

PESTICIDES AND ASTHMA

The term pesticide refers to insecticides, herbicides, fungicides, rodenticides and disinfectants used to control pests. There are over 16,000 different pesticides registered for sale and use in Michigan; further, 2,255 businesses are licensed to apply pesticides and 22,039 individuals are certified as pesticide applicators in our state. We have received 391 reports of patients with work-related asthma associated with pesticide exposure since 1988. Three hundred fifty-five (91%) of the patients had asthma associated with exposure to disinfectants and 36 (9%) with exposure to insecticides, herbicides, fungicides, or rodenticides. Two previous newsletters covered disinfectants that cause asthma: Winter 2008-2009, Vol. 20, #1 and Spring 2009, Vol. 20, #2 (<http://www.oem.msu.edu/Newsletters.aspx>). This newsletter discusses the other types of pesticides associated with asthma.

A review of the acute respiratory complications of organophosphate poisoning was published in December 2014 (1). Still a worldwide problem, this type of clinical presentation, with acute symptoms, is unusual in Michigan. The more common concern in Michigan is the possibility of a *long-term effect* of repeated exposure to pesticides (2, 3). The most comprehensive study of the long term effect of pesticide use and respiratory disease is the Agricultural Health Study being performed by the National Institute of Health (4, 5), a prospective study of approximately 23,000 licensed private pesticide applicators, mostly farmers, enrolled 1993-1997 in Iowa and North Carolina. Detailed histories were obtained to quantitate exposure

CASE HISTORY #1:

A woman in her 40's developed wheezing, cough, chest tightness and shortness of breath in relation to her work. She had never smoked cigarettes. She worked at an apartment complex as an assistant manager. One of her duties was to mix and apply insecticides for bed bugs. The active ingredients of the two insecticides she used contained lambda-cyhalothrin (9.7%) and deltamethrin (0.5%), both synthetic pyrethroids. She was prescribed a bronchodilator. Her employer switched to using a pre-mixed insecticide that did not contain a synthetic pyrethroid. Her symptoms improved and she was able to continue to work at her same job. She continued to use an inhaled bronchodilator twice per week.

to specific pesticides. Individuals were categorized as developing allergic or non-allergic adult-onset physician-diagnosed asthma based on self-reports. Among men, repeated use of 12 pesticides was associated with an increased risk of allergic asthma: coumaphos, heptachlor, parathion, carbon tetrachloride/carbon disulfide, ethylene dibromide, 2,4,5 Trichlorophenoxypropionic acid, s-ethyl dipropylthiocarbamate, paraquat, chlordane, lindane, diazinon and captan. Four were associated with non-allergic asthma: petroleum oil, DDT, malathion and phorate. Among farm women, repeated use of 10 pesticides was associated with an increased risk of allergic asthma: 2,4-D, glyphosate, carbaryl, coumaphos, malathion, parathion, phorate, tebufos, chlordane and metalaxyl. For women, permethrin was the only pesticide associated with non-allergic asthma. No skin or breathing tests were performed as part of this study.

Studies of pesticide-exposed farm workers in Canada (6), Brazil (7), India (8), South Africa (9) and Spain (10) found an association between pesticide exposure, particularly organophosphates and carbamates and asthma but generally did not have information for specific pesticides. The Canadian study reported an increased risk of asthma among farmers who used carbamate pesticides and to one specific carbamate, carbofuran. None of these studies included specific inhalation challenge testing. The studies in Canada and India performed spirometry, the one in Spain performed spirometry, lung volumes and diffusing capacity and the study in South Africa included measurement of exhaled nitric oxide.

THERE ARE SPECIFIC PESTICIDE CASE REPORTS in the medical literature where patients had a positive specific antigen challenge test for exposure to the following pesticides: Captafol, Chlorothalonil, Dichlorvos, Fenthion, Fluazanam, Tributyl tin oxide and Tetramethrin.

CAPTAFOL (Difolatan) is a chloroalkyl thio fungicide that is no longer registered for use in the United States. There is a case report of a 34 year-old male chemical manufacturing worker who developed asthma and had a positive specific antigen bronchial challenge to captafol with both an early and late response (11). Captan and Folpet are structurally similar fungicides that are widely used. There were multiple case reports of contact dermatitis.

CHLOROTHALONIL (2,4,5,6-tetrachloroisophthalonitrile) is a commonly used fungicide. It is used on peanuts, golf courses, wood products and as a paint additive. There are two case reports of work-related asthma, one from Japan of a green house worker (12) and the second a chemical formulator from England (13) who both had positive specific antigen challenge testing to chlorothalonil.

DICHLORVOS is an organophosphate insecticide. A 52 year-old woman developed asthma which was associated with her pet; she had a positive specific antigen challenge test to a flea collar containing dichlo-

rovos (13).

FENTHION is a restricted use organophosphate insecticide. A 21 year-old man in an Australian sheep abattoir developed work-related asthma and had a positive specific antigen challenge test to 3% powder of fenthion sprayed monthly on the dried sheep skins (14).

FLUAZINAM is an agricultural fungicide. A 45 year-old fungicide formulator developed work-related asthma and had positive peak flow testing in relationship to work and positive specific antigen challenge testing to fluazinam (13)

TRIBUTYL TIN OXIDE is a fungicide. A 52 year-old phlebotomist developed work-related asthma after the carpeting in the lab was treated with tributyl tin oxide (15). She had a positive specific antigen challenge test to the fungicide seven months after her initial exposure.

TETRAMETHRIN is a pyrethroid, a synthetic pyrethrin. A 47 year-old exterminator developed work-related asthma and had a positive specific antigen challenge test to tetramethrin (16). There are approximately 25 pyrethroids in 2,500 commercial products sold in the United States and another five, including permethrin, have been associated with allergic or immunological reactions. Pyrethroids are now the most commonly used insecticides and are in common products used in the home.

CASE HISTORY #2:

A woman in her 30's developed wheezing, cough, chest tightness and shortness of breath in relation to work. She was begun on a bronchodilator. She had never smoked cigarettes. She worked as a waitress. Her symptoms occurred after the manager sprayed cyfluthrin, a synthetic pyrethroid. She quit her job upon her doctor's advice. Her symptoms improved and only occasionally require the use of a bronchodilator.

We are interested in hearing from you if you have a patient with recurrent symptoms in association with pesticide exposure. Ways to notify us are listed on the back page of this newsletter or you can call Ken Rosenman, MD at 1-800-446-7805 to discuss.

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In this issue: v26n2 Pesticides and Asthma

*PS Remember to report all cases of occupational disease!

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