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## **The International POPs Elimination Project (IPEP)**

*Fostering Active and Effective Civil Society Participation in  
Preparations for Implementation of the Stockholm Convention*

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# **Global Day of Action on POPs in Kenya**

**PSR – Kenya, CEAG-Africa and iLima-Kenya**

**Kenya  
May 2005**

## **About the International POPs Elimination Project**

On May 1, 2004, the International POPs Elimination Network (IPEN <http://www.ipen.org>) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;
- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;
- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see <http://www.ipen.org>

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# **Global Day of Action on POPs in Kenya**

## **25 May 2005**

### **Background**

Kenya is one of the countries that depends entirely on an agricultural economy - producing both food and cash crops using pesticides. Manufacturing concerns are concentrated in major urban centers like Nairobi, Thika and Mombasa among others. This suggests that both the agricultural and manufacturing concerns are major sources of POPs in Kenya. Additionally solid waste management is a perennial problem plaguing major municipalities. Management of medical waste as well as the burning at waste dumps produces dioxins and furans, which end up being taken up in the food chain.

The burning of medical waste is a leading source of dioxins and mercury in the environment. Dioxins at very low concentrations have been linked to cancer, immune system disorders, diabetes, and birth defects among others. Mercury is associated with nervous system disorders particularly affecting developing fetuses and small children. A number of other hazardous emissions are also associated with burning medical wastes. This suggests that anthropogenic practices by local citizens, commercial concerns as well as commercial incineration companies undermine the successful implementation of the Stockholm Convention in Kenya.

In view of the above factors Physicians for Social Responsibility (PSR-Kenya), iLima-Kenya and African Center for Environmental Advocacy and Governance (CEAG Africa) organized a series of educational activities for community-based organizations involved in solid waste management in the eight districts of Nairobi as part of the Global Day of Action (GDA) in 2005.

### **NGO/CSOs participated and contact persons**

1. Physicians for Social Responsibility (PSR-Kenya) - Dr. Paul Saoke
2. iLima- Kenya – Ms. Rachel Kamande
3. African Center for Environmental Advocacy and Governance (CEAG-Africa) Mr. Njogu Barua

### **GDA activities**

1. One of the GDA activities involved capacity building for the community based organizations involved in solid waste management in Nairobi
2. Development of press materials for public awareness and outreach

### **Status of the Stockholm Convention**

Kenya is a State Party to the Stockholm Convention since December 2004

## **Status of the National Implementation Plan (NIP)**

Kenya is in the process of finalizing its National Implementation Plan (NIP). The initial activities included the designation of the National POPs Focal Point; constituting of the National Steering Committee for the Implementation of the Stockholm Convention in Kenya; convening of the expert committees; and the convening of the National Workshop on POPs in Kenya. The second set of activities included identification of consultants to carry out the National Inventory on POPs. The data collection for the National Inventory of POPs has been concluded and is currently being finalized. The implementation plans have also been finalized and due for submission to the GEF and other relevant parties. Kenya is scheduled to present the final NIPs to the Stockholm Convention Secretariat on 23<sup>rd</sup> December 2006.

## **NGOs participating in the NIP**

Currently there are three NGOs participating in the NIP. These are Physicians for Social Responsibility (PSR-Kenya), iLima-Kenya and African Center for Environmental Advocacy and Governance (CEAG-Africa). Dr. Saoke of PSR-Kenya is the Vice Chairman of the National Steering Committee of the implementation of the Stockholm Convention in Kenya and also chairs the DDT Expert Committee. iLima-Kenya and CEAG-Africa have taken lead roles on the reduction of U-POPs in Kenya under the National Implementation Plans. iLima is expected to fast track the implementation of measures to eradicate open waste burning while CEAG-Africa is preparing to implement a project on “*Dioxin Reduction in Nairobi*”. PSR-Kenya will play a leading role in testing the efficacy of alternatives to DDT in Kenya.

## **Media coverage**

The GDA team produced a media brief on dioxins which we felt required urgent attention in the country. The essence was to capture the public attention in regard to their relationship to plastics-basically use and disposal. These were sent to several media houses based in Nairobi. Most of the FM radio stations aired it as a major news item. The Daily Nation made a follow-up interview with PSR-Kenya and produced an article on September 15<sup>th</sup> 2005 captioned “*How Kitengela was poisoned*” (Annex 4).

