August 19, 2024

U.S. Environmental Protection Agency
EPA Administrator Michael S. Regan, Mail code 1101A
1200 Pennsylvania Ave. NW
Washington, DC 20460
Regan.Michael@epa.gov

Petition Requesting EPA to Remove the Dispersants Corexit 9527A and Corexit 9500A from the Product Schedule of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Pursuant to 40 CFR § 300.970

Dear Administrator Regan,

We, the undersigned, hereby request that the Environmental Protection Agency (EPA), pursuant to 40 CFR § 300.970, remove the oil dispersants Corexit™ EC9527A (9527A) and Corexit™ EC9500A (9500A) from the NCP Product Schedule (Schedule).

In November 2022 the manufacturer of Corexit stopped production and sale of these extremely deadly dispersants. Our shared concern, as presented in this petition, is that stockpiles of these two Corexit dispersants are currently available for use in oil spill response in the United States (and globally), based on statements or information that are misleading, inaccurate, incorrect, or outdated regarding use of the products to control oil discharges—while new or relevant information not previously considered concerning the impacts of these products to human health and the environment *is still not being considered* when authorizing use of these products.

Our concern is urgent. The revised rules in effect have updated test and listing criteria to eliminate use of the more toxic products. Until the new Schedule goes into effect on December 12, 2025, products currently listed will remain conditionally listed and available for use. This means the discontinued Corexit dispersants of concern may still be used for oil spill response despite now knowing that such use endangers workers, the exposed public, and the environment, and cannot be done safely in any waters of the United States. We find this unacceptable. EPA has a mandatory duty under the Clean Water Act to determine what dispersants can be used safely in waters of intended use. This duty cannot be waived for conditional use or any use.

We are asking for an expedited decision-making process to consider our petition for removal of these discontinued Corexit oil dispersants from the NCP Product Schedule—prohibiting their use in waters of the United States, effective immediately.

Most sincerely,

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U.S. Senator Edward Markey

EXECUTIVE SUMMARY

Overview

The ALERT Project, Earth Island Institute, and the Government Accountability Project are petitioning the U.S. Environmental Protection Agency (EPA) to request removal of two oil dispersant products, Corexit 9527A and Corexit 9500A, from the National Contingency Plan (NCP) Product Schedule (Schedule) effective immediately.

Our request is urgent because the EPA allows any product listed currently on the Schedule to be used on oil spill response until the new Schedule goes into effect on December 12, 2025. This includes Corexit dispersants, which are stockpiled and preapproved for immediate use in every coastal state. However, the Manufacturer discontinued the manufacture and sale of Corexit dispersants in November 2022. Allowing use of discontinued products leaves EPA vulnerable to charges of dereliction of its duty under the Clean Water Act to ensure that products *can* be used safely, and it leaves the public vulnerable to the horrific health consequences of using these hazardous products for oil spill response. These concerns drive our request for an expedited decision-making process to delist these products.

Our shared concern is that these two Corexit dispersants are currently available for use in oil spill response based on statements or information made by the Manufacturer (Corexit Environmental Solutions) that are misleading, inaccurate, outdated, or incorrect regarding use of the product to control oil discharges—while new or relevant information not previously considered concerning the impacts of these products to human health and the environment *is still not being considered* when authorizing use of these products. Each charge is cause for removal under the NCP rules.

Our petition focuses on the Manufacturer's statements for first aid measures and toxicological information that were made in its latest available (2019) product Safety Data Sheets (SDSs). The Occupational Safety and Health Administration (OSHA) Hazard Communications (HAZCOM) standard, a right-to-know law, requires manufacturers to provide SDSs to communicate the health hazards of their products, consistent with United Nations' global standards. SDSs are part of the data and information required for listing a product in the NCP Schedule [§ 300.915(a)5].

The statements selected from the 2019 SDSs concern potential health effects and experience with human exposure from inhalation or skin contact, and product toxicity regarding respiratory or skin sensitization, carcinogenicity, teratogenicity and other reproductive effects, and specific target organ toxicity from repeated exposures. We provide 39 cases of lab, clinical, and epidemiology studies, as well as selections from sworn affidavits of injured workers and residents, as evidence to show why the Manufacturer's repeated claims that no symptoms are known or expected, or that no information or data are available, are cause for product removal.

The Regulatory Background provides more detail on the statutory and regulatory laws and the court rulings relevant to our petition. It also provides new and relevant information on revisions in the HAZCOM standards in 2012 that recognize new classifications of health hazards for chemicals that can cause harm at very low levels. These exceptional health hazards include chemicals that induce cancer or germ cell mutations in reproductive cells of humans, or are reproductive toxins that affect the developing fetus, or are respiratory or skin sensitizers. Our petition establishes that each dispersant product, as a mixture, is an exceptional health hazard.

The Factual Background establishes what was known about human health effects in 2010, based on the Manufacturer's SDSs and other information from right to know factsheets, before the post-disaster science rewrote what was known or presumed to be true. It shows that weathered oil-dispersant mixtures were persistent, toxic, and bioavailable—the evidence needed to show that workers and the public were exposed to these mixtures. And it describes the 2021 validation of a mechanism for respiratory and skin sensitization—the evidence needed to regulate products as sensitizers that can make people sick below levels thought to be protective.

The Real-World Experience features one story of direct contact with Corexit 9527A at a BP boat wash station in Bayou La Batre, Alabama. There were hundreds of such stations along the impacted Gulf Coast. We chose Lori B's story because she had photos to document her experience—and because she eventually was treated by a doctor trained in chemically-induced illnesses. Otherwise, her story is like countless others. The real-life consequences are encapsulated in the People's Record of four investigations by the Government Accountability Project, including its latest report, DEEP IMPACT.

The Manufacturer's Statements and Evidence to Support Our Petition provides a summary of the selected statements, facts, and our findings relating to EPA's removal rule, along with ten tables that list key findings from 26 studies and 13 select testimonials (Appendix A). After 50 years of use, the first modern studies to focus on human health effects collectively and consistently show that exposure to Corexit dispersants and oil-dispersant mixtures are more harmful than to oil alone and that exposures are causally linked with respiratory and skin sensitization, long-term respiratory, neurological, and cardiovascular harm, and increased health risk of cancers and reproductive harm. Manufacturer's statements in its 2019 SDSs are misleading, inaccurate, incorrect, and/or outdated concerning impacts of Corexit 9527A and 9500A on human health. This evidence is grounds for product removal—effective immediately.

The Weight of Evidence: Summary and Request for Removal summarizes the types and distribution of evidence for each table in a chart. Instead of considering individual studies separately, this compilation reveals the whole picture of long-term harm caused by these products—and it is extensive. *This weight of evidence is the new or relevant information not previously considered collectively by EPA*. The request for an expedited decision.

Table of Contents

Acronyms

ALERT	A Locally Empowered Response Team
BP	British Petroleum
CDC	Center for Disease Control
CFR	Code for Federal Register
CHD	Coronary heart disease
COPD	Chronic obstructive pulmonary disease
DOSS	Dioctyl sodium sulfosuccinate
EPA	Environmental Protection Agency
ERHMS	Emergency Responder Health Monitoring and Surveillance
HAZCOM	Hazard Communication Standard (aka Right-to-Know Law)
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
GuLF study	Gulf Long-Term Follow Up study
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NIH	National Institute of Health
NIOSH	National Institute for Occupational Safety and Health
NRT	National Response Team
OEL	Occupational Exposure Limit
OEM	Occupational and Environmental Medicine
OPA	Oil Pollution Act of 1990
OSC	On Scene Coordinator
OSHA	Occupational Safety and Health Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PEL	Permissible Exposure Limit
PM2.5	Particulate matter less than 2.5 micrometers
PPE	Personal Protective Equipment
SDS	Safety Data Sheet (also formerly Material Safety Data Sheet, MSDS)
SPECT	Single-photon emission computed tomography
SSDI	Subsea Dispersant Injection
STOT	Specific Target Organ Toxicity
VOCs	Volatile Organic Compounds
USC	United States Code
USCG	United States Coast Guard

PETITIONERS' INTEREST

Earth Island Institute is a nonprofit, membership organization incorporated under the laws of California and headquartered in Berkeley. Its mission is to support environmental action projects and build the next generation of environmental leaders in order to achieve solutions to environmental crises threatening the survival of life on Earth. Earth Island Institute acts as fiscal sponsor for The ALERT Project.

ALERT (A Locally Empowered Response Team) works collaboratively with at-risk communities to reduce toxic exposures from oil-chemical activities and to build a healthy energy future. The organization focuses on educating the public about toxic exposures, engaging people in local community oil spill response planning, and developing safe and effective oil spill response regulations, including those concerning response workers. ALERT aims to strengthen oil spill preparation and response policies, protect the health of response workers and the public, and build the capacity of local communities and Tribes to have meaningful involvement in decision-making before, during, and after oil disasters.

ALERT has over 1,800 constituents in coastal communities around the United States, including Alaska, Hawaii, and the Great Lakes, that receive ALERT's information and tools. These constituents include individuals who have been exposed to oil spills and dispersants through their work on, or residential proximity to, oil spills and who now suffer from chronic conditions that impact their daily activities and quality of life. Allowing conditional use of known toxic products harms our constituents' interests by posing a threat to our wellbeing—a risk many of us have experienced first-hand with debilitating and deadly consequences.

Of particular interest are rules governing dispersant use. ALERT and allies have spearheaded national efforts over the past twelve years to petition for a rulemaking to update the standards to eliminate the more toxic products, write and garner public comments on the 2015 proposed rulemaking, prompt the final rules by successfully litigating to establish that EPA has a nondiscretionary duty to update its rules based on new information relevant to dispersant use,[1] and, now, to petition for removal of toxic dispersant products that we have long been trying to ban—some of us since the 1989 *Exxon Valdez* oil spill in Alaska.

Government Accountability Project was founded in 1977 in the wake of Daniel Ellsberg's landmark release of the Pentagon Papers. After Ellsberg received fierce retaliation from the Nixon administration, it was clear something needed to be done to not only protect brave truth-tellers from government and corporate smear campaigns, but to combat rampant disinformation being foisted on the public by special interests.

[1] 553 F.Supp.3d 737, 746 (N.D. Cal. 2021).

In an era when whistleblowers were commonly referred to as "snitches," "turncoats," and "stool pigeons" by the powers that be, Government Accountability Project took the bold step of serving as the vanguard in defending whistleblowers through legal action, promoting their reputational integrity in the court of public opinion, and spearheading legislative campaigns to facilitate truth-telling and improve protections for those who refuse to remain silent. Since then, our organization has distinguished itself through its formal or informal assistance supporting over 10,000 whistle-blowers who put their lives and livelihoods on the line to serve the greater good. From the pharmaceutical industry to Wall Street, to local and international governments, Government Accountability Project has tirelessly defended and advocated on behalf of those who speak up in the face of injustice.

However, just as important to the organization as representing these brave individuals is its dedication to ensuring that the public is protected from waste, fraud, and abuse at the highest echelons of power. This is no easy task—the Government Accountability Project challenges powerful organizations with seemingly unlimited resources.

Our Environment, Energy and Climate Change program is designed to protect whistleblowers and support accountability in the environmental realm, emphasizing the deeply intertwined nature of environmental protection, energy production, and global climate change. While focusing considerable attention on environmental impacts related to the production, transportation, and consumption of fossil fuels—particularly as it relates to climate impacts—discreet topics like chemical pollution and nuclear safety are also well within the program's purview. Close attention is given to the interconnectivity among energy, climate, and the environment.

Government Accountability Project has released four Investigative reports on the Deepwater Horizon disaster—the most recent report, DEEP IMPACT, in April 2024.[2] A common thread that runs through all these reports is how Corexit dispersants contributed to the personal health crises and medical nightmares suffered by responders, residents, and others who were exposed.

[2] Government Accountability Project, 2013. Deadly Dispersants in the Gulf: Are Public Health and Environmental Tragedies the New Norm for Oil Spill Cleanups? Devine S, Devine T.

Government Accountability Project, 2015. Addendum Report to Deadly Dispersants. Devine S, Devine T.

Government Accountability Project, 2020. Ten Years After Deepwater Horizon: Whistleblowers Continue to Suffer an Unending Medical Nightmare Triggered by Corexit. Devine T, Arnold A.

Government Accountability Project, 2024. DEEP IMPACT. Ongoing Vulnerability in Oil Spills from the Deadly Dispersant Corexit. Pacey L, Devine T, Ott R.

I. Regulatory Background, Consequences, and Crisis

This petition concerns EPA's final rule on Subpart J of the NCP governing use of dispersants (and other products) to mitigate harm from oil spills, promulgated on June 28, 2023, and effective on December 11, 2023.[3] The rule derives its authority from the Clean Water Act. The petition also concerns the Occupational Safety and Health Administration's (OSHA's) Hazard Communication (HAZCOM) standard that requires Safety Data Sheets (SDSs) to communicate health hazards.

Specifically, this petition requests removal of two products from the NCP Product Schedule (Schedule) under EPA's rule, based on statements made by the manufacturer of Corexit dispersants (Manufacturer) in the product SDSs that are required under the HAZCOM standard. The relevant law follows.

Clean Water Act, Court Rulings, and EPA's Final Rule on Subpart J

The final rules revised Subpart J of the NCP that was established under the Clean Water Act to "provide for efficient, coordinated, and effective action to minimize damage from oil and hazardous substance discharges…" [33 U.S.C. § 1321(d)(2)]. Specifically, the Clean Water Act established duties to identify what products *may* be used, the waters where such products *may* be used, and how much (quantity) product *can* be used safely in waters of intended use [33 U.S.C. § 1321(d)(2)(G)(i)–(iii)]. The President delegated these duties to EPA.[4]

From April 20 to July 15, 2010, the BP Deepwater Horizon underwater oil well blowout discharged some 210 million gallons (5 million barrels) of oil into the Gulf of Mexico[5] and raised questions about dispersant efficacy and toxicity, environmental tradeoffs, human health of exposed responders and residents, authorization of use, and the challenges of making dispersant use decisions in response operations for situations that had not been anticipated or addressed in the planning phase, such as using large quantities of dispersant over prolonged duration on the sea surface and in the deep sea, i.e., "atypical dispersant use."

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[3] National Oil and Hazardous Substances Pollution Contingency Plan; Product Schedule Listing and Authorization of Use Requirements, 88 Federal Register (FR) 38280 (June 28, 2023) (to be codified at 40 Code for Federal Register (CFR) pts. 110, 300), https://www.federalregister.gov/documents/2023/06/12/2023-11904/national-oil-and-hazardous-substances-pollution-contingency-plan-product-schedule-listing-and

[4] Executive Order 12777 (most recently). However, this duty was delegated to EPA soon after EPA was established. Congressional Research Services (CRS) Report R43251, 2017 (updated Aug. 29), Oil and Chemical Spills: Federal Emergency Response Framework, coordinated by Bearden DM, Ramseur JL, at August 1971, August 1973, August 1981, and October 1991.

[5] EPA online, 2024. Enforcement: Deepwater Horizon – BP Gulf of Mexico Oil Spill. https://www.epa.gov/enforcement/deepwater-horizon-bp-gulf-mexico-oil-spill

Based on lessons learned from this oil disaster, on January 22, 2015, EPA proposed to amend Subpart J of the NCP to revise the existing product listing criteria, testing protocols, and authorization of use procedures, as well as to establish new provisions for dispersant monitoring and product removal (80 FR 3383). EPA's final rule was prompted by the 2021 summary judgment ruling from the U.S. District Court for the Northern District of California in *Earth Island Institute v. Regan*.[6] There, the court found that EPA "failed to fulfill its nondiscretionary duty to revise or amend the NCP" in light of "new information relevant to dispersant efficacy, toxicity, and terms of authorization."[7] The final rule was issued under court supervision on May 31, 2023. It was promulgated on June 28 and went into effect on December 11, 2023, as noted earlier.

The revisions were substantial—and for good reason. The last major overhaul of Subpart J was in 1994, *thirty years ago*, in response to the Oil Pollution Act and the *Exxon Valdez* oil spill. EPA's final rules established, among other things, new test and listing criteria for all products, including dispersants, that should remove some of the more toxic products and, as back up, a formal public process to remove a product with cause from the Schedule, which is the subject of this petition.

Under the removal rule, products listed as of the effective date may remain conditionally listed and available for use for two years until December 12, 2025, when the new Product Schedule goes into effect. We are petitioning under rule § 300.970 to request immediate removal of the conditionally listed products, Corexit dispersants 9527A and 9500A.

EPA's Rules for Removing Products from the NCP Schedule

The paragraphs of the NCP Subpart J that are relevant to our petition state:

> "§ 300.970 Removal of a Product from the NCP Product Schedule...
>
> (a) The EPA Administrator or designee may remove your product from the NCP Product Schedule... for reasons including, but not limited to:
>
> "(1) Statements or information that are misleading, inaccurate, outdated, or incorrect regarding the composition or use of the product to remove or control oil discharges made to any person, or private or public entity, including on labels, advertisements, technical literature, electronic media, or within the product submission to EPA...
>
> "... or
>
> "(4) New or relevant information not previously considered concerning the impacts or potential impacts of the product to human health or the environment."

[6] 553 F.Supp.3d 737, 746 (N.D. Cal. 2021).

[7] Ibid.

We adopted working definitions for qualifying terms, as follows.

- *Misleading* means giving the wrong idea or impression to lead or cause someone to believe something that is not true.[8]
- *Inaccurate* means incomplete, incorrect or unreliable; misleading in any matter of fact. For example, an inaccurate statement may contain some truth (correct, factual information), but it is not entirely precise, e.g., it may have omitted parts of the record.[9]
- *Incorrect* means materially false or untrue or lacking in the accurate, full, expected information.
- *Outdated* means no longer current; information that has changed since the content was published.
- *New or relevant* means not previously considered concerning impacts to human health or the environment (as provided in the rule).

OSHA, the NCP, and OSHA's Hazard Communication Standard

The NCP governs the organizational structure and proceedings for oil spill responses taken pursuant to the Clean Water Act and the Comprehensive Environmental Response, Compensation, and Liability Act.[10] OSHA derives its authority over NCP responses as a member of the NCP National Response Team (NRT).[11] Specifically, response actions under the NCP must comply with the provisions for worker safety and health in the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations in 29 CFR 1910.120 and applicable provisions of the OSH Act (29 USC 651 et seq.), and state laws with plans approved under section 18 of the OSH Act. When a state without an OSHA-approved plan is the lead agency for response, the state must comply with standards in 40 CFR Part 311, promulgated by EPA pursuant to section 126(f) of SARA (Superfund Amendments and Reauthorization Act).[12] The latter gives OSHA the authority under the NCP to "conduct safety and health inspections of hazardous waste sites to assure that employees are being protected and to determine if the site is in compliance with 40 CFR 300.175(b)(11): "(i) Safety and health standards and regulations promulgated by OSHA (or the states) in accordance with section 126 of SARA and all other applicable standards; and (ii) Regulations promulgated under the OSH Act and its general duty clause."

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[8] Law Insider online: https://www.lawinsider.com/dictionary/misleading

[9] Ibid. https://www.lawinsider.com/dictionary/inaccurate

[10] 33 USC § 1311(d), 42 USC § 9605; see also 40 CFR § 300.2.

[11] 40 CFR § 300.110.

[12] 40 CFR § 300.150 *et. seq.*

The specific statements we have selected for our petition are from the 2019 Safety Data Sheets for Corexit 9500A and Corexit 9527A—the most current ones that were publicly available at the time of writing. SDSs derive their authority from the OSHA Hazardous Communication (HAZCOM) standard (29 CFR 1910.1200).

The HAZCOM standard was first promulgated in 1983,[13] then modified in 1994[14] to require that chemical manufacturers, distributors, and importers provide SDSs to evaluate and communicate the hazards of chemical products as part of employees right to know the hazards and identities of the chemicals they worked with.[15]

OSHA interpreted that the purpose of an SDS was to provide employers and employees the necessary information on the hazards associated with exposure to chemicals in the workplace to protect themselves from hazardous chemical exposures and to work safely with chemical products.[16] "*When new regulatory information, such as exposure limits, or new health effects information becomes available, the SDS must be updated to reflect it*" (emphasis added).[17]

The HAZCOM standards were modified again in 2012 to conform to the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals.[18] These modifications included revised criteria for classification of chemical hazards, which is relevant to this petition.[19] Evaluations are performed by classifying each chemical based on published toxicological or other data to determine its physical and health hazards, as described in the mandatory HAZCOM standard Appendix A Health Hazard Criteria.[20] Manufacturers and distributors are required to provide their clients with SDSs that describe the results of the classification and all known hazards of a chemical.

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[13] 48 FR 53280 Hazard Communication, Final Rule. 11/25/1983. https://www.osha.gov/laws-regs/federalregister/1983-11-25

[14] 69 FR 6126 Hazard Communication, Final Rule. 2/9/1994. https://www.osha.gov/laws-regs/federalregister/1994-02-09

[15] Ibid.

[16] OSHA, 1995. Standard interpretation: The purpose of Material Safety Data Sheets. Involving standard § 1910.1200. 1/25/1995, https://www.osha.gov/laws-regs/standardinterpretations/1995-01-25-0

[17] Ibid.

[18] 77 FR 17574 Hazard Communication, Final Rule. 3/26/2012. https://www.osha.gov/laws-regs/federalregister/2012-03-26

[19] OSHA, 2016. OSHA Quick Card: Hazard Communication Safety Data Sheets, at 1. https://www.osha.gov/sites/default/files/publications/OSHA3493QuickCardSafetyDataSheet.pdf

[20] OSHA § 1910.1200 Appendix A – Health Hazard Criteria (Mandatory). https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1200AppA

New Classifications for Exceptional Health Hazards

Significantly, the 2012 final rule that is currently in effect recognizes new classifications of health hazards that are exceptions to the standard toxicity testing and the expected relationships between chemical concentration/duration and response, i.e., the higher the dose or the longer the duration, the worse the response or symptom. The expected relationships derive from toxicology principles on which Occupational Exposure Limits (OELs), including Permissible Exposure Limits (PELs), are based. However, some substances cannot be quantified in this manner because the harm can occur at very low levels, i.e., harm is independent of dose and duration.

An exception to the above order is recognized for Carcinogenicity, Germ Cell Mutagenicity, Reproductive Toxicity, and chemical mixtures that include these health hazards.[21] These exceptional health hazards are chemicals that induce or increase the incidence of cancers (carcinogens) or genetic mutations (DNA damage) in germ cells (reproductive cells) of humans that can be transmitted to the progeny,[22] or that affect the health of a developing fetus (teratogen) or the reproductive health of women and men and/or their ability to have healthy children (reproductive hazard). Some say there is no safe level for such chemicals.[23]

As of 2012, the OSHA HAZCOM rule also recognizes respiratory and skin sensitizers as exceptions to standard toxicity testing and the expected relationships between chemical concentration/duration and response. The HAZCOM standard describes a two-stage process of "induction of specialized immunological memory in an individual by exposure to an allergen… [followed by] elicitation, i.e., production of a cell-mediated or antibody-mediated allergic response by exposure of a sensitized individual to an allergen."[24] "For respiratory sensitization, the pattern of induction followed by elicitation phases is shared in common with skin sensitization. For skin sensitization, an induction phase is required in which the immune system *learns to react…*" (emphasis added).[25] "Usually, for both skin and respiratory sensitization, *lower levels are necessary for elicitation than are required for induction*" (emphasis added).[26] This makes respiratory and skin sensitizers exceptional health hazards as well, as they are clearly exceptions to the toxicology principles.

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[21] Ibid., at A.0.4.2. "An exception to the above order or precedence is made for Carcinogenicity, Germ Cell Mutagenicity, and Reproductive Toxicity…"

[22] Ibid., at A.5.1.3. "This hazard class is primarily concerned with chemicals that may cause mutations in the germ cells of humans that can be transmitted to the progeny."

[23] New Jersey Dept. of Health, 2008. Right to Know: Hazardous Substance Fact Sheet, 2-Butoxyethanol. Organ damage, at 1; cancer hazard and reproductive hazard, at 4; teratogen, at 5. "Many scientists believe there is no safe level of exposure to a carcinogen." https://nj.gov/health/eoh/rtkweb/documents/fs/0275.pdf

[24] See note 20, OSHA, § 1910.1200 Appendix A, at A.4.1.2.

[25] Ibid., at A.4.1.3.

[26] Ibid., at A.4.1.4.

The 2012 OSHA rule defines a *respiratory sensitizer* as "a chemical that will lead to hypersensitivity of the airways following inhalation of the chemical."[27] Human evidence of "hypersensitivity is normally seen as asthma, but other hypersensitivity reactions such as rhinitis/ conjunctivitis and alveolitis are also considered. The condition will have the clinical character of an allergic reaction. However, immunological mechanisms do not have to be demonstrated."[28]

A *skin sensitizer* is defined as "a chemical that will lead to an allergic response following skin contact."[29] Human evidence of skin sensitizers includes "epidemiological evidence where there is a relatively high and substantial incidence of allergic contact dermatitis in relation to relatively low exposure" or "a relatively low but substantial incidence of allergic contact dermatitis in relation to relatively high exposure."[30]

There it all was in law in 2012: the understanding that exposure to sensitizers can result in long-term harm at initial levels of exposure to contaminants that are well below levels thought to be protective of workers and public health. The law was not predicated on confirmation of a mechanism—the evidence was so strong for its existence, and the need to protect workers from this health hazard was so great. "*Immunological mechanisms do not have to be demonstrated*." Besides there was already precedent in other law.[31]

This is extremely relevant. Crude oil is a chemical mixture that contains exceptional health hazards. This petition provides evidence that Corexit dispersants 9500A and 9527A are each chemical mixtures that contain exceptional health hazards, and that, when crude oil is present with either of these Corexit dispersants, the resulting oil-dispersant chemical mixture contains exceptional health hazards, resulting in a secondary product that is more harmful than oil alone.

The legally recognized existence of respiratory and skin sensitization and of acute symptoms and chronic conditions of overexposure, means the traditional tools of air monitoring to determine specific concentrations and durations of exposure to specific chemicals, and of PELs to identify

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[27] Ibid., at A.4.1.1.

[28] Ibid., at A.4.2.1.2.1.

[29] Ibid., at A.4.1.2.

[30] Ibid., at A.4.2.2.2.1(c) and A.4.2.2.2(c).

[31] The world's first comprehensive civil rights law for people with disabilities, the Americans with Disabilities Act, as amended in 1990, covered Americans with chemical sensitivities (aka "environmental illness"). Section 504 of the Rehabilitation Act of 1973 and Title VIII of the Fair Housing Amendments Act of 1988 were subsequently interpreted to include multiple chemical sensitivities. The concept of chemical sensitivities was not new in the 1990s, as it had been postulated in the 1950s, yet it had remained controversial, lacking an accepted mechanism.

US Dept. of Housing and Urban Development, 1992. Standard interpretation: Section 504 of the Rehabilitation Act of 1973. Packet of letter correspondences. https://www.justice.gov/crt/foia/file/663671/dl

protective or harmful levels of a chemical substance, *are unreliable indicators* for assessing health risk of exceptional health hazards. In fact, in 2012 OSHA even posted a disclaimer on its website of annotated tables for PELs: "OSHA recognizes that many of its PELs are outdated and inadequate for ensuring protection of worker health."[32]

The NRT, comprised of 15 federal agencies, was well aware that its professional emergency responders were getting sick at levels of contaminants below those thought to be protective (the PELs)—and experiencing debilitating chronic health impacts from their initial exposures. The NRT put the revised OSHA standards to immediate use. It published a guidance in 2012[33]—the result of a NIOSH-convened consortium—and a training program with support,[34] to use *symptom-based health monitoring* to assess health risk in situations of uncertain exposures such as when mixtures that contain exceptional health hazards were present or suspected to be present.[35]

Finally, also in 2012, the BP Medical Claims Settlement for sick response workers *and the exposed public* listed as compensable: sequela from direct chemical splash to eyes, chronic rhinosinusitis, reactive airways dysfunction syndrome, and chronic contact dermatitis and chronic eczematous reactions at the site of contact.[36] The latter four could be considered human evidence of exposure to respiratory and skin sensitizers.

The mechanism of respiratory and skin sensitization is discussed in the factual section as new and relevant information.

Weight of Evidence

Of the four types of exceptional health hazards, only sensitization has initial symptoms of exposure. Evidence of exposure to reproductive toxins, including teratogens, germ cell mutagens, and carcinogens is found after a latency period. This makes respiratory and skin sensitization a red flag of sorts for early warning of the presence of exceptional health hazards.

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[32] OSHA Permissible Exposure Limits – Annotated Tables. https://www.osha.gov/annotated-pels

[33] NRT, 2012. Emergency Responder Health Monitoring and Surveillance (ERHMS) Technical Assistance Document, 1/26/2012. https://www.nrt.org/sites/2/files/ERHMS_Final_060512.pdf

[34] NIOSH online, 2024. Disaster-related Exposure Assessment and Monitoring (DREAM) Course. https://www.cdc.gov/niosh/erhms/about/

[35] See note 33, NRT, 2012, ERHMS Guidance, at 39.

[36] Plaisance et al. individually and on behalf of the *Medical Benefits Settlement Class v. BP Exploration & Production*. 2012. Deepwater Horizon Medical Benefits Class Action Settlement (Medical Claims Settlement), as amended on May 1, 2012. Case 2:10-md-02179-CJB-SS, Doc. 6427-1, 05/03/12, No. 12-CV-968. Exhibit 8, at 13–14. https://www.laed.uscourts.gov/sites/default/files/OilSpill/6.pdf

For exceptional health hazards that lack initial symptoms of exposure, OSHA's HAZCOM standards describe a hazard-based system that classifies chemicals on their "intrinsic ability" to induce mutations in germ cells (A.5), or their "inherent properties" to induce cancer (A.6), or on a "strong presumption" that a substance has the capacity to interfere with reproduction in humans or adversely affect the development of their offspring before or after birth (A.7).[37]

Classifications are based on the "weight of evidence" meaning "all available information bearing on the classification of hazard shall be considered together, including the results of valid in vitro tests, relevant animal data, and human experience such as epidemiological and clinical studies and well-documented case reports and observations."[38] However, a single positive study performed according to good scientific principles and with statistically and biologically significant positive results may justify classification."[39]

For Carcinogenicity, Germ Cell Mutagenicity, and Reproductive Toxicity, "mixtures shall be classified based upon information on the ingredient substances, *unless on a case-by-case basis, justification can be provided for classifying based upon the mixture as a whole*,"[40] (emphasis added). These three health hazard classes "allow the classification to be modified only on a case-by-case evaluation based on available test data for the mixture as a whole."[41]

Such schemes are meant for hazard evaluation, not for health risk assessment during oil spills or chemical releases. Of relevance to our petition, the HAZCOM standards are meant to be used for updating literature like Safety Data Sheets when the weight of evidence finds harm—as we believe it has for potential health effects, experience with human exposure, and justifying classification of the oil dispersants Corexit 9500A and Corexit 9527A as respiratory and skin sensitizers, carcinogens, teratogens, and reproductive toxins.[42] Our petition requests removal of these products, based on the Manufacturer's failure to provide accurate, updated information relating to these topics.

