CONSUMER ALERT

Are "Spot-On" Flea Killers Safe?

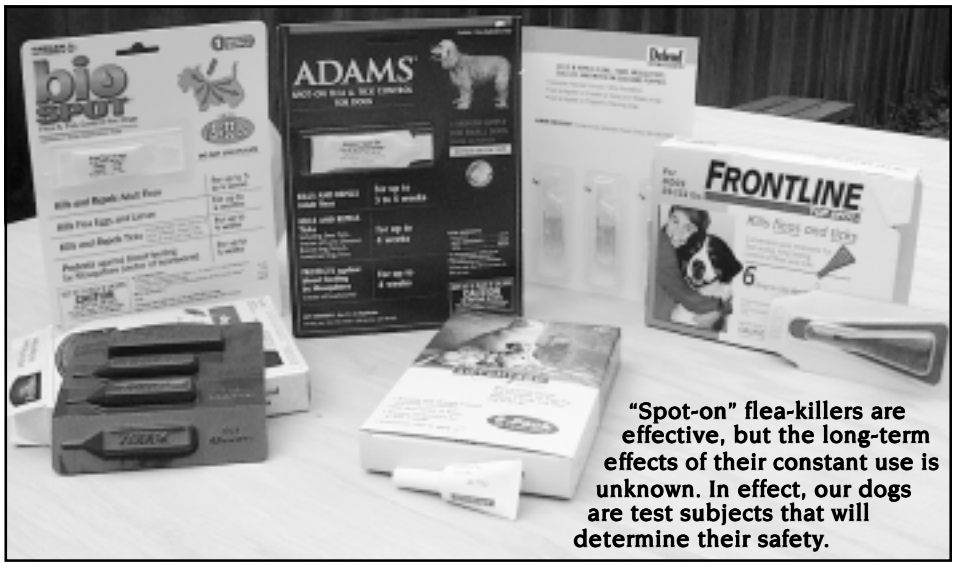
Absolutely not, says our author, despite what the commercials say.

BY KATHLEEN DUDLEY

Tempting as it may be to simplistically consider fleas as horrible insects, the bane of dogs everywhere, poisoning your dog in a vain attempt to wipe fleas out of existence doesn't really make sense. Even though more than half a billion dollars annually are spent on products that kill fleas in that vain pursuit.

Of course fleas can make dogs (and everyone else in the household) perfectly miserable. But it's not as if using toxic flea-killing chemicals is the only way to control fleas. When we attempt to get rid of our dogs' fleas by utilizing chemicals that are toxic to the brain and nervous system, that may disrupt hormone (endocrine) systems, and that cause cancer, it's sort of like burning the house down to get rid of ants – effective, sure, but what are you left with?

In the next issue of WDJ, we will describe effective, nontoxic methods of flea control. No dogs (or any other members of the household) will get sick from these methods, and no dogs (or any other members of the household) will die from them. In contrast, dogs do get sick and die from the toxic chemicals we will describe in *this* article.



"Spot-on" flea-killers are effective, but the long-term effects of their constant use is unknown. In effect, our dogs are test subjects that will determine their safety.

New products not safer

All pesticides pose some degree of health risk to humans and animals. Despite advertising claims to the contrary, both over-the-counter and veterinarian-prescribed flea-killing topical treatments are pesticides that enter our dogs' internal organs (livers, kidneys), move into their intestinal tracts, and are eventually eliminated in their feces and urine. Not only that, but the humans and other household animals who closely interact with dogs who have been treated with these chemicals *can* be affected by the toxins. What happens to the health of all exposed individuals during this systemic absorption and filtration process varies from animal to animal, but the laboratory and field trial results clearly indicate toxicity on the chronic and acute levels.

Until recently, foggers, flea collars, powders, sprays, shampoos, and dips containing organophosphates (chlorpyrifos, malathion, diazinon), pyrethrins, synthetic pyrethroids, and carbamates, were the cutting-edge solutions to our flea problems. They were effective, but unfortunately, they also caused disease and sometimes death. Given enough time, most pesticides eventually cause enough human and animal injuries that they are identified as hazards and are removed from the market.