## **The outcomes of the GDA activities**

The capacity building awareness and training for the community based organizations (CBOs) in Nairobi culminated in their mobilization and preparation for the implementation of the Dioxin Reduction project which is due to be undertaken later in 2006. The GDA team took the opportunity to explore the various practices that give rise to the production of dioxins in the environs of Nairobi. The results have been used to strengthen the proposal. The CBOs are now better equipped to manage the various waste streams they deal with on a daily basis. They have organized themselves in to a single organization and are today producing organic manure, which is very high priced.

The media used the media brief on dioxins extensively to the extent that a major incinerator owner issued death threats to some of the GDA team members. The climax was the publication of the article on “*How Kitengela was poisoned*”. The incinerator owner engaged in aggressive assault on the GDA team members while the Ministry of

Agriculture issued a press statement on the issue. The positive outcome was two fold; the Rotary Club of Westlands invited PSR-Kenya to give a lecture on POPs. As a result the Director of PSR gave a lecture on “*Arresting the Chemical Soup in East Africa*” (Annex 2). The East African Medical Journal also invited the PSR-Kenya Director to write the editorial on “*Air pollution and health*” for their November 2005 issue (Annex 3).

### **Event evaluation**

The event can be evaluated in terms of the reactions it elicited above. This reveals the sensitivity of the POPs issue in Kenya as well as the responses of the professionals to such critical public health issues. This reveals that there are opportunities for involving both the general public as well as the professional communities to be active in the implementation of the POPs Convention in Kenya.

# ANNEX 1

## PRESS RELEASE 25<sup>TH</sup> MAY 2005

### PLASTICS AFFECT YOUR HEALTH PSR-Kenya, iLima and CEAG-Africa for the IPEN Global Day of Action

The bill currently pending in Parliament over the use of plastic bags needs to be supported by all Parliamentarians who need to understand the health effects of plastics. Industry sources have already indicated that the cost of using alternative packaging will definitely rise and be passed on to the consumer. This is not very good news to the consumer since everybody wants to spend as little as they can. The good news is this will save the lives of many people including you.

Plastics are not just dangerous because they are not biodegradable. We know for example that when animals eat them they clog the animals' digestive system, which results in death in many cases. However things get even worse when they are burnt. In the process of burning plastics chemicals called dioxins and furans are created. The Stockholm Convention of which Kenya is a state Party bans the production of dioxins and furans.

Dioxins are a group of highly toxic chemicals that affect the health of animals and people. Some impacts occur at levels to which all of us are exposed to in our daily lives. Among these low-exposure effects are altered immune functions, increased susceptibility to infections, and thyroid and liver function abnormalities. Higher levels of dioxin exposure have been linked to birth defects, child growth retardation, reduced levels of male reproductive hormones, altered ratios of male to female births, diabetes and cancer. Dioxins are classified by IARC as a known human carcinogen.

A single cellular mechanism is thought to be responsible for the wide range of effects dioxins can have. When dioxin enters the human cell, it binds to a soluble protein called the Ah receptor (A for aryl and h for hydrocarbon), which is present in many parts of the body. Inside the cell it binds with a second protein called Ah receptor nuclear translocator or "Arnt" to form Ah receptor-arnt-dioxin complex inside the nucleus of the cell. The complex binds to the DNA and turns genes on or off. The genes that are turned off or on produce proteins, which influence hormone metabolism and growth factors and thus affect reproduction and immune system function. This complex can also cause genetic changes that result in cell proliferation, mutation or cancer. This mechanism is the same in both humans and animals, allowing extrapolation from laboratory experiments involving dioxin effects on animals to a parallel human reaction.

The burning of medical waste is a leading source of dioxins and mercury in the environment. Many hospitals in Kenya do not have proper waste management system and some resort to open waste burning of plastic materials thereby releasing dioxins in to the atmosphere. Dioxins are extremely long-lived compounds that accumulate in the global environment. Airborne dioxins get into the food chain, concentrate in the tissues of humans and animals, and are passed on to the fetus across the placenta. In the process of burning the waste mercury is also released in to the atmosphere. Mercury is associated with nervous system disorders particularly affecting developing fetuses and small children. While exposure of the general population occurs through the ingestion of many common foods, children exposed in utero during critical periods of development appear to be the most sensitive and vulnerable to the effects of dioxin. Dioxin exposure has been linked to disrupted sexual development and IQ deficits, hyperactive behavior and developmental delays.

