

**DRY FORMULATIONS OF PESTICIDES
FOR CONTROLLING ECTOPARASITES ON ANIMALS**

This invention relates to a method for protecting an animal from infestation by fleas and other ectoparasites. Dry formulations of organophosphate insecticides control fleas on animals when applied to a small, limited area of the animal's coat in a high concentration, low volume, single application. These formulations have unexpected properties which makes their use advantageous in comparison to liquid insecticide formulations which are presently used for the control of fleas on animals.

Background of the Invention

Methods for protecting animals from infestation by fleas and other ectoparasites typically involve the application of large volumes of pesticide compositions which contain low concentrations of the insecticide. These methods include spraying the composition onto the coat or fur of the animal, dipping the animal in a bath containing the pesticide formulation, or dusting the animal with a powder containing the insecticide. Application of these liquid or powdered insecticide compositions is inconvenient, cumbersome and messy. Domestic pets are often traumatized by having their entire bodies sprayed, dipped or dusted. Significant amounts of the insecticide never get on the animal, and much of what is applied often falls off shortly after the treatment is applied, which greatly reduces the effectiveness of the treatment and can adversely affect

the environment. The use of dipping solutions can be upsetting to domestic animals, particularly to cats, who often have a natural aversion to water. Dip solutions are expensive, particularly when only one or a few animals are treated, and the solutions must be properly disposed of following their use to avoid contaminating the environment. Most importantly, all of these applications of pesticide compositions must be repeated frequently, since they are only effective for periods of one to two weeks.

Because cats tend to groom themselves by licking their bodies and fur, they are particularly susceptible to adverse reactions resulting from the ingestion of insecticides applied to their bodies to prevent insect infestation. For example, cats may foam at the mouth or salivate excessively following the application of certain insecticides. In more severe cases the treated animals may vomit. These adverse reactions can be due to the toxicity of the insecticides which are used for treatment. They also can occur under circumstances where the insecticide preparation poses no problems due to its toxicity, but the animal reacts to the bad taste or smell of the insecticide in an adverse way.

Insecticide impregnated collars have been used to prevent infestation of domestic animals with fleas. Many domestic animals, particularly cats, object to wearing collars around their necks, and many pet owners do not like to expose the animal or themselves to the insecticides in the collar. In addition, flea collars are generally less effective in preventing flea infestation than the methods discussed previously. The owners of domestic animals often use the collars to supplement other methods involving direct application of the insecticide to the animal's body.

Many of the pesticides commonly used in agricultural and veterinary applications, including the organophosphate compounds are known to be effective for the control of ectoparasites such as fleas. However, these compounds often produce undesirable responses in domestic animals when applied in concentrations and in dosage forms needed to effectively control infestation by fleas. It is well known to those who formulate pesticide compositions that their biological performance in specific applications is frequently affected by the particular formulation that is used. Formulations which make pesticides available in solution are commonly more biologically active than dry pesticide formulations. However, these liquid formulations are more toxic to those who come in contact with them, particularly the animal being treated and the person applying the pesticide to the animal, since they are more readily absorbed through the skin.

Applications of certain formulations of pesticides can cause adverse reactions in domestic animals. For example, domestic cats may respond to the application of organophosphate insecticides by salivating excessively and even vomiting. Adverse reactions also can occur even where the animal does not receive a toxic dose of the insecticide, but merely reacts to the unpleasant taste or smell of the insecticide formulation used. Even though the insecticide formulation poses no health risk to the animal, these responses can be extremely upsetting for the animal's owner, particularly since owners often do not realize that the animal is merely reacting to the unpleasant taste or smell of the preparation.

Thus, there continues to be a need for effective compositions for controlling fleas on animals, particularly domestic cats. Accordingly, it is an object of this invention to develop formulations of organophosphate compositions which are effective for substantial periods of time and are safe, simple and convenient to use and do not cause adverse reactions in the animals to which the formulations are applied.