While the newest flea products – so-called "spot-on" liquids that are applied monthly to a dog's skin – are being marketed aggressively by the manufacturers and veterinarians and represented as safe alternatives to their predecessors, the fact is, they are simply newer. All the "active" ingredients in these spot-on preparations – imidacloprid, fipronil, permethrin, methoprene, and pyriproxyfen – have been linked to serious health effects in laboratory animals (see chart, page 20).

"The public must recognize that any decision to use a pesticide, or to otherwise be exposed to pesticides, is a decision made in ignorance," says Eliot Spitzer, Attorney General of the New York Environmental Protection Bureau. "We do not know the identity of the chemicals to which we are exposed. We cannot make informed individual decisions on the acceptability of those exposures, a basic element in the maintenance and protection of our own health." Spitzer adds, "The requirements for marketing a new product fall considerably short of providing safety for our animal and human families."

Active and inert ingredients

To fully understand the risks associated with any of these products, it is important to understand the various components in a flea product, or any chemical product that you may buy, for that matter.

Like other chemical products, all flea products are made up of "active" and "inert" ingredients; strangely, the actual definitions of those phrases are very different from what they seem to connote. In the case of flea-killing chemicals, the "active" ingredient does, in fact, target and kill fleas – but some of the "inert" ingredients are poisons, too.

While the word "inert" suggests benign activity and even connotes safety in the minds of many consumers, legally, it simply means added substances that are not the registered "active" ingredient. This is important because most people assume that only the "active" ingredient in a chemical

product is of concern. Many people feel comforted by the idea that a product contains only a minuscule amount of an "active" ingredient and up to 99.9 percent "inert" ingredients – a typical formula in many pesticide products. Actually, this makeup should *frighten* consumers.

Why? Because the Environmental Protection Agency (EPA, the government agency that oversees the pesticide industry) requires a higher (if not high enough) standard of scrutiny for "active" ingredients; these must undergo a battery of tests to determine their toxicological profiles, be registered with the EPA, and be listed on the product inserts and packaging. In contrast, "inert" ingredients need not be listed on the product inserts and packaging and are subject to much less testing than the "active" ingredients; "inerts" are generally tested in short-term studies for acute toxicity only.

The word "inert" implies chemicals that are somehow inactive. In actuality, *many "inert" ingredients used in pesticides are as toxic, or more toxic, than the registered "active" ingredients.* For example, naphthalene, one of the "inerts" in an imidacloprid product, showed clear evidence of cancer activity through inhalation (nasal cancers), as well as anemia, liver damage, cataracts, and skin allergies. An unidentified "inert" ingredient in the flea product Advantage was implicated in the death of kittens who received doses within laboratory tolerances.

Why don't pesticide manufacturers have to disclose *all* the ingredients in their products? This kettle began brewing in 1949, when the U.S. Congress passed the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), allowing manufacturers confidentiality on issues they claimed would otherwise make them vulnerable to market competition. "Inert" ingredients, in other words, became protected by industry as "trade secrets." While protecting industry, this act supersedes the public's right to know to what we are being exposed and the health hazards resulting from these exposures. And without full disclosure, we are unable to make educated decisions as to which chemicals we want to avoid.

Laboratory studies

Obviously, products undergo testing in order to qualify for EPA registration, and presumably, most of the overt dangers a product can exert are ameliorated before the product can be marketed. Scientists use healthy, adult, genetically identical mammals to test pesticides, and then extrapolate health information regarding the safety of the product to domestic animals and human beings. In the case of flea products, the laboratory tests are performed on live mice, rats, cats, and dogs.

