



# The impact of Pesticides on Children's Health

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Reducing environmental risks for our children

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# Children Exposure to Pesticides

- Children's exposure to pesticides occurs through different routes, circumstances and settings. Children can be accidentally exposed to pesticides:
  - In their food, water and air
  - Pesticides applied in the house, garden or applied on pets or animals.
  - through pesticides release in the environment e.g air drift , contaminated soil chemical releases to the environment from the manufacture or use of products, or from chemical incidents.
  - Potential occupational exposure to chemicals is also a growing concern.

# The Unique Vulnerability of Infants and Children to Pesticides



## Immature metabolic pathways, metabolism and age related Toxicokinetics & Toxicodynamics

- increased Absorption and Distribution,
- reduced Bio transformation, and Elimination,
- less ability to Detoxify & Excrete e.g. The newborn child has low levels of the enzyme paraoxanase-1, which detoxifies organophosphate pesticides

# The Unique Vulnerability of Infants and Children to Pesticides



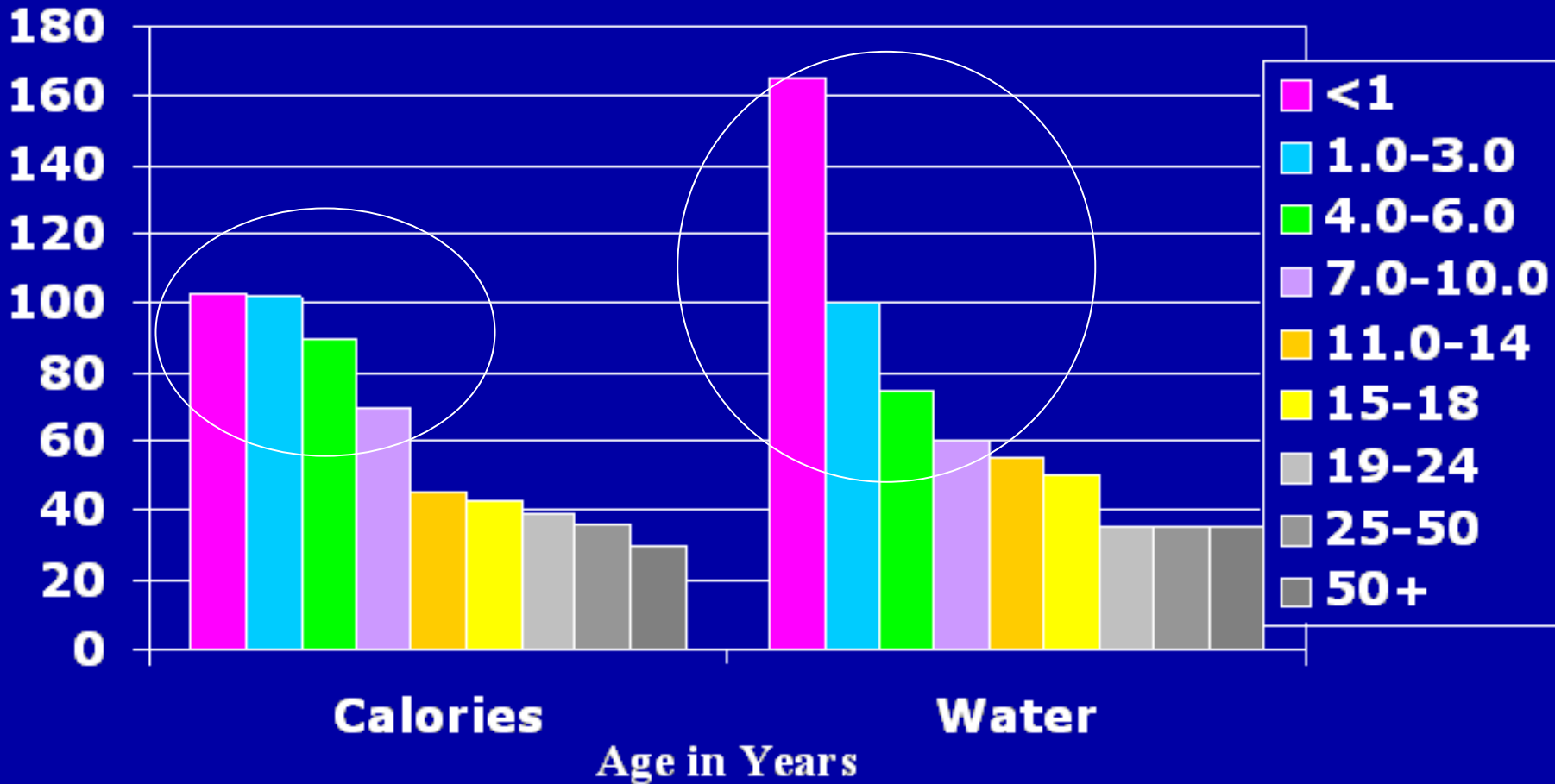
- **Infants and children are growing and developing, and their delicate developmental processes are easily disrupted.**
  - Their immune system is immature.
  - Many organ systems undergo extensive growth and development
- **Children have more future years of life than most adults, to develop diseases and bare the consequences**
  - pre- and postnatal exposures to pesticides can increase risk of childhood cancer
  - early exposure to neurotoxic pesticides may affect brain development increase risk in later life of chronic neurologic diseases such as dementia, Parkinson's disease, and amyotrophic lateral sclerosis
- **Windows of vulnerability**



