

PEER-REVIEWED

How dangerous are winter and spring holiday plants to pets?

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Veterinarians are frequently faced with questions regarding potential plant poisonings, especially around the holidays, when festive plants may be placed in locations accessible to curious pets. This article will help you better recognize plants commonly encountered during winter and spring holidays and treat pets exposed to them.

Remember, an owner may not know a plant's name, and attempting to identify a plant from an owner's description over the phone is often unreliable.

Poinsettias

Poinsettias (*Euphorbia pulcherrima*) appear in retail stores as early as mid-November and may remain in homes into the new year. The plants are easily recognized by their red, white, pink, or mottled leaves, which are frequently mistaken for flowers (Figure 1). The real flowers are the tiny yellow structures located in the cyathium, a modified inflorescence, immediately above the brightly colored leaves. As is characteristic of all species of the *Euphorbia* genus, poinsettias contain a thick, milky, irritant sap.

Reports on the toxicity of this plant have been greatly exaggerated. Early reports of poisonings (e.g. causing a child's death in Hawaii in 1918) were likely due to misidentification of the plant involved.¹ It is estimated that a 50-lb (22.7-kg) child would need to ingest almost 1.25 lb (0.57 kg), or 500 to 600 leaves, to surpass the toxic amount in experimental animals.¹ A recent review of 22,793 cases of poinsettia exposure (93% involving children) reported to the American Association of Poison Control Centers revealed that 92% of the patients did not develop signs of toxicosis.² Rodents fed fresh leaves and bracts of poinsettia (up to 15 g/kg) for one week did not develop lesions, behavioral changes, or clinical signs of toxicosis, but one group of rats in that study showed a significant increase in thyroid weight.³

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FIGURE 1



1. Note the poinsettia's erect stems, deep-green lower leaves, and characteristic bright-red uppermost leaves. Broken or damaged stems exude a viscid, white, milky sap. The inset shows the cyathium, or highly modified inflorescence, directly above the vividly colored leaves.

The most common signs of poinsettia exposure reported to the ASPCA Animal Poison Control Center (APCC) are vomiting, anorexia, and depression (ASPCA APCC Database: Unpublished data, 2001). These effects are self-limiting and require minimal treatment. Therapy is directed at decreasing further irritation to the gut by restricting access to food and water for one or two hours.

Christmas cacti

The Christmas cactus (*Schlumbergera truncata*) is a member of the Cactaceae family and is thus a true cactus, but it is not a desert plant. It is native to the jungles of southeast Brazil, an area with high humidity and rainfall. Also known as the *crab's claw cactus*, the

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FIGURE 2



2. The branches of the Christmas cactus are flat and spineless with a segmental appearance. Note the notches at the margins, giving rise to the common name *crab's claw cactus*. Bright flowers in a variety of colors are found at the stem tip.

Christmas cactus is characterized by its flattened, spineless branches, which have prominent notches at the margins (Figure 2). Flowers appear at the stem tip and can be a variety of colors from pink and red to orange, yellow, or white.

Christmas cactus exposure has been reported to induce contact urticaria and rhinoconjunctivitis in cactus nursery workers.⁴ However, *Schlumbergera* species are not considered toxic, and ingestions are expected to result only in mild gastric upset. The most common clinical signs reported to the ASPCA APCC are vomiting, depression, diarrhea, and anorexia (ASPCA APCC Database: Unpublished data, 2001). Treatment is generally not required beyond allowing the stomach to rest by withholding food and water for one or two hours.

Mistletoe

Members of the Viscaceae, or mistletoe, family grow naturally worldwide, with greatest abundance in the tropics.⁵ The mistletoes are semiparasitic vines that take up water and inorganic nutrients from their tree hosts by penetrating the hosts' vascular systems. Four genera encompassing 43 species of mistletoe are present in North America, but only eight species in the genus *Phoradendron* are of toxicologic significance.⁵ Some uncertainty exists regarding the true toxic potential of this genus, and this potential may be related to the host plant. Host plants influence the toxicity of many parasitic plants, including those in the genus *Viscum*, the European mistletoe. However, little is known with respect to the genus *Phoradendron* and its host plants.

