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DETRIMENTAL EFFECTS OF HOUSEHOLD PLANTS TOXIN

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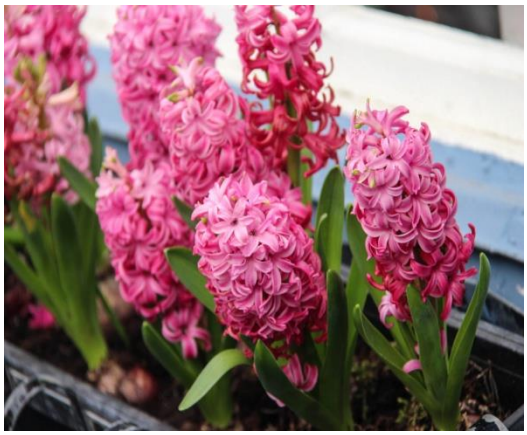
ABSTRACT

People love plants, for food, decoration, or just because taking care of a succulent is a lot less responsibility than a puppy. But many of the house plants that spruce up our surroundings are also poisonous. Kids and pets are the usual victims in plant poisonings because they have a tendency to explore the world with their mouths. In fact, when the American Association of Poison Control Centers compiles their annual poisoning report, plants are typically in the top causes of accidental poisoning in children. So you can be aware of the dangers lurking in your house, Houseplants can be great for your mental health, but eating some of them can be far worse for your bodily health than you might think. Here are some plants you might have around your home that are actually pretty toxic if they end up inside you.

KEYWORDS: Household Plant, Toxins, Health Effects.

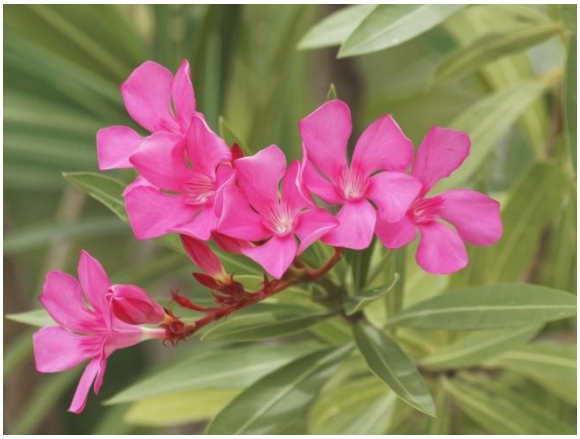
Dieffenbachia, or Dumb Cane, is a tropical plant that is native to Central and South America. It's popular as a houseplant because of its large and attractive leaves. The leaves are green with light yellow or cream blotches arranged in a variety of patterns. The stems are thick and resemble canes. It is a popular house and office plant because it can survive without much sunlight. But it can be bad news if you mess with it. This plant has specialized cells that contain calcium oxalate crystals. That's the same chemical that makes up most kidney stones, which get stuck in the tube that connects your kidneys to your bladder. In Dieffenbachia, these crystals can come in a couple different shapes. Druses have a star-like shape, while raphides are needle-like and researchers think that calcium oxalate crystals might have different functions in different parts of the plant, from deterring hungry herbivores to adding structural support. For instance, if cells in the tasty-looking leaves are damaged, like by chewing, they can forcefully expel the raphides like microscopic darts. These stabby crystals, and other plant proteins on them, can severely irritate the delicate tissue in a mouth.

In humans, the swelling they cause can make it difficult to talk, hence Dieffenbachia's common name: dumb cane, dumb being an antiquated, insulting term for someone who can't speak and if you're unlucky enough to get a squirt of sap in your eye, those crystals can damage your cornea, the clear protective covering on the front of your eyeball. Like any other scratch, this can typically heal. But it's definitely not pleasant.



