CSD NGO Women's Caucus Position Paper for CSD-8

Persistent Organic Pollutants & Reproductive Health

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(Note: This document was originally written as a background paper for the Women's Working Group of IPEN (International Persistent Organic Pollutants Elimination Network.) IPEN is the NGO network organized to participate in current UN negotiations about chemicals classified as Persistent Organic Pollutants. The United Nations is currently considering the elimination or reduction of twelve of some of the most damaging chemicals that are Persistent Organic Polutants (POPs) through the formulation of an international, legally binding treaty. Nine of the POPs chemicals under consideration are pesticides that have been extensively used in both developed and developing countries. Although many countries have banned these chemicals, they remain stockpiled, are produced or used illegally, or, because of lenghthy half-lives, they continue to exist in soil, or other environmental media. In Geneva, this paper instructed both government delegates and public interest groups about how these chemicals are particularly injurious to women's bodies.)

This document contains a description of human reproductive health problems connected with chemical pollution and in particular pollution from POPs in the European region and recommendations for an effective program for POPs elimination.

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PART I

GENERAL INFORMATION ABOUT POPs AND THEIR IMPACT ON REPRODUCTIVE HEALTH

INTRODUCTION.

Reproductive health is now part of the official language and its policies and programs. When we say 'reproductive health', we mean the ability of healthy women to bear healthy children with healthy men. Reproductive health also refers to the ability of these healthy children to develop into healthy adults and then to bear healthy children themselves. It means that if we speak about 'reproductive health', we speak not only about women's reproductive systems but also about health of men and children. And reproductive health is probably one of the most important health aspects to care about, - only with an adequate reproductive health policy can humanity have a future.

The problem of reproductive health is of great and growing concern. Environmental factors which cause the greatest damage to reproductive health are the result of the development of industrial technologies which exist only since a few years or decades. Among these environmental factors are toxic chemicals. That is why the highest rates of breast cancer are found in industrialised countries. The WHO predicts that the number of cancer deaths will double in most countries over the next 25 years. Also contamination from most environmental pollutants is the highest in developed countries. Yet breast cancer is rising very fast in developing countries (about 4% per year), while in developed countries it increases by 1% per year. A breastfeeding infant in the U.S. or other industrialised countries may consume an average of 35-53 pg Teq/kg/day of dioxins in its first year of life (the current U.S. Environmental Protection Authority virtually safe dose is 0,006 pg TCDD/kg/day). This is many times higher than for an infant in a non-industrialised country.

There is another important aspect of the problem. That women's health can be used as indicator of the state of the environment, is a perspective not often taken. But increasingly well-documented evidence support the fact that women (and consequently children) are the first to experience the effects of environmental degradation.

Many factors can cause damage to reproductive health, but one of the most important are chemicals and among chemicals - POPs, Persistent Organic Pollutants.

CHEMICALS IN ENVIRONMENT.

… More than 100,000 chemicals have entered into the market since 1945, and it is estimated that 75,000 of them are still in commercial use. Most of these chemicals remain untested for their safety in humans and other species.

… 44% of 50 countries surveyed by WEDO (Women's Environment & Development Organisation) all over the world (1999) report reproductive health disorders as a result of chemical exposure in the work place and other occupational hazards.

… The health effects of water pollution are especially severe on women and children. In the Ukraine, 13 % of the illnesses affecting women and children have been linked to water pollution, and 21 % to air pollution.

… In Russia pollution has led to doubling of bladder and kidneys disorders in pregnant women. In the Ural region, the synergistic impact of a cocktail of chemicals is causing birth defects, tumours, malignant blood diseases and diabetes.

… In Uzbekistan, prolonged use of water polluted by pesticides and industry has led to increases in pregnancy complications and birth defects, and a higher incidence of anaemia, and kidney and liver diseases in women.

… In the U.K. government experts found that 12,000 to 24,000 people might die prematurely as a result of exposure to air pollution. The incidence of breast cancer here has risen massively, and is now one of the highest in the world. 1 in 12 women risk contracting breast cancer in their lifetime, and there is evidence that this rate increases to 1 in 11 in certain regions of the country. Also, women in certain occupations are at higher risk of contracting the disease.

… In the developed world, there is a dramatic increase in asthma. Often thought to be a disease of childhood, asthma has a clear impact on millions of adults, women in particular. In the U.S., for example, death rates from asthma are 59 percent for women and only 34 percent for men.

… In the U.S. and other industrialised countries, exposure to dioxin in adults is near levels at which WHO warns that subtle adverse neurological and endocrine effects may already be occurring. In the U.S population of 260 million for example, a range of 111 to 1,114 cases of cancer may be directly linked to dioxin exposure from the food chain. (These data are from WEDO's report "Risks, Rights and Reforms", New York 1999).

… The U.S Environmental Protection Agency has formally recognised that health effects associated with hazardous waste sites include birth defects cardiac disorders, changes in pulmonary functions, impact on the immune system, infertility and increases in chronic lymphocytic leukaemia. A Europe-wide study published by the European Commission found that women whose foetuses were malformed were more likely to have lived close to landfills than those whose babies were normal. In February 1999, the Philippines became the first country in the world to impose the nation-wide ban on incinerators, because they can spew extremely harmful pollutants into the atmosphere, even those with modern technology.

PERSISTENT ORGANIC POLLUTANTS (POPs).