Epidemiological studies on incinerators in general have indicated significant links between incinerator emissions and:

- Higher blood levels of dioxins, furans, toluene, lead, and cadmium
- Higher levels of mercury in the hair
- Increased risk of cancers, especially stomach, colorectal, liver, and lung cancers
- Higher prevalence of hypertension
- Excessive deaths from ischemic heart disease and lung cancer.

Since many hospitals and health care clinics are situated within the cities, towns, and rural communities they serve, on-site incinerators are often found adjacent to homes, schools, marketplaces, and other centers of activity, exposing a large population to toxic pollutants. After decades of using medical waste incinerators, many countries are realizing the serious problems with incineration and are investing in non-incineration waste management technologies. For example, 6,200 medical waste incinerators existed in the United States in the late 1980s and less than 800 exist today.

Dioxins are deposited on trees and fields are re-released in to the atmosphere through open field burning and forest fires. This means that dioxins are found everywhere due to their persistence and ability to travel long distances. Exposure begins in the egg or in the womb, where the effects are most insidious, and continues over a lifetime. The danger is cumulative because the chemicals are not easily excreted due to their poor solubility in water. Instead dioxins are stored in body fat and concentrate up through the food web. Wildlife and humans are exposed primarily via fatty food, particularly meat, fish and dairy products. The US Environmental Protection Agency estimates that people who eat such foods face a cancer risk as high as 1 in 100. In 1999 the Belgian beef industry suffered international boycott that even led to temporary closure of a supermarket chain in Kenya for a whole week due to fear of dioxin contamination.

The banning or restriction of plastic bags will greatly reduce dioxin emissions in our environment. However other sources like pulp paper bleaching and steel rolling mills also contribute significant amounts of dioxins in our environment.

## ANNEX 2

**ARRESTING THE CHEMICAL SOUP IN EAST AFRICA  
AN ADDRESS TO THE WESTLANDS ROTARIANS  
5<sup>TH</sup> JUNE 2005  
BY DR. PAUL SAOKE – DIRECTOR PSR-KENYA**

There is no doubt that Non-governmental organizations have been at the forefront of environmental justice. In deed this has not been without cause or reason. Rachel Carson's celebrated work in the early 60's sounded the knell about the wanton environmental destruction from pesticides especially DDT. Concerned individuals responded by forcing their governments to re-examine policies on chemical use in their countries. We may then boldly say that this heralded the era of standards development based on tolerable intake and permitted toxic levels of chemicals, which were commonly in use. In deed the pressure on governments culminated in the landmark Rio conference in 1992, which is the template of most environmental conventions both regionally and globally. Most of you will remember the hard battles that have been fought to limit the ozone depleting substances that have resulted in stringent emission levels. Similarly the Rio call for the protection of human life and sustainable development is an important template, which all development planners must take into account. This also calls for a thorough examination of our current practices in every sector of the economy and social life.

“Sustainability” has been used to describe attributes of the economic system, which does not mortgage the future. This preferred paradigm has attributes, which need to be emphasized. These include the following:

- Dynamic equilibrium
- Adaptability (or the capacity for evolutionary change for changing circumstances)
- Resilience (or the capacity to recover from shocks or sudden changes in conditions)
- Reliability

How these attributes are to be measured or evaluated, what tensions there are among them and between them and the goals of productivity for meeting present needs and equity however remain complex and need to be explored systematically<sup>1</sup>.

Our robbery of the environment of future generations is at least as grave as any injustice we are visiting upon our own and future generations. The desire for environmental justice must consider in earnest the iniquities of economic distribution. We are living in a world, which is characterized by millions of children dying from lack of simple things on the one hand and unbridled excesses of consumption and waste as well as immense military expenses on the other, not to speak of “*such absurdities as hanging live lions*”

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<sup>1</sup> Markhijani A. From Global Capitalism to Economic Justice, 1992



*over a private swimming pool in Bombay tingling amusement, or serving lion steak at a party while millions starve”<sup>2</sup>*

The excess in consumption patterns described above simply mirrors the pressures and drives that lead to excessive and wanton environmental destruction we are impacting on the planet earth. The need for mass production in every sector – driven by the desire for huge profits is currently proving a difficult task to regulate. Indeed the rapid and exponential development in agri-business presents one the most difficult challenges to communities today in the sense that not only is the sociological setups are changed but that chemicals are extensively used as pesticides and weed killers.