# HIGHER EXPOSURE

## Greater Food and water intake/bw

Maintenance Requirements  
cal/kg/day                      ml/kg/day

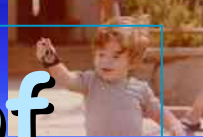




# Of special concern

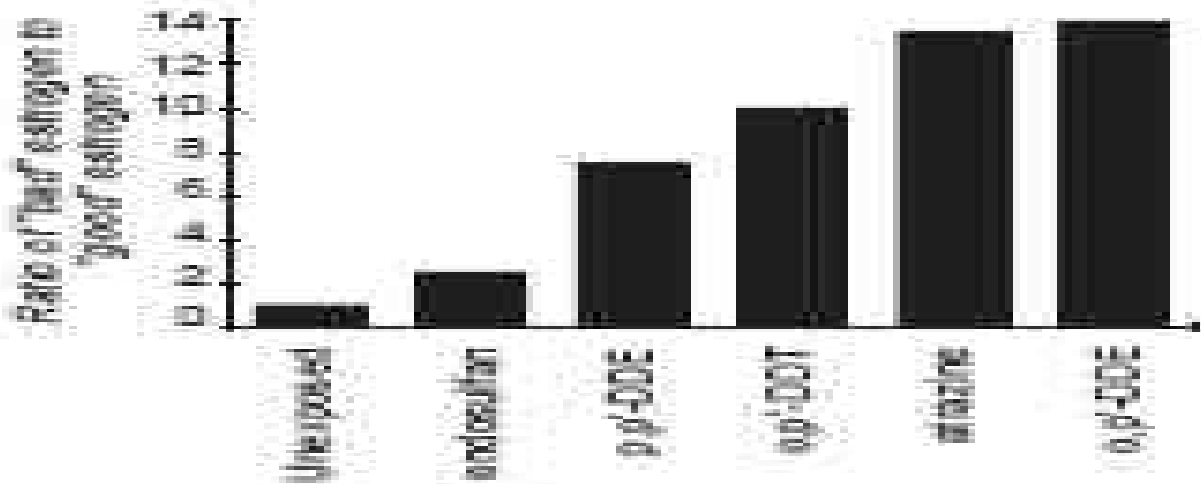
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- pesticides which are endocrine disrupters
- potentially oncogenic pesticides. The enhanced rate of cell division and the longer life span during which cancers initiated in childhood can develop, may significantly affect cancer development.
- Apart from carcinogenic ones, pesticides can indirectly contribute to cancer risks either acting as promoters, activators or through agents weakening of various defense mechanisms or by inducing formation of carcinogenic metabolites. .



# Pesticides can alter the ration of bad/good estradiol metabolites

**Figure 2**  
**Effect of Pesticides on "Good" and "Bad" Estrogen in Breast Cancer Cells**



Source: Bradlow, H. L. et al. 1995. Effects of pesticides on the ratio of 16 $\alpha$ /2-hydroxyestrone. A biologic marker of breast cancer risk. *Environ. Health Persp.* 103(Suppl. 7):147-150.

Endosulfan, atrazine, and DDT all promote the formation of "bad" estrogen. In this experiment, concentrations between 2 and 4 parts per million were used.

- breakdown of the estradiol.
- 2-hydroxyestrone has minimal estrogenic activity and is not toxic to genetic material (genes). "GOOD"
- 16 $\alpha$ -hydroxyestrone is a fully potent estrogen, produces tumors, and is toxic to genes. "BAD"



# Many pesticides are associated with endocrine disruption

## ■ EU list

- High priority- Category 1: Pesticides are endocrine disruptors
- Medium priority - Category 2: pesticides are potential endocrine disruptors.