POPs are toxic, persistent and bio-accumulative substances of organic (carbon-based) chemical compounds and mixtures. These chemicals are products and by-products of human industrial activity that are relatively recent in origin. In the early decades of this century, pollutants with these harmful properties were virtually non-existent in the environment and food. Now this group includes a large number of pesticides, industrial chemicals (polychlorinated biphenyls - PCBs, hexaclorobenzene) and unintentional by-products (dioxins, furans).

POPs are persistent in the environment, some of them can be found in the environment after decades and even centuries. They are also subject to global distillation (i.e., migration from warmer to colder regions).

Surveys over three decades in many parts of the world have shown that DDT (or its breakdown product DDE) as well as most other POPs are found in food products in most regions of the world, especially in fish, meat and dairy products. Because they generally have low water solubility and high lipid (fat) solubility, POPs tend to accumulate in fatty tissues of living organisms.

POPs presently being negotiated in the UN to be eliminated

PESTICIDES INDUSTRIAL CHEMICALS UNINTENTIONAL BY-PRODUCTS
1. DDT 10. Polychlorinated 11. Dioxins 2. Aldrin biphenyls (PCBs) 12. Furans 3. Dieldrin 4. Endrin 5. Chlordane 6. Heptachlor 7. Hexachlorobenzene 8. Mirex 9. Toxaphene (Source: PSR monitor, volume 13, number 1, Febr. 1998)

PESTICIDES

DDT Insecticide used on agricultural crops, especially cotton, and insects that carry diseases like malaria and typhus. Aldrin and Dieldrin Insecticides used for crops like corn and cotton. Also used for termite control.

Endrin Insecticide used mainly on field crops such as cotton and grains. Also used as a rodenticide to control mice and voles. Also used to combat birds. Chlordane Broad spectrum contact insecticide used on agricultural crops including vegetables small grains, maize, other oilseeds, potatoes, sugarcane, sugar beets, fruits, nuts, citrus, cotton and jute. Used on home lawns and gardens. Also used on control of termites. Heptachlor Stomach and contact insecticide used primarily against soil insects and-termites. Also used against cotton insects, grasshoppers, some crop pests and to combat malaria. Hexaclorobenzene Fungicide used for seed treatment of wheat, onions, sorghum. Also found as impurity in several pesticide formulation. Also is found as an industrial by-product. Mirex Stomach insecticide used to combat fire ants and leaf cutters, harvester termites, mealy bug and yellow jacket wasps. Also used as a fire retardant in plastics, rubber, and electrical goods. Toxaphene A mixture of more than 670 chemicals and an insecticide, primarily used to control insect pest on cotton and other crops. It has been used to control insect pests on livestock and to kill unwanted fish in lakes.

INDUSTRIAL CHEMICALS

Polychlorinated Biphenyls (PCBs) Used for a variety industrial uses, including in electrical transformers and large capacitors, as heat exchange fluids, as paint additives, and carbon-free copy paper and in plastics. Hexaclorobenzene (see above)

UNINTENTIONAL BY-PRODUCTS

Dioxins Not produced commercially by intention and have no known use. Dioxins are by-products resulting from the production of other chemicals, like pesticides, polyvinyl chloride, chlorinated solvents. Furans A major contaminant of PCBs.

PART II

POPs AND REPRODUCTIVE HEALTH

POPs and human health

POPs are highly toxic, and have the potential to injure human health and the environment at very low concentrations, sometimes at the concentration of only one or a few molecules.

Damage caused to humans and other species by POPs is well documented and includes: … the pathologies of cancer and tumours at multiple sites; … reproductive disorders; … neurobehavioral impairment including learning disorders; … immune system dysfunction; … lack of development in various body system such as the reproductive system, endocrine system, immune system and neurological system; … adverse effects to the adrenal glands, the liver and the kidneys; … heart diseases; … cerebro-vascular diseases; … still births; … behavioural changes such as fatigue, depression, personality changes, tremors, convulsions. … respiratory diseases.

Hormone Disrupters

Of the 51 synthetic chemicals that have now been identified as hormone disrupters, at least half, including PCBs, are "persistent" products and in that way resist natural processes of decay that render them harmless. These long-lived chemicals will be a legacy and a continuing hazard to the unborn for years, decades, or in the case of some PCB's, several centuries.

In half a century of production, however, the synthetic chemical industry world wide (excluding the USSR) had produced an estimated 3,4 billion pounds of PCBs, and much of it was already loose in the environment and beyond recall. Moreover, the ban put on production of PCB's in the US and other industrialised countries in the seventies, did not address existing PCBs, allowing their use to continue in closed applications - such as transistors, electric ballast, and small appliances - even today.

Hormones and prenatal development. The hormones estrogen and testosterone are the body's sexual messengers ordering embryo's how to grow. Without these testosterone signals, male development gets derailed and boys don't become boys. Instead they become stranded in an ambiguous state, there they cannot function as either males of females. In scientific terms, these are "intersex" individuals or hermaphrodites - a term that comes from the Greek deity Hermaphrodite whom classical sculptors portrayed as a figure with male genitals and female breasts (Theo Colborn, Dianne Dumanoski, John Peterson Myers. "Our Stolen Future", New York, 1996.)

Even a minuscule dose of hormone during the onset of animal embryo's sexual development, can trigger abnormalities in sexual behaviour, and may cause malformed genitalia, lowered sperm count.

Because hormones also regulate the embryo's immune system and brain development the offspring might be prone to disease and behavioural disorders.

