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(71) Applicant(s)
The Board of Supervisors of Louisiana State University and Agricultural and Mechanical College

(72) Inventor(s)
Bazan, Nicolas G.;Paul, Dennis;Builla, Julio Alvarez;Sunkel, Carlos

(74) Agent / Attorney
Watermark Patent & Trademark Attorneys, Level 2 302 Burwood Road, Hawthorn, VIC, 3122

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(71) Applicant: LSU MEDICAL CENTER FOUNDATION [US/US]; 2000 Tulane Avenue, New Orleans, LA 70112 (US).

(72) Inventors: BAZAN, Nicolas, G.; 478 Broadway Street, New Orleans, LA 70118 (US). SUNKEL, Carlos; Calle Amara #47, E-28033 Madrid (ES). BUILLA, Julio, Alvarez; C. Condado de Treoino a, E-28033 Madrid (ES). PAUL, Dennis; 836 Louisiana Avenue, New Orleans, LA 70115 (US).

(74) Agent: EYMARD, Frank, C.; Adams and Reese LLP, 4500 One Shell Square, New Orleans, LA 70139 (US).

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(54) Title: SYNERGISTIC COMBINATIONS WITH ANALGESIC PROPERTIES COMPRISING N-ACYLATED 4-HYDROXYPHENYLAMINE DERIVATIVES

(57) Abstract: The present invention relates to pharmaceutical combinations of opioid and non-opioid analgesics in an intimate admixture with an analgesic from a series of N-acylated 4-hydroxyphenylamine derivatives, linked via an alkylene bridge to the nitrogen atom of a 1,2-benzisothiazol-3 (2H) -one 1, 1-dioxide group and methods for their use to alleviate pain in mammals. The analgesic combinations exhibit enhanced analgesic potency, do not suppress blood coagulation, and have little hepatotoxic effect.

SYNERGISTIC COMPOSITIONS WITH ANALGESIC PROPERTIES COMPRISING N-ACYLATED 4-HYDRO XYPHENYLAMINE DERIVATIVES

DESCRIPTION

TECHNICAL FIELD

The present invention relates to analgesic compositions for enhancing the efficacy and/or potency of certain opioid and non-opioid analgesics, that do not suppress blood coagulation, and have little hepatotoxic effect. More particularly, the present invention relates to analgesic compositions that include analgesics referred to as the SCP series (SCP-1 through SCP-5) in combination with opioid and non-opioid analgesics.

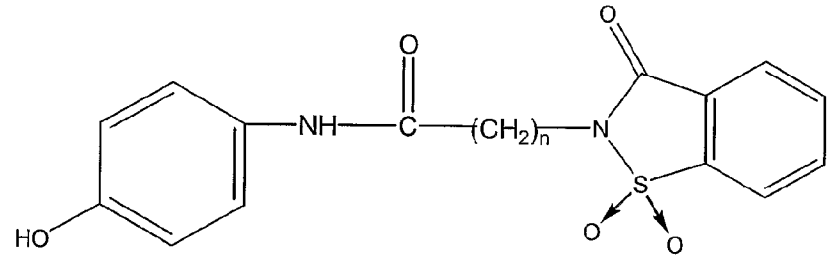
BACKGROUND ART

Drug combinations such as acetaminophen with codeine (Tylenol III) or acetaminophen with oxycodone (Lortab) produce analgesia that is additive or synergistic. The rational for using such combinations is to reduce the dose of each analgesic, and thus reduce adverse effects and toxicity, while retaining or increasing analgesic efficacy. These acetaminophen combinations have greater efficacy for moderate to severe pain.

For many types of pain (e.g., common headache, osteoarthritis) acetaminophen has equal potency and efficacy to acetylsalicylic acid (aspirin). However, the safety of acetaminophen has been questioned. There are approximately 100,000 cases of acetaminophen overdose annually, with approximately 30 deaths resulting. (Clissold, 1980; McGoldrick et al. 1997). Acetaminophen has a toxic metabolite, N-acetyl-benzoquinoneimine (NAPQI), which depletes hepatic and renal glutathione, a cytoprotective endogenous metabolite (Mason & Fischer, 1986; Mitchell et al., 1983). Hepatic and renal toxicity with acetaminophen can occur at doses only 4- to 8-fold higher than the maximum recommended analgesic dose (Neuberger et al., 1980). Pharmaceutical combinations that contain acetaminophen and a centrally acting analgesic may be even more

dangerous than acetaminophen alone. With repeated use these combinations require higher doses to produce the same analgesic effect because of an increase in tolerance. As the dose of the combination is increased to compensate for analgesic tolerance, the safety of the drug decreases as the higher doses of the acetaminophen component increase hepatic and renal toxicity.

In U.S. Patent No. 5,554,636 (Bazan et al.) and U.S. Patent No. 5,621,110 (Bazan et al.), two of the inventors herein disclosed the series of N-acylated 4-hydroxyphenylamine derivatives linked via an alkylene bridge to the nitrogen atom of a 1,2-benzisothiazol-3(2H)-one 1,1-dioxide group along with the process for their preparation and methods of their use for alleviating pain. The disclosures of these patents are incorporated herein by reference. The SCP series is structurally depicted by the following general formula:



wherein n is a number from 1 to 5. These new non-narcotic analgesics surprisingly possess high analgesic activity, do not suppress blood coagulation, and display little hepatotoxic effect. When the term "SCP series" is used herein, it is understood that any of the pharmaceutically suitable salts thereof are included by the term.

The analgesic profiles of the SCP series are at least as good as that of acetaminophen. As expected, both types of drugs show little or no activity in the tail-flick and hotplate tests when compared with codeine. SCP-1 is more potent in the abdominal stretch, formalin, and Freund's adjuvant-induced inflammation assays of analgesia than acetaminophen. SCP-1 is lower in toxicity, and, of even greater importance, lower in

hepatotoxicity (Paul et al., 1998). All of these properties make SCP-1 and related derivatives potentially very useful pharmacologic agents.

