

NIEHS-funded research shows link between DDT and Alzheimer's disease

By Joe Balintfy

Researchers, funded in part by NIEHS, have made progress in connecting the dots between exposure to the pesticide DDT and risk for Alzheimer's disease. The results of a [study](http://www.ncbi.nlm.nih.gov/pubmed/24473795) (<http://www.ncbi.nlm.nih.gov/pubmed/24473795>) published Jan. 27 in the journal JAMA Neurology may help lead to a screening test for Alzheimer's susceptibility in certain people, according to the authors.

Jason Richardson, Ph.D.,

(<http://eohsi.rutgers.edu/content/directory?profile=84>)

associate professor at Rutgers Robert Wood Johnson Medical School, said Alzheimer's is the most common neurodegenerative disease in the world, and the number of cases are expected to explode over the next 20-30 years.

"As with many neurological disorders, many [Alzheimer's] studies focused on genetic susceptibility," he said. "Our study is one of the first that really demonstrates that there may be an environmental influence - specifically that DDT or DDE exposure may have an association."

Listen as Richardson discusses DDT exposure and genetic risk factors for Alzheimer's disease. (0:52)

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[Transcript](#) (187KB)

DDT in the blood and genetic risk

Although banned in the U.S. in the 1970s, DDT lingers in the environment - what Richardson calls legacy contamination - and continues to be used elsewhere in the world. Exposure to DDT can be measured by checking blood levels of DDE, a breakdown product of DDT.

Researchers found DDE levels to be 3.8 times higher in blood samples of Alzheimer's patients compared to controls. According to the study, those with the highest DDE levels were associated with an even higher risk of developing Alzheimer's. The study involved 86 Alzheimer's patients and 79 controls at two study sites.

Richardson said that, based on the data from his research, he may be considered at higher risk for Alzheimer's. "I grew up a farm kid in Louisiana and Mississippi. I applied pesticides. "So, this is something that's kind of near and dear to my heart on a number of levels."

According to Richardson, people carrying the apolipoprotein E (APOE) E4 form of a gene - a leading indicator of a person's risk of getting late-onset Alzheimer's - may be more susceptible to the effects of DDT and DDE. "What our data suggest is that if you do have high levels of DDE in your blood, and you have an APOE E4 allele, you may have worse cognitive function."

Connecting the dots between DDT and Alzheimer's

Scientists are increasingly finding that neurodegenerative diseases, such as Alzheimer's, have an environmental link. "This is building on the evidence that the causes of Alzheimer's disease are a combination of genes and the environment," said Annette Kirshner, Ph.D., health scientist administrator in the [NIEHS Genes, Environment, and Health Branch](#).

Richardson said the new study builds on a 2009 [study](#)

(<http://www.ncbi.nlm.nih.gov/pubmed/19597089>)

of pesticides and Parkinson's disease. "In that study," he explained, "we used 20 Alzheimer's cases as kind of a disease control group." While the organochlorine pesticide the researchers studied was associated with increased risk of Parkinson's disease, it was not associated with Alzheimer's. "But in those 20 [Alzheimer's] patients, we found elevated DDE levels."

He cautioned that the new study has limitations. "If you compare it to the genetic studies where you have thousands and thousands of patients and controls, ours is relatively small." But, Richardson pointed out that, for this study, researchers took an extra step. "Even though we can't prove causality, we tried to take it one step further, asking if there is a mechanistic link between DDT and DDE and Alzheimer's disease. What we show in the paper is that if you expose cultured cells to DDT or DDE



According to Richardson, one problem with Alzheimer's disease is that, often, by the time patients are diagnosed, the disease has progressed to a point where therapeutic interventions are very limited. (Photo courtesy of Jason Richardson)

at levels that have been observed in highly exposed people in the United States, you actually cause an increase in a protein that is linked with Alzheimer's disease."

This study was highlighted in a Jan. 27 [article](#)

(http://news.rutgers.edu/research-news/pesticide-exposure-linked-alzheimer%E2%80%99s-disease/20140127#.UxCuM_ldV8H)

in Research News at Rutgers.

Citation: [Richardson JR](#), [Roy A](#), [Shalat SL](#), [von Stein RT](#), [Hossain MM](#), [Buckley B](#), [Gearing M](#), [Levey AI](#), [German DC](#).

(<http://www.ncbi.nlm.nih.gov/pubmed/24473795>)

2014. Elevated serum pesticide levels and risk for Alzheimer disease. *JAMA Neurol*; doi:10.1001/jamaneurol.2013.6030 [Online 27 January 2014].

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