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[37] See note 20, OSHA § 1910.1200, Appendix A, at A.5.2.2.2, A.6.1, and Figure A.7.1(a), Category 1.

[38] Ibid., at A.0.3.1.

[39] Ibid., at A.0.3.5.

[40] Ibid., at A.0.4.2.

[41] Ibid., at footnotes [5] to A.5.3 Classifications for Mixtures (containing germ cell mutagens), [7] to A.6.3 for Classifications for Mixtures (containing carcinogens), and [9] for Classifications for Mixtures (containing reproductive toxins).

[42] Ibid., at footnotes [2]—[4] concerning respiratory hypersensitivity, induction mechanisms of asthma symptoms, and skin sensitization tests. These notes are included in the regulatory background as they will be further discussed in Part IV as part of new or relevant evidence.

EPA Regulations on Conditional Listing and the Need for an Expedited Decision

The conditional listing rule of the NCP Subpart J states:

> "§ 300.955 Addition of a Product to the NCP Product Schedule...
> (f) *Transitioning Listed Products to the New NCP Product Schedule or Sorbent Product List.* All products on the current NCP Product Schedule as of December 11, 2023, will remain conditionally listed until December 12, 2025, at which time all products that have not been submitted and listed in the new NCP Product Schedule based on the amended test and listing criteria will be removed."

The need for an expedited decision is best understood by considering the legal and political consequences of this rule. In oil spill response, normal use includes the option for dispersant use. Exercising the option has become the norm with protocols that are now a part of law, regulations, and national, regional, and area contingency plans under the NCP.

Corexit dispersants have been used in maritime oil spills in the United States since the Santa Barbara well blowout in 1969[43]—before there was any law or regulation governing use, before EPA was established, before the Clean Water Act was passed, before any science to determine the environmental consequences of use, and half a century before the human health consequences were seriously considered. The early laws only served to entrench attitudes of entitlement in the oil and gas industry that dispersant use would be a given.

For example, following the 1989 *Exxon Valdez* oil spill in Alaska's Prince William Sound, the Oil Pollution Act of 1990 (OPA) called for an expedited decision-making process for dispersant use.[44] EPA's 1994 implementing regulations under Subpart J of the NCP allowed for preauthorization plans for dispersant use as part of planning activities for area and regional contingency plans.[45] All coastal states have them.

This institutionalized dispersant use as part of oil spill preparedness and response and largely left decision-making to the federal (or state) On Scene Coordinator (OSC), the lead responder, during an oil spill, instead of to the people who would live with the consequences of their decisions, as the OPA required.[46] Such ad hoc use decisions remained controversial, as seen during the 2010 BP

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[43] NOAA Incident News, 1969. Santa Barbara well blowout, Santa Barbara, California. January 28, 1969. https://incidentnews.noaa.gov/incident/6206#!513762

[44] 33 U.S. Code § 1321(j)(4)(B)(iii) and (C)(v). https://www.law.cornell.edu/uscode/text/33/1321

[45] EPA, 1994. 59 FR 47453, NCP Final Rule. 40 CFR § 300.910, at 47454. https://archives.federalregister.gov/issue_slice/1994/9/15/47381-47495.pdf#page=73

[46] For historical background on the failure to meaningfully involve state and local governments in decision-making on product use as part of Area Committees established under OPA, see notes 28–39 and text, In: ALERT, 2024. An

Deepwater Horizon oil disaster. In late 2010, despite scientific unknowns and public controversy, the U.S. Department of Interior directed oil and gas lessees and operators offshore on the outer continental shelf to demonstrate the capacity to access and deploy equipment for subsea dispersant injection[47]—a use that was not even authorized under the 1994 NCP regulations, the governing rules at the time (but it is under the 2023 rules[48]).

Ironically, EPA's final rules governing dispersant use are based on pre-2015 science that predated the release of the bulk of the post-BP studies that investigated potential associations between dispersant use and adverse health impacts. No previous oil spill involved the unprecedented level of dispersant use that occurred during the BP Deepwater Horizon oil disaster. There were unprecedented consequences for humans and wildlife, collateral damage that was revealed piece by piece in new and relevant studies. The rules now require manufacturers of products used during oil spill response to consider the current science—or face the consequences of product removal.

This refreshing truth-in-reporting rule has precipitated the current crisis that may never have happened had quality (timely, accurate, and relevant) information driven dispersant policy and use decisions from the start. Corexit 9527 was one of the first modern concentrate dispersants developed by Standard Oil of New Jersey (now ExxonMobil), and it has been in use since the mid 1970s despite being extremely hazardous by nature. In 1991 OSHA Sweden found that Personal Protective Equipment (PPE) was unlikely to protect workers from either dermal or respiratory exposure to 2-butoxyethanol, an ingredient of Corexit 9527.[49] Later in the 1990s, Exxon developed Corexit 9500, a less (but still very) toxic alternative, to replace 9527[50]—but then kept manufacturing and marketing both. Product users (i.e., oil and gas industry and service providers) promoted these products as safe to use during oil spill response. Corexit 9527A and Corexit 9500A became the only two chemical dispersants stockpiled in large quantities in the United States.[51] But this charade fell apart in the wake of the BP Deepwater Horizon disaster when independent lab, clinic, and epidemiological studies all found real harm to humans and other

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Opportunity to Make It Right. Relating to the Policy and Science of Oil Spills, Dispersant Use, and Human Health. https://alertproject.org/wp-content/uploads/2024/02/ALERT240212-Opportunity-FINALrev.pdf

47 U.S. Dept. of Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, 2010. National Notice to Lessees and Operators (NTL) of Federal Oil and Gas Leases, Outer Continental Shelf. Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources. NTL No. 2010-N10. https://www.bsee.gov/sites/bsee.gov/files/notices-to-lessees-ntl/notices-to-lessees/10-n10.pdf

48 § 300.915(b)(3).

49 Johanson G, Boman A (National Institute of Occupational Health, Sweden, and Dept. of Occupational Medicine, Univ. Hospital, Sweden, respectively), 1991. Percutaneous absorption of 2-butoxyethanol vapour in human subjects. *Brit J Industrial Med*, 48:788–792. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1035455/

50 SL Ross Environmental Research Ltd. 2002. Assessment of the use of dispersants on oil spills in Californian marine waters, at 30. Archived.

51 Ibid.

animals from exposures to either of the Corexit dispersants alone or with oil, as presented in this petition.

In November 2022, the manufacturer of Corexit dispersant ("Manufacturer"), currently Corexit Environmental Solutions, a subsidiary of ChampionX, announced "the discontinuation of the manufacture and sale of COREXIT™ oil dispersant and shoreline cleaner products, effective immediately"[52] (Exhibit 1). In January 2023, it announced that "The Company will no longer support the regulatory framework – including product registrations or re-registration [on the NCP Schedule]—for this product line effective July 1, 2023."[53] In May 2023, the International Association of Oil and Gas Producers established a Dispersant Task Force to explore and resolve issues such as determining where else in the world these products could be used—and whether "indemnification requirements for certain products can be met"[54] (Exhibit 2).

Although Corexit dispersants 9527A and 9500A are no longer manufactured and will likely not be relisted on the new NCP Product Schedule, the conditional listing rule allows for use of these toxic products in the United States until December 12, 2025. This raises the specter that the existing stockpiles of toxic dispersants could be used in any oil spill that occurs between now and then in the United States—with the same horrific consequences.[55] It also leaves EPA vulnerable to charges of dereliction of its duty under the Clean Water Act to ensure that products *can* be used safely.[56] Hence the request for an expedited decision-making process on our petition.

II. Factual Background

From the 2010 BP Deepwater Horizon oil disaster to present, the gap between knowledge of potential health effects and experience with human exposure to Corexit dispersants 9527A and 9500A closed rapidly as post-disaster science rewrote what was known—or presumed to be true—in April 2010. The bookends for this period are the Manufacturer's SDSs in 2010 and other information from right to know factsheets, which provide a baseline of what was known at the

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[52] Manufacturer Corexit Dispersants, 2023. Announcement. January 20. https://alertproject.org/wp-content/uploads/2024/04/corexitenviro.pdf

[53] Ibid.

[54] International Association of Oil and Gas Producers, 2023. Corexit Availability – Update to Members and Industry. May 2023. https://www.iogp.org/wp-content/uploads/2023/06/IOGP_COREXIT-Update-Letter-to-Industry-Participants-May-2023.pdf

[55] Sneath S, Laughland O. 2023. "They cleaned up BP's massive spill. Now they're sick – and want justice," *The Guardian* 4/20/2023. https://www.theguardian.com/environment/2023/apr/20/bp-oil-spill-deepwater-horizon-health-lawsuits

[56] Markey, Edward, U.S. Senator, 2024. Letter to Michael Regan, Administrator, U.S. EPA. Oversight letter concerning conditional use of toxic dispersants under NCP Subpart J final rules governing dispersant use. https://www.markey.senate.gov/news/press-releases/on-14th-anniversary-of-bp-oil-spill-senator-markey-calls-on-the-epa-to-better-protect-communities-responders-and-the-environment-from-toxic-oil-spill-dispersants

time, and the 2021 validation of a mechanism for respiratory and skin sensitization, which provides the missing piece needed to regulate sensitizers as exceptional health hazards, along with carcinogens, germ cell mutagens, teratogens, and reproductive hazards.

There is also the matter of what constitutes "normal use" for Corexit dispersants, as this is the extent of the Manufacturer's liability—and dictates what it reports on its SDSs. When dispersants are authorized by another entity for a specific use, the liability for safe use transfers to the entity that authorized use. In the case of oil spills, the U.S. EPA *authorized use* of dispersants by listing the Corexit products of concern in the NCP Schedule—but the agency *does not require* use. The decision to use listed products during an oil spill rests with EPA, the Coast Guard, *and coastal states*, as discussed in the regulatory framework. Under this dichotomy, the Manufacturer (and the courts) do not consider normal use to include oil spill response.[57]

When dispersants are used in oil spill response, they combine with oil to create a unique oil-dispersant chemical mixture (aka chemically dispersed oil) that can exist in multiple phases like oil (e.g., solid tar mats, weathered emulsifications, liquid droplets, and airborne aerosols), as discussed below in this part. Since EPA authorized listing of these dispersant products, the Manufacturer is not responsible for harm from oil-dispersant mixtures and so does not communicate the health risk from exposure to these mixtures in its SDSs. Further, the unique health risk posed by oil-dispersant mixtures *was assumed for decades* to be less than the health risk from oil alone, based largely on unsubstantiated industry rhetoric.[58] However, the post-BP oil disaster science established the unique health risk of oil-dispersant mixtures.

Therefore, in our petition, we provide evidence to remove products for statements made in the SDSs regarding dispersant-only potential and experiences, for which the Manufacturer is responsible, and regarding oil-dispersant exposures and experiences, for which the EPA is responsible, as the entity that authorized use by listing these Corexit dispersants in the NCP Product Schedule.

For response workers and the public to experience health impacts, there must first be evidence that workers and the public were exposed. The evidence of potential for harm and exposure is presented in this section, while the experience of health impacts is presented in Parts III and IV.

Thus, the factual background is framed on these three topics to provide context for our petition:

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[57] McEvoy C. Nalco skirts lawsuits over Corexit [dispersant] use after BP oil spill. *Law360* Nov. 30, 2012. https://alertproject.org/wp-content/uploads/2024/08/11302012-Nalco-Skirts-Lawsuits.pdf

[58] "Dispersants are less toxic than most crude oils and adding dispersant in low levels at the appropriate application rates does not increase the toxicity of the oil," at 1. API/Oil Spill Prevention, 2013. Factsheet No. 2: Dispersants—Human Health and Safety. https://www.oilspillprevention.org/-/media/Oil-Spill-Prevention/spillprevention/r-and-d/dispersants/2-dispersants-human-health-and-safety.pdf

- What was known at the time (2010) about health hazards associated with Corexit 9500A and 9527A;
- The new or relevant science-based understanding that emerged from the BP Deepwater Horizon oil disaster concerning formation and fate of oil-dispersant droplets and potential risk of exposure; and
- The new or relevant science-based understanding of the mechanism of sensitization that can lead to chemical intolerance (2021).

2010 Baseline: SDSs and Other Right-to-Know Information

According to the Manufacturer's 2010 SDSs,

- Corexit 9527A contains the following hazardous chemical substances: the solvents 2-butoxyethanol (30–60% wet weight) and propylene glycol (1–5%) and an active ingredient, a surfactant in a proprietary blend of organic sulfonic acid salts known as dioctyl sodium sulfosuccinate or DOSS (10–30%).[59]

- Corexit 9500A contains petroleum distillates (10–30% wet weight) instead of 2-butoxyethanol and, otherwise, the same surfactant DOSS and the same propylene glycol solvent as in Corexit 9527A.[60]

Health hazards associated with the product and the unique carrier solvents are discussed first, followed by the ingredients common to both.

Corexit 9527A and 2-Butoxyethanol

According to the Manufacturer's 2010 SDS, health hazards associated with repeated, excessive, or prolonged exposure to this *product* include: irritation of the eyes, respiratory tract, and skin, central nervous system effects, and possible aggravation of existing dermatitis conditions; and acute symptoms of injury to red blood cells (hemolysis), the kidney or the liver, and chronic damage to the blood and kidneys.[61] The Manufacturer stated that "the product is not expected to be a sensitizer," that "[n]one of the substances in this product [including 2-butoxyethanol] are listed as carcinogens by [three different classification authorities]," and that "2-butoxyethanol

[59] NALCO, 2010. Safety Data Sheet, Corexit EC9527A. 5/11/2010. https://alertproject.org/wp-content/uploads/2024/04/Corexit-9500-2010.pdf

[60] NALCO, 2010. Safety Data Sheet, Corexit EC9500A. 5/11/2010. https://alertproject.org/wp-content/uploads/2024/04/Corexit-9527-2010.pdf

[61] See note 59, NALCO, 2010, SDS Corexit 9527A.

does not cause adverse reproductive or birth effects in animals."[62] However, others erred on the side of caution, using information that was available at the time of this SDS (2010).

For example, in the state where Standard Oil of New Jersey (now ExxonMobil) developed Corexit dispersants, the New Jersey Department of Health Right to Know Fact Sheet (NJ Fact Sheet) for 2-butoxyethanol (2008) warned, "2-butoxyethanol should be handled as a CARCINOGEN—WITH EXTREME CAUTION" (emphasis in original).[63] "2-butoxyethanol may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level. The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above" (emphasis in original).[64] The latter indicates a lack of association between health effect and level/duration of exposure, the hallmark feature of exceptional health hazards.[65] The NJ Fact Sheet also cautioned that "2-butoxyethanol may damage the developing fetus... [and] the male reproductive system (including decreasing sperm count) in animals and may affect female fertility in animals[66]—indicating possible teratogenicity and reproductive toxicity.[67]

Corexit 9500A and Petroleum Distillates

According to the Manufacturer's SDS, health hazards associated with exposure to or contact with this *product* include: irritation of the eyes, respiratory tract, and skin, and possible aggravation of existing dermatitis conditions; while frequent or prolonged contact with the product may defat and dry the skin, leading to chronic discomfort and dermatitis.[68] The Manufacturer also stated that the product is not expected to be a sensitizer and that none of the substances in this product were listed as carcinogens or, presumably, reproductive toxins, as the latter were not mentioned.[69]

The 2011 NJ Fact Sheet for petroleum distillates provided more information, again erring on the side of caution. While petroleum distillates were "not classifiable as to their potential to cause cancer," it listed other potential chronic health effects, including limited evidence that petroleum

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[62] Ibid., at 5–6.

[63] See note 23, NJ Right to Know Fact Sheet, 2008, at 1.

[64] Ibid.

[65] See note 20, § 1910.1200 Appendix A, at A.4. Respiratory or Skin Sensitization.

[66] See note 23, NJ Right to Know Fact Sheet, 2008, at 2.

[67] See note 20, § 1910.1200 Appendix A, at A.7. Reproductive Toxicity. Note that the NJ Fact Sheet was published in 2008, indicating the information was clearly *available* in 2010 when the SDS was published.

[68] See note 60, NALCO, 2010, SDS Corexit 9500A, at 2.

[69] Ibid., at 5–6.

distillates may affect female fertility (i.e., reproductive hazard), chronic skin irritation, chronic bronchitis with coughing, phlegm, and shortness of breath, and possible liver and kidney damage.[70]

Propylene Glycol (Common to Corexit 9527A and 9500A)

The 2009 NJ Fact Sheet for propylene glycol states that the NJ Dept. of Health found no evidence that propylene glycol causes cancer in animals or affects reproduction based on presently available data. Other chronic health effects were listed including chronic skin irritation (as noted in the SDS) and possible kidney damage with repeated high exposures.[71]

Organic Sulfonic Acid Salts, DOSS (Common to Corexit 9527A and 9500A)

According to the manufacturer's SDS (2021), DOSS may be fatal if swallowed and enters the airways, it causes serious eye damage (corrosion), skin irritation, and respiratory irritation, it may cause damage to organs including cancer, and it is harmful to aquatic life.[72] There were no data available for respiratory or skin sensitization. There was no comparable NJ Fact Sheet because DOSS is a proprietary blend—a chemical mixture.

To summarize, in 2010 at the onset of the BP Deepwater Horizon oil disaster, both Corexit dispersants had known health hazards associated with inhalation or skin contact. The Manufacturer's SDSs describe acute symptoms but are very circumspect in describing chronic conditions (to the point of being incorrect through errors of omission). The SDSs deny any toxicity associated with sensitizers or exceptional health hazards from *the product*. However, other right to know material more concerned with hazard communication than shielding against liability reported evidence from animal studies of respiratory and skin sensitization, adverse reproductive effects, teratogenicity, and carcinogenicity from some of *the ingredients* in Corexit 9500A and 9527A.

We turn next to the matter on which the Manufacturer's SDSs are silent: the potential hazard risks from exposure to the oil-dispersant mixtures.

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[70] New Jersey Dept. of Health, 2011. Right to Know: Hazardous Substance Fact Sheet, Petroleum Distillates. https://nj.gov/health/eoh/rtkweb/documents/fs/2648.pdf

[71] New Jersey Dept. of Health, 2009. Right to Know: Hazardous Substance Fact Sheet, Propylene Glycol. Chronic effects (other), at 2.

[72] CoreChem, 2021. SDS Ultradoss 75, Dioctyl sodium sulfosuccinate. https://corecheminc.com/wp-content/uploads/2021/09/Ultradoss-75-Diocytl-Sodium-Sulfosuccinate-CORECHEM-Inc.-Safety-Data-Sheet-2021.08.18.pdf

EXPOSED: Oil, Dispersant, and Oil-Dispersant Mixtures

> "They said nothing was wrong. 'Oh, nothing's wrong outside. Everything's alright.' You walk out your door, and there's a haze from the top of the trees to the ground, it's gray, and it *reeks* of petroleum. 'But it's *safe*.'"
>
> Kindra Arnesen
> Mother, fisherwoman
> Venice, Louisiana
>
> (Counting dead seagulls on the ground) "14... 15... 16... birds was fallin' outta the sky. We shoulda left."
>
> David Arnesen
> Father, fisherman
> Venice, Louisiana[73]

Dispersants are designed to combine with oil to create chemically-dispersed oil droplets[74] in the water. During an oil spill response, the health risk is from exposure to oil, the dispersant itself, and chemically dispersed oil—the oil-dispersant mixtures.[75] Since much of the human experience with dispersants comes from the BP Deepwater Horizon oil disaster, it is important to know where the dispersant was used and where the oil-dispersant droplets wound up to understand the impact of these products.

Deep (Sub) Sea Dispersant Injection (SSDI)

According to official reports, 771,272 gallons of Corexit 9500A were injected at depth into the oil over almost three months (from April 30 to July 15), as the oil released from the broken wellhead. The initial stated purpose was to prevent or minimize the oil reaching the sea surface and coast.[76]

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[73] Conception Media, 2020. *The Cost of Silence*. Investigative documentary film. Santa Barbara, CA. https://www.conceptionmedia.net/the-cost-of-silence-details See also film trailer, at 1:13–1:29. https://vimeo.com/440728968

[74] Fingas M, 2017. A review of the literature related to oil dispersants. For the Prince William Sound Regional Citizens' Advisory Council. (Figures 1-1 and 1-2, at 2) https://www.pwsrcac.org/wp-content/uploads/A-Review-of-Literature-Related-to-Oil-Spill-Dispersants-September-2017.pdf

[75] API/Oil Spill Prevention, 2013. Fact Sheet No. 1, Introduction to Dispersants, at 3, Figure 2. https://www.oilspillprevention.org/-/media/Oil-Spill-Prevention/spillprevention/r-and-d/dispersants/1-introduction-to-dispersants.pdf

[76] Stenzel MR, SF Arnold, G Ramachandran, et al., 2021. Estimation of airborne vapor concentrations of oil dispersants Corexit EC9527A and EC9500A, volatile components associated with the Deepwater Horizon oil spill response and clean-up operations. *Annals of Worker Exposure and Health* 66 (issue suppl. 1): i202–i217. https://doi.org/10.1093/annweh/wxab056

Well blowout dynamics effectively shredded the pressurized oil into droplets of all sizes, dispersing the oil at depth.[77] Significant amounts of gaseous components, e.g., methane, n-hexane, and hazardous VOCs (Volatile Organic Compounds) were forced to entrain in the water column (i.e., to become part of the liquid water column) by the crushing pressure and frigid ocean temperatures at depth.[78] About 5% or less of the liquid oil droplets[79] remained trapped in the deep intrusion layer with or without dispersant use.[80] The great bulk of oil released from the damaged wellhead rose from the seafloor through nearly a mile (over 5,000 feet) of water column to the sea surface.[81] Although deep sea dispersant injection proved ineffective at preventing most of the oil from reaching the sea surface, it continued until the well was capped on July 15.

To justify continued subsea use while oil was still gushing uncontrolled from the broken riser and rising to the sea surface, BP claimed that dispersant injection at depth reduced the amount of VOCs rising to the sea surface and, therefore, made surface operations safer for workers.[82] However, internal communications between EPA and the US Coast Guard reveal that EPA Administrator Lisa Jackson failed to "see [a] strong correlation between VOCs and [the]

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[77] Fingas M, 2014. A review of literature related to oil dispersants, 2011–2014, for the Prince William Sound Regional Citizens' Advisory Council, Anchorage, Alaska, Section 4.6 at 24–25. https://www.pwsrcac.org/wp-content/uploads/A-Review-of-Literature-Related-to-Oil-Spill-Dispersants-2011-2014.pdf

[78] Paris CB, et al., 2018. BP Gulf Science Data reveals ineffectual subsea dispersant injection for the Macondo blowout. *Front Mar Sci* 5:389. doi.org/10.3389/fmars.2018.00389 At 2 (six years), at 1 "spatio-temporal distribution of petroleum hydrocarbons revealed consistent higher concentrations at the sea surface and in a deep intrusion below 1000 m. The relative importance of these two layers depended on the hydrocarbon mass fractions as expected from their partitioning along temperature and pressure changes…"

[79] Gross J, Socolofsky SA, Dissanayake AL, et al., 2017. Petroleum dynamics in the sea and influence of subsea dispersant injection during [BP] Deepwater Horizon. *Proc Natl Acad Sci,* 114(38), 10065–10070. www.pnas.org/cgi/doi/10.1073/pnas.1612518114

[80] Evidence preceding the commencement of SSDI is similarly consistent with low percentages of liquid oil in the deep intrusion layers. "[O]nly a small fraction of liquid oil was trapped in the layers with and without SSDI." National Academies of Sciences, Engineering, and Medicine (NASEM), 2020. *The Use of Dispersants in Marine Oil Spill Response* (Washington, DC: The National Academies Press), at 46. https://doi.org/10.17226/25161

[81] "Almost all the methane released from the wellhead entered this subsurface intrusion layer along with significant fractions of other dissolved compounds and some tiny (order 100 microns) oil droplets (Lehr et al., 2010). The oil remaining in larger droplets rose to the sea surface, forming slicks."

Lehr et al., 2010. Deepwater Horizon oil budget calculator: A report to the national incident command. Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering Team: National Incident Command. In: NASEM, 2022, *Oil in the Sea IV: Inputs, Fates, and Effects* (Washington, DC: The National Academies Press), at 19 (Box 1-1). https://doi.org/10.17226/26410

[82] Other industry advocates would later make this same unsubstantiated claim. See note 58, API/Oil Spill Prevention, 2013, Dispersants and Human Health, at 2. "Dispersants also reduce exposures of cleanup workers to the oil and oil fumes while recovering it at sea or on the shoreline."

application of subsea dispersants—numbers are very up-and-down; not enough data."[83] When the BP Gulf Science Dataset was made available to the scientific community *six years* after the disaster, independent scientists confirmed the by-then general scientific consensus that blowout dynamics, temperature, and pressure controlled the phases and distribution of oil droplets, not subsea dispersant injection.[84]

As to where the subsea oil-dispersant droplets went, they remained in the deep intrusion layer offshore, dissipating slowly.[85] The oil-dispersant droplets were detected for months after injection stopped,[86] a finding that contributed to the emerging understanding that dispersants were *not* readily biodegradable and were much more persistent in the environment than previously believed. These findings also indicate that dispersants applied in the deep sea were not available via inhalation or skin contact to humans and, thus, did not contribute to the human experience unlike dispersants applied to offshore and nearshore surface oil slicks.

Offshore Surface-Slick Application by Spraying from Planes or Vessels

According to official reports,[87] 1,072,514 gallons of Corexit dispersants were applied offshore to surface oil slicks. Aerial spraying by plane of Corexit 9527A (214,669 gallons) occurred from April 22–31 May and of Corexit 9500A (761,568 gallons) from April 27–July 19. Surface-slick spraying by vessel of 9500A (96,277 gallons) occurred from May 15–July 13, to prevent or minimize the oil from coming ashore. Subsequent studies found much of this may have been ineffective, as well as increasing the health risk for workers and residents alike.

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[83] US Coast Guard, 2010. Federal OSC Documents, USCG Phase V, Admiral Nash Documents, Dispersants. HOV00009027 Batch A. Notes from EPA-USCG Conference Call: Dispersants, 6/22/2010, at 25. NARA, Ft. Worth.

[84] The BP Gulf Science Datasets are a collection of more than 24,500 water samples from at least 67 Response and Natural Resource Damage Assessment studies that were made available to scientific community in 2016.

See note 78, Paris et al., 2018, Data reveals SSDI ineffectual, at 2 (six years), at 1 "substantial amounts of oil continued to surface near the response site, with no significant effect of SSDI volume on PAH [polycyclic aromatic hydrocarbons] vertical distribution and concentration…"

[85] Evidence of Corexit dispersant "persisted up to 300 km from the well, 64 days after deepwater dispersant applications ceased," at 1; In: Kujawinski EB, Kido Soule MC, Valentine DL, et al., 2011. Fate of dispersants associated with Deepwater Horizon oil spill. *Environ Sci & Tech 45*(4):1298-1306 DOI: 10.1021/es103838p

[86] "… based primarily on dispersant indicators, fluorescence and [dissolved oxygen] features, the presence of the plume was detected 412 km [southwest] from the wellhead…", at 409; In: Payne JR, Driskell WB, 2018. Macondo oil in northern Gulf of Mexico waters – Part 1: Assessments and forensic methods for Deepwater Horizon offshore water samples. *Mar Poll Bull* 129:399–411. doi.org/10.1016/j.marpolbul.2018.02.055

[87] See note 76, Stenzel et al., 2021. Estimation of dispersant vapor concentrations, at 2.

Once oil reached the sea surface it was subjected to rapid weathering. Photo-chemical oxidation[88] was found to be the dominant fate of surface oil[89] and it occurred rapidly—within four hours in Gulf of Mexico conditions, reducing the effectiveness of spraying dispersants onto the sea surface by plane or boat and calling into question the utility of such application more than a few kilometers (2 miles) from an offshore source.[90]

Further, in lab studies on crude oil with and without dispersant (Corexit 9500A) at working concentrations used in the BP Deepwater Horizon oil disaster,[91] dispersant use was shown to significantly increase the transfer of heavier weight hydrocarbons (the polycyclic aromatic hydrocarbons or PAHs) *from the seawater into the air as aerosols* compared to crude oil alone.[92] This particular fraction of crude oil is considered to be very hazardous to human health.[93] As ultrafine particulate matter, i.e., aerosols, PAHs can travel longer distances and penetrate more deeply into the alveoli region of the human respiratory system than as larger particles (such as oil mists).[94] In the study, dispersant use increased the total mass of respiratory-deposited ultrafine particulate PAHs, increasing the total mass burden to the human respiratory system by *10-fold*.[95] Yet the increased health risk from the *smaller size* of the PAH aerosols was undetectable using traditional methods of analysis, because the *concentration* remained unchanged.[96] The authors recommended using a lower dispersant-to-oil ratio during oil spills to mitigate human health

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[88] Ward CP, Overton EB, 2020. How the 2010 Deepwater Horizon spill reshaped our understanding of crude oil photochemical weathering at sea: a past, present, and future perspective. *Environ Sci Process Impacts*. 2020 May. 22(5):1125-1138. doi: 10.1039/d0em00027b;

[89] Ward CP, et al. et al. 2018. Partial photochemical oxidation was a dominant fate of *Deepwater Horizon* surface oil. *Environ Sci Technol*. 52, 1797–1805. doi: 10.1021/acs.est.7b05948

[90] Ward CP, et al. 2018. Photochemical oxidation of oil reduced the effectiveness of aerial dispersants applied in response to the [BP] Deepwater Horizon spill. *Environ Sci & Technol Lett* 5:226-231. doi: 10.1021/acs.estlett.8b00084

[91] Afshar-Mohajer N, et al. 2018. A laboratory study of particulate and gaseous emissions from crude oil and crude oil-dispersant contaminated seawater due to breaking waves. *Atmospheric Environ*. 179:177-186. https://doi.org/10.1016/j.atmosenv.2018.02.017

[92] Afshar-Mohajer N, et al., 2020. Impact of dispersant on crude oil content of airborne fine particulate matter emitted from seawater after an oil spill. *Chemosphere* 256; 127063. doi: 10.1016/j.chemosphere.2020.127063

[93] World Health Organization, 2010. *WHO Guidelines for Indoor Air Quality: Selected Pollutants,* Chapter 6, Polycyclic Aromatic Hydrocarbons by Choi H, Harrison R, Komulainen H, Delgado Saborit JM. https://www.ncbi.nlm.nih.gov/books/NBK138709/

[94] Afshar-Mohajer N, Fox MA, Koehler K. 2019. The human health risk estimation of inhaled oil spill emissions with and without adding dispersant, *Sci of the Total Environ* 654:924-932. doi: 10.1016/j.scitotenv.2018.11.110

[95] Ibid., at 924. "... inhalation of dispersant-mediated particulate emissions increased the total mass burden of *nano* particles inhaled and deposited in upper respiratory tract and trachea bronchial region of humans by about 10 times, compared to slicks of crude oil without dispersants."

[96] Traditional methods only capture 1.3–4% of the PAHs in fresh oil, making them unsuited for health risk assessments. See note 86, Payne, Driskell, 2018, Part 1: Assessments and forensic methods.

impacts.[97] However, this recommendation is made from a toxicology perspective rather than from an immunological perspective for exceptional health hazards, discussed in the next section.