These toxicological (poison) studies are performed to establish the LD 50 – the *oral* dose at which the product would kill 50 percent of a test population – and to determine the acute and chronic effects. Throughout and following the test, subjects are killed in order to study the specific system damage (lungs, kidney, etc.). Acute disease tests, such as nervous system and skin reactions, can be performed over a relatively short time period. Most studies are conducted for 3-, 13-, or 52-week intervals, and use exaggerated dosages to compensate for the short testing periods.

"Because of the short period under which the studies are conducted, the health effects resulting from the higher doses of the chemicals are relevant," says Dr. Virginia Dobozy of the EPA's Pesticide Division. These effects can include head-nodding; facial twitching; exaggerated blinking; gag responses; weight increase of the spleen, thymus, and adrenal glands; and/or atrophy of the thymus.

Long-term studies, needed to understand the chronic effects of the pesticides, are few by comparison. Chronic disease such as cancer, immune suppression, developmental or reproductive damage, and DNA damage can take months or years to manifest.

However, the cumulative effect – potential damage from continued use of one specific pesticide product or multiple products over a dog's lifetime – is unknown. Also unknown is the potential for synergistic effects – combined impacts of chemical exposures from their home and outdoor environments. Neither the cumulative nor the synergistic effects of chemicals in products are required to be tested by the EPA before a product is made commercially available. So, our dogs may be more vulnerable to unknown chemical-related dangers than the happy commercials would have you believe.

Critics of the pesticide industry claim that the EPA registers pesticides not on safety, but on a cost-benefit basis, balancing health and environmental concerns against the economic gain to the manufacturer and the end user of the product. But even if the pesticide manufacturers and the EPA are not overly concerned about our safety, we as consumers and guardians should be very concerned.

Too good to be true

Today, spot-on flea preparations are considered by many as the Rolls Royce of flea products, and sell swiftly in veterinary clinics and pet stores. Each of the makers of these products claim that they are safe – safer than ever – and that only the targeted insects will be affected by the products' neu-

Spot-On Pesticides and Their Ingredients

Advantage
Bayer Corporation, Shawness Mission, KS
(800) 255-6826 or nofleas.com
Active ingred: 9.1% imidacloprid
Inert ingred: 90.9% (not disclosed)
(MSDS indicate inerts include some solvents)

Adams Spot-on Flea & Tick Control
Farnam Pet Products, Phoenix, AZ
(602) 285-1660 or farnam.com
Active ingred: 45.0% permethrin
Inert ingred: 55.0% (not disclosed)

BioSpot Flea & Tick Control
Farnam Pet Products, Phoenix, AZ
(602) 285-1660 or farnam.com
Active ingred: 45.0% permethrin
5.0% pyriproxyfen
Inert ingred: 50.0% (not disclosed)

Defend EXspot Treatment
Schering-Plough Animal Health, Union, NJ
(800) 842-3532 or www.sgp.com/main.html
Active ingred: 65.0% permethrin
Inert ingred: 35.0% (not disclosed)

Frontline Top Spot
Merial Limited, Iselin, NJ
(800) 660-1842 or frontline.com
Active ingred: 9.7% fipronil
Inert ingred: 90.3% (not disclosed)
(MSDS indicates inerts include ethanol 7.7%, polyvinlpyrrolidone 6.9%, butylhydroxytoluene 0.3%, butlyhydroxanisole 0.3%, and carbitol [diethylene glycol monoethyl ether])
(Note: **Frontline Plus** is essentially the same as Frontline Top Spot, but with the addition of 8.8% methoprene, an IGR.)

