

PARAQUAT

Overview

Paraquat is a toxic [herbicide](#) that has been related to several hundred cases of fatal human poisoning. Paraquat poisoning has mainly been due to deliberate oral ingestion (for suicide or murder), but there are a few cases of accidental direct ingestion. Although paraquat is now rarely used in the United States, it is still widely applied in developing countries.

Paraquat is nonselective contact [herbicide](#) that binds strongly to soil, where it is highly persistent. Paraquat is acutely toxic to mammals through all routes of exposure and is also known to affect algae and fish.

Just the facts

Physical Information

Name: Paraquat

Use: [Herbicide](#)

Source: Commercially licensed users (of herbicides)

Recommended daily intake: none

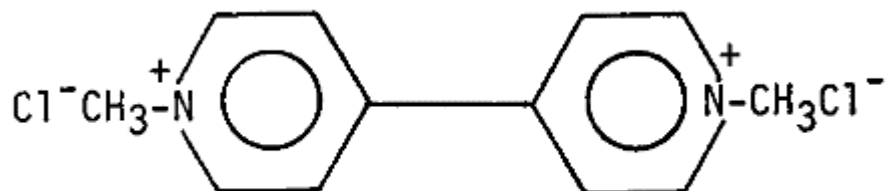
Absorption: oral ingestion, dermal exposure, inhalation

Sensitive individuals: humans

Toxicity/symptoms: pain, swelling of the mouth and throat, GI symptoms, lung fibrosis, kidney damage, usually fatal

Chemical Structure

Structure retrieved
from [UNODC](#)



Chemical Description

Paraquat is a quaternary nitrogen compound known by its chemical name, 1'-dimethyl-4,4'-bipyridinium. The compound's most common presentation is in the form of salts, which are both colorless and odorless, although certain technical formulations may present as white or pale yellow, as well as emit an ammonia-like smell ([EXTOXNET](#)). Paraquat also goes by the more technical term, paraquat dichloride.

In its liquid form, this compound is commonly marketed in the United States as a blue dye in order to keep it from being confused with beverages such as coffee. In this solution, paraquat is given its additive sharp odor, which serves as another safeguard against potential human ingestion. If these preventative measures are ignored or disregarded, a last protective layer exists in that an agent is added that will induce vomiting upon consumption. Paraquat from outside the United States may not have these safeguards added ([#CDC](#)).

Uses and Benefits

As an [herbicide](#), paraquat is widely used for broadleaf weed control, and some common trade names of the product include Crisquat, Dextrone, Herba-xone, and Spot Killer. Its effects take place quickly upon contact and are non-selective, meaning that the compound can affect a wide range of weed plants rather than a particular few ([EXTOXNET](#)).

Paraquat may also be used as an aquatic herbicide, and was once used in the United States and Mexico to kill marijuana plants. However, this particular application proved fatal when a number of deaths were observed when marijuana contaminated with this chemical was inhaled ([#Gilbert, 2004](#)). Because paraquat destroys green plant tissue on contact, it has also

historically been used in the production of certain commercial crops such as alfalfa, almonds, grapes, and cotton ([PAN](#)). Although paraquat is now rarely used in the United States, it is still widely applied in developing countries.

Health Effects

Although paraquat is acutely toxic to mammals through all routes of exposure, it is at its most lethal via the ingestion pathway. Oral LD50 values of the chemical range from 50 to 150 mg/kg in mammal models, and past cases of exposure in humans places our LD50 near 35 mg/kg ([EXTOXNET](#)). Dermal exposure to paraquat has been shown to induce dry and fissured hands, the loss of fingernails, ulceration, and diarrhea ([PAN](#)).

Simply one large oral dose of paraquat is enough to cause a burning of the mouth and throat, which is subsequently followed by gastrointestinal tract irritation. This symptom results in abdominal pain, loss of appetite, nausea, vomiting, and diarrhea. In many cases, ingestion of the compound goes on to cause lung congestion, leading to convulsions and death via respiratory failure ([#Gilbert, 2004](#)). These symptoms may not present instantly, and may in fact develop over several days' time. The impact from paraquat, in damaging the lungs the most, thus more greatly affects people with asthma or other lung-related conditions ([EXTOXNET](#)). Important to note is that even in cases when accidental or occupational ingestion of paraquat is not fatal, exposure can still cause progressive fibrosis of the lungs and damage to the kidneys. As for chronic health effects, laboratory studies on rats did not indicate a significant effect of two years of prolonged low-dose exposure. However, the case was not the same in dog subjects, which developed lung problems after being exposed for 2 years at high doses, roughly above 35 mg/kg per day ([EXTOXNET](#)). However, no observational studies on human exposure have corroborated this result. There is also little evidence to indicate that paraquat has reproductive or teratogenic impacts on mammals. However, the toxicological literature is conclusive regarding the compound's mutagenic potential in microorganisms and mouse cell assays, although it is not clear what levels of exposure are necessary to induce such effects ([EXTOXNET](#)).

Paraquat is not listed by any major health agency to be a carcinogen, nor is it, in most literature, considered as an endocrine disruptor.

Treatment

The only treatments available for poisoning with paraquat are either an attempt to limit absorption by oral administration of substances such as Fullers Earth, which adsorbs paraquat, or the use of haemodialysis or haemoperfusion to rid blood of the compound. After paraquat has accumulated in the lungs, however, there is no effective treatment currently available (#Timbrell, 2002).

Ecological Effects

As noted earlier, paraquat rapidly and strongly absorbs to soil particles, especially those of clay. In soil, the compound can have a half-life of greater than 1000 days (EXTOXNET). Because it binds so strongly to soil, during rainstorms paraquat may also run off into water bodies, one reason why the EPA has listed paraquat as a potential ground water contaminant (PAN). As for its effects on wildlife, paraquat, as stated above, instantly affects green plants upon contact. Possibly for this reason, at high enough levels paraquat inhibits the photosynthesis of algae in streams, disrupting the base levels of food webs. Aquatic weeds also bioaccumulate the compound, and many fish are easily harmed by moderate levels of the chemical, namely, rainbow trout, bluegill, and channel catfish (EXTOXNET).

Source : <http://www.toxipedia.org/display/toxipedia/Paraquat>