

Persistent Organic Pollutants (POPs): A global threat

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Abstract

Persistent Organic Pollutants (POPs) are chemical substances that persist in the environment, bio-accumulate through the food web thus biomagnify and pose a risk of causing adverse effects to human health and the environment even at a distant place of origin of the pollutant. Many POPs were widely used during the boom in industrial production after World War II, when thousands of synthetic chemicals were introduced into commercial use. Many of these chemicals proved beneficial in pest and disease control, crop production, and industry. These same chemicals, however, have had unforeseen effects on human health and the environment. Till date POPs are being called “Dirty dozen” as initially twelve notorious POPs were identified and out of which few are intentionally being produced and few get generated unintentionally as byproducts of some other industrial chemicals and processes. These notorious POPs are of great concern as they are still a global threat.

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 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 12 notorious POPs, and specified under the Convention a scientific review process that has led to the addition of few other POPs chemicals of global concern.

Many of the POPs included in the Stockholm Convention are no longer produced in this country. However, citizens of one country and habitats can still be at risk from POPs that have persisted in the environment from unintentionally produced POPs that are released in a country or from POPs that are released elsewhere and then transported in some other places (by wind or water, for example), or from both. Although most developed nations have taken strong action to control POPs, a great number of developing nations have only fairly recently begun to restrict their production, use, and release.

The “Dirty Dozen”:

The Stockholm convention a global treaty ratified by the international community lead by UNEP- calls for elimination/ complete phase out of following twelve POPs (Table. 1). Out of these twelve notorious POPs, the first eight (Aldrin, Dieldrin, Chlordane, DDT, Endrin, Mirex, Heptachlor, Toxaphene) in the list are insecticides and all are organo-chlorinated compounds. HCBs and PCBs are industrial chemicals and have some industrial uses. But Dioxin and Furans

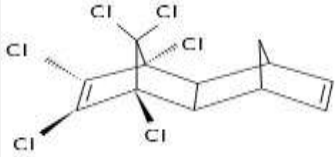
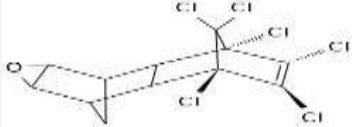
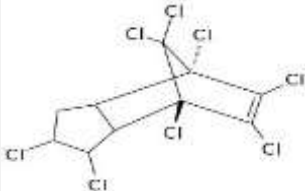
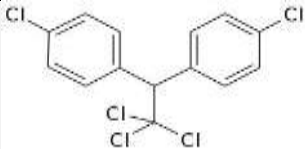
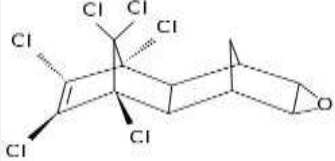
are two unintended byproducts.

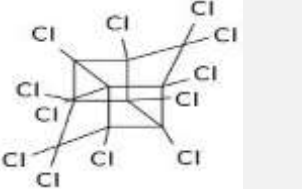
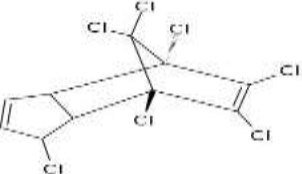
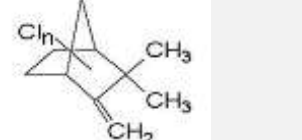
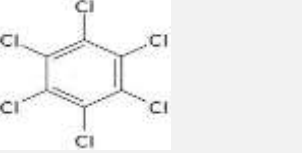
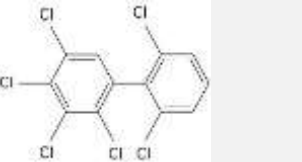
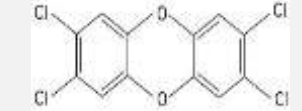
Many people are familiar with some of the most well-known POPs, such as PCBs, DDT, and dioxins. POPs include a range of substances that include:

Intentionally produced chemicals currently or once used in agriculture, disease control, manufacturing, or industrial processes. Examples include PCBs, which have been useful in a variety of industrial applications (e.g., in electrical transformers and large capacitors, as hydraulic and heat exchange fluids, and as additives to paints and lubricants) and DDT, which is still used to control mosquitoes that carry malaria in some parts of the world.