In the Eastern Africa region the main crisis stems from rampant pesticide use in agribusiness and disease vector control. A study by Grace Ohayo Mitoko et al<sup>3</sup> revealed that the main pesticide importers in the region were the Ministries of Agriculture whereas co-operative unions dominated distribution. Although pesticide regulatory mechanisms existed, their weak structures enabled the importation and usage of pesticides no longer in use in the countries of origin. Incidents of abuse were noted, as in the use of organochlorine pesticides on food crops and reported poisoning cases in the district hospitals where Kenya and Tanzania reported 455 and 736 cases respectively. Though tentative, more than 40% of the health care professionals interviewed could not recognize pesticide-poisoning cases. Therefore to avert pesticide related morbidity and mortality in the region, pesticide regulatory bodies need strengthening while pesticide users, the general public and health care workers should be educated on pesticides.

Though pesticide poisoning is largely viewed from short-term toxicological perspective, the net effect of exposure to organochlorine pesticides would be grossly understood from immediate symptomatic manifestations. However a growing volume of scientific knowledge indicates that transgenerational effects are the main bane of exposure. The health effects of exposure lead to a huge chemical body burden, which affects the sexual mechanisms and reproductive system in vitro. The accumulation of these chemicals in the human bodies leads to the development of *chemical soup*, which is bequeathed to the unborn child. Many scientific studies have linked organochlorine pesticides to endocrine disruption, which leads to malformations in children. These chemicals are known to cross the placenta filter and end up mimicking natural hormonal activity or blocking the hormonal receptors thereby inhibiting the natural course of fetal development and sex determination. In many instances the development of certain human parts are distorted as in where hypospadias occurs. In many cases most children who would have been male have ended up being feminized. None-the-less the children inherit the chemical soup, which we do bequeath to them in utero.

The international conventions are instruments meant to control the development of the chemical soup – chemical burden in our blood. The conventions need to be given impetus at local and regional levels for them to have relevance. These conventions – especially the environmental ones recognize that creating border posts cannot solve the

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<sup>2</sup> Markhijani A. From Global Capitalism to Economic Justice, 1992

<sup>3</sup> Afr J Health Sci. 1994 Feb; 1(1): 37-41.

chemical problems, since they recognize no national boundaries and do not require visas to cross the national borders. In deed as is known with chemicals, which have POPs properties, they are semi-volatile, aero-transportable and tend to accumulate in Polar Regions. This signifies the fact that the generation of POPs in the tropics has global effects and significance hence the need to curtail their production – hence the need for international synergies. These conventions are merely guidelines for national legislations. In many respects there is always the false assumption that after ratification of a convention then the work of pressure groups actually cease. It is important to note that the convention stipulates must be translated into municipal laws, which might require constitutional adjustments.

Dichlorodiphenyltrichloroethane (DDT) is an organochlorine insecticide, which is effective against mosquitoes but not environmentally friendly. It persists in the environment hence is labeled as one of twelve persistent organic pollutants (POPs) that are toxic and do not biodegrade easily; the other eleven are aldrin, dieldrin, chlordane, heptachlor, hexachlorobenzene, mirex, toxaphene, dioxins, polychlorinated biphenyls and furans.

DDT like other POPs substances is dangerous when it gets into the human body even in minute quantities. Children get exposed to POPs through direct exposure to contaminants but most profoundly in utero. I would like to dispel the notion of safe levels of POPs - more so that of DDT. Most of the toxicological studies have concentrated on lethal doses in relation to cancers, gross abnormalities and death in order to come up with safe levels. However there is emerging evidence, which indicates that low dose exposure, affects fetal development in utero and can result in irreparable damage to the unborn child

We today know that children whose mothers ate fish from Lake Michigan before they became pregnant were exposed to PCBs in the womb and experienced neuro-developmental delays at birth. This was later associated with short-term memory loss at age four. At age 11 the children experienced intellectual impairment measured at -6.2 I.Q. The PCB concentrations found in the children were only slightly above normal.

