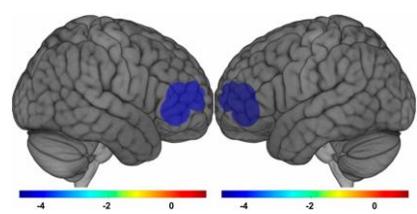


Exploratory Dust Sampling Survey for Pesticides in Cyprus Households

Prof. Dr. Konstantinos C. Makris

Cyprus International Institute for Environmental and Public Health, School of Health
Sciences, Cyprus University of Technology

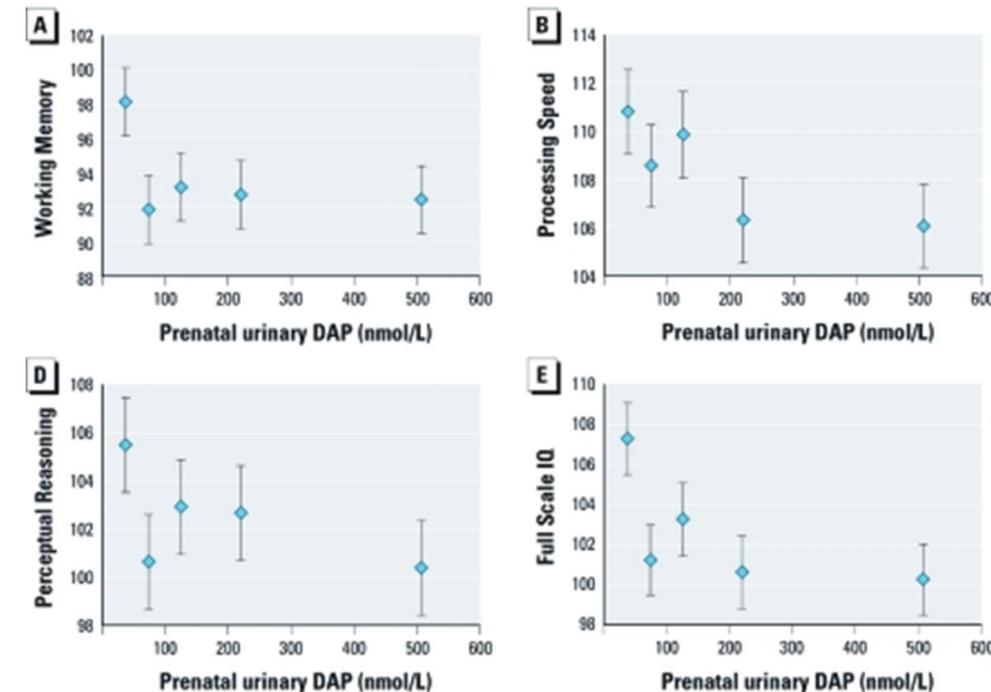


When did we first learn about conclusive effects of pesticides on children's health? CHAMACOS cohort studies in the USA

Prof. Eskenazi's CHAMACOS children cohort studies in the California, USA, were instrumental in phasing out organophosphates (OPs) in the USA, and later, globally.

Higher OP pesticide exposures during pregnancy resulted in:

- ✓ shorter pregnancies
- ✓ Abnormal reflexes in newborns
- ✓ Poorer verbal abilities in preschool children
- ✓ Problems of attention at 5 years of age
- ✓ Poorer social skills at 7
- ✓ Poorer working memory at age 12
- ✓ Traits similar to autism at age 2 and 14



Children’s health effects associated with exposure to HBM4EU priority pesticides

Target organ of the body	Effects	Relevant substances	Adults (men)	Adults (women)	Infants/foetuses	Key:
	Disturbance of neurodevelopment e.g. cognitive deficits	Pyrethroids	(X)	(X)	●	● Strong evidence ● Suspected ● More evidence needed (X) Not applicable
		Glyphosate-based herbicides	(X)	(X)	●	
		Organophosphates (Chlorpyrifos/Dimethoate)	(X)	(X)	●	
	Behavioural disorders	Pyrethroids	(X)	(X)	●	
		Organophosphates (as a group)	(X)	(X)	●	

Scientific evidence

- **Strongest:** Neurodevelopmental effects of pesticides on children adversely affect their normal development and growth
- **Suspected:** effects of pesticides on childhood leukemia, other cancer sites, and on the endocrine system.