Once aerosolized, the oil-dispersant droplets were transported within and above the marine boundary layer along with the weathered oil. Secondary organic aerosols, created by photo-oxidation and aerial spraying of dispersants,[98] were transported *within* the marine boundary layer downwind of the spill and over 80 miles inland, affecting air quality in downwind communities.[99] The Southeast Louisiana air quality study found that average ambient air levels for benzene and fine particulate matter (PM2.5) during the five months of peak emissions (May through September 2010) exceeded pre-spill background levels and protective standards for public health in regional (rural) and coastal areas—and, further, the PM2.5 carried an aerosol signature associated with the oil spill.[100]

The oil mists and aerosols carried *within* the marine boundary layer were observed by coastal residents and others as it coated seaward-facing windows of homes and vehicles and collected in folds of beach umbrellas left outside for the night. It was also observed "from the top of the trees to the ground" as a gray haze that "reeked of petroleum," as shown in the documentary film trailer of *The Cost of Silence*.[101] Soot and other pollutants from smoke plumes that lofted *above* the marine boundary layer[102] were blown overland and returned to the earth's surface as the "oil rain" or as smog[103] observed by coastal residents.

Besides breathing oil-dispersant aerosols, offshore workers also experienced dispersant exposure through direct work with dispersants or work on a vessel from which dispersants were applied

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[97] See note 92, Afshar-Mohajer et al., 2020, Impact of dispersant on PAHs in crude oil, at 7.

[98] de Gouw JA, et al., 2011. Organic aerosol formation downwind from the [BP] Deepwater Horizon oil spill. *Mar Science* 331:1295–99. 10.1126/science.1200320

[99] Middlebrook AM, et al., 2012. Air quality implications of the Deepwater Horizon oil spill. *Proc Nat Acad Sci Phys Sci* 109:20280–5, at Figure 8. doi:10.1073/pnas.1110052108

[100] Nance E, King D, Wright B, Bullard RD. 2016. Ambient air concentrations exceeded health-based standards for fine particulate matter and benzene during the BP Deepwater Horizon oil spill. *J Air Waste Manag Assoc*. Jan, 66(2):224-36. doi: 10.1080/10962247.2015.1114044 The air quality in the urban areas was relatively normal compared to previous years and the levels did not exceed public health standards.

[101] See note 73, Conception Media, 2020, *The Cost of Silence* film trailer.

[102] Perring AE, et al., 2011. Characteristics of black carbon aerosol from a surface oil burn during the Deepwater Horizon oil spill. *Geophys Res Lett*; 38: 1–5. doi: 10.1029/2011GL048356

Ryerson TB, et al., 2012. Atmospheric emissions from the Deepwater Horizon spill constrain air-water partitioning, hydrocarbon fate, and leak rate. *Geophys Res Lett* 38, L07803.

[103] Britannica online, 2022. https://www.britannica.com/science/planetary-boundary-layer

DeLizo J, Fogarty J, 2018. A comparison between the land and marine boundary layers. 7/1/2018 https://www.alabamawx.com/?p=167365

and/or from handling dispersant-related equipment.[104] Those who did so experienced significantly increased respiratory and skin symptoms and long-term illnesses compared to those who did not. In addition, offshore workers experienced direct contact with dispersants when downwind of—or under—aerial spraying operations. Such exposures were not uncommon. These experiences are discussed in Part IV (with documentation).

Nearshore Surface-Slick Application by Spraying from Boats

According to reports, 98% of the total dispersant volume of 1.84 million gallons was applied more than 10 nautical miles offshore,[105] meaning at least 36,875 gallons was applied within 10 nautical miles of shore. But the official record is silent on the volume sprayed in *nearshore* waters within 3 nautical miles of land. The federal On Scene Coordinator ordered all records of government-approved dispersant use in nearshore waters be removed from daily reports, reasoning that "(a)ll shoreline impacts are associated with BP's oil and BP's failure to stop the flow from its leaking well or BP's failure to physically capture its oil before reaching shore."[106] However, it wasn't just shorelines that were impacted.

Dispersant spraying operations in coastal waters created a unique health risk to workers and residents. Workers operated shallow, flat-bottom boats while spraying dispersants without using respiratory protection or skin protection. The deck height was only slightly higher than the spray release point (as shown in the photo link[107])—a small difference that greatly increased the health risk of exposure to dispersant and oil-dispersant aerosols for workers and nearby boaters. Coastal

[104] For example, BP, in coordination with NIOSH, adopted a total VOC action level of 50 ppm, which, if exceeded, triggered VOC mitigation measures, including the use of water sprays, surface spraying of dispersants, relocation to areas with less surface oil, and others. API, 2022. Industry Recommended Response Worker Safety Considerations for Requesting Regulatory Concurrence for Subsea Dispersant Use. API Bulletin 4719(b). November 2022. https://www.oilspillprevention.org/-/media/Oil-Spill-Prevention/spillprevention/r-and-d/dispersants/bulletin-4719b-ssid-authorization.pdf

[105] See note 76, Stenzel et al., 2021. Estimation of airborne concentration of dispersants, at 3.

[106] US Coast Guard, 2010. Federal OSC, Adm. Nash Documents, Dispersnats. 7/3/2010 email from EPA Mathy Stanislaus to RDML James Watson and others. Subject: Follow Up to Yesterday's meeting. National Archives and Records Administration, Ft. Worth, TX. "All BP references and claims regarding relationship of government dispersant approval decisions to any shoreline impacts will be removed from daily reports. All shoreline impacts are associated with BP's oil and BO's [sic] failure to stop flow from its leaking well or BP's failure to physically capture its oil before reaching shore. BP's attempts to distort that fact have no place in operational reports," at 39. https://alertproject.org/wp-content/uploads/2023/02/NARA-FOSC-coastal-disp-use-7.3.2010.pdf

[107] Ott R, 2018. Photo-documentation supplement to written evidence on behalf of intervenor North Shore No Pipeline Expansion (NSNOPE). Hearing Order OH-001-2014 Trans Mountain Pipeline ULC (Trans Mountain) Application for the Trans Mountain Expansion Project. City of Vancouver, BC. (Dispersant staging and spraying operations for nearshore waters in late August 2010, at 5-6.) https://www.congress.gov/116/meeting/house/109117/documents/HHRG-116-IF18-20190313-SD022.pdf

residents documented such use, and the fact that it continued for months after offshore surface-slick spraying stopped on July 13.[108]

Much of the oil that wound up on the beaches was weathered oil-dispersant mixtures. Dispersant-sprayed surface-slick oil had a different chemical signature and distribution pattern than dispersant-injected deep-sea oil.[109] This weathered surface oil-dispersant mixture fluoresced under ultraviolet light.[110] When it wound up on beaches, its presence was evident *at night under UV light* but not during the day when oiled beaches were populated with spill response workers and beachgoers.[111]

The weathered oil-dispersant mixtures were persistent and toxic. Small oil particles and the oil film adhering to sand grains in the upper roughly two feet (70 cm) of beach sand degraded to background hydrocarbon levels within one year, while the golf ball-sized buried tar balls persisted, with estimates of 30 years or more for decomposition (to less than 0.1% of original amount of oil).[112] Presence of the surfactant DOSS, an ingredient of both Corexit dispersants, was used to identify oil-dispersant mixtures persisting from the BP disaster on Gulf of Mexico beaches 26–45 months after the spill and in deep sea coral communities 6 months after the blowout.[113] These findings contributed to the emerging understanding that Corexit dispersants remain associated with oil in the environment and can persist for years.

Further, the weathered oil-dispersant mixtures that washed ashore between Waveland, Mississippi, and Cape San Blas, Florida (some 330 miles), was still highly toxic 11 to 19 months after the BP Deepwater Horizon oil disaster—both in terms of the level of PAHs (which exceeded the Immediately Dangerous to Life or Health limits established by NIOSH) and the presence of Corexit dispersants, identified by ultraviolet light and chemical analysis.[114]

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[108] Ibid., at 5.

[109] See note 86, Payne, Driskell, 2018, Part 1: Assessments and forensic methods, regarding references to surface-slick oil and surface reinfusion efforts (i.e., dispersant spraying from airplanes and boats).

[110] Kirby J III. 2012. Findings of persistency of polycyclic aromatic hydrocarbons in residual tar product sourced from crude oil released during the BP DHOS MC252 spill of national significance. Supported by Surfrider Foundation, April 14. http://surfridercdn.surfrider.org/images/uploads/publications/Corexit_Connections.pdf "Corexit® brand dispersants used in the oil spill clean-up response create a discernible fluorescent signature when illuminated by 370nm UV light," at 6.

[111] Combs C. 2010. Photos: Glowing oil could aid Gulf spill cleanup. *National Geographic*. July 7, 2010. https://www.nationalgeographic.com/science/article/100708-environment-science-gulf-oil-spill-glowing-ultraviolet-pictures

[112] Bociu I, Shin B, Wells WB, et al., 2019. Decomposition of sediment-oil agglomerates in a Gulf of Mexico sandy beach. *Scientific Reports* 9:10071. https://doi.org/10.1038/s41598-019-46301-w

[113] White HK, Lyons SL, Harrison SJ, Findley DM, Liu Y, Kujawinski EB. 2014. Long-term persistence of dispersants following the Deepwater Horizon oil spill. *Environ Sci Technol Lett.* 1(7):295–299. doi.org/10.1021/ez500168r

[114] See note 110, Kirby, 2012, Persistent PAHs, at 4 (immediately dangerous), at 8 (absorption accelerant).

Exposure to weathered oil-dispersant mixtures was part of the job for shoreline workers who were tasked with containing and removing the tar lumps, balls, and emulsions. The OSHA training manual for cleanup workers warned, "OELs don't include skin contact, absorption, and ingestion of weathered oil which are common in cleanups."[115] When dispersant is sprayed on surface slicks, especially nearshore, where there is weathered oil, there is weathered oil-dispersant. While residents and beachgoers may have avoided the visible oil-dispersant mixtures, contact with the weathered oil-dispersant was unavoidable as it adhered in thin films to sand grains[116] or was present in the coastal waters—where people waded and swam throughout the spill response area in 2010 and 2011—in concentrations high enough to cause harm.[117] The human experiences with weathered oil-dispersant are discussed in Parts III and IV.

Staging and Decontamination Activities

Nearshore dispersant spraying operations were supported by staging areas and boat wash operations that used dispersant for decontamination by workers who were unaware of or misinformed about the health risk.[118] These support operations were set up in neighborhoods and public marinas.[119] Coastal residents and workers experienced direct contact from aerial drift at these locations. Residents also encountered aerial drift while boating in coastal waters where dispersants were being actively sprayed and/or were splashed by dripping applicator equipment while walking the beaches at night when dispersant-spraying planes returned from spraying missions. The dispersants settled into outdoor public swimming pools as well.[120] The initial symptoms of exposure and the long-term illnesses resulting from these exposures are discussed in Parts III and IV.

Oil spills have historically been viewed as environmental disasters, affecting nature. This attitude has left the nation ill-prepared to address widespread, adverse effects from oil spills on human

[115] OSHA, 2010. Safety and Health Awareness for Oil Spill Cleanup Workers. Worker Education and Training Program, NIEHS oil spill cleanup initiatives. At 37. June v7 OSHA-3388-062010. https://www.osha.gov/sites/default/files/publications/Oil_Spill_Booklet_05-11_v4.pdf

[116] See note 111, Bociu et al., 2019, Decomposition of sediment-oil agglomerates.

[117] See note 110, Kirby, 2012, Persistent PAHs, at 4 (IDHL), at 8 (absorption accelerant).

[118] See note 2, John Maas Affidavit; In: Government Accountability Project, 2024, DEEP IMPACT, at 40. "Every day during the cleanup BP reassured us that Corexit is as safe as Dawn Dishwasher soap. They knew better. The [2010] Manufacturer's Safety Data Sheet repeatedly requires Personal Protective Equipment (PPE) such as gloves, and eye and face protection. Exposed skin surfaces and clothes must be washed immediately."

[119] See note 106, Ott, 2018, Photo-documentation supplement, at 5–6.

[120] OilSpillLaw.com, 2010. EXCLUSIVE: Tests find sickened family has 50.3 ppm of Corexit's 2-butoxyethanol just one hour north of Tampa (lab report included). Aug 30, 2010. https://web.archive.org/web/20100901034319/http:/www.floridaoilspilllaw.com/exclusive-tests-find-sickened-family-has-50-3-ppm-of-corexits-2-butoxyethanol-in-swimming-pool-just-one-hour-north-of-tampa-lab-report-included

health and mental well-being, especially among a particularly vulnerable citizenry.[121] When oil gets burned or aerosolized by interactions with sunlight, atmospheric chemicals, and dispersants, it becomes an *oil-in-the-air* problem, not only an oil-on-the-water problem. *It shifts an oil spill from an environmental disaster to a potential human health disaster,* a pivotal shift that must be recognized and addressed to make informed choices about product use.

These findings and observations discussed above describe how workers and residents were exposed to dispersants and oil-dispersant mixtures in various forms during the 2010 BP Deepwater Horizon oil disaster response. The section below describes the validated mechanism for respiratory and skin sensitization, the existence of which was known and fairly accurately described in the 2012 OSHA HAZCOM standards. Finding and integrating the mechanism allows physicians trained in Occupational and Environmental Medicine (OEM) to correctly diagnose and treat symptoms of initial exposure and chronic illnesses ascribed to chemical sensitizers—something that was not done during the BP Deepwater Horizon oil disaster despite ample evidence of its occurrence (discussed in Parts III and IV).

2021 New and Relevant Science: The Mechanism for Respiratory and Skin Sensitization

In 2021, the mechanism for the two-phase process of chemical sensitization was published and accepted as *cell-mediated immunology*, which operates *within* cells.[122] Cell-mediated immunology or TILT (Toxicant-Induced Loss of Tolerance) is a mechanism for a class of diseases that are *not* true allergic responses, as it does *not* involve antibody reactions (e.g., immunoglobin E, etc.), and it often manifests at very low levels of exposure.[123] Cell-mediated immunology involves a different branch of the immune system than an antibody-mediated true allergic response, which operates *outside* cells. The cell-mediated response is rapid, as mast cells are paired directly with nerve cells, and it involves cellular memory, a function that can amplify response with subsequent triggering events even at low levels of chemicals that were previously tolerated. This can lead to chemical intolerance, which is being linked with a growing number of chronic conditions, including autoimmune diseases in children of mothers with chemical intolerance.[124]

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[121] National Commission on BP Deepwater Horizon and Offshore Drilling. 2011. Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling. A Report to the President, at 191-192. https://nrt.org/sites/2/files/GPO-OILCOMMISSION.pdf.

[122] Masri S, Miller CS, Palmer RF, Ashford N, 2021. Toxicant-induced loss of tolerance for chemicals, foods, and drugs: Assessing patterns of exposure behind a global phenomenon. *Environ Sci Eur* 33:65. https://doi.org/10.1186/s12302-021-00504-z

[123] Miller CS, Palmer RF, Dempsey TT, *et al.* 2021. Mast cell activation may explain many cases of chemical intolerance. *Environ Sci Eur.* 33, 129. https://doi.org/10.1186/s12302-021-00570-3

[124] Molderings GJ, Afrin LB. 2023. A survey of the currently known mast cell mediators with potential relevance for therapy of mast cell mediators with potential relevance for therapy of mast cell-induced symptoms. Review. *Naunyn Schmiedebergs Arch Pharmacol.* May 27. doi: 10.1007/s00210-023-02545-y.

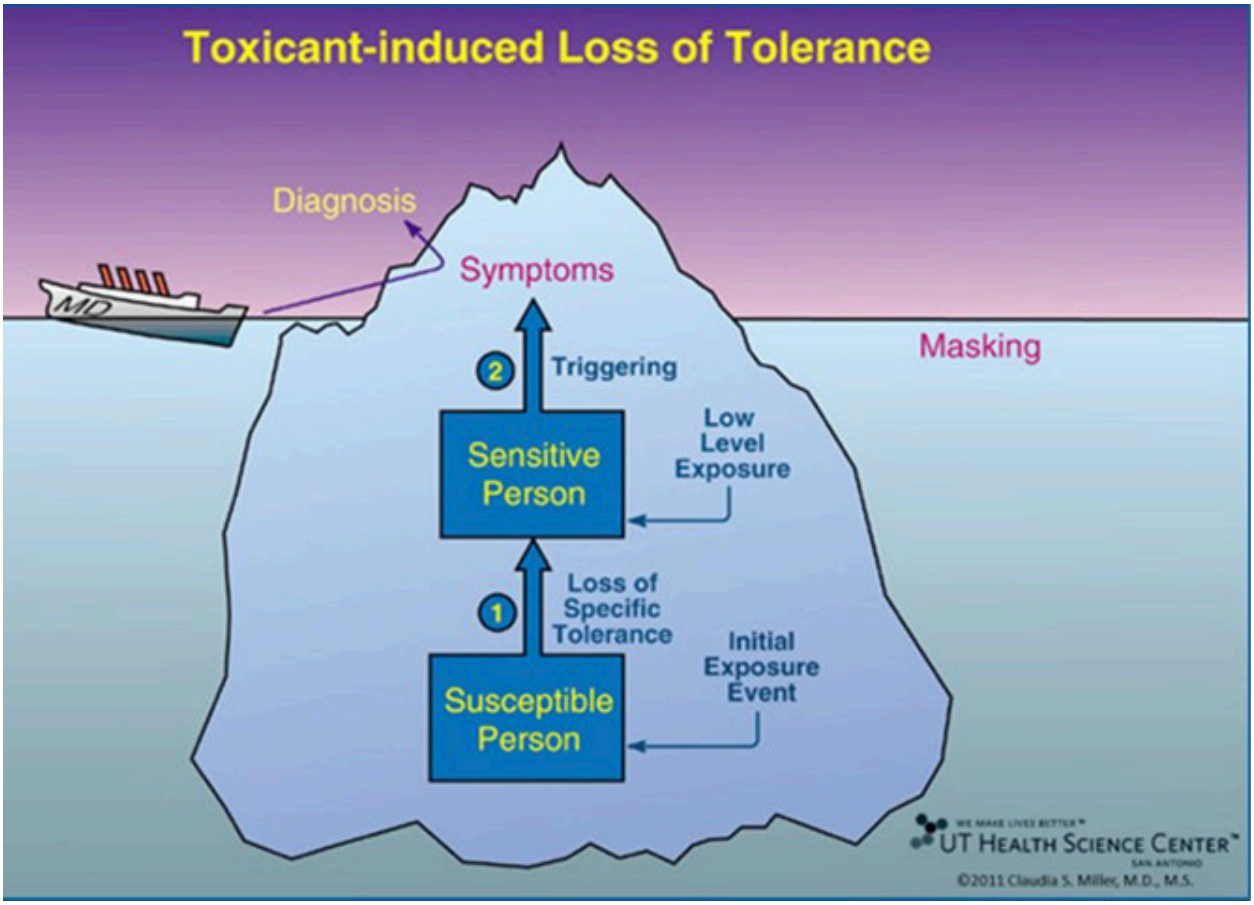

Figure 1. The mechanism of Toxicant-Induced Loss of Tolerance. Used with permission from Claudia Miller, MD, Univ. Texas, Health Science Center.

The main categories of chemicals that initiate a cell-mediated response are derived from fossil fuels (coal, oil, and natural gas) or synthetic organic chemicals, and their combustion products. Another category is biological toxicants, often due to particles and vapors from toxic molds or algae.[125]

As illustrated in Figure 1, initiation (1) happens during acute exposure or repeated lower-level exposures—like during an oil spill. Triggering (2) happens when cells react to previously tolerated chemicals, foods, or drugs. For example, people living in petrochemical corridors or communities with a history of environmental pollution could already be susceptible or sensitive, and they could be rapidly triggered by oil spill exposures. Masking occurs when a susceptible or sensitive person

Heilbrun LP et al. +5, 2015. Maternal chemical and drug intolerances: Potential risk factors for autism and Attention Deficit Hyperactivity Disorder (ADHD). *J Am Board Fam Med* Jul-Aug;28(4):461-70. doi: 10.3122/jabfm.2015.04.140192

[125] Miller CS, Palmer RF, Kattari D, et al. 2023. What initiates chemical intolerance? Findings from a large population-based survey of U.S. adults. *Environ Sci Europe*. 35 (1) DOI: 10.1186/s12302-023-00772-x

makes lifestyle choices to avoid certain chemical exposures—foods, fragrances, personal care products, cigarette smoke, etc.—that cause reactions. After an oil spill for example, masking could occur post-spill when a sensitive person learns what situations to avoid (smoky bars, the cleaning product aisle in the grocery store, air fresheners, toothpaste, etc.) to prevent triggering difficulties breathing.

During an oil spill, health care providers may see patients who are experiencing multiple symptoms—the tip of the iceberg in Figure 1. OSHA's HAZCOM standards describe adverse effects as symptoms of exposure for ten health hazard classifications. In particular, Skin Corrosion/Irritation includes symptoms of skin corrosion or irritants as skin rashes or ulcers, bleeding, or alopecia (A.2). Specific Target Organ Toxicity (STOT) for respiratory tract irritants that impair function includes symptoms such as coughing or difficulty breathing [A.8.2.2.1(a)] and neurological symptoms such as severe headaches or migraines, nausea or vomiting, dizziness or vertigo, irritability, fatigue, deficits in perception and coordination/reaction time, or sleepiness, and impaired memory function [A.8.2.2.2(b)] and "significant functional changes in the central or peripheral nervous systems or other organ systems, including signs of central nervous system depression and effects on special senses (e.g., sight, hearing and sense of smell)" [A.9.2.7.3(b)]. Respiratory or Skin Sensitization includes symptoms of hypersensitivity and "allergic reactions," described earlier (A.4.1.1). Many of these symptoms *are identical* to those identified from oil spill exposures[126] and for Corexit dispersants—in the pre-2013 SDSs.

But to mitigate the harm, providers must understand the environmental exposure history—the rest of the iceberg (Figure 1). This was understood in 2012. For respiratory and skin sensitization, the HAZCOM rules stress the importance of determining a relationship between a current exposure and development of sensitization from past aggravating (initiating or triggering) factors in the home and workplace.[127]

Successful mitigation of long-term harm from chemical sensitization—and the other exceptional health hazards—depends on early intervention. We turn next to the testimonies of harm from exposure to dispersant and oil-dispersant exposure during the BP Deepwater Horizon oil disaster.

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[126] Aguilera F, Méndez J, Pásaro E, Laffon B, 2010. Review on the effects of exposure to spilled oils on human health. *J Applied Tox* 30(4):291–301.

Laffon B, Pasaro E, Valdiglesias V. 2016. Effects of exposure to oil spills on human health: Updated review. *J Toxicol Environ Health.* Part B, 19:3-4, 105-128. doi: 10.1080/10937404.2016.1168730

Levy B, Nassetta, W. 2011. "The Adverse Health Effects of Oil Spills: A Review of the Literature and a Framework for Medically Evaluating Exposed Individuals," *Int J Occup Environ Health*, 17:121–167. doi: 10.1179/107735211799031004

[127] See note 20, OSHA § 1910.1200 Appendix A, at A.4.2.1.2.4.

III. The Real-World Experience

Part III features one story of respiratory exposure to both Corexit dispersants and direct skin contact with Corexit 9527A at a BP decontamination wash station in Bayou La Batre, Alabama, one of hundreds along the impacted Gulf Coast. We chose Lori B's story because she had photos to document her experience—and because she eventually was treated by a doctor trained in chemically-induced illnesses. Otherwise, her story is like thousands of others, as encapsulated in the People's Record section.

In the feature story ("All this Awfulness," below) the symptoms and chronic conditions that are described by Lori B are linked with specific symptoms and chronic conditions listed in the BP Medical Claims Settlement when available, or with the more general OSHA HAZCOM standard descriptions, if not recognized in the Settlement.

The fact that most of the cases brought under the BP Medical Claims Settlement, including Lori B's, have been dismissed is irrelevant because dismissal was largely based on legal technicalities (i.e., the proof of causation standard), not valid scientific evidence.[128] Based on what was known about chemical mixtures that contain exceptional health hazards and respiratory and skin sensitizers at the time of the Settlement (2012), this standard was unreasonable. Based on what is known now, it is immoral. Further, the court drama is playing out and likely headed to the U.S. Supreme Court over the issue of proof of causation. It remains to be seen how the higher courts will deal with the lower courts' obvious prejudices.[129] This petition is based on current science and evidence, including the testimonies and stories that follow.

[128] Loller T, M Phillis, 2024. Once praised, settlement to help sickened BP oil spill workers leaves most with nearly nothing. *Associated Press News* 4/18/2024. https://apnews.com/article/gulf-spill-lawsuits-bp-health-chemical-exposure-f3845a3cb9da869d2689452a7dec0c9c

[129] Loller T, M Phillis, 2024. BP defeated thousands of suits by sick Gulf spill cleanup workers. But not one by a boat captain. *Associated Press News* 4/19/2024. https://apnews.com/article/gulf-spill-lawsuits-bp-health-chemical-exposure-03ed7080ea6e03fc344a1e2100cb33e1

"All this awfulness" – The Lori B Story

Lorinda Bosarge (Lori B) lived in Coden, Alabama, in a home a quarter mile from Portersville Bay in Mississippi Sound.[130] From May to August 2010, there were five airboats with dispersant tanks that ran up and down the Bay from Bayou La Batre to Dauphin Island, Alabama, daily. She could hear the boats from her house. Unaware of the dangers of the chemicals being used, she and her husband sometimes went to the coast to watch as the boat sprayed the bay,[131] but stopped because they both would get sore throats.[132] When the prevailing southwest wind blew from the Gulf coast, she could tell when BP oil spill response crews were spraying Corexit dispersants because the sweet citronella chemical smell penetrated her home, despite all the closed windows and doors. That smell always made her throat start to close up.[133]

On August 21, 2010, Lori B was directly sprayed by Corexit 9527A while walking near a BP decontamination boat wash at a public marina in nearby Bayou La Batre, Alabama.[134] The dispersant covered her face and bare arms. Within hours, the hair follicles on her arms raised up and turned red.[135] She and her husband returned that night to photograph the scene and document the chemical totes of Corexit 9527A. Later that night her face and arms turned a bright hot red—as if she'd been sunburned.[136]

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[130] See note 2, Lori Bosarge Affidavit, 2012; In: Government Accountability Project, 2015, Deadly Dispersants Addendum.

[131] During near daily trips to the bay in 2010, Lori B never saw any signs warning people not to swim or fish in the bay or any advisories about the health risks of the Corexit chemicals that were sprayed in the bay. Lori B, pers. comm. with Riki Ott, 4/26/2024.

[132] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 7, acute pharyngitis. A sore throat is the main symptom of acute pharyngitis. Other signs are a fever, headache, joint and muscle aches, and swollen glands in your neck. https://www.mountsinai.org/health-library/diseases-conditions/pharyngitis-viral

[133] Ibid.

[134] See note 2, Lori Bosarge Affidavit, 2012, at 1; In: Government Accountability Project, 2015, Deadly Dispersants Addendum.

Before Tropical Storm Bonnie (August 3–14, 2010), BP ordered the VOO workers across the Gulf coast to shut down operations as a practice drill for a real hurricane. After the tropical storm, the Coast Guard declared there was no more oil. There was, but the daily spraying in coastal waters stopped. Lori B observed the only thing that was set up after the storm in Bayou La Batre was the trailer and boat wash station—and the totes of Corexit 9527A that were used to wash the boats, trucks, and other spill response equipment. Lori B, pers. comm. with Riki Ott, 4/26/2024.

[135] Lori B, pers. comm. with Riki Ott, 4/26/2024.

See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 8, folliculitis—when hair follicles become inflamed.

[136] Ibid., at 8, describing redness and inflammation or pain.

1996. Lori Bosarge

Lori Bosarge and her husband Dennis intended to make the house where Dennis grew up in Coden, Alabama, a quarter mile from Portsville Bay, their forever home. After Hurricane Katrina, they rebuilt the hurricane shutters, repainted, enclosed the roof eves, and replaced the roof. The satsuma tree bore over 200 fruit annually—it died in 2010 after the BP disaster.

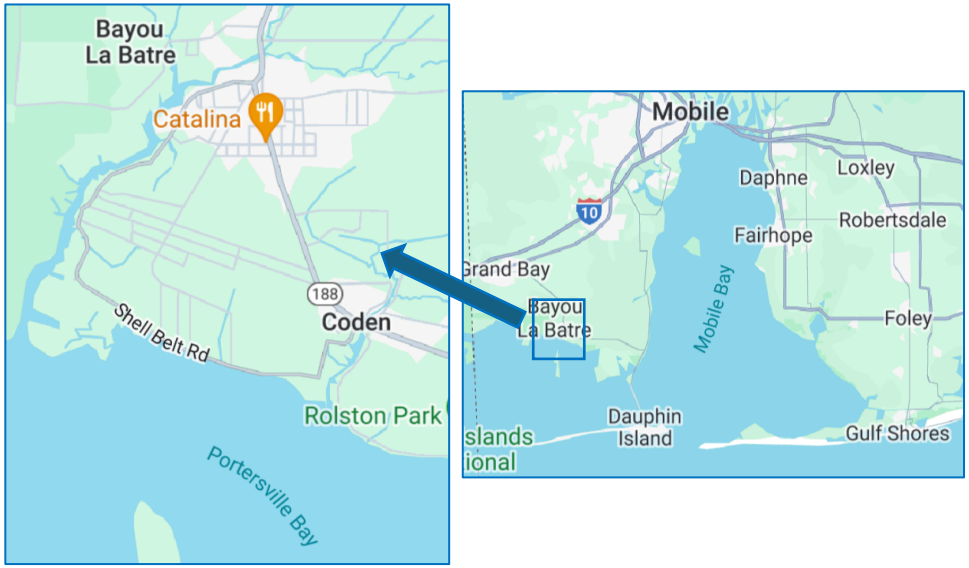
"Never compare resilience from a storm with an oil disaster. I can rebuild after a storm, but life after toxins is an everyday life sentence for the rest of my life." ~ Lori Bosarge

1997. Courtesy Lori Bosarge

2006. Lori Bosarge

From May to August 2010, there were five airboats with dispersant tanks that ran up and down the bay from Bayou La Batre to Dauphin Island, Alabama, daily. Lori could hear the boats from their home. Sometimes she and Dennis went down to the coast to watch as the boats sprayed in Portsville Bay, but they stopped because they would both get sore throats.

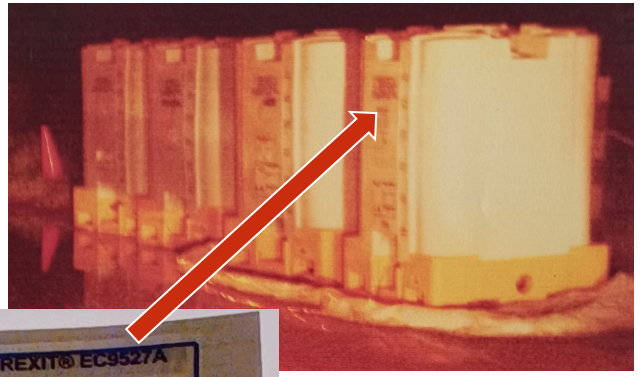
When the prevailing southwest wind blew from the Gulf coast, Lori could tell when BP oil spill response crews were spraying Corexit dispersants because the sweet citronella chemical smell penetrated her home, despite all the closed windows and doors. That smell always made her throat start to close.



