



## Children and pesticides – A review of the evidence

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## What are pesticides?

Chemicals designed to kill living things insects, fungi, and weeds - that attack crops and other vegetation, cause infectious diseases in humans and animals, or act as vectors of infectious agents

*Also toxic to non-target species including birds and humans*



## Pesticide use - EU

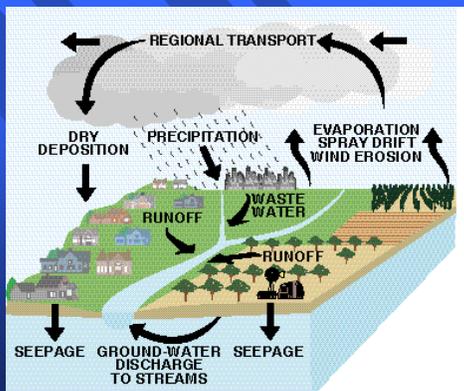
- Around 850 pesticides on the EU market (Risk assessments for these should be completed by 2008 by EFSA)
- > 300 are known to remain as residues in food
- ~ 60,000 products include pesticides among their ingredients
- Most commonly used in EU 1986-1997 (FAOSTAT 2000)
  - Fungicides
  - Herbicides
  - Insecticides
  - Plant growth regulators



## Pesticides and the global environment

- Several hundred billion pounds of pesticides have been produced and released into the global environment
- Pests still destroy an estimated 37 percent of the annual global production of food and fiber crops
- Diseases thought to be controlled by the eradication of insect vectors, such as malaria and dengue fever, are resurgent
- Huge numbers of agricultural workers and their families are exposed to pesticides and are generally poorly educated in the safe use of such chemicals
- The rest of us are exposed at much lower levels through contamination of drinking water, air, and food by pesticides, and especially by too-casual use of pesticides in and around the home

*Prof John Wargo, Yale, 1996*



## Human's exposure routes

- Ingestion
  - Food, incl. baby foods
  - Drinking water and recreational water
  - Breast milk
  - Soil, dust
  - Household items, garden items
  - Contact with pets
- Dermal absorption
- Inhalation
  - Respirable particles contaminated with pesticides
  - Respirable aerosols during spraying
  - Vapour from volatile residues of pesticides
- Transplacental



 **Dietary exposure to pesticides**  
EUROPE

- Many countries run monitoring on residues
- Norway, 2005
  - ◆ >2000 samples; grain, baby food, vegetables, fruits
  - ◆ Tested for 233 substances
  - ◆ No residues in baby food samples
  - ◆ For the other products
    - 40% with residues, 92 different pesticides
    - 2.2% above MRL
      - 0.5% of domestic, 3.1% of imports
    - Beans, celery, lettuce, carrot, oat, basil
    - All 30 organic products without residues



 **Pesticides and organic food**  
EUROPE

- US longitudinal intervention study showed that organic diets significantly lower children's dietary exposure to organophosphorus pesticides
  - Lu et al, *Environ Health Perspect*, 2006
- Organic food can represent increased exposure to pathogenic microbes and mycotoxins.....



 **Children and exposure**  
EUROPE

- Often increased exposure compared to adults
  - Increased intake of food on a mg/kg body weight basis
  - Certain eating habits, including soil and unsafe water
  - Other behavioral factors, including licking, playing with toys

Dietary exposure represents the major source of pesticide exposure for infants and children

- Increased consumption of fruits and vegetables advocated from a nutritional point of view !
- A study of cumulative dietary pesticide intake in children from an agricultural community showed that up to 56% of the children exceeded the acceptable chronic dietary doses

*Fenske, Environm Health Perspect, 2000*



 **Chronic health effects**  
EUROPE

- Neurotoxicity
  - ◆ Developmental neurotoxicity
    - Behavioral, memory, learning deficits
- Immunological effects
- Endocrine disruption
- Reproductive effects
- Cancer

 **Children and health effects**  
EUROPE

- Children can be more sensitive because bodies and organs still are developing
  - ◆ Fetuses, infants, children
    - Developmental periods of high susceptibility
  - ◆ Metabolism and protective systems still immature
    - Lower levels of detoxifying enzymes
    - Blood-brain barrier immature
- Pesticide-specific data on prenatal and postnatal developmental toxicity often lacking

