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<td>Biomarkers of Exposure: Molecules to Ecosystem</td>
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<th>6. AUTHORS</th>
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<tr>
<td>Barry W. Wilson</td>
<td>The Regents of the University of California</td>
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<td>Biomarkers: Cholinesterases, Neuropathy Target Esterase, Fecal Testosterone in Mice, Cell and Organ Cultures</td>
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PUBLIC REPORTING BURDEN FOR THIS COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 1 HOUR PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTION, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THIS COLLECTION OF INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THIS BURDEN, TO WASHINGTON HEADQUARTERS SERVICES, DIRECTORATE FOR INFORMATION OPERATIONS AND REPORTS, 12115 JEFFERSON DAVIS HIGHWAY, SUITE 1204, ARLINGTON, VA 22202-4302, AND TO THE OFFICE OF MANAGEMENT AND BUDGET, PAPERWORK REDUCTION PROJECT (0704-0188), WASHINGTON, DC 20503.
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Biomarkers:

Cholinesterases
Organophosphate pesticides and chemical warfare agents are often monitored by cholinesterase measurements. Major improvements have been made in the clinical and field methods used to determine blood enzymes in man, laboratory animals and wildlife.

Neuropathy Target Esterase
Air Force brake fluids once contained the ortho isomer of tri-cresyl phosphate. A substance associated with outbreaks of a long term neuropathy. Purification methods were studied for neuropathy target esterase (an enzyme associated with the organophosphate induced delayed neuropathy) and we made a good beginning on methodology to establish its localization in the nervous system.

Fecal Testosterone in Mice
Wild animals are important sentinels at Air Force sites and other ecosystems. A method to determine the testosterone level in feces of mice was developed and subjected to a field test at Mare Island. The method will permit non-invasive determination of testosterone levels in wild animals allowing us to establish their reproductive state. Such studies may provide early warning signs of environmental problems, since reproduction is a sensitive feature of the physiology of animals.

Cell and Organ Cultures
Alternatives to animal testing were studied using metals and organophosphates, TCDD-like molecules and nerve, muscle and liver cultures and liver from bird embryos. Highly differentiated surface cultures and brain cell reaggregates were developed and studied. Induction of EROD activity could be demonstrated in embryos and liver cells from wild birds and interactions of cadmium and organophosphates were demonstrated in vitro with muscle and nerve cells.

Analytical

The analytical part of the project focused on improving methods of extraction of environmental contaminants important to the Air Force using techniques such as super critical extractions. Soils were analyzed for important contaminants from Air Force sites.
Conclusion
The project ended with the scientists poised to carry out combined laboratory and field studies with biomarker and analytical techniques at selected Air Force sites such as Beale Air Force base.

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7. (BIOSIS result)
Wilson, B W; Billitti, J E; David, M; Lasley, B L; Fry, D M; Seiber, J N.
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