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Disasters: The Science: Contaminants in the Environment

Contaminants in the Environment from Natural and Man Made Disasters

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Pathways of Chemical Contaminants Released into the Environment

- Industrial facilities utilize raw materials to produce products and waste streams
- Products, waste streams and off spec products are:
  - Released into the environment on an ongoing basis and disposed of in water bodies, dumps, injection wells and the air as well as released into the environment as a result of accidental releases, upset conditions and disasters.
  - Stored in warehouses, tanks and other containers
  - Transported through communities
  - Sprayed on agricultural fields
  - Used throughout the world to address specific applications while allowing the chemicals to leak, spill, escape, flow and be emitted into the air, water and land and negatively impact aquatic flora and fauna and humans.
- Such environmental contamination activities and events occur on a frequent and regular basis with media attention only focused on the larger or more dynamic disasters and events.

Main Categories of Chemicals Released into the Environment

- **Volatile Organic Compounds**
  - Benzene, Toluene, Ethylbenzene, Xylene, Ethylene Dichloride and Vinyl Chloride
- **Semi-volatile Compounds**
  - Polynuclear Aromatic Hydrocarbons, Benzo(a)pyrene, Naphthalene
- **Heavy Metals**
  - Arsenic, Cadmium, Chromium, Lead, Mercury, Vanadium
- **Pesticides**
  - DDT, Chlordane, 2,4,5-T, Atrazine, Carbamates
- **Dioxins, Furans and PCBs**
  - 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD
- **Radioactive Components**
  - Radium 226, Radium 228, Uranium 238, Radon Gas

Pathways of Exposure to Chemicals

- Inhalation
- Ingestion
- Dermal Absorption

Chronic Human Health Impacts Associated with Chemicals

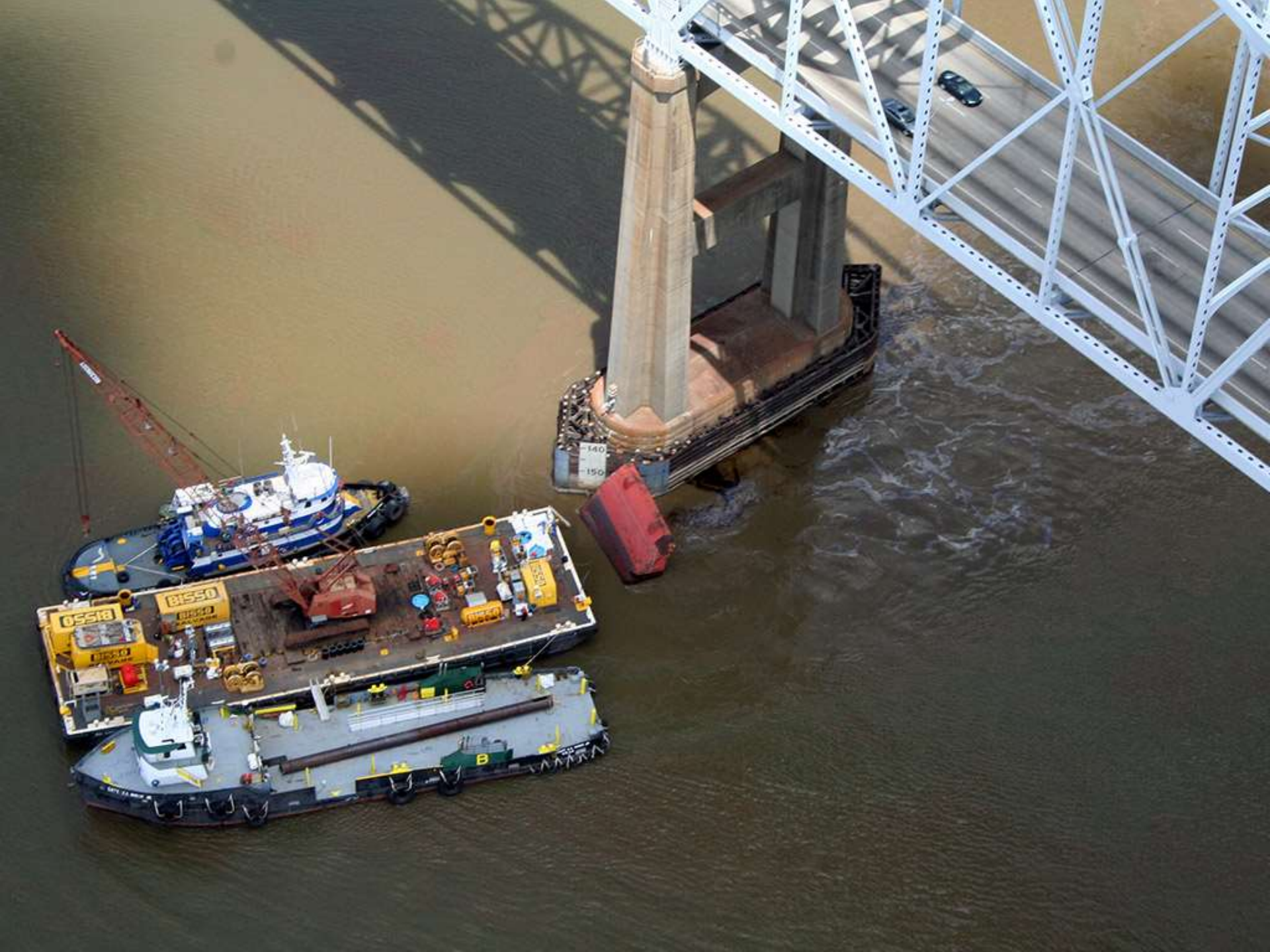
- Carcinogens
- Mutagens
- Teratogens
- Reproductive and Developmental Toxins
- Causes liver, lung, brain and kidney damage
- Damages blood cells
- Damages immune system

