July 16, 2010

CONSENSUS STATEMENT:
Scientists oppose the use of dispersant chemicals in the Gulf of Mexico

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We oppose the use of chemical dispersants in the Gulf, and demand an immediate halt to their application. We believe that Corexit dispersants, in combination with crude oil, pose grave health risks to marine life and human health, and threaten to deplete critical niches in the ocean food web.

We urge federal and state agencies to fund independent research NOW to produce transparent, timely information that will protect the health of Gulf response workers, residents, and wildlife.

Background

Since the Deepwater Horizon drilling platform exploded in the Gulf of Mexico on April 20, 2010, BP has applied almost two million gallons of dispersants, both on the surface and beneath Gulf waters. Government officials acknowledge that the quantity and manner in which dispersants have been applied in the Gulf are unprecedented. The application of dispersant at the source of the discharge, 5,000 feet under the surface of the water, is also unprecedented.

By enhancing the amount of oil that physically mixes into the water column, dispersants reduce the amount of oil that reaches shoreline habitats. Although called for in the Oil Pollution Act of 1990 as a tool for minimizing the impact of oil spills, chemical dispersants are controversial (NRC, 2005) because of the toxicity of dispersed mixtures and their potential negative impacts on ocean life Another point of controversy is that once oil is dispersed in deep water, it cannot be recovered. **Oil, when combined with dispersants in the water column is more toxic to marine species than either alone.**

At a Senate hearing on June 15, 2010, EPA Administrator, Lisa Jackson stated, "In the use of dispersants we are faced with environmental tradeoffs." In fact, the use of dispersants does not represent a science-based, quantifiable "tradeoff" but rather amounts to **a large-scale experiment on the Gulf of Mexico ecosystem that runs contrary to a precautionary approach**, an experiment where the costs may ultimately outweigh the benefits.

Moreover, this "trade-off" has been confounded by the lack of a vigorous, technologically adequate effort to collect crude oil from the surface. Berms and booms quickly proved to be ineffective in this deepwater system. As a result, crude oil has penetrated 30 miles into the coastal wetlands of Louisiana and has reached the shores of other Gulf states.

Dispersants applied by BP have resulted in widely disseminated undersea plumes of oil, confirmed by NOAA on June 8. (http://www.pbs.org/newshour/rundown/2010/06/government-confirms-undersea-oil-in-gulf-of-mexico.html). Samples were collected by scientists from University of South Florida on the MV Weatherbird II and tested by NOAA's lab. Subsequently, the plumes have migrated outward from the discharge source and over time are likely to travel with prevailing currents to the Florida Keys, Cuba, Mexico, and the eastern seaboard of the US. The vast quantities of dispersed oil in these plumes can enter the marine food chain and bioaccumulate in animal tissue, potentially impacting marine ecosystems over many years and over a broad geographical area.

Corexit Dispersants Used in the Gulf

Two dispersants, Corexit 9500 and 9527A, produced by Nalco of Naperville, Illinois, have been used in the Gulf (http://www.deepwaterhorizonresponse.com/go/site/2931/). Although listed among EPA-approved dispersants, Corexits are oil industry-insider products, and are ranked by the EPA as more toxic and less effective than other approved dispersants, which has raised questions about their use in the Gulf (Scarlett et al 2005). A comprehensive report on the health hazards of crude oil and the known ingredients of Corexits is available at: http://www.sciencecorps.org/crudeoilhazards.htm.

Corexit 9527A contains 2-BTE (2-butoxyethanol), a toxic solvent that ruptures red blood cells, causing hemolysis (bleeding) and liver and kidney damage (Johanson and Bowman, 1991, Nalco, 2010). Both Corexit dispersants contain petroleum solvents that mix with the crude oil mass and move through it, thus increasing the uptake of oil by organisms (NRC, 2005, Nalco, 2010).

The properties that facilitate the movement of dispersants through oil also make it easier for them to move through cell walls, skin barriers, and membranes that protect vital organs, underlying layers of skin, the surfaces of eyes, mouths, and other structures.

Crude Oil & Corexit Combined Are More Toxic Than Either Alone

The combination of Corexit and crude oil can be more toxic than either alone, since they contain many ingredients that target the same organs in the body. In addition, Corexit dispersants facilitate the entry of oil into the body, into cells, which can result in damage to every organ system (Burns and Harbut, 2010).

Exposure to chemicals in crude oil and dispersants can occur through skin contact, inhalation of contaminated air or soil/sand, and ingestion of contaminated water or food. These can occur simultaneously.

