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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 May 2002 (23.05.2002)

PCT

(10) International Publication Number
WO 02/39817 A1

(51) International Patent Classification[7]: A01N 43/64 // (A01N 43/64, 25:14)

(21) International Application Number: PCT/IE01/00143

(22) International Filing Date:
14 November 2001 (14.11.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20000924 16 November 2000 (16.11.2000) IE

(71) Applicant *(for all designated States except US)*: **INFO-WISE LIMITED** [IE/IE]; Whitemill Industrial Estate, Wexford (IE).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **EDMONDSON, Paul, Stephen** [GB/IE]; Sea Breeze, Coxtown, Dunmore East, County Waterford (IE).

(74) Agents: **O'BRIEN, John, A.** et al.; c/o John A. O'Brien & Associates, Duncairn House, 3rd Floor, 14 Carysfort Avenue, Blackrock, County Dublin (IE).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DE (utility model), DK, DK (utility model), DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

WO 02/39817 A1

(54) Title: SANITIZING COMPOSITION CONTAINING CHLORINATED ISOCYANURATE FOR IN-OVO INJECTION EQUIPMENT

(57) Abstract: A water soluble sanitising composition comprises a chlorinated isocyanurate and an effervescent alkali base, the effervescent base comprising sodium carbonate agent, adipic acid and sodium bicarbonate in a weight ratio of approximately 1:1:1 to provide a sanitising solution having a pH of from 6.8 to 7.4. A method for sanitising a product such as in-ovo injection equipment comprises the step of dissolving the composition in water to form a sanitising solution and flushing the in-ovo injection equipment with the sanitising solution prior to each in-ovo injection.

# SANITIZING COMPOSITION CONTAINING CHLORINATED ISOCYANURATE FOR IN-OVO INJECTION EQUIPMENT

## Introduction

The invention relates to a sanitising composition and in particular to a sanitising composition which allows for an effective and non-toxic sanitising of products such as *in-ovo* injection equipment.

Automated *in-ovo* injection systems enable the delivery of biological and pharmaceutical products directly into chick embryos, whilst still in the egg. Such injection systems can typically inoculate between 20,000 and 50,000 eggs per hour, eliminating the need to manually inject chicks after they have hatched. Such systems improve productivity in the hatcheries, and result in the production of healthier birds.

During the operation of the *in-ovo* injection equipment, typically one hundred eggs are injected on each process occasion. After each injection it is necessary to flush the lines, needles and the egg surfaces with a suitable sanitiser, to prevent contamination by microbiological pathogens on the surfaces of the equipment and eggs.

Existing procedures involve the use of a sanitiser such as sodium hypochlorite. However, there are a number of serious disadvantages in the use of such a product and similar products such as calcium hypochlorite. Hypochlorites are alkaline products having a pH typically greater than pH8.5. At these high pH levels the product is toxic to the chick embryo. It is therefore necessary to buffer the pH by adding an acid immediately prior to use.

Currently the standard hand-mixed sanitiser solutions may consist of a mixture of 5% sodium hypochlorite diluted in water to give an operating solution strength of 0.5%. Separately, an acid solution is made up to buffer the 0.5% sodium hypochlorite solution to lower the pH. For example citric acid may be dissolved in water and 5% sodium hypochlorite added to the acid solution to give a final solution of 0.5% sodium hypochlorite.

Such hand-mixed sanitising solutions are however unsatisfactory for reliably disinfecting the *in-ovo* equipment for a number of reasons.

Commercial hypochlorite products are available from 1% to over 10% available chlorine. There are no standard solutions available. Because many of these products are used for non-critical purposes (for example, for household uses), the strengths of the products are inconsistent. It is also well known that hypochlorite products are unstable, losing their potency in storage. Where the solution strength is not known with absolute confidence it is necessary to chemically analyse the hypochlorite products to determine the precise strength of the product before making up sanitiser solutions which are used for critical purposes such as sanitising *in ovo* equipment.

In addition, when buffered to the desirable pH with a suitable acid, the resultant sanitiser solution is highly unstable, losing about 30% of its strength in one day and up to 70% of its strength in two days.

The procedure for making up the *in-ovo* sanitising solutions using commercial hypochlorite products is also complex, time-consuming and is prone to costly mistakes and errors, leading to potential pathogenic contamination of the eggs and embryos.

There is therefore a need for an improved stable sanitiser composition which is effective, in particular for sanitising equipment, especially *in ovo* injection equipment in a non-toxic and efficient manner.

Statements of Invention

According to the invention there is provided a water soluble sanitising composition comprising a chlorinated isocyanurate and an effervescent base, the effervescent base comprising an alkali buffering agent, an aliphatic carboxylic acid and an alkali metal bicarbonate to provide a sanitising solution having a pH of from 6.8 and 7.4.