A similar study carried on Lake Ontario made similar conclusions 10 years later. Fredrick Von Saal provides scientific explanation for this phenomenon when he and his colleagues examined the effects of hormonal changes as a result of below recommended safe dose of DDT exposure in mice. By administering 20 ppb of o.p.'DDT to pregnant mice once in just six days, DDT permanently enlarged the prostate glands in the male offspring. It is therefore not surprising that testicular cancer is on the increase among young people in the US and that 60-70 percent of all US men will get prostate cancer at age 65 - a result of tumors which began in utero. A 20-year epidemiological study revealed that hypospadias - failure of the urethra to open at the end of the penis doubled in the United States between 1970 and 1990. The condition now affects 1/100 boys in the US. A more severe form is increasing the most, where the opening is in the scrotum. DDT has been linked to spontaneous abortions and prematurity. A Mexican study found

higher frequency of low birth weight in women with higher levels of DDT and its metabolites in breast milk.

The biological processes controlled by the endocrine system – including immune nervous and reproductive systems are common to all animals. As such the adverse health impacts identified in wildlife and laboratory animals from exposure to DDT and other classes of pesticides serve as indicators of potential hazards to human health.

DDT exposure is linked to many other disorders in males more profoundly the male reproductive organ. Smaller testes, which produce less sperm, have been observed in Denmark and Canada among other countries. Incidence of un-descended testis has been noted to be on the increase. Feminization of males in utero has also been observed in both wild life and humans as a result of exposure to some of these synthetic chemicals. DDTs estrogenic and or antiandrogenic properties can contribute to feminization or demasculinization, resulting in altered behavior. Other developmental effects may involve incomplete urogenital development and undescended testis arising from pre-natal disruption of testosterone. Studies have implicated DDT and some synthetic pyrethroids in the irreversible effects of the nervous system. Specifically these substances alter the proportions of neuro-receptors in the developing brain of the neonates, leading to hypersensitivity and behavioral abnormalities.

Rachel's Environment and Health Weekly <sup>4</sup> extensively quotes studies of more than 20 years, which indicate declining male population in United States, England, Wales, Denmark, Sweden, Finland, the Netherlands, Germany, Chile, Argentina, Brazil, Bolivia, Colombia and Costa Rica. Another study conducted among users of the pesticide Dibromochloropropane (DBCP) revealed sterility in the males and those who were able to have children had three times more daughters than expected.

POPs have also been known to affect psychosocial development of children who were exposed in utero. Dr. Helen Daly in her psychological studies of Lake Ontario noted that babies exposed to the PCB-contaminated fish had a very difficult time shutting down their response to mild stimulation and appeared hyper-responsive to mildly negative events

The Stockholm Convention (also known as the POPs Treaty). This convention had most stakeholders agreeing on most issues except for DDT. During the negotiations there emerged a lobby group calling themselves malariologists who up to this moment insist that DDT has no real proven health effects and is the most effective chemical against malaria. In deed they have carried the debate much further to criminalize environmentalists in the west whom they are accusing of conspiring to murder African children by advocating for the DDT ban as one of the 12 POPs. The one notable weakness of this parochial view is that they deny the existence of alternatives to DDT and that they are equally effective.

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<sup>4</sup> Rachel's Environment and Health Weekly Number 594

Harmful environment effects of DDT have been recognized since 1950s when Swiss scientists established association between unborn and functionally impaired calves whose mothers had been grazed on DDT Sprayed pastures. Studies on human volunteers, non-human primates and other mammalian species indicate that DDT may cause a number of adverse effects ranging from acute toxicity to cancer. Other studies have implicated DDT in increased testicular cancer, reduced sperm count and sperm quality (which lowers fertility), premature births and lower birth weights. Some studies have also linked DDT to high number of hypospadias, which used to affect one in hundred male children born in the US. Exposure to DDE a metabolite of DDT has also been linked to precocious puberty. Consequently, DDE has been linked to shortened period of lactation in breastfeeding mothers.

Much of the traditional research on DDT has focused so much on the teratogenic and carcinogenic aspects of the substance. Concentrations of DDT and its metabolites are clear barometers of exposure. Although DDT levels are noted to be on the decrease globally, there are populations 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 as set by WHO. Moreover studies have shown that the length of lactation decreases with higher DDE body burdens in humans, thus depriving infants of the benefits provided by breastfeeding. In deed recent publication by Chen and Rogan indicates that DDT may have a substantial impact on infant mortality, by increasing the risk of pre-term birth and by decreasing the duration of breast-feeding after birth. In this paper, Chen and Rogan conclude that DDT may cause comparable increase in infant mortality through these mechanisms as the decrease in infant mortality it causes by killing mosquitoes and thus reducing malaria cases<sup>5</sup>. USEPA released the results of a chemical body burden, which indicated the presence of above normal DDT levels in teenagers despite DDT having been banned in that country close to three decades ago.

