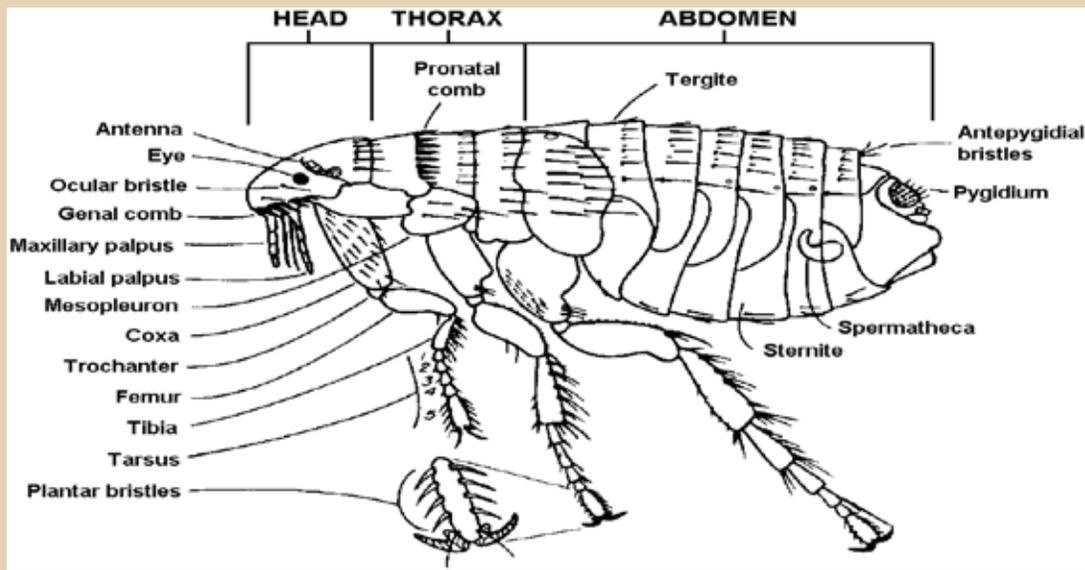


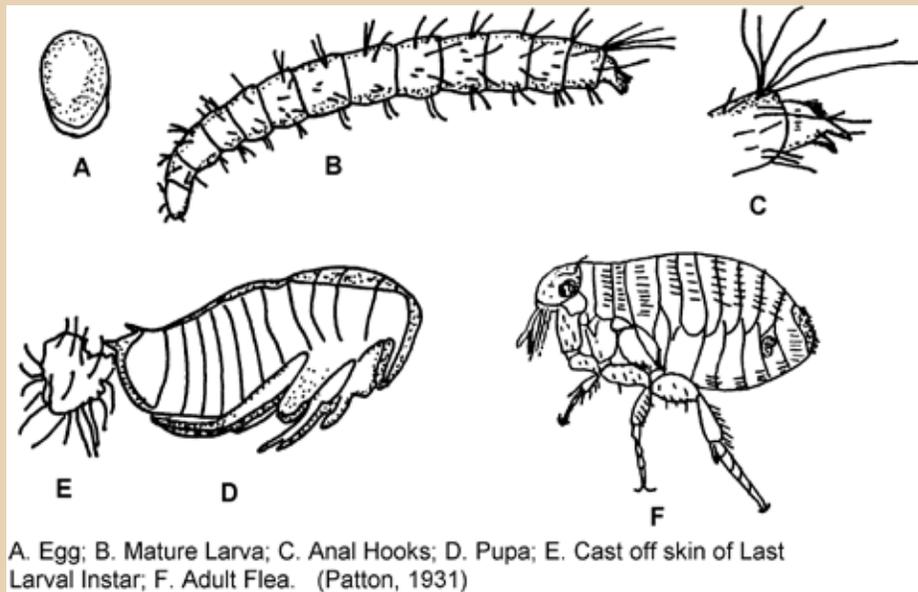
## **CHAPTER 19**

# **THE BEST CONTROL FOR FLEAS AND MANGE**

Did you every wonder about the warning on a flea collar that warns you not to touch it, but it is “safe” enough for your pet to wear 24 hours a day, week after week after week after week...?



## DIAGRAM OF FLEA



## LIFE CYCLE OF FLEA

## PEST OVERVIEW - THE SIX-LEGGED VAMPIRE THAT JUMPS

Although there are over 2,200 species of fleas worldwide, with over 250 species of fleas described just in North America, only a few are commonly encountered by humans with enough frequency to be considered pests. These include the cat flea, *Ctenocephalides felis* (Bouche), the dog flea, *C. canis* (Curtis), the human flea, *Pulex irritans* (L), and the oriental rat flea, *Xenopsylla cheopis* (Rothschild). Other species, such as the rabbit flea, *Cediopsylla symplex*, the mouse flea, *Ctenopsyllus seignis*, the ground squirrel flea, *Diamanus montanus* (Baker), and *Oropsylla hirsuta*, a flea that feeds primarily on prairie dogs, may occasionally achieve pest status when their host mammals nest in or near structures or the fleas attack hunters and hikers. Some, such as the northern rat flea, ground squirrel flea, and *Oropsylla hirsuta* are important vectors of sylvatic plague, bubonic plague, and murine typhus.

Flea management is best done via management of the host animal's habitat. Since fleas must spend at least part of their life cycle on their host, the chances of encountering fleas in areas of the host's habitat where it spends most of its time (e.g., its den or nest) are much greater than in any general area, such as a field or barn in which the host may or may not be found at a given time. One author has suggested that most fleas spend more time in the host nest or burrow than on the host itself (Benton 1980). Each year, 52 million pet owners spend about \$500 million just on over-the-counter flea control products. **Just about every flea feeds only on one creature.**

**Adult fleas are truly the “vampires” of the insect world because they feed only on our blood and the blood of our pets.** They are narrow, small, wingless insects, red, brown or black in color and are protected by a hard flat shell. They are hard to see and even harder to kill with pesticide poisons - so why use poison? When you try to find this tiny (1/32”-1/3”) invader, remember to check your pet closely behind the ears, at the base of tail, on the stomach and between the toes. The flea has armor-like plates in layers - each with backward pointing spikes (or spines) so they can move easily and quickly through hair or feathers. Their feet have double claws for holding on to their host and they also have a barbed “mustache” under their mouth to further anchor them to the skin as they feed with their piercing -sucking mouth parts. You normally can not feel the flea bite as it actually occurs; it is the saliva that soon sets off an itching reaction. Their bites cause an inflammation of the skin and can carry disease and parasites. Fleas can pull up to 400 times their own weight. Fleas literally “fly” with their hind legs; they can jump 150-200 times their body length (the equivalent of a man jumping 1,400-1,800 feet!) On takeoff, a flea is moving 20 to 50 times faster than a space rocket. Behind their legs is a rubbery-muscular protein that allows them to move against gravity 135 times faster than you or me. After its lift-off, the flea cartwheels end over end, until it reaches its new host/meal. One pair of mating fleas living for nine months can theoretically produce a quarter of a million little “vampires”, or up to one trillion offspring in a year! To the voracious little flea, dogs, cats, birds, humans or even elephants are simply something to eat.

**Frequently** launder pet bedding and rugs that pets frequent in hot, soapy water and dry in a clothes dryer or direct sunlight. Steam clean, vacuum or rinse-and-vac carpets with Safe Solutions, Inc. Enzyme Cleaners with or without peppermint and/or borax thoroughly to remove lint and dust around baseboards and cracks where flea eggs and larvae accumulate. Eliminate vegetation that will harbor native mammals and/or rodents. Prevent pets from resting under the building, and exclude wild mammals by screening attic and eaves entrances. Thoroughly clean furniture in areas that pets tend to frequent and use. Wash frequently using diluted Safe Solutions enzyme cleaners. Most research shows adult fleas rarely leave the host ( the primary environment); the second environment is the carpet/floor or nest/burrow which contains the majority of the flea eggs, larvae and pupae. You must control both environments to control the flea infestation.

The secret to flea population management is the flea's life cycle; the adult must contribute timely nourishment for larvae under special conditions or the young will not survive. No longer a regional problem, today **fleas are common in all parts of the country except very dry areas (so install a dehumidifier and a fan).** The most important and common species that you must manage is the cat flea which feeds on a variety of hosts, including cats, dogs, rodents, foxes, opossums and humans. This flea prefers pets and will not affect humans unless populations are excessive or the pet is removed from its resting areas. The situation that occurs when families remove the pet, take a vacation, then return home to find ravenous fleas is not uncommon. An outline of the sequence of events:

- A summertime vacation assures good flea-growing conditions (temperature and humidity).
- Taking the pet with you removes the main host/food supply for your fleas.
- While the family is away, flea larvae continue to develop, feeding on dried blood; pupae complete their cycle and are ready to emerge; flea adults become ravenous.
- The family returns to the adult fleas emerged and emerging - ready to feed and accept ALL available warm-blooded hosts - (you).
- Before you go inspect inside - put your pant legs inside your socks.

Fleas belong to insect order Siphonaptera. They are tiny wingless insects that undergo complete metamorphosis, having egg, larval, pupal and adult stages. There are over 2,400 described flea species in the world, 95% of these are parasites of mammals; the remaining species parasitize birds. Over \$6.6 billion is spent (totally) by pet owners trying and trying and trying to get rid of fleas just in the U. S.! The fight has been going on a long time - W. Colas in his book Adam in Eden: or Natures Paradise published in 1657, noted that "water in which rue (*Ruta*) has been soaked, if scattered about the house, will drive away fleas and kill them."

## FLEAS GENERAL DESCRIPTION

**ORDER** - Siphonaptera (sucking, without wings)

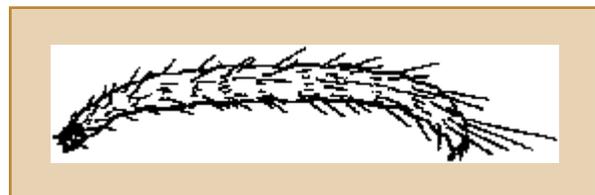
**FAMILIES** - Pulicidae, Leptopsyllidae, Ceratophyllidae

**TYPE METAMORPHOSIS** - Complete



**Egg** - Eggs are white, short smooth, rounded, light-colored and the size of a pinhead or about 1/33" - 1/50" in diameter; visible to the naked eye. Attached to the host or dropped by adult female while feeding on the host, into the host's bedding or nest and/or dropped/laid in the dirt, dust, cracks in the floor, carpeting, upholstery or bedding of the hosts. They can even hatch in the dust bags of vacuum cleaners. Female fleas deposit eggs in groups of 1 to 18 on the host after a blood meal. Some species, such as the cat flea, can deposit up to 25 eggs per day and over 1000 in a lifetime. Flea eggs soon drop off or are brushed off. Due to their spherical or oval shape, they roll into cracks and crevices on the floor or in or near nest and bedding. Flea eggs hatch in 2 to 21 days depending on temperature and humidity. Clean the entire area with diluted Safe Solutions Enzyme Cleaner with Peppermint.

**Larvae** - Larvae are slender, maggot-like, active, legless creatures, with fine hairs, without eyes, and often with a pale brown head and 13 body segments and chewing mouthparts. Found in bedding, soil, dirt, dust, vacuum cleaner bags and floor cracks and crevices where they feed voraciously on all manner of organic debris, refuse and dried blood in the form of adult flea feces. Depending on the availability of food, relative humidity and other environmental factors, the larvae usually pass through 3 instars in a week to several months; during the last instar each larva will be 1/8" - 1/4" long and 1/64" wide. Optimal temperatures for larval development are 65-80° F. Larvae need a relative humidity of at least 50%. It is important to realize that even if the relative humidity of the ambient air is not this high, it could be much higher in the microhabitat of a burrow or den. Flea larvae can also survive short exposures to below freezing temperatures (Silverman and Rust 1983). Larvae can pupate within cocoons spun from silk and may be covered with debris. Steam clean or vacuum slowly, or better yet, rinse-and-vac the entirety of infested flooring with diluted Safe Solutions Enzyme Cleaner with Peppermint.



**Pupa** - The metamorphosis or transformation period between the larval and adult stages; flea larvae usually prefer temperatures of 65° F. to 80° F. with high humidity. The larva spins white silk and creates an oval cocoon covered with grains of sand debris and dust. The emergence of the adult is triggered by a variety of factors including warmth and/or pressure, vibrations and an increase of CO<sub>2</sub> in the air. New flea adults in the cocoon can survive 5 - 7 days without feeding; some adults may not emerge from their cocoon for a year.

