Utah Physicians for a Healthy Environment
Dr. Brian Moench
Artyom Sidorkin
Bronchial Tree
“You are what you breathe”
Save Utah’s air
Save Utah’s air
Plant a tree in the body orifice of your choice.
“We have a philosophy that accidents don’t just happen.”

Dan Johnson
former manager for government and public affairs
Chevron refinery
Pre-polluted:
Over 200 hazardous chemicals perfusing every organ on day one
134 cause cancer
151 birth defects
154 endocrine disruption
158 neurotoxins
Crude oils contain over a thousand different hydrocarbons and, depending on the source of the oil, vary greatly in the relative amounts of individual hydrocarbons and trace metal and sulfur content.
Benzene, PAHs, heavy metals
PAHs and other endocrine disrupting chemicals can pass through the placenta, resulting in concentrations as high as the baby’s own sex hormones.
Regulatory agencies set safe exposure levels for chemicals by testing for effects at high concentrations, then, using statistical extrapolation to determine safe exposure levels. This method assumes that if exposure goes up so do effects and if exposure goes down so will effects. But, research is beginning to show that chemicals do not always follow this rule and may cause different effects at higher and lower levels.
“Even infinitesimally low levels of exposure indeed, any level of exposure at all, may cause endocrine or reproductive abnormalities, particularly if exposure occurs during a critical developmental window. Surprisingly, low doses may even exert more potent effects than higher doses.”
“There are no safe doses for endocrine disruptors.”
<table>
<thead>
<tr>
<th>Drug</th>
<th>Concentration</th>
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<tbody>
<tr>
<td>Cialis</td>
<td>30 ppb</td>
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<tr>
<td>Paxil</td>
<td>30 ppb</td>
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<tr>
<td>Albuterol</td>
<td>2.1 ppb</td>
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<tr>
<td>Birth Control</td>
<td>35 ppt</td>
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Air indoors was more polluted than the air outdoors. “Toxic pollution from oil refineries doesn’t stay outside; it seeps into homes.” Air in Richmond homes had more chemicals present and at higher concentrations than in Bolinas. Vanadium and Nickel were especially high.

Endocrine Hormones: maybe the most powerful biologic agents known
1/1,000 of previously recommended safe dosages of hormone mimickers are now known to create genetic malfunctions and precancerous conditions in invitro cells.
PAHs act as:
* endocrine disruptors, i.e. may interfere with, mimic, or block hormone production, release and activity
* development toxicants
* reproductive toxicants

Low internal doses of endocrine disruptors found in typical human populations have been linked to obesity (Carwile and Michels 2011), infertility (Meeker and Stapleton 2010), neurobehavioral disorders (Swan et al. 2010), and immune dysfunction (Miyashita et al. 2011), among others.
A diverse group of scientists has reexamined this large body of literature, finding examples of low-dose effects for dozens of chemicals across a range of chemical classes, including industrial chemicals, plastic components and plasticizers, pesticides, phytoestrogens, preservatives, surfactants and detergents, flame retardants, and sunblock, among others (Vandenberg et al. 2012).
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Even tiny doses can be poison.
Especially to the youngest
The Department of Health and Human Services, the International Agency for Research on Cancer, the National Toxicology Program, and the EPA have determined that:

Benzene is carcinogenic to humans.
Double the risk for leukemia in the last 10 years for people living in the vicinity of an oil refinery.

Studies with pregnant animals show that breathing benzene has harmful effects on the developing fetus. These effects include low birth weight, delayed bone formation, and bone marrow damage.
Exposure to petrochemicals, specifically benzene, gasoline, and hydrogen sulphide is significantly associated with increased frequency of spontaneous abortion.

Exposure to benzene near the US permissible limit is associated with sperm aneuploidy (wrong number of chromosomes).

Mutagenic effects theoretically can result from a single molecular DNA alteration. Regulatory prudence has led to the use of “one-hit models” for mutagenic end points, particularly cancer, in which every molecule of a carcinogen is presumed to pose a risk. The carcinogens of concern in crude oil are benzene, which is present at a concentration of 1 to 6%, and polycyclic aromatic hydrocarbons (PAHs), which are present at much lower but quite variable concentrations.

The half life of benzene is short (days) the half life of PAHs is much longer and they can bioaccumulate
“Pregnant women should particularly avoid dermal contact with oil and should avoid areas with visible oil contamination or odors.”

Trace metals of concern: arsenic, boron, chromium, lead and nickel
Studies from the Prestige Oil Spill

Airway injury and genotoxicity persisted for over two years
Background: In 2002, the oil tanker Prestige spilled more than 67,000 tons of bunker oil, heavily contaminating the coast of northwestern Spain.

Objective: To assess respiratory effects and chromosomal damage in clean-up workers of the oil spill 2 years after the exposure.

Design: Cross-sectional study.

Setting: Fishermen cooperatives in coastal villages.

Participants: Local fishermen who were highly exposed (n = 501) or not exposed (n = 177) to oil 2 years after the spill.

Measurements: Respiratory symptoms; forced spirometry; methacholine challenge; markers of oxidative stress (8-isoprostanate), airway inflammation (interleukins, tumor necrosis factor-α, and interferon-γ), and growth factor activity in exhaled breath condensate; and chromosomal lesions and structural alterations in circulating lymphocytes.

Results: Compared with nonexposed participants, persons exposed individuals without symptoms. Exposed nonsmoking participants also had higher levels of exhaled vascular endothelial growth factor (risk difference, 44.8 [CI, 27.9 to 61.6]) and basic fibroblast growth factor (risk difference, 16.0 [CI, 3.5 to 28.6]). A higher proportion of exposed participants had structural chromosomal alterations (risk difference, 27.4 [CI, 10.0 to 44.8]), predominantly unbalanced alterations. The risk for elevated levels of exhaled 8-isoprostanate, vascular endothelial growth factor, and basic fibroblast growth factor and structural chromosomal alterations seemed to increase with intensity of exposure to clean-up work.

Limitations: The clinical significance of exhaled biomarkers and chromosomal findings are uncertain. The association between oil exposure and the observed changes may not be causal. The findings may not apply to spills involving other types of oil or to different populations of oil spill workers.

Conclusion: Participation in clean-up of a major oil spill was associated with persistent respiratory symptoms, elevated markers of airway injury in breath condensate, and chromosomal damage.
501 fishermen
persistent symptoms
increased markers of airway injury
more chromosomal damage
Exposure Details
15 days, median of 6 hours/day
primarily younger men
most had respirators
occurred during the winter
Studies from the Prestige Oil Spill

Changes in prolactin and cortisol levels suggesting endocrine disruption


Bioaccumulation and biomagnification of crude-oil components, particularly PAHs, can occur in seafood.
There is no safe level of exposure to bullets.

every molecule of a carcinogen is presumed to pose a risk.