Aug. 21, 2010. Lori Bosarge

On August 21, 2010, Lori was directly sprayed by dispersant Corexit 9527A at a BP decontamination wash station in Bayou La Batre, Alabama. Within hours, the hair follicles on her arms raised up and turned red. She and Dennis returned that night to document the dispersant totes behind the wash station. Later that night, her face and arms turned a bright hot red—as if she'd been sun-burned. The truck had no plates, and the smaller totes at the wash station were not labeled as EPA required. Lori has experienced a litany of continuous health problems since this day.


Aug. 21, 2010. Lori Bosarge


Aug. 21, 2010. Lori Bosarge

Photos document use of Corexit dispersants at the BP boat and vehicle wash station in Bayou La Batre, Alabama, and use after offshore dispersant operations in federal waters ceased in mid-July 2010. Contaminated runoff drained directly into Portsville Bay.

Since she was directly sprayed, Lori B has experienced a litany of continuous health issues. These include reoccurring itchy skin rashes and lesions that resulted in hair loss and permanent scarring,[137] asthma,[138] bronchitis,[139] blurry vision,[140] nose bleeds,[141] upset stomach,[142] inflammation of the kidneys, feeling sick and fatigued all the time, memory loss,[143] and bad headaches, dizziness, vertigo, bouts of seizures, and blackouts.[144] When she could afford it, she sought medical help from multiple doctors and specialists for her health problems, as her health continued to decline since her exposure. All were untrained in occupational and environment medicine (OEM), i.e., a practice that can determine whether illnesses were caused chemical agents or biological agents like bacteria, viruses, pollen, etc. The doctors could not figure out what was causing her multiple system health problems, despite her evidence of direct contact with Corexit 9527A.

In mid-February 2011, Lori B went to Atlanta, Georgia, to visit her grandchildren for ten days. During that time, she did not experience any health problems. However, upon her return, she awoke violently sick, coughing up bloody mucus and wheezing with a runny nose[145] and very high fever. A flu swab and chest x-ray for pneumonia came back negative. The steroids in the nose spray and puffer only made her cough worse. Two weeks later, the symptoms stopped as quickly as they had begun. The cause was never conclusively diagnosed—again, by different doctors untrained in chemically-caused illnesses.

In mid-July 2011, after returning from vacation, she noticed a small blister on her left leg and her arms felt like "reptile skin." Within four days, her leg and arms had swollen tremendously. The leg wound turned into a large, draining lesion and her arms were blistering and raw.[146] The rash spread across her shoulders and back. She was hospitalized for eight days.

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[137] See note 20, OSHA § 1910.1200 Appendix A, at A.2.1. Skin corrosion/irritation.

[138] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 7, 13.

[139] Ibid., at 7.

[140] Ibid., at 6.

[141] Ibid., at 7.

[142] Ibid., at 9.

[143] See note 20, OSHA § 1910.1200 Appendix A, at A.8.2.2.2.

[144] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 9.

[145] Ibid., at 7, describing nasal discharge or post-nasal drip; cough; sputum production; wheezing and shortness of breath.

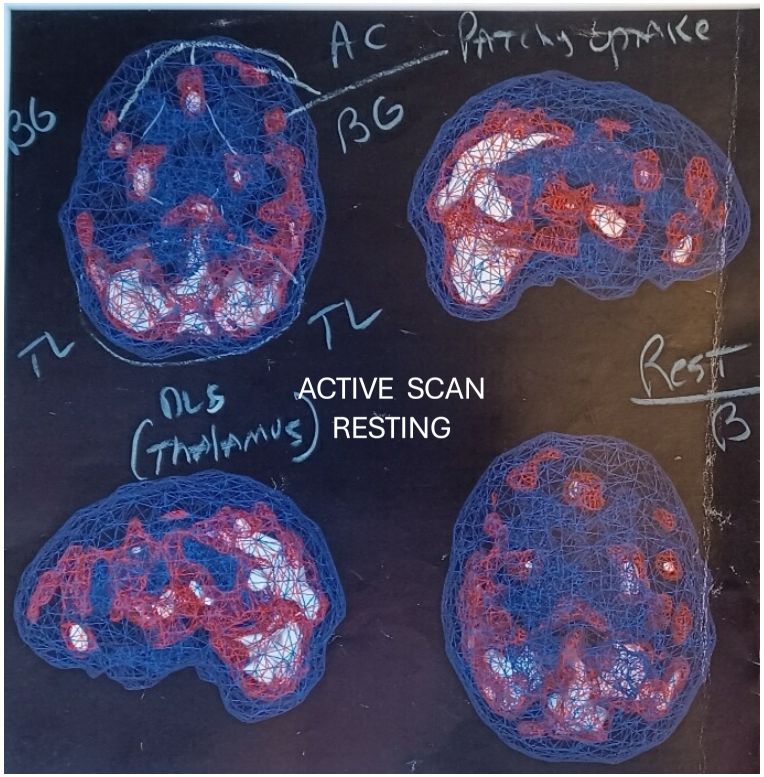
[146] Ibid., at 8, describing acute contact dermatitis, atopic dermatitis, irritant contact dermatitis, eczematous reactions, and hives (urticaria).

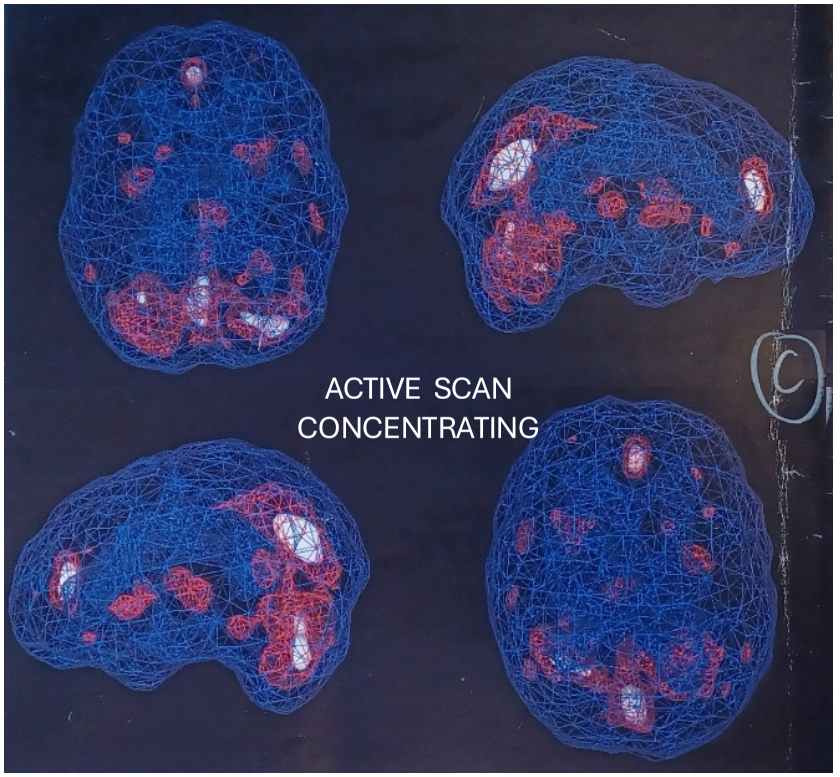
Health issues include reoccurring itchy skin rashes, hair loss, permanent scarring, asthma, bronchitis, blurry vision, nose bleeds, inflammation of the kidneys, feeling sick and fatigued, upset stomach, bad headaches, memory loss, vertigo, dizziness, seizures, and blackouts.

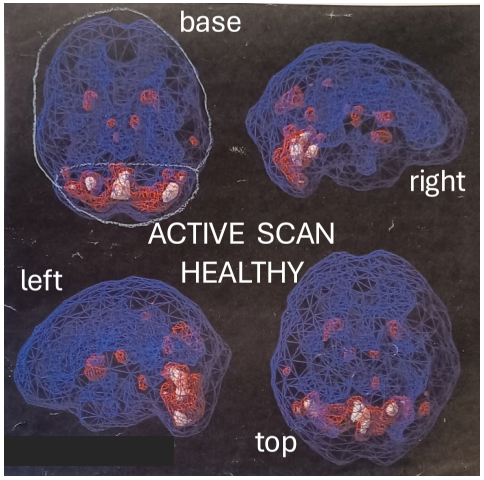
Top: Back and right shoulder
Left: Legs below the knees, ankles, feet, and toes

In mid-July 2011, her left leg and arms felt like "reptile skin." A small blister on her leg turned into a large, draining lesion and her arms were blistering and raw. The rash spread across her shoulders and back. The Mayo Clinic could not determine the cause. In September, worried she might lose her leg—or life—she visited a medical doctor trained in chemically-caused illnesses. He tested her for oil chemicals and began an immediate chemical detoxification treatment. After four weeks, the swelling in her leg was greatly reduced and the lesion was slowly healing, the rashes had settled down, and she was sleeping at night.

Top: Left forearm.
Lert: Left leg lesion the day Lori went to the hospital (July 18, 2011).

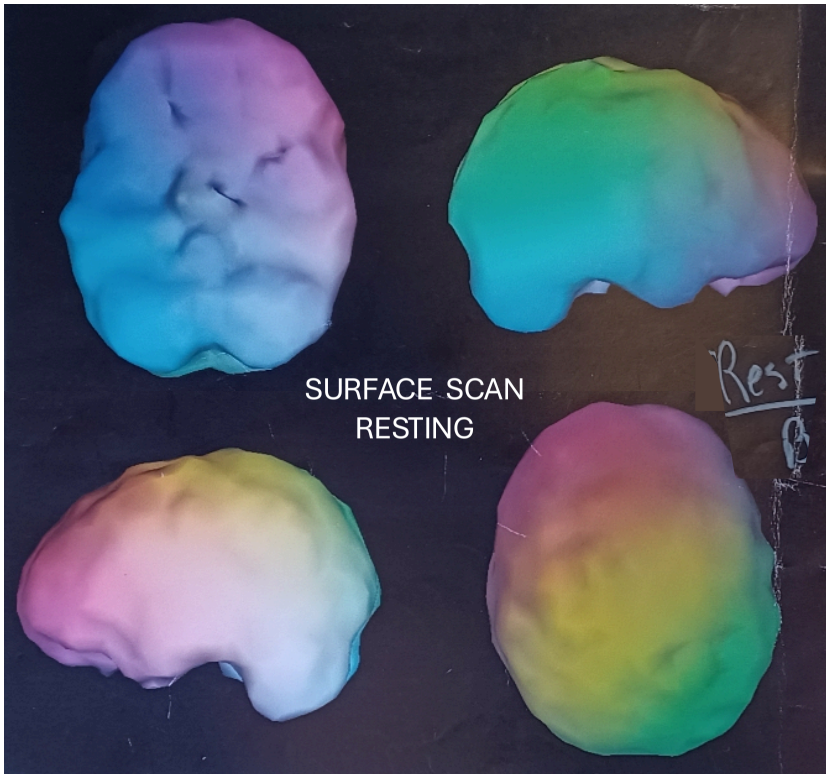


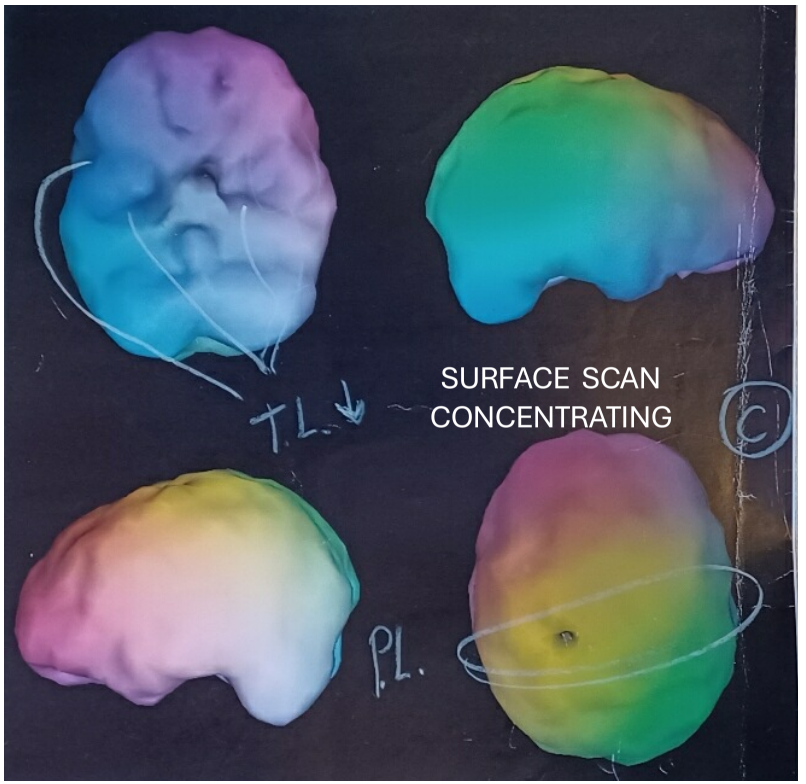


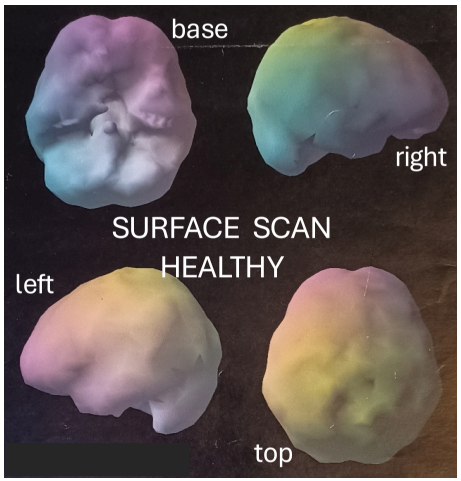


2017. Brain SPECT scans courtesy Lori B.

In 2016, when Lori started having seizures, her medical doctor requested brain SPECT scans to evaluate seizures, brain injury, inflammation, memory loss, chemical exposure, and more. These **active scans** show (lower left) **healthy** activity in a female brain, ages 51–70, compared to Lori's brain scan **resting** (upper left) and **concentrating**, i.e., active (upper right). In each set of scans, images show clockwise from upper left: the base (bottom), right side, top, and left side of the brain. In the scans, blue is average activity and red (or red and white) are the most active parts of the brain. First, the areas of patchy increased activity of the Anterior Cingulate (AC, in both), the Basal Ganglia (BG, resting) and the Deep Limbic System (DLS or thalamus, resting) suggest prior emotional trauma or toxic exposure. Second, the diamond pattern in the base scan resting also may be associated with past emotional trauma or stress. Third, the decreased activity in the temporal lobes (TL) may be associated with problems with cyclical mood disorders, irritability, and memory loss.







2017. Brain SPECT scans courtesy Lori B.

Surface scans show (lower left) topography of a healthy brain surface (color not important) in a female brain, ages 54–58, compared to Lori's brain resting (upper left) and concentrating, i.e., active (upper right). Again, the images show clockwise from upper left: the base, right side, top, and left side of the brain. The pits and holes in her temporal lobe (TL) and parietal lobe (PL) identified areas of atrophy or shrinking of previously injured brain tissue associated with hearing, sound, and the auditory pathway and with sensations like touch, pressure, and pain, consistent with Lori's active SPECT scans. The temporal lobe plays a key role in using language and communicating, processing emotions, and accessing memories. The parietal lobe integrates sensory information, including touch, temperature, pressure and pain, visuo-spatial orientation, and ability to speak or write languages. Her doctor diagnosed her with "**T65-Toxic effect of other and unspecified substances**" and "**R94-Abnormal brain scan**." He recommended many holistic ways to reduce stress, detoxify and balance her brain, and improve her quality of life.

Tests for cellulitis[147] and pemphigus[148] came back negative. The Mayo Clinic could not determine the cause of the rash on her arms from biopsies or research. One dermato-pathologist told her, "There hasn't been enough medical research for the Corexit." After Lori B was discharged, nurses came to her home three times a week for six weeks to dress her leg. Many said they had never seen a rash or wound like it in their entire career. But Lori B learned from visiting Government Accountability Project staff, who were in the area taking sworn testimonies of sick residents, that people exposed to dispersants and/or oil-dispersant mixtures across the coast had similar health issues and similar experiences with treating doctors and nurses—none of whom had been trained in chemically-caused illnesses.

Finally, in late September 2011, concerned that she might lose her leg—or life—if the swelling didn't go down, Lori B visited a medical doctor in Georgia who was trained in chemically-caused illnesses. He tested her for petrochemicals—and began an immediate chemical detoxification (detox) program. After four weeks of detox treatment, the swelling in her leg was greatly reduced and the lesion was slowly healing, her rashes had settled down, and she was sleeping at night.

Lori B continues to seek the chemical detox doctor's natural remedy treatments. In 2016, when she started having seizures,[149] an MRI brain scan in 2017 revealed a "diamond-shaped pattern" in her brain consistent with chemical exposure. The "pits" and "black holes" in her temporal and parietal lobes identified areas of atrophy or shrinking of previously injured brain tissue associated with hearing, sound, and the auditory pathway and with sensations like touch, pressure, and pain.[150] She has learned to expect reactions from her body when she returns to the toxic environment that she still calls home.

[147] Cellulitis is a deep infection of the skin caused by bacteria. It usually affects the arms and legs. It is usually caused by infections from Strep or Staph bacteria. https://www.hopkinsmedicine.org/health/conditions-and-diseases/cellulitis

[148] Pemphigus is a rare group of autoimmune diseases. It causes blisters on the skin and mucous membranes throughout the body. It is thought to be caused by an environmental trigger such as a chemical or drug. https://www.hopkinsmedicine.org/health/conditions-and-diseases/pemphigus-vulgaris

[149] See note 2, Lori Bosarge Affidavit, 2020; In: Government Accountability Project, 2020, Ten Years After Deepwater Horizon.

[150] Kendra C, 2022. Parts of the brain. Gan S medical reviewer. Updated Nov 15, 2022. VeryWell Mind. https://www.verywellmind.com/the-anatomy-of-the-brain-2794895

In the years since, Lori B has developed sensitivity to scents (chemicals), light, and noise that unnerve her. She had to abandon her trade. The "regular smell" and usage of everyday items, such as perfumes, Lysol, candles and Dial dish soap cause her throat to "close up like an asthma attack" so she avoids their use.[151] What hair remains on her arms is "crinkly and stiff"[152] and her skin is armored like reptile skin.[153] Prior to her exposure to Corexit 9527A, she had no allergies or rashes. Now she cannot wear dresses or shorts in summer, due to the "unsightly" scarring on her left leg. She said, "It's hard to live on the Gulf without ever wearing shorts or dresses."[154] She has been unsuccessful at getting disability and continues to amass medical bills from the day "all this awfulness"[155] began over fourteen years ago—by an encounter with Corexit dispersant.

Left: Lori painted this roadside sign in November 2011 after she got out of the hospital.

[151] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 13, describing reactive airways dysfunction syndrome (irritant-induced asthma). See also note 21, OSHA § 1910.1200 Appendix A.4.2.1.2.1 respiratory sensitizers as chemicals that will lead to hypersensitivity of the airways following inhalation of the chemical.

[152] Dry or damaged hair is more prone to being crinkly. https://scandinavianbiolabs.com/blogs/hair-questions-database/why-are-some-of-my-hair-strands-crinkly-hair-texture-facts

[153] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 14, describing chronic contact dermatitis or chronic eczematous reaction. Hyperkeratosis causes patches of thick, rough skin, associated with either chronic contact dermatitis or chronic eczematous reaction (atopic dermatitis). It is long-lasting and tends to flare at times. https://www.webmd.com/skin-problems-and-treatments/eczema/atopic-vs-contact-dermatitis

[154] See note 2, Lori Bosarge Affidavit, at 1; In: Government Accountability Project, 2020, Ten Years After Deepwater Horizon.

[155] Lori Bosarge, pers. comm. with Riki Ott. March 20, 2024.

Water bottle, tar ball
Bayou La Batre, AL

The foamy aftermath of dispersant spraying was photo-documented annually by Lori Bosarge. She collected samples in 2012 when the City of Bayou La Batre dug up the sand near the boat ramp where Lori had been sprayed. Chemical analysis detected weathered Macondo well oil—the oil that had spilled in 2010. A tar ball from the same area in 2013 was nearly as large as a water bottle. Lori called the Coden waterfront, where she and Dennis had watched the dispersant spraying operations in Portsville Bay, "Cesspool Shores." She said, "People would drive out to the beach area and fish even though the stench of death was in the air. There were never any signs to warn people not to swim or fish. The land has now been swallowed by the sea."

The People's Record – The Scope of the Human Health Tragedy

Across the Gulf coast, hundreds of thousands of people encountered oil-dispersant mixtures by breathing air laden with contaminated aerosols, mists, and particulates, or by wading or swimming in contaminated seawater, or by walking or sitting on the beautiful white sand beaches, blissfully unaware that a thin film of oil-dispersant had coated grains of sand washed by the tide or dusted by aerial fallout. In these encounters, the oil-dispersant mixtures were not always visible as oil mists or haze, or as tar balls or oily sheens on or in the water, or in daylight (versus night with ultraviolet light), but the symptoms of the encounter were. Many, like Lori B, encountered direct dispersant spray from Corexit spraying operations—offshore, nearshore, or on land at boat and vehicle decontamination sites or dispersant staging areas, and most know exactly the day and where they were when it happened.[156]

Photos: Oil spill response is regulated as a hazardous waste operation. The response workers in the upper right photo were wearing gloves, and they had their boots taped to their pants legs to prevent skin contact with oil-dispersant mixtures—the tarry-like residual of weathered oil. When I feigned ignorance and asked why the tape, the workers explained, "The ocean is toxic, ma'am. We can't get it on us." I pointed to the barefoot child, beach goers, and swimmers and asked, "Did anyone tell them?" They were silent. Oil spill exposure killed thousands of bottlenose dolphin across the oil-impacted Gulf coast states—in the same waters frequented by human swimmers.

[156] See note 2, Government Accountability Project, 2013, Deadly Dispersants, at 15–16.

Thousands more encountered Corexit dispersants and oil-dispersant mixtures as professional or citizen responders. Nearly 9,000 participated in the US Coast Guard cohort study (not counting non-responders),[157] over 32,600 participated in the NIH GuLF study, of whom 82 percent were residents of coastal counties or parishes.[158]

2010. Don Tillman


2010. Chris Byrant

Top photo: August 10, 2010. Nearshore dispersant spraying operation off Pass Christian, Mississippi. The white tote mid-ship contains dispersant that was being sprayed off the stern. Lower photo: August 22, 2010. Dispersant staging operation and decontamination wash site on Dauphin Island, Alabama. The dispersant totes contained Corexit 9500A, according to the labels. Photos document dispersant use in nearshore waters three and six weeks after federal dispersant operations stopped in offshore waters.

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[157] Rusiecki J, Wang L, Weems L, et al., 2017. The [BP] Deepwater Horizon oil spill Coast Guard cohort study. *Occup Environ Med*. Mar, 75(3):165-175. doi: 10.1136/oemed-2017-104343.

[158] Kwok RK, Engel LS, Miller AK, et al. 2017. The GuLF STUDY: A prospective study of persons involved in the BP DHOS response and clean-up. *Environ Health Perspect*. Apr;125(4):570-578. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5382003/

Thousands and thousands of others encountered oil-dispersant mixtures by simply living in oil-impacted coastal communities, and they stuck it out as they were accustomed to doing for the seasonal hurricanes that roar in from the Gulf. These included thousands of babies and toddlers born between 2006 and 2012 and their mothers.[159] Except for the professional responders, few understood the health risks—until it was too late.[160]

The Government Accountability Project amassed a people's record of eye-witness stories—sworn affidavits or signed statements of oil spill exposures, including many direct encounters with Corexit dispersants. Despite assurances from BP and government officials that Corexit was as safe as dish soap and other common household products[161] and that human contact would be limited,[162] those exposed to dispersants testified to horrendous immediate health symptoms that continue to this day (14 years after exposure and counting). For many, the impact will be lifelong. For others, it has been life-ending.

Multiple witnesses have described immediate horrific health effects such as difficulty breathing; seizures; never-ending migraine headaches, rashes, lesions covering their bodies and eyes; bloody noses and ears; hair loss; brain fog, short-term memory loss, and near immobility due to complete loss of energy[163]—and long-term disease conditions such as chemical pneumonia; neurological disorders resulting in IQ losses of 30 points or more to the point of being dysfunctional; hyper

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[159] Beland L-P, Oloomi S, 2019. Environmental disaster, pollution, and infant health: Evidence from the [BP] Deepwater Horizon oil spill. *J Environ Econ Mgmt.* Nov 98:102265. doi.org/10.1016/j.jeem.2019.102265

[160] Stuart B, 2018. Disappearing Victims. Video of Frank Stuart's story with interviews of widow Sheree Kerner, at 15:46–19:00. https://disappearingvictims.net/oil-water-dont-mix-part-2-disappearing-victims/ Former BP oil spill response contractor Frank Stuart died of Acute Myeloid Leukemia, a cancer associated with crude oil exposure, 8 years after the BP Deepwater Horizon oil disaster.

[161] "It's not far off the toxicity levels of dish soap. And the lab tests show that." Bob Dudley, president and CEO of BP's Gulf Coast Restoration Organization, America speaks to BP, *PBS NewsHour*, July 1, 2010. https://www.pbs.org/newshour/show/america-speaks-to-bp-full-transcript-bob-dudley-interview

"The ingredients in the dispersants are similar to many household petroleum products and detergents… health effects would be similar to exposure to any mild detergent. Dispersants used in the Gulf have no ingredients that cause long-term health effects, including cancer," at 70–71. BP, 2010. Post-Emergency Spilled Oil Cleanup, Module 3 – Shoreline Cleanup (incomplete document). Exhibit C *in* Case 2:22-cv-04391-CJB-DPC, document 14-3, filed 12/29/22. https://downslawgroup.com/wp-content/uploads/2023/03/ShorelineCleanupTrainingModules_CandB.pdf

[162] "After the first two dives, I asked the [National Oceanographic and Atmospheric Administration] NRDA [Natural Resource Damage Assessment] staff specifically if the Corexit was toxic, and they said, 'Corexit only has a 90-minute half-life.'" See note 2, Steve Kolian (EcoRigs founder) Affidavit, 2012; In: Government Accountability Project, 2015, Deadly Dispersants Addendum.

At "a heavily-attended public meeting at the Mobile, Alabama, Civic Center with the Coast Guard…, the Coast Guard official said there would be only limited use of dispersants, in the hundreds of thousands of gallons, and only where there would be no human contact." See note 2, Sydney Schwartz Affidavit (BP VOO Program Task Force leader), 2012; In: Government Accountability Project, 2015, Deadly Dispersants Addendum.

[163] See note 2, Government Accountability Project, 2013, Deadly Dispersants, at 33–38.

allergies to all common household cleaners; hyper food allergies that caused drastic weight loss; increased incidences of various cancers among the affected population; and inability to breathe due to reduced lung capacity.[164] Some were first responders and cleanup workers. Others were family members of responders who were exposed to oil and dispersants secondhand through cleaning oiled boats or washing oily clothes with garments from the rest of the household. Some, like citizen responder and boat captain John Maas, must rely on an oxygen machine to sleep for the rest of their lives. *Victims cannot wake up from this medical nightmare*.

The citizen whistleblowers, including underwater divers, described equally alarming environmental impacts. The dispersant caused the oil to sink to the seafloor, creating underwater "Death Valleys" where marine life cannot survive.[165] Massive tar balls, formed from Corexit and oil, remain buried under the sand, resurfacing during storms and posing a risk to beachgoers.[166] Furthermore, the EPA allowed BP to dispose of over 300 million tons of Corexit-laden waste into municipal landfills, threatening groundwater and public health.[167]

The consequences spread across four coastal states during peak emissions from the BP Deepwater Horizon oil disaster response. Too often victims shared stories like Lori B's story of symptoms worsening over time, of symptoms disappearing during stays with family or friends outside the spill-impacted area only to reappear upon return much amplified, and of long-term illnesses, disabilities, and medical bills for treatments that brought no relief.

As shocking as this was to the exposed people and the medical community that had not encountered symptoms of chemical exposures as part of their regular practice, the harm should have been anticipated by those who made or authorized use of Corexit dispersants because they knew. They knew that that Corexit dispersants contained 57 chemicals, of which 5 were linked with cancer, 33 with skin irritation from rashes to burns, 33 with eye irritation, 11 are or are suspected of being respiratory toxins or irritants, and 10 are suspected kidney toxins.[168] They had to know there would be consequences of wide-scale use, especially to non-target species including humans, from aerial spraying in offshore and surface slick spraying in coastal waters.

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[164] See note 128, Loller, Phillis, 2024, Once praised, settlement leaves most with nothing.

[165] Baurick T, 2020. Seafloor damage from BP spill vastly underestimated in rush for legal settlement. *Times Picayune* Jul 31, 2020. https://www.nola.com/news/environment/article_944018de-c776-11ea-a8f8-9738b904d580.html?fbclid=IwAR30ImV1dWuXWBlOJYBS7ud7zGB5c1CH99YzsihulDrWQQEpv5OfHnnCql4

[166] Handwerk B, 2012. BP oil spill's sticky remnants wash up sporadically on Gulf beaches. *National Geographic* Mar 22, 2012. https://www.nationalgeographic.com/science/article/120322-gulf-oil-spill-tar-balls-wash-up-on-beaches

[167] Chen M, 2010. BP's dumping oil-spill waste in communities of color, study finds. *Colorlines* Aug 3, 2010. https://colorlines.com/article/bps-dumping-oil-spill-waste-communities-color-study-finds/

[168] Toxipedia Consulting Services, Earthjustice, 2011. The Chaos of Clean-Up: Analysis of Potential Health and environmental Impacts of Chemicals in Dispersant Products. August 25, 2011. https://earthjustice.org/wp-content/uploads/2024/06/oil_dispersants_report.pdf

There is also evidence that medical doctors were complicit—the company doctors who saw sick workers and the general practice doctors who saw sick residents avoided diagnosing chemical causes for the symptoms their patients were presenting. En masse.

For example, in an affidavit, Anonymous 2, a boat captain and fisherman who spent six months working for BP and BP contractors on the BP oil disaster response, described visiting the BP medical tent at the end of each day where anyone reporting symptoms "was always told it was due to dehydration or sea sickness, we were never told that it could be related to the oil or dispersants."[169] Anonymous 2 stated:

> "After the first few days I knew what their medical protocol was about. It was created to downplay the number of workers getting sick on a daily basis and the severity of their health problems. There was a safety culture of, 'hush hush, it didn't happen.' One day I and 15 other sick workers were at a public gathering regarding health problems associated with the spill. We all shared very similar experiences about the medical tents. We all had similar symptoms of at least nose bleeds and watery eyes. It was obvious that [the company doctors] were checking workers for symptoms of chemical exposure, but we were regularly diagnosed with seasickness or dehydration. [The company doctors] tried to tell us we had seasickness on days when the water was real calm. Most of the guys have worked on boats since we were young; we weren't buying into the false diagnoses."[170]

Also in an affidavit, Betsey Miller, a veterinarian technician from D'Iberville, Mississippi, shared the story of her husband James, a commercial fisherman who worked through the Vessels of Opportunity program for three and a half months and who became sick within three weeks on the job after boats sprayed dispersant less than 100 yards from his boat. The crews spraying dispersant wore HAZMAT suits and respirators. James and his crew had no safety equipment.