**Adult** - Adult fleas are small, brownish insects flattened from side to side, 1/16" to 1/8" long, wingless hard-shelled, laterally compressed (or flattened sideways), covered with microscopic spines or bristles (which point backward), reddish-brown to black. The long spiny legs are fitted for jumping. Flea adults have short-clubbed antennae which fit into a depression along the side of their heads and they feed on blood. They are ectoparasites of man, his domestic animals and poultry. They can jump 7" - 8" vertically and twice that distance horizontally. A flea can lift 150 times and pull 400 times its own weight. It has been estimated that in warm weather a dog could have 60 fleas - half of which are females capable of laying 600 eggs a month or a total of 18,000 fleas per dog per month! Fertile male and female fleas live 100 days or more. Approximately 2,200 kinds in the world; approximately 250 in the U. S. Adult fleas can live for several years and go without feeding for months at a time under extreme conditions. Fleas can remain in a structure long after the host mammals have been removed. Depending on the flea species and environmental conditions, adult fleas can breed from two weeks to two years after emerging. Adults feed on blood, and females deposit eggs only after a blood meal. Most species remain on the host only long enough to feed. Yet a flea will ravenously bite several times a minute and will continue to bite even when full. Nearly all flea species have host preferences but are not restricted to any one host species. This trait is responsible for the transmission of several diseases (e.g. plague or murine typhus) from one host species to another. Adult fleas prefer warm humid places and will leave a host if it dies. One flea in a lab lived almost 6 years without eating! Remember when you do your control only a very small percentage of your total flea population is in the adult stage.

**TYPE MOUTHPARTS** - Chewing in the flea larval stage and piercing and sucking in the flea adult, consisting of a beak, a pair of palps and short, blade-like maxillae.

**DISEASE ASPECTS** - Fleas are ectoparasites and are known to transmit bubonic plague (the black death) to man and are the principal vectors in the spread of murine or epidemic typhus from rat to man. Fleas transmit Tularemia from cottontail rabbits to man. They also act as the intermediate host of double-pored tapeworm in dogs and of one kind of tapeworm in man. Fleas may also act as vectors of cat scratch disease which is caused by the bacterial pathogen *Bartonella henselae*. It's symptoms include inflammation, swollen lymph nodes and sometimes fever and more serious complications.

**LENGTH OF LIFE CYCLE** - Varies among species according to climatic conditions, anywhere from two to three weeks to two to three months...sometimes as long as two years. Adult fleas can live more than 18 months without a blood meal. Most fleas can reproduce year 'round. Fleas are, however, quite susceptible to temperature changes so that their life cycle may be prolonged. Outdoors, fleas are most abundant during humid, rainy summers and are more common outside in the southern United States than in the north. Indoors, warmth and high relative humidities are conducive to large populations. The sudden appearance of large numbers of adult fleas in mid-summer and fall (flea seasons) is due in large part to the onset of higher humidities and temperatures which permit larval development to accelerate. Flea larvae may undergo arrested development in less than favorable conditions.

**HABITAT** - Fleas may be found in yards and fields, within structures. They are carried by dogs, cats, rats, mice (almost all animals and birds), and may be found wherever these animals are found. "Sand" fleas are usually cat fleas.

**HARBORAGE POINTS** - Fleas inhabit yards, crawl areas, basements, living quarters, kennels, buildings, attics and chimneys. All stages of fleas may be found indoors and outdoors. Indoors fleas may be found in floor cracks, under baseboards, under rugs and in almost any concealed place. Adults feed on all warm-blooded animals.  
**Clean and/or spray with diluted Safe Solutions Enzyme Cleaner with Peppermint.**

Several studies have indicated that fleas spend the majority of their life either on the host or in the host's bedding or nest, so flea management should focus on these areas. In outdoor settings, the emphasis should be on spot treatment of "nests" with an enzyme spray. (Use 1 oz. Safe Solutions, Inc. enzyme cleaners per 1 qt. water.) Exclusion of the host animal from an area may be desirable as well, but the feasibility of this strategy will vary with the animal and the location of its nest. In the case of domestic animals, sanitation should be the focus of a flea management program. Regular cleaning of bedding and other areas where the animal spends the majority of its time with diluted enzyme cleaner should easily reduce flea populations to non-irritating levels. **Salt water will control fleas, but will also kill plants.**

In areas where plague is endemic (e.g., the southwestern United States), efforts should be made to keep humans and fleas (and their wildlife hosts) separate. Prairie dog towns should not be allowed to expand into campgrounds and other developed areas. Camping and other outdoor activities should be restricted during an outbreak when fleas seek other hosts. Prairie dog burrows can be dusted with food-grade DE or sprayed with diluted borax or salt water. **Check with Public Health Service officials if your area is affected.**

In most other cases, fleas are considered pests due to the nuisance caused by their bites. In these situations, management decisions should be made on a case-by-case basis.

### **Medical Importance of Fleas**

Flea bites vary in effect from short-lived itching welts to an overall rash to symptoms which may last over a year, depending on the sensitivity of the victim. Young children are more sensitive than older persons. Commonly, a small red spot appears where the skin has been pierced. Little swelling ensues, but the spot is accompanied by a red halo of irritated skin which usually lasts for several hours to a day.

Fleas are vectors of several diseases important to human health including bubonic plague, murine typhus, and tularemia. The oriental rat flea is the most important plague vector from rodents (primarily rats) to humans, but at least 30 other flea species can also transmit the disease, including the northern rat flea, dog flea, cat flea, and the human flea. Plague (in the sylvatic form) is endemic in the western United States among small rodents such as chipmunks, ground squirrels, and prairie dogs.

Nearly all known cases of plague in humans in the United States since 1925 have been associated with wild rodents (mostly from the Rocky Mountain states) and their resident fleas. The greatest threat to humans exist when domestic rats are exposed to infection from wild rodents in areas adjacent to human communities.

Murine typhus is a mild form of epidemic typhus that is usually spread by the human louse. The Norway rat population is the main reservoir of the disease. The disease is most common in the southwestern and Gulf states. The disease is commonly spread from rat to rat, and from rat to human by the Oriental and northern rat fleas. It has also been transmitted by cat fleas from infected feral cats.

Fleas are also vectors of tularemia, a disease related to plague. The natural reservoirs of tularemia are cottontail rabbits in the East, and jack rabbits in the West. Most cases reported are by hunters. Fleas can also be intermediate hosts of several species of tapeworm including species which can parasitize humans, dogs, and cats.

**NATURE OF INJURY** - Annoying bites and transmission of dangerous organisms and diseases.

### **Flea Bite and Flea Allergy**



Fleas inject an irritating saliva when they feed, normally on your ankles. The flea bite's irritation causes the host to scratch and shake, dislodging flea eggs. The females digest the host's blood and excrete a corkscrew shaped string of black, nearly dry blood. This fecal blood breaks up in pepper-like specks that are also scratched off, into the pet's sleeping or resting areas. Pets and people can be afflicted with dermatitis caused by the flea allergens and are susceptible to flea-transmitted diseases, e.g., typhus, tapeworm and cat-scratch disease.

The flea bite is accompanied by secretions of saliva that prevent the host's blood from coagulating [an aspect accompanying the bites of many blood-sucking insects]. The saliva contains several chemicals that cause irritant reactions, sometimes including hypersensitivity to subsequent flea bites. This sensitivity often results in flea allergy dermatitis, expressed by hair loss, excessive scratching, skin inflammation, infections, etc.

The bite distribution pattern in dogs and cats begins across the hips near the tail and narrows along the back. An area between the hind legs and on the belly can also be affected. Cats are less affected on the belly than

dogs, but often have problems on the neck or collar. Once the allergy is activated, reaction is sudden with few subsequent bites. Flea allergy also seems to be hereditary.

**Range** - In the past, flea control in the northern United States consisted of a summer poison spray inside and poison treatment of the pet since reinfestations from outside were not common. In the southern states where outside infestations were common, poison treatment in the yard was also needed. Today flea infestations and reinfestations are common in all parts of the country except very dry areas. Use a dehumidifier and fans and vacuum daily and thoroughly spray/soak yards and/or inside with diluted Safe Solutions Enzyme Cleaner with Peppermint and/or Not Nice to Bugs®.

Some flea species are capable of transmitting serious disease organisms such as bubonic plague or murine typhus, either through their bite or through their feces. The Oriental rat flea is the primary vector for the plague-causing bacterium, *Yersinia pestis*, found in rodent populations throughout temperate areas of the world. Some other flea species can also transmit this bacterium. Murine typhus is caused by the microorganism *Rickettsia mooseri*, which occurs in rodent populations and can be vectored to people by fleas. Certain fleas are also intermediate hosts of dog and rodent tapeworms, intestinal parasites which can be transmitted to pets and people through ingestion of infected fleas.

During their feeding, fleas inject a hemorrhagic saliva which can destroy or irritate tissues and cause bleeding at the feeding site. The flea bite can produce severe itching, and multiple bites may cause a generalized rash. Some people are more sensitive than others to flea bites and may experience severe allergic reactions.

Several species of fleas may be encountered (usually in late summer and fall) in and around buildings and homes. These include the human flea, *Pulex irritans*, the Oriental rat flea, *Xenopsylla cheopis*, and the northern rat flea, *Nosopsyllus fasciatus*. The two most common fleas found on pets, however, include the cat flea, *Ctenocephalides felis*, and the sticktight flea, *Echidnophaga gallinacea*. Cat and dog fleas are by far the most common troublesome flea pests in buildings and dwellings.

## **MONITORING AND THRESHOLDS FOR FLEAS**

Fleas can be monitored in several ways. The simplest is to count and collect fleas landing or crawling on a volunteer's lower legs for one minute. In making surveys, light colored trousers should be tucked into white socks to help prevent bites and make collecting easier (socks can also be put on over shoes). White or light-colored socks and trousers are preferred to provide greater contrast and facilitate counting and collection. A variation on the above is to wrap fly paper or duct tape (sticky-side out) around the lower legs and count fleas adhering after a predetermined time interval (Cole and Burden 1978).

Fleas may also be combed off animals for an index of animal infestation. Do this over a white surface so fleas can be easily observed (Ehmann and Storey 1982).

Pet bedding should be periodically checked for flea eggs and dried-blood feces (frass) of adult fleas. This has been described as "salt and pepper" because it looks like small flecks of black and white debris. The frass is generally cylindrical, twisted, and about 1/16" long. It is dark in color. Larvae and pupae can be found at the edge of pet bedding or animal nests.

**Indoors, five or more fleas on the legs (or fly paper) of observers in less than one minute is indicative of a very severe flea infestation.**

Flea populations in animal burrows or dens can be sampled by using a flannel cloth that is run through the burrow on the end of a plumber's snake. The number of fleas on the cloth is then counted. Spray tunnels with salt water or diluted enzymes and borax or add them to a very wet flannel cloth and drag it through the burrow.

## **INTELLIGENT PEST MANAGEMENT® CONTROLS**

### **Inspection**

**Indoor.** Carefully clean/vacuum daily (or better yet, steam clean floors weekly with diluted enzyme cleaner or with borax or as needed) even under furniture. A close inspection of a home or building will principally involve

finding the “hot spots” or areas of high flea development. Pet bedding or sleeping areas should be identified first. Pets do not sleep or rest indiscriminately or randomly in a building. They have favorite places and move among them throughout the day. Wherever pets habitually stop and rest, flea eggs and dried blood accumulates. These are “hot” spots where they habitually scratch, bite, or shake, e.g., immediately after leaving a resting spot. Spots where cats land as they jump down from a high, resting or feeding area are places where fleas, eggs and dried blood falls. Fleas are very attracted to anything white - so to determine how severe your infestation is, wear white socks and watch for “spots” to appear. Thoroughly vacuum carpeted and non-carpeted areas daily, for serious infestations steam clean and/or spray wash or rinse-and-vac with diluted Safe Solutions, Inc. enzyme cleaners or soaps, Basic H, eucalyptus soaps and/or any natural soap. As a last resort, dust lightly with food-grade diatomaceous earth. One application of disodium octoborate tetrahydrate or borax will control fleas for a year, but be careful that children and pets do not get these or any boron products in their mouths. Spray over the first application of boron with a second hot water spray to drive the material deep into the carpet; then vacuum thoroughly when dry.