Hormone mimics. To date, researchers have identified at least 51 synthetic chemicals - many of them ubiquitous in the environment - that disrupt the endocrine system in one way or another. Some mimic oestrogen like DES (Diethylstilbestrol) , but others interfere with other parts of the system, such as testosterone and thyroid metabolism. This tally of hormone disrupters includes large chemical families such as the 209 compounds classified as the PCBs, the 75 dioxins, and the 135 furans, which have a myriad of documented disruptive effects. (Theo Colborn, Dianne Dumanoski, John Peterson Myers. "Our Stolen Future", New York, 1996.)

Gray and his colleague William Kelce have also recently discovered that DDE, an ubiquitous chemical and the DDT breakdown product found most often in the human body, acts as an androgen blocker. Like vinclozolin, it binds to and blocks the androgen receptor, so the body's own signals do not get through. Gray believes there are more anti-androgens to be discovered and more out in the environment than anyone has suspected.

Other hormone disrupting mechanisms. However important, oestrogen and the receptor mechanism are far from the hole story on endocrine disruption. Man-made chemicals scramble all sorts of hormone messages, and they can disrupt this communication system without ever binding with a receptor. If cellular phone messages aren't getting through, the problem isn't necessarily with your phone. There may be trouble somewhere else in the system, such as in the satellite that relays the message from continent to continent or the transmitter that sends the message into space. The same holds true for the endocrine system (example taken from "Our Stolen Future", Theo Colborn e.a.).

An oestrogen mimic may interfere with our hormone regulation in different ways e.g. it may block the pathway so the natural hormone may not reach its receptor site; it may pretend to be a hormone and initiate an abnormal response; it may fit into the receptor site and block the hormone pathway or it may interfere with the metabolism of hormones or their transport in the body. It may also push the body down the pathway of producing too much 16aOHE which is undesirable in terms of breast cancer, whereas a higher ratio of 2-OHE (2-Hydroxysteron, one of the oestrogen hormones) is likely to be more beneficial and possibly protective. A large number of chemicals are oestrogen mimics - at least 52 have been identified as interfering with our endocrine system and many of those are also carcinogenic. (Oestrogen Mimics. Putting Breast cancer on the Map, The Women's Environmental Network, London, 1999)

"Endocrine disrupting chemicals have been reported in semen, the ovarian follicle, the womb environment, and in breast milk at especially elevated concentrations of actions and unique target sites" (Theo Colborn; Environmental Health perspectives, Oct. 1995).

Certain chemicals can pass through the placenta from mother to developing foetus. Since the foetus is exquisitely sensitive to even minute quantities of HDCs, it has been suggested that the chemicals we are exposed to in the womb may have an effect years later. For example a synthetic oestrogen, Diethylstilbestrol (DES) was given to over five million women from 1948-1971 and is regarded today as a "model for the problems that other oestrogen-like substances may cause".(Sue Dibb "Swimming in a Sea of Oestrogens", The ecologist, No1, Febr.1995). Originally prescribed to prevent miscarriage, DES was also used for menopausal symptoms , as a "morning after" contraceptive, for girls who were growing "too tall" and most bizarre of all, by farmers to fatten chickens, cows and other livestock. Years later daughters and sons of women who took the drug developed various cancers and genital abnormalities. (Oestrogen Mimics. Putting Breast cancer on the Map, The Women's Environmental Network, London, 1999)

The greatest damage can occur during pregnancy, when some POPs mimic or block the miraculously delicate signals that the mother's and foetus' hormonal system sends to the developing foetus to guide its development. According to some recent scientific studies by Colborn (1996), De Vito (1995), Jacobson and the EPA (1994), as the child develops, endocrine disruption in the womb and through breast milk may result in cancer, endometriosis, learning disorders, immune and neurological disorders and a wide range of other problematic conditions such as low sperm count and sperm volume decline, miscarriages, low IQ, genital malformations and infertility.

POPs' injuring women's health and reproduction.

POPs have been associated with particular impacts on women which affect their ability to bear healthy children, capable of developing into healthy adults. The following pathologies have to be taken into account relating ffoetal contamination and women's ability to bear healthy children:

Miscarriage. Animal studies indicate that exposure to certain synthetic chemicals, such as PCBs, increase the risk of miscarriage. Similar studies implicate chemical exposure with ex- uteri pregnancy.

Intellectual Development. Studies done by Sarah and Joseph Jacobson on the intellectual impairment of children exposed intrauterine to PCBs indicate that these children suffer from lower full-scale and verbal IQ scores, with strongest effects being reported on memory and attention. What is of concern is

that these effects are seen in children exposed to PCB concentration only slightly higher than those found in the general population.

Sperm Count. Shocking findings have been announced in the last few years in regard to infertility of men. A literature review revealed that there has been a serious decline in both volume of semen and the number of sperm between 1949 and 1990. In the research (Carlsen, E et al, "Evidence for the decreasing quality of semen during the past 50 years", British Medical Journal, Vol. 305, 1992, pp. 609-612) which reviewed 61 papers from 61 countries showed that semen volume declined from 3,40 to 2,75 ml and the number of sperm from 113,000,000 to 66,000,000 per ml. Accumulating evidence suggest that 'estrogens' could be responsible for disturbing maturation of males that may seriously affect male fertility.