Critical Life Stage: Childhood

- **Barker hypothesis** ([Barker, 2004](#))
 - organism is “plastic” or “sensitive” to its environment during specific developmental periods
 - programming: when stimuli are applied during early development, permanent changes are generated that persist throughout life
 - not just limited to the in-utero environment, extends into childhood

○ Increased susceptibility to environmental exposures

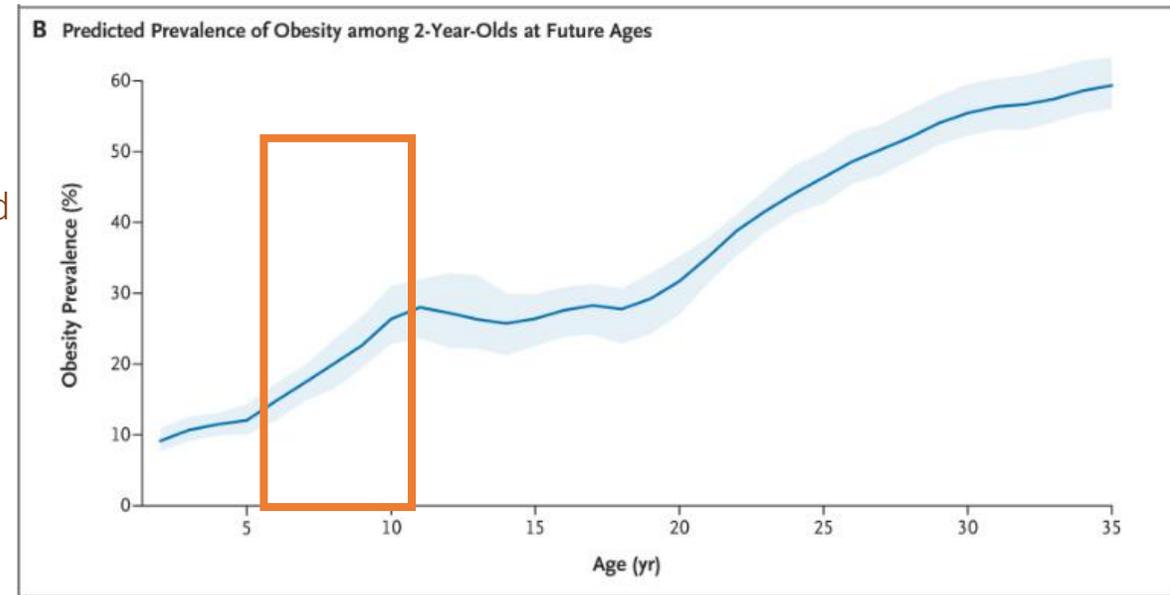
- rapid development
- differences in behaviors and metabolism
- parents’ environmental exposures leading to passive exposures

○ Lung function risk trajectories

- contributed to 75% of COPD cases
- **associated with childhood factors**, like asthma, bronchitis, pneumonia, allergic rhinitis, eczema

○ Obesity risk trajectory in 5-11 years old:

- Steep increase in obesity prevalence, based on CHOICES simulation model



Projected prevalence of obesity at future ages among 2-year-olds in 2016

Children's Dietary and Non-Dietary Pesticide Exposures

- Children are disproportionately vulnerable to pesticide exposure due to developmental sensitivity, higher intake relative to body weight, and multiple exposure pathways (food, water, household dust, proximity to fields).
- Dietary intake (including water) is considered to be the primary route of exposure for most pesticides.
- Non-dietary pesticide exposure can occur as a result of residential pesticide use (home, garden, pets, personal insect repellents), proximity to agricultural areas, time spent in parks and recreational areas or fumigated buildings, or hand to mouth activity (generally higher in young children).
- Available indoor dust studies focus mostly on rural/agricultural settings, studying populations with and without occupational exposure to pesticides. The number and concentrations of pesticides in indoor dust can be significantly higher than in outdoor dust. Pesticides can persist indoors for extended periods, unlike in outdoor environments, where sunlight and humidity accelerate biotic and abiotic degradation.
- Therefore, measures needed to characterize and mitigate the risk of pesticide exposure associated with indoor dust.