**Outdoor.** Kennels and doghouses are obvious places where fleas build up - salt water can be used to kill them there. But there are other places pets prefer to sleep or rest at certain times of the day. Examples are under particular bushes, under porches, or in crawl spaces. If a pet roams the perimeter fence, points of infestation might be located there. Outdoor flea infestations rely on dependable hosts and warm humid climatic conditions. Flea larvae require moisture because they easily dry out and die. Neither can they tolerate free water (such as rainwater) or they drown. Note: infestations are never found in unprotected or undrained situations. Spray all protected areas using a hose-end sprayer with diluted Safe Solutions Not Nice to Bugs® or their Enzyme Cleaner with Peppermint and/or borax or salt water. **(Borax and salt will also kill vegetation.)**

**Reinfestation from outside.** Some species of urban wildlife also harbor cat flea infestations. When urban neighborhoods mature, their habitat for wildlife increases. Raccoons have long been prominent, and, in fact, have overpopulated some urban areas; they live in chimneys, large trees and storm sewers. Chipmunks, ground squirrels, and domestic rodents have also found habitat in “our” ivy terraces, rock walls, soil berms and underground drainage areas. Another mammal, the opossum, has extended its range or has been introduced over most of the United States; it is one of the most common urban wildlife species found today. Pets are always aware of the locations of wildlife habitat in their own backyard. As soon as they are released, they run to these places to investigate, even if they can’t get at the animals. This behavior ideally and quickly facilitates flea reinfestation of clean pets. **Spray the yard with nematodes or with diluted Safe Solutions Enzyme Cleaner.**

**Sanitation.** Fleas require warm-blooded hosts for development and for egg maturation. Elimination of suitable habitat for wild rodents and other animals near structures will often reduce flea population levels. Screened vents prevent animals from resting inside or underneath structures. Eliminating vegetation close to structures and raising woodpiles off the ground reduces rodent harborage.

Indoors, wash or vacuum all pet bedding and sleeping areas on a regular basis with diluted enzyme cleaner or peppermint soap and borax. Cracks and crevices should be routinely vacuumed and sealed, especially the area between the baseboard and floor. Dispose of vacuum cleaner bags to prevent reinfestation. **Pets should be washed with or Safe Solutions Pet Wash monthly or as needed.**

**Ultrasound.** Ultrasonic collars are sometimes purchased for the control of fleas on domestic animals. A recent study (Hinkel, Koehler, and Patterson, 1990) showed that ultrasound devices are ineffective.

**Insect Growth Regulators.** A new technology in the management of fleas is the use of synthetic insect growth regulators (IGRs). These substances are supposedly similar to natural chemicals produced by the flea to regulate the shedding of its skin during molting. They work by interfering with the molting process, thus preventing the immature flea from developing into an adult. This method of control is a long-term process, since it supposedly will only kill larvae as they molt. A recent study using pyriproxyfen (sold as Nylar), an insect growth regulator reported to be effective against several insects, examined its effectiveness against the cat flea. One problem with insect growth regulators is that they break down when exposed to light, limiting their outdoor use. In this study, Nylar was determined to be stable when exposed to light. It was found to persist in home yards for three weeks after application and to prevent development of 90% of the fleas in treated areas (Palma and Meola 1990). Another IGR for flea management indoors is methoprene (trade name Precor). It is important to combine the use of a material such as this with observations of the infested animal’s movement so that only areas where it

spends the majority of its time are treated. **Caution: IGRs may cause tumors in people (and pets) - so use them with great caution.** Food-grade DE, salt water and/or borax and/or diluted Safe Solutions enzyme cleaner with or without peppermint work better and last longer, but salt can harm plants and boron products should never be ingested by people or pets. Use a steam cleaner to steam clean your carpets and furniture with tap water.

**Flea predators.** Fleas are preyed upon by earwigs, ants and beetles that feed on fleas and larvae in the host's nest and nematodes that feed on flea larvae in the ground.

## HABITAT ALTERATION

**Indoor.** Keep pets out of or off of, hard to treat areas - don't let them roam freely. Flea populations build up in warm humid weather of spring and summer and drop to low levels in cool or dry winter weather. Inside air with a low humidity will hold back the buildup of flea populations. If found or before they are found, install negative ion plates and vacuum; wait two weeks and when any pocket areas of flea populations are identified, these and other potential harborage sites should all be vacuumed (daily) as thoroughly as possible. Except for flea allergy dermatitis, which can be initiated with very few flea bites, a moderate flea population can be kept at a tolerable level by steam cleaning or vacuuming alone. **Thorough steam cleaning or vacuuming MUST be performed daily and must always be thorough.** If negative ion plates and vacuuming are both augmented and still leave a few survivors, you may augment the control by spraying with Not Nice to Bugs® or diluted Safe Solutions enzyme cleaners with or without peppermint and/or spraying or mopping with borax or Mop Up® - but be sure not to contaminate anything with borax, which may have some sulfuric acid residue and should never be ingested. Be sure to spray again with hot water to drive the borax into the nap and then vacuum thoroughly when dry.

Reduction of clutter facilitates inspection and permits effective vacuuming. Pets and feral animals should be kept out of crawl spaces, and from under porches and outbuildings. Eliminating the wildlife habitat where fleas are harbored and trapping or killing animals responsible for reinfestations may become essential in stopping difficult flea infestations. Care should be taken, however, not to rely on wild animal elimination alone; these animals are usually replaced by others moving in from an adjacent range. Consult local restrictions when dealing with wild mammals. Read this entire Master IPM Planning Manual.



## INTELLIGENT PEST MANAGEMENT® CONTROLS

**Treatment of Pets.** Spray or wash with diluted Safe Solutions Enzyme Cleaner or their Pet Wash (nontoxic pet shampoo) or lightly dust with their food-grade DE. Note: It has been found that bathing pets with Safe Solutions enzyme cleaners or pet wash shampoos will also cure mange. Wait two weeks. Then as a very last resort, pets can be treated by the pet owner or a veterinarian. Reasonable "safety" may be obtained using Program® Lufenuron, Advantage® imidacloprid or Frontline® Iofipronil - but fleas will probably become resistant soon and the "treatments" still are poisonous. Where flea allergy dermatitis is involved, pets may also have to be treated by veterinarians or else recovery will be slow at best. Pet bedding should be washed once a week. The pet kennel or pet box should also be cleaned and washed each week. The weekly schedule kills eggs and larvae, and eliminates the dried blood essential for complete larval nourishment. Pet owners can purchase Pet Wash, natural soaps, Skin-So-Soft®, IGR products, citrus oils, etc. but they all should only be used according to label information. "Dipping" pets in poisons should only be done as a last resort by veterinarians. Flea collars should never be used. You can simply wash, comb or vacuum fleas off pets. Treatment of puppies and kittens with dusts and/or pesticide poison sprays can be hazardous. These small pets should be moved out of infested areas into clean bedding. Children should not fondle pets treated with pesticide poisons or remain in buildings treated with synthetic pesticide poisons. Medicated ointments can be used on pets, especially dogs, with severe flea allergy dermatitis. You can also apply diatomaceous earth to your pet's fur per label directions. Natural flea powders are usually made from pennyroyal, eucalyptus, rosemary, wormwood or citronella - oils of these herbs can be added to flea collars which can be worn by the pets, or added to soaps that can be used to spray and/or wash pets. Put sliced lemons in a pot and steep for 12 hours and cool - sponge on the pet as needed. **Caution:** Citrus oils have been implicated in some cat deaths. **Use Safe Solutions Enzyme Cleaners and/or their Pet Wash Shampoo. We have taken 27 dead fleas from a 3-day-old kitten without hurting the kitten.**

**Pet diet and skin care.** Feed your pets fresh, whole foods - try to avoid meat by-products, preservatives and

artificial colorings. Add either brewer's or nutritional yeast, fresh garlic or flaxseed oil (found at health food stores) to pet food for skin health and flea repellent.

Use PETA's recipe for the skin: Slice up two lemons and pour nearly boiling water over them, then soak them overnight. The next day, strain the liquid and pour into a spray bottle. The dogs get spritzed liberally and then the solution is massaged into their coats. Citrus oil kills and repels fleas and the dogs smell great also. Spray the bedding as well. Cats hate to be sprayed and find citrus offensive, so for felines, make a solution of one ounce pennyroyal oil (also found at health food stores) with 18 ounces of water. Sponge this solution onto the cat and massage into its coat. You can also spray dogs with this solution - they don't mind. **Warning:** Be sure to dilute pennyroyal - it can be toxic to people and pets if used alone. Skin that is irritated from scratching and flea bites can be soothed by applying aloe vera, nature's miracle healer. First, try washing for 8-10 minutes with salt water, obetter still, use Safe Solutions Pet Wash Nontoxic Shampoo.

Limonene, a frequently-recommended extract from mandarin orange and lemon peels, has caused tumors in male rats, so if you must use citrus oils - try using shampoos or area sprays containing linalool, another citrus derivative, instead. However, linalool can cause respiratory problems and should be used outdoors or with good ventilation.

Food-grade diatomaceous earth (DE) kills fleas by drying them out. DE, a non-toxic, chalky powder made of fossilized algae, can be sprinkled on carpets and lawns. It can be found in garden supply stores. **Caution:** Some diatomaceous earth is a lung irritant if inhaled, so only use Safe Solutions, Inc. food-grade DE if you use DE. Try using baking soda, borax or baby powder containing talc **first** or simply vacuum daily for a month.



**Indoors. Never apply any pesticide poisons until two weeks of thorough vacuuming have been completed.** Do not forget to daily vacuum the garage and home and car, kitchen, bathroom and laundry areas and anywhere the pet(s) sleep; pay particular attention around baseboards, furniture and appliances; wash all rugs, mop all painted, varnished, slate or vinyl floors; wash bedspreads and sheets if pets rest on these areas. On serious infestations steam clean and/or "rinse and vac" and thoroughly clean with diluted Safe Solutions, Inc. enzyme cleaners/soaps, or any natural soaps and/or borax. **Note: Borax, boric acid and borate powders kill flea larvae and 100% of the eggs in carpets, but there are ingestion toxicity concerns.** Dust very lightly with baking soda or talcum powder - always remember less is more. As a last resort, put a pinch of food-grade DE on a piece of paper and blow over washed pet bedding, floors, mopboards and other infested areas per label directions. Insect growth regulators (IGR's) can also be used in flea control. Growth regulators interfere with or replace natural hormones essential for the flea larvae to change into pupae. IGR's have long residues and supposedly leave a good margin of safety for humans. Since IGR's do not affect the pupa or adults, fleas that have reached those stages complete their development. The "pre-adult" under adverse conditions (cool or dry weather) may not leave the pupal cocoon for a period of weeks, even months. This means that some fleas will be able to "dodge" IGR treatments so you will still have to vacuum thoroughly or rinse-and-vac and/or spray with diluted enzyme cleaner. **We never use or apply volatile, synthetic pesticide poisons, e.g., IGR's, microencapsulated pesticides, emulsifiable concentrates, dusts, and space sprays which all have varied residual periods and can contaminate the air and people.** Carpet staining or color alteration can also occur and should always be considered. You can try to spot apply diluted enzyme cleaner or peppermint soap sprays as even, fine overlapping fan sprays under low pressure. **Over-wetting and/or staining carpets must be avoided.** During very humid weather, carpets dry slowly and ventilation or dehumidifying is necessary. Poison sprays will not even reach larvae or adults deep down in the carpet, but they may come into contact with the pesticide poison residue when they move up or out of the nap. Notify all occupants before applying even a least-toxic (non-volatile) pesticide. Do not allow pets or children on the treated carpet especially while it is wet. Contact with the treated pet will control adult fleas on an infested pet so do not let children touch pet. In 12/95 I received Purdue's "Advanced IPM" course that still advocates in Lesson 20 the use of synthetic pesticide poisons, e.g., Dursban LO™ to *treat* flea infested floors/carpets. This in spite of the fact that Dow Elanco no longer *recommends* broadcast treatments or even sells Dursban LO. The Fenske study showed such use extremely dangerous to babies. True IPM is **safe!** The old Dow Elanco label states, "It is impossible to eliminate all risks associated with use of this product." In August 1995, EPA increased its fine from \$740,000 to \$890,000 against Dow Elanco for failure to report health problems associated with the use of Dursban. Finally, in January 1997, Dow Elanco and the EPA agreed to eliminate the use of Dursban for indoor broadcast flea treatments, indoor total release aerosols/foggers and for direct application to companion animals (pet dips, shampoos and sprays).

Diluted Safe Solutions Enzyme Cleaner, Peppermint Soap, borax if properly applied, baking soda and/or vacuums are not volatile poisons; they are Pestisafes®.

**Diatomaceous Earth.** As a last resort, you can treat your carpet with Safe Solutions, Inc. food-grade diatomaceous earth (DE). It will last about one year - remove your furniture and lightly dust DE around all the corners of the room or edge of the rug. Make an "X" from all four corners to the center of the room. Sweep thoroughly with a broom throughout the carpet - after a few hours, vacuum thoroughly. Be sure to wear a mask, a HEPA filter on the vacuum and safety glasses during the entire DE process. **The normally do not recommend most DE treatments because most also have pesticides or can be a lung irritant and swimming pool DE is considered a carcinogen.**

**Anti-flea sachets.** Fleas detest the scent of lavender, mint, rosemary, sweet woodruff and cedar. So try some sachets of these fragrances between couch cushions, or simply wash everything in peppermint or lavender soap including your pet if the smell does not irritate you or your pet.

