

Overview of the UC Davis Superfund Research Program

Bruce D. Hammock
Center Director



Candace R. Spier
Research Translation Core Leader
crspier@ucdavis.edu

Cindy McReynolds
Program Manager
cbmcreynolds@ucdavis.edu

Biomarkers of Exposure to Hazardous Chemicals

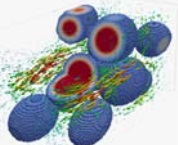
Research Projects

1: Transport and Remediation

Identifying microbial communities that possess remediation potential

Findings: Isolated a natural bacterium that degrades **MTBE**, a gasoline additive known to contaminate aquifers around gasoline stations

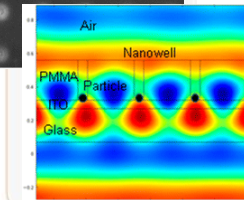
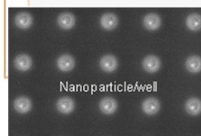
Employing numerical modeling to accurately represent pore-scale distributions of contaminants



2: Biosensors

Improving immuno- and bioassays with new and emerging nanotechnology

Findings: Phase matching of the excitation and the emission in the 2D arrays with particles produces a highly enhanced fluorescence signal



3: Immunochemical Biomarkers

Developing immunoassays for chemical detection

Target analytes:

- PBDEs, TBBPA, non-coplanar PCBs, chlorantraniliprole
- TCS and TCC and their metabolites
- pyrethroid metabolites

Findings: TCC and its metabolites were measured in urine following showering with TCC-containing bar soap



Findings: Pinecone seed harvesters were monitored for pyrethroid insecticide exposure using an immunoassay for the metabolite, **3-PBA**

4: Pulmonary Biomarkers

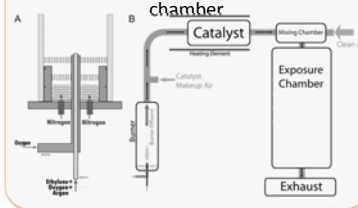
Identifying peptide/protein adducts in urine, lungs and nasal cavities due to chemical exposure

Target analytes:

- naphthalene
- nitronaphthalene
- nanoparticles

Findings: Newborns and infants may be more susceptible to harm from particulate matter than adults

Particle generator and exposure chamber



5: Cell-based Assays

Developing cell lines with unique properties of responding to chemicals

Findings: Non-dioxin-like PCBs, PBDEs, TCS and TBBPA are potent modulators of a



common target, RyR1 and RyR2 (Ca²⁺) channels

Success Story:

A rapid, high-throughput bioassay for the detection of endocrine disrupting compounds in various sample types has been accepted by ICCVAM as an alternative testing model

6: Reproductive Biomarkers

Developing and applying biomarker assays for evaluating human reproductive health

Findings: TCC induces androgen-like effects in male rats, such as, increases accessory sex organ weight

Findings: Transdermal absorption of TCC from commercial bar soap during a normal shower routine can result in detectable concentrations of TCC and modulation of several cytokines and chemokines

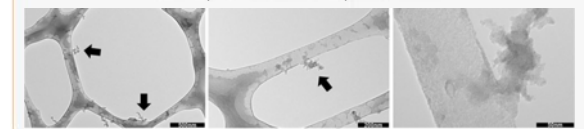
7: Nanoscale Particle Remediation

Developing tools to aid in evaluating the health effects of nanoscale particles



Findings: Developed unique nanoparticles (Gd₂O₃:Eu) as a means to simulate exposure to similar materials for the purposes of tracking the translocation of these particles in the body while also determining dissolution rates

TEM of particles used in exposure studies



Support Cores

A: Analytical

- Develops analytical methods to detect hazardous chemicals for the variety of UCD-SRP projects
 - PBDEs, TBBPA
- Develops methods to detect the parent and key metabolites of chemicals to identify biomarkers of exposure
 - triclosan (TCS), triclocarban (TCC)
- Validates alternative analytical methods such as:
 - Immunochemical assays
 - Cell-based assays

B: Proteomics

- Finds characteristic responses of human and other organisms to given agents
- Identifies biomarkers of early response
- Develops and provides workflows for proteomics services including:
 - profiling of complex protein mixtures
 - analysis of posttranslational modifications



C: Training

- Provides trainees with:
 - research assistantships
 - non-resident tuition waivers
 - enrichment funds
- Provides investigators with support for SRP-related projects through hosting:
 - undergraduate researchers
 - visiting scholars
 - Fulbright scholars

D: Research Translation

- Organizes workshops for Trainees
 - Survival Skills Workshop for Young Investigators
- Organizes a Public Lecture Series
 - SAY-IT (Science and You-Informational Talk)
- Provides support for the UCD Entrepreneurship Academies
- Assists small business startups
- Hosts internship opportunities for undergraduate writing minors



www-sf.ucdavis.edu

E: Administration

- Fiscal support and management
- Grant application support
 - NIH NRSA Fellowships
 - SBIR/STTR
 - Early Independence Award Program
- Seminar support:
 - Environmental Toxicology Series
 - Biotechnology Series
 - NIOSH Western Center for Agricultural Health and Safety