The invention also provides a water soluble sanitising composition comprising a chlorinated isocyanurate and an alkali effervescent base, the effervescent base comprising an alkali buffering agent, an aliphatic carboxylic acid and an alkali metal bicarbonate to provide a sanitising solution having a pH of from 6.8 to 7.4.

According to another aspect the invention provides a water soluble sanitising composition comprising a chlorinated isocyanurate, an aliphatic carboxylic acid, an alkali buffering agent and an alkali metal bicarbonate to provide a sanitising solution having a pH of from 6.8 to 7.4.

The invention also provides a water soluble sanitising composition comprising a chlorinated isocyanurate, adipic acid, an alkali buffering agent and an alkali metal bicarbonate. The composition preferably provides a sanitising solution having a pH of from 6.8 to 7.4.

In a further aspect the invention provides a water soluble sanitising composition comprising a chlorinated isocyanurate, and an effervescent alkali base, the effervescent base comprising adipic acid, an alkali buffering agent and an alkali metal bicarbonate. The composition preferably provides a sanitising solution having a pH of from 6.8 to 7.4, ideally approximately 7.0.

In a particularly preferred embodiment the alkali metal bicarbonate is sodium bicarbonate. The particular advantages of utilising sodium bicarbonate are that it is very soluble in water, it is suitable for use in effervescent preparations, it is available in pharmaceutical or food grade and produces alkaline solutions.

Preferably the alkali effervescent base comprises sodium carbonate as an alkali buffering agent, adipic acid as an aliphatic carboxylic acid and sodium bicarbonate in an approximate weight ratio of 1:1:1, most preferably approximately 20:19:19. These ratios surprisingly produce good quality effervescent tablets with controlled release of solutions of a narrow band of pH values over a time period, and with stable release of available chlorine over a time period.

Preferably the chlorinated isocyanurate is sodium dichloroisocyanurate. Sodium dichloroisocyanurate is readily soluble in water, producing solutions that are effective sanitisers and, more particularly in relation to this invention, remain active over a wide range of pH.

In a preferred embodiment the alkali buffering agent is sodium carbonate. In a particularly preferred aspect the sodium carbonate buffering agent is an admixture of sodium carbonate in a granular form and sodium carbonate in a powder form. Sodium carbonate is readily soluble in water, is available in pharmaceutical or food grades and is strongly alkaline.

In this case preferably the weight ratio of granular sodium carbonate to powder sodium carbonate is between 60:40 and 90:10. The choice of the particular admixture of granular and powder materials enables the production of a stable effervescent tablet of acceptable disintegration characteristics, whilst retaining the opportunity for processing by direct compression.

In a preferred embodiment the aliphatic carboxylic acid is adipic acid. Adipic acid has the advantage of being non hygroscopic, which helps to preserve the integrity and stability of the finished formulation, and also the material has lubricating properties that aid the tabletting process.

The composition of the invention preferably delivers approximately 0.5% available chlorine. A 0.5% available chlorine solution has the wide-spectrum activity necessary for effective sanitation, being effective against spores, viruses, mycobacteria, bacteria and fungi.

In a particularly preferred embodiment the composition is in the form of a water soluble tablet. The effervescent tablet format has the advantages of being in a unit dose format, which self-dissolves in water, to produce sanitiser solutions of known and accurate strength, without having to weigh out powders, measure out liquids and to compute the required dosage and solution strength. Tablets are easier and safer to handle and store, and they do not spill.

According to another aspect the invention provides a water soluble sanitising composition comprising a chlorinated isocyanurate and an effervescent base, the effervescent base comprising sodium carbonate, adipic acid and sodium bicarbonate in an approximate weight ratio of 1:1:1.

The composition is preferably formed by a direct compression technique, which enables the manufacture of the alkali effervescent tablets without pre-processing by granulation and drying of the ingredients or addition of tabletting aids.

The invention also provides a method for sanitising comprising the single step of dissolving a composition of the invention in water and flushing, immersing or dipping product to be sanitised in the sanitising solution. Preferably the composition is in a water soluble tablet form. The product may be eggs or *in ovo* injection equipment.

The invention further provides a method for sanitising *in-ovo* injection equipment comprising the single step of dissolving a composition of the invention in water to form a sanitising solution. The sanitising solution is then flushed through the lines and needles and over the egg surfaces prior to each *in-ovo* injection. Preferably the sanitising solution comprises a chlorinated isocyanurate.

The invention also provides a method for sanitising eggs comprising dissolving a composition of the invention in water to form a sanitising solution and flushing, immersing or dipping the eggs in the sanitising solution.

The invention further provides a process for preparing a water soluble sanitising composition comprising the step of directly compressing into water soluble effervescent tablets a chlorinated isocyanurate such as sodium dichloroisocyanurate, an alkali buffering agent such as sodium carbonate, an aliphatic carboxylic acid such as adipic acid or salt thereof and an alkali metal bicarbonate preferably sodium bicarbonate.