**Preventive treatment.** Preventive treatment may be helpful: where flea infestations were particularly severe the previous year, where flea allergy dermatitis must be avoided, where animals are in poor health, and where outside infestations can be predicted. Rinse-and-vac with borax; then vacuum thoroughly before spring flea activity gets underway — at least one month before flea problems even begin to be noticed (depending on the local climate). Rinse-and-vac applications of borax can be repeated according to predicted need, but we believe it is better to use diluted enzyme cleaner and/or peppermint soap and/or negative ion plates. When summer visitors bring their infested pets, a flea infestation can be anticipated. Thorough vacuuming should be recommended, but where previously uninfested pets are involved, a preventive treatment with diluted Safe Solutions Enzyme Cleaner with or without Peppermint or their Pet Wash might be indicated.

**Outside.** Where pet reinfestation brings on repeated inside infestations, the outside environment may have to be treated with nematodes or diluted enzyme cleaner or peppermint soap, and, as a last resort, with borax or salt dusts or sprays. Random outside treatment or full lawn cover poison sprays are not as effective as careful treatment of pet resting areas and wild animal habitat. Kennels, dog runs and dog houses are also obvious areas to treat. Perimeter fences where pets and wild hosts roam may be the pest interface between one yard and another. Crawl spaces, areas under porches, and openings into basements and attics where pets or wild animals nest should not be closed off until the animals are removed and the adequately treated with salt water or borax water or simply salt or borax or you can flood the area(s) with diluted Safe Solutions, Inc. enzyme cleaner or peppermint soap or nematodes. Emulsifiable concentrates or microencapsulated insecticide poisons should never be used even where labels permit. Emulsifiable concentrates of many pesticides have a short residual life especially when exposed to outside light and weather fluctuations and are dangerous to people and pests. Beneficial nematodes - tiny worms that infect and kill flea larvae can be sprayed on your yard. These non-toxic "pest control operators" can eliminate over 90% of flea larvae within 24 hours following the first application. You can flood or sprinkle or spray salt water or borax water if you are not worried about your plants.

Dusts where they can be applied are often more effective. Take care not to over-apply dusts. Dusting burrows with baking soda, talcum powder or medicated body powder or Comet® or food-grade DE in the protected nesting areas of reinfesting wild animals can be very effective and might eliminate the need for trapping or killing these animals.

Volatile pesticide poison sprays have to be reapplied whenever rainy weather follows any pesticide poison application, so you must re-notify if you insist on using these poisons. Ultrasonic devices. Occupants have been led to believe that ultrasonic devices are effective flea deterrents. Cat fleas have NOT been shown to react to a broad spectrum of ultrasound; consequently, there is no utility for ultrasonic devices in a flea management program. The Pet Products Division of Farnam Cos., Inc., Phoenix is marketing BioFlea Halt® (an outdoor biological flea control spray by Biosys Corp., Palo Alto, CA); the product contains naturally occurring flea predators (microorganisms) that kill flea larvae and pupae. The predators are not harmful to people, pets or beneficial insects. First, try spraying Not Nice to Bugs or cleaning weekly with diluted Safe Solutions, Inc. enzyme cleaners, or peppermint or eucalyptus soap and/or borax and/or salt. Remember, salt and/or borax can kill plants and should not be ingested.

**Synthetic Pesticide Warning:** As the June '96 San Diego Earth Times reported, most chemically-based products pose a real danger to the health of your pet, your kids and yourself. After all, a pesticide flea collar is nothing but a poison necklace around your pet's head. It emits a constant toxic cloud that your pet inhales, as do you and your kids every time you hug or kiss your pet. And what about those insecticidal flea and tick shampoos and powders, sprays and dips? Labels warn you not to get them on your skin, to use rubber gloves and wash your hands. Yet the instructions also tell you to work them into your animal's coat, where they absorb into your pet's skin and are licked off!

This is not the answer. As Alisa Mullins reported in Animal Times magazine (July/August '95), she accidentally poisoned her cat, Pepper, to death with flea dips, powders and shampoos. Signs of pesticide overdose in your pet can include vomiting, diarrhea, trembling, seizures and respiratory problems. Check labels carefully, advises Mullins, who now uses only non-toxic flea remedies on her cats and dogs. As for pet owners who apply these "registered" pesticide poisons to their pets, the California Senate Office of Research has warned against exposure to "registered" pesticide poisons during pregnancy or infancy, which may impair neurological development and contribute to childhood leukemia.

One infamous flea-and-tick repellent, Hartz Mountain Blockade, caused 26 known pet deaths in 1987 and at least 200 dog and cat poisonings. The EPA forced Hartz to list warnings about tremors and vomiting on the label, but Blockade, which contains the pesticides DEET and fevalerate, is still on the market. According to the Washington Toxics Coalition (WTC), an environmental organization working to reduce reliance on toxic chemicals, other active ingredients in anti-flea products include dichlorvos (or DDVP, found in Duokill, No-Pest, and Duravos), propoxur, diazinon and carbaryl nerve poisons that may cause adverse, long-term health effects in both pets and humans.

What doesn't appear on labels, due to "trade-secret" laws, are the *inert* ingredients - solvents and petrochemicals that make up to 90% of a pesticide's mix and are often toxic. These toxic substances include xylene, methyl bromide, benzene, asbestos, DDT (a by-product of the manufacture of certain pesticides) and toluene. The New York State Attorney General's office has listed some of the effects of toluene as including headache, abdominal pain, nausea, dizziness, drowsiness, hallucinations, anemia, liver disorders, central nervous system dysfunction and skin, eye and respiratory irritation. Many of these symptoms have been found among flea dip users in a survey conducted by the California Department of Health Services Hazard Evaluation System. **Before you use any pesticide, read all of the MSDS materials on the active and *inert* ingredients.**

The Cancer Prevention Coalition (CPC) (where Dr. Sam Epstein is chairman), lists the following products in their chronic health advisory column as containing carcinogens or neurotoxins, or both: Ace Hardware Pet & Home Flea & Tick Killer; Cardinal Flea & Tick Shampoo 118 and Shampoo for Cats and Kittens; Daltek Timed-Release for Cats and Kittens and Organic (sic) Flea Spray for Cats and Dogs; Enforcer Flea & Tick Powder, Shampoo and Spray; Flea Stop Pet; Four Paws Flea and Tick Shampoo and Foam Dry Bath.

Note: CPC measures all the above products in various ways. Some pose "minimal risk", CPC advises "caution" against using the others at all. "Minimal risk" doesn't mean you should use a product frequently - there can be cumulative effects," says Keith Ashdown, outreach director of CPC. For more detailed information, including exact names and product numbers, write CPC with your question or buy their Safe Shopper's Bible (520 N. Michigan Ave., Ste 410, Chicago, IL 60611).

## **FOLLOW-UP**

Practice proper and thorough sanitation, including daily vacuuming, exclusion and habitat reduction; be sure all negative ion plates are functioning properly; occupant education is essential both before and after flea pest management programs are conducted. Everyone must be well informed or they will not be motivated to carry through with the steps they alone can do. Flea infestations, often bring about emotionally charged situations — especially when anxieties prevail, such as when children are involved or the infestation is long term. You must be able to clearly and patiently explain the flea life cycle and how each stage is important. You must clarify how infestations can persist and that there may be no easy or quick solution. Where infestations are severe or where management procedures may not be completely carried out, a reinspection and possible retreatment should be scheduled before a rebounding population cancels out all of your previous work and their cooperative effort. **Vacuum thoroughly and clean/spray with diluted Safe Solutions Enzyme Cleaner and/or borax.**

## SUMMARY

Fleas are mainly parasites of mammals and birds. They undergo a complete metamorphosis. The eggs drop off of the host where they are deposited by the female during feeding periods. The larvae with chewing mouthparts hatch and feed on dried host blood — provided by the feeding female flea. Prior to pupating, the larva spins a small, loose white silk of the dried host blood, cocoon. The pupa molts to an adult inside the cocoon. Adults emerge from the pupal cocoon, find the host, feed by sucking blood, mate and produce eggs. The cat flea is the most common flea infesting dogs and cats in the United States.

Understanding the life cycle of the flea, the dependence of this pest on its host, and the importance of the dried host blood, is essential to flea control. **Clean/spray thoroughly with diluted Safe Solutions Enzyme Cleaner or their Pet Wash Nontoxic Shampoo or Not Nice to Bugs®.**

Removing dried blood and adult fleas by daily vacuuming, or better yet, weekly cleaning with rinse-and-vacs and diluted Safe Solutions, Inc. enzyme cleaners/peppermint soaps will control flea populations. Be sure you first read and understand all labels and labeling. **Never use any registered pesticides, even least toxic, without trying all of the alternatives first and then conferring with Get Set, Inc., 1-616-677-1261.**

## Specific Examples

### CAT FLEA

*Ctenocephalides felix*, Bouche

ORDER - Siphonaptera

FAMILY - Pulicidae

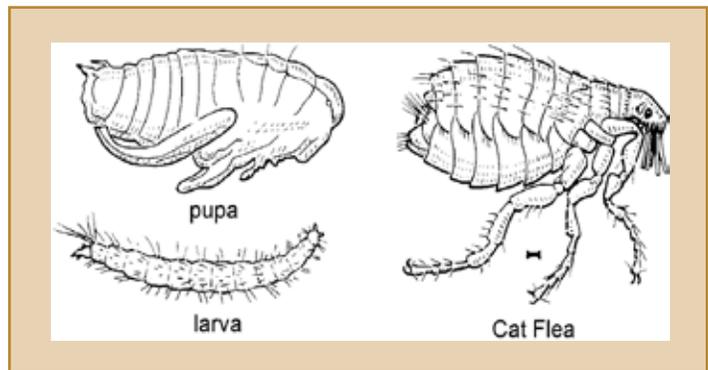
TYPE METAMORPHOSIS - Complete

### Egg

Cat flea production usually peaks during the night, coinciding with the normal sleep periods for pets. Cat flea eggs are white, short, ovoid objects. 1/50" long. Laid in dust, dirt or in the bedding of hosts. After feeding an adult female flea will usually lay up to several hundred eggs within three weeks, which can be seen by the naked eye. The cat flea may lay up to 800 eggs in its lifetime. Flea eggs develop in pet resting areas in warm humid climates. The tiny flea eggs are very smooth, oval and glisten. They do not stick to pet hair and are easily scratched or shaken off. When they fall on pet bedding furniture, carpets, etc., they shake down to the same level as the pepper-like dried blood (see larvae and adults). These eggs will hatch in one week to ten days. Wash bedding and carpeting with Safe Solutions, Inc. enzyme cleaners or eucalyptus, peppermint or lavender soaps. **Be sure to check a small area first for discoloration.** Worldwide, cat fleas have been found infesting more than 50 hosts.

**Larvae** - Flea larvae are tiny, worm-like, whitish (almost transparent) insects with a small brown head. When larval fleas hatch, they are only 1/6" long; after three molts, they grow to near 1/4" but are still difficult to see. The entire larval stage may take only one week under favorable conditions, or it may be prolonged into several months. They can easily be killed by sprinkling borax, salt or spraying salt water where they live. Cat flea hatched eggs and larval exuviae have been found to have a clumped distribution within household carpet. The spatial distribution of the immature stages are influenced by the habits of the pet host indoors. First- and second-instar larvae do not move far from the location of egg deposition and hatch. The movement of the larval stage is influenced by several factors in the environment, including pedestrian and pet traffic. The distribution of larvae in household carpeting is correlated with the sleeping habits of the host and egg deposition habits of the cat flea.

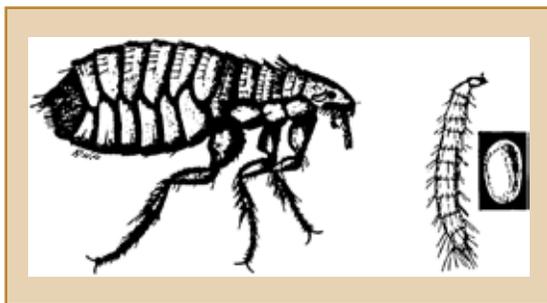
The legless larvae can disappear with remarkable speed (into carpets, pet bedding, etc.) moving by use of a pair of spines at their rear and long (but nearly invisible) hairs on each segment. Larval fleas are scavengers and do not suck the hosts' blood or live on hosts. Cat flea larvae have chewing mouthparts which they use to eat specks of dried blood (see adults). When they are full, the blood turns them to a near purple color. Like many



insects that live in large populations, e.g., pantry pests, mature flea larvae crawl away from the area where they developed, and work their way into cracks or under the edge of the pet bed, rugs, or carpeting. These mature larvae spin a loose, white, silken cocoon in which to pupate. The cocoon often gets covered with dirt particles and other detritus during its construction.