After seeing a litany of doctors unfamiliar with chemical illnesses, her husband took a blood test for toxic chemicals and a doctor who specialized in chemical exposure "explained that James is so poisoned that it could take him several years before some of the symptoms even subside… [and] that he vomits every day because, when he sweats, he releases the chemicals from the fatty tissues, and it is more than his body can process at one time."[171] Betsey described the following visit to their regular doctor:

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[169] See note 2, Anonymous 2 Affidavit, 2012; In: Government Accountability Project, 2015, Deadly Dispersants Addendum.

[170] Ibid., Anonymous 2 Affidavit, 2012.

[171] See note 2, Betsey Miller Affidavit, 2012; In: Government Accountability Project, 2015, Deadly Dispersants Addendum.

> "My husband's doctor had a frank and candid conversation... [The doctor] explained that he couldn't write anything on paper to identify the cause of James' illnesses, because legally he couldn't prove that BP made him sick with the dispersants that they used on the oil spill. He explained, however, that something very similar happened to him 35 years ago when he was a medic in the Vietnam War. He was sprayed with Agent Orange and he and several of the men he was caring for had similar symptoms, including respiratory problems and skin rashes. He explained that James and others were sprayed with a chemical that—like with Agent Orange—the government authorized, and there is no process to address it. He explained that BP and the government don't want to diagnose and treat them because then they would in turn be admitting that they got us sick."[172]

These stories are not unique. The public's general awareness of widespread symptoms of respiratory and neurological harm, and symptoms of eye and skin conditions, forced the listing of some of these symptoms as *acute* conditions in the BP Medical Claims Settlement in 2012, and it forced the listing of some of the anticipated *chronic* conditions associated with the acute harm.[173]

The People's Record is the reality foundation for the scientific research that supports our petition to immediately ban these extremely dangerous and toxic Corexit dispersant products. The individual stories, translated into descriptive measures that could be analyzed, are the backbone of the clinical and epidemiological studies that collectively form the experience of human harm from dispersant exposure that is used to shape policy. These stories share a central theme that initial symptoms of exposure to oil spills are causally linked with long-term skin, respiratory, neurological, and cardiovascular harm, including cancers, to people and animals—and that the harm increases *significantly* with inhalation or skin contact with Corexit dispersants.

[172] Ibid.

[173] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 7-9 (acute) and 14-15 (chronic) conditions.

IV. Manufacturer's Statement and The Evidence to Support Our Petition

To demonstrate the Manufacturer's deception, we chose the wellspring of information from which other misinformation flows—the required Safety Data Sheets (SDSs) for Corexit 9500A[174] and Corexit 9527A[175] from 2019, which were published before the Manufacturer announced it was no longer manufacturing or selling Corexit dispersants.[176] Statements contrary to new or relevant information published after the SDSs (Aug. 30, 2019) are considered outdated.

The statements and evidence are organized into five sections, corresponding to the Manufacturer's statements in the Safety Data Sheets, as follows:

- First Aid Measures;
- Potential Health Effects from skin contact, inhalation, and chronic exposure (Table 1);
- Experience with Human Exposure from skin contact or inhalation (Tables 2 and 3);
- Product Toxicity regarding harm from exceptional health hazards (Table 4); and
- Specific Target Organ Toxicity from repeated or prolonged exposure (Table 5).

As discussed in the Part II introduction, the evidence to support product removal is presented from the perspective of who—what entity—is responsible for communicating the hazards of product use: the Manufacturer for dispersant-only exposures and the EPA as the authorizing entity for oil-dispersant exposures and experiences. This dichotomy is reflected in the discussion and tables. A summary of the facts and our findings follows each section. A summary of the Manufacturer's statements, the facts, and our findings, along with the cited evidence in Tables 1–5, is presented in Appendix A.

First Aid Measures

Manufacturer's Statements for Corexit Dispersants 9500A and 9527A

Section: 4. First Aid Measures

Notes to physician	:	Treat symptomatically.
Most important symptoms and effects, acute and delayed	:	See Section 11 for more detailed information on health effects and symptoms.

[174] Manufacturer Corexit Dispersants, 2019. SDS Corexit EC9500A. 8/30/2019. https://alertproject.org/wp-content/uploads/2024/04/Corexit-9500-2019.pdf

[175] Manufacturer Corexit Dispersants, 2019. SDS Corexit EC9527A. 8/30/2019. https://alertproject.org/wp-content/uploads/2024/04/Corexit-9527-2019.pdf

[176] See note 52, Manufacturer (Corexit Dispersants), 2023. Announcement.

The SDSs for Corexit dispersants tell physicians to "treat symptomatically" for exposure to a hazardous substance. Like the iceberg in Figure 1 above, doctors unfamiliar with chemical exposures would treat the symptoms they see based on their training—and they would likely completely miss the underlying chemical cause (as discussed in Part 3). Unless and until a symptom or condition is accurately diagnosed, including causation, it cannot be successfully treated to minimize harm.

The statement is misleading because any physician reviewing the SDSs, especially those who have not been trained to diagnose and treat for hazardous chemical exposures, would be led to believe patients could be treated symptomatically. The physician would be further misled by the lack of any descriptive symptoms of exposures and the apparent lack of any known or expected health effects in the SDS Section 11—causing one to wonder, perhaps, why the product is even required to have a SDS for hazardous substances.

It is inaccurate because it did not report relevant information concerning respiratory or skin sensitizers. In 2011, Corexit 9500A was classified as a potent skin sensitizer and DOSS, an active ingredient in 9500A, as a moderate skin sensitizer after a lab study with mice confirmed a Th1-hypersensitivity response to the product and its active ingredient, indicating an immunology reaction within the cells.[177] Since Corexit 9527A also contains DOSS as an active ingredient at the same concentration as in 9500A, this makes 9527A a suspect skin sensitizer as well.

Further, as a skin sensitizer, OSHA's HAZCOM standard states that clinical history should include both medical and occupational history to determine the relationship between the current exposure and the development of hypersensitivity.[178] This means diagnosing and treating a person with chemical exposures should involve a physician trained in occupational and environmental medicine (OEM), a specialty training that most doctors do not have.

For example, in the experience of Lori B, even though the majority of her symptoms matched specified physical conditions in the BP Medical Claims Settlement, this was not available until May 2012. OEM doctors would have recognized her multiple symptoms of potential chemical exposure immediately and treated her accordingly, as finally happened a year after her direct contact with Corexit 9527A spray.

To facilitate early intervention and treatment critical to mitigating long-term harm from chemical exposures, the SDSs must provide truthful, accurate, complete, and updated information to

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[177] Anderson SE, Franko J, Lukomska E, Meade BJ, 2011. Potential immunotoxicological health effects following exposure to Corexit 9500A during cleanup of the Deepwater Horizon oil spill. *J Toxicol Environ Health A* 74: 1419–1430. https://www.tandfonline.com/doi/abs/10.1080/15287394.2011.606797

See also Table 4A – Sensitization.

[178] See note 20, OSHA § 1910.1200 Appendix A, at A.4.2.1.2.4.

physicians, and that information must include the type of doctor trained to use it—the ones trained in OEM. Since the Manufacturer's statements in the First Aid Measures do neither, we find that the statements are misleading and inaccurate.

Potential Health Effects from Skin Contact or Inhalation

MANUFACTURER'S STATEMENTS FOR COREXIT DISPERSANTS 9500A AND 9527A

Section: 11. Toxicological Information

Potential Health Effects

Skin, 9500A	:	Health injuries are not known or expected under normal use.
Skin, 9527A	:	Harmful in contact with skin. (††)
Inhalation, 9500A	:	Harmful if inhaled. (††)
Inhalation, 9527A	:	Health injuries are not known or expected under normal use.
Chronic exposure, both	:	Health injuries are not known or expected under normal use.

†† = true statement included for discussion

The evidence in Table 1 consists of one clinical study with 2-butoxyethanol, an ingredient in Corexit 9527A, and three lab studies that describe mechanisms for how dispersants cross the skin and enter the bloodstream, cross the blood-brain barrier and enter the brain, and have the potential to harm multiple body systems.

The SDSs claim that Corexit 9527A is harmful in contact with skin (true) but health injuries from inhalation are not known or expected (incorrect), and that Corexit 9500A is harmful if inhaled (true) but health injuries from skin contact are not known or expected (incorrect). Apparently, these statements were made based on the solvent ingredients that differ between the two products—2-butoxyethanol in 9527A and petroleum distillates in 9500A—instead of the active surfactant DOSS, common to both dispersants, that was proven to be a skin *and* respiratory sensitizer (prior to these statements).

Nearly 30 years earlier, in 1991, authors affiliated with OSHA Sweden reported that uptake of 2-butoxyethanol in human male volunteers via dermal absorption was 3-4 times faster than via inhalation, and that dermal absorption accounted for 75% of the total body uptake.[179] The authors cautioned that respirators may be inadequate to protect workers from 2-butoxyethanol vapors.

[179] See note 49, Johanson, Boman (OSHA Sweden), 1991, Percutaneous absorption of 2-butoxyethanol.

Following this study (as mentioned earlier), Corexit 9500 (now 9500A) was developed to replace Corexit 9527 by substituting petroleum distillates for the solvent 2-butoxyethanol.[180] The reasons given for the substitution were that "2-butoxyethanol… obliges dispersant workers to wear protective clothing *and respiratory protection gear*, which proved cumbersome in tropical climates," and that "the more oleophilic solvent [petroleum distillates] *enhances the penetration* of the dispersant into heavier, more viscous oils" (emphasis added).[181] Petroleum distillates would also, by nature, enhance the penetration *across human skin*.

At a minimum, the OSHA Sweden study and the industry action and statements in the 1990s show that potential health injuries from skin contact *and* inhalation were known or expected from either of these dispersant products. Three lab studies (some 30 years later) only verify what was known or expected.

A 2015 lab study found that Corexit 9500A "acts as a surfactant, possessing an inherent capacity to render the cell membrane fully permeable by interacting with its phospholipid bilayer" by inducing edema (swelling) and killing epithelial cells.[182] The injury was sustained across species—in respiratory epithelial cells from lungs of humans and mice and gills of zebrafish and blue crabs. Exposure to Corexit dispersant "remarkably inhibited" intercellular junctional proteins that join epithelial cells to one another and other tissue, and it disrupted cytoskeletal proteins that provide structure and support for cells. The edema, membrane permeability, cell detachment, and death were attributed to DOSS and/or Polysorbate 80, components of both Corexit 9500A *and 9527A*.

In a 2011 lab study, whole body exposure of male rats to Corexit 9500A disrupted the levels and functions of glial cells in the frontal cortex and in the hippocampus.[183] Glial cells regulate neurotransmission and help form and maintain the blood-brain barrier that protects the brain from toxic chemicals in the blood by blocking their entry into the brain and by filtering harmful substances out of the brain back out into the blood.[184] By disrupting the levels and functions of glial cells, 9500A altered the permeability of the blood-brain barrier, allowing toxic chemicals to flood into the brain. Brain injury occurred in areas that would change the behavior and

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[180] See note 50, SL Ross Environmental Research, 2002, Assessment of dispersant use, at 30.

[181] Ibid.

[182] Li FJ, Duggal RN, Oliva OM, et al., 2015. Heme oxygenase-1 protects Corexit 9500A-induced respiratory epithelial injury across species. *PLoS ONE* 10(4):e0122275. https://doi.org/10.1371/journal.pone.0122275

[183] Sriram K, Lin GX, Jefferson AM, et al. 2011. Neurotoxicity following acute inhalation exposure to the oil dispersant COREXIT EC9500A. *J Toxicol Environ Health A* 74: 1405–1418. https://www.tandfonline.com/doi/full/10.1080/15287394.2011.606796

[184] Persidsky Y, Ramirez SH, Haorah J, Kanmogne GD, 2006. Blood-brain barrier: structural components and function under physiologic and pathologic conditions. *J Neuroimmune Pharmacol.* Sep;1(3):223-36. doi: 10.1007/s11481-006-9025-3.

performance of the affected individual,[185] which makes these products neurotoxins, as discussed in the Table 5A (central and peripheral nervous systems damage).

A 2014 lab study found Corexit 9500A altered intracellular oxidative states and led to mitochondrial dysfunction and apoptosis in five different types of mammalian cells across three species, including human embryo and adult kidney cells, rat nerve cells from the hippocampus (an area of the brain involved in memory, learning, and emotion), human glial cells, and mouse skin cells.[186] In the process of cellular membrane gatecrashing, the dispersant left a trail of inflamed or cleaved and dead cells that thoroughly disrupted cellular communications (neurotransmitter signaling) and energy generators (mitochondria) in ways that would alter the behavior and performance of exposed individuals (see Table 5A).

Collectively, these lab studies show mechanisms by which dispersant-driven harm at the cellular level disrupts homeostasis—the state of balance within cells that maintains a state of balance among all the body systems needed for the body to survive and function correctly. The evidence shows that these Corexit products possess an inherent capacity, as potent surfactants, to render cell membranes fully permeable, allowing the products to rapidly and efficiently facilitate the transfer of dispersant-only or oil-dispersant mixtures across skin and/or lungs into the bloodstream and across the blood-brain barrier into the brain.

Once in the bloodstream, the chemicals initiate cellular-level harm in multiple cancer pathways in cells of humans[187] and mice. These mechanisms, and others discussed in table sections below, demonstrate the potential for chronic harm from these products, and most were established in animal and human studies prior to the statements made in the 2019 SDSs. This makes the Manufacturer's repeated statements that "health injuries are not known or expected…" incorrect.

Further, the Manufacturer's SDSs specifically include the caveat "under normal use" when referring to known or expected health injuries. The caveat "under normal use" is misleading. As discussed earlier, the legal interpretation shields the Manufacturer from communicating the whole truth about product use—in this case, the hazards of oil-dispersant exposure and liability for these

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[185] See note 183, Sriram et al., 2011, Neurotoxicity from inhalation of Corexit 9500A.

[186] Zheng M, Ahuja M, Bhattacharya D, Clement TP, Hayworth JS, Dhanasekaran M, 2014. Evaluation of differential cytotoxic effects of the oil spill dispersant Corexit 9500. *Life Sci* 95: 108–117. https://www.sciencedirect.com/science/article/abs/pii/S0024320513007571

The human glial cells and mouse skin cells were malignant cells. In cell-based toxicological studies, cancer cell lines are often used to test new chemical compounds. They provide a sensitive cellular model for two reasons. First, "cancer cells are highly-specialized cells that have been transformed to a much simpler, more primitive stage and thus possess the ability to grow continuously by division… [Second], due to the high active cell division rate, they are more vulnerable than most normal cells to any toxin," at 111.

[187] Liu YZ, et al., 2017. Carcinogenic effects of oil dispersants: A KEGG pathway-based RNA-seq study of human airway epithelial cells. *Gene* 602:16-23. doi: 10.1016/j.gene.2016.11.028 https://pubmed.ncbi.nlm.nih.gov/27866042/

exposures.[188] However, it does not shield the Manufacturer from communicating potential health effects to workers who handle/apply the products or who clean the dispersant-contaminated equipment and boats or who may be incidentally sprayed by the product during normal use, i.e., dispersant-only use, as mentioned earlier.

Hazard communication is about communicating the *potential* hazards and the *potential* health effects in a worst-case scenario,[189] so the treating physician knows what to do for triage and to mitigate long-term harm. We find the Manufacturer's statements regarding potential health effects to be dangerously incorrect and misleading.

Experience with Human Exposure from Skin Contact or Inhalation

> "Daily we were told that we'd be safe without PPE and, if we tried to use it, we would be fired immediately... Instead, we were instructed to wear clothes such as shorts and flip flops on the boats... Military C-130 planes from the Coast Guard and Air Force Reserve basically crop dusted the workers with ... dispersant. They would spray 232 gallons a minute, 100 feet above the water, in my case directly above me. The winds carried it into coastal communities... Although it was supposed to occur daily, there was no decontamination of workers or anything else. We routinely had to drive home in our contaminated clothing with our contaminated boats in tow... There was no support for health-related issues... workers were fired immediately if they raised concerns at morning meetings... The boat that I had chartered and used for the project was so irrevocably contaminated by the toxic chemical that BP... [took] the position that the boat was essentially totaled by permanent contamination... but human beings working within the boat for an extended time were not affected."[190]
>
> Captain John Maas
> Vessels of Opportunity worker
> BP Deepwater Horizon oil disaster

The two main epidemiology studies conducted after the BP Deepwater Horizon oil disaster—the U.S. Coast Guard (USCG) study[191] and the National Institute of Health (NIH) Gulf Longitudinal

[188] See note 57, McEvoy C, 2012, Nalco skirts lawsuits over Corexit dispersant use.

[189] OSHA, 2012. OSHA Brief: Hazard Communication Standard – Safety Data Sheets. See Sections 4 and 11 for medical treatment. https://www.osha.gov/sites/default/files/publications/OSHA3514.pdf

[190] See note 2, John Maas Affidavit, at 39–47; In: Government Accountability Project, 2024, DEEP IMPACT.

[191] See note 157, Rusiecki et al., 2017, USCG cohort study.

Follow-up (GuLF) study[192]—used very different cohorts yet found very similar short- and long-term harm to multiple body systems in workers exposed to oil, dispersants, and oil-dispersant mixtures.[193]

MANUFACTURER'S STATEMENTS FOR COREXIT DISPERSANTS 9500A AND 9527A

Section: 11. Toxicological Information

Experience with Human Exposure

Skin contact, 9500A	:	No symptoms known or expected.
Skin contact, 9527A	:	No information available.
Inhalation, 9500A	:	No information available.
Inhalation, 9527A	:	No symptoms known or expected.

— Skin Contact

The evidence in Table 2A consists of testimony from direct skin contact with Corexit 9527A and one epidemiology study.

The NIH GuLF study (McGowan et al.) is unique among the NIH GuLF collection in that it looked at distinguishing effects of exposure to dispersants-only on oil spill response workers during the 2010 BP Deepwater Horizon oil disaster and 1–3 years later (at study enrollment).[194] Safety Data Sheets are required to communicate the hazards of product use to the people who work directly with the product or handle dispersant-related equipment. For this reason, the McGowan et al. study is included in the dispersant-only section for human experience with skin contact and inhalation exposure. The experience with respiratory and eye irritation are reported in Table 3A.

Consistent with the evidence for potential health effects of Corexit dispersants in Table 1, the experience of skin/clothing contact with these products shows associations of harm from dispersant-only exposure—skin lesions, rashes, and alopecia. The reported symptoms are also consistent with descriptions in OSHA's HAZCOM standard for Skin Corrosion/Irritant[195] (A.2) and

[192] See note 158, Kwok et al., 2017, The GuLF study cohort.

[193] US Coast Guard (USCG) cohort: Mostly uniformly young, fit, white males with pre- and post-spill medical records and archived biological samples available for all participants.

NIH GuLF cohort: A unique population of culturally, ethnically, and linguistically diverse peoples with some of the highest rates of unemployment and poverty and the lowest rates of access to healthcare in the United States.

[194] McGowan CJ, Kwok RK, Engel LS, et al. 2017. Respiratory, dermal, and eye irritation symptoms associated with Corexit™ EC9527A/EC9500A following the BP DHOS: Findings from the GuLF STUDY. *Environ Health Perspect.* Sep, 125(9): 097015. doi: 10.1289/EHP1677

[195] See note 20, OSHA, § 1910.1200 Appendix A, at A.2.1.1.

the acute specified physical conditions in the BP Medical Claims Settlement.[196] The latter lists folliculitis, an inflammation of hair follicles that causes hair loss.[197]

The NIH GuLF (McGowan et al.) study found that dermal exposure based on self-reported skin or clothing contact with Corexit dispersants during the spill response was significantly associated with skin irritation of 2 days or more of eczema, dermatitis, other skin rashes, sores, or blisters,[198] after accounting for exposure to the crude oil—and despite PPE use reported in 97% of the dermal analysis group.[199]

The McGowan et al. study also found a positive but nonsignificant association between with dispersant exposure and excessive hair loss during the spill response.[200] Excluding participants who reported excessive hair loss did not meaningfully change the results, which ruled out a potential bias in over-reporting of this symptom.[201] The authors maintained "there is no known biological mechanism that would relate dispersant exposure to excessive hair loss."[202] But there was.

Dispersant exposure aside, it was known that *chemicals* could cause folliculitis. The 2012 OSHA HAZCOM standard defined *skin corrosion* as the production of irreversible damage to the skin, typified by "complete areas of alopecia," (i.e., excessive hair loss) among other things, and *skin irritation* as the production of reversible damage to the skin, "particularly taking into account alopecia (limited area)..." among other things.[203] The BP Medical Claims Settlement recognized several acute physical skin conditions including folliculitis.[204]

"Folliculitis, decalvans," which Lori B did not experience but many others did during the BP Deepwater Horizon oil disaster, is a rare inflammation of the scalp that causes scarring with

[196] See note 36, BP Medical Claims Settlement, Exhibit 8, at 8.

[197] Mount Sinai, online, 2024. Health library: Folliculitis. https://www.mountsinai.org/health-library/diseases-conditions/folliculitis

[198] See note 194, McGowan et al., 2017, Symptoms associated with Corexit dispersants, at 097015-6. "Although our results suggest an association between exposure to 9527A, 9500A, or both and adverse acute symptoms, we were not able to completely distinguish these exposures."

[199] Ibid., at 097015-3.

[200] Ibid., at 097015-5.

[201] Ibid., at 097015-6.

[202] Ibid., at 097015-3.

[203] See note 20, OSHA § 1910.1200 Appendix A, at A.2.1.1. (definitions), A.2.2.1 (corrosion), A.2.2.2 (irritation), A.2.2.3 (reversibility).

[204] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 8.

permanent hair loss[205] from destruction of hair follicles.[206] It is usually caused by infections, burns, autoimmune disorders—or chemicals[207] such as the Corexit dispersants.

The authors of the McGowan et al. study did not realize that they were the first to relate dispersant exposure to excessive hair loss. Nor did they realize the significance of participants whose only exposure was handling dispersants on land as part of equipment decontamination activities, as well as those who were exposed outside the known dates of dispersant use.[208] Researchers believed the official reports instead of the eye-witness reports.[209] Excluding participants who reported dispersant exposure during decontamination activities and/or outside the known dates of deep sea and offshore dispersant use did not meaningfully change the results, but it did rule out a potential misclassification of these data.[210] No attempt was made to verify the eye-witness reports, which would have helped with data interpretation.

The evidence in Table 2B includes the three field studies, previously discussed, as new and relevant science that established oil-dispersant mixtures were persistent and bioavailable in harmful concentrations, as fine coatings of sand grains, residual tar balls and weathered materials, and submerged sediments or coarsely aggregated material in coastal waters where people walked, waded, and swam throughout the spill area during the response.[211] Other evidence in Table 2B includes three studies that found oil contaminants in the bodies and/or blood of workers, divers, residents and beachgoers who were exposed to these weathered oil-dispersant mixtures.

Consistent with the evidence presented in Tables 1 and 2A, these weathered oil-dispersant mixtures were readily absorbed across human skin, especially moist or wet skin. The 2012 study found wet skin contact with residual tar (oil-dispersant mixture) resulted "in immediate dermal absorption…"[212] The photos below were taken by the author immediately upon return from sample collection while in contact with submerged contaminated sediments in the swash zone—the land-ocean boundary where breaking waves flatten and run onto the beach.

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[205] Ibid. Mount Sinai, 2024.

[206] Cleveland Clinic, online, 2024. Health library: Scarring alopecia. https://my.clevelandclinic.org/health/diseases/24582-scarring-alopecia

[207] Ibid., Cleveland Clinic, online, 2024.

[208] See note 194, McGowan et al., 2017, Symptoms associated with Corexit dispersants, at 097015-3.

[209] See notes 106–108. As previously discussed, the official record did not include dispersant use in nearshore waters that continued into October or at decontamination stations on land.

[210] See note 194, McGowan et al., 2017, Symptoms associated with Corexit dispersants, at 097015-6.

[211] See notes 109–117.

[212] See note 110, Kirby, 2012, Persistent PAHs, at 8.

Photos by James Kirby III. 2010. Used with permission.

The photos show that under ambient light (left), there were no signs of contaminated skin. However, the ultraviolet light (right) shows numerous areas where contamination from direct contact with oil-dispersant mixtures had absorbed into the skin. The author described:

> "This was not adherence to the skin, it was absorption. No tar product was found stuck to the skin surface and nothing was able to be wiped off the skin onto another material, such as a paper towel or rag... Each fluorescing spot [in the right photo] represents an individual absorption event."[213]

Who doesn't have wet or moist skin at the beach? Extraordinarily high levels of oil contaminants found in crude oil and dispersants (VOCs and n-hexane) were found in the blood of current and former workers, and coastal residents including elders and children, during the spring and summer months of peak oil spill emissions in 2010.[214] The initial levels of oil contaminants in the blood of response workers, divers, kids—people living and recreating along the oil-impacted coast—exceeded the 95th percentile range of the general population.[215]

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[213] Ibid.

[214] Summarco PW, Kolian SR, Warby RA, et al. 2016. Concentrations in human blood of petroleum hydrocarbons associated with the BP/Deepwater Horizon oil spill, Gulf of Mexico. *Arch Toxicol.* 2016 Apr;90(4):829-37. doi: 10.1007/s00204-015-1526-5. https://pubmed.ncbi.nlm.nih.gov/25998020/

[215] See note 2, Wilma Subra Affidavit, 2012; In: Government Accountability Project, 2013, Deadly Dispersants Addendum.

Michael Harbut, a medical doctor who directed the Center for Occupational and Environmental Medicine at Providence Hospital in Detroit, Michigan, cautioned researchers and the medical community to "look for end organ damage rather than the presence of a solvent because the solvent could have evaporated after it has already whacked the brain or whacked the liver." [216]

Residual levels of oil contaminants were still evident up to 3 years later.[217] Together, the three studies present a time-continuum showing that the initial blood levels of oil contaminants were high enough to cause end organ damage even as the levels had returned or were returning to background 1–3 years later. Acute symptoms of skin/clothing contact with oil-dispersant mixtures were skin lesions and rashes in workers and coastal residents, and excessive hair loss, across the four oiled states. Affected individuals described the intensely itchy small red bumps as "the Suicide Itch."[218] The BP Medical Claims Settlement listed the conditions as acute and chronic eczematous reactions, and folliculitis. The rashes reoccur over months and years, as those affected have experienced, and is discussed further in the Table 4 sensitization section.

Similar experiences occurred during the 1989 *Exxon Valdez* oil spill when beach workers and decontamination workers were exposed to other products that contained 2-butoxyethanol such as Exxon's bioremediation agent Inipol EAP22.[219] Direct skin contact with Inipol caused skin rashes and blisters, headaches, and blood in the urine from hemolysis[220]—an indication of likely overexposure to 2-butoxyethanol.[221] Inipol was also used as an industrial cleaning product at

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[216] Cope J, 2010. Interview with Michael Harbut, MD. No safe harbor on Gulf Coast: Human blood tests show dangerous levels of toxic exposure. *Huffington Post*. 9/2/2010. https://www.huffpost.com/entry/no-safe-harbor-on-gulf-co_b_698338

[217] Doherty BT, et al., 2017. Associations between blood BTEXS concentrations and hematological parameters among adult residents of the U.S. Gulf states, Table 2. *Environ Res* 26;156:579-587. doi:10.1016/j.envres.2017.03.048

Werder EJ, et al., 2019. Blood BTEX levels and neurologic symptoms in Gulf states residents. *Environ Res* 175:100-107. doi: 10.1016/j.envres.2019.05.004

Werder EJ, et al., 2018. Predictors of blood volatile organic compound levels in Gulf coast residents. *J Expo Sci Environ Epidemiol* 28(4):358-370 doi: 10.1038/s41370-017-0010-0.

[218] See note 2, Government Accountability Project, 2013, Deadly Dispersants, at 32, EcoRig photo.

During the BP disaster response, the Suicide Itch rashes were often misdiagnosed as staph infections despite no evidence of methicillin-resistant *Staphylococcus aureus* (MRSA) bacteria nor of the infection being contagious.

[219] Exxon, 1989. Material Safety Data Sheet (MSDS): Inipol EAP 22. 7/28/1989. Available online at Alaska Resource and Information Library Service. https://www.arlis.org/docs/vol1/C/41777012.pdf

[220] Bilirubin is a substance that forms during hemolysis when red blood cells are broken down. NIH National Cancer Institute, online, 2024. Dictionary of cancer terms. https://www.cancer.gov/publications/dictionaries/cancer-terms/def/bilirubin. Bilirubin can be excreted in the urine, giving it a darkened color. NIH, National Library of Medicine, online, 2024. https://medlineplus.gov/lab-tests/bilirubin-in-urine/

[221] See note 219, Exxon, 1989, Inipol MSDS, at 3. "Components of this product (2-butoxyethanol) may be absorbed through the skin and could produce blood and kidney damage. Symptoms of overexposure include paleness and red discoloration of the urine."

decontamination stations with similar consequences for workers.[222] Another product that contained 2-butoxyethanol, Simple Green,[223] was also used as a daily cleaner and to launder workers' clothes.[224] A pilot study conducted 14 years after the oil spill found former *Exxon Valdez* response workers described similar symptoms of exposure and chronic harm from exposure to Inipol (greater prevalence of chronic airway disease, multiple chemical sensitivity, and bronchitis) and exposure to Simple Green (bronchitis, persistent hoarseness, and neurological impairment).[225]

Inipol was subsequently discontinued in 2005 by its manufacturer Exxon and removed from the NCP Product Schedule by EPA.[226] Simple Green was reformulated without 2-butoxyethanol, and it is listed on the NCP Schedule.[227] Corexit 9500A was developed without 2-butoxyethanol to replace Corexit 9527A in the late 1990s, yet the latter remains conditionally listed for use.

Based on the human experience with skin contact to Corexit dispersants 9500A and 9527A presented in Table 2, we find that the repeated statements in the Manufacturer's SDSs of "No symptoms known or expected" and/or "No information available" are incorrect or outdated based on evidence and information available prior to or after the publication, respectively.

— Inhalation Exposure

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[222] Ott R, 2004. *Sound Truth and Corporate Myths: The Legacy of the Exxon Valdez Oil Spill.* Dragonfly Sisters Press: Cordova, AK. 561 pp. Digital copy: https://rikiott.com/wpcontent/uploads/2013/07/Sound-Truth.pdf (Korean ed., 2008, Sonamoo Publishing Co.) "A decision was made by Exxon and VECO to integrate Inipol into the cleaning process," at 114, and Sara Clark (alias) experience at decontamination stations, at 113–117.