Zodiac FleaTrol Spot On
Wellmark International, Schaumburg, IL
(800) 950-4783 or zodiacpet.com
Active ingred: 45.0% permethrin
3.0% methoprene (IGR)
Inert ingred: 52.0% (not disclosed)

Adverse Effects of Ingredients Found in Spot-On Products

INGREDIENT	TYPE	AFFECTED SYSTEM	LABORATORY ANIMAL HEALTH EFFECTS
Fipronil	Active	Carcinogen	Thyroid cancer (possible human carcinogen)
		Organ damage	Increased organ weights, altered thyroid hormones
		Neurotoxin (nervous system damage)	Loss of appetite, underactivity, convulsions, whining, barking, crying (vocalization), body twitches/tremors, overactivity, salivation, stiffened limbs, unsteady gait, incoordination, labored breathing
		Teratogen (reproductive damage)	Reduced fertility, decreased litter size and body weights in litters, fetus mortality
		Skin problems	Severe moist inflammation, ulcerations, skin sloughing, chemical burn, itching, hair loss at and beyond the application site
Imidacloprid	Active	Carcinogen	Yet to be determined; evidence of thyroid lesions in dogs
		Organ damage	Liver, kidney, thyroid, heart, lungs, spleen, adrenal, brain, gonads; liver toxicity, increased organ weights, thyroid lesions, increased cholesterol levels in dogs
		Neurotoxin	Incoordination and labored breathing, muscle weakness including muscles necessary for breathing
		Teratogen	Increased miscarriages and smaller offspring
Methoprene	Active	Organ damage	Liver enlargement
		Neurotoxin	Headaches, eye and throat irritation, difficulty breathing, confusion, dizziness and nausea in humans
Permethrin	Active	Carcinogen	Liver and lung tumors (possible human carcinogen)
		Organ damage	Kidney enlargement, changes in lung
		Neurotoxin	Tremors, incoordination, elevated body temperature, increased aggressive behavior, learning disruption
		Teratogen	Fertility is affected
		Autoimmune	Bone marrow changes in laboratory animals
Pyriproxyfen	Active	Teratogen	Reduced weight gain, toxicity to pups
Ethanol	Inert	Teratogen	Adverse effects on fetus
Butylhydroxanisole	Inert	Carcinogen	Animal carcinogen (possible human carcinogen)
Butyldydroxytoluene	Inert	Carcinogen	Animal carcinogen (possible human carcinogen)
Carbitol	Inert	Neurotoxin	Headache, depression, nausea, vomiting, diarrhea, abdominal and lumbar pain
		Organ damage	Pathological lesions in brain, lungs, liver menni; possibility of pulmonary edema, intravascular hemolysis and bone marrow depression
Polyvinlpyrrolidone	Inert	Carcinogen	Not evaluated by EPA for carcinogenic

Sources of the above information include reports from the Environmental Protection Agency; Occupational Safety & Health Administration, US Dept. of Labor; Extoxnet: Extension Toxicology Network; Journal of Pesticide Reform, *Material Safety Data Sheets, Pesticide Action Network North America, and more.*

rotoxic impacts. The products are frequently advertised as safe for small children and adults as well as puppies (over eight weeks) and geriatric dogs. Do they sound too good to be true? Well, perhaps they are.

The spot-on flea products fall into four general categories of insecticides. All have neurotoxic effects. The first three – imidacloprid (a chloro-nicotinyl insecticide), fipronil (a phenylprazole insecticide), and permethrin (a synthetic broad spectrum pyrethroid insecticide) – all work by disrupting the nervous system of insects, killing by contact *or* ingestion. The fourth type contains insect growth regulators (IGR), which don't kill, but interrupt the flea's life cycle.

Imidacloprid is the first of its class of insecticides, and is relatively new on the block; it was introduced in 1994. Laboratory testing on mice, dogs, and rats, indicates that this insecticide can be neurotoxic to laboratory animals, causing incoordination, labored breathing, thyroid lesions, reduced birth weights, and increased frequency of birth defects.

Fipronil was introduced in the United States in 1996. It is a neurotoxin and suspected human carcinogen. Fipronil can cause liver toxicity, thyroid lesions (cancer), damage to the kidneys, increased cholesterol levels, alterations in thyroid hormones, incoordination, labored breathing, increased miscarriages, and smaller offspring.

Learning to Read the Label

Note that cats are at a special risk of being poisoned by this product, even if they simply have "close physical contact" with treated dogs.

