Household air pollution and adult respiratory health

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Household air pollution (HAP) can influence adult respiratory health. More prospective studies are needed, taking into account combined effects and patterns of HAP exposure, and gene-environment interactions. https://bit.ly/3lXc3g7

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In modern society, we spend most of our time indoors, especially in the home environment. Since most studies on respiratory effects of household air pollution (HAP) have investigated children, more studies are needed on HAP and adult respiratory health, especially prospective studies. One review concluded that the indoor factors most consistently associated with adult asthma include fuel combustion, dampness and mould, and second hand tobacco smoke (SHS) [1]. Another recent review concluded that SHS increases the risk of asthma exacerbations, respiratory symptoms and healthcare utilisation, and that other indoor pollutants, such as heating sources and mould, can negatively impact the course of asthma [2].

The term "dampness" is used to describe a situation in a building when excess of moisture causes impaired indoor environment due to microbial growth or chemical degradation of building materials [3]. A number of reviews have concluded that dampness is a consistent risk factor for asthma, respiratory symptoms and respiratory infections [3–5]. Moreover, two prevalence studies found lower forced expiratory volume in 1 s (FEV_1) among adults in damp homes [6, 7]. One prospective population study found increased FEV_1 decline among adults in homes with dampness and mould, equivalent to smoking 5–10 cigarettes per day [8].

SHS is a recognised risk factor for childhood asthma and allergic diseases [1, 2] but few prospective studies are available on SHS and asthma in adults. One recent prospective study found that SHS increased adult onset asthma [9].

Insufficient ventilation in home is common and one review concluded that a higher ventilation flow can be associated with less asthma and a reduction in asthma symptoms [10]. Most studies in this review were from offices. Another recent review concluded that there is a tendency for improvements of respiratory symptoms with increased ventilation in homes, especially for wheeze [11]. However, most home ventilation studies are on children. One Swedish study found that higher measured air exchange rate in homes was associated with reduced asthma symptoms in adults [12].

Few studies exist on associations between chemical exposure in the home and adult asthma. One Swedish study found that recent indoor painting was associated with an increased prevalence of asthma symptoms in adults [13]. A recent large multicentre study from China found that redecoration and new furniture were risk factors for adult asthma [14]. Formaldehyde and volatile organic compounds (VOCs) are the

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main pollutants in indoor settings [15] and some studies have reported associations for adult asthma [16, 17]. One systematic review concluded that formaldehyde and aromatic compounds (benzene, toluene and xylene) were associated with onset and exacerbation of asthma in some studies, but many studies found no association between VOCs and asthma [18].

Heating and cooking exposures, especially with biomass fuel, are recognised risk factors for asthma and COPD, especially in low and middle income countries [19, 20]. Nitrogen dioxide is a major indoor pollutant produced by gas stoves and heaters but has outdoor sources as well. Few prospective studies exist on associations between NO_2 from indoor sources and adult respiratory health. One prevalence study from Singapore found that indoor NO_2 was associated with asthma medication in adults [21]. A multicentre study from Europe found that increased bronchial responsiveness was associated with gas cooking among adults, but only in subjects with the GSTM1 null genotype [22]. Other indoor pollutants can include incense and mosquito repellents. A Chinese multicentre study reported that burning incense and mosquito coils in homes were risk factors for adult asthma [14].

Homes have a mixture of different indoor pollutants but few studies have investigated the combined effects of different HAPs on respiratory illnesses. Moreover, few studies have investigated gene–environment interactions for HAP. In an article in this issue of the *European Respiratory Journal*, Dai *et al.* [23] applied latent class analysis among adults in the Tasmanian Longitudinal Health Study (TAHS) at mean ages 43 and 53 years. They identified seven longitudinal HAP profiles. Three of these profiles; "all gas", "wood heating/smoking" and "wood heating/gas cooking" were associated with persistent asthma, greater lung function decline and per cent reversibility by age 53 years, using the profile "least exposed" as reference category. Window opening and exhaust fan use reduced the effects of HAP from heating and cooking. Moreover, participants with GSTP1 (Ile/Ile) genotypes had higher risk of asthma and lung function decline when exposed to HAP. The study is a unique prospective study on HAP and adult respiratory health and adds evidence on the role of long term exposure to wood heating, gas cooking and heating, and tobacco smoke for adverse adult respiratory health. In the future, more prospective studies are needed on the role of combined exposure to different HAP, as well as studies on gene–environment interactions for HAP, for adult respiratory health.

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