A Risk Characterization of the Health Effects of the Deepwater Horizon Oil Spill
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Introduction
- The defining characteristic of the Deepwater Horizon oil spill is the unprecedented use of chemical dispersants and amount of oil released.
- Dispersants alter the distribution of oil in an aquatic environment, they do not reduce the amount of oil that is present.
- Benzene is a highly toxic and carcinogenic component of crude oil.

Project Aims
- To characterize the toxicological information about risks of exposure to chemical dispersants.
- To estimate the rate of benzene volatilization from the surface of the oil spill.
- To explain the potential impact dispersants will have on inhalational toxicity levels post spill.

Methods
- Combined the health effects of dispersants, individual dispersant ingredients, and crude oil components into a table of exposure limits.
- Utilized the exponential decay model with estimates calculated from Rault’s Law under the well-mixed hypothesis.
- Explained how dispersants would alter volatilization of crude oil components.

Results

Estimated Benzene Exposure:
\[ C(t) = \frac{p}{L} \left(1 - e^{-t}\right) \]

=0.034 g/m³/day
approx. = 2.88 ppm

EPA Acute Allowable Exposure = 2.5 ppm

Benzene-Dispersant Interaction Scenarios:
1. The dispersants will increase the surface area of the crude oil and the volatilization of benzene will occur at an increased rate.
2. The hydrophobic exterior of the dispersant micelles will reduce the potential for volatilization from the crude oil.

Model Assumptions
- The oil is constantly being replenished over the 87 day spill period.
- The ratio of benzene vapor pressure to water vapor pressure was assumed to be the same ratio as the volatilization rate of benzene to the volatilization rate of water.
- There is homogeneous and instantaneous mixing within a 1 km mixing height above the spill, no consideration was made for the stratification of different molecules throughout the air column.

Discussion
- Dispersants pose a moderate risk to human health. The way they distribute toxic components of crude oil throughout the environment is of concern and requires further research.
- The potential inhalation of benzene is of concern for on-site workers in the aftermath of the spill.
- Additional remediation techniques should be developed and evaluated for efficacy and deleterious health effects.