Summary of the Invention

The present invention relates to a method for reducing adverse reactions to an insecticide by an animal in need of administration of insecticide for treating an infestation of parasites. It unexpectedly has been found that applying a dry formulation of an organophosphate insecticide provides an effective and convenient treatment for protecting an animal against infestation by fleas and other ectoparasites, while reducing adverse reactions by the animal to the insecticide. These dry formulations include insecticide-containing microcapsules, which can be applied to one or more limited areas of an animal's body or hair coat. The formulations are effective in inhibiting infestation by ectoparasites for periods of up to two weeks as a result of the controlled release of the insecticide, and they do not cause severe adverse reactions in the treated animals.

Detailed Description of the Invention

The invention of the present application relates to high concentration, low volume, substantially dry formulations of insecticides which are effective for the control of fleas and other ectoparasites on animals. Ectoparasites are parasites which live on the

exterior parts of an animal's body as distinguished from endoparasites which live inside the host animal's body. Common ectoparasites include fleas, ticks, lice, mites and flies.

5 The present invention further relates to methods by which these formulations are applied to the animal being treated. Application of the dry formulations of the invention provides effective protection against infestation by ectoparasites while minimizing the
10 number and severity of adverse reactions that can occur following treatment with topical formulations of insecticides.

 Adverse reactions include reactions which can produce prolonged or lasting toxic effects due to the
15 animal's exposure to a treatment with an insecticide. Such adverse effects include dermal irritation or other exhibited signs of toxicity, such as heavy salivation or vomiting, which can last for hours or even days after the treatment is applied. In the most severe
20 cases, such adverse reactions can result in the animal's death.

 In addition, adverse reactions include reactions which can occur even when the animal does not receive a toxic dose of the insecticide, but nonetheless reacts
25 to being exposed to the treatment. These adverse reactions include excessive salivation and even vomiting, which occur in response to the taste or smell of the insecticide where the preparation is offensive to the animal. Such adverse reactions are particularly
30 a problem when treating cats because of their natural grooming behavior. Topically applied substances are almost certain to be licked and ingested shortly after they are applied to the animal. When the substance is distasteful or unpleasant, the animal will often

salivate immediately and, in more severe cases, it may vomit. Because such reactions generally alarm pet owners and lead to their not repeating treatments for controlling ectoparasites, these reactions also are considered to be adverse reactions, even though they do not result from toxic effects of the insecticides present in the formulations.

While not wishing to be bound by any particular theory as to why the methods of the present invention prevent or reduce adverse reactions, it does appear that the particular formulations, together with the particular methods of the present invention for applying the formulations, reduce the likelihood that the treated animal will groom following the application of insecticide. This effect is most likely due to the treatment being a substantially dry formulation rather than a wet formulation.

Pesticides which are useful for the dry formulations of the present invention include compounds of the group known as organophosphates. This group of compounds is known in the art to possess useful pesticidal properties, particularly in the control of fleas on animals. Suitable organophosphate pesticides can include phosphate, phosphothioate or phosphothionate compounds. Preferred pesticides suitable for use in the formulations include the organophosphate compound known as pirimiphos-methyl O-(2-diethylamino-6-methylpyrimidin-4-yl)O,O-dimethyl phosphorothioate). Specific examples of organophosphate compounds that can be used in the formulation are listed in Table I.

TABLE I

5	
	Chloryriphos
	Pirimiphos-methyl
	Diazinon
	Tetrachlorovinphos

10 In the present application the term "dry
formulation" is used to indicate that the insecticide
is prepared such that it contains no more than
insignificant or negligible amounts of water. One way
in which such a dry formulation can be prepared is to
micro-encapsulate the pesticide using organic
polyisocyanate intermediates to form a polyurea capsule
15 enclosure around the water-immiscible insecticide. The
amount of water in the final preparation will be
determined by the ability of the inert ingredients
surrounding the microcapsules to hold onto water under
the conditions in the drying apparatus used to dry the
20 final microencapsulated preparation. In most cases the
amount of water adsorbed onto the inert material is
very small such that the formulation is substantially
dry.