DISCLOSURE OF THE INVENTION

It is an object of the invention to provide pharmaceutical combinations comprising an analgesic from the SCP series along with an opioid or a non-opioid analgesic that has an analgesic profile at least as good as acetaminophen/opioid analgesic or acetaminophen/non-opioid analgesic combinations.

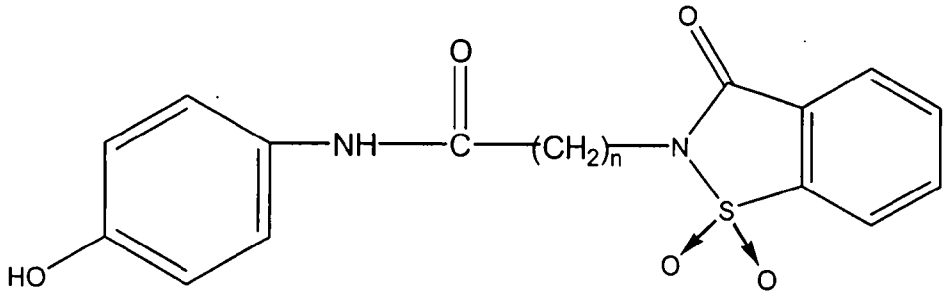
It is another object of the invention to provide pharmaceutical combinations comprising an analgesic from the SCP series along with an opioid or non-opioid analgesic that has lower hepatotoxicity than acetaminophen/opioid analgesic or acetaminophen/non-opioid analgesic combinations.

It is still another object of the invention to provide pharmaceutical combinations comprising an analgesic from the SCP series along with an opioid or non-opioid analgesic that does not suppress blood coagulation, and therefore can be used as a pre-emptive analgesic for procedures expected to produce post-surgical pain.

In a first aspect of the invention there is provided an analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:

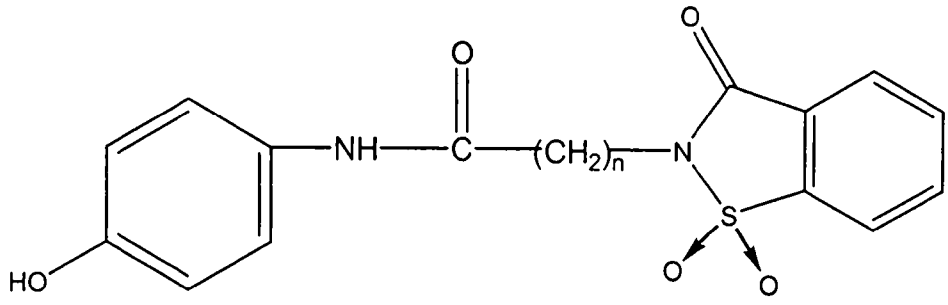
(a) an opioid analgesic;

(b) a non-narcotic analgesic of the general formula,



wherein n is a number from 1 to 5; and
(c) a pharmaceutically acceptable carrier.

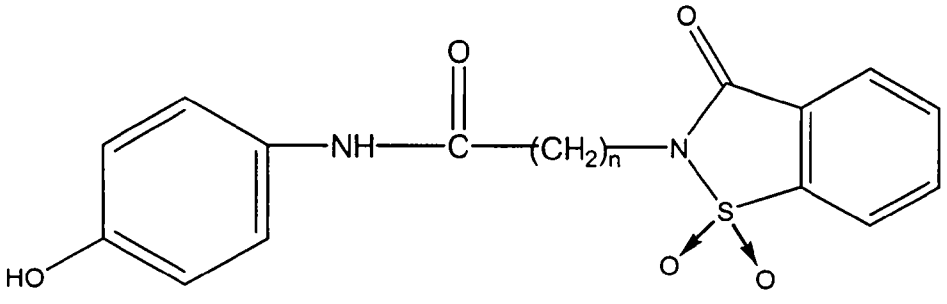
In a second aspect of the invention there is provided an analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:
(a) a non-opioid analgesic;
(b) a non-narcotic analgesic of the general formula,



wherein n is a number from 1 to 5; and
(c) a pharmaceutically acceptable carrier.

In a third aspect of the invention there is provided the use of an analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:

a) an opioid analgesic:
b) a non-narcotic analgesic of the general formula,

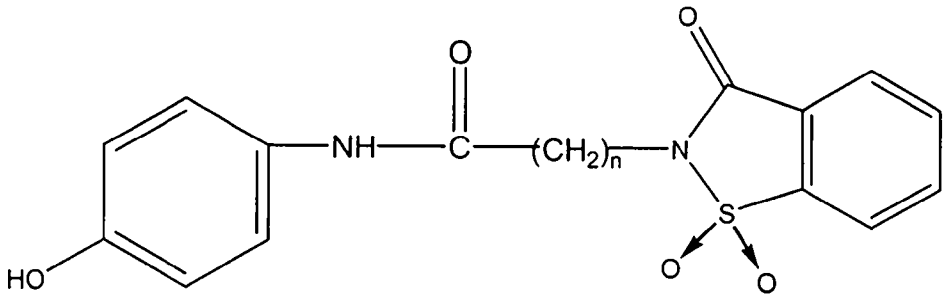


; and
c) a pharmaceutically acceptable carrier, for the manufacture of

a medicament for alleviating pain.

In a fourth aspect of the invention there is provided the use of an analgesic composition comprising synergistic, safe and pharmaceutically effective amounts of:

(a) a non-opioid analgesic;
(b) a non-narcotic analgesic of the general formula,



wherein n is a number from 1 to 5; and
(c) a pharmaceutically acceptable carrier, for the manufacture of a medicament for alleviating pain.

In a further aspect of the invention there is provided a method of alleviating pain in a mammal which method comprises administering to said mammal affected with pain an effective amount of the composition of the first or second aspects of the invention or the medicament of the third or fourth aspects of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the analgesic effect of SCP-1 compared to codeine and acetaminophen.

Figure 2 shows an isobologram for acetaminophen and codeine compared to an isobologram for SCP-1 and codeine.

Figure 3 shows the hepatotoxicity of SCP-1 alone and in combination with codeine compared to acetaminophen alone and in combination with codeine in C57/bl6 mice.

