Nos. 23-11535-A, 23-11538-A, 23-11539-A

UNITED STATES COURT OF APPEALS
ELEVENTH CIRCUIT

IN RE: DEEPWATER HORIZON BELO CASES

BELO PLAINTIFFS: LESTER JENKINS AND DWIGHT SIPLES,

Plaintiffs-Appellants,

Versus

BP EXPLORATION & PRODUCTION, INC., AND BP AMERICA PRODUCTION COMPANY,

Defendant-Appellees.

On Appeal from U.S. District Court for the Northern District of Florida
Case Nos. 3:19-cv-00963, 5:19-cv-00260, 5:19-cv-00310

MOTION FOR LEAVE TO FILE AMICUS CURIAE LETTER IN SUPPORT OF PLAINTIFFS-APPELLANTS AND REVERSAL

Pro Se

BELO Plaintiffs v. BP Exploration & Production, Inc, et al., Nos. 23-11535-A, 23-11538-A, 23-11539-A

CERTIFICATE OF INTERESTED PERSONS & CORPORATE DISCLOSURE STATEMENT

Certificate of Interested Persons

The Certificate of Interested Persons contained in the Initial Brief is complete with the following additions:

- **Ott, Fredericka ("Riki")**, Amicus Curiae
- **Public Citizen**, Amicus Curiae
- **Rothman, Kenneth J.**, DrPH, Amicus Curiae
- **Sansone, Nicolas A.**, Counsel for Amicus Curiae Public Citizen
- **Stevenson Legal, PLLC**, counsel for Amicus Curiae Dr. Kenneth J. Rothman
- **Stevenson, Benjamin James**, counsel for Amicus Curiae Dr. Kenneth J. Rothman
- **Zieve, Allison M.**, Counsel for Amicus Curiae Public Citizen

Corporate Disclosure Statement

Not applicable. Amicus Ott is a natural person and not a corporation or other business association.

Sincerely,

/s/ Fredericka (Riki) Ott
Fredericka (Riki) Ott, PhD
c/o ALERT Project
Earth Island Institute
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Berkeley, CA 94704
Tel: (415) 859-9107
(messages only)
Email: riki@alertproject.org

Pro Se

October 20, 2023

MOTION FOR LEAVE TO FILE AMICUS CURIAE LETTER IN SUPPORT OF APPELLEE'S REQUEST FOR ORAL ARGUMENT AND REVERSAL

I respectfully move this Honorable Court for leave to file the accompanying amicus letter in support of Appellee's Request for Oral Argument and Reversal.

The amicus letter will assist the Court in deciding this consolidated appeal.

My amicus letter makes three points:

First, the National Response Team, comprised of fifteen federal agencies, recommended (in 2012), and has since taken steps to implement, comprehensive health monitoring and surveillance to better protect emergency response workers and others (public health personnel, and cleanup, repair, and restoration workers), based on previous disasters, including the BP Deepwater Horizon oil spill, in which workers experienced health symptoms at low action levels and uncertain exposures and consequently suffered long-term harm. Respect for our nation's emergency responders during oil spills and releases of hazardous substances demands reconsideration of these experiences with a broader scientific frame.

Second, the Occupational Safety and Health Administration, also a member of the National Response Team, revised its mandatory health hazard criteria (in 2012) to recognize symptoms as evidence of exposure in situations where health hazards and/or complex mixtures of hazardous chemicals make risk assessment based on standard toxicology dose-response thresholds unreliable. The district

court's decisions are contrary to what regulatory agencies such as OSHA accept as fact and have regulated accordingly.

Third, scientists use a semi-quantitative approach to determine acute and long-term harm from low action levels and uncertain exposures because the scientists have found these approaches to be more accurate in detecting and understanding human health effects than a quantitative approach with traditional methods, which creates a low-biased impression of the true scale and nature of an oil spill's harmful consequences. Understanding the science is critical to understanding the harm yet the district court has chosen to dismiss critical science.

The Amicus' Interest

I, as amicus, support the appellees. As a concerned citizen, I have a keen interest in maintaining and strengthening our nation's oil spill prevention and response laws and regulations, especially ones designed to protect worker and public health during emergency responses to oil spills. I currently serve as co-chair of the 2023 Health and Safety Task Force, chartered by Regional Response Team 10 and the Northwest Area Committee to evaluate the need and specific ways to incorporate health monitoring programs for response workers and the exposed

public into the Northwest Regional Contingency Plan.[1] In chartering this task force, the regional and state planners recognized the potential for oil spill exposure to cause long-term harm in workers and the public *even when exposed to low action levels*. I also spearheaded two multi-year efforts to petition, then sue (successfully), the EPA to update the rules governing use of toxic chemical dispersants during oil spills (ALERT/*Earth Island Institute et al. v. Wheeler et al.,* Case 3:20-cv-00670-WHO, N.D. Cal. 2021; 88 FR 38280); and to petition OSHA in 2023 to provide greater protection for oil spill response workers.

This case is important to me because it raises several scientific issues concerning the admissibility of expert testimony offered to show general causation in Plaintiffs' toxic tort cases. The nation's first responders and the public rely on government to protect people's health and safety during oil spills and on courts to hold corporations accountable for harm they may have caused. The district court's reductionist approach to considering evidence of harm could literally cause serious harm to Plaintiffs and future oil spill responders and the exposed public by not recognizing existing regulatory law and accepted science.

[1] Regional Response Teams and Area Committees are key components of the federal government's duty under the Oil Pollution Act of 1990 to ensure effective preparedness and efficient response to spills or releases of oil and other hazardous chemical substances, as described in the National Contingency Plan (NCP, 40 CFR part 300).

Position of the Parties

I filed this motion of leave with consent of lead counsel for the Plaintiffs and without consent of lead counsel for the Defendants.

Conclusion

WHEREFORE, the Amicus respectfully requests the Court to accept the accompanying amicus letter.

/s/ Fredericka (Riki) Ott
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CERTIFICATE OF COMPLIANCE

I certify that this amicus letter complies with the type-volume limitations. This amicus letter contains a total of 4,261 words.

/s/ Fredericka (Riki) Ott
Fredericka (Riki) Ott
Pro Se

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on **October 20, 2023**, I mailed the foregoing to the Clerk of the Court for the United States Court of Appeals for the Eleventh Circuit by using the U.S. mail service. Once the Clerk of Court files this on the public docket, THEREFORE, all counsel of record in this case who are registered to receive electronic notice in this case are expected to receive notice.

/s/ Fredericka (Riki) Ott
Fredericka (Riki) Ott
Pro Se

UNITED STATES COURT OF APPEALS
ELEVENTH CIRCUIT

Nos. 23-11535-A, 23-11538-A, 23-11539-A

BP *Deepwater Horizon* BELO Cases v. Lester Jenkins, et al.