A study carried out in Kenya in the mid- 1980s indicated high levels of DDT was used in both agricultural and public health undertaking. High levels of DDE and DDT were observed form a test of 367 domestic eggs from 61 farms in Central Kenya and 41 maternal blood, milk, subcutaneous fat and umbilical cord blood samples from mothers who delivered through caesarean section in Kenyatta National Hospital. DDT enters the human body system through the food chain.

If DDT is to be imported and applied strictly as recommended, elaborate and costly preparations must be made. Furnaces should be put up to incinerate DDT remnants and their containers. Separate washing facilities for personnel handling the chemical must be provided to avoid water contamination. The amount of DDT that will be required in any one year in Kenya to control malarial runs into hundreds of metric tones how will such quantities be stored and transported to house holds country wide without contaminating the environment?

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<sup>5</sup> Emerging Infectious Diseases 9(8):960-964

The international Stockholm Convention, which Kenya signed in May 20001, restricts DDT to Public Health use only if there are no safer alternatives. Most countries of the World have banned use of DDT completely. Only twelve countries in the developing world are still using DDT in malarial control. However some of these countries are registering an increase in childhood cancers. For example, 5% of children below 5 years old in Mauritius are report as dying of cancer. Additional, Ethiopia which manufactures and uses DDT for malarial control is still experiencing malaria epidemics with increasing mortality rates.

There are safer and locally produced natural pyrethroids which are very effective against mosquitoes. The pyrethrum Board of Kenya produces the following efficacious insecticides and larvicides:

- Pylarvex kills mosquito larvae and pupae in their breeding habitants
- Pymos for aerial and indoor residual spraying to kill adult mosquitoes
- Pynet for treating mosquito nets kills and repels adult mosquitoes.

The above-enumerated products have been tested and found to be extremely effective against adult, larval and pupal stages of mosquitoes.

Kenya produces 80% of global output of pyrethrum whose products we should use in malaria control programmes. The latest trials of synthetic pyrethroids produced in other countries have been found to be inferior in efficacy compared to our locally produced pyrethrins.

Pyrethrum compounds are biodegradable and have no harmful metabolites. As a country which produces excessive pyrethrum flowers, we can use our crop to save our environment which is in a state of having every natural gift polluted, while at the same time raise the standard of living of our rural poor.

According to Theo Colborn, 137 million children are born every year in this world. They will have been exposed to POPs for 266 days in the womb, babies whose potential these chemicals can steal quality of life.

## ANNEX 3

### AIR POLLUTION AND HEALTH

PAUL SAOKE

PHYSICIANS FOR SOCIAL RESPONSIBILITY KENYA

EDITORIAL EAST AFRICAN MEDICAL JOURNAL NOVEMBER 2005

Fossil fuel emissions are not only responsible for climate change and ozone depletion but are increasingly becoming a serious public health concern. These emissions contain metals like lead, particulate matter and dioxins, which have been linked to various ailments in humans. Incineration of organic waste is the largest single source of air pollution. Annual atmospheric emissions of trace metals from waste incineration include Antimony (0.67 tons), Arsenic (0.31 tons), Cadmium (0.75 tons), Chromium (0.84 tons), Copper (1.58 tons), Lead (2.37 tons), Manganese (8.26 tons), Mercury (1.16 tons), Nickel (0.35 tons), Selenium (0.11 tons) Tin 0.81 tons) Vanadium (1.15 tons) and Zinc (5.90 tons) (1). Besides these other halogenated organic compounds like polychlorinated biphenyls (PCBs), chlorinated benzenes, polychlorinated naphthalenes, halogenated phenols, brominated and mixed halogenated dioxins are also released. All these are very persistent and bio-accumulative toxic substances. However this article will highlight only lead and dioxins which are of very urgent concerns locally.