Unlike many preparations known in the art, the selection of the ingredients surprisingly forms a tablet with desirable physical characteristics without recourse to pre-preparation of the ingredients by agglomeration and combination

with wetting agents (such as water or isopropyl alcohol), which subsequently requires drying (such as with a fluid bed dryer), and/or compacting and/or granulating, and without the addition of tabletting aids (such as sorbitol, salts of stearates, salts of lauryl sulphate, Emcosoy, polyetheylene glycol, sodium benzoate and similar).

Brief description of the drawings

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only with reference to the accompanying drawings in which:-

Fig. 1 is a graph showing the change in pH over time (hours) for a hand mixed solution in comparison to effervescent tablets of the invention; and

Fig. 2 is a graph showing the stability (mg/l chlorine) of a hand mixed solution in comparison to effervescent tablets of the invention.

Detailed Description

Chlorinated isocyanurates are well known chlorine donors used as swimming pool disinfectants and in formulations used for dishwashing, laundry products or disinfection of baby feeding bottles.

Of the chlorinated isocyanurates available, the most suitable are those with the greatest solubility, such as sodium or potassium dichloroisocyanurate.

The present invention provides a water soluble composition comprising a chlorinated isocyanurate and an alkali buffering effervescent base, which provides a non-toxic solution having a pH from between 6.8 and 7.4. This is a

pH range that is compatible with the embryotic fluid or air sac of a poultry egg. The composition may be used in sanitising equipment, in particular for sanitising *in ovo* injection equipment. The composition is very stable in solution and simple to use.

The composition of the invention may be produced in a solid dose form. A solid dose form eliminates the necessity to weigh out a quantity of powder or granules each time a sanitiser solution is required. Using a single solid dose form also ensures that a sanitising solution having an accurate and known disinfectant concentration is produced in a one step process. The handling of a solid dose form is also easier and safer than handling chlorinated powders or granules or hypochlorite solutions.

The composition may be in the form of tablets especially effervescent tablets. Effervescent tablets are preferred because they disperse quickly in solution and dissolve the active ingredient. There is no need to crush the tablets and/or stir the solutions to achieve a clear sanitising solution within a reasonable time period.

The effervescent tablets comprise an active ingredient such as a chlorinated isocyanurate and an inert, effervescent base. The inert, effervescent base typically comprises an aliphatic carboxylic acid or salt thereof such as fumaric acid or adipic acid and an alkali metal carbonate or bicarbonate such as sodium bicarbonate.

However, effervescent tablets from such a typical formulation producing a sanitiser solution of approximately 0.5% available chlorine strength, produce solutions with a pH of approximately 5.5 to 6.5, and typically approximately pH6.0. Such pH values are too acidic and are toxic to chick embryos.

To achieve a pH which is compatible and non-toxic to the embryotic fluid or air sac of a chick egg the effervescent tablets include a buffering agent to increase the pH to approximately pH 7.0. The formulation to include a buffering agent in accordance with this invention does not inhibit the tableting quality and the composition remains easy to compress into tablet form by a direct compression process. The tablet disintegrates in solution within reasonable time producing a clear working solution. Most importantly the addition of the buffering agent does not inhibit the disinfection capability of the sanitising solution.

Buffering agents of choice must be non-toxic, readily soluble, non-oxidisable and commercially available. Examples suitable for use in the present invention include sodium or potassium hydroxide, sodium tripolyphosphate, trisodium phosphate, sodium carbonate, and the ortho- and metasilicates.

It was found that the use of powdered sodium carbonate in total produces a tablet of poor physical quality. Similarly, a formulation using granular sodium carbonate also produced a tablet of poor physical qualities. The term granular in the specification is taken to encompass compounds having a granular grade giving a typical sieve analysis of:

| Micron | % Retained |
|---|---|
| 2800 | 1.5% |
| 425 | 28.3% |
| 250 | 44.9% |
| 125 | 22.0% |
| 63 | 2.0% |
| | QS |

It was surprisingly found that an admixture containing both granular and powder sodium carbonate produced a tablet of good physical characteristics by a

direct compression process and without the addition of the usual tabletting aids. An admixture where the ratio of granular sodium carbonate to powder sodium carbonate is between 60:40 and 90:10 produced a tablet of excellent physical characteristics.

Tablets prepared using such an admixture of sodium carbonate have been shown to have good disintegration properties, produce clear sanitising solutions and are stable at normal atmospheric conditions.

A critical factor of stabilisation is the pH of the sanitising solution so prepared. Without stable control of the pH in parallel with the desired target pH of the embryotic fluid or air sac, toxic reactions may result in poor hatchability of the chicks from the eggs. The following results demonstrate the remarkable pH control of the current invention, compared especially to the current hand-mixed method when using sodium hypochlorite liquid, buffered with citric acid.

