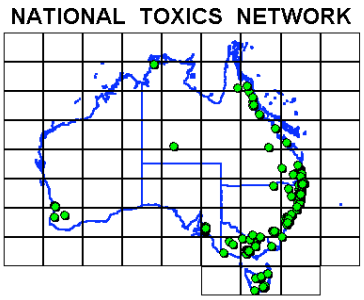

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'Getting off the Chemical Treadmill'

***Dr Mariann Lloyd-Smith,* Co-Chair, IPEN**

Never before has our need to reduce pesticide use been greater. Our knowledge of their impacts is extensive and we know they affect, not only agricultural workers and farmers but their families and our environments as well. From Africa, we receive medical reports of severe endocrine / hormone effects in small children living near commercial farms where large amounts of pesticides are sprayed on crops. And while India is haunted by its old DDT and Lindane contaminated factories, Indian workers are poisoned by modern day practices like the spraying of endosulfan in cashew plantations. In Mexico, serious development and neurotoxic effects have been observed in the children of plantation workers. Throughout the world today, children are born with an alarming number of chemicals including pesticides in their small bodies. Wherever pesticides are used extensively, their impacts are evident in the environment and their toxic effects are felt by the poor, by agricultural workers and their families, and by future generations.

IPEN

The International POPs Elimination Network (NTN) focused on the negotiation and implementation of the *Stockholm Convention on Persistent Organic Pollutants* (POPs) 2001 to ensure the final elimination of pesticides like Dieldrin, Endrin, Aldrin, Chlordane, Mirex, Heptachlor and DDT. All members of the 'dirty dozen chemicals' the Convention targets.

IPEN is a global non-profit network of 400 public interest NGOs in 65 countries working for the elimination of persistent, bioaccumulative toxins (PBTs). While many of our group focus on pesticides, others work to rid the world of poisonous industrial chemicals and the dangerous contents of every day products.

Chemical contamination shows no respect for national borders and no country no matter how big or small can fix this problem, acting alone. However, in 2006 IPEN broaden its focus, releasing our vision for a Toxic Free Future. We committed *"to work for a world in which POPs and other persistent toxic chemical substances no longer pollute our local and global environments, nor contaminate our food, our bodies, and most importantly the bodies of our children and future generations."*

IPEN is committed to intergenerational equity and has as a priority the protection of our children and future generations from chemical exposure. In our work we are guided by the Principles for Chemicals Policy Reform:

- Precautionary Principle
- No data - No market
- Right to Know
- Substitution Principle

If these principles were adhered to in pesticides' registration, many chemicals on the market today would not be permitted. Most importantly, assessments would be based on the mixture of chemicals we are exposed to, rather than individual substances, one at a time.

IMPACTS OF PESTICIDES

In 2004, the Ontario College of Family Physicians[i] reviewed 250 studies from countries around the world connecting pesticides, used both occupationally and in the home and garden, to serious illnesses such as cancer, reproductive problems, and neurological diseases. They concluded that many types of pesticides can cause harm and found good evidence of an association between pesticide exposure and prostate, brain and pancreatic cancers, acute leukemia and non-Hodgkins lymphoma. They also found evidence of serious nervous system effects and an association with diseases that affect reproduction and development. These findings have been strongly supported in the scientific literature.[ii]

Despite advances in chemical management and occupational health, the exposure of workers continues. A 2003 study[iii] of pesticide exposure in California, the site of some of the world's most stringent pesticide use and worker safety laws, illustrates the global problem of pesticide poisoning among agricultural workers. The joint study by the Pesticide Action Network, United Farmworkers of America, and California Rural Legal Assistance Foundation identified nearly 500 pesticide poisonings in California farmworkers every year from 1997 to 2000. The actual number of pesticide-related illnesses is unknown, since many poisonings go unreported. Most poisonings occurred as a result of soil fumigation and pesticide applications to grapes, oranges, and cotton. Pesticide drift accounted for 51% of the cases, and another 25% resulted from exposures to pesticide residues. Violations of worker safety laws were common, contributing to 41% of reported poisonings. No violations occurred in another 38%, indicating that existing laws are inadequate to protect workers from pesticide exposure.