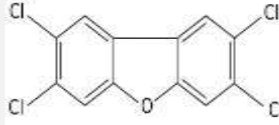
Unintentionally produced chemicals, such as dioxins, that result from some industrial processes and from combustion (for example, municipal and medical waste incineration and backyard burning of trash).

Table 1: Details of “Dirty Dozen”

| Sl no | POPs | Chemical structure | Global use/ source |
|-------|-----------|---|---|
| 1. | Aldrin |  | Insecticides used on crops such as corn and cotton; also used for termite control |
| 2. | Dieldrin |  | Insecticides used on crops such as corn and cotton; also used for termite control |
| 3. | Chlordane |  | Insecticide used on crops, including vegetables, small grains, potatoes, sugarcane, sugar beets, fruits, nuts, citrus, and cotton. Used on home lawn and garden pests. Also used extensively to control termites. |
| 4. | DDT |  | Insecticide used on agricultural crops, primarily cotton, and insects that carry diseases such as malaria and typhus. |
| 5. | Endrin |  | Insecticide used on crops such as cotton and grains; also used to control rodents. |

| | | |
|--|---|---|
| <p>6. Mirex</p> |  | <p>Insecticide used to combat fire ants, termites, and mealybugs. Also used as a fire retardant in plastics, rubber, and electrical products.</p> |
| <p>7. Heptachlor</p> |  | <p>Insecticide used primarily against soil insects and termites. Also used against some crop pests and to combat malaria.</p> |
| <p>8. Toxaphene</p> |  | <p>Insecticide used to control pests on crops and livestock, and to kill unwanted fish in lakes.</p> |
| <p>9. Hexachlorobenzene (HCB)</p> |  | <p>Fungicide used for seed treatment. Also an industrial chemical used to make fireworks, ammunition, synthetic rubber, and other substances. Also unintentionally produced during combustion and the manufacture of certain chemicals. Also an impurity in certain pesticides.</p> |
| <p>10. PCBs</p> |  | <p>Used for a variety of industrial processes and purposes, including in electrical transformers and capacitors, as heat exchange fluids, as paint additives, in carbonless copy paper, and in plastics. Also unintentionally produced during combustion.</p> |
| <p>11. Dioxins (Polychlorinated dibenzo-p-dioxins)</p> |  | <p>Unintentionally produced during most forms of combustion, including burning of municipal and medical wastes, backyard burning of trash, and industrial processes. Also can be found as trace contaminants in certain herbicides, wood preservatives, and in PCB mixtures.</p> |

12. Furans
(Polychlorinated
dibenzofurans)



Unintentionally produced during most forms of combustion, including burning of municipal and medical wastes, backyard burning of trash, and industrial processes. Also can be found as trace contaminants in certain herbicides, wood preservatives, and in PCB mixtures.

POPs and the Food Chain

POPs work their way through the food chain by accumulating in the body fat of living organisms and becoming more concentrated as they move from one creature to another. This process is known as "biomagnification." When contaminants found in small amounts at the bottom of the food chain biomagnify, they can pose a significant hazard to predators that feed at the top of the food chain. This means that even small releases of POPs can have significant impacts.

The Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutants, which was adopted in 2001 and entered into force in 2004, is a global treaty whose purpose is to safeguard human health and the environment from highly harmful chemicals that persist in the environment and affect the well-being of humans as well as wildlife. The Convention requires parties to eliminate and/or reduce POPs, which have a potential of causing devastating effects such as cancer and diminished intelligence and have the ability to travel over great distances.

References

1. <https://www.epa.gov/international-cooperation/persistent-organic-pollutants-global-issue-global-response>.

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