The pH of the Hand Mixed solution started at pH9 reducing to pH8.6 after 6 hours, where it stabilised over the balance of the 24 hour period (Fig. 1). The effervescent tablet of the current invention commenced with a pH of 7.16 rising to 7.18 after 8 hours and reducing to 7.05 after 24 hours. The tablet had a stabilised pH in the range of 7 to 7.2, which is ideally compatible with the egg air sac – thus protecting against potential toxicity problems and, therefore, assisting the maximisation of hatchability.

The choice of the sodium carbonate also significantly contributes to the effervescent nature of the formulation.

It is also envisaged that the composition of the invention may be prepared in other solid dose forms, for example in particulate form sealed within a sachet

which dissolves in a known volume of water to provide a known concentration of sanitising solution.

The invention will be more clearly understood from the following description given by way of example.

Example 1

Tablets are prepared having the following formulation by weight. The formulation given is for a single tablet.

| | |
|---|---|
| Sodium dichloroisocyanurate | 42% |
| Sodium bicarbonate | 19% |
| Adipic acid | 19% |
| Sodium carbonate | 20% |

8.15g sodium dichloroisocyanurate, 3.75g sodium bicarbonate, 3.59g adipic acid and 3.76g of sodium carbonate are weighed out and dry blended together. The dry blend is then compressed by direct compression (on chrome plated tooling) into tablets.

Example 2

The hatchability of live embryos transferred was measured in approximately 50-egg replicates per trial per treatment. Two identical trials were conducted. Eggs were either not injected or were air cell injected with either 30 or 300µl volume, using a hand-mixed sanitiser composition (comprising per litre of water: 106mg sodium bromide, 1.19grams citric acid and 106ml of 5.5% hypochlorite), an effervescent tablet of Example 1 and saline. The chicks (n=108) were grown out in brooder batteries for one week and monitored for mortality. With the exception of the non-injected controls, the treatment combinations were

appropriate for a two-way factorial analysis in which material and volume were both evaluated. The two-way factorial analysis was then conducted using the previous trial as a blocking factor. Table 1(a) and (b) illustrate the results of hatchability and late embryotic mortality results in the two identical trials. Table 2 contains the results pooled across both trials. Results are shown for live and late dead hatch, live pip and dead pip. (Pip refers to a bird that has not completely emerged from the shell).

The hatchability results are based on necropsy of hatch residue.

The results show no significant interactions.

**Table 1(a)**

| Trial 1 | | | Hatch of live | Late Dead | Live Pip | Dead Pip |
|---|---|---|---|---|---|---|
| Not Inj. | None | Mean | 96.94 | 0.52 | 0.51 | 0.51 |
| | | SD | 3.53 | 1.04 | 1.02 | 1.02 |
| | | n | 4 | 4 | 4 | 4 |
| Std. Hand Mix | 30µl | Mean | 97.37 | 0.00 | 1.58 | 0.00 |
| | | SD | 3.14 | 0.00 | 2.03 | 0.00 |
| | | n | 4 | 4 | 4 | 4 |
| | 300µl | Mean | 96.84 | 1.02 | 1.06 | 0.00 |
| | | SD | 1.22 | 2.04 | 1.22 | 0.00 |
| | | n | 4 | 4 | 4 | 4 |
| Effervescent Tablets | 30µl | Mean | 95.23 | 0.00 | 2.11 | 0.00 |
| | | SD | 2.68 | 0.00 | 1.70 | 0.00 |
| | | n | 4 | 4 | 4 | 4 |
| | 300µl | Mean | 98.90 | 0.00 | 0.56 | 0.54 |
| | | SD | 1.27 | 0.00 | 1.11 | 1.09 |
| | | n | 4 | 4 | 4 | 4 |
| Saline | 30µl | Mean | 94.80 | 2.04 | 1.01 | 1.53 |
| | | SD | 3.54 | 1.67 | 1.17 | 1.02 |
| | | n | 4 | 4 | 4 | 4 |
| | 300µl | Mean | 96.80 | 1.12 | 1.56 | 0.52 |
| | | SD | 3.58 | 1.29 | 1.99 | 1.04 |
| | | n | 4 | 4 | 4 | 4 |

Table 1(b)