The European mistletoe was thought to have mystical and medicinal properties, and much of this legend has been carried over to the New World *Phoradendron* species. The American mistletoe, *Phoradendron leucarpum* (also known as *Phoradendron serotinum* and *Phoradendron flavescens*), is a common decoration for Yuletide celebrations (Figure 3). Many potentially toxic compounds have been found in various species of both American and European mistletoe. Glycoprotein lectins in both types of mistletoe inactivate 60S ribosomal subunits and in-

hibit protein synthesis. This is similar to the mechanism of action of ricin (from the castor bean, *Ricinus communis*) and abrin (from the rosary pea, *Abrus precatorius*); however, the lectins in *Phoradendron*

species are much less potent. Phoratoxins, small basic proteins, have negative chronotropic effects on the heart, resulting in decreased blood pressure, cardiac rate, and force of contraction. In addition, γ -aminobutyric acid, alkaloids, phenethylamines, flavonoids, and other compounds have been isolated from various mistletoe species.⁵

Despite the variety of potentially toxic constituents in the mistletoes, serious poisonings are infrequent. Three reviews of human mistletoe exposures from poison control centers reveal a low toxic potential from plant ingestion.⁶⁻⁸ These findings are similar to those of recent animal cases. From 1998 to 2001, the ASPCA APCC received 25 queries about *Phoradendron* species exposure in dogs. The most common clinical sign reported was depression (five cases), followed by vomiting (three cases) (ASPCA APCC Database: Unpublished data, 2001). Much more serious effects—abdominal pain, vomiting, diarrhea, cardiovascular collapse, profound hypotension, and death—have been reported in



3. Commercially available dried Yuletide mistletoe. Fresh mistletoe is often shrublike, forming dense masses, and may have dark-red or white berries.

a person that consumed a homebrewed mistletoe abortifacient tea (from locally grown *P. leucarpum*).⁵

Treatment for animals is symptomatic and is directed at reducing gastrointestinal distress and maintaining hydration and electrolyte balance. Most cases can be managed by having the owner induce vomiting at home and restrict food and water for one or two hours to allow the stomach to rest. If more severe signs develop, blood pressure and electrolyte balance should be monitored and corrected.

Holly

Holly, with its characteristic spinous leaves and brightly colored fruit, is prized as a holiday ornamental (Figure 4). The hollies are members of the Aquifoliaceae family. Two genera of holly exist in North America, but only the *Ilex* genus with its 29 species is considered toxic. The well-known traditional English or Christmas holly is *Ilex aquifolium*.

Various *Ilex* species have been used for medicinal purposes throughout the ages, and in some areas of South America an *Ilex* species is still consumed as a tea (yerba maté). Several compounds with toxic potential may be present in the leaves and berries, in-



4. The thick, waxy, spinous leaves and bright-red fruit of the Christmas holly.

cluding glucosidic saponins, the methylxanthines (caffeine, theobromine, and theophylline), and a cyanogenic diglucoside.⁹ However, the clinical effects appear to be largely due to the saponins. Feeding studies of *Ilex myrtifolia* in beef cattle revealed no clin-

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ical effects or changes on clinicopathologic or histopathologic examination or gross necropsy.¹⁰

Signs elicited in pets after ingesting holly are usually self-limiting and include salivation, vomiting, anorexia, and diarrhea. Animals may also shake their heads and smack their lips (ASPCA APCC Database: Unpublished data, 2001). Treatment, when needed, is symptomatic and supportive and is directed at decreasing gastrointestinal irritation. Rinsing the mouth will help remove mucosal irritants. Withholding food and water may be necessary in animals with persistent vomiting. For more severe cases, maintaining hydration and electrolyte balance with intravenous fluids may be required.

Shamrocks

The shamrock, considered the national emblem of Ireland, is most commonly associated with the celebration of St. Patrick's Day. The "shamrock" that St. Patrick plucked to explain the Holy Trinity was more likely white clover, *Trifolium repens*, which is difficult to grow indoors. The shamrock that appears in grocery stores and floral shops in spring is *Oxalis acetosella*, a member of the wood sorrel family (Oxalidaceae) (Figure 5).¹¹ Members of this family are known as *oxalate accumulators*.¹²



FIGURE 5

5. Characteristic of the shamrock are its three leaflets that fold at night. An erect stalk supports the leaflets, which tend to have a red-purple underside. Some varieties of shamrock have purple leaves throughout. Note the small, white flowers.