Don't just "consult your veterinarian." We would suggest NEVER using on "debilitated, aged, medicated, pregnant or nursing" dogs.

US EPA "Signal Word"


PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS & DOMESTIC ANIMALS — CAUTION
HUMANS: Avoid contact with skin or clothing. Wash thoroughly with soap and water after handling. DOMESTIC ANIMALS: DO NOT USE ON CATS. Cats which actively groom or engage in close physical contact with recently treated dogs may be at risk of toxic exposure. DO NOT USE ON PUPPIES LESS THAN 8 MONTHS OF AGE. Consult a veterinarian before using this product on debilitated, aged, medicated, pregnant or nursing animals. Sensitivities may occur after using ANY pesticide product for pets. If signs of sensitivity occur, bathe your pet with a mild soap and rinse with large amounts of water. If signs continue, consult a veterinarian IMMEDIATELY. In the event of an emergency, contact the National Animal Poison Control Center at (800) 345-4735.
FIRST AID: IF ON SKIN, wash with plenty of soap and water. Get medical attention if irritation persists.
ENVIRONMENTAL HAZARDS: This product is toxic to fish.
PHYSICAL OR CHEMICAL HAZARDS: Combustible. Do not use or store near heat or open flame.
In case of emergency, or for product use information call 1-800-950-4783 or visit our Web site: www.zodiacpet.com
ACTIVE INGREDIENTS:
Permethrin (CAS #52645-53-1) 45.0%
(S)-Methoprene (CAS #65733-16-6) 3.0%
OTHER INGREDIENTS: 52.0%
TOTAL 100.0%
Sold By: Wellmark
EPA Reg. No. 46849-72-2724
EPA Est. No. 2724-TX-1

This is the product maker. If your dog displays any problems following application, report this to the maker. Pesticide manufacturers are required by federal law to forward reports of product injuries to the EPA.

When researching a chemical, use the EPA Registered Number.

List of "active" (known) and "inert" (who knows what?) ingredients.

In a review of the fipronil pet formulations, Dr. Virginia Dobozy of the EPA's Pesticide Division states that "this is a persistent chemical that has the potential for nervous system and thyroid toxicity after long term exposure at low dosages."

Permethrin, a synthetic broad spectrum pyrethroid insecticide, is suspected to be an endocrine disrupter and a carcinogenic insecticide (causing lung cancer and liver tumors in laboratory animals). Some permethrin products have additional "active" ingredients in lesser percentages, and include methoprene, and pyriproxyfen (described below).

Methoprene and **pyriproxyfen** are both insect growth regulators (IGR), which limit the development of juvenile fleas so they cannot reproduce. Test results indicate that methoprene causes enlarged livers and degeneration of parts of the kidneys.

All of the above active ingredients have induced responses in laboratory animals that give cause for alarm. While these new products are suggested as safer than their predecessors, they indicate high levels of acute and chronic poisoning from short-term use.

Method of action

Whether or not it is purposeful, manufacturers of these spot-on flea products have managed to convince many veterinarians and animal guardians that these products are not absorbed into our dogs' systems. The companies' literature describes in vague and contradictory detail how the chemicals don't go beyond the hair follicles and fat layers of the dogs' skin.

Take, for example, information published on Merial's Web site for Frontline ("How Frontline Works"). In one place, it clearly states that fipronil (Frontline's "active" ingredient) *is* absorbed into the skin

("Sebaceous glands provide a natural reservoir for Frontline . . ."), but other statements suggest that fipronil stays there and then leaves through the same entry point without moving into any other parts of the dog's body – an illogical conclusion.

When the EPA's Dr. Dobozy reviewed the results of a fipronil metabolism study, she reported that "significant amounts of radio-labeled fipronil were found [not only] in various organs and fat . . . [but they were also] excreted in the urine and feces, and were present in other parts of the body . . . which demonstrated that the chemical is absorbed systemically."

