

PCBs levels down in Norwegian polar bears

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It's never been easy to be a polar bear. They may have to go months without eating. Their preferred food, seal, requires enormous luck and patience to catch. Add to that the melting of Arctic sea ice due to climate change, and the poisoning of the Arctic by toxic chemicals, and it's easy to see why polar bears worldwide are in trouble.

Among all the bad news, however, comes one possible bright spot. In a study of [PCBs](#) in polar bear cubs in Svalbard, researchers from the Norwegian University of Science and Technology (NTNU) have found that blood levels of PCBs and related contaminants in polar bear cubs appear to have dropped by as much as 59 per cent between 1998 and 2008. At the same time, levels of these contaminants in their mothers were as much as 55 per cent lower over the same period.

"The levels of PCB compounds in [blood samples](#) from females are on the decline," says Jenny Bytingsvik, a biologist at NTNU who is completing her doctoral dissertation on the findings. "For newborn, vulnerable cubs, this is a very positive trend. Reduced levels of PCBs in the mother bears' blood mean that there is also less contamination in their milk. Even though the PCB levels we found are still too high, this shows that international agreements to ban PCBs have had an effect."

Banned internationally since 2004

PCBs (polychlorinated biphenyls) were once widely used as a cooling fluids and [insulators](#) in transformers and electric motors, but were banned by many [industrialized countries](#) 30 years ago because of their

harmful effects on humans and animals. More recently, the [global production](#) of PCBs has been banned as of May 2004 by the Stockholm Convention on Persistent Organic Pollutants, an environmental treaty designed to eliminate or restrict the production and use of [persistent organic pollutants](#), including PCBs.

Polar bears are particularly at risk from these persistent pollutants because the chemicals are fat-soluble and increase in concentration the higher you go in the food chain. That's a double problem for polar bears, because they are at the very top of the food chain, and their preferred foods, like seals, tend to be very rich in fat.

Fertility problems and more

In humans, PCBs are considered a neurotoxin and an endocrine disrupter, and exposure to high levels of the substances has been linked to low birth weights, delayed developmental milestones, and lower IQs in comparison with unexposed children. Overall, a number of studies have found that exposure to persistent pollutants such as PCBs during critical developmental periods is associated with a range of negative health effects in wildlife, experimental animals and humans.

In polar bears, "PCBs affect the bears' thyroid hormones, and in the worst case can reduce the animals' ability to survive in the tough Arctic environment," Bytingsvik adds. "There can be negative effects on the bears' ability to grow and thrive. The contaminants can also affect the ability of the animals to learn and may reduce their fertility."

From mother to cub

Polar bear milk is high in fat, which also unfortunately makes it perfect for transmitting PCBs from mothers to their cubs. Bytingsvik also

looked at levels of OH-PCBs, which are toxic substances created by the body when PCBs are metabolized. While OH-PCBs are still harmful, they are more likely to bind to proteins rather than dissolve in fat, which means that they are more likely to be transferred by umbilical cord blood than by milk. Another source of exposure is the cubs' own metabolic conversion of PCBs into OH-PCBs.

In her study, Bytingsvik was able to look at polar bear blood samples from mothers and cubs that were collected in 1997 and 1998 (which she considered as 1998 for statistical purposes) and 2008. All told, she had samples from 26 mother bears and 38 cubs from the different time periods.

The bears were all sampled in the Norwegian island archipelago of Svalbard, roughly 800 km south of the North Pole. Overall, Bytingsvik found that the levels of OH-PCBs in polar bear mothers dropped by 65 per cent over the 10-year span, while the levels of PCBs dropped by 55 per cent. In cubs, the levels of OH-PCBs dropped by 50 per cent, while levels of PCBs dropped by 59 per cent over the same period. Although the bears were not sampled in exactly the same location in 2008 as in 1998 (which might itself affect PCB levels), Bytingsvik believes that the findings mainly reflect changes in exposure levels over time.

Predicting the future?

While these figures are encouraging, Bytingsvik notes that the overall levels of OH-PCBs and PCBs in the cubs are still too high. As a comparison, the 2008 concentrations of OH-PCB in cubs was roughly 90-170 times higher than levels that are known to affect thyroid hormones in human babies.

"Polar bear cubs can be much more susceptible to the effects of these kinds of environmental contaminants than adults because they are in a

vulnerable phase of growth and development," she says.

Bytingsvik's research is part of a larger international project to assess the condition of [polar bears](#) in the Arctic called Bear Health. The Norwegian leader of the project, Bjørn Munro Jenssen, is Bytingsvik's supervisor. He says her findings are definitely good news.

"PCBs are considered to be among the worst environment contaminants, so it's good to see that the levels have gone down," he said. "At the same time, we can't forget that animals in the Arctic are exposed to a number of other environmental pollutants that are carried northward on the wind or by ocean currents. On top of that, there's [climate change](#). This creates big challenges for many species."

Provided by Norwegian University of Science and Technology

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