| Trial 2 | | | Hatch of live | Late Dead | Live Pip | Dead Pip |
|---|---|---|---|---|---|---|
| Not Inj. | None | Mean | 97.99 | 1.00 | 0.50 | 0.51 |
| | | SD | 1.63 | 1.15 | 1.00 | 1.02 |
| | | n | 4 | 4 | 4 | 4 |
| Std. Hand Mix | 30µl | Mean | 97.44 | 0.52 | 0.50 | 0.00 |
| | | SD | 3.10 | 1.04 | 1.00 | 0.00 |
| | | n | 4 | 4 | 4 | 4 |
| | 300µl | Mean | 98.00 | 0.00 | 1.00 | 0.00 |
| | | SD | 4.00 | 0.00 | 2.00 | 0.00 |
| | | n | 4 | 4 | 4 | 4 |
| Effervescent Tablets | 30µl | Mean | 97.41 | 2.08 | 0.00 | 0.51 |
| | | SD | 0.99 | 0.04 | 0.00 | 1.02 |
| | | n | 4 | 4 | 4 | 4 |
| | 300µl | Mean | 98.98 | 1.02 | 0.00 | 0.00 |
| | | SD | 2.04 | 2.04 | 0.00 | 0.00 |
| | | n | 4 | 4 | 4 | 4 |
| Saline | 30µl | Mean | 98.50 | 0.00 | 0.00 | 1.00 |
| | | SD | 1.00 | 0.00 | 0.00 | 1.15 |
| | | n | 4 | 4 | 4 | 4 |
| | 300µl | Mean | 98.49 | 0.00 | 0.50 | 1.01 |
| | | SD | 1.01 | 0.00 | 1.00 | 1.17 |
| | | n | 4 | 4 | 4 | 4 |

Table 2

| | | | Hatch of live | Late Dead | Live Pip | Dead Pip |
|---|---|---|---|---|---|---|
| Not Inj. | None | Mean | 97.46 | 0.76 | 0.51 | 0.51 |
| | | SD | 2.61 | 1.05 | 0.94 | 0.94 |
| | | n | 8 | 8 | 8 | 8 |
| Std. Hand Mix | 30µl | Mean | 97.41 | 0.26 | 1.04 | 0.00 |
| | | SD | 2.89 | 0.74 | 1.59 | 0.00 |
| | | n | 8 | 8 | 8 | 8 |
| | 300µl | Mean | 97.42 | 0.51 | 1.03 | 0.00 |
| | | SD | 2.81 | 1.44 | 1.53 | 0.00 |
| | | n | 8 | 8 | 8 | 8 |
| Effervescent Tablets | 30µl | Mean | 96.32 | 1.04 | 1.05 | 0.26 |
| | | SD | 2.20 | 1.11 | 1.58 | 0.72 |
| | | n | 8 | 8 | 8 | 8 |
| | 300µl | Mean | 98.94 | 0.51 | 0.28 | 0.27 |
| | | SD | 1.57 | 1.44 | 0.79 | 0.77 |
| | | n | 8 | 8 | 8 | 8 |
| Saline | 30µl | Mean | 96.70 | 1.02 | 0.51 | 1.27 |
| | | SD | 3.08 | 1.54 | 0.94 | 1.05 |
| | | n | 8 | 8 | 8 | 8 |
| | 300µl | Mean | 97.65 | 0.56 | 1.03 | 0.77 |
| | | SD | 2.60 | 1.04 | 1.57 | 1.06 |
| | | n | 8 | 8 | 8 | 8 |

Table 3 illustrates the results of early mortality by trial and Table 4 gives the pooled results. There were no significant interactions or main material effects.

**Table 3**

| Trial 1 | | % Mortality |
|---|---|---|
| Not injected | None | 3.70 |
| Std Hand Mix | 30µl | 0.93 |
| | 300µl | 0.93 |
| Effervescent Tablets | 30µl | 0.93 |
| | 300µl | 0.00 |
| Saline | 30µl | 2.78 |
| | 300µl | 0.00 |
| Trial 2 | | |
| Not injected | None | 0.93 |
| Standard Hand Mix | 30µl | 1.85 |
| | 300µl | 0.00 |
| Effervescent Tablets | 30µl | 2.78 |
| | 300µl | 0.00 |
| Saline | 30µl | 4.63 |
| | 300µl | 0.00 |

**Table 4**

| | | % Mortality |
|---|---|---|
| Not injected | None | 2.31 |
| Std Hand Mix | 30µl | 1.39 |
| | 300µl | 0.46 |
| Effervescent Tablets | 30µl | 1.85 |
| | 300µl | 0.00 |
| Saline | 30µl | 3.70 |
| | 300µl | 0.00 |

The stability of the sanitising solutions is also a critical factor in maintaining efficacy over the cycle of use of the egg injection equipment. The stability of the formulated tablets showed excellent characteristics, especially when compared to the standard hand-mixed product, hereinbefore described.

Figs. 3 and 4 show the stability of solutions over time. The standard Hand Mixed solution (Fig. 2) gave an initial concentration of 4,600 mg/l chlorine, which reduced to 3000 mg/l in less than 10 hours – a 35% drop. The solution had lost almost 20% of its strength after just 4 hours. Such losses could give rise to concerns with the efficacy of the product during the egg injection cycle. The effervescent tablet of the current invention gave a solution initial strength of almost 5,300 mg/l chlorine retaining a level of over 4,900mg/l after 24 hours, with no significant change in strength over the initial 8 hours, giving an exceptional performance.

A study was also carried out to determine the stability of an approximate 0.5% available chlorine solution using the effervescent tablet of Example 1 over a 9 week period. As table 5 illustrates the solution maintained a stable pH over the 9 weeks.