On Appeal from U.S. District Court for the Northern District of Florida
Case Nos. 3:19-cv-00963, 5:19-cv-00260, 5:19-cv-00310

AMICUS CURIAE LETTER IN SUPPORT OF PLAINTIFFS-APPELLANTS AND REVERSAL

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September 20, 2023

David J. Smith
Clerk of Court
U.S. Court of Appeals for the 11th Circuit
56 Forsyth St., N.W.
Atlanta, GA 30303

RE: In re: BP *Deepwater Horizon* BELO Cases v. Lester Jenkins et al.,
Case No. 23-11535

Dear Appellate Judges,

Dr. Riki Ott, PhD, in her official capacity as a concerned citizen-scientist respectfully submits this amicus letter to urge this Court to grant review in the above-entitled matter with consideration of respiratory sensitizers, skin sensitizers, and of uncertain exposures from chemical mixtures and chemical aerosols, as exceptions to old-school toxicology and dose-dependent theories. As set forth below, I believe the significant impacts of this matter on our nation's first responders and the exposed public during oil spill response warrant review of these considerations and reversal of the district court's order excluding Dr. Freeman's and Dr. Solomon's expert testimony and granting summary judgment against the Plaintiffs/Appellants, as well as the final judgments entered against them.

I. Interests of Amicus Curiae

As a concerned citizen, I have a keen interest in maintaining and strengthening our nation's oil spill prevention and response laws and regulations, especially ones designed to protect worker and public health during emergency responses to oil spills. I currently serve as co-chair of the 2023 Health and Safety Task Force, chartered by Regional Response Team 10 and the Northwest Area

Committee (RRT10/NWAC) to evaluate the need and specific ways to incorporate health monitoring programs for response workers and the exposed public into the Northwest Regional Contingency Plan.[1] In chartering this task force, the regional and state planners recognized the potential for oil spill exposure to cause long-term harm in workers and the public *even when exposed to low action levels*.

I also direct Ultimate Civics (www.ultimatecivics.org), to provide teaching tools for civic engagement, and A Locally Empowered Emergency Response Team (ALERT) (www.alertproject.org), to create accessible science tools for and with at-risk communities to engage in civic activities to reduce toxic exposures from oil-chemical activities. Both are projects of our fiscal sponsor Earth Island Institute, a Berkeley-based nonprofit organization.

My interest is firmly rooted in a childhood experience of witnessing trucks spraying DDT throughout our neighborhood, picking up dozens of dying robins after these events and placing them under shrubs to die in peace on my way to or from middle school, and watching the lawyer and scientist prepare, around our family's dining room table, my father's lawsuit against the State of Wisconsin over DDT use (Carter, 1969). My father prevailed, the rest of the nation followed suit—and I learned that even a small group of people can make a big difference. I also learned that scientists like Rachel Carson, who make science accessible to the public and non-scientists, can play a critical role in engaging the public, media, and the courts to make informed, science-based policy decisions. I resolved to become such a scientist.

Following this transcendent experience and thirteen years of higher education focused on marine oil pollution, toxicology, and statistical design,[2] I was prepared to step up when the 1989 *Exxon Valdez* spilled over 11 million gallons of crude oil in Prince William Sound. At the time, I was commercial fishing and living in Cordova, Alaska, where I served as oil point person on the boards of Cordova District Fishermen United and of United Fisherman of Alaska, the largest organization of commercial fishermen in the U.S. Over the next twenty years, I—

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[1] RRTs and Area Committees are key components of the federal government's duty under the Oil Pollution Act of 1990 to ensure effective preparedness and efficient response to spills or releases of oil and other hazardous chemical substances, as described in the National Contingency Plan (NCP, 40 CFR part 300).

[2] BSc, Colby College, 1976; Thomas Watson Fellowship, 1977-78; MSc, Univ South Carolina, 1980; PhD, Univ Washington, 1985.

- testified numerous times before Congress and the Alaska legislature, leading to passage of the Oil Pollution Act of 1990 and the strongest state laws on oil spill prevention and response at the time, respectively;
- initiated an effort[3] in 2001 that transformed the silo science on oil spill harm from individual species to a comprehensive understanding of long-term harm to marine wildlife and ecosystems and long-term Gulf of Alaska monitoring programs to detect changes (Peterson et al., 2003; *Exxon Valdez* Oil Spill (EVOS) Trustee Council, 2021), an eye-opening experience for scientists and the public;
- amassed enough evidence of long-term harm to EVOS response workers to convince the *Los Angeles Times* to investigate (Murphy, 2001) and the Yale Dept. of Epidemiology and Public Health to support a master's thesis on the subject (O'Neill, 2003)—both of which documented lingering harm among former workers over a decade after the event; and
- wrote two books (Ott, 2004; 2008) and was the lead character in a documentary (*Black Wave*, 2008), all to make the new scientific understandings of long-term harm from oil spills to people and wildlife, accessible to the public to prevent similar tragedies in the future.

Unfortunately, history was doomed to repeat. After the BP *Deepwater Horizon* well blew in the Gulf of Mexico, I spent a year in Gulf coast communities (and returned annually through 2017), coaching people to understand their lingering illnesses as potential chemical overexposures and get proper medical treatment, by giving public talks, documenting the emerging human health tragedy for the *Huffington Post* (Ott, 2010–2015) and an investigative documentary (*The Cost of Silence*, 2020), and co-authoring two *Toxic Trespass* training manuals with residents of environmental justice communities (Harris et al., 2016; Ott et al., 2016). I also spearheaded two multi-year efforts with Gulf coast allies to: petition, then sue (successfully), the EPA to update the rules governing use of toxic chemical dispersants during oil spills (ALERT, 2015; *ALERT/Earth Island Institute et al. v. Wheeler et al.*; EPA, 2023); and petition OSHA to provide greater protection for oil spill response workers (ALERT, 2023a).

The opinions expressed in this letter are my own. No counsel for any party authored this letter in whole or in part, and no counsel or party made a monetary contribution intended to fund the preparation or submission of this letter. No person other than Amicus Curiae or its counsel made a monetary contribution to its preparation or submission.

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[3] Received an Environmental Defense Fund NGO Mini-Grant for Science Programs.

II. Balance of Harm Heavily Favors Granting the Requested Considerations During Review & Reversal of the District Court's Rulings

Background

The most recent oil spill of national significance—the 2010 BP *Deepwater Horizon* disaster—repeated what had occurred in previous emergency events since the 1989 *Exxon Valdez* oil spill and the 2001 World Trade Center tragedy (Murphy, 2001; Prezant, 2007). Once again, response workers, cleanup workers, and the public across the impacted coastal Gulf region in four states became sick below exposure levels thought to be safe and the initial exposure have led to still ongoing rare and debilitating long-term illnesses, premature deaths, and cancers (Sneath, Laughland, 2023). The harm could have been prevented.

In June 2010, the Institute of Medicine (IOM) sponsored a workshop in New Orleans to assess the known health effects of oil spills and to determine what could be done to minimize the anticipated harm. The first reviews of human health effects from large oil spills identified a suite of acute symptoms now considered characteristic of oil spill exposures (Aguilera et al., 2010; Levy, Nassetta, 2011). Many of these acute respiratory, neurological, and cardiovascular symptoms—such as cough, wheezing, difficulty breathing, runny nose, burning/itchy eyes, headache, dizziness, nausea, tightness of chest, and tiredness/fatigue—mimic common cold- and flu-like symptoms. Other common acute symptoms were skin rashes or lesions.

