

# Combining Epidemiology and Toxicogenomics to Support an Unfocused Analysis of Pesticide Exposure and Parkinson's Disease

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## Abstract

In agriculture, pesticides have been used extensively for more than 50 years. The majority of the thousands of presently in use, though, have not been fully evaluated for their impact on Parkinson's disease (PD). Additionally, ZPT exposure changed the way that genes were expressed throughout the early stages of embryonic development, particularly in relation to morphological abnormalities and metabolic dysfunctions including decreased oxidoreductase activity. Quantitative analysis of marker genes further revealed that ZPT also induced endoplasmic reticulum (ER) stress and autophagy. Activities of antioxidants and caspases studies revealed inductions of oxidative stress and apoptosis by ZPT. As a result, we draw the conclusion that oxidative damage, apoptosis, endoplasmic reticulum (ER) stress, and autophagy are all involved in ZPT-induced embryonic toxicogenomic responses.

**Keywords:** epidemiology, toxicogenomics, Parkinson's disease, pesticide exposure, embryonic development

**Introduction:** Parkinson's disease (PD) is a neurodegenerative disorder characterized by the loss of dopaminergic neurons in the substantia nigra. The etiology of PD is complex, involving both genetic and environmental factors. Pesticide exposure is one of the most widely studied environmental risk factors for PD. The use of pesticides in agriculture has increased significantly over the past several decades, and this has led to concerns about the potential health effects of chronic exposure to these chemicals. In particular, there is growing concern about the potential role of pesticides in the development of PD. This paper aims to explore the relationship between pesticide exposure and PD, with a focus on the role of toxicogenomics in understanding the underlying mechanisms. We will discuss the current state of knowledge on this topic, highlighting the challenges and opportunities for future research. The goal is to provide a comprehensive overview of the current state of knowledge on this topic, highlighting the challenges and opportunities for future research.

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**Materials and Methods:** This study was conducted using a combination of epidemiological and toxicogenomic approaches. The epidemiological component involved the analysis of data from a large cohort study of agricultural workers, focusing on the relationship between pesticide exposure and the incidence of PD. The toxicogenomic component involved the analysis of gene expression data from embryonic tissues exposed to pesticides, with a focus on identifying changes in the expression of genes involved in oxidative stress, apoptosis, and autophagy.

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**Conclusions:** The findings of this study suggest that pesticide exposure is a significant risk factor for PD, and that the underlying mechanisms involve oxidative stress, apoptosis, and autophagy. These findings have important implications for the development of strategies to reduce the risk of PD, and for the design of future research in this area.

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