Veterinarians and pet owners who pay close attention can witness evidence that these products are indeed systemically absorbed. Dr. Stephen Blake, a San Diego veterinarian, relates a client's experience: "We put Advantage on the backs of our dogs and could smell it on their breath in a matter of minutes following the application." Blake stated that this indication of immediate absorption did not tally with what he had been led to believe by reading Bayer's literature. He continues to question its safety for his clients' animals.

Neurological health effects

Logic tells us that a topical chemical that is not absorbed into the skin has no chance of causing neurotoxic effects. Then why do the Material Data Safety Sheets (MSDSs) for all the permethrin-containing pesticides recommend preventing their products from having prolonged contact with the skin? And why do they all state that skin sensations, such as "numbness and tingling," can occur? Schering-Plough's MSDS makes an additional statement about its Defend EXspot Treatment: "can be harmful if absorbed through the skin and harmful following inhalation," causing headaches, dizziness, and nausea.

Bayer does not reveal more than 90 percent of the ingredients in Advantage, but its MSDS does warn us to "use a respirator for organic vapors" in order to avoid "respiratory tract irritation and other symptoms such as headache or dizziness" (symptoms of nervous system exposure). Bayer's promotional literature for Advantage, however, states that "studies prove that using 20-24 times the dosage on dogs and cats does not cause any internal or external side effects," and that ". . . switching to Advantage from another flea control product poses virtually no risk to your pet."

Dr. Graham Hines, a veterinarian from the United Kingdom, treated a four-year-old female German Shepherd who had two Advantage Top Spot treatments. He reported that "both times she became unusually clingy, and would not leave her guardian's side, yet paced up and down all day, very restlessly. These symptoms persisted for 48 hours before a gradual return to her normal state." The neurotoxic effects were clear to Dr. Hines.

Dr. Blake also finds different results than the Bayer literature. "We are told that the product affects only insects' nervous systems, not mammals'. Several of my clients told me that they accidentally got some Advantage on their hands and when they touched their mouths, their lips became immediately numb for several hours. So much for not having an effect on the nervous system of mammals."

Acute symptoms of headache, nausea, and abdominal and lumbar pain are associ-

ated with carbitol, one of the "inert" ingredients in Frontline. According to the MSDS, carbitol induced these symptoms in laboratory settings.

Curiously, these potential side effects are not published in the literature accompanying the products, nor do many veterinarians know the dangers. But there are numerous anecdotal reports from veterinarians in the U.S. and the U.K. of dogs who were treated with spot-on products who have displayed signs of neurological damage, such as depression, lethargy, convulsions, underactivity, tremors, overactivity, stiffened limbs, and lameness.

Adverse skin effects

Topical skin irritation is listed on all the MSDSs of the products reviewed in this article; however, product literature inserts fail to emphasize the extreme nature of the problems. They all instruct the users that their products are for "external use only," and to "avoid contact with the skin," but only Merial's product insert appears to suggest there is some possibility of adverse skin contact reactions.

Dr. Dee Blanco, a holistic veterinarian practicing in New Mexico, treated 20 dogs for adverse reactions to Farnam's flea product. In a letter to the Farnam regarding a client who had used one of Farnam's permethrin-based insecticides, Dr. Blanco stated, "All the dogs (20 out of her 24 dogs treated with BioSpot) had pruritus (severe itching of the skin) with bleeding and cracking of the skin, various degrees of erythema (intense redness of the skin), many fluid vesicles (blisters), severe hair loss, and elephantiasis (thickening of the skin) with chronic itching. Many also showed severe mental depression, lethargy, and symptoms concomitant with aggravated liver toxicity. All symptoms appeared within two weeks after applications of your (BioSpot) product, also a consistent timeframe for liver toxicity after absorption through the skin. . . To date, most of the dogs have dramatically improved but a few still remain symptomatic."

