SUMMARY

Genetic Modification of the Association of Paraquat and Parkinson's Disease

What we found

- Risk of Parkinson's disease was **doubled** in people who **worked with Paraquat**.
- Strikingly, the risk of Parkinson's disease was increased **11-fold** in people who had a **common genetic variant** (defective GSTT1 gene) and **worked with Paraquat**.

Why this matters

- It is likely that Parkinson's disease is caused by a combination of genes and environment.
- Understanding how genes and environment interact could lead to ways to prevent or slow the progression of Parkinson's disease.
- An 11-fold increased risk of Parkinson's disease is one of the largest risks ever reported.
- Paraquat is one of the most widely used herbicides in the world.
- Paraquat has been used for decades in the farming of fruits and vegetables, to treat cotton before harvesting, to kill weeds in fields before crop planting, and for weed control along roads and highways.
- In 2009, more than a million acres were treated with Paraquat in California alone.
- The GSTT1 gene makes the protein glutathione-S-transferase T1 which protects the body from a variety of toxins.
- In approximately 20% of the population, the GSTT1 gene is defective.

How the study was done

- Study participants were members of the Agricultural Health Study (AHS).
- The AHS includes 89,000 individuals residing in Iowa and North Carolina, many of whom worked as pesticide applicators (mostly farmers) and their spouses.
- We identified 87 AHS participants with Parkinson's disease and compared them with 343 people without Parkinson's disease.
- We asked participants detailed questions about whether they used Paraquat in any job during their lifetime.
- We tested their blood to see if they had a common variant of the GSTT1 gene.
- We then compared Paraquat use and genes in people with and without Parkinson's disease.

Next steps

- Like all epidemiology studies, our results need to be replicated before we can be certain that Paraquat exposure and the GSTT1 gene defect cause Parkinson's disease.
- Our results also need to be investigated in the laboratory to better understand why the combined effects of Paraquat exposure and the GSTT1 gene defect may increase the risk of Parkinson's disease.
- Although we specifically studied the link between Parkinson's disease and Paraquat exposure, other similar toxins should also be studied.

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Paraquat resources: [Centers for Disease Control and Prevention](https://www.cdc.gov) and [Pesticide Action Network (PAN)](https://www.pan.Quit.org).

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