The workshop panel recommended immediate implementation of biomonitoring protocol at any time during an oil spill (BP *Deepwater Horizon* BELO Cases v. Edward Dunklin et al., 2022, on 8). After the workshop, three federal agencies sent BP proposed worker biomonitoring protocols. None were implemented by BP, although the NIOSH director John Howard acknowledged that air sampling does not reflect total exposure and is insufficient to assess health risk without biomonitoring (Ibid., Exhibit 8). For the record, none of the federal agencies implemented a stand-alone biomonitoring program for their workers either.[4]

[4] However, federal and state public employees are required to have the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) trainings (29 CFR 1910.120) and various OSHA respiratory protection trainings *before* they are deployed. Some medical

This was the proverbial last straw for federal agencies involved in emergency responses under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In 2012, the National Response Team (NRT), composed of fifteen federal agencies, published a comprehensive Emergency Responder Health Monitoring and Surveillance system (ERHMS, pronounced "ER-HMS") to resolve persistent and significant gaps and deficiencies in the capacity of the NRT to protect emergency response workers, public health personnel, and cleanup, repair, and restoration workers (NRT, 2012a). While the recommended ERHMS system provides all the expected elements of a comprehensive medical monitoring and surveillance program, including pre-deployment health screening, monitoring of individuals and surveillance of the responder population to assess health risk in real-time, demobilization exit surveys, and long-term tracking for those who experienced adverse health effects (NRT, 2012b), it also introduced "uncertain exposures" as a possible conclusion of exposure assessments.

Understanding the significance of uncertain exposures from chemical mixtures

At the core of the ERHMS system is an exposure assessment of three possible conclusions: acceptable exposures, described as those below a pre-determined occupational exposure limit (OEL) as determined by quantitative or qualitative methods; unacceptable exposures, as those that exceed or will exceed pre-determined OELs; and uncertain exposures, described as follows.

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monitoring is also required for HAZMAT teams and hazardous materials specialists *during* an emergency response (1910.120(q)(9)). While private employees are also covered under OSHA HAZWOPER standards (1910.120(q)) *during* emergency response, the language currently allows employers to hire temporary workers who have not received HAZWOPER training and use them as active responders in the field. For example, during the BP *Deepwater Horizon,* BP (and some states and parishes) implemented a Vessel of Opportunity (VOO) program and hired "thousands of previously untrained" temporary workers (National Commission on the BP *Deepwater Horizon* and Offshore Drilling, 2011, VOO program at 140-141, "thousands" at 277). Without HAZWOPER training, these temporary workers would not have recognized or reported simple cold- and flu-like symptoms as potential early warning signs of potential overexposure to chemical health hazards. Monitoring programs hinge on training employees to recognize and report symptoms. Perhaps this is why the National Commission found, "[T]he National Contingency Plan overlooks the need to respond to widespread concerns about human health impacts" (*Id.*, at 277). Read literally, this could also explain why thousands of former workers (and exposed residents) filed BELO claims. ALERT identified gaps and deficiencies in the OSHA HAZWOPER standards that undermine the NRT's oft-stated highest priority during response operations, i.e., to protect worker health and safety (NRT, 2018). ALERT also prepared suggested language to address the issues (ALERT, 2023b).

> "Uncertainty surrounding the exposure assessment occurs when not enough information is available to make a judgment about health risk. Often, complex or mixed exposures fall into this category. Although individual exposure constituents may not exceed OELs, the complex mixture may pose a threat. Exposure assessments deemed uncertain may also result when the toxicity of the hazard is unknown or when safe limits for exposure have not been established. This determination does not mean that there is no existing or future hazard, but rather it means that additional information gathering, including additional exposure monitoring, medical monitoring, or biological monitoring, is warranted before a determination about the exposure can be made. Where uncertainty exists in exposure assessment, it is wise to utilize an approach known as the "precautionary principle" when making safety and health decisions. Under this principle, it is best to err on the side of safety when any decision concerning human health and safety is in the balance.
>
> "There may be opportunities to perform dose reconstruction based on limited field quantitative data. This effort requires a more in-depth analysis involving the kinds of techniques used in designing exposure reconstruction models.
>
> "A holistic approach to investigating and understanding the impact of exposures on responder health should be adopted—one that does not rely on environmental results alone to determine risk. Information must be gathered from a variety of sources, discussed in other sections of this document, to determine if exposures occurred, who may have been exposed, and who needs medical treatment" (ERHMS, 2012a, at 39).

By recognizing uncertain exposures from complex mixtures of chemicals and other health hazards, the NRT members recognize that adhering to narrow toxicology principles, (i.e., that every chemical mixture has a dose threshold at which its individual components will cause a particular disease), is a too simplistic approach to reliably assess health risk. Instead, the NRT recommends a multi-disciplinary ("holistic") approach to assess health risk, especially when complex mixtures of chemicals are involved *as is the case during oil spills*. The current OSHA HAZWOPER standards even provide mandatory health criteria as tools for a biomonitoring approach.

Understanding sensitivity reactions as dose-**in**dependent

In 2012, OSHA (an NRT member) revised its health hazard communication standard 1910.1200 Appendix A to include new criteria for classification of health and physical hazards and mixtures of chemicals (OSHA, 2012a; 2012b). The standard describes *exceptions to acute toxicity* (i.e., threshold harmful dose) for carcinogenicity, germ cell mutagenicity, reproductive toxicity ("health hazards"), and complex mixtures of chemicals. For these exceptions, the standard describes symptoms of acute exposure rather than quantifiable numbers, as follows: for skin sensitizers, symptoms include skin rashes or ulcers, bleeding, or alopecia (hair loss) (A.2); for respiratory sensitizers, symptoms include coughing, difficulty breathing, or shortness of breath (A.8.2.2.1); and for neurological irritants, symptoms include severe headaches or migraines, nausea or vomiting, dizziness or vertigo, irritability, fatigue, deficits in perception, coordination, and reaction time, and brain fog (A.8.2.2.2). Many symptoms are identical to the those described in Aguilera et al., 2010.

In other words, OSHA recognizes these symptoms as evidence of exposure in situations where health hazards and/or complex mixtures of hazardous chemicals are present.

Further, the 2012 OSHA health hazard communication standard describes respiratory and skin sensitization as a two-phase process, involving "induction of specialized immunological memory in an individual by exposure to an allergen…", in which the immune system learns to react, followed by "elicitation, i.e., production of a cell-mediated or antibody-mediated allergic response by exposure of a sensitized individual to an allergen." Clinical symptoms arise when the subsequent exposure is sufficient to elicit a visible reaction. OSHA notes, "Usually, for both skin and respiratory sensitization, *lower levels are necessary for elicitation than are required for induction*" (A.4.1.4, emphasis added).

In the near century and a half since Paul Ehrlich received a Nobel Prize in Medicine in the field of immunology for discovery of mast cells and explaining the basic principle of immunity (Crivellato et al., 2003), the two-phase mechanism for the cell-mediated response is now understood to involve mast cells that operate within cells. Cell-mediated immunology is a different branch of the immune system than antibody-mediated immunology. In a true allergic response, mast cells operate outside cells in humoral fluids (Masri et al., 2021; Miller et al., 2021; Hoffman TILT Program, 2023a). The cell-mediated response is rapid, as mast cells are paired directly with nerve cells, which can lead to a multi-system response

involving different organs. The cell-mediated response also involves cellular memory, which amplifies response with subsequent triggering events from single or repeated exposures even at low levels of chemicals. This can lead to sensitization and hypersensitivity (chemical intolerance) to oil, chemicals, food, drugs/antibiotics, and toxic mold vapors that were previously tolerated.