PESTICIDE IMPACTS ON CHILDREN

In 2002, the World Health Organisation (WHO), the United Nations Children's Fund (UNICEF) and the United Nations Environment Program had identified the growing body of epidemiological research and studies of laboratory animals, which suggested the possible link of long term exposure to children from certain pesticides. [iv] These include:

- abnormal growth and development, and failure to acquire normal organ function;

- endocrine/hormone disruption: certain pesticides in very small doses may mimic or block hormones or trigger inappropriate hormone activity, which can cause, for example, sterility, lowered sperm counts and breast cancer;
- impaired development of the nervous system that can result in lowered intelligence and behavioural abnormalities;
- cancers, including leukaemia, sarcoma, lymphoma, Wilm's (malignant tumour of the kidney) and brain cancer in children. Studies have indicated that the risk of developing cancer might be higher if exposure to carcinogens begins in childhood; and
- compromised immune system, which in children further exacerbates the risk of infectious disease and cancer, thus increasing mortality rates. This is of special concern as children are simultaneously exposed to both pesticides and infectious pathogens when their immune systems are already compromised by other factors.

More recently, the WHO has alerted countries to the growing impacts of neurotoxins on health and children's development. Organophosphate pesticides are powerful neurotoxins. In Australia, the organophosphate insecticides, chlorpyrifos and malathion (as well as chlordane, DDT and PCPs), were measured in newborns at a regional hospital.[v] In 2006, medical researchers[vi] identified over 200 documented human neurotoxins, of which 90 were pesticides.

UNIQUE VULNERABILITY OF CHILDREN

Children are far more vulnerable to the adverse impacts of hazardous chemicals and their unique vulnerability is well recognised by the WHO, UNICEF and UNEP.[vii] Research from the University of California, published this year,[viii] has shown that newborn children can be up to 164 times more vulnerable than adults to the commonly used organophosphate pesticide, chlorpyrifos and up to 65 times more sensitive to diazinon.

Children react to hazardous chemicals differently from adults as their bodies are still developing and their detoxification systems, immature..[ix] They are also at risk because they have a higher respiration and metabolic rate than adults; they eat and drink more per bodyweight, and live life closer to the ground, crawling, digging in dirt and putting objects in their mouths. Being unaware of chemical risks, children are less able to protect themselves from exposures and their higher skin absorption rate may also result in a proportionally greater exposure. Children are not simply *'little adults'*.

A child's ability to detoxify and excrete toxins also differs from adults. While at times this can offer greater protection, it can also increase vulnerability, for example where a break down product or metabolite is more toxic than the original contaminant. Should the enzyme systems responsible for detoxification be damaged early in life, the result can be a lifetime of disabling chronic illness.

The timing of chemical exposures is also very important. Babies and children experience particular "windows of susceptibility"[x] in their development. If exposures occur during critical times, it may contribute to health problems much later in life; for example, exposure to dioxin in utero can produce disabilities in neurological function and learning ability well into childhood.[xi] Early exposure to carcinogens may also increase the risk of developing cancer later in life.[xii]

Early exposure to endocrine disruptors can affect an individual's immune function or ability to reproduce. The US Centres for Disease Control and Prevention has reported an

increase in the percentage of severe cases of hypospadias.[xiii] One causal factor being investigated is hormone disruption (in the form of reduced testosterone) caused by synthetic endocrine disrupting chemicals, at a critical time in the foetus's development.

Studies in Europe and the U.S.[xiv] have identified a wide range of chemicals in umbilical cord blood as well as in children. They include pesticides, industrial chemicals and many (artificial musks, alkylphenols, bisphenol-A, brominated flame retardants, perfluorinated compounds, phthalates, and triclosan) that are found in the common products used every day in the home and school; products like cleansers, computers, toys, lotions and perfumes, cookware, clothing and carpets. Many of these are cancer promoters, immunotoxins, or hormone disruptors.

UNWANTED POPS - DIOXINS AND FURANS

Some of the most worrying contaminants in children are the group of chemicals called dioxins and furans. These are the unwanted byproducts of incineration and uncontrolled burning, as well as industrial bleaching and some chemical manufacturing processes. They are also found as trace contaminants in some pesticides. UNEP [xv] describes dioxins and furans as posing particular hazards to humans and wildlife, due to their toxicity, their persistency, and their high fat solubility. They bioaccumulate in the body fat of people, marine mammals, and other wildlife and then bioconcentrate up the food chain. Dioxins are passed from mother to the fetus in the womb and to the child through breastmilk. They are semivolatile and mobile, traveling great distances on wind and water currents.

The effects of dioxins can include diseases of the immune system, reproductive and developmental disorders, as well as cancers.[xvi] They have a particular impact on women[xvii] where exposure has been implicated in endometriosis and increased breast cancer rates. Studies have linked prenatal exposure to dioxins with developmental and immune impacts in children.[xviii]Yet, a baby's dioxin exposure does not stop at birth.

