

For Veterinarians: Steps to Follow When Evaluating Whether Pets Have Become Ill From Commonly Used Lawn Care Products

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Given the frequent use of lawn and garden products around the home, it's not surprising that family pets — particularly dogs and cats — often come into contact with the chemicals in such products either before or after their use. Major categories of lawn and garden chemicals include insecticides, herbicides, fungicides, and fertilizers. These chemicals are safe to use in pets' environments if they are applied according to label directions and when pet owners take certain precautions to minimize their animals' exposure. However, sometimes pets are exposed to excessive amounts of these chemicals and acute adverse health effects can occur. These incidents can happen as a result of exposure to either the applied or stored chemical. Exposure to stored, undiluted products increases the risk of acute poisoning because of the higher concentrations of active ingredients present before dilution.

Due to the widespread use of lawn and garden chemicals, along with consumers' increased general awareness about many chemicals' potential to cause adverse health effects, it's not unusual for pet owners to think that exposure to lawn and garden chemicals is a potential reason that a pet has developed an illness. Veterinarians are responsible for objectively evaluating such exposures and attempting to determine whether an illness is due to contact with a product or products, or whether the illness is due to another cause unrelated to chemical exposure.

Unfortunately, with the possible exception of certain insecticides, such as the organophosphates (OP) and carbamates, acute exposure to toxic amounts of most lawn and garden chemicals causes nonspecific clinical signs that can easily be confused with a variety of diseases. This makes it difficult for veterinarians to differentiate acute chemical poisoning from other common pet diseases. Additionally, poisoning from many of these chemicals does not result in changes in organs like the liver and kidney, which can be detected by routine diagnostic testing. To complicate matters further, detection of specific chemicals in tissue samples such as blood or urine often is impossible since many veterinary diagnostic laboratories may not be able to test for the chemicals. And, in many cases, even if a chemical can be detected, little information is available that relates a given tissue concentration to particular adverse health effects; in most situations, detecting a chemical in tissues only confirms that the animal was exposed, not whether the exposure was clinically relevant.

As mentioned previously, the exception to the above comments concerns the diagnosis of either acute OP or carbamate poisoning. These two groups of insecticides cause quite specific damage; they inhibit the activity of the enzyme acetylcholinesterase. Most veterinary diagnostic laboratories can measure this inhibition in whole blood from a live animal or the brain of an animal that has died. Significant reductions in enzyme activity coupled with appropriate clinical signs and detection of chemical residues in tissues is sufficient to confirm poisoning.

Discussions by Gerken (1995) and Yeary (1984; 2000) should be consulted for additional information specific to commonly used lawn chemicals.

Steps

The following steps are suggested to assist veterinarians in objectively evaluating suspected acute poisoning from commonly used lawn and garden chemicals.

- 1. Obtain a complete history.** Along with routine questioning, specific questions should be asked to ascertain: 1) the time interval between product application and pet exposure; 2) the time interval between product application and the onset of clinical signs; 3) the weather conditions between product application and the pet's exposure; 4), whether the lawn was watered between application and the pet's exposure or illness, and 5) the nature and degree of the pet's exposure to the treated areas. For example, does the animal eat grass or was exposure primarily via skin contact? Is the pet outside for only brief periods of time or does it spend most of the day on or near treated areas?
- 2. Establish what chemicals were used and in what amounts.** Were label directions followed? If the owner applied the chemicals, the owner should be advised to bring in the container or label along with the pet. If a lawn care service applied the chemicals, call the service to obtain the needed information. Reputable lawn care companies will supply veterinarians with this information. It is recommended that the veterinarian contact the company instead of the pet owner, since the owner is often understandably upset by their pet's illness, and can be over-emotional.
- 3. Once exposure to a specific chemical or a combination of chemicals has been identified, consult with knowledgeable experts about the toxicity of the chemical or chemicals in question.** Good information sources include personnel from veterinary diagnostic labs (particularly those with specialized training in veterinary toxicology) and poison control centers for animals and humans. It is important to remember that poison control centers for humans may not be aware of species differences regarding the hazard that a particular chemical may present.

Attempt to establish whether the amount of chemical to which the animal was potentially exposed is near an amount known to be associated with adverse health effects in animals of the same species. For example, if a dog is exposed to a specific chemical, toxicity data obtained from canine species is the most useful. However, this information is not always available for the species affected. This is particularly likely to be a problem when cats are involved. In such cases, judgments need to be made based upon toxicity information obtained from studies using unrelated animal species such as mice and rats. Veterinary toxicologists can help in making these judgments.