Immune System Dysfunction and Immunodeficiency Syndrome. Recent studies indicate that children in the high Arctic do not produce the necessary antibodies when they receive vaccination for smallpox, measles, polio and other diseases. Babies in the Arctic take in seven times more PCBs than other infants which can been suggested to be linked to the fact that people eat wild meat and fish and that therefore breast milk is highly contaminated. Also in Europe on background exposure signs of immunotoxicity are detected (Prof. Janna G. Koppe)

Temperament Change. Darvill and others have studied children born to mothers who ate contaminated fish from Lake Ontario. These fish were contaminated with a wide range of POPs like PCBs, dioxin, dieldrin, chlordane and mirex. The children appear to be over-reactive to stimulation, demonstrate a greater number of abnormal reflexes, and do not smile or seem to experience joy as much as do children whose mothers did not eat contaminated fish.

There are also a number of very serious diseases which have direct relation with POPs in the environment.

1. Breast Cancer

A series of studies have analysed the linkages between several POPs and breast cancer. POPs are detectable in almost all samples of adipose tissue or the fat of human breast milk. Eleven studies have analysed various organochlorine compounds including DDE, PCBs and other pesticides and breast cancer. These include studies by Frank Falck, Mary Wolff and others who compared blood samples of women with breast cancer and found that DDE (a metabolite of DDT) levels were 35% higher in women with cancer.

Breast Cancer Facts from the U.S. (WEDO)

… Breast cancer now strikes one in eight women in North America. Almost one third of those will die of it. … In 1950 in the U.S., the incidence of breast cancer was one in twenty. From 1980 to 1987, the rate of breast cancer incidence increased by 32%. Since 1950, it has increased by 57%. … Breast cancer is a leading cause of cancer death for black women aged 15-54 in the U.S. … The incidence rates of pre-menopausal breast cancer are higher in black women than in white women, and the reverse is true for post-menopausal cancer in the U.S. … Seven out of every ten U.S. women that develop breast cancer have no known risk factors (such as: age, delayed or reduced childbearing, family history, early onset of menstruation). … Studies of immigrant populations have found that when women migrate to the U.S. from countries that experience significantly lower breast cancer rates, their incidence rates rise to U.S. levels.

The environmental Connection.

There is growing body of scientific evidence suggesting a link between breast cancer increase and avoidable environmental contaminants: … Scientists believe a ban on three carcinogenic pesticides may be responsible for 30% drop in breast cancer rates in Israel in 1976-1986 despite a worsening of known factors. … Levels of PCBs and DDT were reported to be 50-60% higher in the breast tissues of women with breast cancer than in women without breast cancer in a study in Connecticut.

Lactation and the breastfeeding problem. Studies by Walter Organ, Caren Lanting and others show that the presence of DDT and PCBs in breast milk can reduce the ability to breast feed, with a 40% decrease in lactation time reported among women with the highest levels of DDT and PCBs in their breast milk.

22% of 50 countries, surveyed by WEDO world-wide , report breast milk contamination from chemical exposure.

Breast milk contamination

Breast is toxic?...

The problem of breast milk contamination and breastfeeding has been a major subject of debate. Since the early 1980s, when high levels of PCBs were detected in breast milk in a number of European countries, the question was raised whether it was still advisable to feed new-born babies on breast milk, especially when formula milk was available.

... but breast is best!.

The main conclusion of numerous researches is that: Despite the fact that breast milk can be a major source of PCBs and dioxins, it also provides essential elements for optimal child development, for activating of the immune system, which are not present in formula milk (for example, antibodies against some infection diseases).

The research of Dutch scientists (1989, 1993) showed that even when plasma sampled from breast-fed 42-month-olds contained 4,5 times as much PCBs as plasma obtained from children who had been formula-fed as babies, exposure to PCBs and dioxins via breast milk was unrelated to brain development at 42 months of age. All in all, despite the presence of PCBs and dioxins in human milk, breast-feeding has a small advantageous effect on long-term neurological development. (Caren I. Lanting, 1999)

Despite the presence of PCBs and dioxins in human milk, breast-feeding should be advocated.

However, all possible measures should be taken to reduce the level of dangerous chemicals (and further - to eliminate them) in breast-milk, (see recommendations).

Benefits of breastfeeding. … Breast milk is the ultimate in nutritious fast food; always ready to serve at the right temperature and in clean conditions. But more than a meal and drink, breastfeeding strengthens resistance to infection and protects against any infections the mother is exposed to.

… Bottle fed infants are much more susceptible to gastric and respiratory illness than breastfed babies even in the most sanitary conditions in an industrial nation like Britain.

… Breast feeding is also associated with a reduced risk of Sudden Infant Death, respiratory infections, eczema, diabetes, and with increased intelligence and better nervous system development compared to bottle fed babies.

… It appears that it is the baby suckling which determines hormone levels in the mother which in turn determine the return of ovulation. Breastfeeding thus has a contraceptive effect.

… Other maternal benefits are protection against pre-menopausal breast cancer, ovarian cancer, and hip fractures in old age.

2. Endometriosis

Statistics on the incidence of this disease world wide is still lacking. But endometriosis appears to be on the rise in the US, where it afflicts 10-20% of women of childbearing age. Prior to 1921, there were only 20 reports of the disease in world wide medical literature. German researchers report that women with endometriosis have higher levels of PCBs in their blood than women who do not suffer from this disease. Animal studies indicate that endometriosis is closely linked with exposure to dioxin. . (WEDO, Greenpeace, 1998).

Endometriosis is a puzzling disease affecting girls and women in their productive years. The name comes from the word "endometrium", which is the tissue that lines the inside of the uterus and builds up and sheds each month in the menstrual cycle. In endometriosis, tissue like endometrium is found outside of the uterus, in other areas of the body. In these locations outside of the uterus, the endometrial tissue develops into what are called "nodules", "tumors", "lesions", "implants", or "growths". These growths can cause pain, infertility, and other problems.