Chemicals in crude oil and dispersants can cause a wide range of health effects in people and wildlife. Crude oil has many highly toxic chemical ingredients, including polycyclic aromatic hydrocarbons (PAHs), that can damage every system in the body. These include:

respiratory system
liver
kidneys
circulatory system
immune system
musculoskeletal system
skin and integumentary system
nervous system, including the brain
reproductive/urogenital system
endocrine system
gastrointestinal system
sensory systems
hematopoietic system (blood forming)
disruption of normal metabolism

Damage to these systems can cause a wide range of diseases and conditions. Some may be immediately evident, and others can appear months or years later. The chemicals can impair normal growth and development through a variety of mechanisms, including endocrine disruption and direct fetal damage. Some of the chemicals, such as the PAHs, cause mutations that may lead to cancer and multi-generational birth defects (Burns and Harbut, 2010). Of note, benzene, a human carcinogen, is a VOC that is released by crude oil (CDC, 1999). It is not known what additional VOCs (if any) are added to the crude oil mix by dispersants, due to a lack of disclosure about dispersant ingredients.

Potential human health effects include burning skin, difficulty breathing, headaches, heart palpitations, dizziness, confusion, and nausea — which have already been reported by some workers — as well as chemical pneumonia and internal bleeding (Burns and Harbut, 2010, US EPA 2010). These are more often noticed than more serious effects that don't have obvious signs and symptoms - lung, liver and kidney damage, infertility, immune system suppression, disruption of hormone levels, blood disorders, mutations, and cancer. Coastal communities could also experience more extreme health consequences, including long-

term neurological effects on children and developing fetuses, and hereditary mutations. As of June 21, the Louisiana Department of Health and Hospitals reported 143 cases of illness "believed to be related to oil exposure", including 108 response workers (mostly men) and 35 coastal residents (two-thirds women) (http://www.dhh.louisiana.gov/). The most common symptoms were headache, nausea, throat irritation, vomiting, cough and difficulty breathing.

Corexit Dispersant Ingredients Have Not Been Fully Disclosed

On June 8th, US EPA provided a list of chemicals they stated were in the two Corexit products used to date. Companies are not required to list all ingredients in their products, or to provide detailed information on those that they do list. They can claim ingredients are "proprietary" to avoid disclosure. Ingredients in a product may be listed as a **group** rather than a single chemical.

For example, the group "petroleum distillates, hydrotreated light" is listed on the MSDS for Corexit 9500. There are hundreds of chemicals within this group. Similarly, "organic sulfonic acid salts" are listed as an ingredient, but these may include many potential organic components. **Without specific information, it isn't possible to fully assess short or long-term human health hazards or ecological effects.**

Toxic Impacts on Marine Life

Oil spill impacts can occur by 1) physical contact (oiling), 2) toxicity, and 3) loss of food web niches. Some of the effects of this spill are visible – 1866 dead oiled birds, 463 sea turtles, 59 dolphins, one sperm whale (DH Response Report July 14). Many scientists suspect that **the worst of the impacts on the Gulf are yet to come and will not be apparent without deliberate tracking and scientific assessment.**

Since the 1970s, it has been known that application of dispersants to oil spills increases toxicity by increasing oil and hydrocarbon exposure to water column species. A review of the literature by Dye et al (1980) reported that "virtually every author who has investigated the toxicity of oil-dispersant mixtures reports dramatic increases in mortality compared to oil or dispersant alone, indicating the existence of supra-additive synergy." Today, many scientists are concerned about the likelihood of severe, acute impacts on a wide range of Gulf species that are now being exposed to Corexit and oil in the water column. For vulnerable species such as seagrass, corals, plankton, shrimp, crabs, and small fish, acute effects can be lethal, particularly during the spring spawning season (Ibemesim et al, 2008, Barron et al, 2003, Rhoton et al, 1998, Bhattacharyya et al 2003, Chapman et al 2007, Anderson et al, 2009, Couillard et al, 2005, Ramachandran et al, 2004, Fisher et al, 1993, Gulec et al, 1997). Coral larvae are extremely sensitive to the combined effects, with 0% fertilization rates in the presence of dispersant and dispersed oil, compared with 98% fertilization in the presence of oil alone (Negri and Heyward, 2000, Shafir et al, 2007, Epstein et al 2000).

As plumes of dispersed oil form in the water column, globules of oil and dispersant envelop and kill floating plankton, fish eggs and larvae – and everything else at sensitive life stages. Planktivorous species like herring and whale sharks indiscriminately feed on these globules and may break the oil down to more toxic by-products. Already, vast numbers of bottom-feeders and filter-feeders have been decimated in heavily oiled areas such as Louisiana's Barataria Bay (Shaw, CNN 2010). **Depletion of these critical niches in the food web can set the stage for trophic cascades, causing the collapse of higher organisms** (Peterson et al. 2003).

