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Is exposure to household chemicals associated with asthma in young children?

Asthma is the most common chronic disease of childhood in the developed world. The primary aim of a recent study (1), published in the journal 'Thorax', was to test the hypothesis that early exposure to volatile organic compounds (VOCs), found in most households, increases the risk of asthma in young children. The realisation that the early initiation phase of asthma is likely to occur during infancy and that infants spend most of their time indoors, where VOCs occur in high concentrations, provided the rationale for this study of indoor air quality and asthma in young children.

Volatile organic compounds (VOCs) are irritants from indoor sources and include solvents, floor adhesive, paint, cleaning products, furnishings, polishes, and room fresheners. According to some researchers (2) levels of most VOCs can be 5-10 times higher indoors than outdoors. Furthermore, indoor exposure to VOCs has been related to asthma and asthmatic symptoms.(3-7)

The authors carried out a population based case-control study children aged between 6 months and 3 years. Cases (n = 88) were children recruited at Princess Margaret Hospital accident and emergency department and discharged with asthma as the primary diagnosis; 104 controls consisted of children from the same age group without an asthma diagnosis identified through the Health Department of Western Australia. Information regarding the health status of the study children and characteristics of the home was collected using a standardised questionnaire. Exposure to VOCs were measured in winter and summer in the living room of each participating household.

The study results suggest that cases were exposed to significantly higher VOC levels than controls.

Most of the individual VOCs appeared to be significant risk factors for asthma with the highest odds ratios for benzene followed by ethylbenzene and toluene.

[More specifically - The VOCs identified in the homes of participants included benzene, toluene, *m*-xylene, *o,p*-xylene, ethylbenzene, styrene, chlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene and 1,4 dichlorobenzene, with toluene, xylene, and benzene + toluene being detected in 99% of the homes studied, xylene in 93%, and benzene in 86%.]

Recent painting in the house was reported for significantly more cases than for children without asthma. However, significantly more control subjects than cases had air conditioning. In a multilinear regression model total VOC levels were significantly affected by recent painting. Ethylbenzene and xylene levels were significantly increased in association with smoking, the presence of a new carpet and new furniture.

For every 10 unit increase in the concentration of toluene and benzene the risk of having asthma increased by almost two and three times, respectively.

The authors conclude,

“Domestic exposure to VOCs at levels below currently accepted recommendations may increase the risk of childhood asthma. Measurement of total VOCs may underestimate the risks associated with individual compounds.”

References:

1. Rumchev K, Spickett J, Bulsara M, Phillips M, Stick S. Association of domestic exposure to volatile organic compounds with asthma in young children. *Thorax*. 2004; 59:746-51.
2. Samet J. Environmental controls and lung disease. *Am Rev Respir Dis* 1990; 142:915-39.

3. Norbäck D, Björnsson E, Janson C, et al. Asthmatic symptoms and volatile organic compounds, formaldehyde, and carbon dioxide in dwellings. *Occup Environ Med* 1995; 52:388-95.
4. Weislander G, Norbäck D, Björnsson E, et al. Asthma and the indoor environment: the significance of emission of formaldehyde and volatile organic compounds from newly painted indoor surfaces. *Int Arch Occup Environ Health* 1997; 69:115-24.
5. Ware J. Respiratory and irritant health effects of ambient volatile organic compounds. The Kanawha County Health Study. *Am J Epidemiol* 1993; 137:1287-301.
6. Koren H, Graham D, Devlin R. Exposure of humans to volatile organic mixture. III. Inflammatory response. *Arch Environ Health* 1992;47:39-44.
7. Harving H, Dahl R, Molhave L. Lung function and bronchial reactivity during exposure to volatile organic compounds. *Am Rev Respir Dis* 1991; 143:751-4.