Frequently Asked Oil Spill Questions

Responses prepared by Dr. Sharon Walker, Director of Education and Outreach at the Institute for Marine Mammal Studies and validated by Drs. Thomas F. and Julia S. Lytle-Retired Chemists from the University of Southern Mississippi-Gulf Coast Research Laboratory.

1. What is crude oil? Crude oil is a volatile, viscous mixture of organic compounds containing aliphatic and aromatic hydrocarbons. Some of these hydrocarbons (compounds containing hydrogen and carbon atoms) are toxic and some can cause cancer. Some crude oils are more viscous (light) than others. Lighter crudes evaporate more rapidly and leave less tarry resides after spills. Simply defined crude oil is a flammable, syrupy-type substance that has a distinct odor; stays in the environment, depending on environmental conditions longer than anyone wants; and contains some poisonous chemicals like benzene, toluene, and other light hydrocarbons, some of which are known to produce cancer in humans.

2. What makes crude oil harmful to the environment? Crude oil "coats" whatever it contacts and is very resistant to natural cleansing action because most of the crude oil components are insoluble in water. Beaches; deep and shallow water sediments; marsh grasses; underwater vegetation; all types of migratory, sea, and shore birds; sea turtles, marsh turtles; fish; marine mammals; oyster beds; scallops; mussels; crabs; lobsters; corals; a whole host of other invertebrates (creatures without backbones); and all animal life that comes in contact with the spilled, crude oil is going to be adversely affected.

3. What are the acute (short-term) and chronic (long-term) effects of oil to in the environment? The immediate acute (short-term) effects will occur because because of the smothering effects hampering respiration (the breathing mechanism in plants and animals). Then follows the chronic poisoning effects of toxic compounds in the oil which can occur days, months, and even years after exposure. Aside from the acute and chronic effects on plants and animals, there are indirect effects, such as contamination of food supplies in the food web and possibly contamination to our food supply. The fate and effect of crude oil that gets into the environment is dependent on many conditions, the physical and chemical properties of the particular crude oil (varies tremendously from one crude oil to another, even in the same geographic region), the season, currents and wave action, turbidity, and other related physical conditions. The heavier hydrocarbons are more persistent; staying on the water's surface and "washing up" on beaches; getting into the bays, bayous, marshes, wetlands; and "coating" everything that is in the path of the oil. So, then the animals in these habitats are also

exposed to having the oil "coat" feathers, fur, and skin. It is also important to note the water's temperature, wind, and wave action can also react with the oil and try and "break it up," similar to using an egg beater to "whip" a substance into smaller, more frothy pieces with greater surface areas (such as oil and seawater forming an emulsion-type liquid with greater surface areas) and in this form, dispersants and surfactants can be used to further "break down" the oil.

4. What actually happens to marine animals when exposed to the oil, i.e., marine mammals; fish; migratory, shore, and sea birds; crabs; shrimp; oysters; mussels, scallops; corals; and other commercially important species—and plants? Marine mammals, sea turtles, and birds have lungs similar to human lungs. When marine mammals and sea turtles come to the water's surface to breathe—if they come to the surface in the midst of oil spill—they inhale the oil (light and heavy hydrocarbons) and their respiratory and digestive (if they swallow the oil) systems becomes stressed. And, their skin/fur (marine mammals) and scales/scutes (turtles) become "coated" with the oil. External lesions can form on the marine mammals and on the fins/neck (soft, fleshy tissues) of the sea turtles. Once these hydrocarbons, if inhaled or ingested, move into the blood stream, damage can occur within the blood cells, as well as in the eyes (which came into contact with the oil at the surface), spleen, kidneys, liver, heart, and nervous and reproductive tissues. When seabirds become "coated" with oil, they limit or lose their ability to fly and the stress to their respiratory and digestive systems, as well as other organs is similar to marine mammals and sea/marsh turtles. The bodies of fish and their gills get "coated" with the oil and result in massive fish kills. Oysters, as juveniles and adults, are stationary in reefs and cannot move from an oil-exposed area, so depending on the water temperature, as well as the wind and wave action, they will "close their shells" for a short period of time, but once they again begin to filter feed, if the oil is still present in the water column or on their shells, it can "clog" their gills, and they smother/die. Most shrimp, lobsters, and crabs will be the first organisms to die, particularly shrimp (they are referred to as the our water canaries due to their thin exoskeletons [external, thin shells] and all their exposed legs, swimmerets, eyes, and antennae—combined with the fact, they live on/in the bottom—and the oil will ultimately settle on the sediment).