Recent research has indicated women and girls with endometriosis are at greater risk of cancer, particularly ovarian and breast cancer, as well as non-Hodkin's lymphoma.

The cause of endometriosis is not known, but a number of theories have been advanced. One of them is the retrograde menstruation or transtubal migration theory. Another theory suggests that the endometrial tissue is distributed from the uterus to other parts of the body through the lymph or blood. A genetic theory suggests that certain families may have predisposing factors to endometriosis.

Recent research spearheaded by the Association of Endometriosis has shown that environmental toxins such as dioxins and PCBs, which act like hormones in the body and damage the immune system, cause endometriosis in animals (Endometriosis Association, 1999).

PART III

RECOMMENDATIONS

Women participating in the IPEN conference of NGOs, 4 and 5 September 1999 in Geneva, are calling on Governments to give the highest priority to elimination of POPs because of the dangers these substances pose to the most vulnerable aspects of human health: the reproductive system and the mental and physical development of children from prenatal phase through puberty .

From the research results and testimonies presented by women from different parts of the world at the IPEN conference, it becomes clear that exposure to POPs can have an impact on the ability of prospective parents to conceive, on the ability of mothers for safe breastfeeding and on the intellectual, behavioural and physical development of the child. Persistent Chlorinated Compounds, which act as hormone disrupters, can accumulate in the body and exert their effects as they are released into the system during pregnancy.

The policy on POPs has to be strengthened taking the above aspects fully into account.

Therefore we call upon governments:

… To phase out the production as well as the use of POPs. An elimination of the POPs at the source should be implemented immediately. This elimination should first focus on the twelve priority POPs, including DDT, PCBs and dioxins for which a convention is in the process of being negotiated. There must be developed criteria and procedures based on environment health protection to identify new POPs for elimination, … To apply the precautionary principle: no chemical should be allowed on the market before sufficient scientific proof exists that the chemical is not dangerous to human health, not only in short-term but also in long-term use. … To promote more research to identify POPs in human tissues and to analyse the links between human health and POPs in environment. … To promote research to clean the body of POPs, so that the offspring is no longer intoxicated by POPs in the prenatal phase and by breastfeeding. … To recognise that breastmilk- being according to numerous research the best nutrition for the optimal development of every child - has to be free from POPs. … To provide the systematic control on food production and consumption to identify the harmful chemicals and fully protect the consumers. … To develop labelling schemes for products and goods containing POPs, so that consumers can take informed decisions. … To replace chlorinating of water by safer and effective methods (for example, ozone , ultraviolet light) … To enable a POPs-free approach in the control of malaria and other transmissive diseases. … To prohibit the use of POPs in public health care and veterinary treatment, e.g. the use of lindane as a treatment for lice and scabies in humans and against ectoparasites in sheep. … To develop and implement National and Local Environment and Health Action Plans (NEHAPs and LEHAPs) containing policies to protect human reproductive health and child development from POPs. … To provide governmental support for the monitoring and mapping of the environmental health situation - particularly the impact of chemical pollution - by women's organisations and other NGOs and local groups in co-operation with scientists and experts - the results should be taken into account in national policymaking.

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Annex 1 Some of the most well known hazardous organochlorine pesticides.

1. DDT (Hazards and Exposure Associated with DDT and Synthetic Pyrethroids Used for Vector Control, WWF report, January 1999.)

For decades, DDT has played a major role in global efforts to combat malaria and other vector-born diseases. It was employed with striking early success against malaria. Nonetheless, malaria continues to be a global menace - approximately2,5 billion people in over 90 countries are currently at risk of contracting the disease. It is a leading cause of illness and death in the developing world, contributing to approximately 3 million deaths and up to 500 million acute clinical cases every year. Most deaths occur in sub-Saharan Africa and over half are children under five years old - malaria kills four children per minute or 5,000 per day.

Currently, DDT's only official use, as specified by World Health Organisation (WHO), is for the control of disease vectors in indoor house spraying - although other (illegal) uses are suspected.

It is manufactured in approximately half a dozen countries with global production estimated in 1995 at about 30,000 metric tonnes per year.

Concentrations in humans of DDT and its breakdown product, DDE, are clear barometers of exposure. Although DDT levels are decreasing in parts of the world, there are populations of people and wildlife that experience concentrations of DDT and DDE above critical levels. For instance, investigations in Mexico and South Africa reveal that human breast milk contains DDE at concentrations that exceed the guidelines for the acceptable daily intake by infants set by the WHO. Moreover, studies have shown that the length of lactation (milk production) decreases with higher DDE body burdens in human mothers, thus depriving infants of benefits provided by breast feeding.

In recent years , evidence has grown that elevated concentrations of DDE are associated with reduced lactation by mothers. In many areas where DDT is still used, measured concentrations exceeded health guidelines. Links exist between DDT and reproductive and immunotoxic effects in wild life and humans due to the chemicals' disruption of sex hormones and other chemical messenger systems in the organisms.