25 The microencapsulation of selected pesticides can
be accomplished by the interfacial polymerization of
monomer units present in emulsion droplets, which are
formed when the water-immiscible pesticide is
vigorously mixed with an aqueous solution containing
additional polymerizing monomers and heated as
30 discussed in Seaman et al., "Trends in the Formulation
of Pesticides - An Overview," Pesticide Science 29
(1990) pp. 437-449. The monomers react to form a
polymer skin which encapsulates the pesticide and
controls its release. Encapsulation can reduce the

oral toxicity of the pesticide as much as 100 times over that of non-microencapsulated water based treatments and reduces the dermal toxicity over 10 times that of non-microencapsulated water based treatments.

A preferred method of encapsulation of pesticides for use in the treatment of ectoparasite infestation in animals is that disclosed in U.S. Patent No. 4,285,720, the disclosure of which is incorporated herein by reference. The water-immiscible insecticide being encapsulated is dispersed in an aqueous solution which contains suitable surfactants and a protective colloid. Useful surfactants include nonionic, anionic or cationic surfactants having a hydrophile to lipophile balance (HLB) range of from about 12 to about 16. Examples of suitable surfactants are sodium isopropyl naphthalene sulfonate, polyoxyethylenesorbitol oleate laurate, ethoxylated nonylphenols, and polyethylene glycol ethers of linear alcohols. Preferred surfactants are polyethylene glycol ethers of linear alcohols such as the linear alcohol ethoxylate emulsifier Tergitol 15-S-20. Suitable protective colloids can be selected from a wide range of such materials, including polyacrylates, methyl celluloses, polyvinyl alcohol, polyacrylamide and polymethylvinyl ether/maleic anhydride. The protective colloid can be added to the microencapsulation system either prior to or after the organic dispersion is made.

The dry microencapsulated formulations of the invention contain from about 20 to 80% by weight of the active pesticide. One preferred embodiment is a dry microencapsulated formulation containing from about 55 to 75% pirimiphos-methyl.

Advantageously, the dry composition of the present application can be applied to a single, limited area on the animal to be treated. Alternatively, the treatment can be applied to two or more specific sites of limited area on the animal. Preferably, the composition is applied as a single spot to a limited area on the back of the animal between its shoulder blades at a location which the animal is unable to reach with his tongue, so that he is unable to lick or clean the pesticide composition from his coat. This is particularly important when the composition is used to treat cats, because cats will often salivate or become nauseous after they are exposed to substances they consider distasteful or unpleasant, either orally or by smell. Since the composition is applied topically, it is almost certain to be licked or ingested shortly after it is applied to cats because of their grooming behavior.

The quantity of the dry formulation to be applied to an animal is determined by the animal's size and by the concentration of pesticide in the formulation. Generally, the compositions can be applied at a dose within a range of about 0.1 gram (g) to about 1.0 g of active compound per kilogram (kg) of the animal's weight. Animals weighing between 5 and 10 pounds (about 2.2 to 4.5 kg) can be treated with a single application of from about 0.3 to about 4 g of the dry formulation, containing from 20 to 90% organophosphate. One preferred treatment comprises applying 0.3 g of a dry formulation containing about 70-75% pirimiphos-methyl per kg of the animal's weight.

The dry pesticide formulations of the present invention are useful for controlling fleas and other ectoparasites on animals, particularly smaller animals

which are kept as pets, including dogs, cats, rabbits and rodents. The disclosed compositions and methods are particularly advantageous for controlling fleas on cats. Cats are very inefficient at metabolizing pesticides and are, therefore, particularly susceptible to their toxic effects. Additionally, because of their natural grooming behavior, cats are particularly susceptible to reactions due to the unpleasant taste or odor of preparations which are applied to an animals coat or fur. Application of the disclosed compositions by the method of the present invention is essentially non-toxic to cats, and application of the preparations appears to not stimulate the animal to groom immediately after the application.

