

A WORD OR TWO ABOUT GARDENING

Caution: these plants might rub you up the wrong way.

Although plants, including those found in local landscapes, often contain an array of toxic compounds, a survey of US poison control centers found only 30 deaths in the 18 year period leading up to 2000. There were no reported deaths in the U.S. during 2007, the latest year for which published statistics are available. Even so, incidents involving plants are the fourth most common call to poison control centers numbering more than 60,000 for 2007 compared to almost 55,000 for insecticides. While we expect the pesticides we use in the yard to be toxic (they carry warning labels), plants come with no such warning labels. The potential risks associated with what we choose to plant are rarely considered. We may be aware of the obvious ones, spines and prickles for instance, but are often unaware of the unseen dangers. It is impossible to totally remove risk, but we can at least be aware of potentially hazardous plants in our landscape, in particular any that might attract a child: those with brightly colored fruit/flowers or large succulent leaves. Approximately 85% of all plant poisoning enquiries to poison control centers concern young children.

The present article concentrates on plant toxins that produce symptoms as a result of skin contact (i.e., contact dermatitis). A second article will consider plants that are internal poisons with symptoms that develop after plant parts have been ingested. Three types of **contact dermatitis** are referred to below. The first two produce symptoms rapidly (within minutes): **irritant dermatitis** results from direct physical and /or chemical damage to the skin; **immunologic contact urticaria** is an **immediate type hypersensitivity** reaction which manifests as rapid intense itching and welts. This reaction is in response to the presence of foreign proteins and mediated by production of a specific antibody (**IgE**). Antibodies (immunoglobulins, Ig) are proteins that help neutralize what the body perceives as 'foreign'. Immediate type hypersensitivity is more often seen in individuals that are atopic – sensitive to a greater range of substances because they overproduce IgE. This type of allergic response to contact with plants is rare compared to delayed contact dermatitis.

In **delayed contact dermatitis**, symptoms develop 24-48 hours after exposure to various low molecular weight compounds (e.g., components in plant sap) to which an individual becomes sensitized, and involves cytotoxic cells (rather than antibodies) of the immune system. Factors released by these cells (stimulated by the compound to which you are sensitized) cause the reddening (erythema), intense itching (pruritis) and numerous small to large fluid filled blisters. The compounds in the plant sap to which you become sensitized act as haptens. After penetrating the skin surface haptens bond with normal body proteins making them appear 'foreign' which then elicits the above cellular immune response.

Aroids (Araceae) make up the bulk of plant species most frequently encountered by poison control centers. Of particular concern are *Dieffenbachia* (dumb cane) and to a lesser degree *Spathiphyllum* (peace lily), *Anthurium*, *Aglaonema* (Chinese evergreen), *Colocasia* (taro), *Epipremnum* (pothos vine), *Zantedeschia* (calla lilies) and *Caladium*.

Their popularity as houseplants makes them especially accessible to very young children. They all contain oxalic acid, both free and as microscopic needle-like crystals of calcium oxalate (**raphides**), located in special mucilage containing cells (idioblasts). When the leaf/stem of an aroid is crushed (or chewed) the idioblast tips break off. The mucilage then swells as it absorbs water affecting a rapid mass expulsion of raphides. On contact with sap from broken aroid stems, the released raphides can cause localized **irritant dermatitis** and eye injury. If a rash develops after trimming trees or cleaning up after a storm, check to see if you removed any vines having succulent stems and large green cordate (heart shaped) or pinnatifid (highly lobed) leaves. If so, this is probably the **pothos vine** (*Epipremnum pinnatum*). A cultivar with boldly variegated green and yellow leaves, 'Aureum' (some regard it as a separate species, *Epipremnum aureum*) is sometimes seen growing up tall palms or large trees. **Syngonium podophyllum**, (**arrow head**) vine is another aroid that may be encountered climbing into area trees. Both vines are controlled in Miami-Dade (cannot be planted near native plant communities).