In Australia, estimates based on the Human Health Risk Assessment of Dioxins for the National Dioxin Program show that breastfed Australian infants are consuming many times the Tolerable Monthly Intake for dioxins and furans. In 2002, Australia recommended a Tolerable Monthly Intake (TMI) for Australians of 70 picograms of dioxin TEQ per kilogram of bodyweight per month.[xix] At a crucial time in their development, 3 month old breastfed babies can be consuming at least 16 times the TMI of total dioxins.

Dioxins and furans are listed in the *Stockholm Convention* for reduction and wherever feasible elimination. Of course, there are many who oppose this, including very vocal supporters of incineration.

DIOXINS IN EGGS

In 2005, as part of IPEN's International POPs Elimination Project (IPEP),[xx] our Dioxin, PCBs and Waste Working Group organised the international Egg Report project. The project tested free-range chicken eggs from 17 countries across 5 continent for the POPs chemicals; dioxin, furan, PCB and HCBs . Eggs were chosen as a good bio-indicator of food and environmental contamination. The majority of eggs tested exceeded the acceptable levels set by the European Union and some had the highest dioxin levels ever tested in foods. Many samples were taken from backyards close to pollution sources like

waste incinerators, rubbish dumps and cement kilns.

The overall IPEP project was funded by the Global Environment Facility and a range of countries and UN agencies. (CHECK) The project worked with 200 NGOs from 64 developing countries and countries with economies in transition (DC/EITs) to build awareness, skills and knowledge about POPs. The project has helped build capacity in many groups to allow them to more effectively participate in their own countries chemical management, and in international chemical conventions like Stockholm, Rotterdam and Basel. NGOs taking part in IPEP completed a range of activities like POPs country situation reports, mapping POPs stockpiles and contaminated sites, promoting cleanup and disposal, documenting POPs use, sampling soil, eggs, fish, people, investigating new POPs, getting involved in their POPs National Implementation Plan and building awareness with workers and in civil society.

OLD PESTICIDES AS NEW POPS

IPEN also focuses on identifying new candidate POPs as the Stockholm Convention does more than address the original 'dirty dozen' POPs chemicals. It recognizes the need to take global action on all chemicals with POP-like characteristics, ie.;

- persistent in the environment;
- travel long distances via air and water;
- are toxic; and
- bioaccumulate in living things.

IPEN through its member groups have identified another 20 chemicals that need immediate and urgent consideration as a POP. For example, the pesticide Lindane and some flame retardants (polybrominated diphenylethers (PBDEs) used in computers and furnishings were also found in virtually all egg samples tested. They have now been included in 9 chemicals currently being assessed by the POP Review Committee. As well as Lindane and its isomers, the nine include two other old pesticides chlordecone and pentachlorobenzene. Yet despite this and the fact that Lindane is a severe neurotoxin, it is still used in many countries for treating hair lice in children.

Other POPs candidates include the perfluorinated chemical, perfluorooctanesulfonate (PFOS) once used in a wide range of domestic products including the stain treatment, Scotchguard.

There are other pesticides that IPEN considers fulfil the criteria of a POP, which have not as yet been nominated for assessment.

Endosulfan

The insecticide endosulfan is a acutely toxic and persistent, environmental pollutant, which has severely poisoned Indian farm workers. Endosulfan is an endocrine disruptor, affecting reproductive capacity and increasing the risks of breast cancer.[xxi] Its residues have been reported in human umbilical cord blood, placental tissue, breast milk, fat, blood and urine in many countries.

Endosulfans can volatilise and travel over long distances in air and is highly persistent in soil with the half-life of up to 2 to 3 years It affects the permeability of root membranes, inhibiting and stunting new growth. It is also toxic to wide variety of microorganisms. [xxii]

In 1996, 23 farms in New South Wales and Queensland were placed in quarantine after

inspectors discovered endosulfan above the maximum residue limit in beef cattle. The result of unintended drift from neighbouring cotton fields, some beef contained almost twice the Australian maximum residue level (0.2mg/kg) and almost four times the international Codex level of 0.1mg/kg.

