New study defines the environment as an influencer of immune system responses in dolphins

May 3 2017

Health and Environmental Risk Assessment (HERA) team members secure an Atlantic bottlenose dolphin while a health exam is performed. Credit: Georgia Aquarium/Addison Hill

Two populations of wild dolphins living off the coast of Florida and South Carolina are experiencing more chronically activated immune systems than dolphins living in controlled environments, raising concerns of researchers about overall ocean health, and the long-term health of bottlenose dolphins. The research, publishing May 3 in the scientific journal *PLOS ONE* is the first study of its kind analyzing the role the environment plays in the overall health and immune response of dolphins in the wild compared to those in human care.

"This is likely a result of encountering pathogens, parasites and anthropogenic pollutants in the ocean that do not exist in closely managed zoological habitats," said Patricia Fair, PhD, lead author of the study and Research Professor at the Medical University of South Carolina. "The immune system is incredibly complex and so very important for health. Microbes are part of the natural world and help to develop the immune system. The key to a healthy immune system is a balance between being able to recognize harmful organisms and overstimulation and this study demonstrates the importance of the environment in these responses."

The study analyzed samples and data from four populations of dolphins:

- Two wild populations (one living in the Indian River Lagoon, Fla. and one living near Charleston, S.C.)
- Two populations living in managed care (one at Georgia Aquarium in Atlanta and one at the Space and Naval Warfare Systems Center in San Diego)

Dr. Gregory Bossart, a co-author on the study and Chief Veterinary Officer at Georgia Aquarium has been conducting routine health assessments with colleagues on more than 360 individual dolphins living in Indian River Lagoon and Charleston since 2003 as part of the Health and Environmental Risk Assessment Project (HERA).

During that time, HERA researchers have recorded emerging infectious diseases, tumors, antibiotic resistant bacteria and alarmingly high levels of contaminants in dolphins from both wild populations. Because dolphins are high on the food chain, they bioaccumulate any toxins ingested by their prey.

In the Indian River Lagoon, samples revealed high levels of mercury in the native dolphin population, which HERA researchers suggest could be impacting the health of local fishermen and residents. Not reflected in this current study, but previously published work by HERA researchers, details how these dolphins also exhibited cutaneous fungal disease associated with immune suppression as well as new, emerging viruses and infectious agents some of which are also potential human pathogens.

Researchers studying the dolphin population near Charleston documented high levels of human-introduced organic chemicals likely introduced into the water from industrial and non-point sources.

The study's findings suggest environmental stressors are having an impact on the immune responses of the wild dolphins, creating more chronically activated immune systems, which, in turn, could help explain why the health of wild dolphins in both populations is considered compromised with less than half found to be clinically normal.

"Importantly, the chronic immune system activation as found in the wild dolphins of this study could lead to eventual immunologic dysregulation and the inability to eliminate chronic inflammation. In humans, this type of prolonged smoldering inflammation is associated with cancer, autoimmune disease, cardiovascular disease, and increased vulnerability to infectious disease," said Bossart. "These wild dolphins are trying to tell us something and we are not listening. As a sentinel species, dolphins are an important way to gauge the overall health of our oceans. If wild dolphins aren't doing well, it could also indicate future impacts to ocean

health and even our own health."

By contrast, dolphins living in managed care environments had less chronically activated immune systems, which Bossart suggests is not surprising. "Dolphins in human care are exposed to fewer pathogens because of environmental controls of water and food quality and preventative medical programs. Thus, their immune responses tend to be more focused and short acting. Our findings suggest that the wild dolphins of our study have immune systems that are chronically activated and challenged."

"Georgia Aquarium's HERA Project will continue to look at the health of these two wild dolphin populations, and may grow to include additional populations," said Bossart. "We believe this work will open the doors to additional research on how the surrounding environment impacts the health and immune response of dolphins and other marine species.

Provided by Georgia Aquarium

Citation: New study defines the environment as an influencer of immune system responses in dolphins (2017, May 3) retrieved 30 April 2024 from https://phys.org/news/2017-05-environment-immune-responses-dolphins.html