BEST MODE FOR CARRYING OUT THE INVENTION

The most commonly employed method of managing pain involves the systemic administration of analgesics. Analgesics by

definition include drugs that through their action on the nervous system reduce or abolish the perception of pain without producing unconsciousness. Traditionally, analgesics fall into two broad categories: (1) simple, non-narcotic analgesics, such as aspirin, which appear to work by inhibition of prostaglandin synthetase, and (2) narcotic analgesics, which appear to work through interaction with the endorphin/enkephalin receptor system of the central nervous system. The term "narcotic" has historically been associated with the strong opioid analgesics, but the term is not very useful in a pharmacological context. More appropriately, the category referred to as narcotic analgesics, can be further divided into two groups, the opioids and non-opioids. The term "opioids" refers to drugs with morphine like activity (agonists and antagonists), acting on mu, delta and kappa receptors. The term "non-opioids" refers to drugs that act via a different mechanism.

The drugs that comprise the group known as the opioid analgesics include among others the phenanthrene alkaloids of opium, comprising morphine, codeine, and thebaine. While thebaine produces no analgesia, it is an important intermediate in the production of semisynthetic opioids. Other agents with structures and function related to morphine include: (1) the morphine analogs, such as hydromorphone, oxymorphone, hydrocodone, and oxycodone; (2) Diels-Alder adducts, such as etorphine and buprenorphine; (3) the morphinan derivatives, such as dextromethorphan and butorphanol; (4) the benzomorphan derivatives, such as phenazocine, pentazocine and cyclazocine; (5) the piperidine derivatives, such as meperidine and anileridine; and (6) open chain analgesics (methadone type compounds), such as methadone and propoxyphene. The drugs that comprise the group known as the non-opioid analgesics include: (1) N-methyl-D-aspartate (NMDA) receptor antagonists, such as dextromethorphan and ketamine and other antagonists that suppress central sensitization by competing for any of the binding site

subcategories associated with the NMDA receptor, e.g., the glycine binding site, the phenylcyclidine (PCP) binding site, etc., as well as the NMDA channel; (2) alpha$_2$ adrenoreceptor agonists, such as clonidine, metomidine, detomidine, dexmetomidine, dexmedetomidine and xylazine, that reduce the release of norepinephrine; (3) other agents, such as tramadol, often mistakenly referred to as an opioid, that produce analgesia by their inhibitory actions on monoamine re-uptake rather than by agonist effect; (4) non-steroidal anti-inflammatory drugs such as aspirin, ibuprofen and other drugs that inhibit cyclooxygenase enzymes and (5) mixed agonist-antagonist analgesics such as buprenorphine, dezocine, nalbuphine.

Opioid and non-opioid analgesics may cause a variety of side effects including sedation, constipation, hypotension, nausea, vomiting, elevation of cerebrospinal fluid pressure, respiratory depression, physical dependence and tolerance. Therefore, there is a serious need to develop combinations of drugs that supplement the activity of the opioid and non-opioid analgesics, which allows the use of smaller doses of the opioid and non-opioid analgesics. One way of achieving this result is to enhance the analgesic activity of a known opioid or non-opioid analgesic by the addition of a second non-narcotic analgesic. However, it is difficult to predict when a synergistic effect will be obtained from two pharmaceutical compositions that take effect through different mechanisms.

The SCP series are non-narcotic analgesics that have little hepatotoxic effect. The compounds in this series do not produce the metabolite that is responsible for acetaminophen toxicity. As a result, they are more useful than acetaminophen and other non-narcotic analgesics in the treatment of chronic pain. Moreover, unlike conventional non-narcotic analgesics, such as aspirin or ibuprofen, the SCP series does not suppress blood coagulation. Children, the elderly and liver-compromised patients would also benefit from the administration of SCP for

the treatment of pain. Pharmaceutical combinations utilizing the SCP series with opioid and non-opioid analgesics has been found to provide enhanced analgesia, without suppressing blood coagulation, and without the toxicity associated with conventional non-narcotic analgesics.

The pharmaceutical combinations of the present invention comprise an opioid or a non-opioid analgesic in an intimate admixture with an analgesic from the SCP series along with a pharmaceutically acceptable carrier prepared according to conventional pharmaceutical techniques. Pharmaceutically acceptable carriers include solid or liquid fillers, diluents, and encapsulating substances. The amount of the carrier employed in conjunction with the combination is sufficient to provide a practical quantity of material per unit dose of analgesic.

Pharmaceutically acceptable carriers for oral administration include, sugars, starches, cellulose and its derivatives, malt, gelatin, talc, calcium sulfate, vegetable oils, synthetic oils, polyols, alginic acid, phosphate buffer solutions, emulsifiers, isotonic saline, and pyrogen-free water. Pharmaceutically acceptable carriers for parenteral administration include isotonic saline, propylene glycol, ethyl oleate, pyrrolidone, aqueous ethanol, sesame oil, corn oil, and combinations thereof.

Various oral dosages forms can be employed, including solid forms such as tablets, capsules, granules and bulk powders. Tablets can be compressed, tablet triturates, enteric-coated, sugar-coated, film-coated or multiple compressed, containing suitable binders, lubricants, diluents, disintegrating agents, coloring agents, flavoring agents, flow-inducing agents, and melting agents. Liquid oral dosage forms include aqueous solutions, emulsions, suspensions, and reconstituted solutions and/or suspensions.

Pharmaceutically effective combinations can contain between 0.1 and 1000 mg of an analgesic from the SCP series. The preferred pharmaceutically effective combinations contain between

400 and 1000 mg of an analgesic from the SCP series. The pharmaceutically effective amounts of the opioid and non-opioid analgesics in combination with analgesics in the SCP series are similar to the corresponding combinations of opioid and non-opioid analgesics with acetaminophen.

