



FOCUS ON RESEARCH

VOLATILE ORGANIC COMPOUNDS AND RISK OF ASTHMA AND ALLERGY: A SYSTEMATIC REVIEW OF OBSERVATIONAL AND INTERVENTIONAL STUDIES

Researchers

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Background

There is evidence that occupational exposure to Volatile Organic Compounds (VOC) may cause or worsen asthma and allergic diseases. There is a growing literature exploring early life and domestic exposure to VOCs in relation to the development of asthma and asthma severity, and possible allergic responses.

Aims

We sought to investigate the relationship between personal VOC exposure within domestic settings and the risk of developing and worsening asthma/allergic diseases in children and adults.

Project Outline/Methodology

We undertook a systematic review of literature searching 11 international databases and contacting an international panel of experts for unpublished studies. Study methodology was critically assessed using relevant quality assessment tools. We identified key over-arching themes arising from the studies identified.

Key Results

53 eligible studies were identified: 1 randomised controlled trial; 1 controlled-clinical trial; 6 controlled before-after studies; 6 cohort; 11 case-control and 28 cross-sectional studies. The role of VOCs in causing disease was investigated in 30 studies; established disease in 5 studies; and 18 studies examined both the development of new and established disease. Aromatic VOCs and Formaldehyde were the most commonly investigated with fewer studies looking at alkanes, terpenes, esters and alcohols. Overall, studies generated conflicting findings making it difficult to confirm or refute the role of VOCs in causing or worsening asthma or allergy.

Conclusions

It is unclear if exposure to residential concentrations of VOCs increases the risk of developing and/or worsens asthma or allergic disease. The available evidence is weak; exposure assessment is generally poor, and there is a lack of standardisation of assessment of adverse health outcomes. Prospective, well-designed cohort and randomised controlled trials are required.

What Does this Study Add to the Field?

This is the most detailed and comprehensive systematic review ever undertaken investigating the role of VOCs in the development of asthma and allergic diseases and the role of VOCs in worsening established asthma/allergic diseases in children and adults.

Implications for Practice or Policy

Asthma and allergic diseases are a significant burden to the NHS and the identification of environmental exposures that increase the risk of developing these conditions or worsening established disease is warranted. The relationship between VOCs and the risk of development of asthma/allergic disease and the role of VOCs in worsening established disease in children and adults is a controversial area, but one that warrants further investigation. This is because intervention to reduce VOC exposure is feasible by lifestyle changes (e.g. avoiding redecoration, air fresheners, perfumed items, having a smoke-free home, increasing ventilation) and technological adaptation e.g. use of low emitting VOC materials.

Where to Next?

Based on the evidence in this systematic review, we recommend well-designed, large cohort studies, relating long-term indoor personal exposure measurements to robust standardised asthma/allergy-related health outcomes with adjustment for potential confounding factors. These should be followed by large randomised controlled trials of interventions to establish the effects and cost-effectiveness of VOC reduction measures on the risk of developing asthma/allergic disease and/or worsening established disease. Aromatics, aldehydes (formaldehyde), alkanes and terpenes should, based on this work, be the focus of future research attention. We plan to work with our Consumer Involvement Group to disseminate the findings to relevant charities (e.g. Asthma UK and Allergy UK) and to help in the development of follow-on grant applications.

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