**Pupae** - Shortly after making the cocoon the flea larva molts and forms a white pupa, usually in a crack. The pupa becomes adult but does not emerge immediately, rather, it remains immobile in a form called the “pre-adult” until stimulated to leave the cocoon. This pupal stage is completed within one week to ten days, but the pre-adult form may remain in the cocoon for months. Various stimuli guarantee the flea will leave the cocoon only at a favorable time: being stepped on by the pet, carbon dioxide being exhaled by a host, or, encountering a sufficient number of warm, humid days. The adult flea is ready to feed as soon as it leaves the cocoon.

**Adults** - Wingless, adult fleas live on the pet and in the pet’s sleeping or resting area. Adult fleas are parasites - they obtain their nourishment from a host animal, usually mammals, e.g., cats, opossums, foxes and rats. Cat fleas have been recovered from about 70% of urban-trapped opossums and 30% of urban-trapped raccoons. They feed by biting and sucking blood, sometimes daily, for two or three weeks. Most feeding takes place while the pet is sleeping or at rest. Cat flea larvae cannot live without dried blood from the adults, therefore fleas are not evenly distributed throughout a home or building. Cat fleas can live up to 3 weeks or more on their host. These fleas, like most fleas, require 70° F. - 85° F. temperatures and at least 70% relative humidity in order to develop substantial infestations. Control either and you control these pests. Adults spend most of their lives on their host, but the bulk of their life cycle is off the host. Jump 8” high and as far as 13”.



**DOG FLEA**  
*Ctenocephalides canis* (Curtis)  
Family Pulleidae

**TYPE METAMORPHIS** - Complete.

The cat flea and the dog flea are two very similar and probably are the most common fleas which occur throughout the U. S. and are of the same genus. Cat fleas usually are more prevalent in North America than dog fleas and of all the fleas in existence

are the ones most likely to attack you in your own building, home and/or yard. Dog fleas are more common in Europe. Both of these ectoparasites prefer dogs, cats and, to a lesser degree, man as hosts, although they are less frequently found on a wide variety of other wild and domestic animals including man’s poultry and livestock, rats, opossums, raccoons and foxes. Dog fleas prefer dogs, but will also feed on rabbits and man. Under a microscope the front *tooth* of the cat flea is longer than the front *tooth* of the dog flea. The female flea lays her eggs either on or off the host animal, but most of the eggs laid in the hair drop to the floor and hatch into larvae which feed on any convenient organic material/debris found under rugs and carpeting, in floor cracks, cold air returns and similar areas. After feeding most fleas drop off and wait patiently for another host to pass by, preferring locations where dust and organic debris accumulate. They are frequently found in crawl spaces and houses, under buildings and in yards, although some do remain on the host at all times. They thrive in hot, damp, rainy weather. Both of these fleas (and the human flea) are intermediate hosts of the dog tapeworm, *Dipylidium caninum*, which is commonly found in both dogs and cats. Children, when playing with their pets, can easily become infested with this tapeworm by accidentally swallowing infested fleas. Dog eczema has also been associated with the presence of fleas. Wash with diluted Safe Solutions Enzyme Cleaner or Lavender or Peppermint Soap or use the Safe Solutions Pet Wash on your pet’s fur per label directions. Use Not Nice to Skin Irritations™. **Vacuum daily with a HEPA filter.**

Usually your first indication of flea infestation will be when you begin to see small dark insects or spots that jump. In fact, the best way to inspect for fleas is to wear white socks and walk around your home...watch closely for the fleas to jump on your white socks; also look closely in your pet’s bedding and fur...those white and black specks are flea eggs and/or your pet’s dried blood. The little insects may also be found when biting. Their most severe biting attacks seem to occur when you return from vacation. Your resident flea population will have grown and will be extremely hungry since you took all their hosts/food away. The typical human reaction to flea bites is the formation of a small, hard, red, slight raised bump with a pale, flesh-colored center; this itching spot (which may also bleed) will also have a single puncture point (caused by the flea’s mouthparts) in the center of each

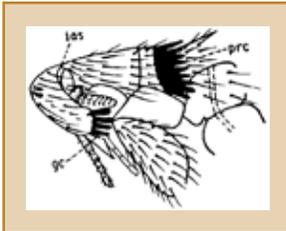
red spot. These characteristics distinguish flea bites from the bites and stings of most other insects. Spiders leave two marks when they bite. Mosquitoes, bees, wasps and bedbugs leave a large swelling or welt. The degree of reaction to each type of bite does; however, vary significantly from one individual to another and from species to species. It is not unusual for one person not to be bitten at all, while another family member may be covered with bites. Both the dog and the cat flea are intermediate hosts of the dog, tapeworm, *Dipylidium canium* (Linnaeus) which is a common internal parasite in both cats and dogs; people can become infected by swallowing an infested flea. Routinely clean or spray with diluted Safe Solutions, Inc. enzyme cleaner or natural soap or peppermint soap, or borax and/or citrus oil. **Don't forget to routinely vacuum with baking soda in the bag or rinse-and-vac with diluted Safe Solutions enzyme cleaner.**



**HUMAN FLEA**  
*Pulex irritans* (Linnaeus)  
Family Pulicidae

The human flea can still be found in buildings of all types throughout the United States and is the most common flea found in homes and upon man on the Pacific Coast. It can survive on human hosts exclusively but is also found on pigs and occasionally on dogs and other domestic and wild animals. This flea has been infected with plague in the laboratory and also is an intermediate host of the dog tapeworm. Because of its exceptionally strong legs, this was the "star" of the flea circus where it spent its life glued or wired to some object, which it either pulled for carried until its death, and was "paid" by being allowed to feed on its "trainer". Note: Several kinds of fleas usually imported from Russia, are still being trained

to jump through hoops, juggle and pull objects several hundred times their weight. Training begins with a fine silk thread or wire wrapped around the flea's neck, then with the aid of a magnifying glass the flea is first made to walk without jumping. Training is a tedious process, but because fleas are so adaptable, they can be trained to perform many ingenious tasks. The human flea bite can cause a severe allergic reaction in some people. The simple vacuum cleaner (which replaced damp mopping and dusting) has removed most of the dust, moisture and organic debris so necessary for its reproduction and, thereby, has greatly reduced this pest in most homes and offices today. **So routinely vacuum and/or rinse-and-vac with diluted Safe Solutions enzyme cleaner!**



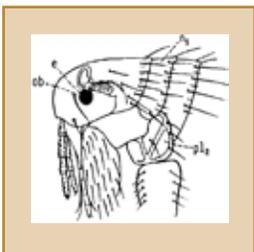
**EUROPEAN MOUSE FLEA**  
*Leptopsyllia segnis* (Schonherr)  
Family Leptopsyllidae

This flea is usually only found on rats in the Gulf states and in California and less commonly on house mice in the same areas. Where there are heavy infestations of rats, fleas can also become a problem indoors. **Eliminate the rodents.**



**NORTHERN RAT FLEA**  
*Nosopsyllus fasciatus* (Bosc)  
Family Ceratophyllidae

This flea commonly infests rats and mice throughout the United States and is the most common rat flea in the northern states. It may transmit bubonic plague organisms from one rat to another but does not usually bite man. **Eliminate the rats.**



**ORIENTAL RAT FLEA**  
*Xenopsylla cheopis* (Rothschild)  
Family Pulicidae

The Oriental rat flea is the chief carrier or vector of the casual organisms of urban (bubonic) plague (bacilli) and murine typhus (rickettsiae). It was originally most common in seaport towns where it has been introduced by both the Norway and roof rats, but now it can also be found throughout most of the United States. It is one of the most abundant rat fleas in the southern states and in southern California. While its preferred hosts are the

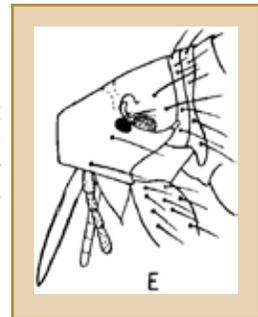
rat, mouse, cottontail rabbit and California ground squirrel, it does occasionally bite people. Murine typhus is an illness of rats, while plague attacks most wild rodents, e.g., meadow mice, field voles, ground squirrels and prairie dogs. Both can be transmitted to man via this flea. **About 600 years ago this “little” flea took the lives of over 40 million Europeans.**



**STICKTIGHT FLEA**  
*Echidnophaga gallinacea* (Westwood)  
Family Pulicidae

The Sticktight Flea is noted for its habit of clinging tenaciously to its host and is normally found only in the southern and southwestern states where it is a pest of poultry, cats, dogs, rats and horses, but it has also occasionally been found embedded in the skin of human beings. Adult females attach themselves firmly to the host, creating ulcers on the head or neck of domestic and/or wild birds, on

the ears of dogs, cats and rats, and almost anywhere on man. While the adult females remain attached to the host throughout their life, the larvae do drop to the ground to feed on organic matter so that all stages can be found in poultry yards and surrounding buildings. This flea has also been found infected with plague and with murine typhus. The fact that the female normally lives on only one host, however, reduces its importance as a primary vector of these diseases. **SPECIAL CONTROL NOTE: ROUTINELY AND THOROUGHLY CLEAN** the floors of all poultry houses with diluted Safe Solutions enzyme cleaner and/or borax; remove and bury (under the soil) all droppings/manure. Rub an oily substance, e.g., petroleum jelly, on to the stationary fleas which covers their spiracles causing them to die by suffocation, or spray them with diluted enzyme cleaner. Spray the ground with salt water.



**CHIGOE FLEA, a/k/a “chigger” or “jigger”,** actually burrows into the superficial layers of the skin. This is not a true chigger. True chiggers are trombiculiform mites.

**GROUND SQUIRREL FLEA**  
*Diamanus montanus* (Baker)  
Family Ceratophyllidae

This flea is responsible for transmitting many bubonic plague cases in our southwest. It is found on ground squirrels throughout the West.

**INTELLIGENT PEST MANAGEMENT® MEASURES**

**Preventing fleas infestations is always easier than removing them.** The simplest and least expensive way is simply not have pets or only to keep them inside or outside at all times. It helps not to let your pets roam freely. Remember to keep your pets and their bedding clean at all times and to comb your pets with a flea comb at least weekly, especially during warm weather. Flea combs have very close teeth which remove fleas from your pet. Most pets love this attention. Dip the comb in hot, soapy water or diluted enzyme cleaner to kill the fleas you “catch”. If you choose to use dangerous flea collars you must replace them on pets about every 3 months. It is better, however, and safer to wash your pets weekly with Safe Solutions Pet Wash (nontoxic shampoo) or wash them with a natural soap and a mixture of orange oil (which is available at health food stores), or Safe Solutions Enzyme Cleaner with Peppermint as an aid in flea destruction. Please note that many pets and people can get skin irritations and other health problems because of their exposure to the poisons in organophosphate flea collars and other direct applications of toxic insecticide poisons in sprays, dusts, shampoos or dips. If so, please spray Not Nice to Skin Irritations™ until the condition improves. Proper control of fleas always involves controlling the fleas on your pets as well as controlling them in the infested areas of your home. There are many veterinarians who still recommend weekly applications of a lightly misted flea spray containing Precor, which is an insect growth regulator, IGR, and/or sprays containing pyrethrins and piperonal butoxide as a *control* especially during the peak flea months in your area. Some pet owners have told us they have had success using diluted enzyme cleaner with peppermint or Avon’s Skin-So-Soft lotion or Safe Solutions Pet Wash directly on their pets or in their pets’ bath water for safer flea control on their pets. There are many kinds of home and commercial flea preparations available for flea control on pets, but we suggest you check with your veterinarian and follow his/her

professional advice. Great care must be taken, however, especially in the case of cats as they lick themselves and might swallow enough insecticide poison or shampoo to damage themselves. Please note there are many skin problems which can make your pets scratch, (as though they had fleas) that are caused by other factors, e.g., over-bathing, diseases, etc.; this is why it is wise to see several veterinarians before treating your pet for imaginary fleas with poison. Be sure you read the MSDS for all active and *inert* ingredients before poisoning your pet. Try spraying Not Nice to Skin Irritations™ first.

## CULTURAL, PHYSICAL CONTROL AND SANITATION

**To control fleas in your building, all infested debris inside should be routinely removed, all infested furniture, carpets, rugs where your pets lie and all the bedding where your pets sleep should either be daily vacuumed thoroughly, steam cleaned or washed with a rinse-and-vac with natural or diluted peppermint soaps or diluted enzyme cleaners and borax or (if extremely old or damaged) simply thrown out and burned. Remember to clean up all animal manure and organic debris on the ground, especially outside around kennels and poultry houses and then bury it. Whenever fleas are visible they may be trapped easily by quickly dabbing a moistened cake of soap onto them.** If you want immediate relief, have your floors and carpets steam cleaned. The heat of the steam will kill all life stages. Heavy rains and/or over-watering will drown larvae in yards. Routinely spray with Not Nice to Bugs® and/or clean with diluted enzyme cleaner with peppermint and/or natural soaps with or without borax or citrus oil as needed. Screen vents, chimneys and porches to keep nuisance wildlife out.