Comprises/comprising and grammatical variations thereof when used in this specification are to be taken to specify the presence of stated features, integers, steps or components or groups thereof, but do not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

EXAMPLES

The following examples are illustrative of pharmaceutically effective combinations of the present invention:

Example 1: Codeine

Dosage of SCP (mg):	100 - 1000
Dosage of Codeine (mg):	0.1 - 100
Preferred Ratios for Oral Dosage (mg codeine : mg SCP):	15 : 450
	30 : 450
	60 : 450
Preferred Weight Ratios for Injectable Delivery (codeine : SCP):	1 : 10
	1 : 5

Example 2: Morphine

Dosage of SCP (mg):	100 - 1000
Dosage of Morphine (mg):	0.1 - 100
Preferred Ratios for Oral Dosage (mg morphine : mg SCP):	15 : 450

	30 : 450
	60 : 450
Preferred Weight Ratios for Injectable Delivery (morphine : SCP):	1 : 60
	1 : 30

Example 3: Hydrocodone

Dosage of SCP (mg):	100 - 1000
Dosage of Hydrocodone (mg):	0.1 - 100
Preferred Ratios for Oral Dosage	

(mg hydrocodone : mg SCP):	2.5 : 450
	5 : 450
	7.5 : 450
	10 : 450
Preferred Weight Ratios for Injectable Delivery (hydrocodone : SCP):	1 : 200
	1 : 100

Example 4: Dihydrocodone

Dosage of SCP (mg):	100 - 1000
Dosage of Dihydrocodone (mg):	0.1 - 100
Preferred Ratios for Oral Dosage (mg dihydrocodone : mg SCP):	10 : 450
	36 : 450
Preferred Weight Ratios for Injectable Delivery (dihydrocodone : SCP):	1 : 100
	1 : 50

Example 5: Oxycodone

Dosage of SCP (mg):	100 - 1000
Dosage of Oxycodone (mg):	0.1 - 100
Preferred Ratios for Oral Dosage (mg oxycodone : mg SCP):	5 : 450
Preferred Weight Ratio for Injectable Delivery (oxycodone : SCP):	1 : 200

Example 6: Controlled Release Oxycodone

Dosage of SCP (mg):	100 - 1000
Dosage of Oxycodone (mg):	0.1 - 100
Preferred Weight Ratios for Oral Dosage (mg oxycodone : mg SCP):	10 : 900
	20 : 900
	40 : 900
	60 : 900

Example 7: Meperidine

Dosage of SCP (mg):	100 - 1000
Dosage of Meperidine (mg):	0.1 - 500
Preferred Ratios for Oral Dosage (mg merperidine : mg SCP):	25 : 450
	50 : 450
Preferred Weight Ratios for Injectable Delivery (merperidine : SCP):	1 : 20
	1 : 10

Example 8: Propoxyphene

Dosage of SCP (mg):	100 - 1000
Dosage of Propoxyphene (mg):	0.1 - 500
Preferred Ratios for Oral Dosage (mg propoxyphene : mg SCP):	65 : 450
	100 : 450
Preferred Weight Ratio for Injectable Delivery (propoxyphene : SCP):	1 : 10

Example 9: Levorphanol

Dosage of SCP (mg):	100 - 1000
Dosage of Levorphanol (mg):	0.1 - 100
Preferred Ratios for Oral Dosage (mg levorphanol : mg SCP):	4 : 450
Preferred Weight Ratio for Injectable Delivery (levorphanol : SCP):	1 : 100

Example 10: Oxymorphone

Dosage of SCP (mg):	100 - 1000
Dosage of Oxymorphone (mg):	0.1 - 200
Preferred Ratios for Oral Dosage (mg oxymorphone : mg SCP):	5 : 450
Preferred Weight Ratio for Injectable Delivery (oxymcrphone : SCP):	1 : 100

Example 11: Hydromorphone

Dosage of SCP (mg):	100 - 1000
Dosage of Hydromorphone (mg):	0.1 - 100
Preferred Ratios for Oral Dosage (mg hydromorphone : mg SCP):	1 : 450
	3 : 450
	5 : 450
	8 : 450
Preferred Weight Ratios for Injectable Delivery (hydromorphone : SCP):	1 : 450
	1 : 150
	1 : 100
	1 : 50

Example 12: Fentanyl

Dosage of SCP (mg):	100 - 1000
Dosage of Fentanyl (mcg):	0.1 - 500
Preferred Ratios for Oral Dosage (mcg fentanyl : mg SCP):	10 : 450
	50 : 450
Preferred Weight Ratio for Injectable Delivery (fentanyl : SCP):	1 : 1000

Example 13: Alfentanyl

Dosage of SCP (mg):	100 - 1000
Dosage of Alfentanyl (mcg):	0.01 - 50
Preferred Ratios for Oral Dosage (mcg alfentanyl : mg SCP):	1 : 450
	5 : 450
Preferred Weight Ratio for Injectable Delivery (alfentanyl : SCP):	1 : 10000

Example 14: Sufentanyl

Dosage of SCP (mg):	100 - 1000

Dosage of Sufentanyl (mcg):	0.1 - 500
Preferred Ratios for Oral Dosage (mcg sufentanyl : mg SCP):	10 : 450 50 : 450
Preferred Weight Ratio for Injectable Delivery (sufentanyl : SCP):	1 : 10000

Example 15: Remifentanyl

Dosage of SCP (mg):	100 - 1000
Dosage of Remifentanyl (mcg):	0.1 - 500
Preferred Ratios for Oral Dosage (mcg remifentanyl : mg SCP):	1 : 450 5 : 450
Preferred Weight Ratio for Injectable Delivery (remifentanyl : SCP):	1 : 100000

Example 16: Levomethadyl

Dosage of SCP (mg):	100 - 1000
Dosage of Levomethadyl (mg):	0.1 - 200
Preferred Ratios for Oral Dosage (mg levomethadyl : mg SCP):	10 : 450 140 : 450
Preferred Weight Ratios for Injectable Delivery (levomethadyl : SCP):	1 : 10 1 : 4

Example 17: Methadone

Dosage of SCP (mg):	100 - 1000
Dosage of Methadone (mg):	0.1 - 200
Preferred Ratios for Oral Dosage (mg methadone : mg SCP):	5 : 450 10 : 450 40 : 450

Preferred Weight Ratios for Injectable Delivery (methadone : SCP):	1 : 100
	1 : 50
	1 : 10