- 4. Perform a thorough physical examination and clinical work-up.** Identify organ systems that are affected. Compare the clinical signs and organ systems affected in the sick animal with the clinical signs and organ systems known to be affected based upon clinical case reports or experimental lab studies. For example, the herbicide 2,4-D is associated with the occurrence of muscular weakness in a variety of animal species. Therefore, one would expect signs of muscular weakness in a pet suspected of being poisoned with this herbicide. If only hepatic or central nervous system disease is evident, it is less likely that previous exposure to 2,4-D is clinically significant.

If the clinical history and signs are compatible with poisoning from a specific chemical, consult with a veterinary diagnostic lab to see if analytical tests can be performed to confirm the presumptive diagnosis or at least establish that exposure has occurred. As mentioned previously, few tests are available to definitively diagnose poisoning due to commonly used lawn and garden chemicals. The OP and carbamate insecticides are exceptions to this generalization.

- 5. If an animal dies before or after presentation and a poisoning is suspected, it is critical that a thorough postmortem examination be conducted.** Ideally, this should be done at a veterinary diagnostic lab under the supervision of a trained veterinary pathologist. The entire body should be submitted to the diagnostic laboratory as soon as possible following death; any delay will greatly decrease the chances of making a diagnosis because of tissue decomposition. If circumstances preclude submitting the entire body, the veterinarian should conduct a complete gross postmortem examination at the clinic and note any abnormalities present. Place tissue specimens from all major organ systems in 10 percent neutral, buffered formalin, and submit them to a trained veterinary pathologist for histopathologic examination.

Adequate samples of brain, liver, kidney, stomach contents, serum, and urine should be collected and frozen for possible toxicologic analysis. Before conducting a gross postmortem examination in the clinic, it is a good idea to consult with personnel from the nearest veterinary diagnostic lab to see if additional tissues should be saved for testing and, if so, how many samples are needed and how samples should be stored and shipped.

While in many cases, it's extremely difficult to prove illness and death due to exposure to lawn or garden chemicals, a systematic evaluation of the animal is necessary in order to improve the chances of reaching a diagnosis. In most cases, the presenting illness is coincidental to previous exposure to chemicals. Therefore, it is imperative that other disease processes be considered in the differential diagnosis.

It's important to reiterate that if chemicals are used according to label directions and appropriate precautions are followed, nearly all commonly used lawn and garden chemicals are safe to use around dogs and cats. Consult your veterinary diagnostic lab for recommendations for minimizing health risks for pets.

Lawn Care Product Exposure and Cancer in Dogs

Another potential concern relates to the chronic, low level exposure to lawn chemicals and the potential of such exposure to cause cancer. A malignant lymphoma — 2,4-D herbicide link across dog breeds — has been hypothesized, as well as a more specific link between herbicide exposure and the occurrence of bladder transitional cell carcinoma in Scottish Terriers (Hayes *et al.*, 1991; Glickman *et al.*, 2004). In addition, a higher than expected rate of seminomas was observed in Vietnam service dogs (Hayes, 1990). The authors included exposure to phenoxy herbicides such as 2,4-D and other pesticides as possible factors.

Attributing cancer to prior pesticide exposure is extremely difficult since, in most cases, a cause-effect relationship between specific cancers and commonly used pesticides has not been experimentally established. In addition, links between cancer and pesticides exposure are often, of necessity, predicated on epidemiologic studies which can be prone to certain weaknesses such

as poor or imprecise wording of questions, recall bias, difficulty in quantifying chemical exposures, and failure to consider confounding factors. For example, several serious study design flaws have cast doubt on the link between canine malignant lymphoma and exposure to herbicides, specifically 2,4-D (Carlo *et al.*, 1992; Kaneene and Miller, 1999). It is rare for one epidemiologic study to confirm a cause-effect relationship between two factors. This is illustrated by a recent publication in which evaluation of 25 years of epidemiologic research has failed to confirm a link between pesticide exposure and non-Hodgkin lymphoma in people (Dreiherr and Kordysh, 2006). Currently, there is insufficient data to confirm a link to cancer occurrence and pesticide exposure in dogs or cats.

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In addition to the above references, some lawn and garden chemical companies will provide fact sheets on specific chemicals to veterinarians on request. A list of accredited veterinary diagnostic laboratories by state can be found at the American Association of Veterinary Laboratory Diagnosticians Web site (aavld.org) under "accreditation." Unfortunately, some veterinary diagnostic laboratories will not handle small animal cases.