Lead in particular has been known as an acute occupational and environmental poison for thousands of years and historians examining the ancient Roman bones are concluding that the Roman upper class failed to reproduce themselves due to heavy exposure to lead as wine sweetener and as utensils. (2,3). About 40% of inspired lead is absorbed from the lung where it is transported to internal organs (like kidney and liver) and bones by blood. The half-life of lead in the blood is estimated at 20-40 days (4). Lead affects both the central and peripheral nervous systems (5). Classic symptoms are lead encephalopathy, weakness and paralysis of the extensor muscle and lead colic. (6,7) Other problems associated with lead poisoning include impaired psychometric intelligence, hyperactivity, IQ loss and reproductive problems (3).

Dioxins are a group of highly toxic chemicals that affect the health of animals and people. Some impacts occur at levels to which all of us are exposed to in our daily lives. Among these low-exposure effects are altered immune functions, increased susceptibility to infections, and thyroid and liver function abnormalities. Higher levels of dioxin exposure have been linked to birth defects, child growth retardation, reduced levels of male reproductive hormones, altered ratios of male to female births, diabetes and cancer. Dioxins are classified by IARC as a known human carcinogen (8). According to United States of America Environmental Protection Agency (USEPA), the major sources of dioxins were municipal garbage incinerators with 36% while diesel vehicle engines produced 1% of total dioxin emissions (9).

Dioxins are extremely long-lived compounds that accumulate in the global environment. Airborne dioxins get into the food chain, concentrate in the tissues of humans and animals, and are passed on to the fetus across the placenta. While exposure of the general



population occurs through the ingestion of many common foods, children exposed in utero during critical periods of development appear to be the most sensitive and vulnerable to the effects of dioxin. Dioxin exposure has been linked to disrupted sexual development and IQ deficits, hyperactive behavior and developmental delays besides being a known endocrine disrupter. A recent study found out that levels of dioxins found in sampled eggs from Dandora in Nairobi were over six times higher than the European Union (EU) dioxin limit for eggs. In addition, the samples exceeded the proposed limits for PCBs (in World Health organization –Toxic Equivalent) by more than four-fold. It further revealed that the level of dioxins in eggs shown as fresh weight exceeded one and half times the limit for commercial eggs in the USA. The US Food and Drug Administration estimates a lifetime excess cancer risk of one in 10,000 for eggs contaminated at 1 pg/g ITEQ. The samples collected near the dumpsite at Dandora exceeded this cancer risk level<sup>6</sup>. (10).

A single cellular mechanism is thought to be responsible for the wide range of effects dioxins can have. When dioxin enters the human cell, it binds to a soluble protein called the Ah receptor (aryl hydrocarbon), which is present in many parts of the body. Inside the cell it binds with a second protein called Ah receptor nuclear translocator or “Arnt” to form Ah receptor-arnt-dioxin complex inside the nucleus of the cell. The complex binds to the DNA and turns genes on or off. The genes that are turned off or on produce proteins, which influence hormone metabolism and growth factors and thus affect reproduction and immune system function. This complex can also cause genetic changes that result in cell proliferation, mutation or cancer. This mechanism is the same in both humans and animals, allowing extrapolation from laboratory experiments involving dioxin effects on animals to a parallel human reaction. (11)

It is imperative that air emission standards must be put in place to check not only motor vehicle emissions but other anthropogenic activities responsible for pollution releases. The phase out of leaded petrol is long overdue in Kenya, while few studies or no studies have looked at the health aspects of exposed populations.

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<sup>6</sup> was estimated (using a cancer potency factor of 130 (mg/kg-day)<sup>-1</sup> and rounding the risk to an order of magnitude) for consumption of 3-4 eggs per week (30 g egg/day) contaminated at 1 ppt ITEQ<sup>6,6</sup>

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## **ANNEX 4**

**The Nation Newspaper (Nairobi):**

### **HOW KITENGELA WAS POISONED**

**Story by Isaiah Esipisu**

**15 September 2005**

An international coalition of organisations wants two institutions in the environs of Nairobi closed for allegedly being a health threat. A study funded by the United Nations Environmental Programme and others says the institutions in Kitengela – some 20 kilometres or so from Nairobi – have long been suspected of handling persistent organic pesticides.

One is a Ministry of Agriculture store for obsolete pesticides about two kilometres from Kitengela shopping centre and the other a privately-owned incinerator for pesticides and other industrial chemical waste that is in the heart of a residential area.