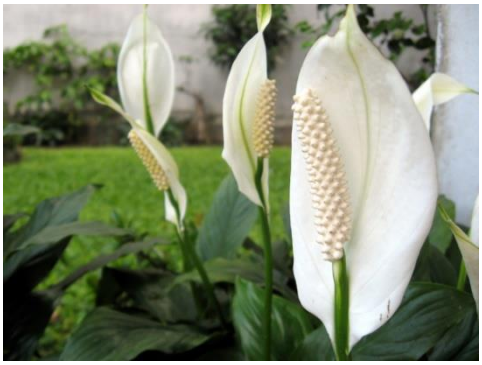
Daffodils and other members of the genus Narcissus from bulbs, they're a classic, cheery spring flower! But they also contain a toxin called lycorine, which is a type of alkaloid. Alkaloids are nitrogen-containing chemical compounds made by lots of living things, including many plants. They can be another way of deterring herbivores. We humans use some alkaloids on purpose, like caffeine or nicotine, even though they can have really extreme effects on our bodies and lycorine is no exception, it causes vomiting, diarrhea, trembling, convulsions, and sometimes even paralysis. Exactly what

it does in our cells isn't well understood. Although there's some evidence it might mess with protein synthesis. People usually don't eat daffodils on purpose, but they can accidentally eat the bulbs thinking that they're onions and that's what happened to some school kids in Suffolk, England in 2009. The kids were making soup using vegetables from a garden they had planted, when someone accidentally added a daffodil bulb to the pot and a bunch of the kids got sick.



Oleander (Nerium oleander) is beautiful but extremely toxic—even in small amounts. It's an evergreen flowering shrub that is grown both outdoors and indoors and produces flowers that can be pink, red, purple, or white. The leathery leaves are long and narrow and have a pointed tip. They are often arranged in pairs or whorls on the stem. Oleander contains four potent toxins—oleandrin, oleondroside, neriin, and digitoxigenin—that are dangerous even in small amounts. Oleander is a popular landscaping shrub in the warmer parts of the US because it's low maintenance, drought tolerant, and has some lovely flowers. But there are some not-so-lovely parts too, like cardiac glycosides. Cardiac glycosides are toxins produced by many different species of plants to, you guessed it, deter herbivores. Oleander specifically has chemicals called oleanderin and neriine. And they interfere with the sodium-potassium pump in heart muscle cells. The sodium-potassium pump does exactly what you'd think from its name: it pumps sodium and potassium ions back and forth across the cell membrane. This helps build up electric charges, and generates a cardiac action potential, which helps coordinate signals that regulate heart muscle contractions. So if you mess with the sodium-potassium pump, you mess with your heartbeat. Specifically, cardiac glycosides inhibit the sodium-potassium pump and reduce the amount of sodium ions it can pump out of the cell. This slows down the heart rate, but increases the force of the heart muscle contractions. Now, other cells in your body have sodium-potassium pumps too, including nerve cells and the cells lining your gut. So Oleander can mess with these too, leading to convulsions and gastrointestinal symptoms like nausea, abdominal pain, and vomiting.

Rhododendrons are popular landscaping shrubs in the wetter parts of North America, but this widespread genus of plants is also native to Asia. And in the 1st Century BCE, they may have contributed to the defeat of the Roman army in Turkey. See, the pollen and nectar in rhododendron flowers contain grayanotoxins. Like cardiac glycosides, grayanotoxins also interfere with cells' ability to move ions across the cell membrane. But they mostly affect nerve cells, so they're considered a neurotoxin. They bind to sodium ion channels in the cell membrane, little pores that open and shut to let sodium ions move into and out of the cell, which helps generate action potentials. And when a grayanotoxin binds, sodium channels get stuck open, which causes all kinds of mayhem in your brain, heart, and gastrointestinal tract, from hallucinations to vomiting. Now, even though humans might not munch on rhododendron flowers for fun, bees visit these flowers and make honey, which we have been known to eat. This toxic honey is called Mad Honey, also the name of my elementary school rock band. So the story goes: when the Roman army invaded what is now Turkey, the locals lined the route with chunks of this Mad Honey honeycomb. The Romans couldn't resist the sweet treat, so they suffered from the toxic effects, and the sick and delirious soldiers were easy to fight off. So I guess the moral of the story is: Never eat mystery road honey.