Example 18: Buprenorphine

Dosage of SCP (mg):	100 - 1000
Dosage of Buprenorphine (mg):	0.01 - 100
Preferred Ratios for Oral Dosage (mg buprenorphine : mg SCP):	1 : 450
Preferred Weight Ratio for Injectable Delivery (buprenorphine : SCP):	1 : 100

Example 19: Butorphanol

Dosage of SCP (mg):	100 - 1000
Dosage of Butorphanol (mg):	0.1 - 200
Preferred Ratios for Oral Dosage (mg butorphanol : mg SCP):	20 : 450
Preferred Weight Ratio for Injectable Delivery (butorphanol : SCP):	1 : 20

Example 20: Dezocine

Dosage of SCP (mg):	100 - 1000
Dosage of Dezocine (mg):	0.1 - 200
Preferred Ratios for Oral Dosage (mg dezocine : mg SCP):	15 : 450
	30 : 450
	60 : 450
Preferred Weight Ratios for Injectable Delivery (dezocine : SCP):	1 : 60
	1 : 30

Example 21: Nalbuphine

Dosage of SCP (mg):	100 - 1000

Dosage of Nalbuphine (mg):	0.1 - 200
Preferred Ratios for Oral Dosage (mg nalbuphine : mg SCP):	50 : 450
Preferred Weight Ratio for Injectable Delivery (nalbuphine : SCP):	1 : 60

Example 22: Pentazocine

Dosage of SCP (mg):	100 - 1000
Dosage of Pentazocine (mg):	0.1 - 500
Preferred Ratios for Oral Dosage (mg pentazocine : mg SCP):	25 : 450
	50 : 450
Preferred Weight Ratios for Injectable Delivery (pentazocine : SCP):	1 : 20
	1 : 10

Example 23: Tramadol

Dosage of SCP (mg):	100 - 1000
Dosage of Tramadol (mg):	0.1 - 500
Preferred Ratios for Oral Dosage (mg tramadol : mg SCP):	50 : 450
Preferred Weight Ratio for Injectable Delivery (tramadol : SCP):	1 : 10

Example 24: Clonidine

Dosage of SCP (mg):	100 - 1000
Dosage of Clonidine (mg):	0.01 - 100
Preferred Ratios for Oral Dosage (mg clonidine : mg SCP):	1 : 450
Preferred Weight Ratio for Injectable Delivery (clonidine : SCP):	1 : 450

Example 25: Aspirin

Dosage of SCP (mg):	100 - 1000

Dosage of Aspirin (mg):	0.1 - 1000
Preferred Ratios for Oral Dosage (mg aspirin : mg SCP):	250 : 450
Preferred Weight Ratio for Injectable Delivery (aspirin : SCP):	1 : 2

As shown in Figure 1, the analgesic potency of SCP-1 is greater than that of acetaminophen in the abdominal stretch assay. In this assay of pain, the number of stretches exhibited by a mouse after an intraperitoneal (i.p.) injection of dilute acetic acid (Koster et al., 1959) are counted. The analgesic compounds (acetaminophen, SCP-1, or codeine) were administered orally and fifty-five minutes later, the mice (groups of 8 or more) received an i.p. injection of 10 ml/kg of 0.4% acetic acid. The number of abdominal stretches was counted beginning 5 minutes after the acetic acid injection for a period of 10 minutes. For each of the compounds tested, the percentage of the number of stretches obtained in control animals (29 $\pm$ 2.1) was calculated. All three compounds produced a dose-dependent decrease in the number of abdominal stretches, however, the potency of SCP-1 was significantly greater than acetaminophen.

As shown in Figure 2, an isobolographic analysis was performed to demonstrate the synergistic effect of an SCP-1/narcotic analgesic pharmaceutical combination. The isobologram is a quantitative method for measuring interactions between drugs where dose-effect relationships are depicted in a multi-dimensional array with lines connecting dose pairs that are equieffective in relationship to a common pharmacological endpoint. Most importantly, the isobolographic analysis permits a full range of doses and dose combinations to be examined where the proportion of the first drug to the second actually varies from 0 to infinity, and to determine, by virtue of the graphical display, whether any one or more of the paired drug combinations displays unique pharmacological properties in comparison to the

entire body of generated data.

Groups of mice (n = 10) were administered a dose of acetaminophen, SCP-1, or codeine to define a dose-response curve for each drug in the abdominal stretch assay. The ED_{50} for each drug was calculated using nonlinear regression analysis. Subsequently, a combination of acetaminophen and codeine or a combination of SCP-1 and codeine was tested using the same assay. The ratios of acetaminophen to codeine or SCP-1 to codeine were equivalent to the ratios of the ED_{50}s of each drug alone. Dose-response curves for the drug combination ratios were produced and ED_{50}s calculated. The ED_{50}s were graphed according to the method of Tallarida et al., (1997). Briefly, the dose of one drug is depicted on the X-axis with a linear scale and a range of 0 to its ED_{50}. The dose of the other drug is likewise depicted on the Y-axis. A line is drawn diagonally from ED_{50} to ED_{50}. This line is known as the line of additivity, as any combination of *X* and *Y* doses that fall upon this line would be predicted to produce 50% analgesia. The experimental ED_{50} is plotted according to the dose of each individual drug and the standard error oriented on a line from the origin through the data point. Thus, when the ED_{50} of the drug combination is plotted, any point ($\pm$ standard error) closer to the origin than the line of additivity would be considered to be synergistic (producing more analgesia than expected based on simple additivity) and any point farther from the origin than the line of additivity would be considered to be antagonistic (producing less analgesia than expected based on simple additivity). The combination of acetaminophen and codeine produced analgesia synergistically (see Figure 2A). The combination of SCP-1 and codeine also produced analgesia synergistically (see Figure 2B).