2. Lindane (from: A briefing for UNISON prepared by the Pesticides Trust, London, 1999)

Lindane - g-HCH [hexachlorocyclohexane], is included in the government "Red List" of dangerous substances. It has been in use as an broad range insecticide for 50 years, long enough to build up a significant body of evidence on its toxic and environmental hazards. It has caused deaths and poisonings in humans and there is authoritative recognition of its long term health effects including carcinogenic effects. It is a serious environmental contaminant and as well as being directly toxic to wildlife. It bio-accumulates along food chains. Scientific and anecdotal evidence links lindane with serious health problems including aplastic anaemia, the birth disorders C.H.A.R.G.E. and breast cancer. (See below).

Lindane has been banned or severely restricted in 37 countries. The Advisory Committee on Pesticides in the UK has so far carried out three reviews of lindane and continued to recommend its

approval. The Pesticides Trust believes that Lindane should be banned on the basis of existing evidence and as a precaution to avoid further health and environmental problems which are suspected of being caused by lindane.

Many other organochlorines which over the years have been linked to major health and environmental problems have been banned or are no longer used. Included in this catalogue are aldrin, dieldrin and endrin which have virtually disappeared, and DDT, heptachlor and toxaphene which have been banned in many countries but are still used quite extensively particularly in some developing countries. Lindane is an organochlorine insecticide that is still in relatively widespread use in developed nations as well as in the third world. It is still in use in treatment against lice and scabies in humans and also against ectoparasites in veterinary treatment. In a control study, Davis et al. reported a statistically significant increase of brain cancer in children following treatment with lindane shampoo. ("Family Pesticide Use and Childhood Brain Cancer", 1993). Veterinary use in sheep can cause contamination of wool, as well of milk and meat.

Lindane is also known as g-HCH since it has to be made up of at least 99% of the gamma isomer of hexachlorocyclohexane (HCH). Technical HCH can include varying proportions of alpha, beta, delta and epsilon HCH isomers, but because these have been shown to have serious short and long term health effects, in the UK all HCH products containing less than 99% of the gamma isomer are banned.

The organochlorines in general, and lindane in particular, are characterised by their broad spectrum insecticidal activity, long persistence in the environment, and their tendency to bio-accumulate along the food chain.

Several cases of human poisoning by lindane have been reported. Children are significantly more susceptible to the toxic effects of lindane. In one case a dose equivalent to 62,5 mg/kg proved fatal, while the LD50 in the rat is above 88mg/kg. In adults, doses above 300 mg/kg ingested orally have proved fatal.

Since lindane has been in very widespread use for several decades, its long term health effects have been extensively studied. Included among the reported chronic effects of exposure to lindane are nervous disorders and increased liver weight.

The International Agency of Research on Cancer (IARC) has concluded that lindane is a possible human carcinogen (class 2B), and the US EPA has classified it similarly as a class B2/C possible human carcinogen.

Key health issues.

… Aplastic anaemia. Exposure to lindane has been linked with blood disorders known as blood dyscrasias, and in particular the disorders aplastic anaemia where the formation of platelets and white cells is disrupted. … C.H.A.R.G.E. This condition which involves multiple congenital abnormalities has been linked to exposure of the mothers of CHARGE children to lindane during early pregnancy. A statistically significant proportion of mothers of CHARGE children in the UK were exposed to pesticides in early pregnancy, and one of the most prominent pesticides implicated was lindane.(Blake and others, Child care health and development, 1993, 19, 395-409) … Breast Cancer. Lindane is an endocrine disruptor which is capable of imitating hormones in humans and thereby disrupting the physiological functions which these hormones control. There is a significant body of evidence which suggests that where lindane is used extensively, and particularly where cattle are exposed to it, the incidence of breast cancer is higher. The UK has the highest rate of death from breast cancer in the world, and in Lincolnshire were lindane is used extensively on sugar beet crops, the rate of breast cancer is 40% higher than the national average. (Women Environmental Network, 1994). The presence of lindane in human milk has been reported in countries throughout the world (Moses, Marion, Pesticides and breast cancer, Pesticides News 22, December 1993, 3-5).

Environmental effects. Lindane is highly volatile, and when applied to field crops in particular, a high proportion (up to 90%0 of the pesticide enters the atmosphere and is later deposited by rain. Lindane is also leached into surface waters and even into ground water.

The International Conference on the Protection of the North Sea agreed to reduce emissions from land, rivers and the atmosphere of number of toxic chemicals including lindane by 50% between 1985 and 1995.

In common with other organochlorine pesticides lindane is fat soluble and this contributes to its tendency to bio-accumulate through food chains. Residues have been detected in the kidneys, liver and adipose tissue of a wide variety of wild animals and birds. It is highly toxic to aquatic invertebrates and fish.

Annex 2

PCBs and Dioxins FROM "DIOXINS—THE VIEW FROM EUROPE" (RACHEL'S ENVIRONMENT & HEALTH WEEKLY) AND CAREN LANTING "EFFECTS OF PRENATAL PCB AND DIOXIN EXPOSURE AND EARLY FEEDING MODE ON CHILD DEVELOPMENT (GRONINGEN, 1998).

Introduced in 1929, PCB's became the first big commercial success for a new elite of chemical engineers who would eventually synthesize tens of thousands of novel chemicals that exist nowhere in nature. The engineers created PCBs by adding chlorine atoms to a molecule with two joined hexagonal benzene rings known as a biphenyl. The result of their tinkering was a family of 209 chemicals known collectively as polyclorinated biphenyls, or PCBs, which soon proved to be immensely useful compounds.

In early assessments, PCBs seemed to have many virtues and no obvious faults. They are non-flammable and extremely stable. Toxicity tests at the time did not identify any hazardous effects. Confident of their safety as well as their utility, the Swan Chemical Company, which would soon become a part of Monsanto Chemical Company in 1935, quickly moved them into production and onto the market.