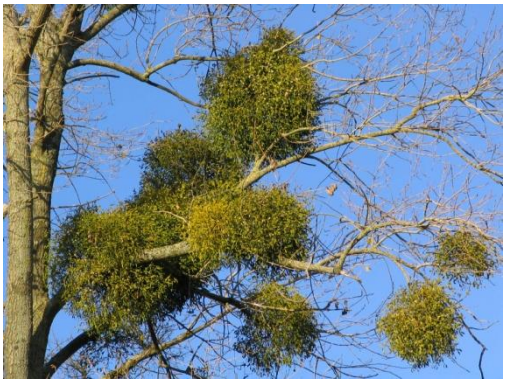
Despite its name, the **Peace Lily, or Spathe**, isn't a true lily. It belongs to the genus Spathiphyllum, which is part of the family Araceae. The leaves of the peace lily are long, narrow, and have a pointed tip. They feel leathery, are dark green in color, and have a shiny surface with prominent veins. **Peace Lily** or spathe of the Valley a favorite flower for bridal bouquets and shady spots in the garden, Lily of the Valley has a shady side too. Which you might know if you're a fan of Breaking Bad. Lily of

the Valley contains nearly 20 or more different cardiac glycosides, the same kind of toxins found in Oleander. One of the major ones is convallotoxin, which is one of the most active natural substances affecting the heart that we know of. Like all cardiac glycosides, it messes with the sodium-potassium pump and wreaks havoc on your heartbeat, so it gets slow and irregular, or in extreme cases, undergoes cardiac arrest. Lily of the valley also contains other toxins called saponins. These aren't very toxic by comparison, but if you eat a lot of them, they'll give you a pretty upset stomach. Saponins are a lot like soap. They're surfactants, which means their molecules have a hydrophilic, or water-friendly, end and a hydrophobic, or water-avoiding, end. And you know what else is made up of carefully arranged hydrophilic and hydrophobic parts: Your cell membranes. So because they're surfactants, saponins can punch holes in cell membranes. And the cells lining your gastrointestinal tract do not appreciate this. Most of the time when someone is poisoned by Lily of the Valley, it's an accident. Like a little kid that tried eating the plant's inviting red berries, or one case study in a medical journal of an elderly woman with dementia who loved the scent of some she was given as a gift, and unfortunately ate them.

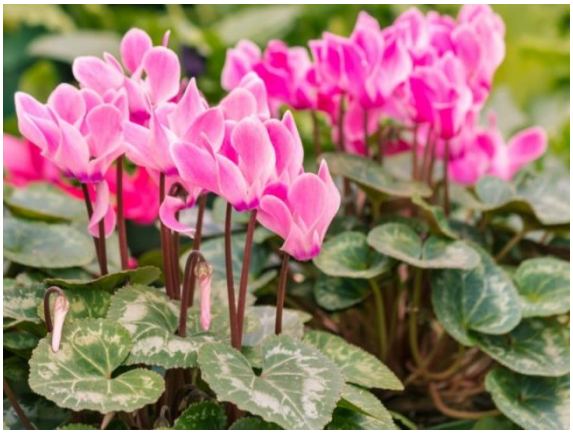
Hydrangeas' fluffy flower poofs may look pretty innocent, but they pack a surprise, a toxin called hydrangin. Hydrangin is a cyanogenetic glycoside and when you eat it, some enzymes in your body convert it to hydrogen cyanide, which you may have heard of before. It's real toxic stuff. Cyanide binds to certain iron-containing molecules in your cells, and shuts down the cells' ability to make that all-important fuel molecule: ATP. Without ATP, your cells quickly starve and die, and so will you. Thankfully your body can detoxify moderate amounts of cyanide, so you'd have to eat a lot of hydrangeas to kill you. And they taste pretty nasty, so a large helping would be hard to swallow. But even eating small amounts of hydrangea will make your digestive tract cells unhappy and cause diarrhea, vomiting, and stomach ache. So if your kid or pet eats them, you should still get them checked out.

Cycas revoluta (Sago palms) are another landscaping plant used in the warmer parts of North America. But they're not closely related to tropical palm trees at all, they're actually part of an ancient group of plants called cycads. Cycads were particularly abundant during the Jurassic Period, so you might remember them from your dinosaur picture books. But even if they look cool, they're hiding a dangerous chemical called cycasin. It's not really the cycasin itself that's the problem. But when your body breaks it down, one molecule that gets produced is methylazoxymethanol or MAM. Now, MAM has a habit of damaging DNA, particularly in developing brain cells and liver cells. Which sounds pretty bad. It's a DNA alkylating agent, which means it binds to DNA and can break strands or make them stick to each other. Which makes it hard for DNA to function or replicate properly, and that can kill affected cells or cause them to become cancerous. Still, you'd probably have to eat a lot of cycad to get enough MAM to cause problems. But on certain islands in the South Pacific where people eat flour made from cycad seeds, there are higher-than-normal rates of neurological diseases like Parkinson's and ALS. And some scientists think that cycads might be partially to blame.

