

Pollutants could pose health risks for five sea turtle species

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A hawksbill sea turtle swims above a coral reef in waters off the British Virgin Islands. Credit: Copyright Mar-y-Sol Gallery

(Phys.org) -- Researchers at the Hollings Marine Laboratory (HML) and four partner organizations have measured for the first time concentrations of 13 perfluoroalkyl compounds (PFCs) in five different endangered species of sea turtles. While PFC toxicology studies have not yet been conducted on turtles, the levels of the compounds seen in all five species approach the amounts known to cause adverse health effects in other animals.

PFCs are man-made [compounds](#) that have many uses including stain-resistant coatings, fire-fighting foams and emulsifiers in [plastics](#)

manufacturing. They have become widespread pollutants, are detectable in human and wildlife samples worldwide, infiltrate food chains, and have been shown in laboratory animals—rats, mice and fish—to be toxic to the liver, the thyroid, neurobehavioral function and the immune system. The PFCs most commonly found in the environment are perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA).

Located in Charleston, S.C., the HML is a collaboration of the National Institute of Standards and Technology (NIST), the National Oceanic and Atmospheric Administration (NOAA), the South Carolina Department of Natural Resources, the College of Charleston and the Medical University of South Carolina.

"In our experiment, we wanted to accomplish two goals," says NIST research biologist and study lead Jennifer Keller. "We wanted to get the first accurate measurements of the plasma blood concentrations of PFCs in five sea [turtle species](#) across different trophic [[food chain](#)] levels, and then compare those concentrations to ones known to cause toxic effects in laboratory animals. That way, we could estimate the potential health risks from PFC exposure for all five [turtles](#)."

The five sea turtle species studied were the green, hawksbill, leatherback, loggerhead and Kemp's ridley. Their preferred diets range up the food chain from the green's sea grasses and algae to the crabs favored by the Kemp's ridley. The researchers expected that the PFC concentrations would be higher in species that fed farther up the food chain, since their prey's tissues would probably concentrate the pollutants.

This was generally the case. Plant-eating green turtles had the lowest plasma concentrations for the majority of PFCs examined, especially PFOS. As expected, leatherbacks, loggerheads and Kemp's ridleys had progressively higher PFOS concentrations. Surprisingly, however,

hawksbills—who browse low on the food chain, primarily on sponges—recorded the second-highest average concentration of PFOS and were the only species to have a detectable PFOA level. The researchers surmise that this may relate to the locations where the hawksbills forage, or it may suggest that sponges have unusually high concentrations of PFOS and PFOA.

In the second part of the study, Keller and her colleagues compared the plasma concentrations of PFOS that they found in the five sea turtle species with previously reported concentrations that were shown to have [adverse health effects](#) in laboratory animals. The results showed that hawksbills, loggerheads and Kemp's ridleys had PFOS concentrations approaching those linked to liver and neurobehavioral toxicity in other animals; levels in loggerheads and Kemp's ridleys approached those linked to thyroid disruption in other animals; and all five species had levels that approached those linked to suppressed immunity in other animals.

"Better understanding the threat of PFCs, especially PFOS, to [sea turtles](#) can help wildlife managers and others develop strategies to deal with potential health problems," Keller says. "Our study provides the first baseline data in this area but more research is needed—especially for hawksbills after seeing their unexpectedly high PFC exposure."

Researchers from the College of Charleston's Grice Marine Laboratory, NOAA's National Marine Fisheries Service and the Loggerhead Marinelife Center also contributed to the study.

More information: * J.M. Keller, L. Ngai, J.B. McNeill, L.D. Wood, K.R. Stewart, S.G. O'Connell and J.R. Kucklick. Perfluoroalkyl contaminants in plasma of five sea turtle species: Comparisons in concentration and potential health risks. *Environmental Toxicology and Chemistry*, Vol. 31, No. 6, pp. 1223-1230 (June 2012). [DOI:](#)

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