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toxic-free future

time to act!

*A guide to some of the world's
most poisonous chemicals*

By Nityanand Jayaraman
and Shailendra Yashwant,
May 2001

GREENPEACE



Pesticide dump site in Hua Hin, Thailand

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most poisonous chemicals*

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overview

Americans are exposed to 22 times the US recommended maximum acceptable levels of dioxins from their food. Nursing Infants are exposed to between 35 and 65 times the acceptable levels.

UNIVERSITY OF TEXAS, SCHOOL OF PUBLIC HEALTH, MARCH 2001.
REPORTED BY ASSOCIATED PRESS, HOUSTON.

Depending on where you come from and what your food and lifestyle is, the levels may vary. But if you were to analyse the fat tissue from your body in a laboratory, you would find that synthetic chemicals such as DDT, HCH, PCBs, dioxins and other substances with equally daunting names have trespassed into your body without your even realising it. The collective term for such chemicals, which have the property of being persistent in the environment (resistant to degradation) is *persistent organic pollutants* or POPs. Today, even a new-born baby arrives in the world with a burden of these toxic human-made chemicals.

If you're a worker in a steel smelter or a pesticide factory, live near an incinerator or an industrial area, or if you are an incorrigible meat eater or live on a seafood-rich diet from contaminated seas, you may find that the levels of POPs in your body are comparatively high.

The daunting names aside, these chemicals are similar: they are all human-made poisons with a track record of damaging life in ways that we never knew possible when they were first released into the environment. All are substances that ought not to be present in your bodies, in the food you eat, in your breast milk, or in your babies.

POPs are blamed for seriously devastating some wildlife populations, by attacking the two pillars of species survival – the ability to reproduce; and the ability to survive by resisting and overcoming illnesses. Other impacts include adverse health effects during the developmental stages of life, structural deformities, reduced survival as well as impacts on the nervous system and behaviour.

POPs have been implicated in effects in living beings ranging from the gory to the subtle – from gross effects like cancers, deformed sex organs and hermaphroditism to hidden consequences such as falling sperm counts, aggressive behaviour and diminished intelligence.

In the following pages, you will read a lot about 12 POPs chemicals [see section *Know Thy Enemy*], which are globally acknowledged as among the deadliest poisons. They are made all the more dangerous because of their ability to resist degradation in the environment or in the bodies of living beings (persistence), and to contaminate life across the corners of the planet by travelling on air currents and through the food chain. Many are also highly toxic and build up (bioaccumulate) in the fatty tissues of animals and humans. These three qualities, namely persistence, bioaccumulation and high toxicity, make them arguably, the most dangerous group of chemicals to which natural systems can be exposed.

The dirty dozen, as these chemicals are sometimes referred to, represent only the most notorious and best-researched of the whole class of POPs chemicals. They are the 12 POPs that have been prioritised for action by the United Nations Environment Programme (UNEP) to eliminate because of the threat they pose to the global environment. All 12 are organochlorines, chemicals that contain chlorine and carbon as constituents. Many more POPs continue to contaminate the environment because of their widespread production and use. These POPs will also have to go as soon as possible and are all subject to the upcoming POPs Convention.

What are these chemicals, how did they get here and who put them there? Should you be worried? What can they do to you? How are your children affected? What do they do to the life – the animals, birds, insects and plants – around you?

the birth of a global convention

“On the farms, the hens brooded, but no chicks hatched. The farmers complained that they were unable to raise any pigs – the litters were small and the young survived only a few days.”

RACHEL CARSON, *SILENT SPRING*, 1962.

In 1962, Rachel Carson predicted that the poisonous synthetic chemicals gaining widespread global use would one day pollute the bodies of virtually every man, woman, child and animal on the planet, undermining the very foundations of life as we know it.

Released nearly four decades ago, Carson’s classic book *Silent Spring* was based on solid footing of science and common sense, of having witnessed indiscriminate aerial spraying of synthetic pesticides and the massive bird deaths that followed.

At the time, many governments and industry spokespersons dismissed Carson’s prophecy. This was to be expected given that the profits of the chemical industry were inextricably linked to the continued production, use and inevitable release into the global environment of these poisons. Most of the big names in the chemical industry today, Monsanto, Dupont, Dow Chemicals, Union Carbide, ICI, Novartis, BASF, Bayer and Shell either had a role or continue to play a role in poisoning the environment with POPs chemicals. Their products and processes have willy-nilly abetted our society’s addiction to these deadly chemicals.

Today, Rachel Carson stands vindicated. Poisonous POP chemicals released into the marketplace by the chemical industry have migrated through the food chain and travelled on air currents to contaminate the far corners of the planet.

Nothing short of a global law enforced by each of the world’s governments can curtail the damage posed by these globe-trotting poisons.

Despite mounting evidence that synthetic chemicals, and particularly POPs, are responsible for damaging life at a global level, initiatives by the world community to eliminate them are hindered by the machinations of the chemical industry with the support of a few governments that want to protect their industries interests. Their actions are based primarily on two questionable premises:

1. That rather than take steps to eliminate these poisons, measures to minimise their releases to “sufficiently low” or “acceptable” levels would stem the problem.
2. That it is acceptable to “risk” causing damage and death to humans and other living beings on a global scale.

This premise is the basis of the chemical industry’s “risk assessment” and “risk management,” an inaccurate approach that discounts the complexity of interactions between chemicals and life in a real world.

Evidence at hand suggests that POPs are chemicals for which we can assume no “safe” levels of exposure. Stopping all environmental releases of POPs is the only way of ensuring that your

children don't come preloaded with chemical poisons.

But the chemical industry and several governments will tell you that stopping all releases of these poisons is not economically or technically feasible. In other words, they declare that healthy, chemical-free babies are not an economically viable proposition.

Any global law that seeks to address the POPs problem must aim to eliminate, rather than limit, the use and release into the environment of these toxic chemicals.

Fortunately, such a globally legal convention is in the making. In December 2000, the world's governments added the finishing touches to a draft of the first global convention set out by the United Nations Environment Programme (UNEP) to eliminate all POPs starting with a priority list of chemicals that are decidedly inappropriate for use because their harmful effects on the environment or human health.

Diplomats from the countries that negotiated the drafting of the convention text will gather in Stockholm in May 2001 to express their in-principle agreement and sign to what will be known as the Stockholm Convention on Persistent Organic Pollutants.

The convention contains regulations aimed at the eventual elimination of all releases of human-made POPs. If a chemical is identified as a poison belonging to the POPs category, the world's governments are in the process of agreeing on the steps to be taken to stop its manufacture, use and release into the environment. The convention will also prescribe means to prevent new POPs from entering the market place and the environment.

The adoption of the UNEP POPs convention does not mean that the fight against persistent organic pollutants or against those who profit by their continued generation and release into the environment is over. Far from it; it means that the fight for a Toxic Free Future has begun with renewed energies and new understanding. In this effort the POPs convention presents a powerful global tool to stop the production and use of POPs. But most importantly, governments must now act against these harmful chemicals.

No new POPs

The POPs Convention requires all countries with a regulatory regime for pesticides and industrial chemicals to "regulate with the aim of preventing the production and use of new chemicals" which exhibit the dangerous properties of POPs. In short, "No New POPs" should be deliberately introduced.