One festive winter holiday tradition is decking the halls with boughs of holly, and with other poisonous plants too. But I'm not talking about poinsettias, they're only mildly toxic. You'd have to eat about 500 leaves to get sick, and they taste terrible so it wouldn't be easy.



Mistletoe, on the other hand, can be much worse. Now, mistletoe species that are native to North America aren't very toxic. But mistletoes in the genus Viscum from Europe have a toxin called viscumin, which is similar to ricin, which you may have heard of before. Ricin is a strong poison made from the castor oil plant and was allegedly used in a tiny pellet during the infamous umbrella assassination of the Bulgarian dissident Georgi Markov during the Cold War. And viscumin seems to be just as deadly. An injected dose as small as 2.4 milligrams per kilogram of body weight can apparently kill a mammal. Both ricin and viscumin are ribosome-inactivating proteins, also known as RIPs, which is a kind of morbidly appropriate initialism. Ribosomes are the structures in your cells that assemble proteins, which do all kinds of work to provide structure and regulate functions throughout your body. When viscumin enters the cell it breaks up an important part of the ribosome, causing irreversible damage and shutting it down. And if your cells can't make proteins, you're in trouble. Because everything starts breaking. So, uh, even if there's some smooching, don't nibble on the mistletoe by mistake.



Potted cyclamen are popular gifts during the holidays, too. They have delicate, colorful flowers, tend to bloom in the winter months, and can be grown outside in mild climates. But they also contain the toxin cyclamine, which is a type of triterpenoid saponin. Like the saponins in Lily of the Valley, this toxin can mess with your cell membranes and irritate your gastrointestinal tract, making you feel pretty lousy. Thankfully, most of the cyclamine is tucked beneath the soil in the plant's rhizome, which is kind of like an underground stem. And all that cyclamine gives the the rhizome a very bitter taste too, so even curious kids or dogs are unlikely to eat enough of it to get seriously ill. The leaves contain less cyclamine, and in traditional Greek cuisine some species were used to make dolmas, little leaf wraps stuffed with rice and other fillings. But, like, please don't pretend you're on Iron Chef and make dolmas at home using random houseplants. It's not a good party idea. In fact, "don't eat the houseplants" is generally a good rule to live by! You can rest easy for the most part, because it'd probably take a lot to get seriously harmed by these plants, even with their toxic defenses.

Prevention of Toxins Exposure

- **Label Plants**
- Before buying a plant, have the store label it with both the common and scientific name.
- Show grandparents and baby sitters where the plant label is. It is very hard for poison specialists to identify plants from a description given on the phone. Know the names of your plants *before* a poisoning happens.

- **Children**
- If you have small children or curious pets, consider removing toxic plants from your garden and house. House plants should be placed out of reach of the very young.
- Teach children not to put any part of a plant in the mouth. This means leaves, stems, bark, seeds, nuts, berries, and bulbs. Do not allow children to suck nectar from flowers or make "tea" from the leaves. Never chew, or let children chew, on jewelry made from seeds or beans.

Handling Toxic Plants

- Store labeled bulbs and seeds safely away from children, pets, and food-storage areas. Avoid confusing bulbs with edible onions.
- Use protective gloves and clothing when handling plants that may be irritating to the skin. Wash clothes afterwards.
- Discard plant leaves and flowers in a safe way so that children and pets cannot get to them.
- Smoke from fires made of twigs and other parts of poisonous plants, including poison oak, can irritate or harm the eyes, throat, and other parts of the body.

CONCLUSION

Plant toxins are found widely in edible plants; apart from harmful effect, these also have nutritious and beneficial to health. These substances may be alkaloid, glycoside, proteins, tannins. These toxins are problem in correlation with different diseases, and they may be a risk as bioterror weapons. Still, it serves as superb tools to study cellular and other mechanisms, and enhanced knowledge about the plant toxins may give us new products for use in medicine. To bring the benefits of traditional knowledge to societies and communities, there is a need for its integration into education. Through the use of culturally relevant messages, reduction of plant poisonings will positively improve the quality of health, and thus quality of life, of both individuals and communities.

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