

NEW CONTAMINANTS IN HUMAN BREAST MILK

C. Corcellas^(a), M.L. Feo^(a), J.P.M. Torres^(b), O. Malm^(b), W. Ocampo-Duque^(c), E. Eljarrat^{(a)*}, D. Barceló^(a,d)

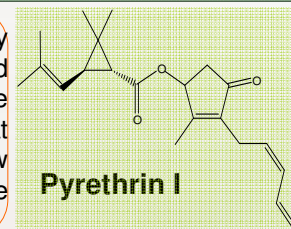
(a) Dep. of Environmental Chemistry, IDAEA, CSIC, Jordi Girona 18-26, 08034 Barcelona, Spain

(b) Lab. of Radiotopes, Biophysics Institute, Rio de Janeiro, Brazil

(c) Faculty of Engineering, Pontificia Universidad Javeriana, Cali, Colombia

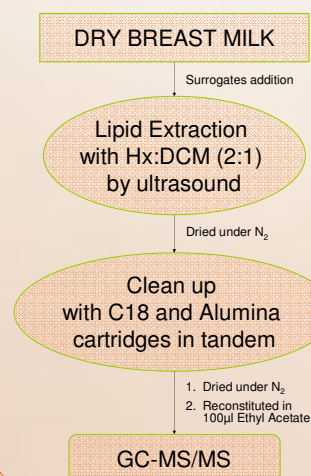
(d) Catalan Institute for Water Research (ICRA), Parc Científic i Tecnològic de la Universitat de Girona, Girona, Spain.

1. INTRODUCTION: Pyrethroids are synthetic insecticides derived from pyrethrins, the natural ones. They contain at least 2 asymmetric carbon atoms, therefore they are found as enantiomeric pairs and diastereoisomers. These pesticides have replaced the organophosphorous used before. Nowadays, they are used as both domestic and agricultural insecticides. They show a low mammalian toxicity given the fact that mammals are able to metabolize them. There is a number of studies that identified their metabolites, only few of them describe their direct presence in tissues, plasma or milk. Nevertheless, there have been some publications that aimed to address their toxicity in mice, with a special attention on stereospecific toxicity.



2. OBJECTIVES: We study the occurrence and concentration levels of 12 pyrethroids in breast milk from different areas around the world. We try to describe differences between countries, considering both rural and urban areas, depending on the different commercial mixture usage. We look for isomeric differences in accumulation in order to determine potential isomeric-selectivity in human bodies. Finally, we calculate the Estimated Daily Intake (EDI) for a nursing and compare it with WHO's Acceptable Daily Intake (ADI).

3. METHODOLOGY:

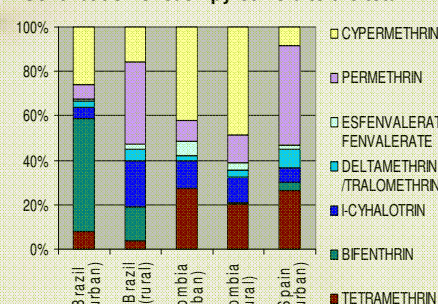


5. RESULTS:

Pyrethroids concentration in samples

		Min	Max	Σ	σ	
BRAZIL (2009/10) (n=17)	Urban	1.84	9.64	5.23	3.01	
	Rural	2.73	19.10	9.54	5.68	
COLOMBIA (2010) (n=27)	Urban	2.01	24.15	9.52	9.12	
	Rural	2.01	23.46	9.15	6.34	
SPAIN - BCN(2009) (n=6)		Urban	2.63	7.79	4.89	2.00
MOZAMBIQUE¹(2002)		Rural	87	1200	425	265
SOUTH AFRICA³(2002)		Rural	5.0	19826	667	

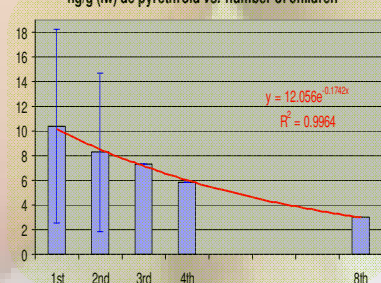
Contribution of each pyrethroid to the total