Potentially more serious, **biting into an aroid** results in vast numbers of raphides piercing the mucosa of the mouth and throat like tiny shards of glass. Apart from immediate physical damage (and pain), it is suggested that raphides may directly stimulate the release of histamine from mucosal mast cells causing localized edema (swelling) and inflammation. Idioblasts are also believed to release free oxalic acid which can result in extensive erosion of the epithelial cells of the mucosa of mouth and throat. Other factors (e.g., proteolytic enzymes) have been isolated but their role in the observed symptoms, including any loss of speech (as occurs with Dieffenbachia) is not known. Due to an almost instantaneous severe burning sensation, it is rare that sufficient plant material is ingested for aroids to cause serious internal poisoning. Although swelling of the throat could obstruct the air passage, this is infrequent and in the vast majority of cases exposure proves to be very painful but far from life threatening.

Apart from aroids, raphides occur widely in many other monocotyledons; in the **Arecaceae (palms)** **raphides** are found in stems, roots, leaves and even flowers. Especially high concentrations are found in the fruits of several palm species grown in local landscapes as many who have removed fruiting stems from a **clustering fishtail palm** (*Caryota mitis*) can attest. Fruit of the **dwarf sugar palm** *Arenga tremula* contains 1.5 xs as much oxalate as the fishtail palm. Both palms are hapaxanthic (stems slowly die once they bear fruit at which time they are usually removed). One option is to remove the inflorescence before fruit sets, or to first carefully remove fruit, then cut down the stem. Other landscape palms with fruit containing high concentrations of oxalate include **buccaneer palm** (*Pseudophoenix sargentii*), **Macarthur palm** (*Ptychosperma macarthurii*), **royal palm** (*Roystonea regia*), **hurricane palm** (*Dictyospermum album*), **spindle palm** (*Hyophorbe verschaffeltii*) and several **Chamadorea spp.** If you collect fruit from these palms for propagation wear long rubber gloves when cleaning flesh from the seeds.

Another family of monocotyledons, **Agavaceae** (*Agave americana*, the **century plant** is most familiar) form **six sided raphides** and contain **saponins** (compounds consisting of a complex triterpenoid, or steroid core, to which one or more sugars are attached).

Saponins (also referred to as steroidal glycosides) are found in various plant families; some are highly poisonous when taken internally, while others can cause severe skin irritation. The latter are found in agaves and aggravate the mechanical damage inflicted by raphides. Landscape agaves are only rarely reported as the cause of contact dermatitis. The fact that most possess fearsome spines no doubt warns people to be on their guard. If you need to remove a large agave (e.g., after flowering when they die) don protective eye wear, gloves and a long sleeved shirt and use a long handled cactus saw (definitely not a chain saw!).

Tradescantia* spp.**, monocotyledons in the **Commelinaceae** (spiderwort family), feature widely in area landscapes. **Purple queen, *Tradescantia pallida (syn. *Setcreasea pallida*), in particular, is a widely used groundcover with brittle succulent stems. Depending on susceptibility, contact with sap from broken stems can cause mild to moderate skin irritation, usually of a transient nature. It is not known for certain what component(s) in the sap are responsible, but *T. pallida* is known to contain calcium oxalate crystals in the form of raphides. The oyster plant ***Tradescantia spathaceae***, syn. *Rhoeo spathaceae* (a controlled species in Miami-Dade) also causes an itching/burning skin irritation. There appear to be no accounts regarding adverse effects following contact with a third species ***Tradescantia zebrina*** (wandering sailor) also used as a groundcover.

While raphides are mostly found in monocotyledons they also occur, to varying degrees, in 27 dicotyledon families. Among these, the **Vitaceae** (grape family), contain one species **Virginia creeper (*Parthenocissus quinquefolia*)** responsible on occasion for mild to moderate **irritant dermatitis**. A superficial resemblance to poison ivy has led to the two plants being misidentified. Unlike poison ivy, which produces a delayed contact dermatitis 24-48 h after exposure (see below), symptoms due to Virginia creeper develop far more rapidly. These include intense localized itching, inflammation and swelling, the result of contact with sap from broken stems and bruised leaves. Such was the case for a local landscape crew clearing vines from an overgrown lot. Poison ivy was initially suspected, however samples of the vine brought to this office were quickly identified as Virginia creeper.

