

Gulf War veterans display abnormal brain response to specific chemicals

23 March 2009



This is Dr. Robert Haley from UT Southwestern Medical Center. Credit: UT Southwestern Medical Center

A new study by UT Southwestern Medical Center researchers is the first to pinpoint damage inside the brains of veterans suffering from Gulf War syndrome - a finding that links the illness to chemical exposures and may lead to diagnostic tests and treatments.

Dr. Robert Haley, chief of epidemiology at UT Southwestern and lead author of the study, said the research uncovers and locates areas of the [brain](#) that function abnormally. Recent studies had shown evidence of [chemical](#) abnormalities and shrinkage of white matter in the brains of veterans exposed to certain toxic chemicals, such as sarin gas during the 1991 Persian Gulf War.

The research, published in the March issue of the journal *Psychiatry Research: Neuroimaging*, enables investigators to visualize exact brain structures affected by these chemical exposures, Dr. Haley said.

"Before this study, we didn't know exactly what parts of the brain were damaged and causing the symptoms in these veterans," he said. "We designed an experiment to test areas of the brain that would have been damaged if the illness was

caused by sarin or pesticides, and the results were positive."

In designing the study, Dr. Haley and his colleagues reasoned that if low-level sarin or pesticides had damaged Gulf War veterans' brains, a likely target of the damage would be cholinergic receptors on cells in certain brain structures. If that was so, administering safe levels of medicines that stimulate cholinergic receptors would elicit an [abnormal response](#) in ill veterans.

In the study, 21 chronically ill [Gulf War veterans](#) and 17 well veterans were given small doses of physostigmine, a substance which briefly stimulates cholinergic receptors. Researchers then measured the study participants' brain cell response with brain scans.

"What we found was that some of the [brain areas](#) we previously suspected responded abnormally to the cholinergic challenge," Dr. Haley said. "Those areas were in the basal ganglia, hippocampus, thalamus and amygdala, and the thalamus. Changes in functioning of these brain structures can certainly cause problems with concentration and memory, body pain, fatigue, abnormal emotional responses and personality changes that we commonly see in ill Gulf War veterans."

A previous study funded by the U.S. Army found that repetitive exposure to low-level sarin nerve gas caused changes in cholinergic receptors in lab rats.

"An added bonus is a statistical formula combining the brain responses in 17 brain areas that separated the ill from the well veterans, and three different Gulf [War syndrome](#) variants from each other with a high degree of accuracy," Dr. Haley said. "If this finding can be repeated in a larger group, we might have an objective test for Gulf War syndrome and its variants."

An objective diagnostic test, he said, sets the stage for ongoing genetic studies to see why some people are affected by chemical exposures, and why others are not. New studies would also allow the selection of homogenous groups of ill veterans in which to run efficient clinical trials for treatments.

Dr. Haley first described Gulf War syndrome in a series of papers published in January 1997 in the *Journal of the American Medical Association*. In previous studies, research from Dr. Haley showed that veterans suffering from Gulf War syndrome had lower levels of a protective blood enzyme called paraoxonase, which usually fights off the toxins found in sarin. Veterans who served in the same geographical area and did not get sick had higher levels of this enzyme.

Dr. Haley and his colleagues have closely followed the same group of tests subjects since 1995. In 2006, UT Southwestern and the Department of Veterans Affairs established a dedicated, collaborative Gulf War illness research enterprise in Dallas, managed by UT Southwestern.

Texas Sen. Kay Bailey Hutchison, a longtime supporter of Gulf War research, facilitated that agreement and secured a \$75 million appropriation over five years for Gulf War illness research.

Source: UT Southwestern Medical Center ([news](#) : [web](#))

APA citation: Gulf War veterans display abnormal brain response to specific chemicals (2009, March 23) retrieved 5 May 2021 from <https://medicalxpress.com/news/2009-03-gulf-war-veterans-abnormal-brain.html>

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