■ List of OSPAR (Oslo and Paris Commission),

■ List produced by the UK and German Environment Agencies and WWF, etc

■ The risks of the effects of low level exposure to individual or multiple EDCs /pesticides have not yet been adequately considered

MRLs ???



# MRLs should be Toxicologically safe

## -Is this prerequisite fulfilled?

- For EDCs- pesticides this is unlikely in most of the cases
- But also for traditional toxicological effects e.g. acute toxicity there are cases where MRLs needs to be re-evaluated



Are pesticide residues at levels below MRLS  
always safe for children ???

# Are pesticide residue levels found in 2005-2006 safe for children?



- The Predicted Short Term Intake values (PSTI) were estimated from monitoring data and the observed residue concentrations, using the deterministic approach model developed by JMPR
- PSTI values were evaluated for children of 4-6 years ( $W=15\text{kg}$ ),
- Only data below or at the MRL level from the national monitoring Program of 2005 and 2006 were used,
- The PSTI values were compared to the ARfD values (or ADI) when no ARfD values were available.



# The PSTI values were compared to the ARfD values (and /or ADI

## ■ PSTI children > ArfD

- Procymidone in strawberries
- Imazalil in lemons and grapefruit
- Fenthion in peaches/nectarines
- Chlorpyrifos in tomatoes

EDCs

## ■ PSTI children > ADI

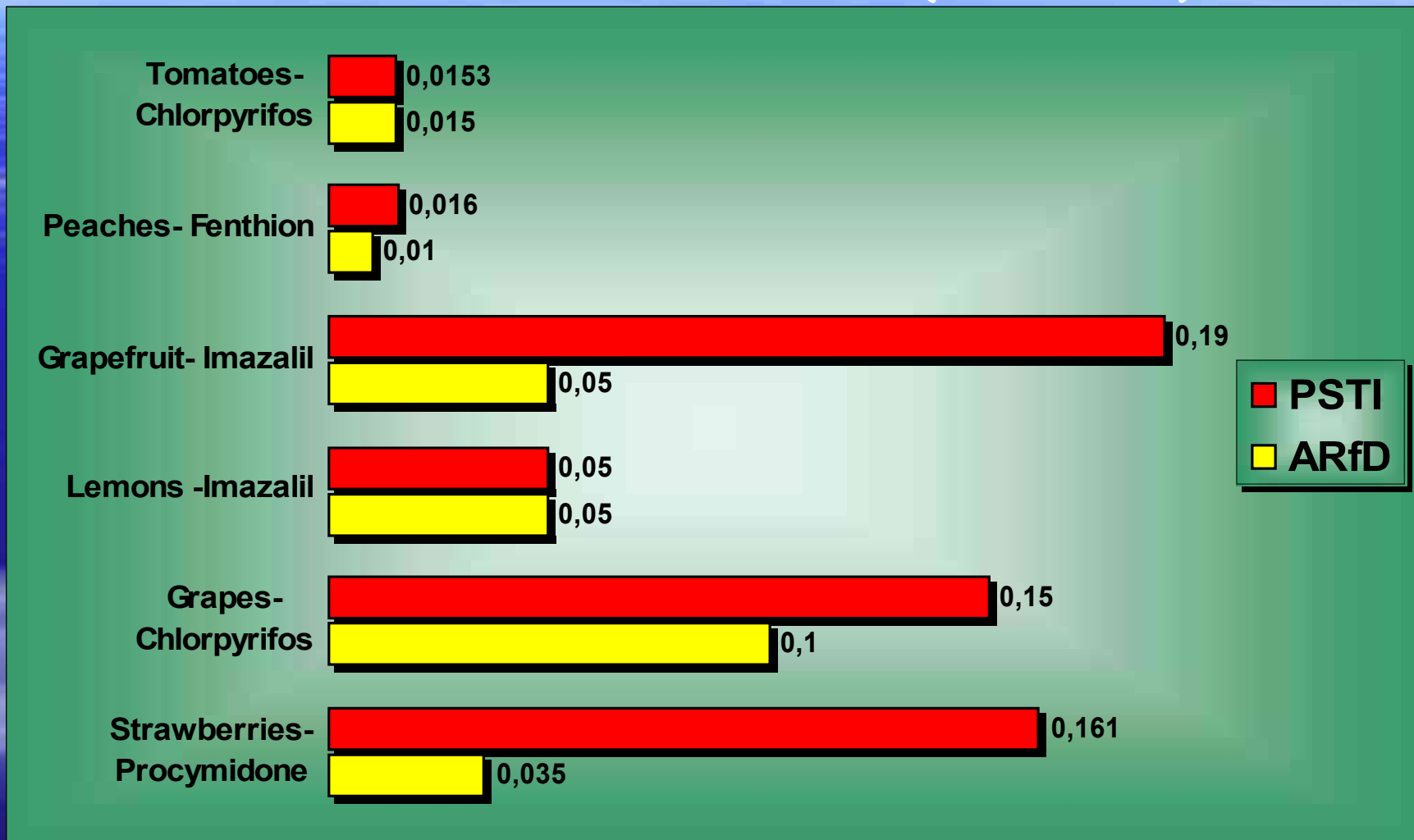
(ARfD not set)