The disclosed methods and compositions also are useful for the control of other insect pests, including fleas, lice, ticks and flies, on herd animals such cattle, sheep, goats, horses, donkeys, camels, pigs, reindeer, caribou, and buffalo.

20

Example 1

Preparation of Dry Encapsulated Pirimiphos-methyl

Dry encapsulated pirimiphos-methyl was prepared by mixing 1770 g of water with 47.0 g of 40% Reax, 100M sodium lignosulfonate (a poly-protective colloid) and 76.0 g of 20% aqueous Tergitol XD emulsifier in an open reaction vessel with stirring. In a separate container 2000 g of technical grade pirimiphos-methyl (at least 90% purity) was mixed with 32.0 g of polymethylene polyphenylisocyanate and 130.0 g of tolylene diisocyanate, then added to the aqueous solution in the reaction vessel. An appropriate catalyst, such as a basic tertiary organic amine, also can be added to the

water-immiscible mixture if desired. The mixture was vigorously stirred using a high shear stirrer to create an oil in water emulsion. After the emulsion was formed and particles of the desired size were obtained, mild agitation was continued for the remainder of the reaction. The temperature of the emulsion was raised to 60°C and the pH of the dispersion was maintained at 8.5 for 3 hours with stirring to allow the interfacial polymerization to proceed to completion. The resulting aqueous suspension of microcapsules was cooled to room temperature. 1.1 g of Witconate AOK (wetting agent), 15.5 g of colloid 225 (dispersant) and 5.9 g of Kaolin RC-32 (disintegrant) were added to the aqueous suspension of microcapsules as spray drying adjuvants, and the resulting slurry was spray dried. The dried, microencapsulated product was determined to contain 72.5 weight % pirimiphos-methyl.

To make the formulations more pleasant to use, a fragrance such as Alpine Mask™ can be included in the formulation by adding 0.9% of the fragrance to the formulation after encapsulation.

Example 2

Evaluation of the Efficacy of Applications of Dry Formulations of Organophosphate Insecticides for Controlling Fleas on Cats

The efficacy of microencapsulated dry formulations of pesticides was demonstrated in a dose titration study using a microencapsulated dry formulation of 74% pirimiphos-methyl, which was applied to cats selected from a random population of mixed breed, domestic animals. The animals were housed in individual cages in environmentally controlled rooms and provided with a

commercial cat food and water *ad libitum*. For the dose titration study the animals were divided into four groups of three cats each. Each group received either 1) no treatment; 2) 0.2 grams of the dry formulation of micro-encapsulated 74% pirimiphos-methyl preparation prepared in accordance with the procedures of example 1; 3) 0.3 grams of the preparation or 4) 0.4 grams of the preparation. Each cat was infected with 100 cat fleas, (species Ctenocephalides felis) one day before the microencapsulated preparation was applied. The preparation was applied to the animal's fur or coat as a single spot application to the dorsal neck area of each animal, near the shoulder.

The effect of the preparation on reducing or controlling infestation by fleas was determined by monitoring the number of fleas remaining on the bodies of both treated and untreated animals. The number of fleas remaining on the animals was determined by counting the number of dead fleas found on the pans which covered the bottom of each cage each day and by doing direct body counts on each animal to determine the number of fleas remaining on the animal. The data obtained were used to calculate the percent reduction of fleas in each group using the formula given in Table II.

TABLE II

Test Day	Treatment ^A		
	0.2 g ^B	0.3 g ^B	0.4 g ^B
3	100%	100%	100%
7	95%	97%	90%
9	94%	94%	94%

^ACats were infested with 100 fleas one day prior to treatment and again on day 6. Whole body counts of fleas remaining on each animal were made on days 3, 7 and 9.