At the top of the food web, large fish (amberjacks, tuna, grouper) and marine mammals are exposed to oil and dispersant through feeding on contaminated fish. Air-breathing animals like dolphins and sperm whales are exposed to volatile petroleum fumes every time they surface for air - and taking oil into the blowhole can cause chemical pneumonia and liver and kidney damage. Skin contact with Corexit and oil can cause ulcers and burns to membranes of the eyes and mouth. Corexit 9527, which was used in the Gulf until supplies ran out in May, contains the toxic solvent, 2-butoxyethanol, that ruptures red blood cells, causing animals to

undergo hemolysis (internal bleeding) (Burns and Harbut, 2010, Nalco 2010). Fishermen in the Gulf have reported that dolphins spouting oil from the blowhole have approached their boats (Shaw, TEDXOilSpill, 2010). These dolphins are likely suffocating from petrochemical solvent-related burning of lung membranes ("chemical pneumonia") and thus are dying before our eyes. As scientists, the question is, how will we know?

Finally, dispersing oil at depth means that a significant volume of oil is not able to be recovered at the surface. This dispersed oil can enter the marine food chain at many points and bioaccumulate in animal tissue, potentially impacting marine ecosystems over many years and over a broad geographical area.

Scientists Express Concerns

On July 10, 2010 the journal *Nature* reported concerns expressed by scientists about the implications of the use of dispersants (Nature News, July 10, 2010). David Valentine, a geomicrobiologist at the University of California, Santa Barbara, described BP's use of dispersants as "an experiment that's never been performed before – to dump that much of an industrial chemical into the ocean."

Susan Shaw, a marine toxicologist and director of the Marine Environmental Research Institute, responded to the EPA's announcement on 30 June that its initial round of toxicity testing on eight dispersants, including Corexit 9500 found no "biologically significant" endocrine-disrupting effects on the small estuarine fish and mysid shrimp tested. "We already know that dispersants are less toxic than oil if you compare the two," says Shaw. "But because Corexit contains a petroleum solvent, we're actually putting petroleum solvent on top of a petroleum spill. So it's increasing the hydrocarbons in the water column." Furthermore, says Shaw, the dispersant can increase the toxicity of the oil for those marine organisms that encounter it. "It's like a delivery system," says Shaw. "The [dispersed] oil enters the body more readily and it goes into the organs faster."

Dispersion is thought to speed up oil degradation because tiny droplets can be more readily metabolized by oil-eating microbes. Samantha Joye, a biogeochemist at the University of Georgia in Athens disagrees: "It assumes that the dispersant doesn't impact the microbial community, and we have no idea if that's true or not. There's just as good a chance that this dispersant is killing off a critical portion of the microbial community as it is that it's stimulating the breakdown of oil."

Federal Agencies Need to Fully Disclose Test Results

Although EPA has listed extensive sampling and analysis plans on the federal spill website, they have not provided most of the results that they have. They do not describe the chemicals that people are inhaling, nor do they warn people that many volatile organic chemicals from crude oil can have serious long term health consequences, including cancer.

Similarly, NOAA has been accused of "hoarding" its Natural Resources Damage Assessment (NRDA) data on the extent and effect of undersea oil plumes. Despite early urgent warnings from independent scientists that oil suspended in the water column is likely killing wide swaths of sea life, NOAA was slow to send out research vessels to probe the extent of the problem. To date, very little of the NRDA data has been released to researchers, presumably because of pending litigation. However, the raw data is being immediately turned over to the Joint Incident Command, and thus to the lead defendant, BP.

The Need to Know

Beyond the 11 men who were killed in the Deepwater Horizon rig explosion, the human toll of the Gulf oil spill is unknown. In past disasters, inadequate public information and protections have caused serious health problems among responders and local communities that were poorly informed about hazards.

To mitigate past and future damage to human and wildlife populations as well as the ocean ecosystem, **it is critical that the federal government and state agencies provide the results of their air, water, seafood, and other testing to the public as soon as the information becomes available.**

Withholding information, however well-intentioned, is dangerous and should be avoided at all costs. Testing results must be made available as quickly as possible to enable Gulf officials, response workers, and individual citizens to make informed decisions regarding potential health risks and the best courses of action.

We urge federal agencies to provide the following to ensure the best possible health for people and wildlife in the Gulf Region:

1. An immediate halt to the use of chemical dispersants in the Gulf of Mexico, particularly the application of dispersants at depth.

2. Full disclosure of all the chemical ingredients in the Corexit formulations and full toxicity data on these chemicals in combination with oil – this information should be posted on a website and should include studies submitted by the manufacturers to EPA, not meaningless summaries.

3. A federal site that provides adverse effects information from the previous uses of Corexit dispersants. This should cover environmental media, wildlife, and human populations. This information was collected after Corexit 9527 was used in the Exxon Valdez spill in Alaska.

4. Access to the extensive monitoring data that EPA and NOAA have collected documenting what chemicals are in the air and water and their observed adverse impacts. Only limited summary data have been provided to the public.

5. Funding for independent research on short-term and long-term impacts; money that is available to qualified researchers NOW, not months later (as in the Exxon Valdez spill) when exposure has lessened and impacts will be difficult, if not impossible, to document.

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