**HARBORAGE POINTS** - Fleas frequently inhabit yards, crawl areas, basements, living quarters, attics and chimneys. All stages may be found indoors and outdoors. Indoors they may be found in floor cracks, under baseboards, under rugs, and in almost any concealed place. Adults feed on all warm blooded animals, e.g. rats, mongoose, dogs, opossums, foxes, coyotes and people. They are most active in warm, moist weather. Fleas can jump about 6" vertically and can easily hitch a ride into the building on humans. Usually, however, fleas are found where animals sleep, travel or frequent. Fleas will normally die if temperatures are kept at 95° F. for more than a few hours. Thorough vacuuming daily (with 2 tablespoons of corn starch or baking soda in the bag) for several weeks should control all populations by removing flea eggs, food sources, adults, cocoons and larvae. Vacuuming also stimulates adults to leave their cocoons. Wash all infested bedding in hot, soapy water at least once a week. Daily vacuum rugs, carpets, furniture, cracks and crevices around baseboards and cupboards and cold air returns. Fleas can not only survive but develop within dry vacuums so discard bags daily or add 2 tablespoons of baking soda, talcum powder or cornstarch (before you begin) or remove the bag (when you finish) and heat it in the oven or place them inside a black garbage bag and leave in the direct sun for a few hours, or simply burn or seal in plastic and dispose of in the trash. If you must spray, use diluted Safe Solutions, Inc. enzyme cleaners or peppermint or eucalyptus soaps, or a short-term or knock-down Pestsafes® such as cedar oil, citrus oil or peppermint, lavender or eucalyptus oil. Be sure to remove wild animals from the building and/or prevent their further access. Once an area has been treated for cat fleas, periodically monitor/inspect for reinfestation. Remember to thoroughly vacuum floors, carpets and furnishings on a regular basis. Carpeted areas where pets sleep should be vacuumed daily for at least several weeks. Pets can also be carefully inspected and treated or combed to remove fleas regularly. Pet bedding should be laundered weekly in borax - more often in warm weather. Thoroughly clean items brought into the building, such as used carpets or upholstered furniture, to prevent this from being a source of flea (re)infestation. **For long-term control, dust or spray borax, then spray hot water again, let dry and thoroughly vacuum.**

**INTELLIGENT PEST MANGEMENT® CONTROLS** - Install negative ion plates. Wash, spray, mop and/or rinse-and-vac and/or launder with Safe Solutions Pet Wash, diluted Safe Solutions enzyme cleaners, Basic H, lavender, eucalyptus or peppermint soaps, or any natural soap, and/or lightly dust with talcum or medicated body powder or baking soda or food-grade DE. Cat flea larvae die after exposure to a temperature of 103° F. for only one hour. Remove and clean or destroy pet bedding, or steam clean everything. Check attics, chimneys, basements and crawl areas for dead rodents, birds or other animals as well as any animal nests. This type of debris must be promptly removed and properly buried and/or destroyed. If rodent infestation is a problem, it must be controlled before any satisfactory results with flea control measures can be achieved.

A proper and sustained vacuuming of floors and carpets is essential for good flea control (waxing floors also smother fleas and eggs). Adult fleas will be found in the carpet and flea larvae can be found either firmly attached to the carpets or in the cracks between boards. Fleas can also be found on upholstered furniture, so vacuum

these thoroughly too. A new patented process introduces sodium polyborate (a borax salt) into carpets to kill fleas by dehydration and blockage of their digestive tracts. This borate salt (another form of borax or boric acid) remains effective in carpets for at least one year. Push it deep into the carpet nap by spraying the carpet with another tank of hot water. An alternative control: try lightly dusting with talcum powder or mix 1 cup of baking soda, 1 cup of corn starch and 30 drops of pennyroyal or rosemary. Let dry, sprinkle on the carpet and/or floor, then brush into carpet, wait several hours and then vacuum. Use a steam cleaner to “vaporize” them to oblivion.

**As with all controls - test first on a small area.** Desiccating insecticidal dusts such as Safe Solutions food-grade diatomaceous earth (not the swimming pool filter kind) are also used for flea control. Talcum powder and/or any of these fine dusts are also irritating to people and pets as well and should not be inhaled, so use only with extreme care. Routinely use a “rinse and vac” to clean and wash and spray with diluted enzyme cleaners, peppermint soaps or any natural soaps. Remember to clean water bed liners with diluted enzymes or diluted peppermint soap or with borax or chlorine bleach and/or the areas between the liners and the water bed - these areas harbor and incubate fleas.

Any number of herbal flea control products are available commercially. Do not forget to replace them frequently. **Try a little bit first to make sure you or your pet are not allergic.**

**NOTE:** As few as 2 - 7 chlorpyrifos-containing flea poisons/dips or shampoos per day have been calculated to contaminate a sewage treatment system serving 400,000 residents [Regional Monitoring News, Winter 1995-6]. **Just one more reason not to use these “registered” poisons!**

**Only as a last resort** treat infested structures with diatomaceous earth or a liquid residual, e.g., insecticidal soap and/or citrus oils, e.g., D-limonene (associated with cancer) and linalool which are citrus-peel extracts. Products that contain d-limonene kill larval and adult fleas, while those containing both ingredients kill all flea stages. You can make your own citrus-based flea repellent by simmering a quartered lemon or orange in a pint of boiling water for 24 hours. Cool and dab the liquid on to repel fleas. As a last resort, the IGR’s methoprene (FleaTrol®, Precor®) and fenoxycarb (Torus®) can also be applied as liquids or as an aerosol to areas of potential flea development, e.g., carpets and pet bedding. They arrest the growth of the flea at or before the pupal stage, preventing development of fleas to adulthood for months after a single application. **Caution: Fenoxycarb may have an oncogenic (tumor-causing) potential.** The insecticidal properties of the naturally occurring fatty acids used to make soaps have been refined and are useful in the battle against fleas. These soaps are virtually non-toxic to mammals, and they biodegrade rapidly after application. Safe Solutions Pet Wash (nontoxic shampoo) can be used to bathe flea-infested animals and to wash bedding. Another enzyme product, Safe Solutions Enzyme Cleaners, composed of natural enzymes and surfactants can be used with or without borax, and can be used to spray rugs, pet bedding, floors and other areas where the pet may have dropped fleas, flea eggs or where young fleas may be living as they mature into adults. Better yet, simply routinely vacuum daily. **Be sure any surfaces you are treating are not harmed by your sprays.** Concentrate any treatment or control on floor cracks, furniture and secluded areas where fleas might harbor. Since all rooms may be infested, thoroughness is essential. **Be sure children and pets can not ingest borax or any boron products.**

If your spot applications fail, apply a light fan spray of Not Nice to Bugs® or diluted enzyme cleaner to the entire surface of carpets, floors and furniture. Crawl space areas can also be treated as a last resort with liquid formulations of enzyme cleaner and borax or any salt you choose. Try diluted enzyme cleaners or peppermint or eucalyptus soaps first to remove blood, debris and fleas. Remember, if you want to try any synthetic pesticide poisons, they are not only dangerous but they are not very effective. Fleas have no resistance to natural enzymes or borates either as borax, boric acid or disodium octoborate tetrahydrate or virtually any salt. Borates contaminate the adult feces which the larvae eat and then die. Be careful not to contaminate food, toys or water. **A moist, protected environment is required for larval development; a relative humidity of less than 75% or over 95% is often fatal, so properly install and use a fan and/or a dehumidifier or air conditioner.**

**Follow label directions very carefully.** Most volatile, synthetic pesticide poison *residuals* cannot be legally or safely used to treat entire surface areas, nor do we recommend their use at any time - so only use Pestisafes® or other least-toxic materials, especially if it is determined the fleas present an imminent health hazard to people. **Outdoors,** organic matter can temporarily harbor fleas while they are off the host. Either bury, dry out or heavily water these areas to kill the eggs and larvae. These areas may also be treated with diluted enzyme cleaners, salt water or eucalyptus or peppermint soap, natural soap or borax. Remember to routinely clean up and properly dispose of all organic wastes and debris and if you use any pesticide products - be sure not to violate the label. **Attic spaces would not normally need to be treated unless animals have access to the attic.** If the attic

needs to be treated, it can also be done with very careful applications of least-toxic treatments of liquid, e.g., diluted Safe Solutions Enzyme Cleaner with Peppermint, salt water or natural soap with borax.

### WAYS TO REDUCE FLEAS ON PETS THAT LIVE IN BUILDINGS

TECHNIQUE	EFFECT
<b>INTERIOR HOUSEKEEPING</b>	
Thoroughly vacuum areas where pets sleep or spend time on a regular basis daily for at least several weeks.	Removes eggs, larvae, adult fleas and skin debris. Also removes adult flea excrement and dried blood that provides food for larvae.
Use a steam cleaner or rinse-and-vac with natural soap or diluted enzyme cleaner or peppermint or eucalyptus soap with borax or citrus oil in soap.	Immediately kills the eggs, larvae and adult fleas in addition to removing the same materials a dry vacuum does, only better.
Keep pets out of carpeted areas and other hard-to-clean areas (such as closets).	Makes housekeeping functions that reduce fleas easier to perform.
Launder pet bedding on a weekly basis with diluted enzyme cleaner or soaps and borax.	Kills adults, larvae and eggs. Eliminates skin debris and hair.
<b>EXTERIOR MAINTENANCE</b>	
Closely mow grass, destroy weeds and trim shrubbery. Perform weekly as needed. Spray with nematodes.	Exposes eggs and larvae to more sunlight and kills them. Search out and destroy flea larvae.
Irrigate areas surrounding buildings on a regular basis.	Kills eggs and larvae. Add salt or enzymes if needed.
<b>PET CARE</b>	
Bathe pets on a regular basis (2-4 times a month during peak flea months) with Pet Wash.	Soap or enzyme water will kill and dislodge loose hairs and skin debris that serves as food for larvae.
Groom pets daily, using a fine-toothed flea comb. Good technique for cats. Dip comb in soapy water or diluted enzyme cleaner or peppermint soap.	Removes adult fleas and eggs. Removes loose hairs and skin debris.
Confine pet to single indoor sleeping area.	Keeps fleas confined to localized area where control efforts can be concentrated.
Spray pet and sleeping areas with diluted enzyme cleaner. Use Safe Solutions Pet Wash.	Helps to reduce numbers of fleas attacking pet.

**Caution Note: Many essential oils and/or commercial poison shampoos or sprays cannot be used safely on cats. Most over-the-counter pet shampoos, soaps, dips, sprays, powders and collars often contain very dangerous synthetic pesticide poisons, e.g., organophosphates or carbamate poisons. Use only as a last resort. If you must use something try the Safe Solutions Pet Wash (nontoxic shampoo), diluted Safe Solutions Enzyme Cleaner, citrus oils, nematodes, flea combs, vacuums, traps, baking soda, talcum powder, food-grade DE, and then IGR's or other poisons as a last resort.**

## INTELLIGENT PEST MANAGEMENT® OR LEAST-TOXIC FLEA CONTROL SUMMARY

- 🐾 **Routinely monitor** population levels and keep a log of your (and the occupants') observations.
- 🐾 **Restrict** your pet's access inside your home or to your yard.
- 🐾 **Vacuum on a weekly basis** during the year and then vacuum **daily** in late summer and early fall when flea populations increase. Dispose of the *filled* bags by sealing in a black plastic bag and/or placing in the freezer for a few days or in a sunny location outside in a black plastic bag to "cook", or put 2 tablespoons of baking soda in the bag. Salt or saltwater will kill/desiccate immature fleas (salt also kills plants). Safe Solutions Enzyme Cleaner can be used to clean the floors at a rate of 2 oz. per gallon of water.
- 🐾 **Weekly remove and wash** all bedding and rugs with which pets come in contact with Safe Solutions, Inc. enzyme cleaners and borax. Spray with Not Nice to Bugs®.
- 🐾 **Flea comb** your pet regularly. Dip the comb in soapy water or diluted enzyme cleaner.
- 🐾 **Bathe your pet with Safe Solutions Pet Wash if the flea population starts to build up.**
- 🐾 **Only if the above procedures are insufficient, try an insect growth regulator (IGR) or borax** formulation to prevent adult flea emergence.
- 🐾 **Spot treat infested areas** indoors/outdoors with Not Nice to Bugs® or diluted Safe Solutions Enzyme Cleaners or peppermint, lavender, or eucalyptus soaps, natural soaps, insecticidal soap, salt water and/or an IGR or a least-toxic product following the label instructions carefully and protecting yourself and others while applying them. Try spraying the carpet and lawn with natural soaps or diluted enzyme cleaners with peppermint at a diluted rate of 1 oz. per quart water. The *Heterohabditis bacteriophora* or *Steinernema carpocapsae* nematodes can also be used to control fleas. Ants will also eat fleas and/or larvae. **Be sure you thoroughly vacuum.**
- 🐾 **Try a professional steam-cleaning, enzyme- or boron-based cleaners and/or soaps and daily vacuuming and/or negative ion plates and/or a steam cleaner first. Boron is toxic if ingested.** Powdered boric acid is about twice as potent as the boric acid salt, disodium octaborate tetrahydrate (DOT) or borax, in killing flea larvae, and less than 7 oz. of DOT per 1,000 sq. feet will kill better than 90% of all carpet-infesting flea larvae for at least a year. Respray with hot water, let dry and be sure to thoroughly vacuum.
- 🐾 Use neem oil or Azadirachtine or some other natural insect repellent on your clothes.
- 🐾 Diluted borax, ocean or salt water will kill fleas and plants and will rust iron.