When a Disaster or Event Occurs, Where to Go to Quickly Find Information on Chemicals Associated With the Facility of Interest

- EPA Toxic Release Inventory Data Base (RTKNET.org) – industrial sector and chemicals released into the air, land, and water by industrial facilities
- Tier II Data Base – chemicals stored on facility site, maximum quantity and location –Local Emergency Response Agency
- State and Federal Regulatory Agencies:
  - Title V Annual Air Emissions Report
  - Inspection and Compliance Orders
  - Facility Air, Water and Waste Permit Conditions

Chemical Characteristics and Health Impacts

- New Jersey Fact Sheets (Material Safety Data Sheets)
- Agency for Toxic Substances and Disease Registry Data Base – Health Impacts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Bayou Corne
sinkhole


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Radon Gas Associated with Marcellus Shale Natural Gas

- Historically natural gas from Louisiana and Texas was and is lower in Radioactivity (Radium 226, Radium 228 and Uranium 238) and had longer distances to travel to the north east by pipeline. Thus the degradation of the Radioactivity to Radon Gas had occurred along the pipeline transportation pathway.
- The Marcellus Shale natural gas is higher in radioactivity than Louisiana and Texas natural gas and has shorter travel time to New York and the North East states. Thus the Radon Gas concentrations are higher and result in increased exposure to consumers in New York and the New England states.
- Radon inhalation and smoking are the two highest causes of lung cancer.

Radioactive Pipe Scale and Radioactive Sock Filters from Production of Oil and Gas

- Radioactive scale precipitates out in production pipes and equipment
- Radioactive particles are filtered out of produced water and flowback fluids prior to disposal in injection wells.
- The generation of radioactive scale and radioactive contaminated socks in the Marcellus Shale area of Penn., Ohio and West Virginia and Bakken Shale area in North Dakota are causing extensive completed pathways of exposure and disposal problems.
- The radioactive components are bone seekers when inhaled and ingested and cause lung and bone cancer.

Trihalomethanes in Drinking Water

- Trihalomethane compounds area formed when organic compounds in water are disinfected with chlorine
- The Trihaolmethanes consist of:
  - Trifluoromethane
  - Bromodichloromethane
  - Tribromomethane
  - Trichloromethane
- The Triholomethanes are known and suspected cancer causing agents.
- Water systems using surface water as a raw water source have switched from chlorine to chloromines as a disinfectant.
- 82 water systems in Louisiana utilize chloromines as disinfectants.

Amoeba in Drinking Water

- The St. Bernard water system just south of New Orleans and a water system in DeSoto Parish in northern Louisiana use chloramines for disinfection and have tested positive for a brain-eating amoeba, Naegleria fowleri.
- The concentration of chlorine in the water systems were increased to 0.5 parts per million throughout the distribution lines.
- In late January 2014, the St. Bernard water system was cleared of the presence of the brain-eating amoeba.
- Check your Water Supply Consumer Confidence Report for your drinking water system for the presence of Trihalomethanes in your drinking water system.

Natural and Man Made Disasters

- Natural and Man Made Disasters result in the release into the environment of a variety of chemicals in quantities that can cause:
  - a host of health impacts to the exposed communities
  - contamination of surface and ground water resources, soils and sediments, air quality, vegetation, aquatic and terrestrial organisms
  - persist in the environment for long periods of time
  - bioaccumulate in terrestrial and aquatic flora, fauna and humans

- Journalists have an obligation to provide the public with clear and concise information to assist the public in dealing with the chemicals being released, the associated health impacts and measures the public can use to prevent or reduce their exposure.