

Deepwater Horizon oil spill contributed to high number of Gulf dolphin deaths

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Dolphins swimming through oil in the Gulf of Mexico during the Deepwater Horizon oil spill in April 2010. Credit: NOAA

As part of an unusual mortality event investigation, a team of scientists has discovered that dead bottlenose dolphins stranded in the northern

Gulf of Mexico since the start of the Deepwater Horizon oil spill have lung and adrenal lesions consistent with petroleum product exposure according to a paper published today in the peer-reviewed online journal *PLOS ONE*.

These findings support those of a 2011 health assessment of live [dolphins](#) in Barataria Bay, Louisiana, a heavily oiled area during the spill which showed those resident dolphins had poor health, adrenal disease, and lung disease.

The timing, location, and nature of the detected lesions support that contaminants from the Deepwater Horizon oil spill caused these lesions and contributed to the high numbers of dolphin deaths within this oil spill's footprint. Increased dolphin deaths following the oil spill are part of the northern Gulf of Mexico unusual mortality event investigation.

"This is the latest in a series of peer-reviewed scientific studies, conducted over the five years since the spill, looking at possible reasons for the historically high number of dolphin deaths that have occurred within the footprint of the Deepwater Horizon spill," said Dr. Teri Rowles, veterinarian and one of 22 contributing authors on the paper, and head of NOAA's Marine Mammal Health and Stranding Response Program, which is charged with determining the causes of unusual mortality events, also known as UMEs. "These studies have increasingly pointed to the presence of petroleum hydrocarbons as being the most significant cause of the illnesses and deaths plaguing the Gulf's dolphin population. This study carries those findings significantly forward."

Direct causes of death, during this period, likely included:

- Chronic adrenal insufficiency resulting from adrenal gland effects;
- Increased susceptibility to life-threatening outcomes due to

adrenal insufficiency, especially when challenged with pregnancy, cold temperatures, and infections; and

- Increased susceptibility to primary bacterial pneumonia, possibly due to lung injury, or alterations in immune function.



One of the dolphins who stranded and died following the Deepwater Horizon oil spill in the Gulf of Mexico during the summer of 2012 off the Louisiana coast.
Credit: Louisiana Department of Wildlife and Fisheries

Animals with untreated adrenal insufficiency are at risk of life-threatening adrenal crises. The adrenal gland produces hormones - such

as cortisol and aldosterone - that regulate metabolism, blood pressure and other bodily functions.

"Animals with adrenal insufficiency are less able to cope with additional stressors in their everyday lives," said Dr. Stephanie Venn-Watson, the study's lead author and veterinary epidemiologist at the National Marine Mammal Foundation, "and when those stressors occur, they are more likely to die."

Since early 2010, there has been an ongoing cetacean unusual mortality event involving primarily bottlenose dolphins in the northern Gulf of Mexico. Three out of four groupings of elevated dolphin strandings identified within this event followed the Deepwater Horizon oil spill.

This ongoing die-off, with the highest number of dead bottlenose dolphin strandings on record in the northern Gulf of Mexico, coincided with the largest marine-based oil spill in the United States.

Barataria Bay, Louisiana, was one of the most heavily oiled coastal areas from the Deepwater Horizon oil spill, and the new study shows that half of the dead dolphins examined from Barataria Bay that stranded between June 2010 and November 2012 had a thin adrenal gland cortex, indicative of adrenal insufficiency. One in every three dolphins examined across Louisiana, Mississippi and Alabama had this lesion. In comparison, only 7 percent of the dead stranded reference dolphins, collected from other coastal regions outside the Deepwater Horizon oil spill area and time frame, had a thin adrenal cortex.



One of the stranded dead dolphins that came ashore in 2012 along the Louisiana coast being photographed for study. Credit: Louisiana Department of Wildlife and Fisheries

In fact, almost half of the dolphins with this otherwise rare adrenal lesion appeared to have died without another clear explanation for their death.

In addition to the adrenal lesions, the scientific team discovered that more than one in five dolphins that died within the Deepwater Horizon oil spill footprint had a primary bacterial pneumonia. Many of these cases were unusual in severity, and caused or contributed to death.

"These dolphins had some of the most severe lung lesions I have seen in the over 13 years that I have been examining dead dolphin tissues from throughout the United States," said Dr. Kathleen Colegrove, the study's lead veterinary pathologist based at the University of Illinois. In comparison, only 2 percent of reference dolphins had these lesions.

In other mammals, exposure to petroleum-based polycyclic aromatic hydrocarbons, known as PAHs, through inhalation or aspiration of oil products can lead to injured lungs and altered immune function, both of which can increase an animal's susceptibility to primary bacterial pneumonia. Dolphins are particularly susceptible to inhalation effects due to their large lungs, deep breaths and extended breath hold times.

The prevalence of Brucella and morbillivirus infections, which were investigated as potential alternative causes for increased dolphin deaths, was low in UME dolphins after the oil spill and was no different compared to the reference dolphins. Additionally, biotoxin levels were either low or below the detection limit in the UME dolphins.

Ongoing studies assessing changes in these lung and [adrenal gland](#) lesions over time will help to address questions regarding how long these chronic conditions may last.

Provided by NOAA Headquarters

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