX	