

Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/jes

Review

Pesticide exposures and respiratory health in general populations

Ming Ye^{1,*}, Jeremy Beach^{1,2}, Jonathan W. Martin³, Ambikaipakan Senthilselvan¹

1. School of Public Health, University of Alberta, Edmonton, Alberta T6G 1C9, Canada. E-mail: mye@ualberta.ca

2. Division of Preventive Medicine, Department of Medicine, University of Alberta, Edmonton, Alberta T6G 2T4, Canada

3. Division of Analytical and Environmental Toxicology, Department of Laboratory Medicine and Pathology, University of Alberta, Edmonton, Alberta T6G 2G3, Canada

ARTICLE INFO

Article history:

Received 22 June 2016

Revised 10 November 2016

Accepted 18 November 2016

Available online 8 December 2016

Keywords:

Canadian Health Measures Survey

Environmental

General population

Pesticides

Respiratory health

ABSTRACT

Human exposures to pesticides can occur in the workplace, in the household and through the ambient environment. While several articles have reviewed the impact of pesticide exposures on human respiratory health in occupational settings, to the best of our knowledge, this article is the first one to review published studies on the association between pesticide exposures and human respiratory health in the general populations. In this article, we critically reviewed evidences up to date studying the associations between non-occupational pesticide exposures and respiratory health in general populations. This article also highlighted questions arising from these studies, including our recent analyses using the data from the Canadian Health Measures Survey (CHMS), for future research. We found few studies have addressed the impact of environmental pesticide exposures on respiratory health, especially on lung function, in general populations. In the studies using the data from CHMS Cycle 1, exposures to OP insecticides, pyrethroid insecticides, and the organochlorine pesticide DDT were associated with impaired lung function in the Canadian general population, but no significant associations were observed for the herbicide 2,4-D. Future research should focus on the potential age-specific and pesticide-specific effect on respiratory health in the general population, and repeated longitudinal study design is critical for assessing the temporal variations in pesticide exposures. Research findings from current studies of non-occupational pesticide exposures and their health impact in general population will help to improve the role of regulatory policies in mitigating pesticide-related public health problems, and thereafter providing greater benefit to the general population.

© 2016 The Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences.

Published by Elsevier B.V.

Contents

Introduction	362
1. Pesticide exposures and respiratory health in general populations	362
1.1. Respiratory symptoms	363

* Corresponding author. E-mail: mye@ualberta.ca (Ming Ye).

1.2. Respiratory diseases	363
1.3. Lung function	363
2. Findings from the CHMS	364
2.1. OP insecticides and respiratory health in the Canadian general population	364
2.2. PYR insecticides and respiratory health in the Canadian general population	364
2.3. DDT and respiratory health in the Canadian general population	365
2.4. Herbicide 2,4-D and respiratory health in the Canadian general population	365
3. Discussion	365
3.1. Environmental pesticide exposures and respiratory health in general populations	365
3.2. Biomonitoring of pesticide exposures	366
3.3. Future research	366
4. Conclusions	367
References	367

Introduction

Human exposures to pesticides can occur in the workplace, in the household and through the ambient environment. According to the United States Environment Protection Agency (US EPA) Pesticide Program, approximately two billion pounds of pesticides is used every year in North American (US EPA, 2011), but only 1% reaches its target (Gavrilescu, 2005), suggesting the majority of pesticides will enter the environment without producing the intended benefit. Pesticide run-off from farm land and subsequent movement into water bodies further increases the spread of pesticides in the environment (Damalas and Eleftherohorinos, 2011; Davis et al., 1992) thereby increasing the likelihood of exposure to non-target organisms and the general public. Consumption of food containing pesticide residues is a recognized source of pesticide exposures in the general population (Schettgen et al., 2002; Ye et al., 2015b). It has been estimated that up to 50% of fruits, vegetables, and cereals grown in the European Union (EU) contain pesticide residues, and that one out of 20 food items in EU markets is known to exceed EU legal limits for pesticide residues (EU EC, 2005). Milk and vegetable oil products can also be contaminated with pesticides. A number of studies have suggested that although the concentrations did not exceed EU legal limits, the organochlorine pesticide 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane (DDT) was detected in a high percentage of milk products in the Greek market (97.4%) (Tsakiris et al., 2015) and the organophosphate (OP) pesticides, including fenthion and dimethoate, were detected in more than 80% of olive oil products from the Greek market (Tsatsakis et al., 2003). In Canada, it has been estimated that 68.5% of fruits and vegetables contain detectable residues of one or more pesticides; although most of these pesticide were at low concentrations (<1 mg/kg), there were still 3% of fruits and vegetables with pesticide levels higher than legal maximum residue limits (Ripley et al., 2000). The pesticide residues on food items mainly originate from farming and/or from pesticide applications during food storage and transport (Sanborn et al., 2002).

Occupational pesticide exposures, particularly in agricultural occupations (Ye et al., 2013), have been associated with human respiratory health problems, including self-reported coughing, wheezing, and airway inflammation (O'Malley, 1997; Sanborn et al., 2002), asthma (Beard et al., 2003; Deschamps et al., 1994;

Hoppin et al., 2006, 2008, 2009; Senthilvelan et al., 1992), chronic obstructive pulmonary disease (COPD) (Chakraborty et al., 2009; Hoppin et al., 2007; Tual et al., 2013; Valcin et al., 2007), lung cancer (Alavanja et al., 2004; Beane Freeman et al., 2005; Bonner et al., 2005; Hou et al., 2006; Lee et al., 2004; Pesatori et al., 1994; Purdue et al., 2007; Rusiecki et al., 2006; Samanic et al., 2006), and impaired lung function (Chakraborty et al., 2009; Hernandez et al., 2008; Mekonnen and Agonafir, 2004; Peiris-John et al., 2005; Reynolds et al., 2012; Royce et al., 1993; Salameh et al., 2005; Zuskin et al., 2008). However, given that low-dose environmental pesticide exposures are more prevalent than higher-dose occupational exposures (Damalas and Eleftherohorinos, 2011), it would be more important to understand how environmental pesticide exposures impact respiratory health in the general populations.

In this review article, we critically reviewed evidence available to date examining the associations between environmental pesticide exposures and respiratory health, including lung function, respiratory symptoms and diseases, in the general populations. This article also highlights questions arising from the literature, including our recent analysis using the data from the Canadian Health Measures Survey (CHMS), for further research. To review the literature, we searched English-language studies, reports and abstracts between 1980 and May 2016 in MEDLINE® using key words (including synonyms, adjective and plural forms) and combinations of key words, including occupation, non-occupation, environment, pesticide, insecticide, herbicide, respiratory, pulmonary, airway, lung function, infection, asthma, bronchitis, and COPD. Searching strategy also included cross-referencing of research and review papers. Studies of occupational and workplace-related pesticide exposures were excluded.

1. Pesticide exposures and respiratory health in general populations

While association between workplace-related pesticide exposures and respiratory diseases and symptoms are well documented (Ye et al., 2013), a summary of adverse health impact of environmental chemicals, including pesticides, indicates that pesticide exposures from environment or diet may as well cause respiratory diseases and symptoms in the general populations (Sanborn et al., 2002).

Download English Version:

<https://daneshyari.com/en/article/5754121>

Download Persian Version:

<https://daneshyari.com/article/5754121>

[Daneshyari.com](https://daneshyari.com)