^BData are expressed as

$$\text{Percent Reduction of Fleas on Cats} = \frac{\text{Total Fleas on Control Cats} - \text{Total Fleas on Treated Cats}}{\text{Total Fleas on Control Cats}} \times 100$$

The results of the efficacy study indicate that the micro-encapsulated dry formulations reduced infestation on treated animals three days after treatment by 100% when compared with controls.

- 5 Additionally the one treatment, applied on day 1 protected animals against reinfestation for more than nine days under the conditions employed in the test.

Example 3

10 Response of Cats to a Dry Formulation of Microencapsulated Organophosphate Insecticides

Thirty six male and female cats were randomly placed into one of four treatment groups to evaluate their response to treatment with a dry formulation of microencapsulated pirimiphos-methyl. Each group

received one of the four following treatments: 1) 0.3 grams of 72% dry microencapsulated pirimiphos-methyl, 2) 0.6 grams of 72% dry pirimiphos-methyl and 3) 1 ml (milliliter) of 21% pirimiphos-methyl in 79% methyl carbitol. Treatment 3 served as a positive control for the study.

The cats were housed individually and provided with a commercial cat food and water *ad libitum*. All treatments were applied to the cat's back, on the dorsal thorax near the shoulder blades, one time on Day 0 of the study. The liquid composition of control treatment 3 was applied by pipetting 1 ml aliquots directly onto the animals' skin. Treatments 1 and 2 were briefly rubbed into the cat's coat. The cats were observed continuously for the first hour following the application of the test formulation, at hourly intervals for the next four hours following treatment, then twice daily for the next two days.

Five of the nine cats who received control treatment 3 (1 ml of 21% pirimiphos-methyl in 79% methyl carbitol) demonstrated an adverse salivation response within one hour following the application of the pesticide. One of these responses was mild, with the animal having mild clear drops of saliva on its lips. Three of the cats had a heavy salivation response within one hour of treatment and one cat had a profuse salivation response. All of these responses lasted for 10 to 20 minutes following the application of the pesticide formulation and were determined to not be transient responses. One cat continued to salivate abnormally for four hours after the application of the liquid pirimiphos-methyl formulation. A sixth cat vomited twice within the first hour following treatment and again on the next day.

In contrast to the animals receiving control treatment 3, none of cats in treatment group 1, the group treated with 0.3 grams of the microencapsulated dry formulation of 72% pirimiphos-methyl, had
5 salivation episodes which lasted longer than two minutes. Additionally, none of the cats in this group vomited in response to the application of microencapsulated dry formulation of pesticide. Only
10 two of the cats demonstrated a mild salivation response during the first hour following treatment, and two demonstrated a heavy response. One cat exhibited a mild salivation response 3 hours following the application of the microencapsulated formulation.

The animals in treatment group 2, the group
15 treated with 0.6 grams of the microencapsulated dry formulation of 72% pirimiphos-methyl, demonstrated extremely brief, transient responses which lasted no longer than two minutes. None of the cats in this group vomited in response to the application of the dry
20 formulation.



CLAIMS

1. A method for reducing adverse reactions to an insecticide by an animal in need of insecticide administration to treat an infestation of parasites which comprises topically applying to the animal an organophosphate insecticide in a dry formulation.
2. The method of claim 1 wherein the insecticide is provided in the form of microcapsules.
3. The method of claim 2 wherein the insecticide comprises pirimiphos-methyl.
4. The method of claim 2 wherein the insecticide comprises a microencapsulated dry formulation of from about 20 to 80% organophosphate.
5. The method of claim 2 wherein the insecticide comprises a microencapsulated dry formulation of from about 70 to 75% organophosphate.
6. The method of claim 1 wherein the dry formulation is applied only to a single, limited area of the animal's fur or skin.
7. The method of claim 6 wherein from about 0.1 gram to about 1.0 gram of the dry formulation per kilogram of body weight is applied to the animal.
8. The method of claim 1 wherein the parasites comprise fleas, ticks or lice.
9. The method of claim 1 wherein the animals to be treated are selected from the group consisting of cattle, sheep, goats, horses, donkeys, pigs, dogs, cats and rabbits.
10. The method of claim 1 wherein the animal to be treated is a cat.
11. The method of claim 10 wherein the dry formulation is microencapsulated pirimiphos-methyl.
12. A method for reducing adverse reactions to an insecticide by an animal in need of insecticide

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administration to treat an infestation of ectoparasites which comprises treating the animal by topically
5 applying to the animal a microencapsulated dry formulation of from about 20 to about 80% pirimiphos-methyl at a dosage of about 0.1 gram to about 1.0 gram per kilogram of the animal's weight.

