NTP
National Toxicology Program

# National Toxicology Program Activities Related to the Gulf Oil Spill

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## Making the Most of Federal Deepwater Horizon Data for Human Health

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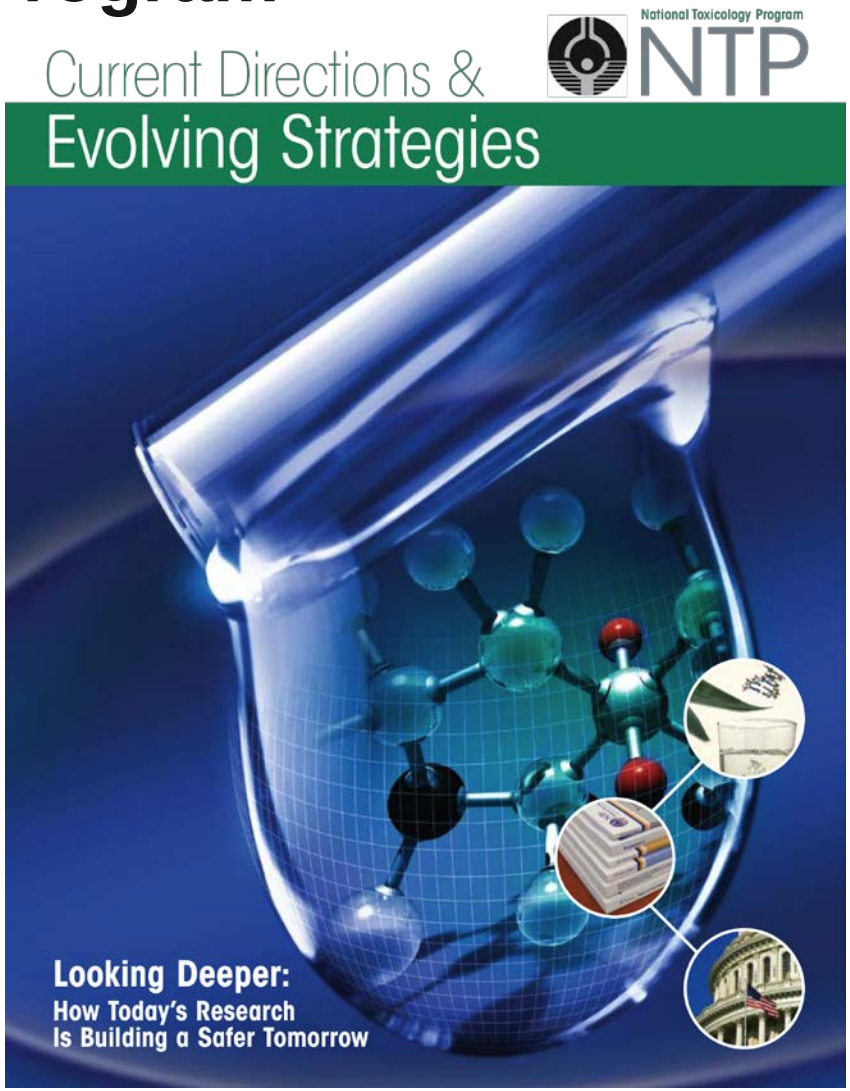
# The National Toxicology Program

- Established 1978 within DHHS
- Core agencies: NIEHS, NIOSH, NCTR
- Coordinate toxicology testing programs within the Department of Health and Human Services
- Strengthen the science base in toxicology
- Develop and validate improved testing methods
- Provide information about potentially toxic chemicals to health, regulatory, and research agencies, scientific and medical communities, and the public



# NTP Gulf Oil Spill Activities

- Information gathering and review
- Analytical characterization of source and weathered oil
- Federal interagency coordination on toxicology research needs
- Development of toxicology research programs

# Information Gathering and Review

- Identify and compile relevant literature (~350 sources/publications)
  - DWH monitoring and sampling
  - Human (mental) health effects of prior oil spills
  - Oil constituent identification
  - Crude oil toxicity
  - Crude oil constituent toxicity
  - Dispersant toxicity
    - Dioctyl sodium sulfosuccinate
    - Dipropylene glycol n-butyl ether
  - Crude oil weathering
  - Crude oil combustion emissions
- Assess availability of hazard data for crude oil and constituents
- Assess potential for cumulative toxicity

# http://ntp.niehs.nih.gov/oilspill/


## Toxicology Resources on Petroleum

The NTP has compiled these environmental health and toxicology resources on petroleum and constituents to facilitate information exchange among members of the Interagency Oil Spill Human Health Monitoring & Research Workgrou

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### Agency Main Websites

- BP Gulf Oil Spill - HHS Health Response
- CDC 2010 Gulf of Mexico Oil Spill
- Deepwater Horizon Unified Command Gulf of Mexico Oil Spill Response
- EPA Response to BP Spill in the Gulf of Mexico
- NIEHS WETP Oil Spill Emergency Response and Cleanup
- NIOSH Oil Spill Response Resources
- NLM Crude Oil Spills and Health
- NOAA (2010) Deepwater Horizon Oil: Characteristics and Concerns.
- OSHA Keeping Workers Safe During Oil Spill Response and Cleanup Operations

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### Background

- DOE (2004) Barrel to Gallon Conversion
- Wikipedia (2010) Current news regarding BP oil spill