[223] Sunshine Makers, 2003. MDSD Simple Green Lemon Scent. Version # 14101. "The only ingredient of Simple Green with established exposure limits is undiluted 2-butoxyethanol (<6%)… Symptoms of overexposure to humans include reddening of eyes or of skin (reversible)."

[224] See note 222, Ott, 2004, *Sound Truth,* at 88, "Finally VECO supply sent Simple Green®, which the women found worked well when added with Tide to each wash load. The laundry [decontamination] crew was unaware of the health hazards of using Simple Green…" and at 85–95, Phyllis "Dolly" LaJoie on laundering work.

[225] O'Neill A. 2003. Self-Reported Exposures and Health Status Among Workers from the *Exxon Valdez Oil* Spill Cleanup. MSc Thesis for the Degree of Master of Public Health, Yale University, Dept. of Epidemiology and Public Health. https://rikiott.com/wp-content/uploads/2016/05/oneill_thesis.pdf

Workers who stated they were exposed to Inipol or Simple Green were significantly more likely to report dry, scratchy or sore throat during cleanup work, persistent cough and/or phlegm, and rash or skin irritation than those who were not exposed to these products, at 54; Moderate chemical exposure to Inipol was associated with a greater reported prevalence of chronic airway disease and symptoms of multiple chemical sensitivity—and bronchitis among the longest job worked category, at iv and 56–57; Exposure to Simple Green was associated with statistically significant increases in the prevalence of symptoms of bronchitis, persistent hoarseness, and symptoms of neurological impairment, at 58.

[226] US EPA, 2023. NCP Product Schedule as of 12/11/2023, at iv. "Inipol discontinued by manufacturer–2005." https://www.epa.gov/system/files/documents/2023-12/ps_dec23_508.pdf

[227] Ibid., at 20 and 28. Simple Green is listed as a surface washing agent.

The evidence in Table 3A consists of one epidemiology study—the NIH GuLF McGowan study. (The human experience with respiratory and eye irritation from this same study was previously reported in Table 2A—as well as the reasons for including this study in the dispersant-only section for human experience with skin contact and inhalation exposure.)

The McGowan et al. study classified (defined) airborne dispersant exposure as exposure of those who worked with dispersants or on a ship from which dispersants were applied, or with any task that involved dispersant-related equipment, such as with pumps that delivered dispersant to the wellhead, for more than half of the time. In addition, it classified workers as directly exposed only if they worked personally with dispersants, while others who worked in the vicinity of dispersants and/or dispersant-related equipment were classified as indirectly exposed.

The McGowan et al. study found that airborne dispersant exposure based on self-reported symptoms of respiratory or eye irritation during the spill response was significantly associated with all health outcomes of cough, wheeze, tightness in chest, shortness of breath, burning in nose/throat/lungs, itchy eyes, and burning eyes after taking into account exposure to the crude oil—and despite PPE use reported in 48% of the respiratory analysis group.[228]

Three other key findings indicate the presence of an exceptional health hazard—a respiratory sensitizer—as associations between responses and exposure to dispersants were not the expected toxicological relationships between chemical concentrations and/or duration and response. Instead, the study reported that: (1) the likely lower indirect exposure was still significantly associated with most respiratory and eye irritation outcomes, although less strongly than direct work with dispersants; (2) the associations between respiratory and eye irritation and dispersant exposure remained significant at all work locations, regardless of airborne level of oil exposure; and (3) at the time of study enrollment 1–3 years later, dispersant exposure remained significantly associated with the prevalence of most symptoms for respiratory and eye irritation among those who had reported initial symptoms—and among those who had *not* reported symptoms initially.

These findings show that (likely) lower levels of dispersant exposure also presented a hazard and health risk, that the overall associations were not being driven by unmeasured characteristics of a particular work location *including concentration of oil contaminants associated with a particular job,* and that dispersants were likely a chemical respiratory sensitizer that could cause chronic harm after initial acute or repeated lower-level exposures.

The experience with human exposure, described in McGowan et al. study, is consistent with the lab studies in Table 1 that established how Corexit dispersants altered cell membranes to enter the bloodstream or to cross the blood-brain barrier. It is also consistent with a 2011 lab study that

[228] Ibid.

found dermal exposure of mice to Corexit 9500A and DOSS, one of its active ingredients, induced a cell-mediated immunological response that led to classification of Corexit 9500A *as a potent sensitizer* and DOSS *as a moderate sensitizer*. This is discussed further in the Table 4 section.

The evidence in Table 3B consists of two studies from the USCG epidemiological collection, including an initial investigation on acute respiratory symptoms and a 5-year follow up study on chronic respiratory conditions.

An early USCG study found oil exposure overlapped dispersant exposure in 91% of participants,[229] so the effect of exposure to dispersant alone could not be meaningfully assessed. To investigate the impacts of oil dispersants on human health within the context of an oil spill, subsequent USCG studies compared prevalence ratios (number of cases) for responders who reported oil-only exposure (v. controls with neither oil nor dispersant exposure) and those who reported both oil exposure and dispersant exposure ("oil-dispersant exposures") v. controls.

The USCG Alexander et al. study found that oil-dispersant exposures had at least twice the prevalence ratios of coughing and five times the prevalence of shortness of breath and wheezing than exposure to crude oil alone,[230] indicating that Corexit dispersants greatly increased the impact of initial respiratory harm to responders—and the health risk for chronic conditions. This finding is consistent with the post-disaster science-based understanding of cellular-level mechanisms of harm from dispersants and the experience with human exposure, discussed in Tables 1–3A.

Another key finding was that associations with coughing, shortness of breath, and wheezing were present before *and after* the well was capped (on July 15) when *offshore* dispersant spraying by plane and boats largely stopped. This indicates a persistent environmental presence of oil-dispersant mixtures long after the well was capped, consistent with the emerging understanding that dispersants remain associated with oil and that the mixture is persistent, bioavailable, and toxic for years, much longer than previously thought (Table 2B). It also indicates possible presence of a respiratory sensitizer, as the associations were independent of levels of chemicals in the air.

Further, the Alexander et al. study found that associations were particularly strong among responders with the longest deployments (>60 days) and generally followed an exposure-response relationship. This is also an indicator of a respiratory sensitizer, as there was a significantly high and substantial prevalence of respiratory symptoms in the cohort population in relation to a relatively low exposure (for the longer deployments) of the airborne oil-dispersant mixture.[231]

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[229] See note 157, Rusiecki et al., 2017, USCG study, description.

[230] Alexander M, Engel LS, Olaiya N, Wang L, Barrett J, Weems L, Schwartz EG, Rusiecki JA. 2018. The BP DHOS Coast Guard cohort study: A cross-sectional study of acute respiratory health symptoms. *Environ Res*. Apr, 162:196-202. doi: 10.1016/j.envres.2017.11.044

[231] See note 20, OSHA, § 1910.1200 Appendix A, at A.4.2.2.2.1(b).

Finally, significant trends were found between *respiratory* symptoms of coughing and shortness of breath and increased frequency (duration) of *skin contact* with dispersants, suggesting that dermal exposure also contributed to respiratory symptoms. This is consistent with the OSHA Sweden and lab studies in Table 1.

These last three findings show that a symptom-based approach to assessing health risk is a more reliable indicator of harm for chemical mixtures than environmental assessments (like air quality) based on numeric measurements of exposure to individual chemicals. This is because symptoms indicate when harm is truly occurring regardless of whether levels of chemicals and PELs/OELs are deemed to be safe. This is especially true when respiratory and skin sensitizers are present.

The USCG follow-up study (Rusiecki et al.) examined respiratory symptoms, chronic respiratory conditions, and patterns of association with crude oil exposure alone over the 5.5 years post-disaster period, based on medical records. The most consistent findings of increased health risk from inhalation exposure were for symptoms involving the respiratory system and other chest symptoms (that are not specific to a single disease), and for the group of diseases classified as asthma and reactive airway diseases under the (International Coding of Disease) ICD-9 system.[232] These associations were "appreciably greater" for oil-dispersant exposures than for oil-only exposures, as was the elevated risk for shortness of breath. This finding is supported by an NIH GuLF follow up study that found responders exposed to dispersants had modestly lower lung function, as spirometry measurements taken 1–3 years after the disaster, compared to other responders.[233] These follow up studies indicate that Corexit dispersants are respiratory sensitizers as both acute and chronic harm from oil spill exposures became consistently worse when these products were present.

Also relevant is the Rusiecki et al. finding that the patterns of risk of various symptoms or diseases relative to exposures (i.e., the hazard ratios) were the same even when cohort members most often exposed to hazardous occupational exposures were excluded from analyses.[234] This

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[232] Rusiecki J, Denic-Roberts H, Thomas DL, et al. 2022. Incidence of chronic respiratory conditions among oil spill responders: Five years of follow-up in the Deepwater Horizon oil spill Coast Guard cohort study. *Environ Res.* Jan; 203:111824. doi: 10.1016/j.envres.2021.111824..

[233] Gam KB, Kwok RK, Engel LS, et al., 2018. Lung function in oil spill response workers 1-3 years after the Deepwater Horizon disaster. *Epidemiology*. May;29(3):315-322. doi: 10.1097/EDE.0000000000000808.

[234] Ibid., at 3. The study population was restricted "to those who had not enrolled in the Coast Guard's Occupational Medical Surveillance and Evaluation Program (OMSEP) at the time of the BP Deepwater Horizon oil disaster or during the follow-up period."

OMSEP is a separate USCG program for employees routinely involved in hazardous waste operations or emergency response—or employees "who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or physical agents from an emergency response or hazardous waste

strengthens the argument that these dispersants are respiratory and/or skin sensitizers, as it shows similar (although attenuated) outcomes among persons who were not routinely exposed to hazardous chemicals. Further, the findings of progressive, chronic respiratory harm and elevated dyspnea and respiratory abnormalities in responders vs. non-responders in the later period (2013 to October 2015), but not in the earlier period (April 2010 through 2012) also indicate that these dispersant products are respiratory sensitizers, as lower levels elicited harm.

Human experience from inhalation of oil-dispersant exposures consistently demonstrates strong relationships between initial respiratory symptoms and later-developing respiratory conditions when studies compared symptoms between responders vs. non-responders.[235] Further, the relationships were stronger for oil-dispersant exposures than for oil-only exposures.

Based on the human experience from inhalation of Corexit dispersants 9500A and 9527A presented in Table 2, we find that the repeated statements in the Manufacturer's SDSs of "No symptoms known or expected" and/or "No information available" are incorrect or outdated based on evidence and information available prior to or after the publication, respectively. The evidence in Tables 1–3 forms the framework to understand the multi-system, multi-organ harm from Corexit dispersants alone and with crude oil presented in Tables 4 and 5.

Product Toxicity — Harm from Exceptional Health Hazards

MANUFACTURER'S STATEMENTS FOR COREXIT DISPERSANTS 9500A AND 9527A

Section: 11. Toxicological Information

Toxicity – Product

Respiratory or skin sensitization	:	no data available
Carcinogenicity	:	no data available
Reproductive effects	:	no data available
Teratogenicity	:	no data available

operation," at 2-21, 7.a.(1)(a)–(d). U.S. Coast Guard Occupational Medicine Manual. COMDTINST M6260.32 June 2018. https://media.defense.gov/2018/Jul/05/2001939223/-1/-1/0/CIM_6260_32.PDF

[235] The availability of pre- and post-spill medical records for all responders and non-responders also strengthened the ability of the USCG cohort studies to detect harm. The NIH GuLF studies were conducted on a medically underserved population, which may have biased low study results in general. A later NIH GuLF study that defined asthma as self-reported wheeze and self-reported physician diagnosed asthma found oil spill workers had greater prevalence of asthma than nonworkers, however associations were less apparent for medically-diagnosed asthma alone. Authors concluded there was "a true undercounting of clinical asthma in this population," at 6. Lawrence KG, Niehoff NM, Keil AP, + 12. 2022. Associations between airborne crude oil chemicals and symptom-based asthma. *Environ Int.* 167:107433. doi: 10.1016/j.envint.2022.107433

In the section on Product Toxicity, the Manufacturer's SDSs categorically state "no data available" for each of the exceptional health hazard classes listed—respiratory or skin sensitization, carcinogenicity, reproductive effects, and teratogenicity—and for specific target organ toxicity. We present evidence to the contrary in Tables 4A–C.

> "My physical condition changed in a dramatic manner immediately after the spill... I began suffering from continuous respiratory problems manifested by ceaseless coughing... [and] an odd shortness of breath and related fatigue, which... worsened with time. [In 2015] I was diagnosed with chemically induced asthma, as well as reactive airways disease. As my condition had worsened, I began experiencing nightly panic attacks due to my inability to breathe as I was trying to sleep... Medical tests indicate I only have 35-45% lung capacity. I require oxygen every night to be able to sleep... the recurring, severe headaches have not stopped.
>
> "I am hardly alone in my misery. My deck hands and I all suffered rashes and growths on any skin surfaces where we had been exposed to Corexit, because there was no PPE and we were working in shorts. I had painful white warts, some as big as erasers. They've broken out some 20 times and continue to come back."
>
> Captain John Maas[236]
> Vessels of Opportunity worker
> BP Deepwater Horizon oil disaster

— Respiratory or Skin Sensitization

Evidence in Table 4A includes an animal study, which led to classification of Corexit 9500A and DOSS (an active ingredient in both Corexit dispersants) as skin sensitizers in 2011, and testimonials from a person who experienced a single exposure to Corexit 9527A and from others who experienced multiple exposures to both Corexit dispersants.

A 2011 lab study (Anderson et al.) found dermal exposure of mice to Corexit 9500A and DOSS at working concentrations of dispersant-to-oil ratios used during the BP Deepwater Horizon disaster response, caused dose-responsive increases in dermal irritation (swelling in ears), lymphocyte proliferation, and elevations in interferon (that help the body's immune system fight infection and other diseases, such as cancer).[237] The mouse ear swelling test evaluates for delayed contact

[236] See note 2, John Maas Affidavit, at 39–47; In: Government Accountability Project, 2024, DEEP IMPACT.

[237] See note 177, Anderson et al., 2011, Immunological effects from Corexit 9500A.

hypersensitivity, an immune response that occurs through direct action of sensitized T-cells when stimulated by contact with a toxin—with or without the production of antibodies.

Significantly, the proliferation of immune defense cells (lymphocytes and interferon) in the Anderson et al. study occurred without corresponding increases in immunoglobin E (an antibody) and interleukin (that regulates growth and activity of antibodies). This indicated a Th1-cell-mediated immunological mechanism, i.e., a TILT mechanism, for chemical sensitization.

The mechanism and the dose-response increases resulted in classification of Corexit 9500A as a *potent sensitizer* and DOSS as a *moderate sensitizer*. Authors concluded there were "implications for workers and the general public beyond those involved in the Gulf oil spill," referring to the potential adverse health risk of everyday products with specific ingredients in common with Corexit 9500A.[238]

There are two other relevant items. First, the Anderson et al. study *pre-dated* the 2012 edition of OSHA's HAZCOM standard that recognized respiratory and skin sensitization and required reporting of relevant data. This means that all the Manufacturer SDSs for Corexit 9500A after 2012—and certainly by 2019—should have noted this study. Second, since DOSS is an active ingredient in both Corexit dispersants, it is very likely that Corexit 9527A is also a potent skin sensitizer. There is ample evidence to support that both products are respiratory sensitizers as well.

For example, besides the acute symptoms associated with her direct dermal contact with Corexit 9527A, Lori B also developed several medically-diagnosed chronic conditions consistent with exposure to chemical sensitizers. Her skin is armored like reptile skin—a type of contact

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[238] Ibid., at 1429. Examples of such products include "use as a wetting agent in dry gelatin, beverage mixtures and fruit juice drinks, skin creams and body shampoos, baby bath liquids, cosmetics, and surface-active agents, and as emulsifiers for agents used in food contact, household cleaning products, hand creams and lotions, odorless paints, and stain blockers," at 1428.

Common ingredients such as 2-butoxyethanol and DOSS in Corexit dispersants and household products is a cause for concern. A chemical mixture that "does not appear to pose a health threat in 'everyday' lives does not exclude the possibility of potential exposure to hazardous concentrations of the substance during conditions of use found at the workplace" (OSHA, 1989). EPA and consumer advocates provide information about the health hazards of these and other chemicals in household products (EPA, 1992; Force of Nature, 2024)

OSHA, 1989. Standard interpretation: Enforcement of OSHA's Hazard Communication Standard in the construction industry. Involving standard 1910.1200. 8/21/1989. https://www.osha.gov/laws-regs/standardinterpretations/1989-08-21

EPA, 1992 (updated in 2000). Hazard Summary, Glycol Ethers (2-Butoxyethanol): Uses, sources and potential exposure, and more. https://www.epa.gov/sites/default/files/2016-09/documents/glycol-ethers.pdf

See Force of Nature, online, 2024. Toxic Chemical Glossary. What is 2-butoxyethanol: Chemical Free Living. Accessed 3/23/2024. https://www.forceofnatureclean.com/chemical-free-living-2-butoxyethanol/

dermatitis or chronic eczematous reaction known as hyperkeratosis that causes patches of thick, rough skin that tends to flare at times.[239] She has chronic hypersensitivities to scents, light, and sound from dispersant damage to specific areas of the brain associated with sound, hearing, and the auditory pathway that conveys sound into conscious perception. For the same reason, she also has sensitivities to sensations like touch, pressure, and pain (see also Table 5A).

Captain John Maas also developed several medically-diagnosed chronic conditions consistent with exposure to chemical sensitizers that he incurred daily from direct dermal contact with and inhalation of Corexit dispersants while working on the BP disaster response for 12-hour extended shifts for nearly two months.[240] Besides the hallmark chronic, reoccurring skin rashes and issues, he has chemical-induced asthma and chronic reactive airways disease—both hyper-sensitivities that are indicators of chemical sensitization/intolerance. Severe headaches and fatigue are also symptoms associated with toxicant-induced loss of tolerance (TILT).[241]

In central (hyper) sensitization, the central nervous system undergoes structural, functional, or chemical changes that amplify sensory input across many organ systems, causing the body to overreact to stimuli that aren't usually painful. The first study to investigate associations between TILT and migraines found significant associations between migraines and patients with chemical intolerance, measured as central sensitization and hypersensitivity-related symptoms.[242] The chemically sensitive/ intolerant (TILT) group had significantly higher rates of photophobia (light sensitivity), osmophobia (odor sensitivity), visual aura (light flashes, dots, or waves in vision), sensory aura (tingling in a limb or numbness), and central (hyper) sensitization. The TILT group also had significantly higher rates of migraines and mental distress—and *non*-significantly higher rates of phonophobia (noise sensitivity). These symptoms of hypersensitivity are experienced by Lori B, John Maas, and many others injured by Corexit dispersants.

The epidemiology studies provide further evidence (Tables 3 and 5) that Corexit dispersants are respiratory and skin sensitizers—alone and with oil. The human experience meets OSHA's HAZCOM definitions of sensitization as high and substantial incidence of responses in a defined

[239] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 14, listing chronic contact dermatitis or chronic eczematous reaction.

[240] See note 2, John Maas Affidavit; In: Government Accountability Project, 2024, DEEP IMPACT. Maas was likely exposed to both Corexit dispersants as VOO contractor was from early May through early July. During this time, aerial spraying offshore included use of Corexit 9527A until May 31, while nearshore surface slick spraying included both products. In his affidavit, Maas reported daily contact with oil, oil-dispersant-contaminated-water, airborne dispersant, and oil-dispersant mixtures. Such exposures were not unique but part of the job for many VOO workers.

[241] Suzuki K, Okamura M, Haruyama Y, et al., 2022. Exploring the contributing factors to multiple chemical sensitivity in patients with migraine. *J Occup Health.* Jan;64(1):e12328. doi: 10.1002/1348-9585.12328.

[242] Ibid.

population to relatively low exposures, chronic respiratory hypersensitivity and skin irritation, and development or worsening of chemical intolerances and associated hypersensitivity.

Based on the collective experience with Corexit dispersants 9500A and 9527A presented in Tables 2–4A, we find that the Manufacturer's statements in its SDSs of "no data available" regarding product toxicity as a respiratory or skin sensitizer are incorrect or outdated based on evidence and information available prior to or after the publication, respectively.

— Carcinogenicity

> "Around six months or so following the spill, the first fisherman's wife came to me and said her husband had been diagnosed with cancer and the doctor gave him only a few months to live. The doctor was right... In the first few years following the spill, I attended funerals on a regular basis until I finally realized the emotional toll was too much to carry. So instead of attending, I sent food or funds... I've lost count of how many have been diagnosed with cancer since the 2010 disaster, and I've lost count of how many have died... Counter tops of stores throughout our communities house donation jars to fill the financial gaps for cancer patients' expenses... Now a cancer diagnosis isn't a surprise."
>
> Kindra Arnesen[243]
> Mother, fisherwoman
> Venice, Louisiana

Evidence in Table 4B includes six lab studies, dating from 2013 to 2020, on various mammal cells from mice to whales, and humans, found that tests with Corexit 9527A and 9500A with or without oil consistently promoted genotoxicity by damaging DNA and triggering multiple cancer pathways. Tests with 9527A generally elicited more pronounced responses than 9500A.

Of the two lab studies with dispersant-only tests, one found that contact with Corexit dispersants 9500A and 9527A triggered enhanced production of reactive oxygen species at the highest test level in human bronchial airway cells. Corexit 9527A tests produced significantly higher cell death with more pronounced response than 9500A.[244] Reactive oxidative species are known to damage genetic coding (DNA, RNA), lipids, proteins, and enzymes, and lead to cancer initiation.[245] The

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[243] See note 2, Government Accountability Project, 2024, DEEP IMPACT, at 2.

[244] Shi Y, Roy-Engel AM, Wang H, 2013. Effects of Corexit dispersants on cytotoxicity parameters in a cultured human bronchial airway cells, BEAS-2B. *J Toxicol Environ Health A* 2013; 76: 827–835. doi: 10.1080/15287394.2013.821396

[245] NIH National Cancer Institute, online, 2024. NCI Dictionary of cancer terms: Reactive oxygen species. https://www.cancer.gov/publications/dictionaries/cancer-terms/def/reactive-oxygen-species

other study found these Corexit dispersants both killed (cytotoxic) and damaged DNA (genotoxic) of sperm whale skin fibroblasts.[246] Fibroblasts secrete collagen proteins that help maintain the structural framework of tissues and play an important role in tissue repair. Corexit 9527A was less cytotoxic but more genotoxic than 9500A.

Subsequent lab studies conducted with human bronchial epithelial cells tested with a water-accommodated (soluble) fraction of Macondo well crude oil (the oil that spilled during the BP Deepwater Horizon disaster) and/or one of the two Corexit dispersants (9500A and 9527A) found oil-dispersant mixtures promoted more double- and single-stranded DNA breaks and activation of DNA damage response mechanisms than oil alone.[247] This indicated that oil-dispersant mixtures can initiate genotoxic effects. Further, oil-9527A mixtures produced more of the more damaging double-stranded DNA breaks than oil-9500A mixtures, consistent with earlier lab studies.

Similarly, a series of RNA-sequence analyses identified "a significant pattern of change towards cancer development in human bronchial epithelial cells tested with oil-dispersant mixtures, especially the tests with [Corexit] 9527A."[248] The pattern was one of cancer initiation through transcription errors that blocked various receptors for protein processing and signaling. There was a more pronounced effect (a greater number of differentially expressed genes) in cells after tests with oil-9527A, versus 9527A alone, indicating a synergistic effect, consistent with earlier studies. After tests with oil, 9500A, and oil-9500A, Liu et al. identified several biological processes—enhanced immune response and airway angiogenesis (formation of new blood vessels within preexisting ones), degradation of cell junctions, and decreased steroid synthesis—that are consistent with alterations associated with lung diseases like asthma, cystic fibrosis, and COPD.[249]

In a follow up study, the oil-9527A mixture elicited the most pronounced effects on DNA damage and proliferation by initiating 27 cancer pathways compared to 8 for the oil-9500A mixture.[250] Corexit 9527A tests mostly involved indirect DNA damage by blocking ribosome biogenesis (synthesis of proteins into an amino acid sequence), while Corexit 9500A tests were characterized by blocking DNA damage response mechanisms (i.e., blocking specific receptors that protect against cancer initiation preventing an inflammatory response and promoting an immune

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[246] Wise CF, Wise JTF, Wise SS, et al., 2014. Chemical dispersants used in the Gulf of Mexico oil crisis are cytotoxic and genotoxic to sperm whale skin cells. *Aquatic Toxicol* 152:335-340. dispersants are cytotoxic and genotoxic to sperm whale skin cells. https://www.sciencedirect.com/science/article/abs/pii/S0166445X14001490

[247] Major D, Derbes RS, Wang H, Roy-Engel AM. 2016. Effects of Corexit oil dispersants and the WAF of dispersed oil on DNA damage and repair in cultured human bronchial airway cells, BEAS-2B. *Gene Rep.* 3:22-30. doi: 10.1016/j.genrep.2015.12.002

[248] Liu YZ, Roy-Engel AM, Baddoo MC, et al., 2016. The impact of oil spill to lung health – Insights from an RNA - seq study of human airway epithelial cells. *Gene* 578(1):38-51. doi: 10.1016/j.gene.2015.12.016

[249] See note 187, Liu et al., 2017, Carcinogenic effects of oil dispersants in humans, at 3.

[250] Ibid., at 6.

response). Also, when presented with oil, Corexit 9527A functionally shifted the small lung cancer pathway to a smaller set of genes that have even more cancer pathways, including non-small cell lung cancer (aka neuroendocrine tumors), prostate cancer, chronic myeloid leukemia, and pancreatic cancer,[251] among others.[252]

Authors point out that such results are not surprising,[253] given that Corexit 9527A contains the 2-butoxyethanol and its toxic effects have been previously established.[254] What did surprise the authors, however, was that these two dispersants were still used in the United States, despite being banned in the United Kingdom over concerns for harm to intertidal sea life on rocky shores.[255]

The human health findings were later corroborated by murine models. In the pulmonary system of mice, exposure to oil-dispersant mixtures promoted more genotoxicity and DNA damage, cell death, inflammation (one of the hallmarks of cancer), and tumor formation than exposures to oil or dispersant alone.[256] Also, similar to the earlier RNA-sequence studies with human tissue discussed above, damage to mouse tissue was more pronounced—i.e., more cancer pathways were triggered—in tests with Corexit 9527A than tests with 9500A (19 versus 7, respectively), consistent with the findings for human airway cells.

Collectively, these studies show the mechanisms of dispersant-driven harm that induces cancer initiation at the cellular level. Concern about potential health effects from inhalation exposure to the Corexit 9527A were sufficient *for the industry* to develop a "less toxic" alternative in the late 1990s. These studies show that even the "less toxic" alternative, Corexit 9500A, is carcinogenic.

Based on these lab studies with Corexit dispersants 9500A and 9527A presented in Table 4B, we find that the Manufacturer's statements in its SDSs of "no data available" regarding product carcinogenicity are incorrect or outdated based on evidence and information available prior to or after the publication, respectively.

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[251] Ibid., at 8.

[252] Kanehisa M, Goto S, 2000. KEEG: Kyoto Encyclopedia for Genes and Genomes. *Nucleic Acids Res* 28(1):27-30. *doi: 10.1093/nar/28.1.27* KEEG is a collection of databases dealing with genomes, biological pathways, diseases, drugs, and chemical substances.

[253] Ibid., at 10.

[254] CDC (Centers for Disease Control), NIOSH Pocket Guide to Chemical Hazards, 2-butoxyethanol, last reviewed Oct. 30, 2019. https://www.cdc.gov/niosh/npg/npgd0070.html

[255] See note 187, Liu et al., 2017, Carcinogenic effects of oil dispersants in humans, at 10.

[256] Liu YZ, Miller CA, Zhuang Y, et al., 2020. The Impact of the Deepwater Horizon Oil Spill upon Lung Health-Mouse Model-Based RNA-Seq Analyses. *Int J Environ Res Public Health*. Jul 29;17(15):5466. doi: 10.3390/ijerph17155466

—Teratogenicity and Reproductive Effects

Evidence in Table 4C consists of one lab study (Chen et al.) that found teratogenic effects of Corexit 9527A. In addition, two epidemiology studies on reproductive effects (birth outcomes) in dolphins and humans after the BP Deepwater Horizon oil disaster found cause for concern about dispersant use.

In 2016, the mouse P19 stem cell was used for the first time to evaluate the dispersants Corexit 9500A and 9527A for effects on early embryonic neuronal differentiation associated with retinol signaling.[257] Retinol (vitamin A) is essential in formation and development of embryos. In cells, expression of over 500 developmental genes is mediated by retinoic acid (biosynthesized from retinol) and modulated by the retinol signaling pathway. The P19 line are pluripotent cells that differentiate into cell types from all three germ layers (ecto-, endo-, and meso-derm) and even germ cells. Relevant to this study (and our petition), "[n]ormal retinol signaling is indispensable for neural tube formation and hindbrain development [top of spinal cord, brain stem, cerebellum] ... Disruption of the... [retinol signaling pathway], therefore, is potentially teratogenic."[258]

After finding Corexit 9500A was more cytotoxic than Corexit 9527A to P19 cells, the study focused on adverse effects (short of death) of Corexit 9527A. The study found that Corexit 9527A interferes with retinol signaling and neuronal differentiation in P19 embryonic cells that are critical to survival. At least three possible molecular mechanisms were identified,[259] including disruption of enzyme function in the formation of retinol acid, which reduced the downstream expression/activation of a gene required for differentiation of embryonic stem cells into neurons; interference with enzymatic binding (by blocking receptors) of some proteins during the conversion process of retinol into retinoic acid, resulting in reduced production of retinol acid; and jamming of the neuro signaling required for guiding differentiation by altering membrane permeability.

Tests on individual ingredients of Corexit 9527A found that the surfactant ingredient *"DOSS is a major, if not the only, ingredient that is responsible for the observed adverse effects of Corexit 9527A* seen in P19 cells" (emphasis added).[260]

The Chen et al. study relates its findings to the March 2011 unusual cetacean mortality event "when 151 dead bottlenose dolphins including a relatively high frequency of premature and young

[257] Chen Y, Reese DH, 2016. Corexit-EC9527A disrupts retinol signaling and neuronal differentiation in P19 embryonal pluripotent cells. *PLoS ONE* 11(9): e0163724. https://pubmed.ncbi.nlm.nih.gov/27684493/

[258] Ibid., at 2.

[259] Ibid., at 11.

[260] Ibid., at 10.

animals were found in the northern gulf of Mississippi. The timing of this incident, one year following the [BP Deepwater Horizon] oil spill, indicates a potential association between the period of gestational exposure and oil spill, dispersant application, and/or other ecological factors…"[261] Subsequent epidemiology studies on Barataria Bay (Louisiana) dolphins related the long-term reproductive and other harm more generally to oil spill exposure that included oil-dispersant exposure.[262]

Two studies on birth outcomes of babies born to responders or residents of oiled coastal communities also found harm from oil spill exposures. A US Coast Guard study found "a suggestive risk for any poor live birth outcome [i.e., low birth weight, preterm birth, or major structural birth defects] among infants born to female spill responders," although interpretation was limited by small numbers.[263] Another study (Beland, Oloomi) with much higher numbers found increased incidence of low birth weight (<2500 g) and premature born infants (<37 weeks of gestation) among residents of oiled coastal counties and parishes across four states after the BP disaster.[264] These were linked with increased concentrations of fine particulate matter (PM2.5) and secondary organic aerosols (nitrogen dioxide, sulfur dioxide, and carbon monoxide) from oil spill activities and atmospheric interactions with surface oil. More pronounced adverse infant health outcomes were found for black, Hispanic, less educated, unmarried, and younger mothers.