Hundreds of chemicals are released into the global marketplace every year without adequate testing. Attempting to stem the ongoing chemical contamination of the human body and environment by banning a few is a helpful but by no means the answer to the whole problem. Before we can begin undoing the mistakes of the past, it is imperative that we close the tap and prevent the release of any new chemical that cannot be proven to be harmless.

Elimination is the goal for all known and new POP chemicals. However, to wean the industry and society from their perceived dependence on these deadly chemicals, the Convention lays down a rough roadmap.

Name of POP Chemical	Action Required	Comments
Pesticides		
Pesticides (Aldrin, Dieldrin, Mirex, Hexachlorobenzene, Chlordane, Heptachlor, Toxaphene)	Prohibit and/or take measures to stop production, use, import and export	Subject to time-bound country-specific exemptions for a specified use
DDT	Restrict the production and use	Country-specific exemptions for specified use upon demonstrations of ability to regulate usage, and initiatives to seek and implement alternatives
Industrial Chemicals		
Polychlorinated Biphenyls (Intentionally manufactured for use as transformer oil and other applications)	Prohibit and/or take measures to stop production, use, import and export	Subject to time-bound country-specific exemptions for a specified use
By-product POPs		
POP chemicals released as by-product of industrial activities (Dioxins, Furans, PCBs, HCB)	All human-made releases should be continually reduced with the aim of elimination where feasible. Substitution Principle dictates that the modification or substitution of products, material and processes should be integral to the efforts to eliminate releases of POP chemicals	Developing countries have qualified the provision as subject to availability of technical and financial assistance

Industry must change

The “No New POPs” requirement tells the chemical industry that they can no longer use the world as a large-scale laboratory. In the interests of a healthy living environment, the POPs treaty requires the industry to stop producing and releasing persistent toxic chemicals.

Very specifically, the Convention opens the door to end established problems such as PVC, chlorinated solvents, chlorine bleaching, chlorinated pesticide manufacturing and incinerators. These materials and processes are inextricably linked to the generation and release of the most poisonous chemicals known to science.

know thy enemy

Persistent Organic Pollutants (POPs) comprise a large number of human-made synthetic chemicals that cause severe and long-term effects on wildlife, ecosystems and human health. Five properties make these chemicals more deadly than other poisons that we are familiar with.

1. **Persistence:** POPs are die-hard chemicals that resist natural breakdown processes. In other words, once released into the environment, they remain in and exert their poisonous effects on the environment for long periods of time.
2. **Fat-loving:** POPs chemicals have a natural affinity to fatty substances, such as oil, milk, butter, meat and blubber. That is why they are found in largest quantities in the fat tissue of living organisms. Again, just as they are persistent in the environment, POPs dissolved in fat remain there for long periods of time. **Bioaccumulation and Biomagnification:** Because they are fat-soluble and resist natural breakdown processes, POPs chemicals tend to build up (bioaccumulate) in the fatty tissues of animals and humans. For many POPs, the levels of these increase (biomagnify) as one animal eats another, so that the highest levels are found in predators that are at the top of food chains such as humans, birds of prey and polar bears.
3. **Long-range transportation:** This is the property that makes POPs the widespread global poisons they are. POPs may be released directly into the air from industrial processes or they may evaporate into the air from land and water. Once airborne, POPs can travel hundreds or even thousands of kilometres on air currents before settling back again to the earth. It is speculated that some POPs move on air currents from warmer regions of the globe towards colder regions at higher latitudes. It is this process of “global distillation” that may explain the build-up of POPs in the arctic environment, thousands of kilometres from the places where they were originally released.
4. **Toxicity:** Even very low concentrations of POPs have the potential to harm human and animal health. POPs have been known to cause, and are suspected of causing, a wide range of adverse impacts on the health of wildlife and humans. Many of these effects are irreversible.
5. **Transgenerational Poisons:** POPs are transferred from mother to offspring, through the placenta while the foetus is in the womb, and via breast milk once the baby is born. Exposure at these early stages of life is especially dangerous because this is the time when the body’s systems and organs are developing. These toxic chemicals can significantly alter the course of the foetus or child’s development.

Effects on Wildlife and Human health Associated with POPs exposure

- Suppression of photosynthesis in phytoplankton (the basis of the aquatic food chain)
- Increased mortality and malformation in young fish
- Eggshell thinning and chick deformities in many species of birds
- Feminisation leading to sterility in bald eagles
- Tumours and lesions in beluga whales
- Decreased levels of male hormones in Dall's porpoises
- Sterility in harbour and grey seals
- Skull abnormalities and other developmental problems in Baltic seals
- Dysfunction of the immune system in harbour seals
- Low sperm counts in men
- Developmental effects such as reduced birth weight, reduced head size and poor co-ordination in children
- Immune system impairment in Inuit peoples

POPs prioritised by UNEP

- *Dioxins and furans*: Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are commonly referred to dioxins and furans or collectively as dioxins. There are 210 individual congeners (chemicals) in the group, although some are more toxic, and some more abundant, than others. 2,3,7,8 - tetrachlorodibenzo-p-dioxin (2,3,7,8 -TCDD) is the most toxic congener, or chemical form, and is now recognised as a human carcinogen. Dioxins are produced as unintentional by-products of many manufacturing and combustion processes that use, produce or dispose of chlorine or chlorine derived chemicals. Important sources of dioxins to the environment include waste incineration, combustion of PVC in landfill fires and open burning, and many organochlorine production processes, including PVC production.
- *Polychlorinated Biphenyls (PCBs)*: PCBs comprise of a group of 209 different congeners. Around half this number has been identified in the environment. The more highly chlorinated PCB congeners are the most persistent and account for the majority of those polluting the environment. PCBs were produced as industrial chemicals that were mainly used for insulation in electrical equipment. Production of PCBs has almost totally ceased world-wide, although there are reports of it continuing in Russia. At least one third of PCBs that have been produced are estimated to have entered the environment. The other two thirds remain in old electrical equipment and in waste dumps from where they continue to leach into the environment. Although this is the major source of PCB pollution in the environment today, some PCBs are also produced as by-products of incineration and certain chemical processes involving chlorine such as PVC production.
- *Hexachlorobenzene (HCB)*: This chemical was previously used as a fungicide for seed grain. It is also produced unintentionally as a by-product during the manufacture of chlorinated solvents, other chlorinated compounds, such as vinyl chloride, the building block of PVC, and several pesticides. It is a by-product in waste streams of chlor-alkali plants and wood

preserving plants, and in fly ash and flue gas effluents from municipal waste incineration. Its major source today remains the manufacture of pesticide.

- *Organochlorine Pesticides*: There are eight pesticides in this category listed by UNEP. These are aldrin, dieldrin, endrin, DDT, chlordane, mirex, toxaphene and heptachlor. The majority of these are banned or restricted in many countries, although not all. For example, DDT is still widely used in some less industrialised countries, particularly for mosquito control.