13. A method for protecting an animal from infestation with ectoparasites comprising topically applying a dry formulation of an organophosphate insecticide to an animal in need of such protection.

14. The method of claim 13 wherein the insecticide is provided in the form of microcapsules.

15. The method of claim 14 wherein the insecticide comprises pirimiphos-methyl.

16. The method of claim 14 wherein the insecticide comprises a microencapsulated dry formulation of from about 20 to 90% organophosphate.

17. The method of claim 14 wherein the insecticide comprises a microencapsulated dry formulation of from about 70 to 75% organophosphate.

18. The method of claim 14 wherein the animal to be treated is a cat.

19. The method of claim 13 wherein from about 0.1 gram to about 1.0 gram of the dry formulation per kilogram of body weight is applied to the animal.

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CLAIMS

1. A method for reducing adverse reactions to an insecticide by an animal in need of insecticide administration to treat an infestation of parasites which comprises topically applying to the animal a dry
5 formulation of a microencapsulated organophosphate prepared by combining the organophosphate and a polyisocyanate with an aqueous solution of a surfactant and a protective colloid to form a dispersion so as to microencapsulate the organophosphate and subsequently
10 drying the resultant microcapsules.
3. The method of claim 1 wherein the insecticide comprises pirimiphos-methyl.
4. The method of claim 1 wherein the insecticide comprises a microencapsulated dry formulation of from about 20 to 80% organophosphate.
5. The method of claim 1 wherein the insecticide comprises a microencapsulated dry formulation of from about 70 to 75% organophosphate.
6. The method of claim 1 wherein the dry formulation is applied only to a single, limited area of the animal's fur or skin.
7. The method of claim 6 wherein from about 0.1 gram to about 1.0 gram of the dry formulation per kilogram of body weight is applied to the animal.
8. The method of claim 1 wherein the parasites comprise fleas, ticks or lice.
9. The method of claim 1 wherein the animals to be treated are selected from the group consisting of cattle, sheep, goats, horses, donkeys, pigs, dogs, cats and rabbits.
10. The method of claim 1 wherein the animal to be treated is a cat.
11. The method of claim 10 wherein the dry formulation is microencapsulated pirimiphos-methyl.

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12. A method for reducing adverse reactions to an insecticide by an animal in need of insecticide administration to treat an infestation of ectoparasites which comprises treating the animal by topically
5 applying to the animal a microencapsulated dry formulation of from about 20 to about 80% pirimiphos-methyl at a dosage of about 0.1 gram to about 1.0 gram per kilogram of the animal's weight.

13. A method for protecting an animal from infestation with ectoparasites comprising topically applying a dry formulation of a microencapsulated organophosphate insecticide to an animal in need of
5 such protection, wherein said microencapsulated formulation is prepared by combining the organophosphate and a polyisocyanate with an aqueous solution of a surfactant and a protective colloid to form a dispersion so as to microencapsulate the
10 organophosphate and subsequently drying the resultant microcapsules.

15. The method of claim 13 wherein the insecticide comprises pirimiphos-methyl.

16. The method of claim 13 wherein the insecticide comprises a microencapsulated dry formulation of from about 20 to 90% organophosphate.

17. The method of claim 13 wherein the insecticide comprises a microencapsulated dry formulation of from about 70 to 75% organophosphate.

