HEALTH EFFECTS IN ARCTIC WILDLIFE LINKED TO CHEMICAL EXPOSURES

The Arctic

Imagine a region where the sun is hardly seen for months at a time, while during other months the sun never sets, a region where snow and ice are essential to life. The Arctic is a beautiful but unforgiving and harsh environment that, in some areas, resembles a frozen desert. Every possible advantage and fine-tuned adaptation is needed for animals and people to successfully call this region home. But amazingly, the Arctic is a region full of life. It is the home to hares, lemmings, birds, wolverines, reindeer, caribou, musk oxen, seals, walrus, whales, arctic foxes, wolves, and polar bears. Today the Arctic is inhabited by about 4 million people.

Despite its remote location, the Arctic is still affected by distant pollution. Of special concern are the volatile man-made industrial and agricultural chemicals that travel north to the Arctic largely via air and water currents. Global use and production of chemicals is increasing, meaning that arctic environmental contamination will increase in the future.

"As scientists continue to conduct research in the Arctic, new studies emerge all the time showing that the health of arctic wildlife is already being negatively affected by exposure to chemicals", says Samantha Smith of WWF's International Arctic Programme

In February 2005, WWF highlighted the presence and levels of toxic chemicals in the Arctic. Now, this new report focuses on what is known about *actual health problems* in arctic mammals and birds linked to chemical exposures.

Drift ice, Norway. Arctic archipelago.

 Tagging of polar bears to monitor their development *(Ursus maritimus)*. Arctic, Norway, Svalbard

Health effects

Chemical exposures in arctic wildlife have been linked to disturbances of the hormone and immune systems, vitamin A levels, and bone mineral density.

Hormones control almost every body function—including the internal organs, neurological function, immune system, hunger/thirst, metabolism, growth, fertility, gender, sex drive, pregnancy, day/night cycles, behaviour, and ability to react to environmental conditions.

Several classes of pollutants are toxic to the immune system. Alterations in the immune system may result in reduced resistance to disease, increased virus levels, and increased rates of disease transmission within and among populations.

One of the greatest concerns is that contaminant mixtures may interact with other natural stressors in the Arctic, (e.g. climate change, habitat loss) reducing animals´ ability to successfully deal with every day challenges, (e.g. harsh winters, feeding, nesting predation) leading to reduced reproductive capacity, increased likelihood of disease or even death, and population declines.

HEALTH EFFECTS ALREADY OCCURRING IN ARCTIC SPECIES

Species	Health Effects
POLAR BEARS	Impaired immune system, vitamin A and hormone alterations; decreased bone mineral density
SEALS & SEA LIONS	Skeletal deformities, reproductive problems, skin disease, immune toxicity, cancers, and changes in vitamin A and thyroid hormone levels
BELUGA WHALES	Parasitic infections, other infectious diseases, cancers (especially intestinal), lesions indicating reproductive and immune problems
BIRDS	Effects on reproduction, behaviour, immune function, and development; reduced parental attentiveness during egg incubation, feather alterations

Arctic mammals

Marine mammals eat contaminated invertebrates, fish, birds and other mammals. Increasing accumulation of chemicals up the food chain results in the highest chemical levels generally being found in top predators (e.g. polar bears).

POLAR BEARS

These top arctic predators are heavily contaminated with chemicals, including current-use chemicals found in household items, such as brominated flame retardants (BFRs) and fluorochemicals. Adverse effects linked to chemicals in polar bears include immune system, vitamin A and hormone alterations; and decreased bone mineral density (a measure of the amount of calcium in the bones and the thickness of the bones that reflects general bone health).

Polar bears from the Barents Sea with average sum PCB levels between 72.3 and 83.9 ng/g (nanograms per gram) wet weight in plasma had altered levels of thyroid hormones.

The fluorinated chemical PFOS was detected in the livers of Alaskan polar bears at mean concentrations of 793 and 537 ng/g wet weight for adults only and for adults, sub-adults and cubs respectively.

Although no studies have yet been published regarding health effects in arctic species related to PFOS, in experimental studies PFOS has been linked to neonatal mortality, respiratory problems, and neuroendocrine alterations in rodents and to reproductive problems and hormone alteration in fish. In birds, PFOS levels have been associated with increased liver weight and hematocrit levels.