Some other POPs

- *Hexachlorocyclohexane isomers (HCH)*. Gamma-HCH, or lindane, is an organochlorine pesticide and a component of some shampoos for treatment of headlice. Its use as a pesticide in agriculture has declined in recent years, but it nevertheless continues to be used for this purpose in some countries of Europe, Latin America and Asia. Use of technical HCH, a mixture of HCH isomers including alpha-HCH, is yet more restricted. Nevertheless, as a result of some continued releases and its persistence in the environment, alpha-HCH remains widespread in the environment, including the Arctic.
- *Brominated flame retardants*: These chemicals are widely used as fire retardants in electronic equipment e.g. electronic boards in computers, radio and television sets, in plastics, textiles, building materials, carpets and in vehicles and aircraft. The production and use of some of these chemicals is increasing. Brominated flame retardants include polybrominated diphenyl ethers (PBDEs), polybrominated biphenyls (PBBs), as well as the more recently developed tetrabromobisphenol-A. It is becoming increasingly clear that PBDEs are widely distributed in the global environment and can accumulate in the tissues of humans and wildlife; similar evidence is growing for other brominated flame retardants.
- *Organotin Compounds*: Organotin compounds are used as active ingredients in anti-fouling agents, fungicides, insecticides and bactericides. One of the chemicals in this group, tributyltin (TBT), has been used as an anti-fouling agent in paints for boats and aquaculture nets since the 1960s, although its use is now restricted to large vessels and a global phase out for this use on all ships has been set for 2003-2008. TBT is perhaps best known for its hormone disrupting effects in marine invertebrates, although it is also highly toxic to other organisms. It has been described as perhaps the most toxic chemical ever deliberately introduced into natural waters and has become widespread in the marine environment.
- *Short Chain Chlorinated Paraffins*: These chemicals have for many years been used to produce a range of products, including use as fire retardants and plasticisers in PVC, rubber and other plastics, varnishes, sealants and adhesives, leather treatment chemicals and as extreme pressure additives in lubricants and metal cutting oil. It should be noted that it is not just the short chained chlorinated paraffins that are problematic but the whole group of chlorinated paraffins.

Death in small doses

Many POPs exhibit a trait that makes them dangerous even in the smallest quantities. POPs, such as dioxins, furans, PCBs and DDT can disrupt the hormone system. The hormone system is the mechanism in living things that triggers the fundamental biological processes for the efficient functioning of the body.

Hormones are the chemical messengers that are constantly circulating in the blood stream in our bodies. Their levels are constantly monitored and adjusted by a self-regulatory mechanism. Hormones are the body's chemical equivalent of a messenger. They must seek out and occupy a receptor site, like a key in a lock. This is what triggers a physiological response in the body.

Some synthetic chemicals, including some POPs, disrupt the hormone system by either mimicking hormones (hormone mimics) or blocking them (hormone blocker). In both cases, such chemicals seek out and occupy receptors that ought to have accommodated the right hormone at the right time.

By locking with the cell receptor, the hormone mimics fool the body into believing that it's time to trigger the biological activity related to the hormone. Hormone blockers too occupy the cell receptor. But rather than mimic any hormone, they disrupt the system by preventing any hormone from occupying the receptor. As a result, physiological functions that ought to be triggered are sabotaged.

Some POPs disrupt the endocrine system by mimicking or blocking the female sex hormone, oestrogen. Oestrogen is key to the normal development of both male and female reproductive organs during animal or human's foetal life. Chemicals that mimic or block oestrogen have devastating and irreversible effects on the sexual destiny of the foetus.

Oestrogen and other steroid hormones also play a critical role in the growth of brain, liver, kidneys, and skeletal, thyroid and immune systems.

“Many wildlife populations are already affected by [hormone disrupters]. These impacts include thyroid dysfunction in birds and fish; decreased fertility in birds, fish, shellfish and mammals; decreased hatching success in birds, fish and turtles; gross birth deformities in birds, fish and mammals; behavioural abnormalities in birds; demasculinisation and feminisation of male fish, birds, and mammals; defeminisation and masculinisation of female fish and birds; and compromised immune systems in birds and mammals.”

THE WINGSPREAD STATEMENT. RACINE, WISCONSIN, USA, 26-28 JULY, 1991.

POPs: a global menace

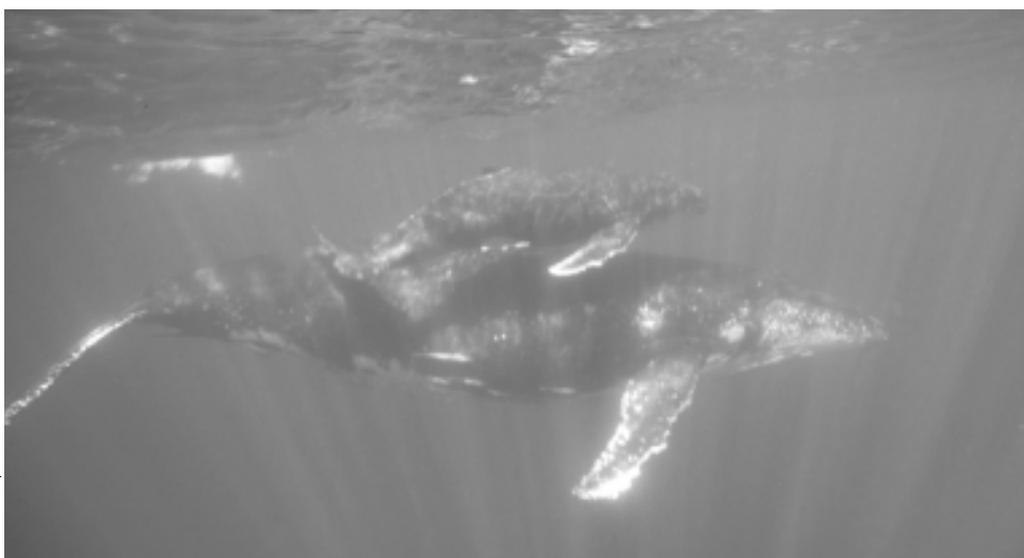
In September 1999, Greenpeace published a limited catalogue of 50 Global POPs Hotspots. The catalogue does not cover even a fraction of the POPs hotspots world-wide. However, it establishes beyond doubt that while some places are more under threat than others, no country or region has escaped POPs contamination.

POPs are widespread pollutants that do not respect national boundaries. They contaminate sites close to where they are released in the environment from industry and agriculture but also can be transported for thousands of kilometres on air currents. Additionally, they are transported in the waters and sediments of rivers and oceans. In recent decades, numerous POPs have been produced and released into the environment in vast quantities and, due to their long-distance movement on air currents, POPs now represent a global contamination problem. Even low concentrations of POPs in the environment can lead to high levels in the tissues of animals and birds and the human food chain has become contaminated.

The North Pole, one would think, is as far away as one can get from industrial pollution. But POPs have reached appreciable levels even in this remote region due to the movement of POPs on air currents towards colder latitudes.

Based on the limited data available, several disturbing situations are evident:

1. POPs contaminate mothers' milk globally;
2. POPs-related wildlife deaths and disorders have been reported world-wide;
3. Fish populations, particularly predatory fish, can carry high levels of POPs;
4. Meat and dairy products can carry significant levels of POPs
5. Investment in technologies and products that release POPs continues despite above evidence.