For example, this underlying mechanism was found in a comparison of chemical intolerances in Persian Gulf War veterans with Gulf War Illness, World Trade Center responders with the WTC Cough, pilots exposed to aircraft oil fumes with Aerotoxic Syndrome, and EPA workers exposed to semi-volatile organic compounds during building renovations with Sick Building Syndrome, among others (Miller et al., 2021). A large population study confirmed the main categories of substances that initiate a cell-mediated response are biological toxicants from particles and vapors from toxic molds or algae and fossil fuel-derived toxicants (e.g., from coal, oil, natural gas), their combustion products, and/or synthetic organic chemical derivatives (e.g., pesticides, pharmaceutical drugs/ antibiotics, and implants) (Miller et al., 2023).

This means that sensitivity symptoms associated with oil and chemical exposures to health hazards and complex chemical mixtures are *always* ***in****dependent* of dose-response relationships and threshold doses that are based strictly on levels of exposure quantified in numbers. It supports the Plaintiffs/Appellants argument that the district court erred in requiring plaintiffs' experts to identify a *quantifiable* threshold dose or a dose-response relationship, both rooted in toxicological principles, to prove that exposures during oil spills can generally cause negative health effects. These symptoms cannot be quantified solely or adequately by old-school toxicology principles and protocols or by antibody-mediated immunology principles (i.e., true allergic responses) and protocols, which also rely on old-school toxicological dose relationships. It's like trying to pound a square peg into a round hole—it's just not a good fit. Instead, an approach using cell-mediated immunology principles is called for.

Epidemiology and cell-mediated immunology

Environmental epidemiology uses a multi-disciplinary, semi-quantitative approach with metrics based on *qualitative* expressions of symptoms, duration, and estimates of exposure *as surrogates for dose measurements* that are often not available when exposures from complex mixtures occur in a broad geographical setting. For example, toxicologist Bernard Goldstein noted that for "many epidemiological studies of toxic agents, dose is a binary—yes or no—

determination instead of a quantitative expression" or "qualitative estimates of high and low exposure" (Goldstein, 2009, at 563 and Fn. 27).

Quantifying dose levels with traditional analytical methods underestimate oil exposure. Measurements that rely on sentinel chemicals or groups of oil components like THCs (Total Hydrocarbons), VOCs (Volatile Organic Compounds), PAHs (Polycyclic Aromatic Hydrocarbons), etc., as a proxy for oil spill exposure do not detect all the oil components. For example, only 1.3–4% of the PAHs in fresh oil are captured by traditional methods (Payne, Driskell, 2018). Also, traditional methods do not account for the *size* of oil-contaminated droplets.

For example, dispersants were found to increase the ratio of nano-to-micro-size oil droplets in air emissions *without altering the concentration of particle-bound PAHs* (Afshar-Mohajer et al., 2018), a particular fraction of PAHs considered to be very hazardous to human health (World Health Organization, 2010). By increasing the number of airborne particles by 10 to 100 times across the entire nano-scale range, dispersants increased the total mass of aerosolized particles by 2 to 3 times compared to that of crude oil (*Id.*, 2018). Such ultrafine particles are known to travel long distances and to penetrate deeply into the alveoli region of the human respiratory system. Inhalation of dispersant-mediated particulate emissions increased the total mass burden of *nano*particles inhaled and deposited in upper respiratory regions (upper respiratory tract and tracheobronchial region) of humans about 10 times, compared to slicks of crude oil without dispersants (Afshar-Mohajer et al., 2019). Dispersants also increase the airborne content of crude oil (Afshar-Mohajer et al., 2020).

Of practical concern are the inhalable oil mists, chemically-dispersed oil aerosols, and secondary organic aerosols, which are not accounted for at all with traditional analytical methods and yet are now know to be the dominant fate for surface oil (Ward et al., 2018; 2022). Oil spill exposures are not simply from a single chemical in a defined setting, but rather from complex, multi-phase mixtures of oil-chemical hazards in constantly variable physical and environmental settings. Therefore, a semi-quantitative approach is more accurate in detecting and understanding human health effects than a quantitative approach with traditional methods, which creates a low-biased impression of the true scale and nature of an oil spill's harmful consequences.

Further, the district courts have misconstrued the concept of "dose" itself. Dose is nothing without duration. Goldstein wrote, "Dose is defined as

concentration multiplied by frequency or duration—it is not just the exposure level at any one point in time (2009, at 554). He goes on to explain:

> "Understanding how dose affects response is central to the science of toxicology. Dose-response curves are a classic means of illustrating this relationship, and developing a dose-response curve through direct observation or through extrapolation is an essential element of the function of toxicologists. Extrapolation may be from high to lower doses, from one group of humans to another, or between species. Toxicologists generally posit two main dose response curves: those that have a "threshold" and those that do not…"

Practically, this means that dose-response relationships can be established without dose thresholds, the latter relevant for cancers and other health hazards, (i.e., germ cell mutagenicity, reproductive toxicity, and complex mixtures of chemicals) described in earlier (OSHA, 2012a).

This is why a semi-quantitative approach was used in epidemiology studies following large oil spills from the *Prestige* (Spain, 2002), *Hebei Spirit* (South Korea, 2007), and BP *Deepwater Horizon* (U.S., 2010). These studies used qualitative expressions of symptoms, duration, and estimates of exposure instead of quantitative measurements. From these studies emerged consistent findings of adverse chronic health harm among response workers and exposed residents. Causal relationships are now widely recognized between initial acute symptoms of oil spill exposure and long-term respiratory (Lawrence et al., 2022; Rusiecki et al., 2022; Abereton et al., 2023), cardiovascular (Chen et al., 2022; Denic-Roberts et al., 2022), and neurological harm (Krishnamurthy et al., 2019; Quist et al., 2019), including cancers (Park et al., 2019), in workers and among residents of oil-producing communities (Onyije et al., 2021).

Significantly, the chronic harm from oil exposures:

(1) occurs at initial levels of petroleum hydrocarbons that are at the lower end of OELs and the upper end of public health standards (Pratt et al., 2020);

(2) is characterized by a set of acute symptoms (Laffon et al., 2016) that are consistent with known sensitivity or hypersensitivity responses to oil and other hazardous substances, as reflected in existing law (OSHA, 2012a);

(3) increases with exposure to oil dispersants (McGowan et al., 2017; Fingas, 2021); and

(4) increases in medically-underserved communities (Beland, Oloomi, 2019; Hu et al., 2021; Lawrence et al., 2021).

The findings of long-term harm to human health are well supported by advances in understanding the fate of oil and chemically dispersed oil, in particular: the rapid formation of noxic secondary organic aerosols via photooxidation of oil at the sea surface (Middlebrook et al., 2012); the dispersal of these aerosols and other oil components over long distances both within (de Gouw et al., 2011) and above the marine boundary layer (Perring et al., 2012; Middlebrook et al., 2012; Ryerson et al., 2012); and, in coastal and rural regions of southeast Louisiana (where the study was based), the *exceedances* of protective standards for public health in air samples, carrying an oil spill-derived aerosol signature, over the five months of peak emissions following the BP *Deepwater Horizon* oil disaster (Nance et al., 2016).

Further, the findings are also well supported by wildlife studies, in particular, the Barataria Bay (Louisiana) bottlenose dolphin epidemiology studies that found consistency in mechanisms of action and disease pathogenesis, progressing from molecular and cellular effects to organ dysfunction and systemic effects that compromise fitness, growth, reproductive potential, and survival—or, in cases of high concentrations, multiple organ failure and death (Lane et al., 2015; McDonald et al., 2017; Schwacke et al., 2017; Venn-Watson et al., 2015).