With the issuance of federal regulation requiring the use of nonflammable cooling compounds in transformers used inside buildings, PCBs quickly found a steady major market in the electrical industry. Other industries put PCBs to use as lubricants, hydraulic fluids, cutting oils, and liquid seals. In time, these chemicals also found their way into a host of consumer products and thus into the home. They made wood and plastics nonflammable. They preserved and protected rubber. They made stucco weatherproof. They became ingredients in paints, varnishes, inks, and pesticides. In retrospect, it is clear that the very characteristics that made them a runaway commercial success also made them one of our most serious environmental pollutants.

The term "dioxin" encompasses a family of 219 different toxic chemicals, all with similar characteristics but different potencies.[1] This is the group of polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs). They have two connected benzene rings. In the case of PCDDs, the benzene rings are connected by two oxygen atoms, whereas in the PCDFs the benzene rings are connected by one oxygen atom. Hydrogen atoms attached to the carbon atoms may by substituted with a chlorine atom.

Except as laboratory curiosities, dioxins are never intentionally produced because they have no commercial value. They are unwanted by-products of thermal processes and of chemical formulations. The following major categories of sources can be distinguished: … Formation during incineration processes. This includes municipal waste combustion, scrap metal recycling, vehicle fuel combustion, cigarette smoking and combustion of wood. … Formation as by-products in industrial processes, such as in the production of pesticides and in the pulp of paper industry. … Mobilisation of dioxins from secondary sources, such as waste dumps and the application of sewage sludge as fertiliser.

For example, according to EPA, the major sources of dioxins in 1995 in USA were: … municipal garbage incinerators (36% of the national total); … copper smelting (17%); … medical waste incinerators (16%); … forest fires (7%); … cement kilns burning hazardous waste (5%); … industrial coal combustion (2.4%); … residential wood combustion (2%); … industrial wood combustion (1%); … diesel engines (1%); … aluminium smelting (0.5%); … incineration of sewage sludge (0.2%); Plus 12% of the national total spread directly into the nation's soils in sewage sludge. (The total is not exactly 100% because of rounding.)

The predominant mode of environmental transport of PCBs and dioxins is the atmosphere. They can be dispersed in the air either in vapour or in aerosol form especially during inefficient incineration and during incineration of PCB-containing materials. Subsequently, the more highly chlorinated PCBs and dioxins, which are virtually insoluble, remain associated with the soil. The lower-chlorinated congeners have a small solubility in water, where they probably cling to the sediment and are washed down-stream.

PCBs and dioxins in environment and humans.

Some evidence of toxic effects in workers began emerging as early as 1936, indicating that PCBs were not as safe as previously believed. PCBs were on the market for 36 years before serious questions surfaced publicly about this wonder chemical. In the meantime, manufacturers kept coming up with new uses. From 1957 through 1971, paper companies put PCBs in their carbonless copy paper, enabling typists, in an era before widespread use of the copying machine, to make duplicates of documents without carbon paper.

The person to first recognise that PCBs had become a pervasive contaminant was the Danish-born chemist Sören Jensen. In 1964 Jensen, who worked at the Institute for Analytical chemistry at the University of Stockholm, kept encountering mysterious chemical compounds as he tried to measure DDT levels in human blood. Whatever it was, Jensen found it wherever he looked - in wildlife specimens collected three decades earlier, in the Swedish environment, in the surrounding seas, in hair samples of his wife and infant daughter. The presence of the mystery contaminant in wildlife samples taken in 1935 indicated it could not be a chlorine-based pesticide, which came into broad use only after World War II. It took Jensen more than two years of investigation to identify the synthetic pollutant as PCBs. A report of Jensen's finding first appeared in the British journal New Scientist in 1966.

As other scientists began to look for PCBs, they, too, found them everywhere - in soil, air, water; in the mud of lakes, rivers, and estuaries; in the ocean; in fish, birds, and other animals. Chemists had long puzzled about the elusive peaks that showed up repeatedly on their gas chromatograph charts when they were analyzing samples taken from the environment. The peaks which looked similar to those made by DDT, registered the presence of some chemical, but until Jensen compared the peaks using a chemical sample provided by German manufacturer, they did not know what the contaminant was. Finely, they had the answer - PCBs.

Ten years later, in 1976, finally the United States banned the manufacture of PCBs, and other industrial countries eventually followed.

In half of century of production, however, the synthetic chemical industry world wide (excluding the USSR) had produced and estimated 3,4 billion pounds of PCBs, and much of it was already loose in the environment and beyond recall. Moreover, the ban did not address existing PCBs, allowing their use to continue in closed applications - such as transistors, electric ballast, and small appliances - even today.

There is no way to discover exactly how the PCBs in the polar bears made their way to the Svalbard archipelago or where they came from. But research over the past two decades has given scientists a good understanding of how PCBs travel through ecosystems and migrate over long distances.

Human population have been exposed to PCBs and dioxins via three major pathways: … accidental; … occupational; … environmental.

As compared to the latter category, levels of exposure in the first two groups are significantly higher. PCBs and dioxins can be found in all compartments of the human body, including adipose tissue and blood lipids. They pass the placenta, and they are transferred into human breast milk fat .

Accidental exposure to PCBs and dioxins.

Three general populations, that have accidentally been poisoned with PCDDs and PCDfs exist.