A study was also devised to assess the toxicity of SCP-1 in combination with codeine in comparison to the toxicity of acetaminophen in combination with codeine, the results of which are depicted in Figure 3. The study was performed on C57/bl6

mice weighing 22-25 g. The mice were administered doses of acetaminophen, SCP-1, codeine, a combination of acetaminophen and codeine, or a combination of SCP-1 and codeine in a corn oil vehicle using an esophageal cannula. The administered doses of acetaminophen and SCP-1 were equivalent to the acetaminophen LD50 in mice (3.7 mmole/kg) and the administered dose of codeine was 50 mg/kg. After 24 hours, plasma activity levels of glutamic/pyruvic transaminase (GPT) and glutamic/oxalacetic transaminase (GOT) were obtained to assess hepatotoxic levels of drugs. As shown in Figure 3, acetaminophen produced a large increase in GPT activity in serum, but neither SCP-1 nor codeine, nor the combination of both, produced any significant increase in activities.

It is apparent from the instant specification that various modifications and changes may be made by those skilled in the art. It is therefore intended that the following claims be interpreted as covering all modifications and changes that fall within the true spirit and scope of the invention.

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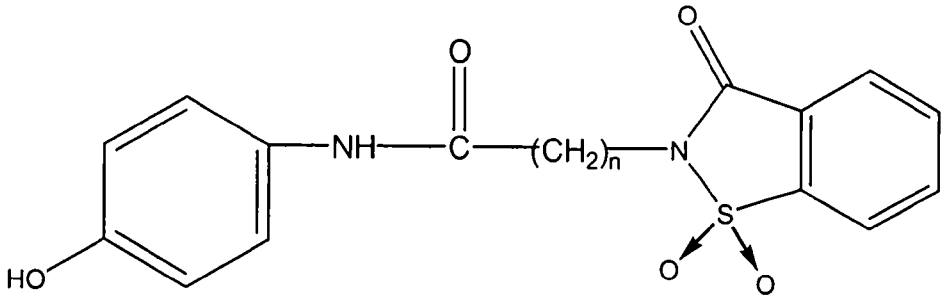
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:

(a) an opioid analgesic;

(b) a non-narcotic analgesic of the general formula,



wherein n is a number from 1 to 5; and

(c) a pharmaceutically acceptable carrier.

2. The composition according to claim 1, wherein the opioid analgesic is a phenanthrene alkaloid of opium.

3. The composition according to claim 1 or 2, wherein the opioid analgesic is selected from the group consisting of morphine and codeine.

4. The composition according to claim 1, wherein the opioid analgesic is a morphine analog.

5. The composition according to claim 1 or 4, wherein the opioid analgesic is selected from the group consisting of hydrocodone, oxycodone, hydromorphone, oxymorphone, metopon, apomorphine, normorphine, and N-(2-phenylethyl)-normorphine.

6. The composition according to claim 1 or 2, wherein the opioid analgesic is a synthetic derivative of thebaine.

7. The composition according to claim 1, wherein the opioid analgesic is selected from the group consisting of etorphine and buprenorphine.

8. The composition according to claim 1, wherein the opioid analgesic is a morphinan derivative.

9. The composition according to claim 1 or 8, wherein the opioid analgesic is selected from the group consisting of dextromethorphan, butorphanol, levorphanol, levallorphan, cyclorphan, and racemorphan.

10. The composition according to claim 1, wherein the opioid analgesic is a benzomorphan derivative.

11. The composition according to claim 1 or 10, wherein the opioid analgesic is selected from the group consisting of phenazocine, pentazocine, and cylcazocine.

12. The composition according to claim 1, wherein the opioid analgesic is a piperidine derivative.

13. The composition according to claim 1, wherein the opioid analgesic is selected from the group consisting of meperidine, anileridine, piminodine, ethoheptazine, alphaprodine, betaprodine, diphenoxylate, loperamide, fentanyl, sufentanyl, alfentanyl, and remifentanyl.

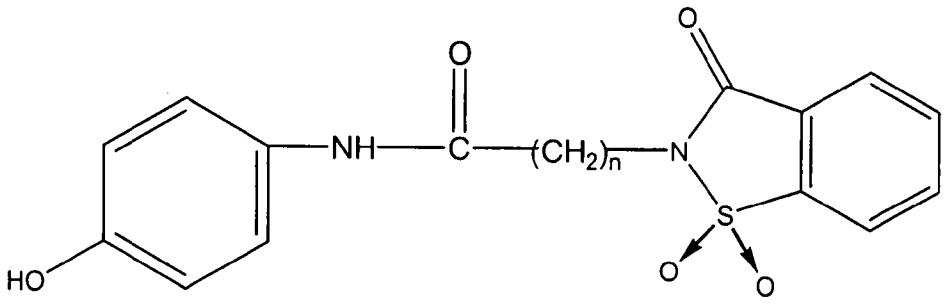
14. The composition according to claim 1, wherein the opioid analgesic is an open chain opioid analgesic.

15. The composition according to claim 1 or 14, wherein the opioid analgesic is selected from the group consisting of methadone, isomethadone, and propoxyphene.

16. An analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:

(a) a non-opioid analgesic;

(b) a non-narcotic analgesic of the general formula,



wherein n is a number from 1 to 5; and

(c) a pharmaceutically acceptable carrier.

17. The composition according to claim 16, wherein the non-opioid analgesic is an NMDA receptor antagonist.

18. The composition according to claim 16 or 17, wherein the non-opioid analgesic is selected from the group consisting of dextromethorphan and ketamine.

19. The composition according to claim 16, wherein the non-opioid analgesic is an alpha$_2$ adrenoreceptor agonist.

20. The composition according to claim 16 or 19, wherein the non-opioid analgesic is selected from the group consisting of clonidine, metomidine, detomidine, dexmetomidine, dexmedetomidine and xylazine.

21. The composition according to claim 16, wherein the non-opioid analgesic is a monoamine re-uptake inhibitor.

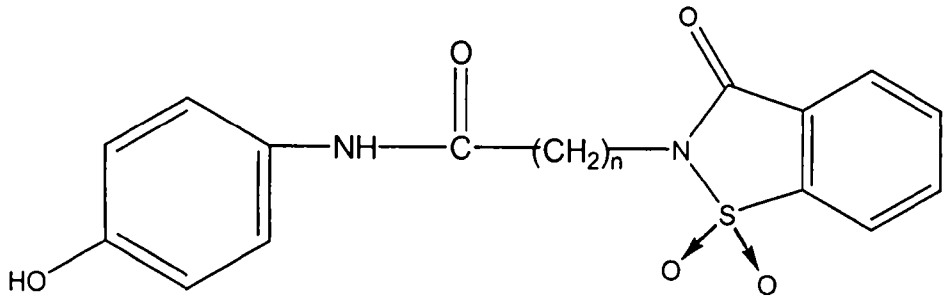
22. The composition according to claim 16 or 21, wherein the non-opioid analgesic is tramadol.