Conclusion

Supreme Court Justice Stephen Breyer once commented, "A judge is not a scientist and a courtroom is not a scientific laboratory," but judges "must aim for decisions that, roughly speaking, approximately reflect the scientific state of the art" (Associated Press, 1998).

The current scientific state of art recognizes causal relationships between initial acute symptoms of oil spill exposure and long-term respiratory harm, cardiovascular harm, and neurological harm, and cancers in workers and among residents of oil-producing communities, based on epidemiology studies and cell-mediated immunology principles. The findings are well-supported by secondary studies (literature reviews), wildlife studies, a plethora of clinical and laboratory studies, and even existing regulatory law. The relationships have been consistently observed over time in different areas in oil spills since the 1989 *Exxon Valdez* and in other large-scale disasters and/or wars involving oil and chemical releases.

I consider myself a reasonable person. Yet I find it incredulous that the district court could not see the metaphorical elephant in the room—the fact that the nation's largest oil spill could and did cause the harm claimed by the Plaintiffs/ Appellants. Let the science speak. Ungag the experts. Law is supposed to lag science—but not by decades.

The nation's first responders and the public rely on government to protect people's health and safety during oil spills and the courts to hold corporations accountable for harm. The court's reductionist approach to considering evidence of harm could literally cause serious harm to first responders and the exposed public by not recognizing existing regulatory law and accepted science.

Therefore, I respectfully urge this Court to reverse the district court's order excluding Dr. Freeman's and Dr. Solomon's expert testimony and granting summary judgment against the Plaintiffs/Appellants, as well as the final judgments entered against them. As this Court deliberates, I hope it considers the health and safety of our first responders and the exposed public, including children, whose lives will be irrevocably altered, during the next big oil spill or other oil-chemical disaster, by long-term illnesses and cancers *that are preventable*.

Sincerely,

750

Fredericka ("Riki") Ott, PhD

Table of Citations

Cases

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UNITED STATES COURT OF APPEALS
ELEVENTH CIRCUIT

Nos. 23-11535-A, 23-11538-A, 23-11539-A

BP DEEPWATER HORIZON BELO CASES V. LESTER JENKINS, ET. AL.

ON APPEAL FROM U.S. DISTRICT COURT FOR THE NORTHERN DISTRICT OF FLORIDA
CASE NOS. 3:19-CV-00963, 5:19-CV-00260, 5:19-CV-00310

AMICUS CURIAE LETTER
OF FREDERICKA ("RIKI") OTT, PHD
IN SUPPORT OF PLAINTIFFS-APPELLANTS AND REVERSAL

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Nos. 23-11535-A, 23-11538-A, 23-11539-A

UNITED STATES COURT OF APPEALS
ELEVENTH CIRCUIT

IN RE: DEEPWATER HORIZON BELO CASES

BELO PLAINTIFFS: LESTER JENKINS AND DWIGHT SIPLES,

Plaintiffs-Appellants,

Versus

BP EXPLORATION & PRODUCTION, INC., AND BP AMERICA PRODUCTION COMPANY,

Defendant-Appellees.

On Appeal from U.S. District Court for the Northern District of Florida
Case Nos. 3:19-cv-00963, 5:19-cv-00260, 5:19-cv-00310

AMICUS CURIAE LETTER
of Fredericka "Riki" Ott, PhD
in Support of Plaintiffs-Appellants and Reversal

Pro Se

BELO Plaintiffs v. BP Exploration & Production, Inc, et al., Nos. 23-11535-A, 23-11538-A, 23-11539-A

CERTIFICATE OF INTERESTED PERSONS & CORPORATE DISCLOSURE STATEMENT

Certificate of Interested Persons

The Certificate of Interested Persons contained in the Initial Brief is complete with the following additions:

- **Ott, Fredericka ("Riki")**, Amicus Curiae
- **Public Citizen**, Amicus Curiae
- **Rothman, Kenneth J.**, DrPH, Amicus Curiae
- **Sansone, Nicolas A.**, Counsel for Amicus Curiae Public Citizen
- **Stevenson Legal, PLLC**, counsel for Amicus Curiae Dr. Kenneth J. Rothman
- **Stevenson, Benjamin James**, counsel for Amicus Curiae Dr. Kenneth J. Rothman
- **Zieve, Allison M.**, Counsel for Amicus Curiae Public Citizen

Corporate Disclosure Statement

Not applicable. Amicus Ott is a natural person and not a corporation or other business association.

Sincerely,

Fredericka Riki Ott

Fredericka (Riki) Ott, PhD
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2150 Allston Way, Ste. 460
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October 10, 2023

CERTIFICATE OF COMPLIANCE

Pursuant to Fed.R.App.P. 32(g), I certify that this amicus letter complies with the type-volume limitations. This amicus letter contains a total of 4,261 words.

/s/ Fredericka (Riki) Ott
Fredericka (Riki) Ott
Pro Se

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September 20, 2023

David J. Smith
Clerk of Court
U.S. Court of Appeals for the 11th Circuit
56 Forsyth St., N.W.
Atlanta, GA 30303

RE: In re: BP *Deepwater Horizon* BELO Cases v. Lester Jenkins et al.,
Case No. 23-11535 -A

Dear Appellate Judges,

Dr. Riki Ott, PhD, in her official capacity as a concerned citizen-scientist respectfully submits this amicus letter to urge this Court to grant review in the above-entitled matter with consideration of respiratory sensitizers, skin sensitizers, and of uncertain exposures from chemical mixtures and chemical aerosols, as exceptions to old-school toxicology and dose-dependent theories. As set forth below, I believe the significant impacts of this matter on our nation's first responders and the exposed public during oil spill response warrant review of these considerations and reversal of the district court's order excluding Dr. Freeman's and Dr. Solomon's expert testimony and granting summary judgment against the Plaintiffs/Appellants, as well as the final judgments entered against them.

I. Interests of Amicus Curiae

As a concerned citizen, I have a keen interest in maintaining and strengthening our nation's oil spill prevention and response laws and regulations, especially ones designed to protect worker and public health during emergency responses to oil spills. I currently serve as co-chair of the 2023 Health and Safety Task Force, chartered by Regional Response Team 10 and the Northwest Area

Committee (RRT10/NWAC) to evaluate the need and specific ways to incorporate health monitoring programs for response workers and the exposed public into the Northwest Regional Contingency Plan.[1] In chartering this task force, the regional and state planners recognized the potential for oil spill exposure to cause long-term harm in workers and the public *even when exposed to low action levels.*

I also direct Ultimate Civics (www.ultimatecivics.org), to provide teaching tools for civic engagement, and A Locally Empowered Emergency Response Team (ALERT) (www.alertproject.org), to create accessible science tools for and with at-risk communities to engage in civic activities to reduce toxic exposures from oil-chemical activities. Both are projects of our fiscal sponsor Earth Island Institute, a Berkeley-based nonprofit organization.

My interest is firmly rooted in a childhood experience of witnessing trucks spraying DDT throughout our neighborhood, picking up dozens of dying robins after these events and placing them under shrubs to die in peace on my way to or from middle school, and watching the lawyer and scientist prepare, around our family's dining room table, my father's lawsuit against the State of Wisconsin over DDT use (Carter, 1969). My father prevailed, the rest of the nation followed suit—and I learned that even a small group of people can make a big difference. I also learned that scientists like Rachel Carson, who make science accessible to the public and non-scientists, can play a critical role in engaging the public, media, and the courts to make informed, science-based policy decisions. I resolved to become such a scientist.

