

# Longitudinal exposure to pyrethroids (3-PBA and trans-DCCA) and 2,4-D herbicide in rural schoolchildren of Maule region, Chile

Por: [Munoz-Quezada, MT](#) (Teresa Munoz-Quezada, Maria)<sup>[1]</sup>; [Lucero, BA](#) (Lucero, Boris A.)<sup>[1]</sup>; [Gutierrez-Jara, JP](#) (Pablo Gutierrez-Jara, Juan)<sup>[2]</sup>; [Buralli, RJ](#) (Buralli, Rafael J.)<sup>[3]</sup>; [Zuniga-Venegas, L](#) (Zuniga-Venegas, Liliana)<sup>[1,2,4]</sup>; [Munoz, MP](#) (Pia Munoz, Maria)<sup>[5]</sup>; [Ponce, KV](#) (Vilches Ponce, Karina)<sup>[6]</sup>; [Iglesias, V](#) (Iglesias, Veronica)<sup>[5]</sup>

[Ver número de ResearcherID y ORCID de Web of Science](#)

## SCIENCE OF THE TOTAL ENVIRONMENT

**Volumen:** 749

**Número de artículo:** 141512

**DOI:** 10.1016/j.scitotenv.2020.141512

**Fecha de publicación:** DEC 20 2020

**Tipo de documento:** Article

[Ver impacto de la revista](#)

### Abstract

Background: Several studies showed that early exposure to pesticides affects the development and health of children. In Maule, there is previous evidence of the high exposure to organophosphate pesticides (OP) of schoolchildren. However, to date, there are no studies assessing exposure to pyrethroids and the herbicide 2,4-D. Objective. To evaluate children's exposure to pyrethroids insecticides 3-phenoxybenzoic acid (3-PBA), trans 3-(2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (trans-DCCA) and 2,4 dichlorophenoxyacetic acid (24-D) herbicides. Method: Longitudinal study with 48 schoolchildren from two rural schools in the Maule region, Chile. Urinary metabolites of pyrethroids 3-PBA, Trans-DCCA and 24-D herbicides were evaluated in 2016 and 2017. Mann Whitney U for repeated measurements and Spearman's rho correlation tests were used for data analysis. Also, we used a system of impulsive differential equations for mathematical modeling. Results: All the schoolchildren assessed had more than two pesticide urinary metabolites in both years, with the 3-PBA metabolite being the most frequent. There was an increase in concentrations of urinary 3-PBA in November 2017, compared to 2016 (from 0.69  $\mu\text{g/L}$  to 1.90  $\mu\text{g/L}$ ). In 2016, the specific metabolites of 3-PBA were correlated with Trans-DCCA, 2,4-D, chlorpyrifos, diazinon, and para-nitrophenol. In 2017, 3-PBA was correlated with 2,4-D, and Trans-DCCA. The concentrations of 3-PBA of Chilean children were higher than studies conducted in the USA that found an association of prenatal exposure to these metabolites with cognitive difficulties. Conclusions: We found high concentrations of pyrethroid metabolites among all the schoolchildren assessed, which may impact on their health and development. These insecticides had received no attention from the scientific community in Chile, and neither from the government agencies, despite the increased use of these chemicals in recent years. This is the first study in South America that confirms the exposure to pyrethroids and herbicides through biomarkers in human population living near farm fields. (C) 2020 Elsevier B.V. All rights reserved.

## Palabras clave

**Palabras clave de autor:**[Pesticides](#); [Pyrethroids](#); [Herbicides](#); [Rural schoolchildren](#); [Health risk](#)

**KeyWords Plus:**[ORGANOPHOSPHATE PESTICIDES](#); [URINARY METABOLITES](#); [COQUIMBO REGION](#); [CHILDREN](#); [RISK](#); [PROVINCE](#); [WORKERS](#); [FARM](#)

## Información del autor

### Dirección para petición de copias:

*Universidad Catolica del Maule Univ Catolica Maule, Fac Hlth Sci, Neuropsychol & Cognit Neurosci Res Ctr, Talca, Chile.*

**Dirección correspondiente:** Munoz-Quezada, MT (autor correspondiente)

+ Univ Catolica Maule, Fac Hlth Sci, Neuropsychol & Cognit Neurosci Res Ctr, Talca, Chile.

## Direcciones:

+ [ 1 ] Univ Catolica Maule, Fac Hlth Sci, Neuropsychol & Cognit Neurosci Res Ctr, Talca, Chile

+ [ 2 ] Univ Catolica Maule, Ctr Invest Estudios Anzados Maule, Talca, Chile

+ [ 3 ] Univ Sao Paulo, Fac Salude Publ, Dept Salud Ambiental, Sao Paulo, Brazil

+ [ 4 ] Univ Catolica Maule, Fac Med, Maule, Chile

+ [ 5 ] Univ Chile, Fac Med, Sch Publ Hlth, Santiago, Chile

+ [ 6 ] Univ Catolica Maule, Fac Basic Sci, Maule, Chile

**Direcciones de correo electrónico:**[mtmunoz@ucm.cl](mailto:mtmunoz@ucm.cl)

## Financiación

Entidad financiadora <a href="#">Mostrar más información</a>	Número de concesión
Comision Nacional de Investigacion Cientifica y Tecnologica (CONICYT) CONICYT FONDECYT	11150784 11190562
Agencia Nacional de Investigacion y Desarrollo (ANID) of the Chilean Government	REDES 180078 PIA SOC180040

[Ver texto de financiación](#)

## Editorial

ELSEVIER, RADARWEG 29, 1043 NX AMSTERDAM, NETHERLANDS

## Información de la revista

- **Impact Factor:** [Journal Citation Reports](#)

## Categorías / Clasificación

**Áreas de investigación:**Environmental Sciences & Ecology

**Categorías de Web of Science:**Environmental Sciences

**Información del documento**

**Idioma:**English

**Número de acceso:** WOS:000581793800065

**ID de PubMed:** 32846350

**ISSN:** 0048-9697

**eISSN:** 1879-1026