POPs not only injure wildlife and people at the point of release into the environment. Rather, once released, they can travel through air and water to regions such as the Arctic and the deep oceans that are far distant from their original source. In the regions around the globe, concentrations of these POPs poisons have built up in humans and other living organisms to levels that can cause serious health impacts. Animals at the top of the food chain, such as whales, are particularly at risk from chemical contamination.

focus on special groups

Workers in most countries remain unaware that their livelihoods are poisoning them slowly. Many wildlife scientists are yet to appreciate the destructive role played by POPs chemicals on the planet-wide anomalies reported among wildlife. People do not link the pollution caused by their lifestyles and industries to their growing litany of health complaints. Couples tend to blame one another for their inability to have children without realising that synthetic chemicals introduced into the environment may have a role in inducing infertility among men and women. Children get blamed for being “slow” or for unruly behaviour, even while scientists churn out evidence that industrial pollutants may have something to do even with the IQ of children or their aggressiveness.

Few realise that industry, which is accountable for introducing and producing most of these deadly chemicals, is robbing us and our unborn generations of our fundamental rights to health, clean environment and bear children.

WOMEN AND POPs

An emerging understanding of the way POPs function indicates that they may have a role in the rising incidence of female health disorders, including cancers and gross abnormalities related to the reproductive system.

Over the past 50 years, women in industrialised countries have been experiencing more reproductive problems.

- Girls are reaching puberty earlier.
- The incidence of endometriosis is increasing and it is occurring at an earlier age.
- The incidence of breast cancer is increasing.
- A shorter period of lactation.

Scientific research indicates that POPs may increase the risk of these conditions. For instance:

Shortened Duration of Lactation

Declines in the duration of lactation have been reported throughout the world. This represents a serious public health concern because of the associated implications for increased infant illness and death, especially in less industrialised countries.

Research in areas where environmental levels of DDE are comparatively high has shown that higher DDE levels in women were linked to shorter periods of lactation. This was mainly caused by insufficient milk production to allow continuation of breast feeding. Researchers think that DDE could be inhibiting lactation because of its oestrogen-like effects and may therefore be contributing to lactation failure throughout the world.

Endometriosis

Endometriosis is a disease that is estimated to affect as many as one in ten US women of reproductive age. It is a condition that is associated with chronic pain and infertility and may be caused by some alteration of the immune system.

PCBs and dioxin can increase both the prevalence and severity of endometriosis in monkeys. The effect of dioxin occurred at levels which are less than 10-fold greater than current levels in people's bodies in industrialised countries. Research suggests that PCBs and dioxins could increase the risk of endometriosis in women, although human evidence is currently limited.

Certain POPs are also on the "suspects" list for possibly increasing the risk of getting breast cancer.

For years, the industry has downplayed the extent of harm caused by the trespass of poisonous chemicals into our bodies by couching it in language that suggested that the damage is within the realm of "acceptable risk."

It is precisely this misplaced notion of "acceptable risk" that is sought to be changed by the POPs convention. POPs chemicals, by their very nature, pose an unmanageable threat and have to be eliminated.

MEN AND POPs

Scientists have observed a disturbing trend over the past 50 years in some countries which shows that sperm counts and sperm quality are declining. At the same time, the incidence of other male reproductive disorders has also increased. Testicular cancer has increased world-wide, by as much as 4-fold in some areas, and is now the most common form of cancer in men in some countries. In addition, the incidence of testicular maldevelopment (undescended testicles), and the incidence of boys born with urethral abnormalities appear to have increased in some countries.

The increased incidence of these conditions in men has occurred simultaneously with the enormous rise in production and releases in POPs into the environment. It has been proposed that chemicals that disrupt the body's hormone system, including many POPs, could be partly or even wholly to blame for this increase in male reproductive disorders.

Evidence for the possible involvement of POPs in these conditions is based on scientific research in laboratory animals and humans. It is thought that all of the above male reproductive disorders probably have their origins during foetal development in the womb and possibly also during childhood. Exposure to increased levels of oestrogen during development in humans and animals leads to such reproductive abnormalities. It is therefore likely that exposure to man-made POPs chemicals which mimic oestrogen, or other POPs such as dioxins which could have similar effects through disruption of other hormones, could have the effect of increasing male reproductive disorders over the past 50 years.

Although these male reproductive disorders probably originate during the early stages of life, most do not become evident until adulthood. In other words, the increases in health disorders today are results of POPs exposure 20 to 40 years ago. We will not know the impacts of today's environmental levels of POPs on male reproductive health for another 20 to 40 years.

WORKERS AND POPS

The current environmental load of POPs is primarily a result of their releases into the environment from world-wide production, use and disposal. In this one-sided war waged by synthetic chemicals against life, workers are first in the line of fire.

Over the past 50 years or so, workers from many different lines of employment have been exposed to POPs in countries all over the world. In more recent years, while more stringent safety regulations and banning of POPs chemicals in industrialised countries would have reduced exposure in the workplace, this is not always the case in less industrialised countries. Caught between an unfair choice of death by poisons and a life in poverty, workers in poorer nations choose to remain silent about poisons in the workplace.

Factory workers involved in producing POPs-containing pesticides and chemicals; the farmers, planters, harvesters and food-processors using the pesticides; the thousands of children in Asia, Africa and South America who rummage through burning mounds of garbage to salvage the still-usable discards of 21st century consumers – these are the people who end up as the faceless victims of localised POPs pollution. The ragpicker children making an existence from garbage heaps are potentially exposed to dioxins, PCBs and HCB released during burning of the waste heaps and to containers of discarded pesticides and solvents containing POPs.

A group of workers handling pesticides such as DDT were found to have decreased fertility when compared to a less exposed group, according to a 1991 study published in the journal *Environmental Research*. There was also a significant increase in still births, short-lived babies and congenital defects in children born to these men.

Clear evidence exists that pesticide sprayers suffer elevated exposure to the chemicals they work with. For instance, research on workers in Mexico who sprayed DDT against diseases such as malaria showed they had 6-fold greater concentrations in their tissues than the general population from the area. Similarly, levels of HCH were elevated in workers who sprayed this chemical against vector borne diseases in Brazil.

In most cases, where occupational exposure has been observed or is likely to occur, the workers are unaware of the nature of the poisons they deal with. Again, the spectre of job-loss has been used effectively to stem any effort to meaningfully implement the 'Right to Know' and ensure hazard-free work conditions.

In industrialised countries exposure of workers to certain POPs no doubt still continues today in some lines of employment. For instance, studies have shown elevated levels of dioxins in the blood of incinerator workers. Workers at plants manufacturing PVC could potentially be exposed to dioxins and PCBs from production processes.

Research on health impacts of occupational exposure to POPs in industrialised countries is not extensive but does provide some evidence of adverse effects associated with exposure to dioxins and other POPs in the workplace. In industrialising nations, research on workers is even more limited. This is despite the fact that the industrialising economies of Asia have substantial installations of POPs-generating technologies. The rapidly industrialising economies of China, Southeast Asia and South Asia are rushing headlong with investments in new industries, many of which, like incinerators and PVC factories, have the potential to release POPs.

Tributyl tin is an aggressive biocide (kills living organisms) that has been used in ship's paints since the 1970s. The toxicity of TBT prevents the growth of algae, barnacles and other marine organisms on the ship's hull.