Following this transcendent experience and thirteen years of higher education focused on marine oil pollution, toxicology, and statistical design,[2] I was prepared to step up when the 1989 *Exxon Valdez* spilled over 11 million gallons of crude oil in Prince William Sound. At the time, I was commercial fishing and living in Cordova, Alaska, where I served as oil point person on the boards of Cordova District Fishermen United and of United Fisherman of Alaska, the largest organization of commercial fishermen in the U.S. Over the next twenty years, I—

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[1] RRTs and Area Committees are key components of the federal government's duty under the Oil Pollution Act of 1990 to ensure effective preparedness and efficient response to spills or releases of oil and other hazardous chemical substances, as described in the National Contingency Plan (NCP, 40 CFR part 300).

[2] BSc, Colby College, 1976; Thomas Watson Fellowship, 1977-78; MSc, Univ South Carolina, 1980; PhD, Univ Washington, 1985.

- testified numerous times before Congress and the Alaska legislature, leading to passage of the Oil Pollution Act of 1990 and the strongest state laws on oil spill prevention and response at the time, respectively;
- initiated an effort[3] in 2001 that transformed the silo science on oil spill harm from individual species to a comprehensive understanding of long-term harm to marine wildlife and ecosystems and long-term Gulf of Alaska monitoring programs to detect changes (Peterson et al., 2003; *Exxon Valdez* Oil Spill (EVOS) Trustee Council, 2021), an eye-opening experience for scientists and the public;
- amassed enough evidence of long-term harm to EVOS response workers to convince the *Los Angeles Times* to investigate (Murphy, 2001) and the Yale Dept. of Epidemiology and Public Health to support a master's thesis on the subject (O'Neill, 2003)—both of which documented lingering harm among former workers over a decade after the event; and
- wrote two books (Ott, 2004; 2008) and was the lead character in a documentary (*Black Wave*, 2008), all to make the new scientific understandings of long-term harm from oil spills to people and wildlife, accessible to the public to prevent similar tragedies in the future.

Unfortunately, history was doomed to repeat. After the BP *Deepwater Horizon* well blew in the Gulf of Mexico, I spent a year in Gulf coast communities (and returned annually through 2017), coaching people to understand their lingering illnesses as potential chemical overexposures and get proper medical treatment, by giving public talks, documenting the emerging human health tragedy for the *Huffington Post* (Ott, 2010–2015) and an investigative documentary (*The Cost of Silence*, 2020), and co-authoring two *Toxic Trespass* training manuals with residents of environmental justice communities (Harris et al., 2016; Ott et al., 2016). I also spearheaded two multi-year efforts with Gulf coast allies to: petition, then sue (successfully), the EPA to update the rules governing use of toxic chemical dispersants during oil spills (ALERT, 2015; *ALERT/Earth Island Institute et al. v. Wheeler et al.*; EPA, 2023); and petition OSHA to provide greater protection for oil spill response workers (ALERT, 2023a).

The opinions expressed in this letter are my own. No counsel for any party authored this letter in whole or in part, and no counsel or party made a monetary contribution intended to fund the preparation or submission of this letter. No person other than Amicus Curiae or its counsel made a monetary contribution to its preparation or submission.

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[3] Received an Environmental Defense Fund NGO Mini-Grant for Science Programs.

II. Balance of Harm Heavily Favors Granting the Requested Considerations During Review & Reversal of the District Court's Rulings

Background

The most recent oil spill of national significance—the 2010 BP *Deepwater Horizon* disaster—repeated what had occurred in previous emergency events since the 1989 *Exxon Valdez* oil spill and the 2001 World Trade Center tragedy (Murphy, 2001; Prezant, 2007). Once again, response workers, cleanup workers, and the public across the impacted coastal Gulf region in four states became sick below exposure levels thought to be safe and the initial exposure have led to still ongoing rare and debilitating long-term illnesses, premature deaths, and cancers (Sneath, Laughland, 2023). The harm could have been prevented.

In June 2010, the Institute of Medicine (IOM) sponsored a workshop in New Orleans to assess the known health effects of oil spills and to determine what could be done to minimize the anticipated harm. The first reviews of human health effects from large oil spills identified a suite of acute symptoms now considered characteristic of oil spill exposures (Aguilera et al., 2010; Levy, Nassetta, 2011). Many of these acute respiratory, neurological, and cardiovascular symptoms—such as cough, wheezing, difficulty breathing, runny nose, burning/itchy eyes, headache, dizziness, nausea, tightness of chest, and tiredness/fatigue—mimic common cold- and flu-like symptoms. Other common acute symptoms were skin rashes or lesions.

The workshop panel recommended immediate implementation of biomonitoring protocol at any time during an oil spill (BP *Deepwater Horizon* BELO Cases v. Edward Dunklin et al., 2022, on 8). After the workshop, three federal agencies sent BP proposed worker biomonitoring protocols. None were implemented by BP, although the NIOSH director John Howard acknowledged that air sampling does not reflect total exposure and is insufficient to assess health risk without biomonitoring (Ibid., Exhibit 8). For the record, none of the federal agencies implemented a stand-alone biomonitoring program for their workers either.[4]

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[4] However, federal and state public employees are required to have the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) trainings (29 CFR 1910.120) and various OSHA respiratory protection trainings *before* they are deployed. Some medical

This was the proverbial last straw for federal agencies involved in emergency responses under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In 2012, the National Response Team (NRT), composed of fifteen federal agencies, published a comprehensive Emergency Responder Health Monitoring and Surveillance system (ERHMS, pronounced "ER-HMS") to resolve persistent and significant gaps and deficiencies in the capacity of the NRT to protect emergency response workers, public health personnel, and cleanup, repair, and restoration workers (NRT, 2012a). While the recommended ERHMS system provides all the expected elements of a comprehensive medical monitoring and surveillance program, including pre-deployment health screening, monitoring of individuals and surveillance of the responder population to assess health risk in real-time, demobilization exit surveys, and long-term tracking for those who experienced adverse health effects (NRT, 2012b), it also introduced "uncertain exposures" as a possible conclusion of exposure assessments.

Understanding the significance of uncertain exposures from chemical mixtures

At the core of the ERHMS system is an exposure assessment of three possible conclusions: acceptable exposures, described as those below a pre-determined occupational exposure limit (OEL) as determined by quantitative or qualitative methods; unacceptable exposures, as those that exceed or will exceed pre-determined OELs; and uncertain exposures, described as follows.