Table 5

| Time (Weeks) | Available Chlorine (ppm) | pH | Temperature (°C) |
|---|---|---|---|
| 0 | 4843.9 | 6.89 | 15 |
| 1 | 4434.56 | 6.96 | 14 |
| 2 | 3572.32 | 6.97 | 16 |
| 3 | 3615.87 | 6.97 | 16 |
| 4 | 3342.97 | 6.94 | 17 |
| 5 | 3070.08 | 6.93 | 18 |
| 6 | 2933.63 | 6.89 | 16 |
| 7 | 2387.84 | 7.05 | 18 |
| 8 | 2319.62 | 6.98 | 17 |
| 9 | 2046.72 | 6.95 | 18 |

The invention is not limited to the embodiments hereinbefore described which may be varied in detail.

Claims

1. A water soluble sanitising composition comprising a chlorinated isocyanurate and an effervescent alkali base, the effervescent base comprising an alkali buffering agent, an aliphatic carboxylic acid and an alkali metal bicarbonate to provide a sanitising solution having a pH of from 6.8 to 7.4.

2. A composition as claimed in claim 1 wherein the alkali metal bicarbonate is sodium bicarbonate.

3. A composition as claimed in claim 1 or 2 wherein the alkali buffering agent is sodium carbonate.

4. A composition as claimed in any preceding claim wherein the aliphatic carboxylic acid is adipic acid.

5. A composition as claimed in claim 4 where the effervescent base comprises sodium carbonate, adipic acid and sodium bicarbonate in an approximate weight ratio of 1:1:1.

6. A composition as claimed in claim 5 wherein the weight ratio is approximately 20:19:19.

7. A composition as claimed in any preceding claim wherein the sanitising solution has a pH of approximately 7.0.

8. A composition as claimed in any preceding claim wherein the chlorinated isocyanurate is sodium dichloroisocyanurate.

9. A composition as claimed in any of claims 3 to 8 wherein the sodium carbonate buffering agent is an admixture of sodium carbonate in a granular form and sodium carbonate in a powder form.

10. A composition as claimed in claim 9 wherein the weight ratio of granular sodium carbonate to powder sodium carbonate is between 60:40 and 90:10.

11. A composition as claimed in any preceding claim wherein the composition delivers approximately 0.5% available chlorine.

12. A composition as claimed in any preceding claim in the form of a water soluble tablet.

13. A composition as claimed in any of claims 1 to 12 wherein the composition is formed by a direct compression technique.

14. A water soluble sanitising composition comprising a chlorinated isocyanurate and an effervescent base, the effervescent base comprising sodium carbonate, adipic acid and sodium bicarbonate in an approximate weight ratio of 1:1:1.

15. A water soluble sanitising composition comprising a chlorinated isocyanurate, an aliphatic carboxylic acid, an alkali buffering agent and an alkali metal bicarbonate to provide a sanitising solution having a pH of from 6.8 to 7.4.

16. A water soluble sanitising composition comprising a chlorinated isocyanurate, adipic acid, an alkali buffering agent and an alkali metal bicarbonate.

17. A water soluble sanitising composition comprising a chlorinated isocyanurate, and an effervescent base, the effervescent base comprising adipic acid, an alkali buffering agent and an alkali metal bicarbonate.

18. A water soluble sanitising composition substantially as hereinbefore described with reference to the examples.

19. A method for sanitising comprising the steps of dissolving a composition as claimed in any of claims 1 to 18 in water to form a sanitising solution and flushing, immersing or dipping a product to be sanitised in the sanitising solution.

20. A method for sanitising comprising the steps of dissolving a water soluble composition as claimed in any of claims 1 to 18 in tablet form in water to form a sanitising solution and flushing, immersing or dipping a product to be sanitised in the sanitising solution.

21. A method as claimed in claim 19 or 20 wherein the product is *in ovo* injection equipment.

22. A method as claimed in claim 19 or 20 wherein the product is an egg.

23. A method for sanitising *in-ovo* injection equipment comprising the step of dissolving a composition as claimed in any of claims 1 to 18 in water to form a sanitising solution and flushing *in-ovo* injection equipment with the sanitising solution prior to each *in ovo* injection.

24. A method for sanitising *in-ovo* injection equipment comprising the step of dissolving a water soluble composition as claimed in any of claims 1 to 18 in tablet form in water to form a sanitising solution and flushing the *in ovo* injection equipment with the sanitising solution prior to each *in-ovo* injection.

25. A method for sanitising *in-ovo* injection equipment comprising the step of dissolving a composition comprising a chlorinated isocyanurate in water to form a sanitising solution and flushing the *in ovo* injection equipment with the sanitising solution prior to each *in-ovo* injection.

26. A method for sanitising eggs comprising dissolving a composition as claimed in any of claims 1 to 18 in water to form a sanitising solution and flushing, immersing or dipping the eggs in the sanitising solution.