Members of the **Anacardiaceae** are responsible for more cases of contact dermatitis in the U.S. than all other plants combined. Of these by far the most important are five species of ***Toxicodendron*** - eastern and western poison oak, poison sumac and eastern and western poison ivy. Only **eastern poison ivy (*Toxicodendron radicans*)** is found in south Florida and in Miami-Dade it is infrequent in residential areas. Sap from all these plants contains oily phenolic lipids, urushiols (alkenyl catechols) that readily penetrate the outer layers of skin. They are then susceptible to oxidation to more reactive quinones which act as haptens and bind to proteins on the surface of white blood cells deeper in the skin. These modified proteins are recognized as 'foreign' (antigens) and prime the body's immune system, sensitizing susceptible individuals to further exposure. While initial contact may elicit a mild skin response up to 2 weeks later, subsequent contact with urushiols causes a far more pronounced **delayed type contact dermatitis** (after 24 – 48 h).

Contact need not be direct with poison ivy but surfaces contaminated with sap. The latter could be anything from clothing, mulch, gardening tools or even your pet's fur (urushiols are only allergenic to primates). In addition urushiols remain allergenic for many months (or years in cool dry climates). In the absence of treatment, full recovery from poison ivy dermatitis takes about 3 weeks depending on the degree of sensitivity and extent of exposure. Approximately 10 – 15% of the US population is tolerant (do not react) to urushiol exposure, with up to 75 % in a given area sensitized (far fewer in large urban centers where there is less greenery). The degree of sensitivity varies and appears to be genetically determined, with peak sensitivity to exposure occurring in children between the ages of 8 – 14 years.

Urushiols and related phenolic lipids are found in other members of the Anacardiaceae. Locally this includes the native **poisonwood tree (*Metopium toxiferum*)** which contains highly allergenic alkenyl catechols similar to those found in *Toxicodendron* spp. This is a hazardous tree that is best limited to serious native plant collectors. Two other related plants of local interest are **mango (*Mangifera indica*)** and **Brazilian pepper (*Schinus terebinthifolius*)** which contain less allergenic alkenyl resorcinols and alkenyl phenols respectively. Allergens are concentrated within the bark, berries and new leaves of Brazilian pepper, while in mango they are found in sap, but more significantly also in the skin of the fruit (trace amounts in flesh). The allergens in all of these members of the Anacardiaceae cross react with one another to varying degrees. For instance, a person who has been sensitized by prior exposure to poison ivy is also likely to react to the allergens in mango skin. There is evidence that persons raised in mango growing areas who have consumed mango regularly from an early age develop a tolerance to mango induced allergic dermatitis. The **cashew tree *Anacardium occidentale*** is grown locally in Miami to a limited extent. Great care needs to be exercised in handling the nut. The double-walled shell contains high concentrations of a potent allergen and vesicant, anacardic acid, which is structurally related to the alkenyl catechols (urushiols).

***Philodendron* spp** are aroids that apart from possessing irritant raphides, also contain alkenyl resorcinols. These have been associated with a **delayed type contact dermatitis** that develops in susceptible individuals after repeated contact with philodendrons over months or years. There is however no evidence of cross reactivity with extracts obtained from *Toxicodendron* spp. Phenolic lipids are found in members of the **Proteaceae** including alkenyl resorcinols in the **silk oak (*Grevillea robusta*)**. Appreciated for its delicate foliage and orange yellow flowers it is a fast growing tree producing rapid shade. More common in central Florida, it adapts poorly to local alkaline soils and is highly prone to storm damage. The tree has been reported as the cause of contact dermatitis similar but less severe to that seen in poison ivy.

Plants of the spurge family **Euphorbiaceae** contain not only some of the most deadly of all plant toxins (e.g., ricin), but depending on the species the lactiferous sap (latex) can cause severe **irritant dermatitis**. The irritants involved, **diterpene esters** (especially **phorbol esters**), are found in both the latex and seeds of many euphorbs. If taken internally they can cause severe poisoning. Skin contact with latex results in a range of symptoms from mild skin irritation to localized swelling and severe blistering,

while contact with the eyes cause intense burning and possible temporary blurred vision.

