

PESTICIDES & PARKINSON'S— IS THERE A LINK?



Parkinson's disease (PD) is a neurodegenerative condition characterized by uncontrolled movements, including tremors and stiffness, as well as impairment in cognition and sleep.

Signs of PD occur when neurons in the basal ganglia become **injured or die**, causing less dopamine to be released and result in problems with movement. As well, the sympathetic nervous system is affected as nerve endings that produce norepinephrine can die out.

The cause of Parkinson's is unknown. However, it is believed to be developed from a combination of genetics, environmental factors, and aging. **Emerging findings suggest that pesticide exposure can increase the risk of the disease.**

EVIDENCE

Described in a review article published in 2006 by *Environmental Health Perspectives* titled "Pesticides and Parkinson's disease--is there a link?", researchers were interested in the role of exogenous toxins causing the development of PD. As the toxicant 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) was found to result in symptoms of the disease, compounds similar to MPTP in pesticides were particularly analyzed.



The researchers reviewed a number of epidemiologic and toxicologic studies done on the possible link between pesticides and Parkinson's disease. Many of the causes indicated a **connection between the neurodegenerative development of PD and classes of pesticides**, such as paraquat in herbicides, as well as insecticides. The **amount of time of exposure** to these factors were also linked to an increased risk. As a result, the authors stated that:

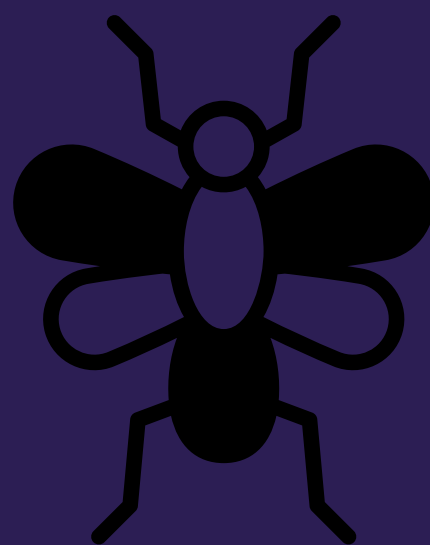
"the weight of evidence is sufficient to conclude that a generic association between pesticide exposure and PD exists."



FURTHER FINDINGS

In the 2023 study, "A pesticide and iPSC dopaminergic neuron screen identifies and classifies Parkinson-relevant pesticides", published in *Nature Communications*, researchers at UCLA Health and Harvard identified **10 pesticides toxic to neurons involved in the development of Parkinson's**.

Data from 829 patients with PD and a control group of 824 alongside their living area was included. By analyzing and estimating the exposure history of 288 pesticides recorded since 1972, the researchers determined that **patients with PD were more likely to live and work in areas with higher pesticide use, such as near agricultural faculties, compared to controls**.



58 of the pesticides appeared to be linked to PD. Most of them were tested for toxicity in dopaminergic neurons derived from patients with PD. It was found that 10 of the pesticides caused significant neuronal death, which included:

- **4 insecticides: dicofol, endosulfan, naled, and propargite**
- **3 herbicides: diquat, endothall, and trifluralin**
- **3 fungicides: copper sulfate (basic and pentahydrate) and folpet.**

Pesticides used in cotton farming were analyzed as well. The researchers found that **trifluralin**, a commonly applied herbicide, produced great toxicity in dopaminergic neurons and mitochondrial dysfunction.

To better understand the link between Parkinson's and pesticides, the researchers' next plan is to study which biologic pathways, such as the non-neuronal cells in the brain, are affected among people with PD who have been exposed to the identified toxins.

References:

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By: Faith Zou