23. The composition according to claim 16, wherein the non-opioid analgesic is a mixed agonist-antagonist analgesic.

24. The composition according to claim 16 or 23, wherein the non-opioid analgesic is selected from the group consisting of buprenorphine, dezocine and nalbuphine.

25. The use of an analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:

a) an opioid analgesic:
b) a non-narcotic analgesic of the general formula,

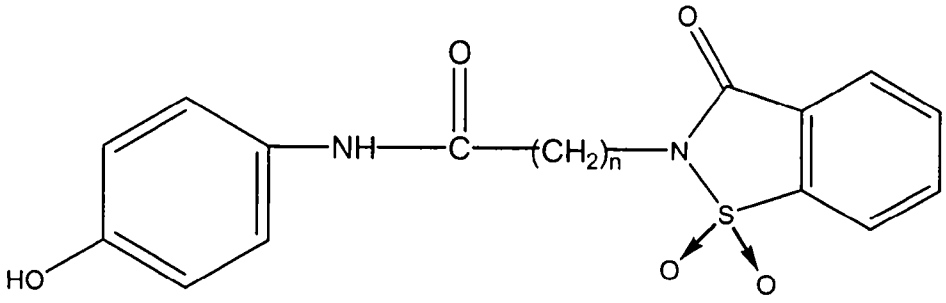


; and

c) a pharmaceutically acceptable carrier, for the manufacture of a medicament for alleviating pain.

26. The use of an analgesic composition comprising synergistic, safe and pharmaceutically effective amounts of:

(a) a non-opioid analgesic;
(b) a non-narcotic analgesic of the general formula,

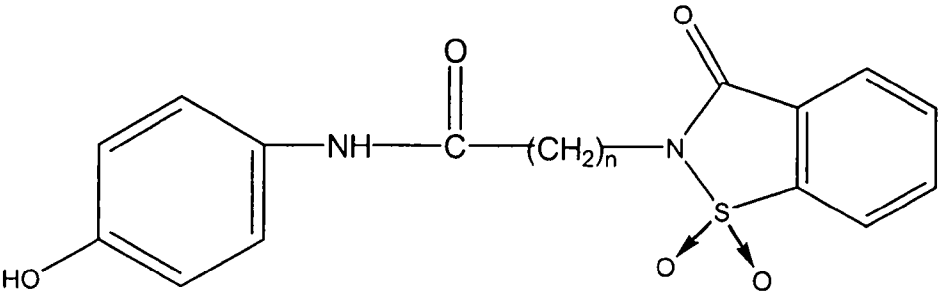


wherein n is a number from 1 to 5; and
(c) a pharmaceutically acceptable carrier, for the manufacture of a medicament for alleviating pain.

27. The use of an analgesic composition of any one of claims 2 to 24, for the manufacture of a medicament for alleviating pain.

28. A method of alleviating pain in a mammal which method comprises administering to said mammal affected with pain an effective amount of the composition of any one of claims 1 to 24 or the medicament of claims 25, 26 or 27.

29. An analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:
(a) an opioid analgesic;
(b) a non-narcotic analgesic of the general formula,

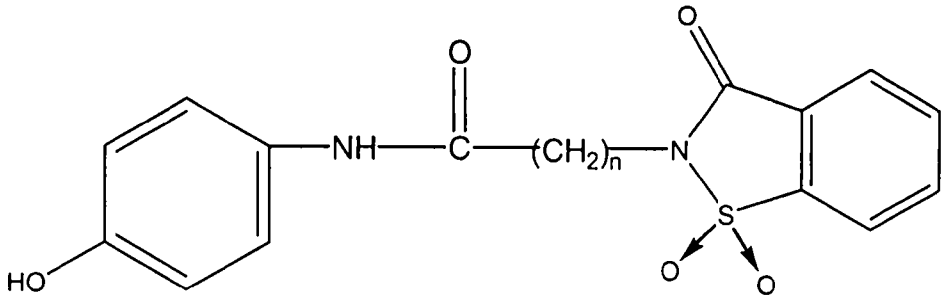


wherein n is a number from 1 to 5; and
(c) a pharmaceutically acceptable carrier,
substantially as hereinbefore described with reference to Examples 1 to 17.

30. An analgesic composition comprising synergistic, safe, and pharmaceutically effective amounts of:

(a) a non-opioid analgesic;

(b) a non-narcotic analgesic of the general formula,



wherein n is a number from 1 to 5; and

(c) a pharmaceutically acceptable carrier,

substantially as hereinbefore described with reference to Examples 18 to 25.

31. The use of an analgesic composition of claim 29 or 30, for the manufacture of a medicament for alleviating pain.

32. A method of alleviating pain in a mammal which method comprises administering to said mammal affected with pain an effective amount of the composition of claim 29 or 30, or the medicament of claim 26, 27, 28 or 31.

