



CHEMICALS PERSISTENCE IN THE BIOSPHERE: A GLOBAL ISSUE

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ABSTRACT

Persistent Organic Pollutants (POPs) are chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects to human health and the environment. With the evidence of long-range transport of these substances to regions where they have never been used or produced and the consequent threats they pose to the environment of the whole globe, the international community has now, at several occasions, called for urgent global actions to reduce and eliminate releases of these chemicals because they are highly toxic to humans and the environment, Persist in the environment, resist bio-degradation, Take up and bio-accumulate in terrestrial and aquatic ecosystems, Capable of long-range, transboundary atmospheric transport and deposition.

KEY WORDS- Persistent Toxic Substances, Monitoring Process

Introduction

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment around the world. Because they can be transported by wind and water, most POPs generated in one country can and do affect people and wildlife far from where they are used and released. They persist for long periods of time in the environment and can accumulate and pass from one species to the next through the food chain. To address this global concern, the United States joined forces with 90 other countries and the European Community to sign a groundbreaking United Nations treaty **Exit** in Stockholm, Sweden, in May 2001. Under the treaty, known as the Stockholm Convention, countries agreed to reduce or eliminate the production, use, and/or release of chemicals and specified under the Convention a scientific review process that has led to the addition of other POPs chemicals of global concern.

A Global Issue

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Convention a scientific review process that has led to the addition of other POPs chemicals of global concern. dichlorodiphenyl trichloroethane (DDT) dieldrin endrin heptachlor hexachlorobenzene mirex toxaphene polychlorinated biphenyls (PCBs) polychlorinated dibenzo-p-dioxins (dioxins) polychlorinated dibenzofurans (furans) **Persistent organic pollutants (POPs)** are organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic processes. Because of this, they have been observed to persist in the environment, to be capable of long-range transport, bioaccumulate in human and animal tissue, bioaccumulate in food chains, and to have potential significant impacts on human health and the environment. Many POPs are currently or were in the past used as pesticides. Others are used in industrial processes and in the production of a range of goods such as solvents, polyvinyl chloride, and pharmaceuticals. There are a few natural sources of POPs, such as volcanic activity and vegetational fires but most POPs are created by humans in industrial processes, either intentionally or as byproducts. Public concern about contamination by POPs exists, due to the multitude of evidence showing the negative effects of POPs on human health and the environment. Several compounds have been identified as hormone disruptors which can alter normal function of endocrine and reproductive systems in humans and wildlife. Cardiovascular disease, cancer, obesity, and diabetes have also been linked to POPs. Exposure to POPs during pregnancy has been linked to developmental defects in the resulting offspring. There are many risks and effects of

having these chemicals in our environment. After these pollutants are put into the environment, they are able to stay in the system for decades causing problems such as cancer, birth-defects, learning disabilities, immunological, behavioral, neurological and reproductive disorders in humans and animals. The effect of POPs on human and environmental health was discussed, with intention to eliminate or severely restrict their production, by the international community at the Stockholm Convention on Persistent Organic Pollutants in 2001.

Initially the Stockholm Convention recognized only twelve POPs for their adverse effects on human health and the environment, placing a global ban on these particularly harmful and toxic compounds and requiring its parties to take measures to eliminate or reduce the release of POPs in the environment. Aldrin, an insecticide used in soils to kill termites, grasshoppers, Western corn rootworm, and others, is also known to kill birds, fish, and humans. Humans are primarily exposed to aldrin through dairy products and animal meats.

1. Chlordane, an insecticide used to control termites and on a range of agricultural crops, is known to be lethal in various species of birds, including mallard ducks, bobwhite quail, and pink shrimp; it is a chemical that remains in the soil with a reported half-life of one year. Chlordane has been postulated to affect the human immune system and is classified as a possible human carcinogen. Chlordane air pollution is believed the primary route of human exposure.
2. Dieldrin, a pesticide used to control termites, textile pests, insect-borne diseases and insects living in agricultural soils. In soil and insects, aldrin can be oxidized, resulting in rapid conversion to dieldrin. Dieldrin's half-life is approximately five years. Dieldrin is highly toxic to fish and other aquatic animals, particularly frogs, whose embryos can develop spinal deformities after exposure to low levels. Dieldrin has been linked to Parkinson's disease, breast cancer, and classified as immunotoxic, neurotoxic, with endocrine disrupting capacity. Dieldrin residues have been found in air, water, soil, fish, birds, and mammals. Human exposure to dieldrin primarily derives from food.
3. Endrin, an insecticide sprayed on the leaves of crops, and used to control rodents. Animals can metabolize endrin, so fatty tissue accumulation is not an issue, however the chemical has a long half-life in soil for up to

12 years. Endrin is highly toxic to aquatic animals and humans as a neurotoxin. Human exposure results primarily through food.