- Azinphos methyl in apples
- Cypermethrin in runner beans, spinach, grape, apples, pears and peaches/nectarines
- L-cyhalothrin in peaches/nectarines and pears
- Thiapentazone in grapefruit



# PSTI for children versus ARfD

Cases where OR < MRL (2005-2006)



# PSTI/ARfD

/ for children Cases where OR < MRL  
(2005 - June 2006)





Not only exposure through food

Exposure to pesticides in rural areas and home

**NEED TO MINIMIZE THE EXPOSURE**

**Awareness-education**

# CYPRUS - CEHAP: To reduce children's and pregnant women exposure to pesticides



- To organize training for trainers
- to involve communities in rural areas in awareness raising and prevention activities
  - such disseminating information to parents and workers on risks and prevention

3. To raise awareness on potential effects of pesticides on pregnant women, children and on general population at reproductive age
4. To issue a leaflet - guide for parents



# Concluding Remarks 1/4

- Fetus, infant and Children are more vulnerable to pesticides because are at a developmental stage, with critical windows of vulnerability, undeveloped defense mechanisms and because of enhanced exposure,
- Exposure to low levels of pesticides below the MRLs may cause harm to infants and Children,
- It is clear that as new information is emerging and ARfDs are set, existing MRLs do not in all cases represent safe levels of exposures and need re evaluation

# Concluding Remarks 2/4



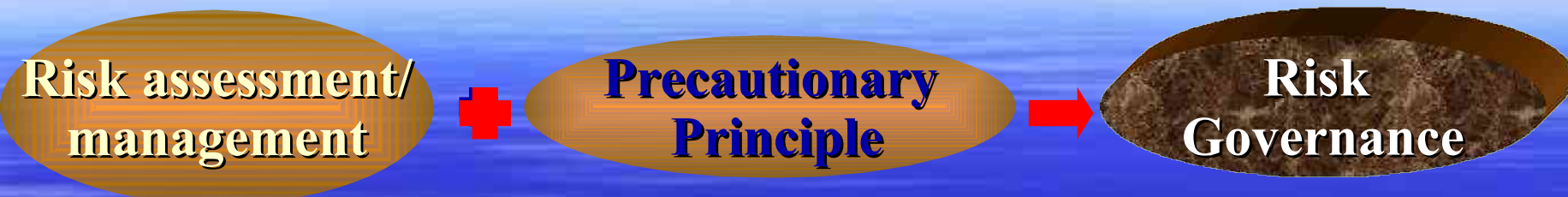
Risk assessment is limited by **IGNORANCE** and **UNCERTAINTIES** and the fact that only one chemical is considered at a time

stellaMichaelidou

- **There is a Lack of Toxicological data on a No of pesticides metabolites in particular**
  - on the effects at early life stages and their combined effects and cumulative effects.
  - data are still missing or are inadequate in relation to the
    - effects on immune & reproduction system
    - pesticides acting as cancer promoters etc
    - Pesticides which disrupt the endocrine functions
- **Toxicology we are implementing for EDCs needs to be further developed**
- **Interactions still remain a BLACK BOX**
- **Inadequate information on what children's overall exposure is.**



# Concluding Remarks 3/4



**Risk Assessment/management** has to be further developed and transformed into an

**Inclusive Risk Governance** encompassing the application of **Precautionary Principle**:

- Taking into account emerging knowledge on cocktail effects and effects of low doses
- Considering exposure during critical periods of development,
- Judging **UNCERTAINTIES** against potential risks of inaction,
- Addressing potential **IGNORANCE** through application of the best science and expert opinion



# Concluding Remarks 4/4

## prevention , precaution and minimization of exposure to Pesticides

### ● Based on the precautionary principle

- Substitution with safer alternatives

- Safety factors should be applied when evidence for pre- and postnatal toxicity does exist or toxicity data applicable for children are lacking.

- For Pesticides which are or suspected to be **endocrine disruptors** substitution should be primarily considered or at least additional factors for safety

### ● On individual and community level minimization of exposure



**THANKS FOR  
YOUR  
ATTENTION**