The most common *Euphorbia* found in local landscapes is **crown-of-thorns, *Euphorbia milii***; several compact cultivars and the floriferous ***E. x lomi* hybrids** having stimulated renewed interest over the past 6-7 years. The latex from crown-of-thorns usually causes a mild to moderate irritant dermatitis compared to the more severe symptoms seen in the large so-called 'cactus' euphorbs. Several diterpene esters are known to act as **co-carcinogens** (i.e., they are not directly carcinogenic, but may promote cancer in concert with other factors). In this regard attention has been drawn to the co-incidental distribution in E. Africa of **pencil cactus, *Euphorbia tirucalli*** with areas that experience particularly high rates of Burkitt's lymphoma. This is an aggressive form of cancer found mostly in children (extremely rare in the US) in which the Epstein-Barr virus may play an essential role.

In local landscapes pencil cactus latex can cause intense inflammation, blistering of skin (which can be slow to heal) and severe eye injury. It is a large plant with many thin brittle branches which break easily releasing a stream of latex making it especially hazardous to prune. Although pencil cactus has become rarer in local landscapes, small plants are sometimes seen in the succulent section of garden shops (intended for windowsill use) including a cultivar sold as 'Sticks on Fire' with numerous thin orangey red tipped stems. This and ***Euphorbia trigona* (African milk tree or cathedral cactus)**, another potentially large species, should be placed where they are inaccessible to children. This latter euphorb is also available in a striking red form and where used as a potted patio plant eventually becomes too large and unwieldy - easily toppled, especially if the spines catch on clothing. The **candelabra cactus (*Euphorbia lactea*)** is another large species with especially toxic latex, though now more usually seen in one of several dwarf **cristate** forms. Highly ornamental, looking like pieces of coral, they are usually grafted onto *Euphorbia nerifolia* and are available in area garden shops.

Widely used in local landscapes, the **croton *Codiaeum variegatum*** has clear sap and while not causing the irritant type dermatitis described for the above euphorbs, it is associated with **delayed type contact dermatitis** following repeated exposure to sap. Documented cases have involved frequent handling of crotons (e.g., taking cuttings) either as hobby gardeners or nursery workers. The allergen involved has not been identified. Incidentally, true crotons (*Croton* spp.) are rarely cultivated, but contain at least one especially poisonous species *Croton tiglium*, the seeds of which were once used as a purgative. Isolated instances of allergic dermatitis have been recorded after contact with another euphorb found in local landscapes, the **chenille plant, *Acalypha hispida***. The **manchineel *Hippomane mancinella***, native to south Florida (and south to Columbia) finds little use as a shade tree despite its attractive foliage because of highly irritant sap. Use of the tree for shade has proved unwise, fine droplets of sap dripping from the tree have been known to cause painful skin blisters and temporary eye injury.

The **Apocynaceae** is another family characterized by milky latex. While certain species are extremely poisonous if taken internally, contact with the latex is an infrequent cause of irritant dermatitis. The latex from **allamandas, *Plumeria* spp. (*frangipanis*)** and ***Adenium* spp. (desert rose)** may cause mild irritation. Unidentified

allergens in crushed **oleander** (*Nerium oleander*) leaves have been documented as the cause of delayed contact dermatitis. Latex is also found in many members of the **Moraceae**. **Edible fig** (*Ficus carica*) latex contains a proteolytic enzyme (ficin, used to tenderize meat) that in part is responsible for an **irritant dermatitis**. Several small proteins present in the latex of *Ficus benjamina* have been associated with **immunologic contact urticaria** as well as hay fever like symptoms (immediate type hypersensitivity) in susceptible individuals. Some cross reactivity with natural rubber latex is also seen.

The leaves of *F. carica* contain **furanocoumarins**, contact with which is associated with **phytophotodermatitis**. Following contact and exposure of skin to sunlight, severe erythema and blistering develop over the next 48 hours often followed by a period of prolonged hyper-pigmentation of affected skin. Members of the **Rutaceae** also possess photosensitizing furanocoumarins. **Bergapten** (found in oil of bergamot from *Citrus bergamia*) is in large part responsible for the photo-dermatitis that may follow contact with **limes** (more so Persian than Key limes).