Literature on the true toxic potential of *O. acetosella* is lacking, but other members of the family (*Oxalis pes-caprae* and *Oxalis corniculata*) have soluble oxalate concentrations ranging from 3% to 14%. In these plants, the sap pH is low, and the oxalate occurs as the potassium salt.¹² *Oxalis pes-caprae* has been responsible for large-scale oxalate poisoning in sheep in Israel.¹³

Soluble oxalates (as opposed to the insoluble or crystalline form) are absorbed from the gut and filtered through the glomerulus. Oxalic acid can then combine with calcium to form calcium oxalate crystals that deposit in the renal tubules, damaging the basement membrane and causing renal tubular epithelial degeneration and necrosis. Renal pathology is similar to that occurring from intoxication by ethylene glycol,

other oxalic-acid-containing products such as some rust removers, and several other soluble oxalate-containing plants such as rhubarb (*Rheum rhabarbarum*). Fortunately, most shamrock ingestions do not progress to this extreme.

Vomiting, anorexia, and salivation are the most common clinical effects noted in pets (ASPCA APCC Database: Unpublished data, 2001). Animals ingesting large quantities of plant material, or those with preexisting kidney disease, should be closely monitored for renal failure. In most instances, inducing emesis and restricting food and water to allow the gut to rest are all that is required. In the unlikely event of renal compromise, institute standard measures for treating acute renal failure.

Easter lilies

Cats are extremely sensitive to some members of the Liliaceae family. Easter lilies (*Lilium longiflorum*), tiger lilies (*Lilium tigrinum*), Japanese show lilies (*Lilium hybridum*), rubrum lilies (*Lilium rubrum*), numerous lily hybrids, and day lilies (*Hemerocallis* species) are associated with renal failure in cats.¹⁴ Most exposures occur in the spring when Easter lilies are introduced into the home (Figure 6). Between March 1 and April 1, 2002, veterinarians at the ASPCA APCC consulted on about 60 cases of cat exposures to various lilies.¹⁵

All parts of the lily plant are considered toxic, and ingestion of as little as one leaf in a cat can be fatal.¹⁶ The toxic principle and mechanism of action have not been determined. Initial clinical signs include vomiting, anorexia, and depression in the first two to



FIGURE 6

6. Note the erect central stalk of the Easter lily from which the dark-green, narrow, tapered leaves arise. The trumpet-shaped flowers are large, white, showy, quite fragrant and are typically held erect or horizontal.

six hours. Blood urea nitrogen, creatinine, potassium, and phosphorus concentrations rise over the next 24 to 72 hours. Often the creatinine concentration is disproportionately elevated compared with the blood urea nitrogen concentration. Creatinine concentrations as high as 44 mg/dl have been reported. Epithelial casts may appear in the urine. Histopathologic examination reveals necrosis of the tubular epithelial cells with an intact basement membrane.^{14,16,17} Tubular epithelial cells can regenerate with prompt, aggressive treatment.^{14,16}

Therapy consists of rapid decontamination (inducing emesis to remove plant material and then administering activated charcoal and a

cathartic) and intravenous fluid diuresis at twice maintenance (130 ml/kg/day) for at least 48 hours. Postponing treatment for more than 18 hours can result in renal failure and death. Renal function in anuric cats may be restored after hemodialysis or peritoneal dialysis.

Plants such as peace lilies (*Spathiphyllum* species) and calla lilies (*Zantedeschia* species) contain oxalates and should not be confused with *Lilium* or *Hemerocallis* species, nor should lilies of the valley (*Convallaria majalis*), which contain cardiac glycosides. Amaryllis, sometimes referred to as *amaryllis lily*, is a member of the Amaryllidaceae family. Amaryllis is not considered a primary renal toxicant in cats. The alkaloids in amaryllis are phenanthridine derivatives, noted for their gastrointestinal effects (nausea, vomiting, diarrhea). In addition, hypotension, sedation, seizures, and hepatic degeneration have been reported.¹⁸

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