

Time for Action on Cleaning and Disinfecting Agents



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The article by Dumas and colleagues¹ in the current issue of the *Journal*, has identified a significant association between poorer asthma control in women aged over 60 and reported exposure to cleaning and disinfecting agents in their homes, using data from a nested case-control study. The larger study comprised a postal questionnaire survey conducted every 2 years among women affiliated with a French national health insurance plan that covered mostly teachers. The same group has also recently reported an association between increased risk of current asthma in older women and the frequency and number of irritant cleaning products used at home.²

There are potential limitations from these studies as with other cross-sectional studies, including the self-reporting of cleaning product usage and symptoms. Nevertheless, the associations reported are consistent with other findings from the same research group and also from several other groups that have observed an increased risk of airway disease in occupational settings among workers with exposure to cleaning and disinfecting agents, such as health care workers and domestic cleaners. A recent systematic review and meta-analysis³ found a 50% pooled relative risk of asthma and 43% increased risk of chronic obstructive pulmonary disease in cleaners. The occupational conclusions are also consistent with the smaller number of studies of exposures to cleaning agents in nonoccupational settings, including studies evaluating effects of bleach and sprayed cleaning products. Pulmonary function data from the European Community Health Survey have also shown an association between cleaning at home or at work and accelerated decline in forced expiratory volume in 1 second (FEV₁) for women.⁴

In the current study by Dumas et al,¹ of interest not only was poor asthma control associated with more frequent use of cleaning sprays and chemicals, especially sprayed products, but at the other end of the spectrum “infrequent cleaning tasks and intermediate use of products” was also significantly associated with poor asthma control. Potentially, this might have been a result of greater exposure to other asthma triggers such as irritant dusts and allergens in homes that underwent less cleaning. Of note, in this study, report of “very frequent general cleaning” that did not include use of chemicals was not associated with poor

asthma control, suggesting this may be a good practical solution that could be recommended to patients with asthma.

Despite the reported adverse associations with airway diseases from this and other publications, a few studies have suggested benefits for allergic diseases and asthma from the use of cleaning products in the home. An older study⁵ focused on use of bleach for cleaning in homes and, as with other studies, reported that lower respiratory symptoms were more prevalent among those using bleach 4 or more days per week (odds ratio 1.24–1.49). However, although use of bleach was not associated with indoor allergen concentrations, there was a dose-response relationship between bleach use and reduced rates of sensitization to cat and grass. In addition, children with asthma have been reported to have a better quality of life score associated with homes cleaned with dilute hypochlorite.⁶

The findings from the present study by Dumas and colleagues¹ extend our knowledge of associations between cleaning/disinfecting agents and asthma that have been observed in other study populations. Cleaning/disinfecting agents are ubiquitous in their use and general use has greatly increased during the current coronavirus disease 2019 (COVID-19) pandemic, both at home and in public areas such as grocery stores and other shops as well as in offices and other work environments in addition to health care settings to reduce risks of COVID-19 infection. The potential negative occupational respiratory and skin impacts from these exposures have been noted in a recent review.⁷

Mechanisms for airway effects from cleaning and disinfecting agents include sensitization and allergic responses as well as irritant upper and lower airway responses. In addition to their role in asthma and association with development of chronic obstructive pulmonary disease (COPD), cleaning agents are commonly reported as a trigger among those with laryngeal sensitivity syndromes. Most cleaning and disinfecting agents are potential skin and respiratory irritants, and some components can cause allergic contact dermatitis. For individuals with pre-existing asthma, these chemicals are likely to exacerbate asthma, especially with higher inhaled exposures (eg, with use of sprayed products or with use in small, poorly ventilated areas such as washrooms). Potential sensitizers include disinfecting agents such as glutaraldehyde, formaldehyde, and orthophthalaldehyde and enzymes, mainly used in health care settings, and quaternary ammonium compounds, as are commonly present in general purpose cleaners used in homes and occupational settings; these can act as sensitizers or as irritants. Different cleaning agents may be mixed and result in irritant gases or potentially new sensitizing compounds. If products with bleach and ammonia are inadvertently mixed, or when bleach is used on areas contaminated with urine, highly irritant chlorones may be formed. Exposure to these or other high-irritant exposures can also cause new-onset irritant-induced asthma.

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Among case series of work-related asthma, use of cleaning and disinfecting agents have been relatively common as the underlying exposures.⁸ In the investigation of these patients, measurable changes at work can be documented by serial peak flow readings and changes in methacholine response (and or sputum eosinophils) during work periods versus periods off work. However, it is often difficult in clinical practice, and in cross-sectional studies,⁹ to identify the specific chemical responsible for changes because cleaners frequently use multiple cleaning agents and there are often multiple cleaning chemicals in each product, as well as additives such as fragrances (eg, terpenes and limonene). Specific immunological tests are of limited value for investigating possible allergic responses to cleaning agents, and therefore, specific avoidance of a single agent can seldom be advised. Although patients with work-exacerbated asthma may be able to continue the same work with better occupational hygiene measures including appropriate respiratory protective equipment, those with occupational asthma from sensitization should no longer work in areas where the causative chemical is used. If there is no clear identification of the sensitizing cleaning chemical, they may need to change their job.

The current study by Dumas and colleagues¹ and previous studies have emphasized the need for better public and worker education on the safer use of cleaning and disinfecting agents at work and in the home. Potential actions to reduce risks from the use of cleaning and disinfecting agents in public areas and occupational settings include education of workers who are using these agents to understand risks and avoid mixing of agents inappropriately. Safe dilutions of agents should be used and preferably should be applied by wiping rather than spraying. There should be good ventilation, and proper respiratory- and skin-protective equipment should be used.¹⁰ For those using cleaning and disinfecting agents in home settings, education as to the appropriate use and risks potentially may be provided by public education programs and by clear labelling of cleaning products to indicate precautionary measures to take. Avoidance

of overusage of cleaning agents, using wiped instead of sprayed cleaning agents, and general cleaning such as vacuum cleaning and other nonchemical dust control measures may be best advised in home environments, especially for those with asthma. Such advice can be considered in clinical settings when patients with asthma are being offered advice for other environmental control measures in the home.

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