In industrialised nations, skin, eye and lung protection are mandatory for any contact work with TBT-containing paints. That is because, even in small doses, organotin compounds can damage human health.

At the Alang shipbreaking yards, India, where most of the world's ships come to die, 20 years of breaking TBT-coated ships has severely contaminated the coastline and the plots where workers break ships' steel into smaller pieces. The levels of this poison on the workfloor soil are high enough to render the soil a hazardous waste requiring regulated disposal under European law.

In Alang (below), barefoot workers wade through ankle deep sediment rich in TBT to get to the ships that lie like beached whales on the mudflats.



© Greenpeace/Vishwant

POISONING OUR CHILDREN

The young are exposed to POPs in the following ways:

- *In the womb:* It is almost certain that every pregnant woman in the world has POPs in her body that are transferred to the foetus in the womb. POPs pass from the mother's body directly to the foetus through the placenta. The magnitude of this exposure depends on the level of contamination in the mother's body.
- *As a nursing infant:* POPs chemicals that circulate in a woman's body can pass to her nursing infant in her breast milk. Many different POPs have been identified as contaminants of human breast milk. The US EPA has estimated that an infant that is breast-fed for one year will receive 4–12 per cent of its total lifetime exposure to dioxins.
- *As a child:* The greatest exposure to POPs for children, like adults, is through the unavoidable route of eating food. POPs are found everywhere in the outdoor and indoor environment and exposure is also possible through skin contact with POPs-contaminated materials, breathing and intake by mouth. Children are potentially exposed to other toxic chemicals such as phthalate plasticisers from sucking and chewing toys made from soft PVC and playing on PVC floors. Other exposure in the home may come from household dusts that have recently been found to contain brominated flame-retardants and organotins.

Foetal exposure

For infants and children born over the last six decades, exposure to synthetic poisons like POPs began at conception. The placenta, which connects the developing foetus in the womb to its mother, does not act like a barrier to protect the foetus from POPs chemicals circulating in the mother's body. Consequently, the foetus is exposed to POPs during its development in the womb. This is of immense concern because the foetus is the most sensitive lifestage to POPs. Effects that occur during foetal development can lead to irreversible, permanent health impacts after birth. Not only is the foetus more sensitive than other lifestages, it is also the most vulnerable. This is because mechanisms which provide some protection against toxic chemicals in the adult are not fully developed in the foetus.

Breast feeding

It is of great concern that a cocktail of synthetic chemical poisons today contaminates mother's milk, which is a baby's first feed. In fact, a mother can significantly reduce her body-burden of POPs by breast-feeding by which she passes on a portion of the accumulated POPs in her body to her infant. Consequently, POPs which have accumulated in a woman's body during her whole lifetime decrease in the mother's body as they pass into her breast milk, and subsequently to her nursing infant. One study estimated that a woman reduces her body levels of certain PCBs and dioxins by over 50 per cent by breast-feeding for 6 months.

Before going any further, it is very important to note that health experts suggest that the benefits of breastfeeding outweigh the negative effects of exposure to POPs chemicals. But this should be no reason for complacency. The right of mothers to breastfeed and the rights of infants to be breastfed must not be jeopardised.

The amount of POPs a child gets through breast milk depends on the level of POPs contamination which has accumulated in the mother's body during her lifetime. Mothers who have been exposed to high levels of POPs from their diet or from living in a contaminated area pass higher quantities of POPs to their nursing infants. For instance:

- Research has shown particularly high levels of some POPs are present in breast milk of Inuit women from Arctic Quebec in Canada. The high levels are attributed to the seafood-rich diet of the indigenous people of the Arctic. Inuit mothers had levels of PCBs of seven or more times greater in their breast milk than women from Southern Quebec, while concentrations of DDE, HCB and dieldrin were on average 4 times higher in Inuit women.
- DDT has been used in recent years or is still being used in some tropical South Asian and South American countries and this is reflected in higher levels of DDT in human milk from these countries.

The denial of a healthy feed to our babies is perhaps the most shocking violation of the right to life perpetrated by the chemical industry. It is therefore of utmost importance to take steps to arrest any further environmental releases of POPs by individuals, governments or industry.

Developmental effects

Effects of POPs exposure in the womb and/or via breast-feeding may not be apparent at birth, but often become evident as a child grows up. Studies on individuals from the general population of some countries suggest that exposure to certain POPs – PCBs and dioxins – during development can reduce intellectual capacity and alter immune systems. These effects are only subtle and may not directly threaten the existence of an individual. However, they are significant enough to have a noticeable impact on an individual's health.

Studies show that levels of PCBs and dioxins present in the body tissues of some women from the general population are sufficient to cause undesirable effects on the nervous system and immune system of their babies and reduced growth in the womb leading to lower birth weight. For instance:

- Research was carried out on women who had eaten moderate amounts of fish from Lake Michigan several years before becoming pregnant. The fish was known to contain comparatively high amounts of PCBs. It was shown that infants and children born to these women had reduced intellectual ability compared to children born to women who had not eaten the fish. The effects are long-term since they are still apparent in children by the age of 11. Problems included small, but significant reductions in intellectual ability, especially reading skills, and poorer short-term memory and deficits in attention. Even though scores on tests were within the normal range, they were at the lower end of the normal range, which means the children would be expected to perform less well at school.
- Research was conducted on babies born to healthy women in the Netherlands. It showed that women who had higher levels of PCBs and dioxins in their bodies, and therefore whose babies had higher exposure to these chemicals in the womb and through breast milk, had slight adverse effects on neurological development at the age of 30 months. The effects were described as "unwanted" by researchers. Infants who had higher exposure also had changes in certain cells of their immune system.

- Inuit women who live in Arctic Quebec have comparatively high levels of some POPs in their bodies because of their seafood diet which is high in animal fat. Research showed that higher levels of PCBs and dioxins in breast milk were associated with an increased incidence of ear infections in their babies.
- Edible fatty fish from the Baltic Sea has comparatively high levels of some POPs including PCBs and DDTs. Fishermen and their families from the Swedish east coast eat at least twice as much fatty Baltic Sea fish as the general Swedish population and consequently they have higher levels of POPs in their body tissues. Research has shown that East coast fishermen's wives and sisters gave birth to babies with significantly lower birth weights. It was concluded that a high intake of organochlorine contaminated fish from the Baltic Sea may cause growth retardation in the womb (intra-uterine growth retardation).



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TRASHING OUR FUTURE

Our waste stream contains significant quantities of chlorinated material, particularly products made using PVC plastic. Open burning of such wastes is a known source of dioxins, furans and other life-threatening POPs.

The responsibility of the manufacturers of products and their consumers ends with the utility of the product at which point it is discarded. That is when millions of street children in industrialising countries – some as young as four years of age – take over, living in and scavenging through the garbage mountains located inevitably in the poorer parts of fast-growing cities. Landfill fires – intentional and unintended – are commonplace.

For the ragpicker children, exposure to POPs comes at a time when their bodies are unusually vulnerable to these poisons. This is the time when young children fully develop their intelligence, and immune and reproductive systems.



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INDIGENOUS PEOPLE

Indigenous Peoples of the Arctic who consume a traditional diet are individuals who would least be expected to have high exposure to POPs. But sadly some groups who eat a traditional seafood-rich diet are highly exposed to POPs. This is because the high proportion of fish and, in particular, sea mammals they eat in their diet have accumulated high amounts of POPs due to the long distance transport of POPs to colder regions of the planet.