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monitoring is also required for HAZMAT teams and hazardous materials specialists *during* an emergency response (1910.120(q)(9)). While private employees are also covered under OSHA HAZWOPER standards (1910.120(q)) *during* emergency response, the language currently allows employers to hire temporary workers who have not received HAZWOPER training and use them as active responders in the field. For example, during the BP *Deepwater Horizon*, BP (and some states and parishes) implemented a Vessel of Opportunity (VOO) program and hired "thousands of previously untrained" temporary workers (National Commission on the BP *Deepwater Horizon* and Offshore Drilling, 2011, VOO program at 140-141, "thousands" at 277). Without HAZWOPER training, these temporary workers would not have recognized or reported simple cold- and flu-like symptoms as potential early warning signs of potential overexposure to chemical health hazards. Monitoring programs hinge on training employees to recognize and report symptoms. Perhaps this is why the National Commission found, "[T]he National Contingency Plan overlooks the need to respond to widespread concerns about human health impacts" (*Id.*, at 277). Read literally, this could also explain why thousands of former workers (and exposed residents) filed BELO claims. ALERT identified gaps and deficiencies in the OSHA HAZWOPER standards that undermine the NRT's oft-stated highest priority during response operations, i.e., to protect worker health and safety (NRT, 2018). ALERT also prepared suggested language to address the issues (ALERT, 2023b).

> "Uncertainty surrounding the exposure assessment occurs when not enough information is available to make a judgment about health risk. Often, complex or mixed exposures fall into this category. Although individual exposure constituents may not exceed OELs, the complex mixture may pose a threat. Exposure assessments deemed uncertain may also result when the toxicity of the hazard is unknown or when safe limits for exposure have not been established. This determination does not mean that there is no existing or future hazard, but rather it means that additional information gathering, including additional exposure monitoring, medical monitoring, or biological monitoring, is warranted before a determination about the exposure can be made. Where uncertainty exists in exposure assessment, it is wise to utilize an approach known as the "precautionary principle" when making safety and health decisions. Under this principle, it is best to err on the side of safety when any decision concerning human health and safety is in the balance.
>
> "There may be opportunities to perform dose reconstruction based on limited field quantitative data. This effort requires a more in-depth analysis involving the kinds of techniques used in designing exposure reconstruction models.
>
> "A holistic approach to investigating and understanding the impact of exposures on responder health should be adopted—one that does not rely on environmental results alone to determine risk. Information must be gathered from a variety of sources, discussed in other sections of this document, to determine if exposures occurred, who may have been exposed, and who needs medical treatment" (ERHMS, 2012a, at 39).

By recognizing uncertain exposures from complex mixtures of chemicals and other health hazards, the NRT members recognize that adhering to narrow toxicology principles, (i.e., that every chemical mixture has a dose threshold at which its individual components will cause a particular disease), is a too simplistic approach to reliably assess health risk. Instead, the NRT recommends a multi-disciplinary ("holistic") approach to assess health risk, especially when complex mixtures of chemicals are involved *as is the case during oil spills*. The current OSHA HAZWOPER standards even provide mandatory health criteria as tools for a biomonitoring approach.

Understanding sensitivity reactions as dose-**in**dependent

In 2012, OSHA (an NRT member) revised its health hazard communication standard 1910.1200 Appendix A to include new criteria for classification of health and physical hazards and mixtures of chemicals (OSHA, 2012a; 2012b). The standard describes *exceptions to acute toxicity* (i.e., threshold harmful dose) for carcinogenicity, germ cell mutagenicity, reproductive toxicity ("health hazards"), and complex mixtures of chemicals. For these exceptions, the standard describes symptoms of acute exposure rather than quantifiable numbers, as follows: for skin sensitizers, symptoms include skin rashes or ulcers, bleeding, or alopecia (hair loss) (A.2); for respiratory sensitizers, symptoms include coughing, difficulty breathing, or shortness of breath (A.8.2.2.1); and for neurological irritants, symptoms include severe headaches or migraines, nausea or vomiting, dizziness or vertigo, irritability, fatigue, deficits in perception, coordination, and reaction time, and brain fog (A.8.2.2.2). Many symptoms are identical to the those described in Aguilera et al., 2010.

In other words, OSHA recognizes these symptoms as evidence of exposure in situations where health hazards and/or complex mixtures of hazardous chemicals are present.

Further, the 2012 OSHA health hazard communication standard describes respiratory and skin sensitization as a two-phase process, involving "induction of specialized immunological memory in an individual by exposure to an allergen…", in which the immune system learns to react, followed by "elicitation, i.e., production of a cell-mediated or antibody-mediated allergic response by exposure of a sensitized individual to an allergen." Clinical symptoms arise when the subsequent exposure is sufficient to elicit a visible reaction. OSHA notes, "Usually, for both skin and respiratory sensitization, *lower levels are necessary for elicitation than are required for induction*" (A.4.1.4, emphasis added).

In the near century and a half since Paul Ehrlich received a Nobel Prize in Medicine in the field of immunology for discovery of mast cells and explaining the basic principle of immunity (Crivellato et al., 2003), the two-phase mechanism for the cell-mediated response is now understood to involve mast cells that operate within cells. Cell-mediated immunology is a different branch of the immune system than antibody-mediated immunology. In a true allergic response, mast cells operate outside cells in humoral fluids (Masri et al., 2021; Miller et al., 2021; Hoffman TILT Program, 2023a). The cell-mediated response is rapid, as mast cells are paired directly with nerve cells, which can lead to a multi-system response

involving different organs. The cell-mediated response also involves cellular memory, which amplifies response with subsequent triggering events from single or repeated exposures even at low levels of chemicals. This can lead to sensitization and hypersensitivity (chemical intolerance) to oil, chemicals, food, drugs/antibiotics, and toxic mold vapors that were previously tolerated.

For example, this underlying mechanism was found in a comparison of chemical intolerances in Persian Gulf War veterans with Gulf War Illness, World Trade Center responders with the WTC Cough, pilots exposed to aircraft oil fumes with Aerotoxic Syndrome, and EPA workers exposed to semi-volatile organic compounds during building renovations with Sick Building Syndrome, among others (Miller et al., 2021). A large population study confirmed the main categories of substances that initiate a cell-mediated response are biological toxicants from particles and vapors from toxic molds or algae and fossil fuel-derived toxicants (e.g., from coal, oil, natural gas), their combustion products, and/or synthetic organic chemical derivatives (e.g., pesticides, pharmaceutical drugs/ antibiotics, and implants) (Miller et al., 2023).

This means that sensitivity symptoms associated with oil and chemical exposures to health hazards and complex chemical mixtures are *always* ***in****dependent* of dose-response relationships and threshold doses that are based strictly on levels of exposure quantified in numbers. It supports the Plaintiffs/Appellants argument that the district court erred in requiring plaintiffs' experts to identify a *quantifiable* threshold dose or a dose-response relationship, both rooted in toxicological principles, to prove that exposures during oil spills can generally cause negative health effects. These symptoms cannot be quantified solely or adequately by old-school toxicology principles and protocols or by antibody-mediated immunology principles (i.e., true allergic responses) and protocols, which also rely on old-school toxicological dose relationships. It's like trying to pound a square peg into a round hole—it's just not a good fit. Instead, an approach using cell-mediated immunology principles is called for.

Epidemiology and cell-mediated immunology

Environmental epidemiology uses a multi-disciplinary, semi-quantitative approach with metrics based on *qualitative* expressions of symptoms, duration, and estimates of exposure *as surrogates for dose measurements* that are often not available when exposures from complex mixtures occur in a broad geographical setting. For example, toxicologist Bernard Goldstein noted that for "many epidemiological studies of toxic agents, dose is a binary—yes or no—

determination instead of a quantitative expression" or "qualitative estimates of high and low exposure" (Goldstein, 2009, at 563 and Fn. 27).