The 30-page report – *Hotspot Report for a Contaminated Site: Kitengela Obsolete Pesticide Store in Kenya* – says the store and its location are contaminated with a wide variety of toxins, including industrial and agricultural chemicals that are not biodegradable, generally known as Persistent Organic Pollutants or POPS.

These are chemical substances that persist in the environment, accumulate through the food web, and pose a risk of hurting people and the environment.

Other organisations sponsoring the study included the Global Environment Facility, Swiss Agency for Development and Cooperation, and the Swiss Agency for the Environment Forests and Landscape. The research was carried out by the Environmental Liaison, Education and Action for Development or E

The Ministry of Agriculture put up the building in 1967 for storage of pesticides for control of mosquitoes and locusts. But with time, the report says, it began to store obsolete pesticides and other toxic waste collected from all over the country.

The store, constructed with wooded cut-offs and iron sheets walls and roofing, is said to be in very poor physical state, "with the potential of being a serious health and environmental hazard. It does not meet the basic requirements for a chemical store as outlined by the International Trade Association for Manufacturers of Agrochemicals".

The investigating parties say they found stockpiles comprising 40 drums of contaminated soil and other chemicals used for desert locust control. "During our visit, there was a pungent odour emanating from the chemicals which caused headaches among several members of the research team after only a few minutes in the store. An unusual whitish rusting of iron sheets was also observed," says the report, which is widely circulated on the Internet.

By 2000, the store was reportedly handling more than what it was designed for. The chemicals were leaking into the ground through the dirt floor, posing a great danger to the environment and ground water sources. The floor was eventually cemented but, according to the report, it has since been corroded and the chemicals are still seeping into the ground.

The store is barely 50 metres away from Kitengela seasonal river, which is used to water local livestock and a Ministry of Agriculture goat breeding project.

"It was confirmed that contamination of the soils under the store is at least seven feet deep and over one kilometre radius," says the study. "It was estimated that the contaminated soil around the store is approximately 400 tonnes."

In 2000, the Agrochemicals Association of Kenya hired Dr Phillip Mwabe, an engineering lecturer at the University of Nairobi, to clean up the chemicals. Dr Mwabe has since put up an incinerator and burns the chemicals at high temperatures. The incinerator is in a residential area.

In an earlier interview with the media, Dr Mwabe had been categorical that he did not deal with toxic waste. He had said he was in the business of smelting aluminum to make steel components since 1999. Efforts to get him were futile as he is said to be out of the country and nobody else in his company could comment on the issue.

But according to Dr. Paul Saoko, who was involved in the study, burning is not the right way to dispose of the chemicals because dioxins, which are very difficult to destroy, escape into the environment.

Inhaled over time, the dioxins can lead to serious health complications including cancers, children with low IQ and weakening of immune systems. "This is why the World Bank and the United Nations Global Environment Facility are funding a project to collect all POPs in Africa and ship them to Europe for safe disposal," says Dr. Saoko. But the Ministry of Agriculture says it is not aware of any danger posed by the store.

Speaking to *Horizon* on behalf of Director of Lands and Crop Management John Cheluget, Public Relations officer Lugk Mohammed said no one had ever complained about the store.

He added: "We have contracted Mr. Mwabe to dispose the chemicals. How he does it is the concern of the Ministry of Environment. I have a problem with the residents, because they are the ones who encroached on the incineration site."

The area adjacent to the two sites does not have adequate surface water for people, livestock and irrigation. Locals depend on underground water reserves that face the threat of chemical contamination. The chemicals are likely to percolate even deeper because of the porous rocks in the area and head into the ocean.

Last year, Kenya signed the Stockholm Convention which requires that all POPs be disposed of safely. In local terms, this means they should be handed over to the African Stockpile Programme. The process is free of charge for countries that have signed up for the Stockholm Convention. If they were to be disposed of locally, according to some experts, they should be sunk in an underground cemented casing and covered safely.

Combustion does not help because dioxins are not easily destroyed, even in high temperatures. Their toxicity can only be reduced if they are burned at about 1,200 degrees centigrade. It is highly expensive to achieve such temperatures, especially in the developing world.

The other recommended methods are recycling the chemicals for different use or destroying them using other chemicals.

Stakeholders are lobbying for a new store to be built by the ministry, which will meet all the international standards of storing such chemicals to avoid environmental contamination.