27. A sanitising method substantially as hereinbefore described with reference to the examples.

28. A process for preparing a water soluble sanitising composition comprising the step of directly compressing into water soluble effervescent tablets a chlorinated isocyanurate, an alkali buffering agent, an aliphatic carboxylic acid or salt thereof and an alkali metal bicarbonate.

29. A process for preparing a water soluble sanitising composition substantially as hereinbefore described with reference to the examples.

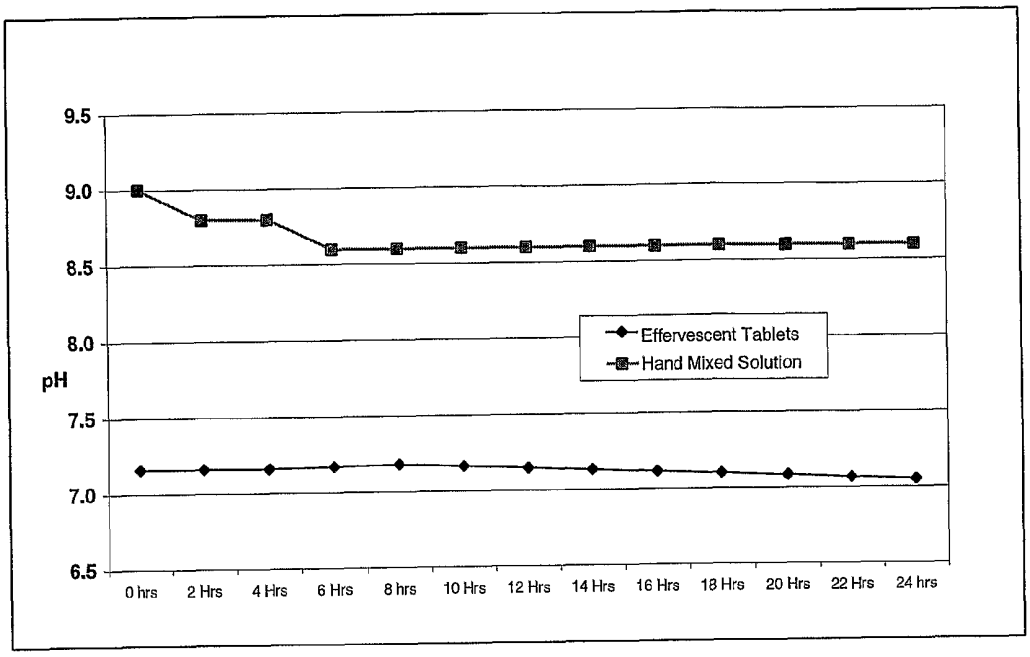
9.5
9.0
8.5
8.0
pH
7.5
7.0
6.5
0 hrs
2 Hrs
4 Hrs
6 Hrs
8 hrs
10 Hrs
12 Hrs
14 Hrs
16 Hrs
18 Hrs
20 Hrs
22 Hrs
24 hrs
Effervescent Tablets
Hand Mixed Solution

Fig. 1

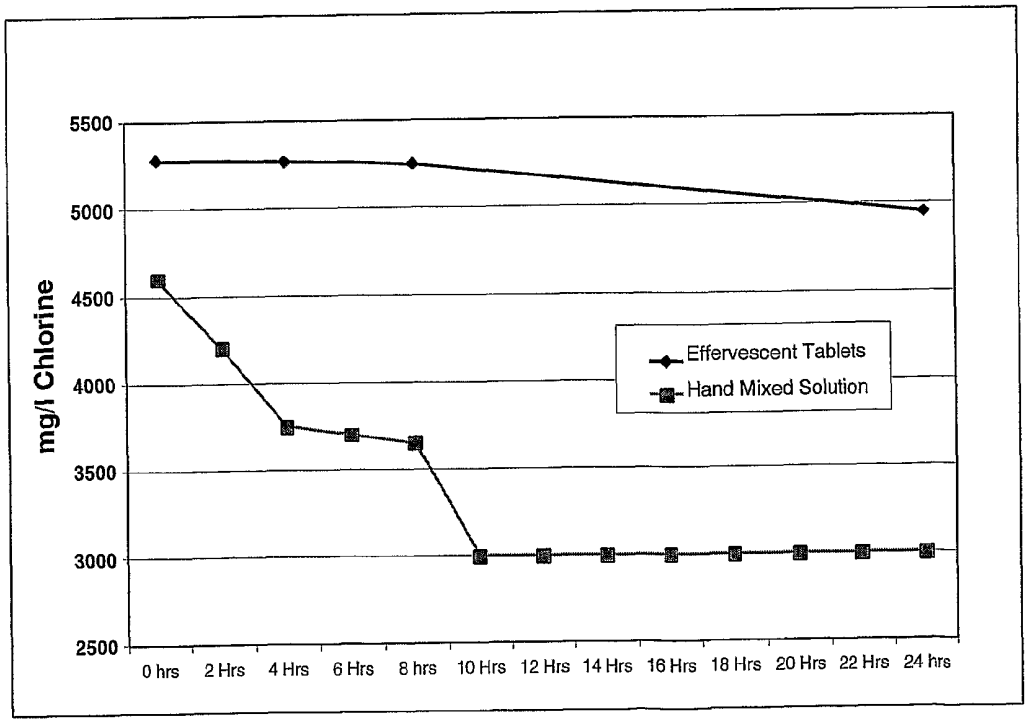
5500
5000
4500
4000
3500
3000
2500
mg/l Chlorine
0 hrs
2 Hrs
4 Hrs
6 Hrs
8 hrs
10 Hrs
12 Hrs
14 Hrs
16 Hrs
18 Hrs
20 Hrs
22 Hrs
24 hrs
Effervescent Tablets
Hand Mixed Solution