4. Heptachlor, a pesticide primarily used to kill soil insects and termites, along with cotton insects, grasshoppers, other crop pests, and malaria-carrying mosquitoes. Heptachlor, even at very low doses has been associated with the decline of several wild bird populations – Canadian geese and American kestrels. In laboratory tests have shown high-dose heptachlor as lethal, with adverse behavioral changes and reduced reproductive success at low-doses, and is classified as a possible human carcinogen. Human exposure primarily results from food.
5. Hexachlorobenzene (HCB), an industrial and technical chemical first introduced in 1945–1959 to treat seeds because it can kill fungi on food crops. HCB-treated seed grain consumption is associated with photosensitive skin lesions, colic, debilitation, and a metabolic disorder called porphyria cutanea tarda, which can be lethal. Mothers who pass HCB to their infants through the placenta and breast milk had limited reproductive success including infant death. Human exposure is primarily from food.
6. Mirex, an insecticide used against ants and termites or as a flame retardant in plastics, rubber, and electrical goods. Mirex is one of the most stable and persistent pesticides, with a half-life of up to 10 years. Mirex is toxic to several plant, fish and crustacean species, with suggested carcinogenic capacity in humans. Humans are exposed primarily through animal meat, fish, and wild game

Scope of the challenge

- Prevent the exposure of humans and the environment to harmful chemicals and waste of global importance.
- Combine environmentally safe technologies and systems with financial and organizational mechanisms, policies, and practices that help countries move towards innovative, rapid, transformational change.
- Develop the enabling conditions, tools and environment for the sound management of harmful chemicals and wastes
- Reduce the prevalence of harmful chemicals and waste and support the implementation of clean alternative technologies/substances

Of all the pollutants released into the environment every year by human activity, Persistent Organic Pollutants (POPs) are among the most dangerous. POPs are pesticides, industrial chemicals, or unwanted by-products

of industrial processes that have been used for decades but have more recently been found to share a number of disturbing characteristics, including:

- Persistence — they resist degradation in air, water, and sediments;
- Bio-accumulation — they accumulate in living tissues at concentrations higher than those in the surrounding environment;
- Long-range transport — they can travel great distances from the source of release through air, water, and migratory animals, often contaminating areas thousands of kilometers away from any known source.

POPs are highly toxic and long-lasting, and cause an array of adverse effects, including disease and birth defects in humans and animals. Some of the severe health impacts from POPs include cancer, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system.

POPs do not respect international borders, and are often intergenerational, affecting both adults and their children. POPs can affect people and wildlife even at very low doses. The serious environmental and human health hazards created by these chemicals particularly affect developing countries, where systems and technology for monitoring, tracking, and disposing of them can be weak or nonexistent. Across Africa, for example, at least 50,000 tons of obsolete pesticides are contaminating soil, water, air, and food sources.

Monitoring Process

The amended law introduces a scheme that enables persistent and highly bioaccumulative chemical substances to be controlled by statute until their toxicological properties are revealed. In other words, the new scheme classifies persistent and highly bioaccumulative substances as Type I Monitoring Chemical Substances and enables the government to grasp the use of these chemical substances by mandatory reporting of quantities manufactured or imported from manufacturers and importers.

The manufacture of Type I Monitoring Chemical Substances is not restricted at the stage when they are so designated. After carrying out the stipulated exposure evaluation based on information concerning the notified manufacture and/or import volume and the use of the chemical substance, as necessary the government will carry out a preliminary toxicity evaluation of long-term toxicity for humans and top predators and a risk assessment. Under the

new system, if the results of these evaluations show that even if risk reduction measures are taken, the chemical substance may have long-term toxicity and pose a risk of environmental pollution, the government can direct the manufacturer or importer to conduct a hazard survey to establish/evaluate whether or not the chemical substance has long-term toxicity. If this survey determines that the chemical substance has long-term toxicity it shall be immediately designated as a Class I Specified Chemical Substance and its manufacture, import and/or use is to be de facto prohibited.

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