# Toxic BP spill oil component disrupts fish hearts, new study says

*Chemical in BP oil identified as specific substance responsible for disrupting hearts of fish setting off alarms for exposure of humans.*

NEW ORLEANS , LA, USA, February 7, 2017 /EINPresswire.com/ -- A toxic chemical found in oil has now been identified as the specific substance responsible for disrupting the hearts of fish exposed to crude oil spills, including the BP Deepwater Horizon disaster, according to a paper published in the Jan. 31 issue of Nature Scientific Reports. The discovery is setting off alarm bells about the exposure of human beings to the same chemical in air and water.

The substance is phenanthrene, one of many chemicals known as polycyclic aromatic hydrocarbons found in crude oil. It is described as a "pervasive global pollutant" in the study. The chemical has now been shown to be the substance in oil that disrupts fish hearts in ways that can lead to slowing heart rates, reducing the ability of the heart to contract and causing irregular heartbeats that can lead to heart attacks or death.

The chemical actually disrupts heart muscles in fish in the same way that human heart muscles are disrupted by terfenadine, sold under the brand name Seldane, a non-drowsy antihistamine that was taken off the market in the United States in 1998, said John Incardona, a research toxicologist at the National Oceanic and Atmospheric Administration's Northwest Fisheries Science Center in Seattle, Wash. The new study showed that phenanthrene had the same three-ring molecular structure and blocked the same ion channel that carries electrical signals to heart muscles, he said.

For fish, the presence of the chemical in water is extremely dangerous to its eggs, Incardona said, because it does not dissolve in water, but is quickly absorbed by the fish egg tissue. "If eggs are floating around, the spilled oil gets into the fish egg and accumulates at levels where the phenanthrene blocks the ion channels," he said.

The exposure of Atlantic bluefin tuna eggs to oil from the BP well has been a major concern of researchers such as Barbara Block, a renowned tuna biologist at Stanford University and lead author of the new paper. Her laboratory conducted the cellular research that discovered phenanthrene was the ion disrupter.

"By carefully isolating heart cells from tunas, Olympians of the sea, and using electrophysiological and confocal microscopy techniques, we recorded ionic currents and found exactly where phenanthrene blocks the heart excitation-contraction coupling pathway, which is the link between the on-off switch, or excitation, and the contraction that powers every heart beat," she said.

Block's research before the BP disaster showed that Atlantic bluefin tuna spawn in the Gulf of Mexico in a broad, long band that includes the BP Macondo well blowout site, about 50 miles south of New Orleans. She tracked one of the huge fish as it swam back and forth near the well site before returning to the Atlantic Ocean and heading to waters off New England and Canada.

After the spill, Block and other scientists conducted laboratory research that indicated that the

polycyclic aromatic hydrocarbons caused heart problems in amberjack and yellowfin tuna. Incardona said similar research on fish species in Prince William Sound after the Exxon Valdez oil disaster there in 1989 also found that these hydrocarbons had disrupted their heart rhythms.

But it was this most recent research that determined exactly which specific chemical was responsible, and is now raising questions about the chemical's effect on human beings. When oil-based fuels and petrochemicals are incompletely burned, they create phenanthrene that can be inhaled through the air -- via car and truck exhaust -- or ingested or absorbed via water, according to a National Oceanic and Atmospheric Administration scientists who co-authored the new report.

"The mechanism which alters cardiac function in fish and the protein that phenanthrene targets -- the ion channel responsible for potassium movement from the cell -- is also present in humans," said Fabien Brette, a research associate at Stanford University at the time of the study and co-lead author of the new paper. "What we measured on fish cardiac cells can occur on human cardiac cells, and this could mean risk of sudden death."

Researchers used what is called a confocal laser scanning microscope, which increases the ability of the user to see the tiniest details of cells by scanning focused beams of laser light across them. They also used a technique called patch clamp electrophysiology, where tiny glass pipettes are used as electrodes to close a small patch of surface area of a heart membrane -- as small as just one or a few ion channel molecules -- to measure changes the flow of calcium ions through the channels that control the fish heart rhythm.

The researchers found that after being exposed to phenanthrene, calcium ion movement into and out of heart cells was disrupted and reduced. It also led to disruptions in the outward flow of potassium ions, just as more complex mixtures of crude oil did.

The effects on fish are both short-term and persistent, said Holly Shiels, associate professor of life sciences at the University of Manchester and another author of the study. "In the short term, cardiac dysfunction in these fish can affect really metabolically demanding activities like swimming or reproduction or foraging. In the long term, if you have heart function compromised, it could be fatal," she said.

The concern is that phenanthrene can be causing similar short-term and long-term effects in human beings, now that its effects on fish are better understood, Incardona said. "Here's an environmental chemical that has the same effect as a bunch of drugs that have already been taken off the market," he said.

"A physician might be sued for malpractice if he gave a person that drug today. Yet phenanthrene, it's everywhere," including in urban pollution resulting from car and truck exhausts.

A better understanding of the effects of phenanthrene on humans should be the next research step, he said.

http://www.nola.com/environment/index.ssf/2017/02/toxic_bp_spill_oil_component_s.html

Maureen Dauphinee
Real Coastal Warriors
585-563-6185
email us here