Fig. 2

# INTERNATIONAL SEARCH REPORT

Inte ıal Application No
PCT/IE 01/00143

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01N43/64 //(A01N43/64,25:14)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A01N

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 practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 5 114 647 A (ALEXANDER ROY P ET AL)<br>19 May 1992 (1992-05-19)<br>the whole document<br>--- | 1-29 |
| X | GB 2 242 130 A (INFOWISE LTD)<br>25 September 1991 (1991-09-25)<br>the whole document<br>--- | 1-29 |
| X | CH 527 124 A (H & T KIRBY & COMPANY LTD)<br>31 August 1972 (1972-08-31)<br>the whole document<br>--- | 1-29 |
| X | GB 1 505 738 A (KIRBY PHARMACEUTICALS LTD)<br>30 March 1978 (1978-03-30)<br>the whole document<br>--- | 1-29 |
| | -/-- | |

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" 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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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.

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 21 December 2001 | 10/01/2002 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31–70) 340–2040, Tx. 31 651 epo nl,<br>Fax: (+31–70) 340–3016 | Bertrand, F |

Form PCT/ISA/210 (second sheet) (July 1992)

# INTERNATIONAL SEARCH REPORT

Int nal Application No
PCT/IE 01/00143

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication,where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | PATENT ABSTRACTS OF JAPAN<br>vol. 006, no. 019 (C-090),<br>3 February 1982 (1982-02-03)<br>& JP 56 142210 A (SHIKOKU CHEM CORP),<br>6 November 1981 (1981-11-06)<br>abstract | 1-29 |
| X | FR 2 575 637 A (CHARBONNAGES STE CHIMIQUE)<br>11 July 1986 (1986-07-11)<br>the whole document | 1-29 |
| X | EP 0 230 133 A (SURGIKOS INC)<br>29 July 1987 (1987-07-29)<br>the whole document | 1-29 |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte ıal Application No
PCT/IE 01/00143

| Patent document cited in search report | | Publication date | Patent family member(s) | | Publication date |
|---|---|---|---|---|---|
| US 5114647 | A | 19-05-1992 | NONE | | |
| GB 2242130 | A | 25-09-1991 | NONE | | |
| CH 527124 | A | 31-08-1972 | NONE | | |
| GB 1505738 | A | 30-03-1978 | HK | 30979 A | 18-05-1979 |
| JP 56142210 | A | 06-11-1981 | JP | 1564873 C | 25-06-1990 |
| | | | JP | 62003803 B | 27-01-1987 |
| FR 2575637 | A | 11-07-1986 | FR | 2575637 A1 | 11-07-1986 |
| | | | BE | 904011 A1 | 09-07-1986 |
| | | | CH | 668190 A5 | 15-12-1988 |
| | | | DE | 3545807 A1 | 10-07-1986 |
| | | | ES | 550574 D0 | 01-12-1987 |
| | | | ES | 8800821 A1 | 16-02-1988 |
| | | | IT | 1182110 B | 30-09-1987 |
| | | | LU | 86215 A1 | 14-04-1986 |
| | | | NL | 8503450 A | 01-08-1986 |
| EP 0230133 | A | 29-07-1987 | AT | 64271 T | 15-06-1991 |
| | | | AU | 599067 B2 | 12-07-1990 |
| | | | AU | 6672786 A | 25-06-1987 |
| | | | BR | 8606285 A | 06-10-1987 |
| | | | CA | 1317543 A1 | 11-05-1993 |
| | | | DE | 3679800 D1 | 18-07-1991 |
| | | | DK | 615286 A | 20-06-1987 |
| | | | EP | 0230133 A1 | 29-07-1987 |
| | | | GR | 862857 A1 | 07-04-1987 |
| | | | IE | 59447 B | 23-02-1994 |
| | | | JP | 62155854 A | 10-07-1987 |
| | | | MX | 166802 B | 08-02-1993 |
| | | | NZ | 218606 A | 28-11-1989 |
| | | | ZA | 8609521 A | 27-07-1988 |