Environmental Research
Volume 212, Part B, September 2022, 113316



Oxidative stress of glyphosate, AMPA and metabolites of pyrethroids and chlorpyrifos pesticides among primary school children in Cyprus

Konstantinos C. Makris ^a  , Nikolaos Efthymiou ^a, Corina Konstantinou ^a, Elena Anastasi ^b, Greet Schoeters ^c, Marike Kolossa-Gehring ^d, Andromachi Katsonouri ^b  

^a Cyprus International Institute for Environmental and Public Health, Cyprus University of Technology, Limassol, Cyprus

^b Cyprus State General Laboratory, Ministry of Health, Nicosia, Cyprus

^c The Flemish Institute for Technological Research (VITO) and the University of Antwerp, Belgium

^d German Environment Agency (Umweltbundesamt), Berlin, Germany

Received 4 March 2022, Revised 11 April 2022, Accepted 12 April 2022, Available online 16 April 2022, Version of Record 22 April 2022.

Objectives of the pilot survey

- Explore the magnitude of contamination with pesticides in house dust from areas nearby agricultural areas
- Evaluate the percent and extent of pesticide contamination with banned and highly toxic pesticides



Methodology

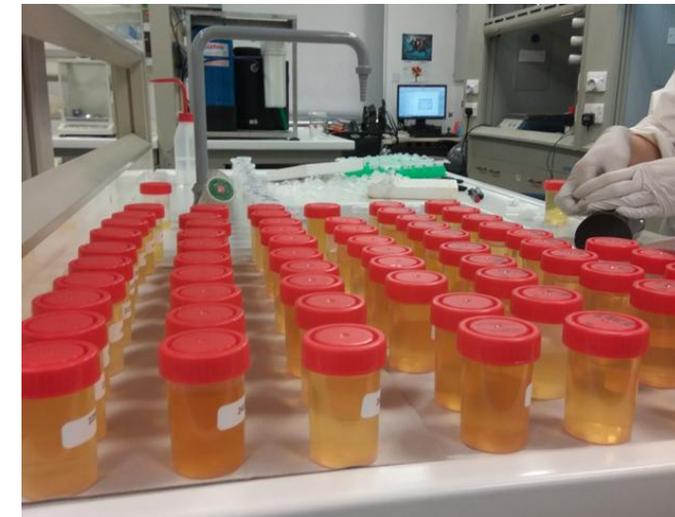
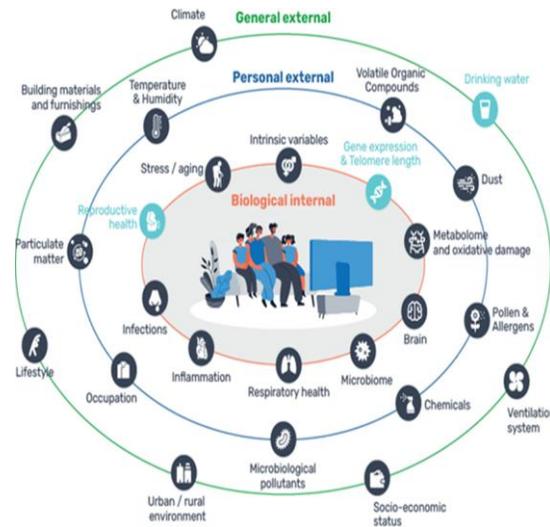
Households participating in this pilot study (about 10 households) were selected based on their close proximity less than 200meters from active agricultural land in different districts of Cyprus. The participants were asked to collect the dust from their house during a period of a week, via vacuum cleaning using a vacuum cleaner. The presence of about 50 pesticides either marketed or banned in the EU were measured in dust samples. LOD shall be about 3-5ng/g.

Indoor dust sample: Use of electric vacuum cleaner~ 5-20 g; Number of samples: 1 per household; total 10 households. The participants are asked to collect indoor dust by sweeping the floors of different rooms of their homes (living room, kitchen, hallway, sleeping room, bathroom), maintaining their habits and frequency of home cleaning using a clean vacuum cleaner bag collection. All dust collected in the house over a 10-day period was combined into one, composite dust sample. These composite samples were put in polypropylene falcon tubes of 50mL, sealed in polyethylene bags and stored at -20°C, before being transported to the Laboratory. Once there, each composite sample was sieved using a 500 µm stainless steel sieve before analysis.

Contextual questionnaire: Information on type of dwelling, distance from ag land, use of pesticides, biocides pet treatment, etc.

Analysis: Pesticides in dust were analysed after pesticide extraction using mass spectrometry in an accredited lab (Foodlab Ltd.).

LOD was 0.7ug/g for all pesticides.