Dr. Blanco also stated that one dog died of liver cancer within three months of this BioSpot application, which she says "could have been exacerbated by the application of BioSpot." Permethrin is indicated as a possible carcinogen by the EPA, causing liver enlargement and cancers in laboratory mammals.

When Dr. Dobozy reviewed the reports from fipronil product studies, she found that Frontline "does not adequately describe the severe reactions" reported by veterinarians – sloughing, "chemical burn" conditions, and extensively affected areas well beyond the application site. When these incidents were reported, Merial recommended bathing the dogs. *That's* strange, because their literature indicates the product remains effective after bathing.

The MSDS for Bayer's Advantage tell us that "prolonged contact with the skin can cause defatting of the skin due to solvent component in the products," to "avoid skin contact," "to wear appropriate gloves when handling the product," and to "wash off any contamination."

Chronic disease

Based upon toxicological studies, a dog suffering from liver, kidney, thyroid, adrenal, spleen, lung, brain or gonadal conditions could experience heightened states of chronic diseases, with the potential for development of cancer, when spot-on flea preparations are used. Permethrin is linked to malignant liver and lung tumors and autoimmune system disease, and at very low levels suppresses the immune system. Thyroid lesions have developed in laboratory studies in dogs during imidacloprid tests. Further studies are necessary to understand the possibilities of malignancy. Thyroid cancer has been linked to fipronil, according to the EPA. The data from the metabolism and chronic toxicity studies for fipronil indicate that " . . . this is a persistent chemical and has the potential for nervous system and thyroid toxicity after long-term exposure at low levels," according to Dr. Dobozy.

In the *Journal of Pesticide Reform,* author Caroline Cox cites studies that show thyroid sensitivity to imidacloprid can result in thyroid lesions, as well as increased incidences of miscarriages, mutagenic (DNA damage) abnormalities, and abnormal skeletons in animal studies. In addition, one metabolite (breakdown of the chemical into new chemical compounds during the metabolism process in the body) of imidacloprid appears to be far more toxic to mammals than the imidacloprid itself.

General risk factors

Of course, not all dogs exhibit immediately noticeable symptoms when dosed with a commercial spot-on flea product. Adult animals and those in the peak of health are less likely to show immediate signs compared to animals that are young, old, or suffering from chronic disease. Animals with a heightened sensitivity to chemicals or with exposures from multiple sources such as a flea collar; other dips, sprays, dust, or flea bombs; yard pesticides; and house termite extermination, are most likely to react. The cumulative and synergistic impacts of pesticides can take a heavy toll on animals.

Dr. Jerry Blondell, of the US EPA Office of Pesticides, has indicated clearly "not to use pesticides on the old, the sick, or the young." While some of the literature for the spot-on products does discourage this usage, many dog guardians *and* veterinarians overlook or disregard these written precautions.

Although the number of dogs reported to react to these products may seem small, this does not suggest the overall impact is small. First, spot-on products are relatively new, and many problems are cumulative.

Second, reactivity to chemicals in a population is similar to other population statistics and is represented by a bell-shaped curve. In other words, at one end of the spectrum are sensitive individuals, and at the opposite end are resistant individuals; these groups are relatively small compared to the vast middle group, who show varying degrees of susceptibility – but who are all susceptible. Thus the sensitive group – dogs who have displayed signs of toxicity – happen to be the sentinels for the younger, healthier ones who will eventually be affected; it's just a matter of time.

Safe alternatives

Integrated pest management (IPM) is a nontoxic approach used to eradicate any insect infestation. Simply, it is a way of thinking about how to preserve the quality of life on this planet and within the earth's stratosphere – of understanding not only the damages of the pesticide to all species and the environment, but also understanding the consequences of insect resistance to the constant parade of new, more sophisticated, and perhaps more toxic pesticide formulas. The IPM process was initially designed to safeguard all species, including the environment, from the ravages of pesticides.

In the next issue, we will present a complete indoor and outdoor IPM treatment program for effective, non-poisonous flea control.

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