The high exposure of Indigenous Peoples to POPs has been confirmed by dietary surveys of people living in the Canadian Arctic. It is of concern that these surveys showed that estimated “safe” intake levels of certain POPs in the diet that have been set by the Canadian government are often exceeded as a result of eating a traditional diet high in sea mammals.

Research on Indigenous Peoples from Canada and Greenland has also shown that their body tissue levels of certain POPs, such as PCBs, dioxins and DDT, are higher than in people from many other countries as a consequence of their diet.

The traditional diet of Indigenous Peoples of the Arctic is important socially and culturally as well as having nutritional benefits. Action must be taken at national and international levels to control the entry of POPs into the environment in order to make a sustained contribution to the health and culture of Indigenous People of the Arctic.

A Message from the Indigenous People of North America

(Excerpted from “Drumbeat for Mother Earth: How Persistent Organic Pollutants Threaten the Natural Environment and the Future of Indigenous Peoples”)

ONE WITH MOTHER EARTH

Whether as Native Americans or First Nations, we are “indigenous” to these lands called Canada and United States. We are “peoples” that have collective rights within the hundreds of tribes that still exist today. We are “Indigenous Peoples” who have inherent rights to our traditional lands and we still maintain our culture and our spiritual beliefs.

Indigenous knowledge teaches us how to walk upon our Earth Mother and to respect the sacredness of her creation. We use every part of our Earth Mother to sustain us in ceremony and in everyday life. We use the water for ceremony and to nourish our communities. When our water, soil and air are poisoned with toxic chemicals, our rights to practice our traditional lifestyles and heritage and to live in a clean and safe environment are violated.

OUR SACRED RELATIONSHIPS

Indigenous knowledge also teaches us our sacred relationship to the Ones-that-Swim, Ones-that-Fly, Ones-that-Crawl, and the The Four-Legged Ones. These sacred relationships with plants and animals are embodied in our clan identities through our many traditions. Some of these species are endangered and some are polluted with high levels of toxic pollutants in their bodies. If these species are compromised, our clan identification could be endangered as well.

POLLUTED FOOD

To Indigenous Peoples, fishing and hunting are not sport or recreation, but part of a spiritual, cultural, social and economic lifestyle that has sustained us from time immemorial. In some areas, fishing and hunting rights are treaty rights.

Over 1,000 distinct indigenous communities, reserves, villages and reservations or territories exist in both Canada and United States. These territories sustain us and when they are contaminated with chemical pollutants, our communities often suffer the most – because when the environment is polluted, Indigenous Peoples are polluted.

When we no longer can eat fish and wild meat, [our] high protein food is often replaced with junk food like potato chips and soft drinks. In addition, the active social part of harvesting of traditional foods is replaced by a less active lifestyle.

In many areas of our Indigenous territories, our communities are being told not to eat the contaminated fish and animals. Advisories are being posted everywhere. Advisories prohibiting or discouraging the consumption of traditional foods affect Indigenous Peoples’ right to practice our cultural and spiritual ways.

POPS IN FOOD

The main exposure route to POPs is through the consumption of food. Most of the 12 POPs listed by UNEP are widespread pollutants that are found in foodstuffs from all over the world.

POPs are soluble in fats (lipophilic) and consequently the highest levels are usually found in fatty foods such as meat, fish and dairy products although POPs can also be found in vegetables, fruit and cereals. Levels in fish and fish oils taken from POPs-contaminated waters can be particularly high.

Most studies on POPs contamination in food has been undertaken in industrialised countries. Data for less industrialised countries is generally more limited, especially for Africa. Research shows that notably high levels of POPs in foodstuffs are found in a diverse range of countries. For instance:

- For marine fish, fatty fish from the Baltic Sea around the south-east coast of Sweden is highly contaminated with certain POPs, notably PCBs and DDT. Dietary intake of this fish has been found to result in significantly higher levels of such POPs in the blood of consumers.
- For freshwater fish, studies show that fish tested from rivers in some countries exceed limits recommended for certain POPs by the World Health Organisation/Food and Agricultural Organisation including Spain, Australia, Canada and Taiwan.
- The people of Faroe Islands, who consume pilot whale meat and blubber, are estimated to have high exposure to certain POPs chemicals.
- In India, a high proportion of milk samples tested were highly contaminated with DDT and HCH and some exceeded national limits.

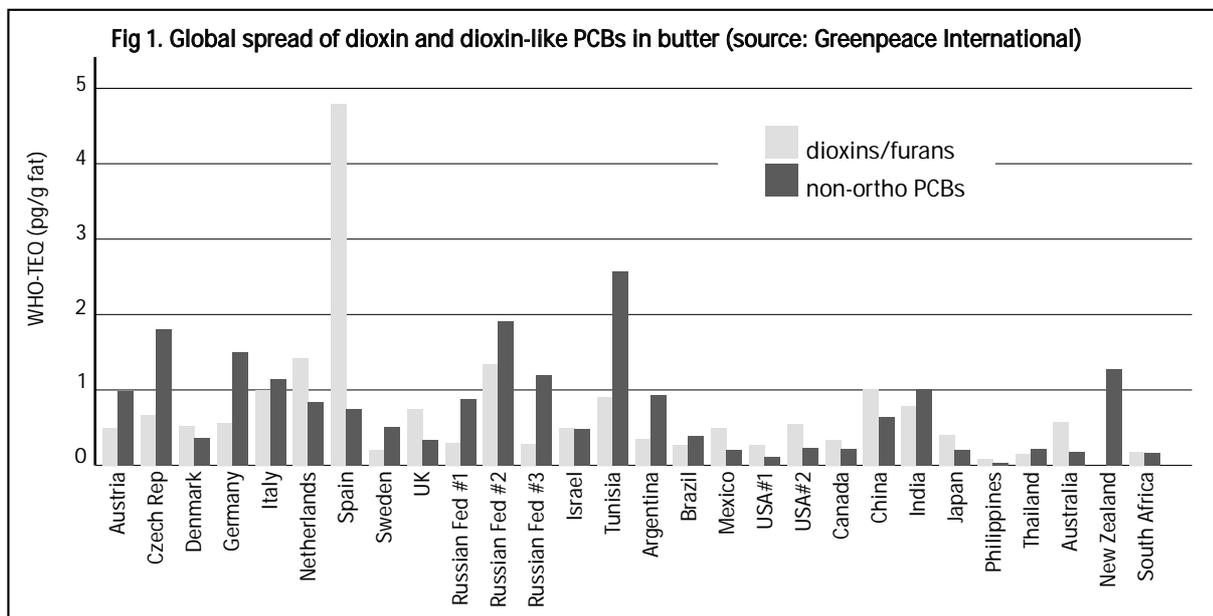
Regulatory authorities attempt to protect public health by setting permissible levels of certain POPs which should not be exceeded in the diet. However, the process used to derive the limits contains many uncertainties. There may be no "safe" level of exposure for most POPs and it is unlikely that the regulations are truly protective of human health. Studies in European countries show that limits for dioxins and some PCBs in the diet are currently exceeded in Spain and by some children in the UK. In India, the recommended limit for aldrin and dieldrin in the diet was found to be exceeded.