**FLEA TRAPS** - Note: You can make inexpensive/effective flea traps by placing a sticky trap or a soapy water filled bowl or shallow cake pan directly under a night light using a small 4 watt bulb or Christmas tree light. The light will attract the fleas. You can also attract fleas to the soapy water or glue with a small piece of dry ice suspended 1' - 2' over the trap/saucer. In the past I have seen people place a lit (votive) candle in the middle of a saucer filled with soapy water. Heat and/or carbon dioxide attract the fleas; when they jump into the flame, soapy water and/or sticky trap, they are safely destroyed. Note: A "square" shallow trap or pan will fit better against a wall (under the night light) than a round bowl. Daily replace the soapy water; flush the old down the toilet. A recent Kansas State University study of the efficacy of flea traps initially gave very disappointing results. In a 10 by 10 foot room, after 20 hours, the flea traps only caught 12% of the fleas that had been released. Then when the color of the light bulb was changed (from white to yellow-green), the flea catch increased to 28% of those released. The best results, though, occurred when the light was put on a timer so that it was on for 5 to 10 seconds alternating with 5 to 10 seconds off. Under this regime, 87% of the fleas were trapped on a glue board during the 20-hour trial. Perhaps the intermittent light simulates a cat or dog walking by to be "attacked".

## FINAL COMMENTS ON YOUR PET'S FLEAS

**Allergic Reactions** - Many pets are allergic to fleas, and violent skin eruptions result from just one bite. When a flea bites an animal it injects saliva that causes the production of anti-prostaglandins in the animal's bloodstream, bringing about the allergic response. Allopathic medicine prescribes a cortisone product administered orally. In holistic medicine, evening primrose oil (EPO), an edible supplemental oil from the seeds of an evening primrose plant, is an effective natural remedy, normally without side effects. Orally administered, EPO restores the prostaglandin level in the bloodstream and neutralizes the allergic reaction. Four to six 500 mg. capsules (depending on the size of your dog) can be given daily to dogs until symptoms are relieved or as a preventive measure for sensitive animals in flea-ridden areas. Cats require smaller doses (two to three capsules daily). A new once a month oral flea product will soon be available for use in your pets. Its advantage over previous

flea controls is that it sterilizes flea eggs and larvae, thus breaking the life cycle (85% of the flea population consists of eggs and larvae). It is important to remember that flea prevention is always easier than fighting an established problem. The mineral zinc can also comfort your pet during flea infestations. Supplemented in your pet's food (10 to 15 mg. daily for dogs and cats), it can help relieve itching and dandruff associated with flea bites and resultant allergies. Safe Solutions Pet Wash or diluted enzyme cleaners give relief from itching and kill fleas. Another alternative is to wash your pets well with warm water and natural soap and/or Skin-So-Soft, diluted peppermint soap and/or eucalyptus soap; then rinse with a herbal rinse - put 2 pounds of fresh or dried rosemary in a 1/2 pint of boiling water - steep 20-25 minutes, strain and allow to cool - then rinse pet - do not towel dry because it will remove the residue - make sure pets are dry before letting them go outside. **Be sure you and your pet and carpeting do not react to any of your treatment choices and spray them with Not Nice to Skin Irritations™.**

**Flea Control is Big Business** - The July 1998 issue of Pest Control Technology noted: In 1997, the pest control industry did about \$350 million in flea control work. This represented only 4% of the total dollars spent by pet owners on flea control and flea related problems - that's nearly \$9 billion dollars! Included were treatments for flea dermatitis, secondary skin irritations and flea allergy dermatitis. Nearly half of this total - \$4 billion - was spent by the pet owners on do-it-yourself products. More than half of all U. S. homes have pets. Of these, 70% of the dogs and 55% of the cats have or will have fleas.

**Intelligent Pest Management® Flea Control** - Essential oils extracted from plants, are effective natural substances that can be used to fight flea infestation. As essential oils are extremely concentrated, keep in mind that even though they are natural extracts, they are organic chemicals and some are potential toxic, so carefully use them only in minute quantities. Topical use is generally safe, as long as the oils are mixed in an appropriate base, e.g., aloe vera nectar, which is anti-inflammatory, anti-fungal and helps regenerate skin cells. Aloe vera soothes itching associated with flea bites and other skin ailments, thereby facilitating therapy as well as being the ideal base for essential oils. Calendula ointment is an excellent insect repellent and counterirritant. You can make an effective flea repellent by mixing 10 drops of the essential oil of cedar leaf (not bark) in a half-cup of aloe vera nectar and pouring the mixture into a spray bottle. Shake well before spraying. Two spray applications are generally required to rid an animal of a major flea infestation, but the spray can be applied as a preventative daily during peak flea season. You can normally use this formulation on cats, dogs and other companion animals of any age. Garlic taken internally is sometimes effective in preventing flea infestations as it contains 75 sulfur-containing substances that are in part eliminated through the skin and breath, thereby repelling fleas. As previously noted, a flea comb allows you to pick up fleas and their eggs by wedging the tiny pests between the teeth of the comb. You can slow down the fleas by diluting 10 drops of essential oil of thyme or basil in a half-cup of aloe vera nectar. Spray the solution on the area you are grooming to sedate the fleas, making them easier to catch with your flea comb. To prevent fleas from jumping back onto your pet; immediately dunk the comb into a bowl of soapy water. Make a flea collar by soaking a leather strip or absorbent cotton rope in essential oils of pennyroyal, eucalyptus, peppermint, cedar or citronella for 24 hours. Re-soak every couple weeks. Herbal pillows or collars can be made of mixtures of oregano, pennyroyal, bay leaf, vetivert, eucalyptus, thyme, cedar, rosemary, rue, sage, sassafras and/or wormwood and placed where the pet(s) sleep. Diluted Safe Solutions Enzyme Cleaners and/or Pet Wash and/or Skin-So-Soft® or Not Nice to Bugs® will safely and quickly control fleas everywhere. Neem oils, sprays, and powders also will control fleas when sprayed or dusted. Salt or salt water have been used to kill immature fleas "forever" - but they will also kill plants. Using steam cleaners and dry ice or carbon dioxide or Alka-Seltzer on glue boards can be used to control fleas as well.

**Natural Plant Caution** - Many aromatic compounds produced by plants are hepatotoxic. Pennyroyal contains pulegone, a hepatotoxic monoterpene that can damage the liver and depletes glutathione. Dogs treated with pennyroyal oil have had acute illness, vomiting and death. Flea dips containing d-limonene when not properly diluted have produced necrotizing dermatitis with sloughing of the skin. Cats are particularly sensitive to crude citrus extracts and even the refined linalool and d-limonene extracts with toxicosis resulting in hypersalivation and ataxia. Eucalyptus is toxic when ingested. Citronella can also be toxic in large quantities. Melaleuca (tea tree) oil primary toxicosis is characterized by depression, muscle tremors and weakness, incoordination and contains a number of sensitizing compounds that can cause contact dermatitis.

**Boron Caution** - while sprinkling carpet and/or mopping the floors with borax and/or any other boron product, e.g., sodium borate (DOT), will control flea infestations for up to a year - but, be very careful not to let babies, pets or others eat or ingest these toxic materials that can cause diarrhea and even death when consumed. If

you sprinkle borax on the carpets, remember to “sweep them in” with a broom and then thoroughly vacuum the next day. **We do not advise crawling children be allowed on floors treated with sodium borate, boric acid, DOT, Mop Up®, borax and/or any other boron product. Rinse the Pet Wash from your pet.**

**DE Caution** - DE can dry out a pet's skin, so use it lightly.

**One more volatile, synthetic pesticide poison caution:** Although childhood cancer is rare - accounting for only about 2% of all cancers diagnosed among all age groups - it is still the leading cause of disease-related death among U. S. children. Each year, approximately 8,000 children in the U. S. under the age of 15 are stricken with cancer, and this rate appears to be increasing by approximately 10% annually. While many believe that there may be a link between childhood cancer and pesticides, there is little information to draw from regarding chemical (poison) exposures and toxicity to children. Three recently published studies shed some additional light on this problem.

In a study published in October 1997, researchers reviewed 31 studies between 1970 and 1996 and looked at the relationship of childhood cancer to exposure to pesticide poisons as a result of a parent's occupation or home use. Although many of the studies had limitations that restricted definitive conclusions, researchers found that several studies indicated that pesticide poison exposure may be linked to an increased risk of some childhood cancers. Occupational pesticide exposure of parents was associated with an increased risk of Wilms' tumor, Ewing's sarcoma and germ cell tumors. Other studies found that frequent occupational exposure or home pesticide poison use was more strongly linked to both childhood leukemia and brain cancer than either *professional* extermination in the home or use of garden pesticide poisons. In addition, living on a farm was associated with increased risk of several childhood cancers.

Another study, “Household Pesticides and Risk of Pediatric Brain Tumors,” followed up an earlier study of childhood brain cancer conducted on the west coast of the United States. Researchers focused on families in Los Angeles County, California, who participated in the original study. Families were asked about exposure to pesticide poisons used for termite control, ants and roaches, garden pests (including weeds), lice treatments, and flea and tick control. Questions were also asked about what precautions were taken during pesticide use in the home. When researchers analyzed both prenatal and childhood exposure, they found a significant relationship between pediatric brain tumors and prenatal exposure to flea and tick products, especially among children diagnosed at less than five years of age. Risk was higher when the mother was directly involved in preparing the (poison) product, applying it and cleaning up, and was primarily related to sprays or foggers rather than shampoos, powders or collars. Researchers also found that risk was significantly increased when family members remained in the house after spraying or dusting for pests and if pesticide label instructions were never followed. The study calls for additional research into potential cancer risks of specific chemicals (toxins) used in household pesticides (poisons), particularly those used in flea and tick sprays and foggers.

A third study is part of a continuing effort to improve understanding of children's pesticide poison exposure in agricultural settings. Children up to six years of age who lived with pesticide poison applicators in an agricultural region in central Washington State were monitored for increased risk of pesticide poison exposure. Urine samples were collected from 88 children and tested for breakdown products from organophosphate pesticide poisons used in the region during the testing period. The results indicated that children of poison applicators had higher levels of exposures than did other children in the same community. Age of the child also appeared to play a role in exposure - younger children had higher levels of exposures than their older siblings. This may be due to behavioral differences such as more hand-to-mouth behavior among younger children. As researchers anticipated, the study found that the closer a child lived to an orchard, the greater the exposure.