   Marine and fresh water plants are stressed, again due to the coating, of the plant which reduces carbon dioxide/oxygen diffusion (gas exchange) at the plant tissue surface; this oil coating decreases a plant's ability to photosynthesize (feed itself and produce oxygen) and also allows the temperature to increase within the plant and on the soil's surface, further stressing the plant. Research has documented oil persists in the

environment for years in the soil and in the roots of these plants, thereby reducing plant growth. Tiny marine plants, phytoplankton, provide 60-80% of all the oxygen on this planet and all species' greatest source of oxygen is derived from the world's ocean of which the Gulf of Mexico, MS Sound, and all our bays and bayous are components.

5. Who is in charge of the clean-up from an oil spill? The U.S. Coast Guard has the leadership role and the ultimate say; however, significant assistance is provided from other federal agencies such as, but not limited to, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, the Department of Health, the Department of Interior-Mineral Management Service, the Department of Homeland Security-Federal Emergency Management Service, the Department of Defense, the U.S. Navy, Governors' offices, and numerous state agencies, e.g., in Mississippi, the Department of Marine Resources, the Department of Environmental Quality, universities, research facilities, non-profit organizations, civic organizations, and thousands of volunteers.

6. What are the types of clean-up materials are used in an oil spill? Thousands of feet of containment booms have been placed near the Chandeleur Islands and in Breton Sound, around portions of Ship Island, Horn Island, and the mouths of some of coastal Mississippi's cities, currently Waveland, Bay St. Louis, Gulfport, Ocean Springs, and Pascagoula. Containment booms are effective if the wind, wave, action, and tides are not excessively high…which has not been the case since the British Petroleum-Deepwater Horizon well "blew and burned" on April 20. Other clean-up materials include adsorbents for using at the water's surface and for various oil-covered animals, dispersants, burning, and surfactants.

7. What is a surfactant/dispersant? A surfactant/dispersant is a soapy-type substance used to react and "break-down" the oil into very small oil droplets which then allows the oil to be dispersed in the water.

8. What are the adverse effects to the volunteers and paid employees involved in an oil-spill clean-up? Odor from crude oil is an irritant to some people, and evaporation of the oil degrades air quality. Both of these adverse effects may result in nausea, vomiting, and headaches. People who are easily stressed by reduced air quality need to stay indoors and ventilate their homes with air-conditioners. If symptoms persist, individuals need to see a physician or other health care provider. Further, it is essential and required that volunteers be trained prior to working with stranded animals concerning proper clothing and safety precautions when assisting in "clean-up" efforts. If volunteer

gets oil on his/her skin, the area should be washed with soapy water and clothes should be washed in the usual manner. Prolonged "clean-up" efforts and resulting exposure to the oil/fumes may result in a skin rash. Training programs began on the Mississippi's coast May 1, 2010 at the Institute of Marine Mammal Studies and on May 2, a training program was offered in Ocean Springs.

9. How long will oil remain in the environment if the British Petroleum-Deepwater Horizon well can be capped? Acute (short-term) effects can be possibly reduced to hours, days and weeks; the lighter hydrocarbons can rapidly evaporate. Chronic (long-term) effects can persist for months and years.

10. What is the anticipated length of time for the spill to continue leaking/pumping 1,000 to 5,000 barrels per day (approx. 40 gallons per barrel) if the Remotely Operated Vehicle (ROV) can "cap" the well? This process has not worked yet; however, safeguard technology should have been in place so this catastrophe should never have happened. I don't know the answer to this question; however, British Petroleum should know the reservoir capacity of this well. The May 2, *Sun Herald* article (page 2A) indicated in an interview with a BP company official speaking on the condition of anonymity reported that the Gulf seabed reservoir was in the tens of millions of barrels. Spokespersons for BP have indicated BP will pay clean-up costs; however, many public officials within MS are skeptical of these statements and want this commitment in writing with some "up front," fiscal assistance.

11. What type of problems is the ROV encountering? The Gulf seabed oil site is approximately one mile in depth (over 5,200 ft); the pressure is intense and the pipe that is inserted in the well could collapse according to engineers and biological/chemical scientists (May 2, *Sun Herald*, page 2). The ROV is spraying a dispersing chemical at the oil coming from the pipe in hopes of reducing the amount of oil reaching the surface. Fears exist in terms of this pipe collapsing which would result in no warning and the oil could possibly become a geyser at the water's surface and regulating the flow would even be more problematic.

12. Why not continue burning the crude oil when it comes to the surface? Burning the oil, using booms, and using dispersants/surfactants are all helpful and effective to a point; however, if technologically possible, the oil needs to be stopped at the seabed source. This can be accomplished by "bringing in" another deepwater rig and drilling to a point in the well prior to the leak area; however, this "relief well fix" could take three months to implement, resulting in unrelenting oil leakage (*Sun Herald* article, page 7B).