18. The method of claim 14 wherein the animal to be treated is a cat.

19. The method of claim 13 wherein from about 0.1 gram to about 1.0 gram of the dry formulation per kilogram of body weight is applied to the animal.

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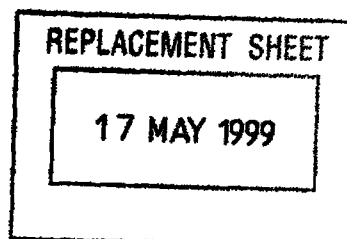


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CLAIMS:

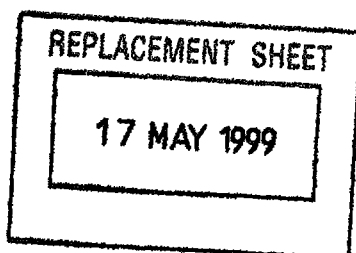
REPLACEMENT SHEETS		SG
☐	Description	: paged to paged
☒	Claim(s)	: paged 16 to paged 18
☐	Drawing(s)	: paged to paged
☐	Abstract	: paged to paged
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1. A use of a microencapsulated dry formulation of one or more organophosphate insecticides in an amount which reduces adverse reactions including salivation and vomiting to organophosphate insecticides relative to one or more organophosphate insecticides in a non-microencapsulated form in a preparation of a medicament for treating an infestation of parasites in an animal in need thereof.
2. The use of claim 1, wherein said formulation comprises from about 20 to 80% of said organophosphate insecticide.
3. The use of claim 1, wherein said formulation comprises of from about 70 to 75% of organophosphate insecticide.
4. The use of claim 1, wherein said dry formulation is applied only to a single, limited area of the animal's fur or skin.
5. The use of claim 1, wherein said amount is from about 0.1 gram to about 1.0 gram of said formulation per kilogram of body weight of the animal.
6. The use of claim 1, wherein said parasites comprise fleas, ticks and/or lice.
7. The use of claim 1, wherein said animal is selected from the group consisting of cattle, sheep, goats, horses, donkeys, pigs, dogs, cats and rabbits.
8. The use of claim 1, wherein said animal is a cat.
9. The use of claim 1, wherein said formulation is prepared by combining said organophosphate insecticide and a polyisocyanate with an aqueous solution of a





16. The use of claim 11, wherein said formulation is prepared by combining said organophosphate insecticide and a polyisocyanate with an aqueous solution of a surfactant and a protective colloid to form a dispersion so as to form microcapsules containing said organophosphate insecticide, and drying the microcapsules.



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(21) International Application Number: PCT/US96/18231 (22) International Filing Date: 14 November 1996 (14.11.96) (30) Priority Data: 08/560,033 17 November 1995 (17.11.95) US (71) Applicants: MALLINCKRODT VETERINARY, INC. [US/US]; 675 McDonnell Boulevard, Saint Louis, MO 63134 (US). ZENECA LIMITED [US/US]; 1200 S. 47th Street, Box 4023, Richmond, CA 94804-0023 (US). (72) Inventors: MEYER, Jeffery, Alan; 1209 Hampton Lane, Mundelein, IL 60060 (US). PENNINGTON, Robert, G.; Route 1, Box 69A, Rayville, MO 64084 (US). SCHER, Herbert, Benson; 1208 Wickman Drive, Moraga, CA 94556 (US). (74) Agents: ERNST, Barbara, G. et al.; Rothwell, Figg, Ernst & Kurz, #701 East, 555 13th Street, N.W., Washington, DC 20004 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, 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, UZ, VN, ARIPO patent (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). Published <i>Without international search report and to be republished upon receipt of that report.</i>
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(57) Abstract		
Dry formulations of organophosphate insecticides provide effective and convenient to use treatments for protecting animals from infestation by fleas and other ectoparasites. These dry formulations are effective for periods of up to two weeks because of the controlled release of the insecticide onto the animal, they are convenient to use and most importantly, they do not cause severe adverse reaction in the treated animals.		