Chlorpyrifos

Other pesticides may not fulfill all the POPs criteria, yet still pose significant risks to the health of humans and the environment. Chlorpyrifos (0,0-diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate) is a widely used broad spectrum insecticide, yet it is very toxic to humans and is one of the most common environmental pollutants. Its residues have been found in soil, water and air.[xxiii]

Chlorpyrifos is very toxic to freshwater fish, aquatic invertebrates and estuarine and marine organisms as well as birds.[xxiv] It has caused many fish and bird kills[xxv] and has also been shown to bioaccumulate in the eggs and liver of birds. [xxvi]

Chlorpyrifos was found in the urine of nearly all of 400 US children tested.[xxvii] In one Australian study, it was detected in the meconium (first bowel discharge) of nearly 60% of newborns tested. [xxviii]

In 2000, the United States Environment Protection Agency (USEPA) acknowledging its severe neurotoxicity particularly to children entered an agreement with Dow Agro-Sciences to withdraw the domestic use of the pesticide in homes, hospitals and preschools as well as severely restricting the crops on which it may be used.

However, many countries including Australia continue to use it extensively, despite its detection in soil, water and air.[xxix]

Paraquat

The herbicide, Paraquat is another widely used pesticide particularly in the palm oil plantations. It is highly toxic to animals and humans and has serious and irreversible delayed effects if absorbed. If ingested, as little as one teaspoonful can be fatal and no antidote exists. Paraquat is also toxic if absorbed through the skin, which is the main route of exposure for workers.

The greatest risk of serious accidents is during mixing, loading and knapsack spraying. In a study of plantations in Costa Rica, 284 accidents caused by paraquat were identified between 1988 and 1990, including 123 cases of systemic poisonings, burns, eye injuries and fingernail damage.[xxx] The conditions of its use in many developing countries mean it is very difficult to follow label instructions and recommendations. Sprayers often have no or inadequate protective clothing, lack training, and have little knowledge of the specific effects of the product. Workers on estates are frequently employed as sprayers for 10 months of the year, six days a week. Incidents also happen in developed countries, for example, in 1992, a UK agricultural worker died after being splashed in the face with paraquat when he dropped an open container. [xxxi]

WHY DOES PESTICIDE USE CONTINUE ?

So why do farmers continue to use pesticides despite the environmental, health and sustainability costs? Simply, because the use of chemical inputs such as pesticides has

increased agricultural production and productivity. However, we know the negative impacts have increased too, including damage to agricultural land, fisheries, fauna and flora, and human health. The costs from these impacts are large and affect farmers' returns, however, despite these high costs, farmers continue to use pesticides and in most countries in increasing quantities.

However, another very important impact of pesticide use is the unintentional destruction of beneficial predators of pests thereby increasing the virulence of many species of agricultural pests. Some studies suggest this essentially locks farmers into ongoing treadmill of pesticide use. The continued use of chemicals destroys any option for biological pest control by killing the predators of pests, and many farmers then feel they have little choice. Even if farmers decide to adopt biological pest control strategies, they are affected by the pesticide use on neighbouring farms. Therefore, researchers suggest that despite the economic, social and ecological gains from biological control of pests, once farmers adopt pesticides as the dominant pest control strategy they will continue to be used in larger quantities despite their serious negative impacts.[xxxii]

CONCLUSION

I would like to finish this presentation on a positive note. A recent study commissioned by the International Federation of Organic Agriculture Movements (IFOAM) examined the role of 'Organic Agriculture in Mitigating Climate Change.'

The study found that organic agriculture can play an important role in reducing GHG emissions and sequestering carbon. Mainstream agriculture is a major contributor to emissions of methane (CH4), nitrous oxide (N2O), and carbon dioxide (CO2), responsible on a global scale, for approximately 15% of all greenhouse gas (GHG) emissions. Yet, in organic agriculture there is a favourable energy and emissions balance because;

- Energy-demanding synthetic fertilizers and plant protection agents are rejected, also limiting the total nitrogen released in production and use,
- Soil fertility is maintained mainly through farm internal inputs (organic manures, legume production, wide crop rotations etc.), promoting aerobic microorganisms and high biological activity in soils which increases the oxidation of methane; and
- External animal feeds - often with thousands of transportation miles - are limited to a low level.

Organic agriculture has significant and viable sequestration potential through improved organic matter management in soils and other practices in cropland management and in agroforestry. According to this study, organic agriculture could contribute significantly in the reduction of GHG releases and in the sequestration of carbon in soils and biomass.

This is good news in a world where the environment, vulnerable wildlife and our children are under threat from chemical contamination of our air, water and soil. Thankfully, people like yourselves; organic farmers, members of environmental organizations and representatives of enlightened governments are taking action.

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