Endosulfan and the Arctic

Annex A for Endosulfan

Endosulfan poses unacceptable hazards to human and environmental health in the circumpolar Arctic. Arctic communities are acutely sensitive to the impacts of persistent organic pollutants such as endosulfan. Lipid based food webs contribute to rapid and significant bioaccumulation in high trophic level species. Furthermore, Arctic Indigenous Peoples rely on local plants and animals for their physical, spiritual, and cultural sustenance. Contamination of the Arctic and the traditional foods of Arctic Indigenous Peoples is an affront to their health, human rights, and cultural identities.

Arctic Ecosystems

Several studies have shown ongoing deposition of endosulfan in the Arctic due to continued use at lower latitudes. Endosulfan remains one of the most common organochlorine contaminants in Arctic air.[1] According to Arctic Monitoring and Assessment Programme (AMAP) data, the Yukon region of Alaska historically has some of the highest endosulfan concentrations in circumpolar Arctic air, most likely due to transport from the contiguous United States and Asia.[1]

Endosulfan has been found in numerous environmental samples from the Arctic. Atmospheric transport is thought to be the major transport pathway, with net deposition of endosulfan reported in multiple areas of the circumpolar Arctic.[2] Based on the most recent data, it is likely that endosulfan continues to accumulate in ice free Arctic waters unabated.[3] Levels of alpha-endosulfan in Arctic snow are now comparable to gamma-HCH (lindane) levels.[11] Endosulfan is also present in Arctic lake waters where endosulfan-sulfate is often the predominant compound.[4]

The western Arctic has the highest environmental concentrations of endosulfan, specifically in the Bering and Chukchi Seas.[5] This geographic trend corresponds to levels of alpha-endosulfan found in ringed seals, with the highest levels found in the western Arctic off Barrow, Alaska. Mean blubber concentrations were 22.6 ng/g alpha-endosulfan with the upper concentration at 43.39 ng/g.[6]

Arctic Biota

In a review of available data, it was determined that endosulfan is one of the few persistent organic pollutants (POPs) whose levels are increasing in marine biota of the Canadian Arctic.[7] Endosulfan appears to be more bioaccumulative in Arctic ecosystems than in warmer climates.[11] Beta-endosulfan is typically the most prevalent isomer in high trophic level species.[8] Although endosulfan does not bioaccumulate to the same extent as legacy organochlorines, the bioaccumulative nature of endosulfan has been documented in several studies.[11] In a review produced by Bayer Crop Science, biomagnification factors (BMFs) for endosulfan were as high as 22.7 for cod to ringed seal in Barrow, Alaska USA. On average, BMFs were above ten for fish to predatory marine mammals.[6]

An intensive study of biota in Greenland showed that endosulfan is a ubiquitous contaminant. Median concentrations (ng/g ww) from aquatic species from Greenland are in the low ppb range with concentrations of 21 ppb in Arctic char, 3 ppb in shrimp, and 19 ppb in snow crab. Endosulfan levels were slightly higher in marine mammals with the highest concentrations found in beluga (83 ppb in skin) and narwhal (120 ppb in skin) and concentrations of 25 ppb in ringed seal muscle and 45 ppb in harp seal blubber.[9] Beluga whales from the Canadian Arctic have been found to be contaminated with varying levels of endosulfan ranging from 10 ppb ww to greater than 70 ppb ww depending on location.[10]

Endosulfan-Sulfate

The major metabolite of endosulfan, endosulfan-sulfate, is also persistent. There is a significant paucity of research on the fate, transport and environmental effects of endosulfan-sulfate.[11] It is clearly present at significant concentrations in Arctic ecosystems. Measurements of sea water in Barrow Strait, Canada revealed higher concentrations of endosulfan sulfate than of the parent compounds of endosulfan.[12] Endosulfan sulfate was found at comparable levels to endosulfan in Arctic beluga whales, suggesting it is similarly bioaccumulative.[10] Furthermore, alpha and beta endosulfan in combination with endosulfan-sulfate appear to assert more toxic effects than exposure to the individual compounds.[13]

Necessary Action

In light of this evidence, action must be taken to remove endosulfan from the global market. Endosulfan is highly toxic to aquatic organisms.[14] It is acutely toxic to people and animals at low concentrations and is easily absorbed.[15] It causes long term effects due to endocrine disruption in multiple species including humans.[16,17]

The Parties of the Stockholm Convention must uphold their commitment to precautionary action and their promise to protect the vulnerable ecosystems and Peoples of the Arctic by including endosulfan in Annex A of the Convention.

Alaska Community Action on Toxics

Images courtesy of U.S. Fish and Wildlife Service-National Digital Library

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