# Paraquat and Parkinson's Disease

## Frequently Asked Questions

### What is Parkinson's disease? What are its symptoms?

Parkinson's disease is a chronic and progressing neurologic disorder that affects approximately 1 million people in the U.S. It results from the degeneration or dying off of certain cells, called dopaminergic neurons, which are located in the substantia nigra portion of the brain.

Parkinson's is called a movement disorder because some of the most common symptoms are tremors, and the slowing and stiffening of movements. However, symptoms can be different in different people. Other symptoms can include loss of coordination, loss of smell, speech problems, chronic constipation, fatigue, and excessive sweating. Tell your doctor if you have any symptoms that are of concern to you.

### Is there a cure for Parkinson's disease?

There is no cure for Parkinson's disease, which makes it even more important to prevent the disease when possible. Banning the use of Paraquat in the U.S. is an important step in preventing Paraquat and other pesticide expsoures that are linked to the development of Parkinson's disease.

### How do we know that Paraquat can increase the risk of developing Parkinson's disease?

Extensive scientific research over the last twenty years has demonstrated a link between Parkinson's disease and people who were exposed to Paraquat. In fact, Paraquat use has long been restricted to certified applicators due to concerns based on this research.

In the last ten years, research on Parkinson's disease has intensified, with two particularly convincing studies involving humans: one by the National Institutes of Health (NIH), and one Italian meta-analysis. Both studies provide persuasive evidence for an increased risk of Parkinson's Disease in farmers and in people who live near where Paraquat is used.

Freya Kamel, a scientist within an epidemiology branch of the NIH, has said that research on the link between paraquat and Parkinson's disease is *"about as persuasive as these things can get."*

## How does Paraquat cause Parkinson's disease?

Paraquat kills cells through a mechanism called oxidative stress, meaning that altered cell chemistry leads to cell damage and death. Parkinson's disease results from the loss of function in the dopamine neuron cells of the substantia nigra pars compacta, a small region of the brain. These neurons may be more vulnerable to oxidative stress than other neurons, and thus more affected by Paraquat, particularly in people with a genetic susceptibility. Not everyone who is exposed to Paraquat develops Parkinson's disease, nor does everyone with a genetic susceptibility.

Only a small number of Parkinson's disease cases are genetic or inherited. As with many diseases, there likely is an interaction between environmental exposures and genetics that leads to the disease.

## Is this the only herbicide to be linked to adverse human health effects?

No. Rotenone has also been linked to Parkinson's disease, but it was phased out as a pesticide in the U.S. because of safety concerns. It is still used for government-directed fish kills.

Other pesticides have been linked to many diseases and conditions, including infertility, breast cancer, learning difficulties, and leukemia.

## Who is most at risk of developing Parkinson's disease after coming into contact with Paraquat?

None of us are immune from the health effects of toxic chemicals. What makes some of us more susceptible to developing one disease or another is not yet known, but likely it is a combination of our environment interacting with our genes.

People with a genetic predisposition for Parkinson's disease may be more affected by low level exposures to Paraquat, and therefore more likely to develop the disease, although many people have developed Parkinson's disease without a known genetic susceptibility.

Those at the greatest risk are people who most frequently use or are exposed to Paraquat, such as farmworkers and those who live in or near areas where large amounts of Paraquat are sprayed.

## What's the difference between primary and secondary exposure?

Primary exposure to a pesticide is an exposure that occurs as a direct result of applying the pesticide. Secondary exposure occurs when sprayed pesticides move through the air or groundwater and contaminate a well, or soil, or the air in and around a home.

## What other health risks have been linked to Paraquat use?

Paraquat is highly toxic to humans – one small accidental sip is often fatal, and there is no antidote. Many deaths occur around the world each year from accidental ingestion of Paraquat, often as a result of the concentrate being transferred into a beverage container. Paraquat and another herbicide, diquat, **caused 85%** of all herbicide-related deaths in the U.S. from 1998 to 2011.

Other health risks due to long-term low-dose exposure to Paraquat include asthma, kidney disease, and scarring of the lungs.

## How does Paraquat use impact surrounding communities and even the rest of the country?

In 2017 alone, an estimated **11 million pounds** of paraquat were used in the United States, on nearly 15 million acres. This makes it highly likely that many citizens in agricultural communities are unknowingly exposed to Paraquat over time, either through the air, soil, or water.

Additionally, apples, grapes, wheat, almonds, pears, and strawberries are sprayed with paraquat. Consuming these products, and other produce grown with pesticides, can expose humans to Paraquat by ingestion.

## Is there any safe way to use Paraquat?

No. Because of its high toxicity to humans and animals, Paraquat has been banned in the European Union, China, and **over 40 other countries**. It should be banned in the U.S. as well.

## Why hasn't the EPA banned the use of Paraquat?

To this point, the EPA's approach to Paraquat has been influenced by politics. EPA is currently reviewing and reassessing Paraquat, while many of us in the scientific community are continuously working to influence the agency to prioritize human and environmental health, as it should.

---

Prepared by:
Angela C. Hind, M.D.
angelachind@you-md.com

Angela Hind, M.D. has served as a medical consultant for several significant legal cases involving environmental toxins and health. In this role, she has been instrumental in researching and identifying scientific data related to health effects of toxic exposures, and assembling teams of renowned subject-matter experts, including research scientists, physicians, industrial hygienists, and toxicologists.