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### Chemical Hazards

- API (2003)Crude oil HPV test plan (386 kb)
- IARC (1989) Vol 45 crude oil summary (166 kb)
- IPCS (1982) Environmental Health Criteria document for Selected Petroleum Products (529 kb)
- Macko et al. (1982) Gulf of Mexico dissolved hydrocarbons associated with the Ixtoc I mousse (78 kb)
- Mobbs (1996) The Sea Empress spill: The potential for human health effects.
- OECD (2003) Propylene Glycol Ethers
- SeaWeb (May 2010) Oil spills annotated bibliography (869 kb)
- Wang and Stout (2007) Wang and Stout (2007) Oil Spill Environmental Forensics. Fingerprinting and Source Identification (418 kb)
- Yang et al. (2009) Characteristics of bicyclic sesquiterpanes in crude oils and petroleum products (1.1 mb)

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### Chemical Identification and Analysis

- Alken Murry Corp. (1999) Glossary of Petroleum Industry Common Terms & Symbols
- Energy Intelligence Group., Inc. (2007) Crude oils and their key characteristics (e.g., sulfur contents)
- Wang and Stout (2007) Oil Spill Environmental Forensics. Fingerprinting and Source Identification (418 kb)
- Wang et al. (2004) Biomarker fingerprinting: Application and limitation for correlation and source identification of oils and petroleum products

# Analytical Chemistry

- Identify and characterize potentially hazardous materials to which workers, volunteers, residents may be exposed
- Acquired samples
  - Tar balls collected from Louisiana and Alabama beaches
  - MC252 source oil collected from the wellhead
  - COREXIT EC9500A
- In-depth characterization of metals and PAHs, including alkyl derivatives and heterocyclics (sulfur or nitrogen containing)
- Support for NIOSH acute dermal and inhalation toxicology studies
  - may include analyses of test articles/atmospheres and levels of marker chemicals in animal tissues

# NTP Analytical Goals for 2011

| Analyte Category | Analytical Goal | Qtr I | Qtr II | Qtr III | Qtr IV |
|---|---|---|---|---|---|
| General Characterization | Fingerprinting | ✓ | | | |
| | Component Classification | ✓ | ✓ | | |
| Substituted PAHs | Identification | | ✓ | | |
| | Quantification | | ✓ | ✓ | |
| Metals | Identification | ✓ | | | |
| | Speciation | | ✓ | ✓ | |
| Heterocyclics | Identification | | ✓ | ✓ | |
| | Quantitation | | ✓ | ✓ | ✓ |
| Follow up based on findings from above | | | | ✓ | ✓ |

# Federal Interagency Toxicology Workshop on the Gulf Oil Spill

- October 13, 2010 in Washington DC
- Agencies represented: ATSDR, EPA, FDA, NIEHS, NIOSH, NOAA, OSHA, USFWS, USGS
- Purpose:
  - Assess near- and long-term GOS-associated toxicology issues
  - Identify ongoing research and knowledge gaps related to:
    - Human health impacts of direct exposures to oil or dispersant
    - Food source contamination
    - Ecological health, within context of ultimate effects on human health
  - Establish dialogue for coordination and information sharing

# PAH Toxicology Research Program

- Priority long-term research need identified in interagency workshop
- Prior interest to address data deficiencies identified in ongoing EPA IRIS assessment
- Anticipated to be broad in scope:
  - Individual chemicals, artificial and real-world complex mixtures
  - Assess carcinogenicity and other relevant toxicological outcomes
- During 2011:
  - Consult with agency partners to identify critical data needs to inform cumulative risk assessment of petrogenic and pyrogenic PAHs
  - Identify and procure relevant compounds for testing
  - Develop preliminary project plan for public review

# Other Toxicology Research Programs Being Considered

- Bioavailability and persistence of oil and dispersant constituents or transformation products
  - Informed by ongoing analytical work
  - Biological disposition of DOSS in mammalian model
- Relative hazard of various crude oils including weathered oil
  - Assess contribution of PAHs vs other components
  - Unable to obtain sufficient quantities of MC252 fresh or weathered oil for conducting *in vivo* toxicology studies
  - Alternative approaches such as creating artificial mixtures or utilizing reference crude oils are feasible
- Interactive effects of oil constituents and oil + dispersant
  - Ongoing NIOSH toxicology studies will be informative

# Evolving Toxicology Research Needs

- Wealth of knowledge on long-term health effects of certain oil constituents but very little information to predict adverse health outcomes for exposed populations including sensitive subgroups
- What else do we need to know about the hazard of the materials to which workers and residents are exposed to make the right public health decisions for this particular incident
  - Unable to identify clear high priority questions that cut across agencies and could be addressed by toxicology studies conducted in the near-term
- What experimental toxicology studies would have utility for future spills
  - Clear need for more information on PAHs
- Continually assess need for studies that may be prompted by questions or findings from GuLF study, e.g.
  - Additional analytical work to support exposure reconstruction
  - Identify markers of early or intermediate effects
  - Interpretation of biomonitoring results
  - Follow-up on specific health outcomes

# Questions, Comments?

# Interagency GOS Toxicology Workshop Recommendations

*General needs identified*

- Coordination across federal and academic research enterprise
- Communication with states on monitoring and sampling
- Formal mechanism for information sharing with the petroleum industry
- Knowledge base to support assessment of fisheries health
- Consolidated resource (database) on oil properties
- Repository of standard reference materials
- Compendium of sampling and analytical protocols
- Coordinated and carefully (pre)planned sampling strategies
- Knowledge assimilation and lessons learned for hazard assessment that can be applied in future incidents

# Interagency GOS Toxicology Workshop Recommendations (cont.)

*Toxicology gaps and needs*

- Metabolism, degradation and biopersistence of dispersant constituents
- Dispersant potentiation of bioavailability/toxicity of oil constituents
- Significant gaps related to PAHs
  - Relevant exposure sources across entire class
  - Baseline data on levels in environment and biota
  - Characterization of metabolites and degradation products that may contaminate food sources
  - Persistence and bioaccumulation in relevant species
  - Potential for cumulative toxicity
  - Hazard data to derive reference doses for those chemicals where such data is lacking