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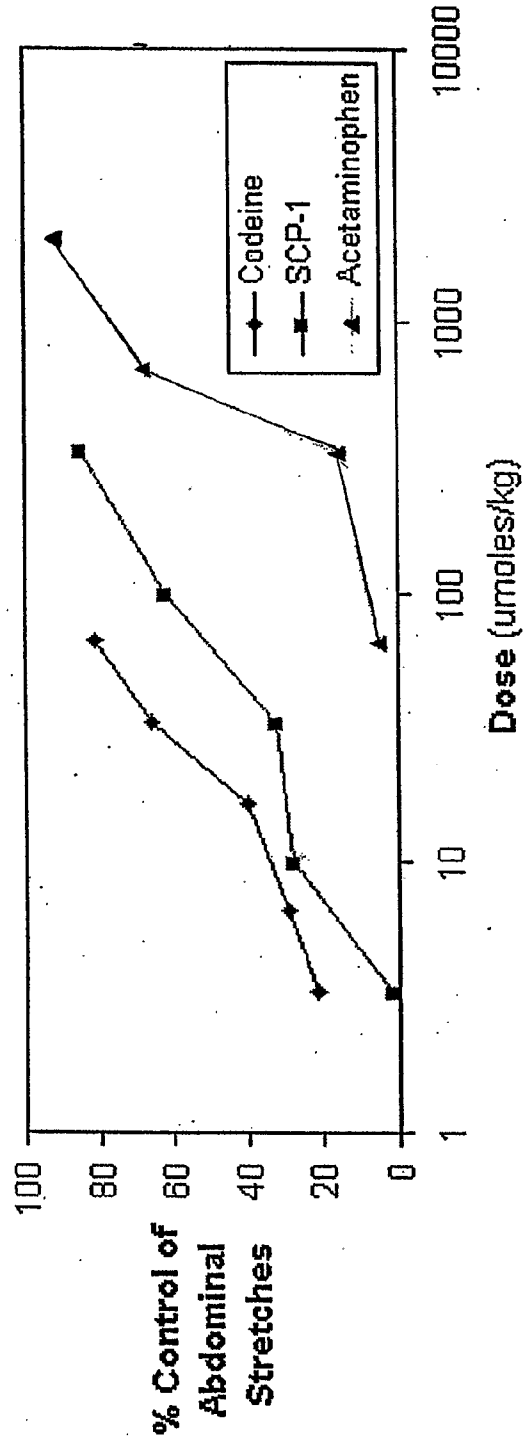
% Control of Abdominal Stretches
100
80
60
40
20
0
1
10
100
1000
10000
Dose (umoles/kg)
Codeine
SCP-1
Acetaminophen

Figure 1

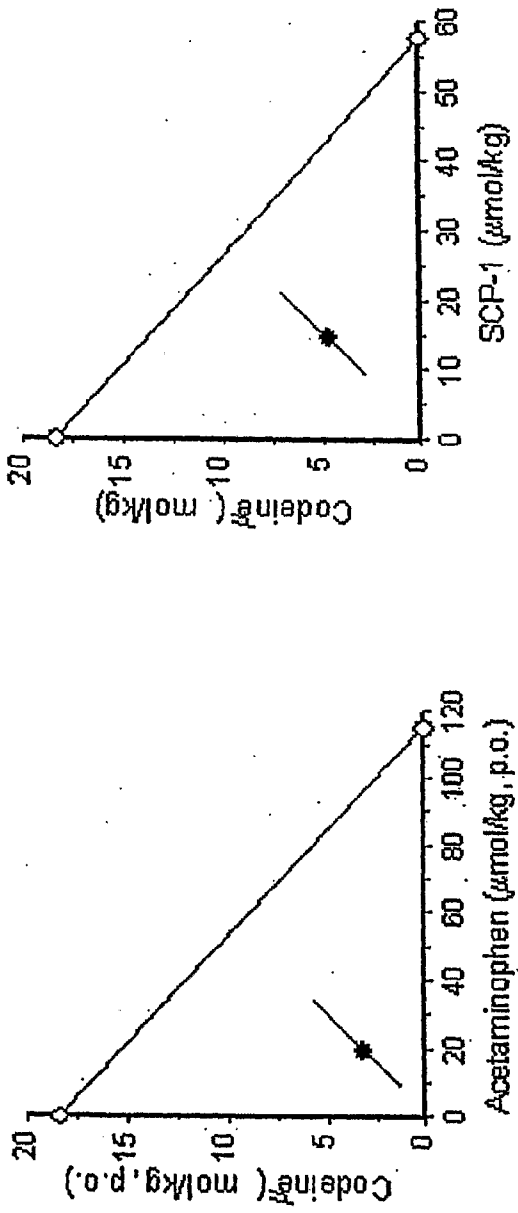
Codeine (μmol/kg, p.o.)
0
5
10
15
20
0
20
40
60
80
100
120
Acetaminophen (μmol/kg, p.o.)
A
Codeine (μmol/kg)
0
5
10
15
20
0
10
20
30
40
50
60
SCP-1 (μmol/kg)
B

Figure 2

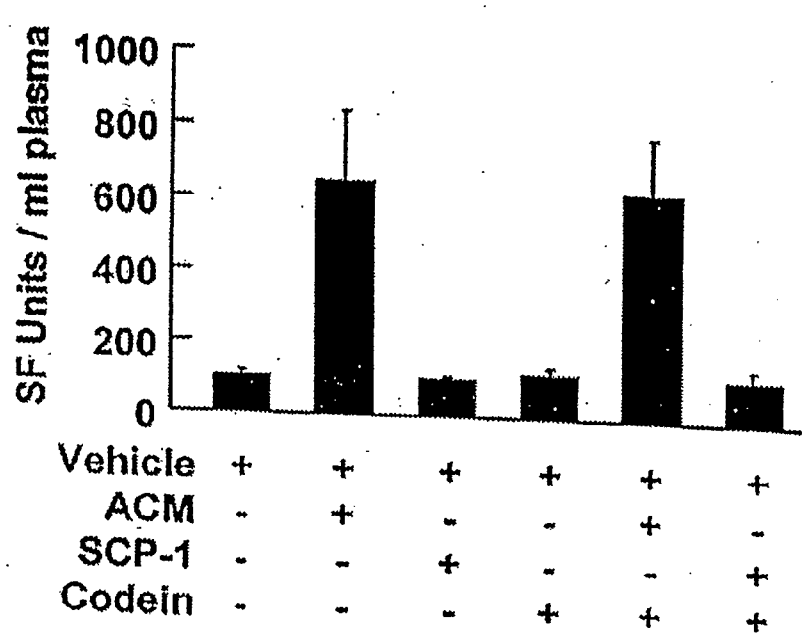
SF Units / ml plasma
1000
800
600
400
200
0
Vehicle + + + + + +
ACM - + - - + -
SCP-1 - - + - - +
Codein - - - + + +

Figure 3