Although neither of these epidemiology studies singled out dispersants as the cause of harm for the measured birth outcomes, there is clearly cause for concern, based on the growing weight of evidence. The Beland, Oloomi study implicated dispersant use in contributing to the harm (by increasing the amount of oil-derived aerosols). It suggested that negative health impacts for infants could be minimized during an oil spill by reconsidering activities, i.e., product use.

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[261] Ibid., at 11.

[262] Schwacke, Lori, et al., 2014. Health of common bottlenose dolphins (*Tursiops truncatus*) in Barataria Bay, Louisiana, following the Deepwater Horizon oil spill. *Environ Sci Technol*. 48, 93–103. http://pubs.acs.org/doi/abs/10.1021/es403610f

Smith, C. R., T. K. Rowles, L. B. Hart, et al. 2017. Slow recovery of Barataria Bay dolphin health following the Deepwater Horizon oil spill (2013–2014), with evidence of persistent lung disease and impaired stress response. *Endangered Species Res* 33:127–142. doi: 10/esr00778.

Venn-Watson S, et al., 2015. Adrenal gland and lung lesions in Gulf of Mexico Common Bottlenose Dolphins (Tursiops truncatus) found dead following the [BP] Deepwater Horizon Oil Spill. *PLoS ONE* 10(5): e0126538. doi: 10.1371/journal.pone.0126538.

[263] Hall C, Conlin AMS, Burrell M, et al. 2023. Health outcomes among offspring of US Coast Guard responders to the Deepwater Horizon oil spill, 2010-2011. *Occup Environ Med*. Apr, 80(4):192-195. doi: 1136/oemed-2022-108714.

[264] See note 159, Beland, Oloomi, 2019, Environmental disaster, pollution, and infant health. Study population was derived from over nine million births in the southern United States over the selected period.

The Chen et al. study clearly indicates that Corexit 9527A is a teratogen in mice and that the active ingredient DOSS was responsible for the harm. Since DOSS is a common ingredient in both Corexit dispersants, this should make 9500A a suspected teratogen as well. OSHA's HAZCOM standard states that "a single, positive study performed according to good scientific principles and with statistically or biologically significant positive results may justify classification" as a human reproductive toxicant for Category 2,[265] when considering weight of evidence for classification under reproductive toxicity.[266]

Based on the single lab study with Corexit 9527A presented in Table 4C, supplemented with evidence from human and dolphin studies, there is "a strong presumption that the [products] have the capacity to interfere with reproduction in humans," the bar for classification in the HAZCOM standards [1910.1200 A.7.1(a)]. We find that the Manufacturer's statements in its SDSs of "no data available" regarding product teratogenicity and reproductive effects are incorrect or outdated based on evidence and information available prior to or after the publication, respectively.

Specific Target Organ Toxicity (STOT) from Repeated or Prolonged Exposure

> "The confusion is the scariest part. I had trouble stringing together simple words, just had this terrible delay in thought process. And I continued on that way for about three years after the spill. I would get in my truck to go somewhere, and I would have to pull over and stop. I would just ask myself, 'Where am I?'"
>
> Captain Frank Howell[267]
> Vessels of Opportunity worker
> BP Deepwater Horizon oil disaster

> "I suffer from chronic rashes, neuropathy or nerve breakdowns, atrial fibrillation or irregular heartbeat, and high blood pressure. The neuropathy bothers me every day and causes my feet to hurt and tingle."
>
> Theo Atkinson[268]
> Vessels of Opportunity worker
> BP Deepwater Horizon oil disaster

[265] See note 20, OSHA § 1910.1200 Appendix A, at Figure A.7.1(a). "Substances shall be classified in Category 2 for reproductive toxicity when there is some evidence from humans or experimental animals, possibly supplemented with other information, of an adverse effect on sexual function and fertility, or on development, in the absence of other toxic effects… and where the evidence is not sufficiently convincing to place the substance in Category 1…"

[266] Ibid., at A.7.2.3.

[267] See note 2, Government Accountability Project, 2024, DEEP IMPACT, at 63–64.

[268] Ibid., at 70, 71.

— Central and Peripheral Nervous Systems

The dispersant-only evidence in Table 5A includes a lab study that was previously discussed to support potential human health effects by showing that dispersants alter membrane permeability (Table 1) and a testimonial to support human experience with respiratory and/or skin sensitizers (Table 4A). These are discussed further in this section as evidence of central and peripheral nervous system toxicity. The new oil-dispersant evidence in Table 5A includes two epidemiology studies that show Corexit dispersants are neurotoxins.

A 2011 lab study found that whole-body inhalation exposure of male rats to Corexit 9500A disrupted neurotransmitter signaling in the brain by jamming, destroying, or misaligning the synapses, the junctions where neuron filaments connect and communicate with each other within the brain and between the brain and the rest of the body.[269] Specifically, Corexit 9500A destroyed olfactory marker proteins involved in signal transduction, the watchmen that oversee the process of transferring genetic material into cells—or in this case, of blocking entry of foreign genetic material (Corexit chemicals) into cells. Corexit destroyed a particular protein, tyrosine hydroxylase, the signalmen responsible for making and regulating the signal hormone dopamine, a key neurotransmitter in the brain. The signalmen were destroyed in a particular place, the striatum, a signal tower of sorts, a deep-brain nucleus that links motivation to motor movements of simple motor tasks as well as more complex cognitive tasks, such as reward processing, decision-making, and social interactions.

Corexit 9500A also disrupted the levels and functions of glial cells in the frontal cortex (an area of the brain involved in performance of motor tasks, judgment, abstract thinking, creativity, and maintaining social appropriateness) and in the hippocampus (an area of the brain involved in memory and learning—e.g., holding short-term memories and transferring them to long-term storage—and in processing emotion). Glial cells regulate neurotransmission and help form and maintain the blood-brain barrier, a docking station of sorts for the precise alignment and fusion of vesicles that shuttle neurotransmitters into or out of brain cells.

By disrupting the levels and functions of glial cells, Corexit 9500A altered the permeability of the blood-brain barrier, allowing toxic chemicals to flood into the brain. Brain injury occurred in areas that would change the behavior and performance of the affected individual.[270]

On balance, this study is powerful evidence that Corexit 9500A destroys or alters the function of the brain's watchmen, signalmen, signal code, and regulators, and the communication infrastruc-

[269] See note 183, Sriram et al., 2011, Neurotoxicity with acute inhalation exposure, Corexit 9500A.

[270] Ibid.

ture—the junctions, signal towers, docking stations, and the blood-brain barrier itself. It is an example of the mechanisms of dispersant-driven harm at the cellular level that disrupt homeostatsis, a state of balance within cells that maintains a state of balance among all the body systems needed for the body to survive and function correctly. As within, so without: Homeostasis.

Exposed and affected Gulf coast residents dubbed the brain fog, disorientation, and short-term memory loss, "Corexit brain."[271] The brain controls how we think, learn, move, and feel. Lori B's experience, after being directly sprayed with Corexit 9527A, was of feeling sick and fatigued all the time, memory loss, and bad headaches, blurry vision, dizziness, vertigo, bouts of seizures, and blackouts—all indicators of central nervous system (brain) damage. Her experience with hypersensitivity to odors, light, and sound, discussed earlier,[272] with or without migraines,[273] stems from dispersant ravaging specific areas of her brain associated with hearing, sound, sensations, and the auditory pathway. It is life-changing—and it was mirrored in thousands of others who are experiencing severe and extensive brain damage from dispersant encounters.

All these symptoms are consistent with manifestations of central nervous system effects, described as "Significant functional changes, more than transient in nature, in the respiratory system, central or peripheral nervous systems, other organs or other organ systems, including signs of central nervous system depression and effects on special senses (e.g., sight, hearing and sense of smell)," in OSHA's HAZCOM standards under Specific Target Organ Damage (STOT) for single[274] and repeat exposures[275]

The two epidemiology studies also found neurological system damage from oil-dispersant exposures. One USCG study found positive associations and significant trends between increased frequency of oil-dispersant exposure via inhalation or skin contact and increased likelihood of headaches, lightheadedness, difficulty concentrating, numbness/tingling sensation, blurred vision, and memory loss/confusion that "were appreciably greater in magnitude than for oil alone for all neurological symptoms."[276]

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[271] See note 2, Lorrie Williams Affidavit, 2012; In: Government Accountability Project, 2015, Deadly Dispersants Addendum.

[272] See notes 149–151 and discussion.

[273] Chitsaz A, Ghorbani A, Dashti M, et al, 2017. The prevalence of osmophobia in migranous and episodic tension type headaches. *Adv Biomed Res*. 2017 Apr 17;6:44. doi: 10.4103/2277-9175.204587.

[274] See note 20, OSHA § 1910.1200 Appendix A, at A.8.2.1.7.3(b) (single exposure).

[275] Ibid., at A.9.2.7.3(b) (repeated exposure).

[276] Krishnamurthy JK, Engel LS, Wang L, + 5. 2019. Neurological symptoms associated with oil spill response exposures: Results from the Deepwater Horizon oil spill Coast Guard cohort study. *Environ Intl.* 163:104963. doi: 10.1016/j.envint.2019.104963

The USCG study also noted that "exposure via both inhalation and skin contact resulted in the highest prevalence ratios for numbness/tingling sensations and blurred/double vision, in particular."[277] Tingling or numbness in the appendages such as described by Theo Atkinson, and blurred or double vision,[278] can result from damage to the peripheral nervous system—in these cases, linked with chemical exposures to dispersants-only or oil-dispersants.

The peripheral nervous system consists of nerves that go to the skin and muscles (somatic nervous system) and nerves that connect the central nervous system to visceral organs like the heart and stomach (autonomic nervous system). Other acute expressions or symptoms of peripheral nervous system damage during the oil spill include tingling skin associated with skin damage from rashes and inflammation, and gastrointestinal distress such as nausea and vomiting—all of which were commonly reported by workers exposed to dispersants-only or oil-dispersants during the BP oil disaster[279] and are listed under acute conditions in the BP Medical Claims Settlement.

An NIH GuLF study assessed chronic neurological function 4–6 years after the oil spill. It found modest decreases in neurobehavioral function, especially in sustained attention, memory, executive function,[280] and coding (response speed)[281] associated with both airborne exposures to oil spill vapors (of BTEX and n-hexane) and job class.[282] The magnitude of the deficit, as measured by summary response latency (the delay in response), was the equivalent of aging 4 to 9 years, and it varied across the job classes with the greatest magnitude for land cleanup workers (9 years).[283] Significantly, the airborne levels to which most spill response workers were exposed "were at the lower end of levels typically encountered in occupational settings, but above levels typically experienced by the general population"[284]—under normal conditions. Because of the elevated response in the land cleanup workers, this study has implications for the exposed public who were largely part of the same local populace as most of the GuLF cohort.

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[277] Ibid., at 7.

[278] Cleveland Clinic online, 2024. Peripheral neuropathy. https://my.clevelandclinic.org/health/diseases/14737-peripheral-neuropathy

[279] See note 2, Betsey Miller Affidavit, 2012, "skin tingling," "violent vomiting"; In: Government Accountability Project, 2015, Deadly Dispersant Addendum.

[280] Neural executive function is a set of skills, controlled by the frontal lobe of the brain, that allow you to get things done by managing your time, paying attention, planning and organizing, remembering details, and multitasking.

[281] Neural coding concerns how information is transformed as it is processed in the brain to produce directed behavior, e.g., an external stimulus and response.

[282] Quist AJL, Rohlman DS, Kwok RK, et al. 2019. Deepwater Horizon oil spill exposures and neurobehavioral function in GuLF STUDY participants. *Environ Res*. Dec;179(Pt B):108834. doi: 10.1016/j.envres.2019.108834.

[283] Ibid., at 7.

[284] Ibid., at 3.

The NIH GuLF study focused on neurotoxicity of airborne oil components, the BTEX and n-hexane that were found in the blood of exposed workers and residents.[285] Spraying dispersants from planes and surface vessels also likely increased the amount of aerosolized oil particulate PAHs[286] and the associated health risk from these neurotoxins.[287] As previously noted, the increased health risk from the *smaller size* of the PAH aerosols is not measured using tradition analytical methods but would have been detected in the job-based classification as decreased neurobehavioral function, as found in the NIH GuLF study. Further, land cleanup workers and coastal residents were at increased health risk from nearshore dispersant spraying operations and decontamination activities that used dispersants to "clean" equipment.[288]

The BP Medical Claims Settlement fails to list *any* chronic neurological harm linked with the initial symptoms of potential neurological damage.[289] This failure derives, in part, from the Manufacturer's failure to accurately and fully communicate the known health hazards from its Corexit products—something this petition seeks to remedy in future SDSs by making anything less than accurate, complete, and current information grounds for product removal.

Based on the evidence presented in Table 5A, we find that the Manufacturer's statements in its SDSs of "no data available" regarding specific target organ toxicity from repeated or prolonged exposure of the product to the central and peripheral nervous systems are incorrect or outdated based on evidence and information available prior to or after the publication, respectively.

— Hematological, Respiratory, and Cardiovascular Systems

Evidence in Table 5B includes a clinical study with oil spill workers that assessed acute and chronic hematological changes and acute and chronic pulmonary and cardiac functions over a 7-year period, and two epidemiology studies that assessed initial cardiovascular symptoms and chronic risk of coronary heart disease.

Once oil enters the bloodstream, it is metabolized mainly in the liver and the metabolites produce reactive oxygen species that are excreted in the urine. The metabolites and reactive oxygen species cause oxidative stress in the body, affecting DNA, protein, lipids, and cellular membranes, and altering profiles of blood and liver enzymes, and urinary metabolites.[290] These are warning

[285] See notes 214–218.

[286] See notes 87–97.

[287] Olasehinde TA, Olaniran AO. 2022. Neurotoxicity of polycyclic aromatic hydrocarbons: A systematic mapping and review of neuropathological mechanisms. *Toxics*. 2022 Jul 25;10(8):417. doi: 10.3390/toxics10080417

[288] See notes 106–119.

[289] See note 36, BP Medical Claims Settlement, 2012, Exhibit 8, at 13–14.

[290] Reardon S, 2011. Gulf oil spill. Ten months after Deepwater Horizon, picking up the remnants of health data. *Science* 331:1252.

signs, the harbingers of potential chronic illnesses and cancers that require early intervention to minimize long-term harm.

The clinical study assessed prevalence of symptoms, pulmonary and cardiac function, and hematologic and hepatic biomarkers in a cohort of responders who had worked at least 3 months along the coast of Louisiana and had been exposed to the oil spill and dispersants. Results were compared with unexposed persons who lived at least 100 miles away from the Louisiana coast.

During the initial clinical study, the most reported symptoms associated with oil-dispersant exposure included frequent headaches (77%), shortness of breath (71%), skin rash (59%), chronic cough, dizzy spells, and fatigue (51–49%), among others like chest pain,[291] consistent with findings from other oil spills.[292] The incidence of their occurrence was comparable 7 years after the disaster.[293] Also during the initial study, workers also had significantly altered blood profiles (decreased platelet counts and increased hematocrit levels and white blood cell counts), significant amounts of phenol in their urine (indicating benzene exposure), and higher levels of three liver enzymes that are specific biomarkers of hepatic dysfunction and damage, compared to the unexposed group. No improvement was found after 7 years, indicating prolonged, adverse harm and possible development of blood and liver toxicity due to oil spill exposure.

Further, while none (0%) of the workers had experienced severe pulmonary function abnormalities during their initial visit, most workers had progressive deterioration of their respiratory system over 7 years—91% had developed chronic rhinosinusitis and 45% had chronic reactive airways dysfunction syndrome.[294] Initial ECGs (electrocardiograms) revealed that over half (52%) of the workers experienced some type of cardiac function abnormalities indicative of increased risk of heart failure from cardiovascular diseases, an unexpected finding given the average age of the subjects (35.8 years).[295] Seven years later, cardiac function abnormalities were slightly decreased (41%), an improvement possibly due tissue repair, according to the authors who

[291] D'Andrea MA, Reddy GK. 2013. Health consequences among subjects involved in Gulf oil spill clean-up activities. *Amer J Med*. Nov. 126(11):966-74. doi: 10.1016/j.amjmed.2013.05.014

[292] See note 126, Aguilera et al., 2010, A review of oil spill effects on human health; Laffon et al., 2016, Updated review; Levy, Nassetta, 2011, A review of oil spill effects on human health.

[293] D'Andrea MA, Reddy GK. 2018. The development of long-term adverse health effects in oil spill cleanup workers of the BP Deepwater Horizon offshore drilling rig disaster. *Front Public Health*. Apr 26; 6:117. doi: 10.3389/fpubh.2018.00117

[294] Ibid.

[295] Ibid., at 6. Cardiac function abnormalities included abnormal ECG, ventricular conduction delay, anterior fascicular block, sinus rhythm nonspecific T wave, sinus bradycardia ST and T wave abnormality, sinus rhythm early repolarization, and ventricular hypertrophy.

concluded that "intensive participation for only several weeks in oil spill cleanup activities resulted in persistent long-term adverse health effects."[296]

These studies provide clinical evidence of the immediate health effects experienced by workers and residents exposed to oil and dispersants. The interpretation of harm from oil, dispersants, and oil-dispersant exposures was left to subsequent epidemiology studies. The clinical studies also demonstrate the need for SDSs to provide accurate, complete, and current information—unlike the 2019 SDSs—so that physicians can intervene early to minimize chronic harm from these chemical exposures.

A US Coast Guard study found an increased prevalence of chest pain, and a trend of increased prevalence of sudden heartbeat changes, associated with increased self-reported exposures to crude oil and to oil-dispersant exposures via inhalation, skin contact, and being in the vicinity of burning oil.[297] Analysis of associated medical data revealed an elevated hazard risk of essential hypertension diagnosis (mostly benign) during 2010–2012 and elevated hazard risk during 2013–2015 for mitral valve disorders and heart palpitations that are major risk factors for developing coronary heart disease (CHD).[298] Non-significant elevated risks were observed for other forms of chronic ischemic heart disease and its subcategory, coronary atherosclerosis in responder vs. non-responder comparisons. The cardiovascular symptoms and conditions were generally stronger among workers who reported exposures to oil-dispersants than those who reported neither. Because the study cohort was young and healthy (mean age 30 years), the investigators "did not expect to observe severe heart disease such as [myocardial infarctions, i.e., heart attacks] or CHD after only five and a half years of follow-up."[299]

The NIH GuLF studies examined long-term cardiovascular associations in an older, less fit, and more diverse cohort 5- and 10-years after the oil spill. The 5-year studies found increased risk of heart attacks and fatal CHD were associated with longer duration of response work (> 180 days vs 1–30 days), residential proximity of the spill (living in or adjacent to a county or parish with an oiled coastline),[300] and higher estimated exposure to total hydrocarbons using the job-exposure

[296] Ibid.

[297] Denic-Roberts H, Rowley N, Haigney MC, et al. 2022. Acute and longer-term cardiovascular conditions in the Deepwater Horizon oil spill Coast Guard cohort. *Environ Intl.* 158: doi.org/10.1016/j.envint.2021.106937

[298] Ibid.

[299] Ibid., at 8.

[300] Strelitz J, Keil AP, Richardson DB, et al. Self-reported myocardial infarction and fatal coronary heart disease among oil spill workers and community members 5 years after Deepwater Horizon. *Environ Res.* 2019 Sep 22, 168:70–79. doi: 10.1016/j.envres.2018.09.026

model as a surrogate for concentrations.[301] Airborne particulate levels carrying an oil spill-derived aerosol signature were elevated in coastal communities through at least September 2010, as discussed earlier,[302] with implications for both land-based cleanup workers and coastal residents.

Both dispersant use and burning of surface oil contribute to particulate formation and aerosolization, however, the NIH GuLF studies "were unable to account for co-exposure to all other occupational exposures from the oil spill response activities, such as chemicals dispersants…"[303] The 10-year follow-up study focused on associations from exposure to burning surface oil only and thus is of limited utility to our purpose, other than to confirm that exposure to increased fine particulate matter (PM2.5) was linked with increased CHD risk among these exposed response workers. As discussed earlier, Corexit dispersants also increase the amount of oil-dispersant aerosols and the health risk of respiratory harm.[304]

Like the clinical study, these epidemiology studies demonstrate that oil spill exposure resulted in persistent long-term adverse harm to the hematological, respiratory, and cardiovascular systems. Based on the evidence presented in Table 5B, we find that the Manufacturer's statements in its SDSs of "no data available" regarding specific target organ toxicity from repeated or prolonged exposure of the product to these systems are incorrect or outdated based on evidence and information available prior to or after the publication, respectively.

V. The Weight of Evidence: Summary and Request for Removal

After some 50 years of dispersant use in oil spill response, the first modern studies to focus on human health effects of Corexit 9527A and 9500A collectively and consistently found that exposures to these products and their secondary products—the oil-dispersant mixtures—are more harmful than exposure to oil alone, and that exposures are causally linked with respiratory and skin sensitization, and long-term respiratory, neurological, and cardiovascular harm, and cancers.

Altogether, 39 cases of testimonials, lab, clinic, and epidemiological studies were selected as evidence to challenge select statements in the Manufacturer's 2019 SDSs for Corexit 9500A and 9527A. The clinic and epidemiology studies and testimonials are corroborated by 11 lab studies

[301] Strelitz J, Sandler DP, Keil AP, Richardson DB, Heiss G, Gammon MD, Kwok RK, Stewart PA, Stenzel MR, Engel LS. Exposure to total hydrocarbons during cleanup of the Deepwater Horizon oil spill and risk of heart attack across 5 years of follow-up. May 2019. *Amer J Epidemiology* 188(5:917–927. https://doi.org/10.1093/aje/kwz017

[302] See notes 98–103, re: transport of airborne oil spill contaminants within and above the marine boundary layer.

[303] Chen D, et al., 2023. Fine particulate matter and incident coronary heart disease events up to 10 years of follow-up among *Deepwater Horizon* oil spill workers. *Environ Res* 217:114841. At 7. https://doi.org/10.1016/j.envres.2022.114841.

[304] See notes 91–97 and text.

with animals from mice to whales (mammals) and from vertebrates (fish) to invertebrates (crabs). Collectively, the weight of evidence includes the following types of studies by focus area.

Focus Area and Type of Study	Testimony	Lab	Clinic	Epidemiology
Table 1. Experience – Skin	10		3	1
Table 2. Experience – Inhalation		2		5
Table 3. Product Toxicity				
A. Sensitizer	2	1		
B. Carcinogenicity		6		
C. Reproductive Effects		1		
Table 4. Specific Target Organ Toxicity				
A. Central/Peripheral Nervous Systems	1	1		2
B. Blood, Respiratory, Cardiovascular			2	2
Totals (39)	**13**	**11**	**5**	**10**

The evidence was presented as dispersant-only exposures, for which the Manufacturer is responsible/liable for harm, and as oil-dispersant mixture exposures, for which the authorizing entity for listing the product for use during oil spill response (the U.S. EPA) is responsible/liable for harm associated with such use. Accordingly, the dispersant-only evidence serves as grounds for product removal under the regulations, i.e., 40 CFR § 300.970(a)(1) and/or (a)(2), while the oil-dispersant evidence serves as additional grounds for removal under the law, i.e., 33 U.S.C. § 1321(d)(2)(G)(iii). The evidence is summarized by rule.

Under the regulations and contrary to the Manufacturer's statements in the 2019 SDSs, there were data available on potential health injuries of dispersant exposure via skin contact or inhalation *under normal use*. The potential was realized in the human experience as multi-symptom, multi-system harm associated with these products' innate ability to render cell membranes fully permeable. This facilitates the rapid and efficient transfer of dispersant and oil across skin and/or lungs into the bloodstream and across the blood-brain barrier into the brain. Once in the bloodstream, these dispersants can impact multiple body systems and initiate multiple cancer pathways, some of which have been identified in the selected studies. Once in the brain, these dispersants can impact both the central and peripheral nervous systems, impacting multiple body systems and emotions, learning, and behavior.

There were data available for each product and for ingredients common in both products like DOSS. With the latter, evidence of harm from one product implicates the other. In general, Corexit 9527A was a more potent genotoxin, and 9500A a more potent cytotoxin, but significant harm was incurred from each product. These data show that Corexit dispersants are potent respiratory and skin sensitizers (both), potent carcinogens (both), and a potent teratogen (9527A only tested to-date, but the harm was incurred from a common ingredient DOSS).

Further, the list of specific target organ toxicity includes extensive and debilitating central nervous system damage and peripheral nervous system damage, hematological system (blood) damage associated with cancer initiation pathways, respiratory system damage expressed as respiratory sensitivities and chronic diseases, integumentary (skin) system damage expressed as skin sensitization and chronic reoccurring rashes and lesions, and cardiovascular system damage expressed (currently) as increased risk of heart attacks and fatal coronary heart disease.

The human experience from dispersant exposure and oil-dispersant exposure via skin contact or inhalation is now largely defined by post-BP disaster science. This record of debilitating illnesses and premature deaths continues to grow as new studies of chronic harm are published. The magnitude of acute and chronic harm from oil-dispersant exposures was appreciably greater than from oil alone.

In general, the evidence in Tables 1, 4, and 5 support removal under regulations, while the human evidence in Tables 2 and 3 support removal under law. It is the weight of all available evidence that makes the case for product removal. For example, evidence of respiratory harm is found in Table 1 as potential harm from permeability of bronchial airway cells, Tables 2 and 3 as human evidence of respiratory and skin sensitization and other harm, Table 4 as the mechanism of skin sensitization, and Table 5 as chronic respiratory conditions including some indicative of respiratory sensitization.

And, finally, it should be evident from this record that, contrary to the Manufacturer's statements in the 2019 SDSs on first aid measures, treatment for symptoms alone will *not* lead to accurate diagnosis and treatment of illnesses caused by dispersant or oil-dispersant exposures. This was known and even explained in the 2012 OSHA HAZCOM standard. Finding the mechanism for chemical intolerance in 2021 only confirmed that a holistic approach is required to prevent the long-term harm associated with exposure to mixtures that include respiratory and skin sensitizers. Treating symptomatically is like severing one viper on the head of Medusa and hoping that all the other vipers won't kill your patient, when what really needs to happen is removal of the Medusa—the toxic oil-dispersant chemicals in the body.

We find the weight of evidence to remove Corexit 9527A and 9500A from the NCP Schedule compelling. Instead of considering individual studies separately, this compilation reveals the whole picture of long-term harm caused by these products. *This weight of evidence is the new or relevant information not previously considered collectively by EPA*.

Further, under OSHA's HAZCOM standard, the Manufacturer has provided data and information that are misleading, inaccurate, incorrect, and outdated for First Aid Measures and Toxicological Information on multiple counts in its SDSs for these products. The Manufacturer's submittal of

these SDSs in its information package to EPA to maintain product registration on the NCP Schedule now becomes grounds for removal of these Corexit dispersant products from the NCP Schedule. The weight of evidence also demonstrates that these products cannot be used safely in waters of the United States, when considering impacts or potential impacts of the product to human health or the environment.

There are two reasons to expedite the decision-making process. First, EPA has allowed conditional use of these products until December 12, 2025, despite the facts that they are no longer manufactured, as of November 2022 (Exhibit 1), or supported by technical information (such as the SDSs) for registration within the regulatory framework as of July 1, 2023 (Exhibit 2). Yet these Corexit dispersants are still widely available and preauthorized for use in coastal states. To avoid a repeat of the human health tragedy that followed in the wake of the BP Deepwater Horizon oil disaster, we request that EPA engage in an expedited decision-making process for our request.

This confluence of events has put EPA in an untenable position: How can EPA justify using products that the Manufacturer no longer manufactures or supports with updated, accurate technical information?

We ask EPA to set precedent that anything less than accurate, complete, and current information in technical literature, provided by a manufacturer, concerning impacts or potential impacts of a product to human health and the environment, WILL be grounds for product removal.

The Manufacturer of Corexit 9527A and 9500A has failed to meet this bar. We ask the EPA to ban these products—effective immediately.

APPENDIX A

MANUFACTURER'S STATEMENTS, FACT SUMMARY, AND FINDINGS, AND TABLES 1–5

NOTE: Manufacturer's statements were selected from the 2019 Safety Data Sheets (SDSs) for Corexit 9500A[305] and Corexit 9527A.[306] Statements from Sections 4 and 11 of the SDSs are identical for each of the Corexit dispersants except where noted. Two TRUE statements (††) are included for discussion. Statements contrary to new or relevant information published after the SDSs (Aug. 30, 2019) are considered outdated.

MANUFACTURER'S STATEMENTS FROM 2019 SAFETY DATA SHEETS FOR COREXIT DISPERSANTS 9500A & 9527A

Section: 4. First Aid Measures

Notes to physician	:	Treat symptomatically.
Most important symptoms and effects, acute and delayed	:	See Section 11 for more detailed information on health effects and symptoms.

Section: 11. Toxicological Information

Potential Health Effects

Skin, 9500A	:	Health injuries are not known or expected under normal use.
Skin, 9527A	:	Harmful in contact with skin. (††)
Inhalation, 9500A	:	Harmful if inhaled. (††)
Inhalation, 9527A	:	Health injuries are not known or expected under normal use.
Chronic exposure, both	:	Health injuries are not known or expected under normal use.

Experience with Human Exposure

Skin contact, 9500A	:	No symptoms known or expected.
Skin contact, 9527A	:	No information available.
Inhalation, 9500A	:	No information available.
Inhalation, 9527A	:	No symptoms known or expected.

Toxicity – Product

Respiratory or skin sensitization	:	no data available
Carcinogenicity	:	no data available
Reproductive effects	:	no data available
Teratogenicity	:	no data available

Specific Target Organ Toxicity (STOT) – Repeated or Prolonged Exposure

STOT - repeated exposure	:	no data available

[305] Manufacturer Corexit Dispersants, 2019. SDS Corexit EC9500A. 8/30/2019. https://alertproject.org/wp-content/uploads/2024/04/Corexit-9500-2019.pdf

[306] Manufacturer Corexit Dispersants, 2019. SDS Corexit EC9527A. 8/30/2019. https://alertproject.org/wp-content/uploads/2024/04/Corexit-9527-2019.pdf

(1) FACTS: Regarding statements on First Aid Measures.

It was known since 2011 that Corexit 9500A was a potent skin sensitizer, and that DOSS, the active ingredient in 9500A, was a moderate skin sensitizer. Since Corexit 9527A also contains DOSS as an active ingredient, this makes 9527A a suspected skin sensitizer as well.