Hay fever (immediate type hypersensitivity reaction to pollen antigens, IgE mediated) is an all too familiar outcome of exposure to many members of the **Asteraceae** (Compositae). **Delayed contact dermatitis** is far less common and most often develops in middle age men. Rather than reacting to the protein antigens of pollen it involves repeated exposure to low molecular weight components, notably **sesquiterpene lactones**, found in leaves and stems. Many of these compounds are relatively benign (taste bitter to ward off herbivores), and some have important medicinal properties, e.g., artemisinin from Chinese wormwood as an anti-malarial. Only sesquiterpene lactones with a particular chemical configuration are allergenic, (i.e., function as haptens, bond with proteins so as to make them appear foreign).

Within the Asteraceae, the landscape /house plants most often found responsible for dermatitis are **chrysanthemums** (crosses involving *Dendranthema grandiflorum*). There are other ornamental species to which susceptible individuals can become sensitized including *Tagetes* spp. (marigolds), *Helianthus* spp. (sunflowers), *Tithonia diversifolia* (Mexican sunflower), *Pseudogynoxys chenopodioides* (syn. *Senecio confusus* Mexican flame vine) and *Gamelopsis chrysanthemoides* (African daisy bush). The Asteraceae contains familiar highly allergenic weeds such as ragweed (*Ambrosia artemisiifolia*) that, in addition to being important causes of hay fever, are linked to delayed contact dermatitis. *Parthenium hysterophorus* (parthenium weed) is a common weed locally in the Redland farming district. In India and Australia it has become a serious health problem and is responsible for widespread airborne dermatitis due to contact with dried wind blown plant parts.

Plants in the **Araliaceae** contain various **polyacetylenes**, especially **falcarinol**, which can cause **irritant dermatitis** and less often sensitize susceptible individuals to a **delayed contact dermatitis**. Most reports concern common ivy; however of more potential local relevance *Schefflera arboricola* (**dwarf schefflera**) also contains falcarinol and has been linked to delayed contact dermatitis. Various cultivars of this shrub, especially 'Trinette' are widely used in area landscapes and grown commercially (usually cuttings). Symptoms are most likely to develop following a history of frequent

contact with cut stems or bruised leaves (during pruning or taking cuttings) when exposure to sap is more likely. Irritant dermatitis has also been reported after contact with *Polyscias* spp. (aralias) all parts of which contain saponins, plus polyacetylenes in at least one species, *Polyscias fruticosa* (ming aralia).

The above plant families are those most commonly found in local landscapes that have the potential to cause irritant and/or allergic dermatitis. Sensitivity to a given plant varies and in many cases symptoms may be mild or only develop after repeated exposure. If you suffer an irritant dermatitis when working in the yard and cannot link symptoms to contact with one of the above groups of plants, the list is not exhaustive. In addition there are non-plant causes of irritant dermatitis. Plants may have been sprayed with a chemical or harbor unseen insects e.g., contact with the native little fire ant, *Wasmannia auropunctata* or one of several caterpillars with urticating (stinging) hairs/spines). **If you have any concerns about symptoms that develop after indoor or outdoor contact with plants call Poison Control 1-800-222-1222**

Yes, it's hot and humid for most of the year in Miami. Nevertheless, when doing yard work wear a long-sleeved shirt, long pants and gloves. This will provide protection from skin contact with plant material especially that scattered by power equipment such as line trimmers (when eye protection is also advisable). Be extra careful clearing out overgrown areas where you aren't quite certain what might have sprouted up. This is particularly important if you are taking over a previously repossessed property with a yard which may have been neglected for an extended period. If you aren't certain as to the identity of plants in your yard take cuttings (not just a leaf!) to your local Extension office. I am indebted to Jeffrey Bernstein MD, Medical Director Florida Poison Information Center Miami Office, for the benefit of his expertise.

John McLaughlin

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