Manomet's MET/TURN Project

Sublethal Effects of Exposure to Cholinesterase-inhibiting Pesticides: Humans and Vertebrate Wildlife

Toxics Use Reduction Institute

Study Objectives

- Synthesize current knowledge of adverse effects
- Investigate parallels between humans and wildlife

Study

- Cholinesterase-inhibitors
- Chronic/low-level exposure
- Sublethal effects
- Human studies mostly epidemiological; occupational
- Wildlife studies mostly experimental; birds
- Peer reviewed
- 200 papers

Outline

I. Neurological effects
II. Genotoxic effects
III. Immunotoxic effects
IV. Carcinogenic effects
V. Reproductive effects
VI. Respiratory effects
VII. Dermalogical effects
VIII. Ecological effects

Human
- Adult
- Children

Wildlife
- Mammals
- Birds
- Reptiles
- Amphibians
- Fish

Neurological

- Human
  - Sensory and motor function; balance;
  - Neurobehavioral
  - Inconsistent findings – increased symptoms but no testable effects; increased effects with fewer symptoms; no effects

Neurological

- Wildlife
  - Impaired behavior
  - Impaired memory and learning
  - Food intake

Genotoxic

- Human
  - Increased aneuploidy in sperm genetic material
  - Increased fragile sites and chromosomal aberrations in lymphocytes
- Wildlife
  - DNA strand breakage in mammals, fish, and amphibians

Immunotoxic

- Human
  - Impaired immune system components
  - presence of autoantibodies
- Wildlife
  - Disruption in immunoglobulin after *in utero* exposure

Carcinogenic

- Human
  - Non-Hodgkins lymphoma – increased risk with OP and carbamates
  - Brain, lung, prostate
  - Childhood brain cancers with home uses, developmental age

Reproductive

- Human
  - Decreased sperm quality
  - Decreased birth weight and length
  - Fetal death
  - Altered reproductive hormones
- Wildlife
  - Altered testes and sperm
  - Decreased fertilization
  - Altered reproductive hormones
  - Reduced egg-laying
  - Increased fledging time

Other Effects

- Human
  - Decreased bone density
- Wildlife
  - Metabolic – hypothermia, decreased temperature tolerance
  - Ecological – change in prey/food items

Difficulties

- Exposure levels
- Dose-response relationship
- Influence of mixtures
- Diseases with long latency period
- Confounding factors
- What are the long term consequences?

Points

Human

- Reproductive effects: impaired sperm quality; birth parameters
- Childhood brain cancer with home uses
- Neurobehavioral effects

Wildlife

- Sublethal effects can indirectly lead to lethality

Research Needs

Human

- Accurate exposure assessments
- Dose-response relationship
- Prospective studies

Wildlife

- Increased research with reptiles and amphibians.
- Impacts on population, community and ecosystem level responses

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