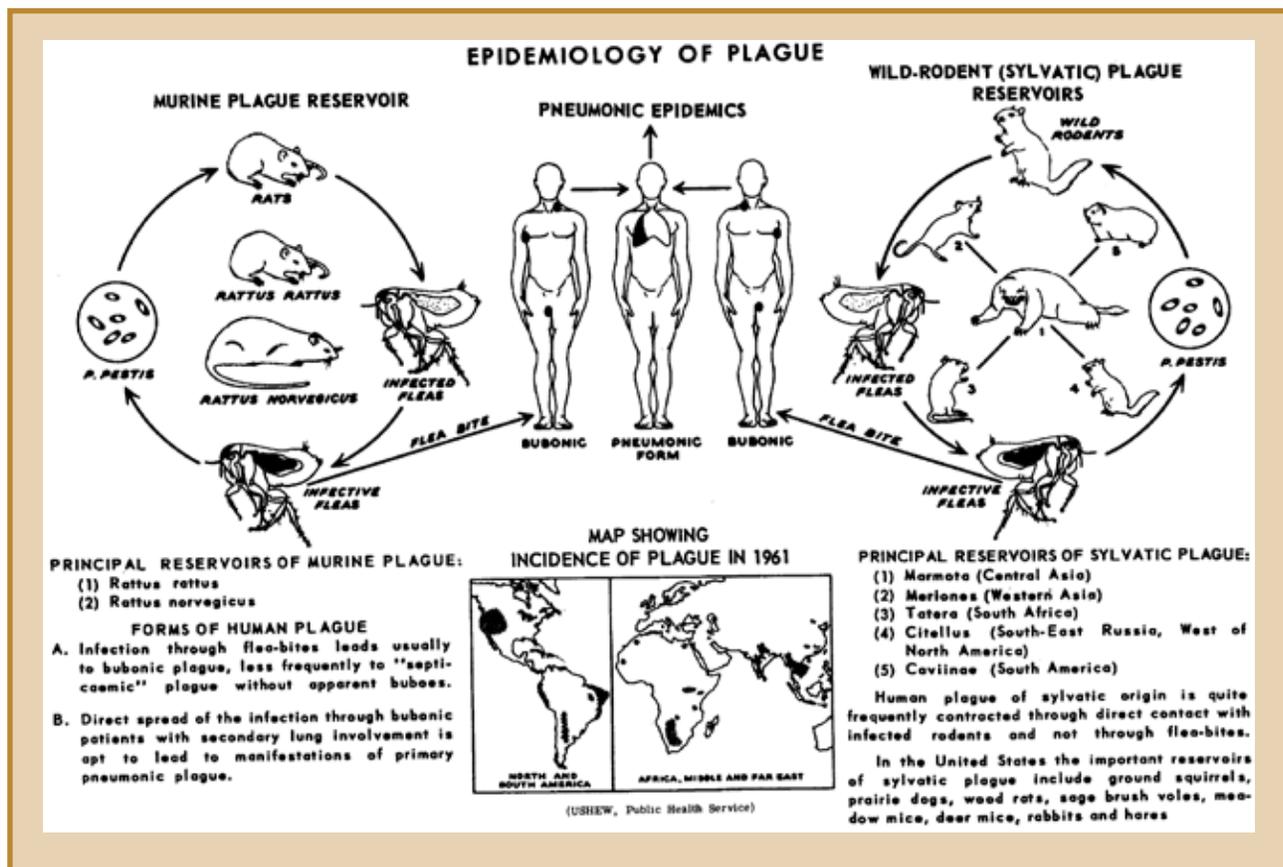
Sources: “Childhood Cancer: A Growing Problem,” Environmental Health Perspectives, January 1998.

Julie L. Daniels, et al., “Pesticides and childhood Cancers,” Environmental Health perspectives, October 1997.

Janice M. Pogoda and Susan Preston-Martin, “Household Pesticides and Risk of Pediatric Brain Tumors,” Environmental health Perspectives, November 1997.

Carrie Loewenherz, et al., “Biological Monitoring of Organophosphorus Pesticide Exposure among Children of Agricultural Workers in Central Washington State,” Environmental Health Perspectives, December 1997.

Contact: PANNA



Note: Please remember that a normal flea population contains only about 1% biting adults; the rest of the population contains 35% eggs, 55% larvae and 9% pupae. **It is this 99% non-biting population that your IPM controls must address.** Flea larvae desiccate quickly at relative humidity levels below 50% and survive only in shaded, moist areas where mammals spend regular hours. Regular and thorough vacuuming puts considerable stress on the entire population. Most fleas are very susceptible to freezing temperatures and/or salt and/or diluted enzyme cleaner solutions and/or Not Nice to Bugs®. **Use several IPM techniques to totally destroy the entire 100% of the population.**

A fly and a flea got caught in a flue -  
 Said the fly: "Let us flee."  
 Said the flea: "Let us fly."  
 So together they flew through  
 a flaw in the flue.

### Fleas - Typical First Strikes by Housekeeping and Maintenance

1. Steam clean or vacuum thoroughly every day for two weeks (and on a regular basis throughout the year) and/or mop with ½ cup borax per gallon water or wash or rinse-and-vac floors or spray with diluted Safe Solutions Enzyme Cleaner with Peppermint. Use a steam cleaner weekly to clean carpets, floors and furniture. If you spray carpet with 1 gallon of a 2% solution of borax, boric acid or sodium borate per 2,000 sq. feet - and then respray with another gallon of hot water you will take the toxic material (crystals) down to the nap. **Remember to test spray a small area first and be sure to launder all pet bedding regularly.** Remember that vibrations from walking and vacuuming will stimulate new adult fleas to emerge from their pupal sacs - so vacuum again in one hour. Spray with Not Nice to Bugs® **Keep infants off floors.**
2. Mop or spray the floors with 2 oz. per gallon water or spray 1 oz. per quart diluted Safe Solutions Enzyme Cleaner with Peppermint and/or ½ cup borax per gallon water. Spray yards and crawls with 1 oz. per quart diluted Safe Solutions Enzyme Cleaner with Peppermint or salt water (salt water will also kill plants). Sprinkle gardener's lime or salt. Repeat as needed. **Salt and/or borax will also kill plants.**

3. The oldest form of flea control was to catch the flea, place it between your thumbnail and forefinger nail and press until you heard a nice pop. As each flea female can lay one egg an hour, this may not be a very practical or “easy” job. Make some knee-high flannel boots that fit over your shoes and pant legs. Fleas will jump on and become entrapped in the nap long enough for you to monitor and/or vacuum them up. You could also use duct tape (sticky-side up) to trap them. Lightly sprinkle baking soda, borax, food-grade DE and/or talcum; leave on overnight and then vacuum. **Routinely remove dust and debris and caulk and/or seal all cracks, crevices and other openings.**
4. Steam clean and/or rinse-and-vac with diluted enzyme cleaners and/or borax. This will remove dried blood, carpet fibers and other debris, diluted excrement, some flea larva and their silk, eggs, pupal cocoons, adults, feces and other food sources. Note: Most flea larvae coil themselves around carpet fibers and are not easily removed. **Carpet is the perfect flea environment!**
5. Spray pets with (1 oz. per qt. water) Safe Solutions Enzyme Cleaner with Peppermint or bathe them in Safe Solutions Pet Wash and wash bedding weekly in their enzyme cleaner and borax.
6. Use a hose-end sprayer and spray the yard with nematodes or with (2 - 4 oz. per gal. water) of enzyme cleaner or citrus-based oils or soaps or dust with neem seed powder to control outside flea sources. Note: 90% of opossums in urban Midwest areas are infected with fleas. Hot summer temperatures (especially when dry) normally prevent fleas from developing. Only shady and moist areas need to be sprayed.
7. Put a goose-neck lamp 8” - 10” (with a green light) over a pan of “fizzy” seltzer water with a few drops of dish soap at night. The fleas are attracted to the heat and carbon dioxide and drown.
8. Heat the area to 103° F. for 1 hour. Reduce the relative humidity. (Larvae need a moist area to survive.)
9. Routinely clean and mop with 1 oz. of Safe Solutions, Inc. Enzyme Cleaner with Peppermint per gallon of water. Sprinkle salt where animals lie; salt dehydrates the fleas and they die.
10. A handful of leaves from the black walnut tree, southernwood, rue, camphor, lavender, sage, rosemary, catnip, pennyroyal, eucalyptus, peppermint, feverfew and tansy can be brewed in a tea pot with boiling water. Steep overnight, strain and spray to repel fleas. **Check for allergies and stains before spraying.**
11. To monitor infestations, slowly walk through suspected areas wearing white knee socks. When the fleas jump on you, you should clearly be able to see them on the socks. See item 3.
12. Outdoors, organic matter can harbor flea larvae. If you dry out these areas or saturate them with salt water, you will kill flea eggs and larvae. **Remove any rodents or wildlife nesting in or near your buildings.**
13. As a last resort spray with Not Nice to Bugs® or lightly apply Safe Solutions, Inc. food-grade diatomaceous earth (DE) (using a dust mask and goggles) to the carpeting (litter boxes, roosts, bedding, furniture and other areas your pet frequents) and then rub some dust (or diluted DE) through your pet’s fur to the skin, especially on the scalp and tail, behind the neck and in any area where your pet can’t bite or scratch. Caution: Diatomaceous earth can dry out your pet’s skin, so lightly use it no more than once a month. **Remember to vacuum up all residue after a few days.** Pets eating about 1% diatomaceous earth in their food will also kill internal parasites. Food grade DE is also thought to stimulate the digestion and to add 14 trace minerals to benefit the pet. So if your pet eats food grade DE it will continue to kill internal parasites.
14. Howard Rustin said he washed his large dog with about 1 oz. Safe Solutions Enzyme Cleaner with Peppermint and never saw such a clean dog. The old hair, dirt, fleas and skunk odor were gone immediately.
15. Dan Dickerson’s Flea Trap: 1 rodent glue board, 1 piece moist sponge, 1 Alka Seltzer® tab; Place Alka Seltzer tab on top of moist sponge piece; cover lightly with plastic wrap on top of seltzer tab to hold it in place. CO<sub>2</sub> and moisture in to attract fleas. **Flea traps catch few fleas when cats are present.**
16. **If you are still seeing fleas, read the entire chapter.**

**NOTE: Not Nice to Skin Irritations® and Safe Solutions Enzyme Cleaner and their Pet Wash help take away the itch from poison ivy and/or flea bites and they literally clean away all of the dead skin, odor, fleas, eggs and debris from the various dogs on which they were tested and left their coats very soft and luxurious. Mange and ringworm also are removed by these two cleaners and/or Lice R Gone®**

**Mange:** Mange is a general term used to describe any kind of mite infestation. Mites are not insects; instead they are more closely related to spiders. They are microscopic and cannot be seen with the naked eye. Adult *Sarcoptes scabiei* mites live 3-4 weeks in the host’s skin. After mating, the female burrows into the skin depositing 3-4 eggs in the tunnel behind her. The eggs hatch in 3-10 days producing a larva which, in turn, moves about on the skin surface, eventually molting into a “nymphal” state and finally into an adult. The adults move on the surface of the skin where they mate and the cycle begins again with the female burrowing

and laying eggs. Her presence generates an inflammatory response in the skin similar to an allergic response. Demodex is a common infestation of the dog's skin with tiny, cigar-shaped, 8-legged mites that reside and feed in the hair follicle and oil glands of the skin. This condition is usually less severe than a sarcoptic mite infestation. Sarcoptic mange is called notoedric mange in cats (commonly known as scabies) and is caused by an infestation by a mite called notoedres, a microscopic external parasite that burrows deep into the skin that is also known as *Sarcoptes scabiei*. All of these skin conditions (including ringworm) have been shown to be quickly controlled by shampooing your pets with either Safe Solutions Enzyme Cleaner, Lice R Gone® or their enzyme Pet Wash as needed. See also Human Lice and Scabies, Chapter 16.

**Oops:** The joint master of the Price of Wales' favorite fox hunt club was fined £6,000 (about \$10,000) after marine life in a stretch of river was devastated by cypermethrin contamination. The cypermethrin was incorporated in sheep dip being used to treat mange in the Prince's foxhounds. The cypermethrin contamination killed around 10,000 individuals of an endangered species of crayfish in the river. Workers at the kennels of the hunt, which Prince Charles, Camilla Parker Bowles and Princess Micaela of Kent have all ridden with, diluted the dip to spray on the dogs. But after treating the hounds the remaining solution was poured down drains at the site and it ended up in the Avon River via sewage treatment works.—*PA News, October 20, 1998 via Aget*



You can purchase products from Safe Solutions, Inc. directly from its web site at: <http://www.safesolutionsinc.com> or by calling 1-888-443-8738.



Nano-UV Wand is a large area disinfection scanner. Surfaces become virtually germ and mold-free after a quick 10-second sweep that also kills the eggs of dust mites, lice and fleas. This and a smaller uv light can be purchased at Safe Solutions, Inc.

Note: Safe Solutions products are not sold as pesticides; they are only sold as shampoos and/or cleaners. Not Nice to Bugs is sold as a safe EPA exempt pesticide.

Safesolutions™

www.safesolutionsinc.com  
phone: (888)-443-8738  
fax: (616)-677-2650



**Safe SOLUTIONS™**  
**Pet Wash**  
**Nontoxic Shampoo**

*Soothing Spa Treatment  
Restores Coat To Health  
Removes Odor & Dander  
Relieves Pet Problems  
Guaranteed Effective*

8 fl oz (230 mL)

**Pet Wash restores fur to lustrous health**  
*Nontoxic · Hypoallergenic · Biodegradable*

**Directions:**

Bathe pet with warm water. Massage shampoo into the hair and form lather. Allow to soak minimum 10 minutes, then rinse thoroughly. Repeat as needed.

**Modo de Empleo:**

Enjuague el cuero cabelludo con agua tibia. Masaje el champu en cabello y creando espuma. Dejesse por lo menos 10 minutos y enjuage. Repita que se requiera.

**Precaution:**

Avoid contact with the eyes to prevent irritation; immediately flush with water if contact occurs. Contact a physician for accidental ingestion. Do not allow children to use while unattended.

**Ingredients:**

Purified water, anionic/nonionic surfactant blend, glycerin, enzymes, peppermint oil, sodium borate

**Manufacturer:**

American Patent # 6663860  
Australian Patent # 737578

Please recycle container.



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