ASTHMA AND ALLERGY BENEFITS OF USING AIR PURIFIERS
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Asthma and Allergy Benefits of Using Air Purifiers

Summary
Exposures to allergens and indoor pollutants are associated with asthma exacerbations and other respiratory symptoms. Indoor exposures to these agents are important because people spend a majority of their time indoors at home. The use of air purifiers in homes can reduce the levels of asthma triggers in indoor air. Recent studies have found significant reductions in asthma symptoms, unscheduled asthma emergency room visits, and medication usage as well as significant increases in symptom free days in asthmatic children associated with the use of an air purifier.[1-7]

Indoor Pollutants Trigger Asthma and Allergy Symptoms
The Institutes of Medicine (IOM) has concluded there is an association between asthma exacerbation and exposure to allergens from cats, dogs, cockroaches and dust mites, environmental tobacco smoke (ETS), mold, nitrogen oxides and rhinovirus.[8] Within a subset of these allergens, (cat, cockroach, ETS and dust mite) IOM found that the evidence was compelling enough to find this relationship to be causal.[8] More recently, the U.S. Environmental Protection Agency (EPA) has concluded that a causal relationship is likely to exist between short and long term exposures to fine particulate matter (PM2.5; PM less than 2.5 microns in aerodynamic diameter) and respiratory effects, such as hospitalizations, respiratory emergency room visits, and other respiratory symptoms, including reductions of pulmonary function and increases in inflammation for children with asthma.[9]

The Importance of Indoor Environments
People spend approximately 90% of their time indoors, with roughly 70% of that time indoors at home.[10] Many of the allergens and pollutants associated with asthma and respiratory symptoms have indoor sources, and are therefore found at much higher concentrations indoors than outdoors. This is the case for allergens such as pet allergens, dust mites, and cockroach allergen; respiratory viruses which exacerbate asthma symptoms; and also for pollutants such as environmental tobacco smoke and nitrogen oxides released when using gas appliances.

Indoor exposures are not limited to allergens and pollutants from indoor sources but also include asthma triggers that infiltrate homes from outdoor air. Indoor exposures to asthma triggers of outdoor origin such as such as PM2.5 and mold spores, can sometime contribute more to total exposures than exposure that occurs outdoors. Fine particles and particle-bound mold spores are generally so small that they can easily move around door and
window frames as well as through small openings in the walls and roofs of homes.\(^{[11]}\) Because of the amount of time spent indoors and the easy migration of fine particles indoors, residential indoor concentrations are the primary contributor to personal exposures to PM\(_{2.5}\).\(^{[12]}\)

**Air Purifiers can Limit Indoor Exposures**

Guidelines for asthma management suggest that allergen avoidance is the ideal way to manage allergic respiratory diseases.\(^{[13]}\) In terms of the home environment, this may be possible for some relevant allergens, such as animal dander, but for other allergens and pollutants, complete avoidance is impractical and in many cases impossible (e.g., fungal spores outdoors and ambient PM\(_{2.5}\)). Minimizing exposures to indoor allergens and pollutants can be achieved by removal of the agents from the indoor air. Allergens and most pollutants that trigger respiratory symptoms are particles, and therefore can be easily and effectively removed from the air by filtration.

Studies have shown that air purifiers can be an effective way to control exposure to airborne allergens and PM,\(^{[14]-[17]}\) cigarette smoke,\(^{[18]}\) cat and dog allergens,\(^{[19, 20]}\) and fungal spores and pollen.\(^{[21]}\) In studies of homes with pets, the use of air purifiers significantly reduced airborne levels of cat and dog allergens.\(^{[19, 20]}\) Cheng and colleagues demonstrated that air purifiers can reduce mold and pollen levels to less than 10% of concentrations prior to operating the air purifiers within one hour.\(^{[21]}\) In an urban setting, Brauner showed that the use of air purifiers reduced indoor PM\(_{2.5}\) levels by approximately 60%.\(^{[15]}\) Similarly, Allen and colleagues demonstrated that the use of commercially available air purifiers placed in bedrooms and family rooms reduced indoor PM\(_{2.5}\) by approximately the same amount.\(^{[14]}\)

“**The ideal way for patients to manage allergic rhinitis is with complete avoidance of all relevant allergens. Because this generally is not possible, patients should be counseled to reduce their exposure to as many relevant allergens as is practical.”**

- *J Allergy Clin Immunol 2008;122:S1-84.*
Reducing Indoor Exposures Benefits Respiratory Health

Recent studies that are some of the largest, best designed studies investigating this issue have shown a health benefit from reducing indoor exposures. In a double-blinded, randomized trial, investigators from Johns Hopkins University and the Centers for Disease Control and Prevention found that children residing in homes with air purifiers experienced a significant increase in symptom free days.\(^{(1)}\) These results are consistent with other controlled trials.\(^{(22-24)}\) Lanphear and colleagues found an 18.5% reduction in unscheduled asthma visits due to the use of air purifiers in homes of asthmatic children exposed to second hand smoke.\(^{(3)}\) In a multifaceted trial to reduce indoor pollutants that included portable air purifiers, Morgan et al reported a 13.6% reduction in the number of unscheduled visits attributable to asthma and a significant reduction in asthma symptoms.\(^{(5)}\) In a trial of multiple environmental interventions that included air purifiers, Eggleston et al reported a significant improvement in asthma symptoms but no difference in unscheduled asthma visits.\(^{(2)}\) Studies have shown that PM\(_{2.5}\) exposure is associated with medication use in asthmatics and that the use of air purifiers is associated with decreased medication usage.\(^{(6, 7)}\) Taken together, these studies provide evidence that environmental interventions, such as air purifiers, consistently reduce exposures to allergens and pollutants in the home and provide health benefits to children with allergic diseases.

“...based on our review of the literature, there is sufficient evidence that air filtration does reduce indoor levels of ambient particulates that might trigger disease processes themselves.”

REFERENCES


