# Toxicological Perspectives on the Gulf Oil Spill

Janice Chambers, PhD, DABT, ATS
Director, Center for Environmental Health Sciences
Giles Distinguished Professor
College of Veterinary Medicine
Mississippi State University
chambers@cvm.msstate.edu

# Toxicology

- Study of adverse effects of chemicals
- Inherently an interdisciplinary field
- Therefore toxicologists are often involved in collaborative research

# Chemicals of Interest

- VOC's and aliphatics
- Aromatics including polycyclic aromatic hydrocarbons
- Asphaltics
- Heavy metals
- Sulfur
- Weathered oil components
- Combustion products
- Dispersants
- Mixtures of above
- Mixtures of above with drugs, occupational chemicals, lifestyle chemicals, food contaminants, air pollutants
- Potential for synergy or antagonism

# Potential Toxicities

- Acute→ chronic
- Respiratory, short term
- Genotoxicity from PAH's leading to carcinogenicity, mutagenicity, teratogenicity
- Induction of xenobiotic metabolizing enzymes, cytochromes P450; a prominent inducible activity would be ethoxyresorufin O-deethylase (EROD) that serves as a biomarker for exposure to PAH's and other persistent pollutants
- Behavioral effects, ex. fear, anxiety
- Stress-related changes: stress hormone derangement, oxidative stress, alterations in normal physiology and biochemistry, alterations of homeostasis

# Affected Populations

- Workers: clean-up, paid and volunteers
- Vulnerable populations: children, pregnant women, elderly, weak and diseased, environmental justice populations

# Risk Assessment

- Risk: from a toxicological perspective, the probability of adverse effects arising from a specified exposure
- Relates toxicity to exposure levels
- Risk assessor needs to know what toxicities might occur from specific chemical exposures
- Risk assessor needs to know what level of exposure people encountered

# Fields for Potential Collaboration

- Toxicologists (to determine effects, develop biomarkers)
- Analytical chemists (to determine exposure, develop biomarkers)
- Health professionals (including health records, baseline information)
- Epidemiologists
- Biostatisticians
- Exposure modelers
- Clinical chemists
- Biochemists
- Immunologists
- Physiologists
- Psychologists
- Human behavior experts

# Useful Resources

- Clinical health records to establish health baselines and track future health conditions
- Health Information Exchanges (HIE) useful in easily obtaining the above data
- Ex. Mississippi Coastal Health Information Exchange (MSCHIE); established after Hurricane Katrina to prevent a repeat of the loss of papre medical records

# Summary Comments

- Dose-response relationships are critical to understanding what effects can be attributed to the oil spill
- Samples should be obtained and stored where possible for potential development of biomarkers
- Exposure pathways should be determined; modeling would be important
- Cumulative risk should be addressed: exposure to multiple chemicals by multiple routes, and in combination with other factors that could affect the level of toxicity displayed