

# Biosensor for Nerve Agents and Pesticides

Tech ID: 19558 / UC Case 2002-159-0

## BACKGROUND

Organophosphorus and organothiophosphorus compounds are used extensively in insecticides, and are highly toxic to many organisms including humans. Insecticide residues are found in soil and groundwater, and the detection of these residues is important for their elimination from the environment and to protect the health of both humans and animals. Organophosphorus compounds are also used in nerve agents, such as soman, sarin, cyclosarin, VX, and tabun, for chemical warfare purposes. These agents are some of the most toxic man made poisons and are potent inhibitors of the enzyme acetylcholinesterase (AChE).

Rapid analysis of toxic materials in the areas of food and water analysis, environmental monitoring, and in industrial settings is a problem that continues to exist and is currently addressed by time-consuming, expensive methods or by inadequate techniques.

## TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed a ligand sensing fluorescent enzyme assay for detecting, quantifying, and evaluating hazardous organophosphate pesticide and nerve agent exposure. The technology utilizes fluorescently labeled mutants of the acetylcholinesterase enzyme (AChE) that exhibit fluorescence wavelength shifts upon ligand binding. The assay does not require reagent addition, can distinguish between organophosphates, and can be used in conjunction with laser, microarray, and capillary electrophoretic techniques for rapid detection of organophosphate conjugated AChE.

## APPLICATIONS AND ADVANTAGES

### Advantages:

The method is rapid, sensitive, near real-time, automatable and can differentiate different organophosphates. The detection device can be designed to be economical, small in size, portable and suited for remote sensing.

### Applications:

Detection and monitoring of

- organophosphate insecticide contamination in food and water analysis, environmental, and industrial settings
- chemical warfare/terrorism organophosphate agents

## STATE OF DEVELOPMENT

Several fluorescently labeled mutants of acetylcholinesterase (AChE) have been developed to detect the accumulation of organophosphates, insecticides and nerve agents, such as soman, sarin, cyclosarin, VX, tabun, and other materials used for chemical warfare purposes with high sensitivity.

## RELATED MATERIALS

- ▶ Shi J., Boyd A.E., Radic Z., Taylor P., Reversibly bound and covalently attached ligands induce conformational changes in the omega loop, Cys69-Cys96, of mouse acetylcholinesterase. *J. Bio. Chem.* 2001, 276(45):42196-204 - 11/09/2001

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,642,273	02/04/2014	2002-159

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## OTHER INFORMATION

### CATEGORIZED AS

- ▶ **Medical**
  - ▶ Diagnostics
  - ▶ Disease: Central Nervous System
  - ▶ Other
- ▶ **Security and Defense**
  - ▶ Food and Environment
  - ▶ Other

### RELATED CASES

2002-159-0

## OTHER INFORMATION

### Patent Info:

US patent application No. 20050089926 "Ligand Sensing Fluorescent Acetylcholinesterase for Detection of Organophosphate Activity"

### Related Cases:

[2012-316](#) [2012-317](#) [2012-411](#)

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