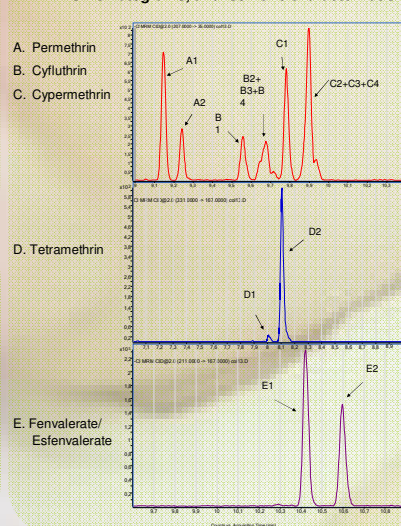
Estimated Daily Intake ($\mu\text{g pyr} \cdot \text{kg}^{-1} \text{bw} \cdot \text{day}^{-1}$) compared Acceptable Daily Intake values

	BRAZIL	COLOMBIA	SPAIN	ADI ⁴
Bifenthrin	0.00 - 1.33	0.00 - 0.30	0.00 - 0.33	4
Cypermethrin	0.21 - 1.80	0.78 - 4.60	0.07 - 0.25	20
Deltamethrin	0.00 - 0.16	0.00 - 1.30	0.07 - 0.27	10
λ -Cyhalothrin	0.00 - 3.90	0.03 - 0.96	0.02 - 0.21	5
Permethrin	0.03 - 1.38	0.00 - 3.19	0.99 - 1.66	50

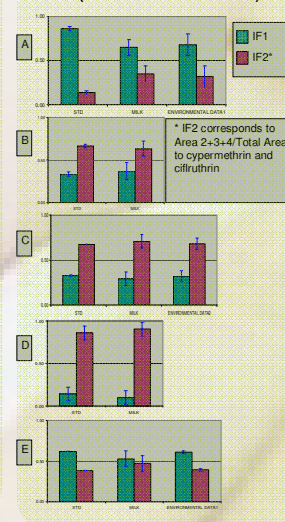
ng/g (lw) de pyrethroid vs. number of children



MRM Chromatograms, and isomeric characterization



Isomeric Factor (Isomer Area / Total Area)



4. ANALYTES and Surrogates:

1. Bifenthrin
 2. λ -Cyhalothrin
 3. Cyfluthrin
 4. Cypermethrin
 5. Deltamethrin
 6. Esfenvalerate/Fenvalerate
 7. Fluvalinate
 8. Permethrin
 9. Phenothrin
 10. Resmethrin
 11. Tetramethrin
 12. Tralomethrin
- d₆-trans permethrin*
d₆-trans cypermethrin

6. CONCLUSIONS:

- Pyrethroids are present in human breast milk.
- Our results are less threatening than those from malaria zones where pyrethroids were massively used for some time.
- Different patterns were observed depending on the country, so the typical commercial mixtures clearly influence the pattern.
- According to the WHO criteria, the measured values are safe for human health.
- An exponential decay of the concentration levels of pyrethroids in the milk with increasing number of children was observed.
- With a few data on the isomeric characterisation of the environmental samples that could be found in the literature, it is very difficult to draw a firm conclusion on the isomer selective accumulation of pyrethroids. In this study, no isomer selectivity in human body could be observed.

ACKNOWLEDGMENTS: This research was funded by Spanish Ministry of Education and Science (Project CEMAGUA (CGL2007-64551/HID))

REFERENCES:

1. Feo ML, et al. *Pyrethroid use-malaria control and individual applications by households for other pest and home garden use*, Environ Int (2011), doi:10.1016/j.envint.2011.08.008
2. Feo ML, et al. *Presence of pyrethroid pesticides in water and sediments of Ebro River Delta*, J. of Hydrology (2010); 393, 156-162
3. Bouwman H, et al. *Simultaneous presence of DDT and pyrethroid residue in human breast milk from a malaria endemic area in South Africa*, Environ Pollut 2006;144:902-17
4. FAO. Codex Alimentarius. www.codexalimentarius.net 2005.