 **Neurotoxicity**  
EUROPE

- Possible **developmental neurotoxicity** needs more attention (research, risk assessment, testing)
  - Behavioral, memory, learning deficits
  - Delayed toxicity due to exposure during a very sensitive developmental period
- **Organophosphates**
  - ◆ Fetuses and infants more sensitive
    - Animal models suggest that even moderate doses are neurodevelopmental toxicants
    - Brain and nervous system effects
      - Through cholinesterase inhibition and other mechanisms
    - Recent study shows adverse associations between prenatal dialkylphosphate exposure and mental development

*- Eskenazi et al, Environm Health Perspect, 2007*



## Endocrine disruption

- **Endocrine disruptors**
  - ◆ Interfere with normal chemical-signaling and endocrine functions even at extremely small doses
  - ◆ Include some pesticides
    - E.g. endosulfan, DDT, chlordan are estrogenic
  - ◆ Need more attention in risk assessment



## Reproductive toxicity

- Pesticide exposure before or during pregnancy associated with increased risk of
  - Infertility
  - Perinatal death
  - Spontaneous abortion
  - Premature birth
  - Fetal growth retardation
  - Early childhood cancer
  - Congenital malformations
    - 3 infants of US farm workers from same farm exposed to multiple pesticides



## Immunotoxicity

- The immune system of infants and young children shows increased sensitivity to toxic effects of chemicals
- Several pesticides are immunotoxic, incl. dieldrin, lindane, malathion, dichlorophos



## Acute toxicity

- Dermal and ocular irritation (or allergic response)
- Upper and lower respiratory tract irritation
- Allergic responses / asthma (fungicides)
- Gastrointestinal symptoms
- Neurological symptoms
- Specific syndromes
  - Cholinergic crisis (organophosphorus pesticides)
  - Bleeding (warfarin-based rodenticides)
  - Caustic lesions and pulmonary fibrosis (herbicide, paraquat)



## New areas in risk assessment

- **Additive** effects caused by exposure to multiple pesticides
- **Synergistic** effects caused by exposure to multiple pesticides
- **Developmental neurotoxicity**
- Health effects of short term exposure to acutely toxic pesticides, including chemicals which operate by one-hit mechanisms such as teratogens



## Managing pesticides for risk reduction

- Rigid risk assessments taking into account children's sensitivity needed
- Suggestions to eliminate most dangerous classes
- Management of obsolete stocks
- Risk reduction included in research and development efforts to new pesticides

**Application of the precautionary approach needed**

The future for our children

# The Children's Environment and Health Action Plan CEHAPE



1989 to 2004: 4 Ministerial Conferences



## Aims of the CEHAPE

A science based political commitment ...  
...by Member States for the Member States

- to give political visibility and ensure political commitment
- to orient priority actions and policies over the next years by including commitments to actions that would address both national priorities as well as region-wide priorities
- to protect and enhance children's health with respect to environmental hazards.





## 4 Regional Priority Goals

**RPG 1** to prevent and significantly reduce the morbidity and mortality arising from gastrointestinal disorders and other health effects, by ensuring that adequate measures are taken to improve access to safe water and adequate sanitation for all children.

**RPG 2** to prevent and substantially reduce health consequences from accidents and injuries and pursue a decrease in morbidity from lack of adequate physical activity by promoting safe, secure and supportive human settlements for all children





## 4 Regional Priority Goals

**RPG 3** to prevent and reduce respiratory disease due to outdoor and indoor air pollution, thereby contributing to a reduction in the frequency of asthmatic attacks in order to ensure that children can live in an environment with clean air

**RPG 4** we commit ourselves to reducing the risk of disease and disability arising from exposure to hazardous chemicals (such as heavy metals), physical agents (e.g. excessive noise) and biological agents and to hazardous working environments during pregnancy, childhood and adolescence





## Intergovernmental Midterm Review Vienna 13-15 June 2007

Reporting on progress made by European countries towards commitments taken at the 4th Ministerial Conference on Environment and Health, held in Budapest in 2004

Learning lessons from experience  
Setting the agenda for the future







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