Polar Bear, *Ursus maritimus*. Churchill area, Manitoba, Canada

Harp Seal, *Phoca groenlandica*, suckling pup. Gulf of St. Lawrence, Canada

SEALS AND SEA LIONS

Seals and sea lions are known to be contaminated with PCBs, organochlorine pesticides, metals, and current-use brominated flame retardants and fluorinated chemicals. The highest sum-PBDEs (a group of BFRs) detected thus far was in grey seals (mean of 222.6 to 514.7 ng/g in blubber). PFOS (a fluorinated chemical) was detected in harbor seal kidney at a mean of 378.46 ng/g wet weight.

PFOS accumulates in the blood and liver of exposed animals and people. PFOS can bind to blood proteins and may interfere with hormones.

Known effects in seals and sea lions associated with contaminants include skeletal deformities, adrenal gland pathology, uterine blockage, impaired reproduction, skin disease, immune toxicity, cancers, and changes in thyroid hormone levels and vitamin A (a micronutrient required by almost every tissue in the body).

BELUGA WHALES

Belugas prefer shallow coastal waters and swim up river inlets where pollutants are concentrated. Belugas are known to be contaminated with many chemicals. The bodies of some belugas from the Saint Lawrence estuary in Canada are so contaminated that their carcasses are treated as toxic waste. Belugas suffer from parasitic infections, other infectious diseases, cancers (especially intestinal), and lesions indicating reproductive and immune problems. Recently, newer chemicals such as brominated flame-retardants and fluorinated chemicals have also been detected in belugas.

Although no studies have yet been published regarding health effects in arctic species related to brominated flame retardants, in other species they have been linked to hormone disruption and altered neurobehavioral development.

BIRDS

Many chemicals that are attracted to fat are taken up and excreted in egg yolks. In birds, the embryo is exposed to chemicals during the most critical early development phase.

Birds, like mammals, are susceptible to alterations in hormone levels and their reproductive cycle is controlled by hormones. In birds, thyroid hormones regulate metabolism, growth, weight, nervous system function, egg hatching, molting, and reproduction. Bird eggs are good contaminant monitoring tools, and also serve as sentinels for human health.

Sea birds, such as gulls, have long life spans, low reproductive rates and a delayed onset of reproduction. Population stability depends on a high adult survival rate and even small reductions in the adult survival rate may have large consequences for the overall population growth rate.

Delphinapterus leucas Beluga whale Bering Sea, Pacific Ocean

Osprey *(Pandion Haliaetus)* and Great Black-backed Gull *(Larus marinus)*, Sweden

In some locations, such as arctic Norway, PCB levels are considered to be alarmingly high in glaucous gulls and research has shown immune suppression. Gull studies have also shown associations between contaminants and effects on reproduction, behaviour, immune function, and development. Reduced parental attentiveness during egg incubation and feather alterations have also been noted.
Female great black-backed gulls with high levels of organochlorines have been documented to lay their eggs later, suffer more nest predation, and have a greater decline in egg volume than less contaminated female gulls.

Birds are also contaminated with current-use chemicals.

Conclusion

Studies are now available for several arctic mammal and bird species that indicate chemical exposures are likely adversely affecting the health of these species. Some of the effects seen are potentially quite serious (e.g. immune suppression, hormone disturbances, altered behaviour).

The data discussed in WWF´s new report, taken together, indicate contaminants have the potential to adversely impact the health of not only the specific species and populations studied, but probably other yet un-studied marine mammals and birds as well.

Chemical exposures are especially of concern for wildlife when one considers that most species are already facing other serious threats to survival and, in some cases, large population declines.

Although some harmful chemicals are already banned, newer current-use chemicals—such as brominated flame retardants and fluorinated chemicals—are now being detected in arctic mammal and bird species.

Based on this evidence, politicians must enact more precautionary chemical legislation. The European Union will soon finalise the REACH chemical legislation, which stands for Registration, Evaluation, and Authorization of Chemicals. The time to act is long overdue, especially when considering that REACH will have minimal economic impact- and in fact has the potential for great economic and environmental benefits. Recent WWF blood tests on European citizens and politicians have shown that we are all contaminated with a cocktail of toxic chemicals, and none of us are immune to their potential effects.

In order not to repeat the mistakes of the past we need improved chemical safety now. The proposed new EU chemicals law offers EU legislators a once-in-a-lifetime opportunity to ensure a high level of protection against hazardous chemicals for humans, wildlife and the environment. It is an opportunity for safer chemicals that we cannot afford to miss.

For the full version of this report and related material, please see:
http://www.panda.org/detox

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DETOX CAMPAIGN

Alopex lagopus, Arctic fox asleep, Canada.