There have been a number of food-contamination incidents which have resulted in foodstuffs becoming highly contaminated with POPs. Some incidents occurred due to local sources of pollution such as incinerators. Others have occurred after waste or toxic products have been mixed with food for human or animal consumption. For instance:

- Animal feed accidentally contaminated with PCBs and dioxins was distributed to farms across Belgium at the beginning of 1999. This led to illness in chickens and high levels in their tissues. The EC advised that all chickens and egg products must be removed from sale and restrictions were also put on the sale of other meats. The incident had a major economic impact on the Belgian food industry with world-wide exports of food being affected.
- Use of dioxin-contaminated citrus pulp pellets as animal feed caused high contamination of milk in Germany towards the end of 1997 and the start of 1998. The source of contamination

was found to come from dioxin-contaminated lime waste produced as a by-product by Solvay, a chemical company in Brazil.

- Fires involving large quantities of PVC have resulted in contamination of nearby agricultural produce with dioxins. One fire at a metal processing plant in Lingen, Germany, 1996, involved the burning of around 10 tons of PVC. Leafy vegetables and other foodstuffs collected up to 2 km downwind of the fire were severely affected and their consumption had to be restricted.
- Two major POPs food-contamination incidents occurred in which PCBs leaked into cooking oil. One incident in Japan in 1968 affected 1700 people and the other in Taiwan in 1979 affected 2000 people. The intake of PCBs in the oil caused many severe impacts on health. Women who were pregnant at the time gave birth to children with a wide range of health problems.



HEALTH PROFESSIONALS

Doctors, health workers and health care institutions are crucial players in any global effort to rid the planet of POPs and in healing the harm caused by these chemical poisons.

Ironically, hospitals, particularly those that prescribe allopathy, use and dispose large quantities of POPs-generating material, such as PVC plastic which release dioxins when burnt in incinerators or landfills. Hospital waste incinerators are ranked high among the list of dioxin emitters in the United States.

Health care workers and institutions have a dual responsibility:

1. Take steps to stop health care practices and institutions from polluting the environment. This can be done by changing to non-toxic substances for use in hospitals and clinics. For instance, hospitals can shift to non-PVC alternatives for virtually every PVC product used in hospitals.
2. Take steps to understand, identify POPs-related health disorders at a community level. POPs-related health effects are best understood when seen as trend data, rather than as individual

cases. The medical community is in the best position to gather and analyse such data, and provide the impetus required to set up national registries for diseases and health disorders.

Faced with the impossibility of eliminating dioxin emissions from incinerators, many incinerators in Western countries are shutting down. Simultaneously, though, these dirty technologies are being exported to less-informed countries in the South.

Much of the work to make health care institutions toxic-free has already been done, with alternatives on offer for most toxic substances used in a hospital setting. Health Care Without Harm, a US-based campaign for environmentally responsible health care, aims to support the development and use of environmentally safe materials, technology and products within the health care setting.

WARNING FROM THE WILDERNESS

“If we don’t believe that animals in the wild are sentinels for us humans, we’re burying our head in the sand”

LINDA BIRNBAUM, FORMER DIRECTOR OF TOXICS, US EPA.

The last sixty years of chemical intensive industrialisation has added a new twist to the tragic story of plummeting wildlife populations and declining biodiversity. Synthetic chemicals, including POPs, introduced in the global marketplace have been implicated in the mass mortalities of wildlife species and in destabilising entire populations of birds and wild animals to the point of driving some to a state of local extinction.

POPs have been associated with numerous effects on wildlife including reproductive problems, physical deformities, behavioural abnormalities, interference with sex organs and impaired immune systems. Some of the more notorious examples of POPs effects on wildlife are given below.



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- Egg-shell thinning caused by DDE, the breakdown product of DDT, devastated many populations of wild birds from many countries from the 1950s to 1970s. It resulted in crushed eggs and breeding failure in many birds of prey and fish-eating birds. More recently, while some species have recovered others are still struggling. This includes cormorants breeding on the River Rhine and Meuse in Germany. In the Baltic, the eggs of guillimots have not yet regained their original thickness while white-tailed sea eagles still have reduced breeding success probably due to DDT and other POPs.
- Many detrimental impacts have been recorded in birds from the Great Lakes including death and deformities in embryos and chicks (e.g. crossed bill, lack of eyes, skeletal malformations), as well as other problems, including edema and behavioural changes. There is evidence that these effects, which result in reproductive failure of the birds, may result from contamination with dioxins, PCBs and possibly other POPs which act through similar mechanisms.
- The otter has undergone large declines in numbers over Europe from the 1950s to the 1990s. There is strong evidence that the main culprit is PCB pollution.
- Mass mortalities of dolphins have occurred since the late 1980s. Huge numbers of striped dolphins died between 1990 and 1992 around the Mediterranean caused by a virus. Similarly, in the late 1980s and early 1990s many bottlenosed dolphins died along the eastern coast of the US. In both instances the dolphins had high levels of PCBs. Researchers think it is possible that PCBs and other POPs contaminants could have contributed to suppression of the immune system, rendering the dolphins more susceptible to the infections that subsequently led to their death.
- A population collapse of seals in the Dutch Wadden Sea that was linked to PCBs occurred between 1950 and 1975. In the Baltic during the 1970s, numbers of grey and ringed seals fell sharply due to a disease complex that resulted in reproductive failure and other adverse effects on their organs. Research shows that this was probably caused by certain POPs, particularly PCBs. A recent study shows that populations are now increasing although the seals are still suffering from symptoms of the disease complex.
- Declines in reproductive performance, higher mortality of cubs and aberrantly formed genitalia have been observed in polar bears from some regions of the Arctic. It is possible that certain POPs are involved in these health problems.

Wildlife enthusiasts and scientists may do well to pay more attention to the impacts of toxics on wildlife. This is important for two reasons:

1. Humans are not much different from animals. What we observe among wildlife species as effects of pollution serves as early warning indicators of the threats we face as species.
2. Every living being fills an important ecological niche and, as such, has an inviolable right to life. An animal does not have to be appealing or useful to humans in order to justify its existence or fulfil a crucial role on this planet. By compromising the living conditions or the survival of other life forms, humans are threatening their own survivability.

the way forward

The problem of POPs pollution may seem impossible. But it is encouraging to note that the ban on POPs pesticides in several countries has, in fact, led to the reduction of levels of these chemicals in human tissues, including breast milk, and in wildlife. However, mere bans will not be sufficient to continually reduce the POPs levels. It has been found that levels of some POPs are slow to decrease or stabilise because of ongoing release of POPs from existing reservoirs of contamination – including contaminated sites, waste dumps and stockpiles. Furthermore, some POPs continue to be produced as by-products of a number of industrial processes such as incineration and manufacture of PVC. Other POPs continue to be produced by industry as additives or ingredients, such as brominated flame-retardants, and the history of widespread POPs environmental contamination is already repeating itself with such chemicals.

The declared intention of the UNEP POPs Convention to ban the production and use of some POPs globally is a significant step in the regulation of POPs. However, it is essential to ensure that decisions taken at a political level will lead to effective action. POPs are a global problem and require global responsibility.

