Chlorpyrifos in Human Breast Milk?

Karyn Ann Casey, University of Tennessee - Knoxville

Date of Award
12-2005

Degree Type
Dissertation

Degree Name
Doctor of Philosophy

Major
Nursing

Major Professor
Maureen Groer

Committee Members
Johnnie Mozingo, Mitzi Davis, Patricia Droppleman, Donald Creasia

Abstract

The widespread use of pesticides by farmers, pest control operators and even the general public can pose significant risks to children's health. One particular pesticide, chlorpyrifos, was the most widely used pesticide in the United States with total use estimated at approximately 30 million pounds per year. Young children and the developing fetus are far more susceptible to the effects of pesticide exposure as a result of unusual exposure patterns and developmental immaturities. Transplacental transfer and lactational exposure are the pathways exclusive to the developing fetus and infant. Chlorpyrifos exposure is of special concern in this population because of its potential for disruption of normal brain function and cognitive development.

The purpose of this study was to determine the concentration of chlorpyrifos in three different biological specimens: breast milk, plasma, and saliva. The research method employed for this study was a secondary analysis of existing samples collected for the purposes of a prior study. Based on specimen availability, there were a total of 26 subjects each for the lactating group and the non-lactating group. The lactation group had 26 matched breast milk, plasma and saliva samples and the non-lactation group had 26 matched plasma and saliva samples. The biological specimens were tested in the laboratory using an assay specific to chlorpyrifos. The Chlorpyrifos RaPID Assay was developed by Strategic Diagnostics, Inc and had a detection limit of 0.1 ng/ml (ppb) and a linear range of 0.22 to 3.0 ng/ml (ppb).

Overall, for the lactation group, 25/26 samples were positive for chlorpyrifos with milk concentrations significantly higher than plasma or salivary concentrations. 19/26 plasma samples were positive and 10/26 saliva samples were positive for chlorpyrifos. For the non-lactation group, 23/26 plasma samples were positive for chlorpyrifos and 16/26 saliva samples were positive. In addition, the plasma chlorpyrifos concentrations were significantly higher than salivary concentrations in the non-lactation group. Comparing the two groups, salivary chlorpyrifos concentrations were significantly higher in the lactation group.

There is mounting evidence of pesticide contamination in the breast milk of lactating women. This study has contributed to this knowledge by documenting chlorpyrifos concentrations in breast milk, plasma, and saliva of lactating and non-lactating mothers.
However, further research needs to be done to determine what these chemicals are doing to our children.

Recommended Citation
https://trace.tennessee.edu/utk_graddiss/672

Chlorpyrifos, a developmental neurotoxic pesticide, is one of the most commonly used insecticides in Europe. Yet increasing evidence links it with serious health conditions including disruption of the hormonal system and impacts on children’s brain development. Chlorpyrifos residues are commonly found in our fruits, vegetables, cereals and dairy products as well as our drinking water. Its current authorisation is set to expire on 31 January 2019. There is a solid body of scientific evidence of chlorpyrifos' adverse effects on human health, and the current reauthorisation procedure provides the European Commission and Member States with the opportunity to get this harmful chemical off the shelves once and for all. Human milk is a complex fluid that has developed to satisfy the nutritional requirements of infants. In addition to proteins, lipids, carbohydrates and other biologically active components, breast milk contains a diverse microbiome that is presumed to colonize the infant gastrointestinal tract and a heterogeneous population of cells with unclear physiological roles and health implications. Noteworthy cellular components of breast milk include progenitor/stem cells. This review summarizes the current state of knowledge of breast milk cells, including leukocytes, epithelial cells, stem cells and... Cells of human breast milk. Malgorzata Witkowska-Zimny. ORCID: orcid.org/0000-0003-2167-8657 1 &. Human breast milk is recognized by health organizations around the world as an ideal source of nutrition to support early life. A diet of exclusively breast milk is recommended for the first 6 months of life followed by the addition of solid foods plus breast milk for up to 2 years of age. What's in breast milk that makes it such a highly recommended choice? Breast Milk vs. Infant Formula. Breast milk is produced by a woman's body specifically to meet her child's nutritional needs. Human milk is a dynamic source of nutrients and bioactive factors; unique in providing for the human infant's optimal growth and development. The growing infant's immune system has a number of developmental immune deficiencies placing the infant at increased risk of infection. This review focuses on how human milk directly contributes to the infant's innate immunity. Although research into the specific factors in human breast milk, which lead to the remarkable health benefits of exclusive breastfeeding, has been ongoing for decades; there are still intriguing mysteries of how human milk contributes to the development and regulation of both the infant's innate (10) and adaptive immune function (11–13).