House Dust Pesticides Results

House sample dust	Acetamiprid	Boscalid	Fipronil	Imidacloprid	Piperonyl Butoxide	BAC	DDAC	Carbendazim	DEET	Myclobutanil	Thiabendazole	Cypermethrin	Phenothrin	Propamocarb
Οικιακή σκόνη 1	2	2	31	51	2.5	340	88	-	-	-	-	-	-	-
Οικιακή σκόνη 2	-	-	2	130	4.7	41	120	-	-	-	-	-	-	-
Οικιακή σκόνη 3	2	-	-	13	3.7	170	-	-	2	200	2.5	-	-	-
Οικιακή σκόνη 4	2	-	130	2070	3.3	3700	32	2	-	-	-	12	4.8	-
Οικιακή σκόνη 5	-	-	-	7.7	6,0000	7400	41	-	-	-	-	-	-	-
Οικιακή σκόνη 11	2	9,7	-	7100	-	230	-	-	-	-	-	-	-	2
Οικιακή σκόνη 7	-	-	-	7.8	4.2	-	-	-	-	-	-	-	5.6	-
Οικιακή σκόνη 8	-	-	19	-	-	49	-	-	-	-	-	-	-	-
Οικιακή σκόνη 9	-	-	26	1.5	9.9	-	43	-	-	-	-	-	-	-
Οικιακή σκόνη 10	-	-	2	780	16	13900	-	2	2	-	-	-	25	-

Results of the Exploratory Survey in Cyprus

- A house with up to 9 different pesticides
- Mixture exposure effects on children's health is unknown
- Totally banned: Carbendazim, cypermethrin and imidacloprid for sure, probably phenothrin too
- Insecticides/acaricides-agricultural use: Acetamiprid, Imidacloprid, Cypermethrin, fipronil
- Fungicides - agricultural use: Boscalid, Myclobutanil, Thiabendazole, Propamocarb
- Insecticides/acaricides-biocides, veterinary drugs, repellent (ectoparasites, mosquito): fipronil, DEET, Phenothrin
- Piperonyl Butoxide: safener, probably used as synergistic to suppress resistance to pyrethroids like phenothrin and cypermethrin.

Detected pesticides in house dust: What that means for children's health

Fipronil is banned as a pesticide, but it is almost certainly coming from household pet flea treatments.

High levels of the long-banned, bee-killing and neurotoxic **imidacloprid** were found in most dust samples from different households. It is also used as a house pet flea treatment.

Acetamiprid is a highly concerning bee-toxic pesticide. Mounting scientific evidence shows that this neurotoxic substance, like other neonicotinoids, passes directly the placental barrier and can affect the development of foetuses' brains. The European Food Safety Authority (EFSA) has highlighted it to the European Commission since 2013 and only last year, after years of slowing down the process, has the European Commission requested from pesticide companies, a developmental neurotoxicity study.

Carbendazim is also a banned and highly problematic substance and it has not been on the market for many years.

Take Home Messages

Both dietary and non dietary sources of pesticides and their mixture effects on children's health must now be addressed.

Household dust analysis showed that some banned pesticides are actively used for flea treatment in house pets. Children exposures when in contact with pets or with dust in the house are unmapped and worth of characterizing them in detail.

The much needed paradigm change for pesticides use will take time. We need incentives/alternatives for the general public and to continuing educational awareness campaigns for different stakeholder groups.

Pesticides and Health



About the SIG

The ISEE Special Interest Group on Pesticides and Health is a global scientific community within the International Society for Environmental Epidemiology (ISEE) focused on i) advancing understanding of how pesticide exposures impact human health, ii) designing, testing and developing pesticide control options and related interventions for workers and the general population, including vulnerable subpopulation groups, iii) creating a forum for pesticide related policy changes. The aims of this ISEE Special Interest Group (SIG) are to:

1. Provide a platform for various stakeholders to connect and collaborate with colleagues, worldwide, who share a scientific interest in pesticides and health topics.
2. Establish a global scientific forum to exchange data, knowledge, foster collaboration, and develop scientific consortia that address health challenges posed by pesticides across diverse populations and vulnerable groups, at either local or regional or global scales.

- [About the SIG](#)
- [News Upcoming Events](#)
- [Training Opportunities](#)
- [Publications](#)
- [Join our SIG](#)

Leadership

Chair: Konstantinos C. Makris

Co-Chair: Brenda Eskenazi

[The Cypriot Children's Health and Environment Observatory](https://childrenfirstcy.com)

<https://childrenfirstcy.com>