The OSHA HAZCOM standard recommended in 2012 that exposure to respiratory or skin sensitizers should be treated comprehensively, not symptomatically, with a clinical history that includes both medical and occupational history to determine the relationship between the current exposure and the development of hypersensitivity.

FINDING: These First Aid Measures statements are misleading and inaccurate.

(2) FACTS: Regarding statements on Potential Health Effects (Table 1).

It was known since 1991 that, in humans during whole body exposure to *airborne* 2-butoxyethanol, an ingredient in Corexit 9527A, the primary route of uptake into the blood—accounting for 75% of the total uptake—was *absorption across the skin*, not inhalation.

It was known since 2011–2015 that these dispersants possess an inherent capacity, as potent surfactants, to render cell membranes fully permeable, across species including humans, thereby rapidly and efficiently facilitating the transfer of dispersant and oil across skin and/or lungs into the bloodstream and across the blood-brain barrier into the brain.

FINDING: The Potential Health Effects statements are incorrect and outdated.

(3) FACTS: Regarding statements on Experience with Human Exposure (Tables 2 and 3).

It was known since 2012–2019 that Corexit dispersants remained associated with oil and were persistent in harmful concentrations—as fine coatings of sand grains, residual tar balls and weathered materials, and submerged sediments or coarsely aggregated material in coastal waters where people walked, waded, and swam throughout the spill area—during the response and for up to at least 1.5 years after the disaster.

It was known since 2012–2017 that these weathered oil-dispersant mixtures were readily absorbed across human skin, especially moist or wet skin and that PPE, even when used, was inadequate to protect workers from harm.

It was known since 2013—2016 that extraordinarily high levels of oil contaminants in crude oil and dispersants, associated with end organ damage, were found in the blood of workers and coastal residents during the months of peak oil spill emissions in 2010 and that these levels had returned to background 1–3 years later (2019), while retaining a signature of formerly high concentrations.

It was known since 2013 (testimonials) and 2017–2022 (studies) that exposure to Corexit dispersants only or as oil-dispersant mixtures via skin contact or inhalation was strongly associated with acute symptoms of skin and respiratory irritation and neurological harm and

chronic conditions of respiratory damage—and that these associations were much stronger than for exposure to oil alone. Also, harm occurred at low levels of exposure, and worsened over time with reoccurring skin rashes, headaches, and persistent coughs, consistent with chemical intolerance from respiratory and/or skin sensitization.

FINDING: The statements on Experience with Human Exposure are incorrect and outdated.

(4) FACTS: Regarding statements on Product Toxicity (Tables 4A to C).

It was known since 2011 that Corexit 9500A is a potent skin sensitizer and that its active ingredient, DOSS, is a moderate skin sensitizer. Since DOSS is an active ingredient in Corexit 9527A, this makes 9527A a suspect skin sensitizer as well. Testimonials (and medical records) from individuals who experienced skin contact with 9527A or oil-dispersants are consistent with exposure to respiratory and skin sensitizers.

It was known since 2013—2020 that both Corexit products are potent carcinogens: Tests on various mammal cells from mice to whales, and humans, found that Corexit 9527A and 9500A with or without oil consistently promoted genotoxicity by damaging DNA and triggering multiple cancer pathways; 9527A generally elicited more pronounced responses than 9500A.

It was known since 2016 that Corexit 9527A is a potent teratogen as it interferes with retinol signaling and neuronal differentiation that are critical to embryo survival, and that the surfactant ingredient DOSS was largely responsible for this harm. Since Corexit 9500A also contains DOSS as an active ingredient, this makes 9500A a suspected teratogen as well.

There is cause for concern that these Corexit products may be reproductive toxins as aerosols were implicated in epidemiology studies found poor live birth and health outcomes from oil spill (oil, dispersant, and oil-dispersant) exposures of dolphins, responders, and residents from the oil-impacted region.

FINDING: The cited Product Toxicity statements are incorrect and outdated.

(5) FACTS: Regarding statements on Specific Target Organ Toxicity (Tables 5A and B).

It was known since 2011–2020 that Corexit dispersants are potent neurotoxins that cause central nervous system damage, experienced by responders and residents as brain damage and loss of function, bad headaches, hypersensitivities to odors, light, and sound, fatigue, irregular heartbeat, and peripheral nervous system damage, experienced as numbness or tingling in the appendages, blurred or double vision, and nausea.

It was known since 2013–2018 that Corexit dispersants are blood system and respiratory system toxins as oil-dispersant exposure significantly altered blood profiles in ways indicative of cellular level damage associated with (spill-related) benzene damage and liver dysfunction and damage; and further, that progressive deterioration of the respiratory system occurred over time with development of chronic reactive airways disease, indicative of chemical intolerances. among other conditions.

It was known since 2019–2022 that Corexit dispersants are potent cardiovascular system toxins as oil-dispersant exposure increased risk of severe heart disease (heart attacks) and coronary heart disease after only five and a half years—even in a young, fit population; and, further, symptoms and conditions were generally stronger among workers who reported oil-dispersant exposure (vs. oil alone) and among residents who lived in oil-impacted areas.

FINDING: The statements on Specific Target Organ Toxicity are incorrect and outdated.

Table 1. Potential human health effects

Dispersant-only exposure

- Whole body exposure of male human volunteers to 2-butoxyethanol resulted in uptake rates and concentrations in blood that were 3–4 times higher from dermal absorption than from inhalation; OSHA Sweden affiliated authors cautioned that respirators alone were unlikely to adequately protect workers from 2-butoxyethanol vapors.[307]
- In a 2015 lab study across species, Corexit 9500A altered membrane permeability of respiratory epithelial cells from human and mouse lungs and gills of zebrafish and blue crab through inflammation of cell tissue and cleavage of key proteins, leading to cell death (apoptosis).[308]
- In a 2011 lab study with male rats, whole-body inhalation exposure to Corexit 9500A altered the permeability of the blood-brain barrier, allowing toxic chemicals to flood into the brain and disrupting neurotransmitter signaling in the brain in ways that would change the behavior and performance of the affected individual.[309]
- In a 2014 lab study, Corexit 9500A altered intracellular oxidative states and led to mitochondrial dysfunction and apoptosis in five different types of mammalian cells including human embryo and adult kidney cells, human glial cells, rat nerve cells from the hippocampus (an area of the brain involved in memory, learning, and emotion), and mouse skin cells.[310]

[307] Johanson G, Boman A (OSHA Sweden), 1991. Percutaneous absorption of 2-butoxyethanol vapour in human subjects. *Brit J Industrial Med*, 48:788–792. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1035455/

[308] Li FJ, Duggal RN, Oliva OM, et al., 2015. Heme oxygenase-1 protects Corexit 9500A-induced respiratory epithelial injury across species. *PLoS ONE* 10(4):e0122275. https://doi.org/10.1371/journal.pone.0122275

[309] Sriram K, Lin GX, Jefferson AM, et al. 2011. Neurotoxicity following acute inhalation exposure to the oil dispersant COREXIT EC9500A. *J Toxicol Environ Health A* 74: 1405–1418. https://www.tandfonline.com/doi/full/10.1080/15287394.2011.606796

[310] Zheng M, Ahuja M, Bhattacharya D, et al., 2014. Evaluation of differential cytotoxic effects of the oil spill dispersant Corexit 9500A. *Life Sci* 95: 108–117. https://www.sciencedirect.com/science/article/abs/pii/S0024320513007571

Table 2A. Experience with human exposure: Skin contact
Dispersant-only exposure
• Direct skin contact with Corexit 9527A caused skin corrosion (lesions, rashes, and dermatitis) with scarring, reoccurring itchy rashes, and hair loss.[311]
• Direct skin contact with Corexit 9527A also led to feeling sick and fatigued all the time, memory loss, bad headaches, dizziness, vertigo, bouts of seizures, and blackouts.[312]
• An NIH GuLF study found that exposure from skin/clothing with Corexit 9527A/9500A was significantly associated with skin irritation despite "relevant PPE use" reported by 97% of the participants in the dermal analysis group.[313] There was also a positive but nonsignificant association with excessive hair loss.

[311] Lori Bosarge Affidavit, 2012; In: Government Accountability Project, 2015. Addendum Report to Deadly dispersants in the Gulf. Devine S, Devine T.

[312] Ibid. See notes 137–144 and discussion.

[313] McGowan CJ, Kwok RK, Engel LS, et al. 2017. Respiratory, dermal, and eye irritation symptoms associated with Corexit™ EC9527A/EC9500A following the BP DHOS: Findings from the GuLF STUDY. *Environ Health Perspect.* Sep, 125(9): 097015. doi: 10.1289/EHP1677

Table 2B. Experience with human exposure: Skin contact

Oil-dispersant exposure

- Corexit dispersants remain associated with oil in the environment and were found to persist on oiled Gulf of Mexico beaches for about four years[314] or longer for larger tar mats and balls.[315]
- Weathered oil-dispersant material that washed ashore between Waveland, Mississippi, and Cape San Blas, Florida (some 330 miles), was still highly toxic 11 to 19 months (~1 to 1.5 years) after the BP Deepwater Horizon oil disaster.[316] Also from this study:
  - Dispersants act as a "built-in absorption accelerant," making uptake of oil by skin absorption, especially for wet skin, rapid and highly efficient.
- Crude oil volatile organic compounds and n-hexane were found in the blood of workers, coastal residents, and children during peak emissions of the BP oil disaster at very high levels associated with end organ damage.[317]
- Residual levels of oil contaminants were still evident in blood 1–3 years later, and they still carried the signature of once-high levels of oil components even as the overall levels returned to background.[318]
- Numerous and consistent acute and chronic reports from exposed Gulf coast residents of an intensely itchy rash of small red bumps, later dubbed the "Suicide Itch."[319]

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[314] White HK, Lyons SL, Harrison SJ, Findley DM, Liu Y, Kujawinski EB. 2014. Long-term persistence of dispersants following the Deepwater Horizon oil spill. *Environ Sci Technol Lett.* 1(7):295–299. doi.org/10.1021/ez500168r

[315] Bociu I, Shin B, Wells WB, et al., 2019. Decomposition of sediment-oil agglomerates in a Gulf of Mexico sandy beach. *Scientific Reports* 9:10071. https://doi.org/10.1038/s41598-019-46301-w

[316] Kirby J III. 2012. Findings of persistency of polycyclic aromatic hydrocarbons in residual tar product sourced from crude oil released during the BP DHOS MC252 spill of national significance. Supported by Surfrider Foundation, April 14. http://surfridercdn.surfrider.org/images/uploads/publications/Corexit_Connections.pdf

[317] Summarco PW, Kolian SR, Warby RA, et al., 2016. Concentrations in human blood of petroleum hydrocarbons associated with the BP Deepwater Horizon oil spill, Gulf of Mexico. *Arch Toxicol* 90(4):829-37. doi: 10.1007/s00204-015-1526-5

[318] Doherty BT, et al., 2017. Associations between blood BTEXS concentrations and hematological parameters among adult residents of the U.S. Gulf states, Table 2. *Environ Res* 26;156:579-587. doi:10.1016/j.envres.2017.03.048

Werder EJ, et al., 2019. Blood BTEX levels and neurologic symptoms in Gulf states residents. *Environ Res* 175:100-107. doi: 10.1016/j.envres.2019.05.004

[319] Affidavits of Kindra Arnesen, A.C. Cooper, Jorey Danos, John Gooding, Jamie Griffin, Steve Kolian, Betsey Miller, Michael Robichaux MD, Wilma Subra, 2012; In: Government Accountability Project, 2013. Deadly Dispersants in the Gulf: Are Public Health and Environmental Tragedies the New Norm for Oil Spill Cleanups? Devine S, Devine T. https://whistleblower.org/wp-content/uploads/2017/11/Corexit_Report_Part1_041913_compressed.pdf

Government Accountability Project, 2020. Ten Years After Deepwater Horizon: Whistleblowers Continue to Suffer an Unending Medical Nightmare Triggered by Corexit. Devine T, Arnold A. At 11, suicide itch. https://whistleblower.org/wp-content/uploads/2020/04/Ten-Years-After-Deepwater-Horizon.pdf

Table 3A. Experience with human exposure: Inhalation
Dispersant-only exposure

• An NIH GuLF study found airborne dispersant exposure was significantly associated with adverse respiratory and eye irritation despite PPE use (absent respirators) reported by 48% of the participants in the respiratory analysis group.[320] Other findings indicated presence of a respirator sensitizer:
  • While direct work with dispersants was more strongly associated with symptoms of respiratory and eye irritation than indirect exposure, i.e., working in an area where dispersants were used, indirect exposure was still significantly associated with most of the same symptoms.
  • The associations between dispersant exposure and symptoms of either respiratory or eye irritation remained significant at all work locations from land to offshore, regardless of airborne concentrations of oil exposure.
  • At the time of study enrollment 1–3 years later, dispersant exposure remained significantly associated with the prevalence of most symptoms for respiratory and eye irritation among those who had reported initial symptoms—and among those who had not reported initial symptoms.

[320] McGowan CJ, Kwok RK, Engel LS, et al. 2017. Respiratory, dermal, and eye irritation symptoms associated with Corexit™ EC9527A/EC9500A following the BP DHOS: Findings from the GuLF STUDY. *Environ Health Perspect.* Sep, 125(9): 097015. doi: 10.1289/EHP1677

Table 3B. Experience with human exposure: Inhalation

Oil-dispersant exposure

- A USCG study on dispersant exposure via inhalation (Alexander et al.) found that relationships between oil-dispersant exposures and symptoms of coughing, shortness of breath, and wheezing among disaster responders were much greater in magnitude than for oil alone.[321] Other findings indicated presence of a respirator sensitizer:
  - Associations with coughing, shortness of breath, and wheezing were present before *and after* the well was capped (on July 15) when *offshore* dispersant spraying by plane and boats largely stopped, and associations were particularly strong among responders with the longest deployments (>60 days).
  - Oil-dispersant exposures had at least twice the prevalence ratios of coughing and five times the prevalence of shortness of breath and wheezing than exposure to crude oil alone, and the associations generally followed an exposure-response relationship relating to duration of exposure and increased frequency of inhalation or dermal contact.
  - Although skin irritant outcomes were not analyzed in this study, significant trends were found between respiratory symptoms of coughing and shortness of breath and increased frequency of dermal dispersant contact (as duration), suggesting that dermal exposure also contributed to respiratory symptoms and followed an exposure-response relationship.
- A USCG follow up study on dispersant exposure via inhalation (Rusiecki et al.) found that associations between inhalation of crude oil-dispersant vapors and chronic respiratory *conditions* (as diagnosed illnesses) after 5 years[322] were "appreciably greater" than for crude oil-only exposures.

[321] Alexander M, Engel LS, Olaiya N, et al., 2018. The BP DHOS Coast Guard cohort study: A cross-sectional study of acute respiratory health symptoms. *Environ Res.* Apr, 162:196-202. doi: 10.1016/j.envres.2017.11.044

[322] Rusiecki J, Denic-Roberts H, Thomas DL, Collen J, Barrett J, Christenbury K, Engel LS. 2022. Incidence of chronic respiratory conditions among oil spill responders: Five years of follow-up in the Deepwater Horizon oil spill Coast Guard cohort study. *Environ Res.* Jan; 203:111824. doi: 10.1016/j.envres.2021.111824.

Table 4A. Product Toxicity: RESPIRATORY OR SKIN SENSITIZATION
Dispersant-only exposure
• In lab studies, dermal exposure of mice to Corexit 9500A and one of its active ingredients, dioctyl sodium sulfosuccinate (DOSS), at working concentrations used during the BP Deepwater Horizon disaster response, induced a Th1-cell-mediated immunological response that led to classification of Corexit 9500A as a *potent sensitizer* and DOSS as a *moderate sensitizer*.[323]
• Direct contact with Corexit 9527A led to chronic reoccurring rashes, impaired memory function and loss, seizures, headaches, blurry vision, chemical sensitivities to smells, and sensitivities to light and sound.[324]
• Direct contact with Corexit dispersants led to chemical-induced asthma, chronic reactive airways disease, chronic reoccurring rashes and other chronic skin conditions, and severe reoccurring headaches.[325]

[323] Anderson SE, Franko J, Lukomska E, Meade BJ, 2011. Potential immunotoxicological health effects following exposure to COREXIT 9500A during cleanup of the Deepwater Horizon oil spill. *J Toxicol Environ Health A* 74: 1419–1430. https://www.tandfonline.com/doi/abs/10.1080/15287394.2011.606797

[324] Lori Bosarge Affidavit; In: Government Accountability Project, 2020, Ten Years After Deepwater Horizon.

[325] John Maas Affidavit, at 39–47; In: Government Accountability Project, 2024. DEEP IMPACT.

Table 4B. Product Toxicity: CARCINOGENICITY
Dispersant-only exposure
• In lab studies with human bronchial epithelial cells, Corexit dispersants 9500A and 9527A triggered enhanced production of reactive oxygen species at the highest test level and significantly higher cell death with more pronounced response in the 9527A tests.[326]
• In lab studies with sperm whale skin cells, Corexit 9500A and 9527A were cytotoxic and genotoxic; 9527A was less cytotoxic but more genotoxic than 9500A.[327]
Oil-dispersant exposure
• In lab studies with human bronchial epithelial cells, oil-dispersant mixtures (whole and water-accommodated fractions) promoted more double- and single-stranded DNA breaks and activation of DNA damage response mechanisms than oil alone; oil-9527A mixtures produced more double-stranded DNA breaks than oil-9500A mixtures.[328]
• In lab studies with human bronchial epithelial cells, an oil-9527A mixture induced a pattern of change towards cancer development by promoting a greater number of RNA transcription errors that blocked various receptors for protein processing and signaling than found in cells after tests with oil-9500A.[329]
• In lab studies with human bronchial epithelial cells, an oil-9527A mixture elicited the most pronounced effects on DNA damage and proliferation by initiating 27 cancer pathways compared to 8 for the oil-9500A mixture; also, oil-9527A functionally shifted the small lung cancer pathway to a smaller set of genes that have even more cancer pathways.[330]
• In lab studies with mouse models, exposure to oil-dispersant mixtures promoted more genotoxicity and DNA damage, cell death, inflammation, and tumor formation in the pulmonary system than exposures to oil or dispersant alone; also, tests with Corexit 9527A triggered more cancer pathways than tests with Corexit 9500A (19 vs. 7, respectively).[331]

[326] Shi Y, Roy-Engel AM, Wang H, 2013. Effects of COREXIT dispersants on cytotoxicity parameters in a cultured human bronchial airway cells, BEAS-2B. *J Toxicol Environ Health A* 2013; 76: 827–835. doi: 10.1080/15287394.2013.821396

[327] Wise CF, Wise JTF, Wise SS, et al., 2014. Chemical dispersants used in the Gulf of Mexico oil crisis are cytotoxic and genotoxic to sperm whale skin cells. *Aquatic Toxicol* 152:335-340. https://www.sciencedirect.com/science/article/abs/pii/S0166445X14001490

[328] Major D, et al., 2016. Effects of Corexit oil dispersants and the WAF [water-accommodated fraction] of dispersed oil on DNA damage and repair in cultured human bronchial airway cells, BEAS-2B. *Gene Rep* 3:22-30. doi: 10.1016/j.genrep.2015.12.002

[329] Liu YZ, Roy-Engel AM, Baddoo MC, et al., 2016. The impact of oil spill to lung health – Insights from an RNA -seq study of human airway epithelial cells. *Gene* 578(1):38-51. doi: 10.1016/j.gene.2015.12.016

[330] Liu YZ, et al., 2017. Carcinogenic effects of oil dispersants: A KEGG pathway-based RNA-seq study of human airway epithelial cells. *Gene* 602:16-23. doi: 10.1016/j.gene.2016.11.028 https://pubmed.ncbi.nlm.nih.gov/27866042/

[331] Liu YZ, Miller CA, Zhuang Y, et al., 2020. The Impact of the Deepwater Horizon Oil Spill upon Lung Health-Mouse Model-Based RNA-Seq Analyses. *Int J Environ Res Public Health*. Jul 29;17(15):5466. doi: 10.3390/ijerph17155466

Table 4C. Product Toxicity: TERATOGENICITY AND REPRODUCTIVE EFFECTS

Dispersant-only exposure

- A lab study with mouse P19 embryonal pluripotent cells found Corexit 9527A interferes with retinol signaling and neuronal differentiation that are critical to survival.[332] Three specific mechanisms were identified:
  - 9527A blocked biosynthesis of retinol acid from retinol by disrupting an enzyme involved in formation of retinol acid needed for differentiation of embryonic stem cells into neurons.
  - 9527A interfered with enzymatic binding (by blocking receptors) of some proteins during the conversion process of retinol, which inhibited production of retinoic acid.
  - 9527A jammed the neuro signaling required for guiding differentiation (by altering membrane permeability), which inhibited neuronal differentiation.
- This study found that the surfactant ingredient DOSS was a major, if not the only, ingredient responsible for the observed adverse effects oc Corexit 9527A in mouse P19 cells.
- This study also found that Corexit 9500A was more cytotoxic than Corexit 9527A to mouse P19 embryonal pluripotent cells.

[332] Chen Y, Reese DH, 2016. Corexit-EC9527A disrupts retinol signaling and neuronal differentiation in P19 embryonal pluripotent cells. *PLoS ONE* 11(9): e0163724. https://pubmed.ncbi.nlm.nih.gov/27684493/

Table 5A. Specific Target Organ Toxicity (STOT) – Repeated or Prolonged Exposure

CENTRAL AND PERIPHERAL NERVOUS SYSTEMS

Dispersant-only exposure

- As reported in Table 1, in a 2011 lab study, whole-body inhalation exposure of male rats to Corexit 9500A altered the permeability of the blood-brain barrier, allowing toxic chemicals to flood into the brain and disrupting neurotransmitter signaling in the brain in ways that would change the behavior and performance of the affected individual.[333]
- As reported in Table 4A, direct skin contact with Corexit 9527A led to feeling sick and fatigued all the time, memory loss, bad headaches, blurry vision, dizziness, vertigo, bouts of seizures, blackouts,[334] and hypersensitivities to odors, light, and sound.[335]

Oil-dispersant exposure

- A USCG study that assessed acute neurological symptoms during oil spill response found positive associations and significant trends between increased frequency of crude oil exposure via inhalation or skin contact and increased likelihood of headaches, lightheadedness, difficulty concentrating, numbness/ tingling sensation, blurred vision, and memory loss/ confusion; the highest prevalence ratios occurred for numbness/tingling sensations and blurred/double vision, in particular. Significantly,
  - "Exposure to both oil and oil dispersants yielded associations that were appreciably greater in magnitude than for oil alone for all neurological symptoms."[336]
- An NIH GuLF study that assessed chronic neurological function 4–6 years after the oil spill found modest decreases in neurobehavioral function, especially in sustained attention, memory, executive function, and coding (response speed) associated with both airborne exposures to oil spill vapors and job class.[337] Further,
  - The magnitude of the deficit in one measure (delay in response) was the equivalent of aging 4 to 9 years, and it varied across the job classes with the greatest magnitude for land cleanup workers (9 years).

[333] Sriram K, Lin GX, Jefferson AM, et al. 2011. Neurotoxicity following acute inhalation exposure to the oil dispersant COREXIT EC9500A. *J Toxicol Environ Health A* 74: 1405–1418. https://www.tandfonline.com/doi/full/10.1080/15287394.2011.606796

[334] Lori Bosarge Affidavit, 2012; In: Government Accountability Project, 2013, Deadly Dispersants.

[335] Lori Bosarge Affidavit, 2020; In: Government Accountability Project, 2020, Ten Years After Deepwater Horizon.

[336] Krishnamurthy JK, Engel LS, Wang L, et al., 2019. Neurological symptoms associated with oil spill response exposures: Results from the Deepwater Horizon oil spill Coast Guard cohort study. *Environ Intl.* 163:104963. doi: 10.1016/j.envint.2019.104963.

[337] Quist AJL, Rohlman DS, Kwok RK, et al. 2019. Deepwater Horizon oil spill exposures and neurobehavioral function in GuLF STUDY participants. *Environ Res.* Dec;179(Pt B):108834. doi: 10.1016/j.envres.2019.108834.

Table 5B. STOT – Repeated or Prolonged Exposure

HEMATOLOGICAL, RESPIRATORY, AND CARDIOVASCULAR SYSTEMS

Oil-dispersant exposure

- A clinical study with an initial examination[338] and a follow up[339] 7 years after the BP Deepwater Horizon oil disaster assessed prevalence of symptoms, including hematologic and hepatic biomarkers, and pulmonary and cardiac function, in oil spill workers who participated in response activities along the Louisiana coast. These studies found:
  - The most reported symptoms by workers during their initial visits were frequent headaches (77%), shortness of breath (71%), skin rash (59%), chronic cough, dizzy spells, and fatigue (49–51%); the incidence of their occurrence was comparable 7 years after the disaster.
  - Workers exposed to oil-dispersants had significantly altered blood profiles, significant amounts of phenol in their urine (indicating benzene exposure), and higher levels of three liver enzymes that are biomarkers of hepatic dysfunction and damage, compared to the unexposed group; no improvement was found 7 years after the disaster.
  - Most workers had progressive deterioration of their respiratory system over 7 years—91% had developed chronic rhinosinusitis and 45% had chronic reactive airways dysfunction syndrome.
  - During their initial visit, over half of the workers experienced some type of cardiac function abnormalities indicative of increased risk of heart failure from cardiovascular diseases, an unexpected finding given the average age (35.8 years); 7 years after the disaster, cardiac function abnormalities persisted.
- A USCG study found increased cardiovascular symptoms (chest pain, arrhythmia or irregular heartbeats) were associated with increased exposures to crude oil and oil-dispersant from direct skin contact and inhalation; symptoms and conditions were generally stronger among workers who reported oil-dispersant exposure (vs. oil or dispersant alone).[340]
- NIH GuLF studies 5-years after the oil spill found increased risk of heart attacks and fatal coronary heart disease were associated with longer duration of response work, residential proximity of the spill,[341] and higher estimated exposure to total hydrocarbons.[342]

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[338] D'Andrea MA, Reddy GK, 2013. Health consequences among subjects involved in Gulf oil spill clean-up activities. *Amer J Med* 126(11):966–74. doi: 10.1016/j.amjmed.2013.05.014.

[339] D'Andrea MA, Reddy GK. 2018. The development of long-term adverse health effects in oil spill cleanup workers of the BP Deepwater Horizon offshore drilling rig disaster. *Front Public Health*. Apr 26; 6:117. doi: 10.3389/fpubh.2018.00117

[340] Denic-Roberts H, Rowley N, Haigney MC, et al., 2022. Acute and longer-term cardiovascular conditions in the Deepwater Horizon oil spill Coast Guard cohort. *Environ Intl.* 158: doi.org/10.1016/j.envint.2021.106937

[341] Strelitz J, Keil AP, Richardson DB, et al. 2019. Self-reported myocardial infarction and fatal coronary heart disease among oil spill workers and community members 5 years after Deepwater Horizon. *Environ Res*. Sep 22, 168:70–79. doi: 10.1016/j.envres.2018.09.026.

[342] Strelitz J, Sandler DP, Keil AP, et al., 2019. Exposure to total hydrocarbons during cleanup of the Deepwater Horizon oil spill and risk of heart attack across 5 years of follow-up. May. *Amer J Epidemiology* 188(5:917–927. https://doi.org/10.1093/aje/kwz017

EXHIBIT E-1

Corexit Environmental Solutions ("Manufacturer"), 2023, Press release 1/20/2023

January 20, 2023

COREXIT Environmental Solutions announced in November 2022 the discontinuation of the manufacture and sale of COREXIT™ oil dispersant and shoreline cleaner products, effective immediately. These products include COREXIT EC9500A, COREXIT EC9500B, COREXIT EC9527A, and COREXIT EC9580A.

This decision is consistent with the Company's actions on other product lines in areas adjacent to our core markets that are no longer a strategic or structural fit for our business. We recognize that dispersant products are important to the industry and operators' oil spill response plans.

The Company will actively engage with industry consortia and organizations, such as the International Oil & Gas Producers Association, to determine a sustainable solution to support the needs of the oil and gas industry as the Company exits the COREXIT product line. We appreciate the partnership, collaboration, and patience of industry stakeholders as we collaborate with these industry consortia and organizations.

It's important to understand these facts about COREXIT inventory and availability:

- Our Company has not made or sold COREXIT products for the past nine years.
- Oil spill response organizations around the world hold stockpiles of COREXIT and other dispersants and are positioned to manage major spills globally.
- COREXIT products may be sourced from industry organizations and oil spill response groups.
- The Company plans to work with IOGP to help those who currently identify COREXIT products as a stated oil spill response (OSR) solution to identify other acceptable alternative OSR strategies.

The Company will no longer support the regulatory framework – including product registrations or re-registration – for this product line effective July 1, 2023. COREXIT-related Regulatory inquiries may be directed to corexitinfo@corexit.com.

EXHIBIT E-2

International Association of Oil and Gas Producers, Corexit Availability, Update 2023

COREXIT AVAILABILITY – UPDATE TO MEMBERS AND INDUSTRY

Dear IOGP Members / Industry Partners

This is an important update on the manufacture of the dispersant COREXIT™.

COREXIT Environmental Solutions LLC, a subsidiary of ChampionX , announced in November 2022 they would discontinue the manufacture and sale of COREXIT™ oil dispersant and shoreline cleaner products, effective immediately. In January 2023, they updated that communication to indicate that they will no longer support the regulatory framework – including product registrations or re-registration – for this product line effective July 1, 2023.

Since COREXIT™ Environmental Solutions LLC's announcements, IOGP and various oil spill response organizations (OSRO) have been exploring options for our members and the wider industry.

The first step taken by IOGP and its members was to establish a task force dedicated to resolving the issues resulting from the ChampionX announcements.

This task force is led by Harvey Johnstone, IOGP's Environment Director

The task force's work has been informed by the attached information paper that outlines the issue and the work of the Task Force will be conducted in line with the IOGP Competition Law Guidelines.

There are several issues in the short and longer term that the task force will be working to resolve, such as:

- Adequacy of global dispersant stockpiles and supply.
- Registration support for existing stockpiles and future supply of dispersants
- Understanding the global registration processes for dispersants in various countries.
- The adequacy of the number of dispersants registered in each country.
- Indemnification requirements for certain dispersant products.

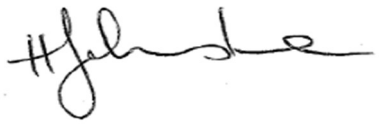
To start addressing the most immediate issues, IOGP recently met with ChampionX to establish communications and seek clarity on current options relating specifically to COREXIT™.

As a consequence of the initial meetings and discussions, I can report that ChampionX remains committed to exiting the dispersants manufacturing and supply market, and upon considering IOGP's request to continue their support of the regulatory framework around the use of COREXIT, including product registrations, or re-registration, have indicated that they will extend temporary support beyond the 1st July 2023. A further communication from IOGP will be forthcoming on this and we will continue to provide regular updates regarding progress with various task force.

IOGP will set up a Dispersants Task Force Portal on the IOGP website where all communications will be placed. We will place the link in our next communication.

Should you have any queries or questions regarding this matter, please do not hesitate to contact me.

Kind regards,



Harvey Johnstone
Environment Director
IOGP

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