The first incident took place in 1968 in Japan which 1770 persons were affected. This incident was called 'Yusho'. In that case cooking oil was contaminated with a complex mixture of PCBs, dibenzofurans, and quaterphenyls.

A similar incident occurred in Taiwan in 1979, with more than 200 victims. This one was called 'Yu-cheng'(oil disease). The clinical manifestation of chronic poisoning consisted of acne form eruptions, hyperpigmentation, peripheral neuropathy, abdominal pain and, deformation of the nails. Because chemicals persist in human tissue, and because they pass the placenta the offspring of female patients was exposed in utero. The exposed children tended to have a low birth weight and more frequently showed dystrophic fingernails and pigmented or dystrophic toe nails than the control group. These babies also had an increased rate of hyperpigmentation and acne, and a higher rate of generalised itching, localised skin infections and hair loss. In addition, neonatal conjuctival hypersecretion and jaundice occurred more frequently. At follow-up, the exposed children showed a delay in growth, cognitive and motor development.

Another population that has overtly been exposed to this class of compounds is that in and around Seveso (Italy). In 1976, the Seveso population was exposed to 2,3,7,8 TCDD as a result of an accidental release from a 2,4,5-trichlorophenol manufacturing plant. The main route of exposure to the nearby residents was inhalation of and dermal contact with the contaminated fall-out and ingestion of contaminated food products.

The effects of high levels of exposure can also be studied in the workers employed in, for example, industries manufacturing PCBs or PCB-containing products. Exposure takes place mainly via skin absorption or inhalation.

The major route of environmental exposure (more than 90%) is the consumption of contaminated food from which almost complete absorption takes place.

In the Netherlands, dairy products accounted for half and a mixture of animal and vegetable oils in e.g. savory snacks, sauces, pastry, and biscuits accounted for a quarter of the PCB and dioxin Intake.

In other regions, contaminated fish is an important source of exposure.

Low-level exposures to dioxins are also known to interfere with the immune system, the reproductive system, the endocrine system, and the early growth and development of humans and animals. In sum, dioxins are a family of powerful all-purpose poisons.

In recent years, the International Agency for Research on Cancer (IARC), a division of the World Health Organisation, has labelled the most potent dioxin, called TCDD -2,3,7,8 tetrachlordibenzo-p-dioxin, a known human carcinogen. IARC has labelled many of the less potent dioxins "probable" human carcinogens.

Scientists at the a meeting of 40 scientists convened in Switzerland in May 1998 by the World Health Organisation concluded that, based on animal experiments, the following effects might be expected in humans: decreased sperm counts in humans who have a daily dioxin intake of 14 pg/kg/day; learning disabilities and endometriosis in humans with a dioxin intake of 21 pg/kg/day; suppression of the immune system might be expected in offspring of humans with an intake of 37 pg/kg/day. This WHO meeting " recognized that subtle effects may already occur in the general population in developed countries at current background levels, 2 to 6 pg/kg body weight. They therefore recommended that every effort should be made to reduce [dioxin] exposure to the lowest possible level," according to a statement released by the World Health Organisation.

They concluded also that dioxin is 2 to 10 times as toxic as it had seemed in 1990, and a group of German scientists concluded last April that dioxin may be responsible for 12% of human cancers in industrialised countries. If this estimate were correct, it would mean dioxin is responsible for 120,000 cancers each year in the U.S. This new German estimate is at least 10 times as high as previous estimates by U.S. government scientists.

Some dioxins are more toxic than others, and the scientific community has established a way of comparing the toxicity and the quantities of various mixtures of dioxins. The technique is called TEQ, or toxic equivalents. The TEQ system takes into account the variations in toxicity and expresses toxicity in terms of the most toxic dioxin, which is TCDD.

For example, U.S. EPA estimates that total dioxin emissions in the U.S. averaged about 3000 grams (3 kilograms, or 6.6 pounds) per year TEQ in 1995. This means that all of the dioxins released into the environment in 1995 in the U.S. had a total toxicity equal to the toxicity of 3000 grams of TCDD. (EPA

acknowledges considerable uncertainty in this estimate; the true average lies somewhere between 1200 grams and 7900 grams TEQ, EPA says.

The cancer hazard from routine exposure to dioxin has recently been estimated by the above mentioned group of German scientists. They report that, for adults, the lifetime cancer hazard lies somewhere between one per hundred and one per thousand for each picogram of dioxin TEQ ingested per kilogram of body weight per day (pg/kg/day). Since the daily ingestion in the U.S. ranges from one to 10 pg/kg/day, we can calculate that the cancer hazard from environmental exposure to dioxin ranges between one per thousand and 100 per thousand. The middle of this range would be 50 per thousand. Because the average person's lifetime chance of getting cancer is now about 400 per thousand (or four in 10), we can see that routine exposure to environmental dioxins may be making a substantial (12%) contribution to the danger of cancer in this country, if the German estimate holds true. If it holds true, it qualifies as an another public health disaster.

The mechanisms by which dioxin causes cancer, remain poorly understood. In most studies, dioxin seems to be a powerful promoter of cancer, rather than an initiator. In other words, once a cell has been made cancer-prone by something else, dioxin may push it over the edge and turn it into a full-blown cancer. This would explain why dioxin seems to cause a general increase in many cancers among exposed populations..

In the early 1990s, many governments, including the U.S. government, reported that everyone in the industrialized world is exposed to substantial quantities of dioxins day in and day out, thus acknowledging a humiliating failure of the world's public health apparatus.

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