Quantifying dose levels with traditional analytical methods underestimate oil exposure. Measurements that rely on sentinel chemicals or groups of oil components like THCs (Total Hydrocarbons), VOCs (Volatile Organic Compounds), PAHs (Polycyclic Aromatic Hydrocarbons), etc., as a proxy for oil spill exposure do not detect all the oil components. For example, only 1.3–4% of the PAHs in fresh oil are captured by traditional methods (Payne, Driskell, 2018). Also, traditional methods do not account for the *size* of oil-contaminated droplets.

For example, dispersants were found to increase the ratio of nano-to-micro-size oil droplets in air emissions *without altering the concentration of particle-bound PAHs* (Afshar-Mohajer et al., 2018), a particular fraction of PAHs considered to be very hazardous to human health (World Health Organization, 2010). By increasing the number of airborne particles by 10 to 100 times across the entire nano-scale range, dispersants increased the total mass of aerosolized particles by 2 to 3 times compared to that of crude oil (*Id.*, 2018). Such ultrafine particles are known to travel long distances and to penetrate deeply into the alveoli region of the human respiratory system. Inhalation of dispersant-mediated particulate emissions increased the total mass burden of *nano*particles inhaled and deposited in upper respiratory regions (upper respiratory tract and tracheobronchial region) of humans about 10 times, compared to slicks of crude oil without dispersants (Afshar-Mohajer et al., 2019). Dispersants also increase the airborne content of crude oil (Afshar-Mohajer et al., 2020).

Of practical concern are the inhalable oil mists, chemically-dispersed oil aerosols, and secondary organic aerosols, which are not accounted for at all with traditional analytical methods and yet are now know to be the dominant fate for surface oil (Ward et al., 2018; 2022). Oil spill exposures are not simply from a single chemical in a defined setting, but rather from complex, multi-phase mixtures of oil-chemical hazards in constantly variable physical and environmental settings. Therefore, a semi-quantitative approach is more accurate in detecting and understanding human health effects than a quantitative approach with traditional methods, which creates a low-biased impression of the true scale and nature of an oil spill's harmful consequences.

Further, the district courts have misconstrued the concept of "dose" itself. Dose is nothing without duration. Goldstein wrote, "Dose is defined as

concentration multiplied by frequency or duration—it is not just the exposure level at any one point in time (2009, at 554). He goes on to explain:

> "Understanding how dose affects response is central to the science of toxicology. Dose-response curves are a classic means of illustrating this relationship, and developing a dose-response curve through direct observation or through extrapolation is an essential element of the function of toxicologists. Extrapolation may be from high to lower doses, from one group of humans to another, or between species. Toxicologists generally posit two main dose response curves: those that have a "threshold" and those that do not…"

Practically, this means that dose-response relationships can be established without dose thresholds, the latter relevant for cancers and other health hazards, (i.e., germ cell mutagenicity, reproductive toxicity, and complex mixtures of chemicals) described in earlier (OSHA, 2012a).

This is why a semi-quantitative approach was used in epidemiology studies following large oil spills from the *Prestige* (Spain, 2002), *Hebei Spirit* (South Korea, 2007), and BP *Deepwater Horizon* (U.S., 2010). These studies used qualitative expressions of symptoms, duration, and estimates of exposure instead of quantitative measurements. From these studies emerged consistent findings of adverse chronic health harm among response workers and exposed residents. Causal relationships are now widely recognized between initial acute symptoms of oil spill exposure and long-term respiratory (Lawrence et al., 2022; Rusiecki et al., 2022; Abereton et al., 2023), cardiovascular (Chen et al., 2022; Denic-Roberts et al., 2022), and neurological harm (Krishnamurthy et al., 2019; Quist et al., 2019), including cancers (Park et al., 2019), in workers and among residents of oil-producing communities (Onyije et al., 2021).

Significantly, the chronic harm from oil exposures:

(1) occurs at initial levels of petroleum hydrocarbons that are at the lower end of OELs and the upper end of public health standards (Pratt et al., 2020);

(2) is characterized by a set of acute symptoms (Laffon et al., 2016) that are consistent with known sensitivity or hypersensitivity responses to oil and other hazardous substances, as reflected in existing law (OSHA, 2012a);

(3) increases with exposure to oil dispersants (McGowan et al., 2017; Fingas, 2021); and

(4) increases in medically-underserved communities (Beland, Oloomi, 2019; Hu et al., 2021; Lawrence et al., 2021).

The findings of long-term harm to human health are well supported by advances in understanding the fate of oil and chemically dispersed oil, in particular: the rapid formation of noxic secondary organic aerosols via photooxidation of oil at the sea surface (Middlebrook et al., 2012); the dispersal of these aerosols and other oil components over long distances both within (de Gouw et al., 2011) and above the marine boundary layer (Perring et al., 2012; Middlebrook et al., 2012; Ryerson et al., 2012); and, in coastal and rural regions of southeast Louisiana (where the study was based), the *exceedances* of protective standards for public health in air samples, carrying an oil spill-derived aerosol signature, over the five months of peak emissions following the BP *Deepwater Horizon* oil disaster (Nance et al., 2016).

Further, the findings are also well supported by wildlife studies, in particular, the Barataria Bay (Louisiana) bottlenose dolphin epidemiology studies that found consistency in mechanisms of action and disease pathogenesis, progressing from molecular and cellular effects to organ dysfunction and systemic effects that compromise fitness, growth, reproductive potential, and survival—or, in cases of high concentrations, multiple organ failure and death (Lane et al., 2015; McDonald et al., 2017; Schwacke et al., 2017; Venn-Watson et al., 2015).

Conclusion

Supreme Court Justice Stephen Breyer once commented, "A judge is not a scientist and a courtroom is not a scientific laboratory," but judges "must aim for decisions that, roughly speaking, approximately reflect the scientific state of the art" (Associated Press, 1998).

The current scientific state of art recognizes causal relationships between initial acute symptoms of oil spill exposure and long-term respiratory harm, cardiovascular harm, and neurological harm, and cancers in workers and among residents of oil-producing communities, based on epidemiology studies and cell-mediated immunology principles. The findings are well-supported by secondary studies (literature reviews), wildlife studies, a plethora of clinical and laboratory studies, and even existing regulatory law. The relationships have been consistently observed over time in different areas in oil spills since the 1989 *Exxon Valdez* and in other large-scale disasters and/or wars involving oil and chemical releases.

I consider myself a reasonable person. Yet I find it incredulous that the district court could not see the metaphorical elephant in the room—the fact that the nation's largest oil spill could and did cause the harm claimed by the Plaintiffs/ Appellants. Let the science speak. Ungag the experts. Law is supposed to lag science—but not by decades.

The nation's first responders and the public rely on government to protect people's health and safety during oil spills and the courts to hold corporations accountable for harm. The court's reductionist approach to considering evidence of harm could literally cause serious harm to first responders and the exposed public by not recognizing existing regulatory law and accepted science.

Therefore, I respectfully urge this Court to reverse the district court's order excluding Dr. Freeman's and Dr. Solomon's expert testimony and granting summary judgment against the Plaintiffs/Appellants, as well as the final judgments entered against them. As this Court deliberates, I hope it considers the health and safety of our first responders and the exposed public, including children, whose lives will be irrevocably altered, during the next big oil spill or other oil-chemical disaster, by long-term illnesses and cancers *that are preventable*.

Sincerely,

Fredericka (Riki) Ott

Fredericka ("Riki") Ott, PhD

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