Politicians must take responsibility by ensuring that action is taken when decisions and legislation have been made. Industry must take responsibility by adopting the principles of clean production.

The public needs information about chemicals in the products they buy. Products which contain hazardous chemicals as additives must be clearly labelled so the consumer has a choice to avoid such products if they so wish.

As individuals, you can minimise POPs exposure to yourself and contribute to the larger effort:

- Demand your Government to test, reveal and constantly minimise the hazardous chemicals present in your food and water;
- Buy or raise your own organically grown food;
- Make your garden or public parks and green-spaces free of pesticides
- Educate yourself on the hazardous chemicals present in your daily use products such as soaps, shampoos, plastics, household cleaning solvents and insecticides;
- Minimise use of synthetic household pesticides and solvents;
- Reduce or eliminate the use of plastics, particularly PVC plastic;
- Do not burn household wastes, especially those that contain plastics or used containers of household solvents and pesticides;
- Give your children unvarnished, unpainted toys (if you're unsure about the kinds of paints used). Avoid plastic toys, particularly those made of soft PVC plastic.

The precautionary principle

The precautionary principle acknowledges that, if further environmental degradation is to be minimised and reversed, precaution and prevention should be the overriding principles of policy. The precautionary principle needs to be fully implemented so that in the future we may be better able to avoid problems before they occur.

Because POPs are known to cause adverse effects on humans and other living creatures at very low concentrations, it is prudent to take precautionary measures to eliminate the currently identified POPs and to ensure that no new POPs are introduced. Industry has an obligation to demonstrate that any new chemical, technology, process or activity introduced by them is not a POP and is not likely to cause harm.

The burden of proof

The precautionary principle requires that the burden of proof should not be laid upon the protectors of the environment to demonstrate conclusive harm, but rather on the prospective polluter to demonstrate no likelihood of harm.

Currently, the law in most countries requires communities and victims of pollution to prove beyond reasonable doubt that a factory, or pollution, or a chemical has caused them harm. This burden of proof has to be reversed. Factories and those who pollute or release chemicals into the environment or marketplace should be required to prove that their activity or products do not harm human health or the environment.

Such a reversal of burden of proof can come only through path-breaking legislation or precedent-setting legal cases.

The right to know

Most people are completely unaware of the poisons that industries have thrown into our air, water and land. Factory workers are kept in the dark regarding the health effects caused by the chemicals they work with or of the precautions that need to be taken while handling such chemicals and processes.

“Trade secret” laws that are used frequently, and often unethically, by corporations place more value in protecting the interests of a corporation than on the lives of people and the quality of the environment.

This has to change. Many industrialised countries now require the publishing of Toxics Release Inventories or National Pollutants Registries. These document the total releases from individual industrial sources of a list of priority chemical pollutants. Armed with information on how much poisons each company releases into the environment, communities can launch effective campaigns to reduce and eliminate such releases.

Action:

- Lobby your Government to implement comprehensive right-to-know legislation
- Lobby your Government to publish Toxics Release Inventories

The right to say “no”

The Right to Know is meaningless in the absence of a Right to Say “No” to polluting practices. Such a right goes in hand with the democratic power available to citizens in any country, and has to be part of a much broader and fundamental process of political reform.

Adoption of zero discharge and clean production

The aim of “zero discharge” is to halt environmental emissions of all hazardous chemicals. Zero discharge necessitates the adoption of clean production techniques both in industry and agriculture.

Clean production is the phrase used to describe a vision of environmentally sustainable and socially just production methods. Clean Production requires industries to embark on more efficient technologies in terms of material and energy use and to produce cleaner products with less overall and less hazardous wastes. This can be done by:

- a) *Substitution*: Substituting a harmful product, process or process ingredient with a harmless one.
- b) *Closed loop*: Nature is a closed-loop system. Industries that mimic or come close to replicating such closed-loop systems tend to be less polluting and more sustainable by minimising wastes and increasing recycling rates within the factory.
- c) *Phase Out*: Phasing out products and industries that cannot be operated without threatening the environment or human health.
- d) *Polluter Pays*: By ensuring that the Polluter Pays, the society provides the industry with a financial ultimatum that they will be forced to close shop unless they change their polluting practices.

It is essential that the change to clean production is fully supported by fiscal incentives and enforceable legislation.

GREENPEACE DEMANDS

- Ultimately, measures to eliminate releases of ALL OTHER HAZARDOUS SUBSTANCES to the environment will need to be taken both at a regional basis and on a global basis, because chemical contamination of the environment is a global problem and chemicals do not respect national boundaries.
- As a matter of urgency, action must be taken to stop production and use, and eliminate all discharges, emissions and losses of persistent organic pollutants (POPs).
- The elimination of production and use of POPs, and human activities that lead to the generation of POPs, must be achieved through the substitution of POPs (or the processes and materials which generate them) with non-hazardous alternatives.
- Industry and agriculture must pursue clean production technologies and manufacture clean products, recognising that the only way to prevent releases of POPs into the environment is to avoid their production and use.

Presume that all chemicals are hazardous until demonstrated otherwise, i.e. until proven to be non-hazardous, or in those instances where hazard identification is limited by lack of information, chemicals must be assumed to present hazards of unknown proportions.

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Greenpeace activists blocking a rubbish incinerator in Herstal, Belgium

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Testing for toxic emissions from a pesticides plant, Home Bush Bay, Australia

Find out more...

Greenpeace has produced a number of reports detailing the effects of persistent organic pesticides. All are available from www.greenpeace.org/~toxics

- *Poisoning the Future: Impact of endocrine-disrupting chemicals on wildlife and human health* 1997
- *The Tip of the Iceberg: State of knowledge on persistent organic pollutants in Europe and the Arctic* (1999).
- *A Recipe for Disaster: A review of persistent organic pollutants in food* (2000).
- *The global distribution of PCBs, organochlorine pesticides, polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans using butter as an integrative matrix* (2000)
- *POPs in the Baltic: A review of persistent organic pollutants in the Baltic Sea* (2001).
- *Incineration and Human Health: State of knowledge of the impacts of waste incinerators on human health* (2001).
- *Concentrations of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans and dioxin-like PCBs in three samples of butter from the Baltic region of the Russian Federation* (2001)

Further information about POPs can be found on the following websites:

About the birth of the POPs convention

UNEP: www.unep.ch

International POPs Elimination Network: www.ipen.org

About the effects of pesticides

Pesticide Action Network: www.panna.org

Our Stolen Future: www.ourstolenfuture.org

About women and POPs

www.ipen.org

Women, Environment and Development Organisation: www.wedo.org

<http://accord.cis.lead.org> (In Russian)

Women in Europe for a Common Future

<http://www.antenna.nl/wecf>

World Alliance for Breastfeeding Action

<http://www.waba.org.br>

About workers and POPs

International Union of Food and Agricultural, Hotel, Restaurant, Catering, Tobacco and Allied Workers' Associations www.iuf.org

About Indigenous people and POPs

Indigenous Environment Network: www.ien.org

About the work of health professionals

www.noharm.org

www.psr.org

For information on clean production

www.uml.edu/Dept/WE/

www.cleanproductionaction.homestead.com



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Chemical drums at the Union Carbide factory, Bhopal, India

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