

## *Clean as a Whistle, But What About that Wheeze*

In the last two editions of the *Project SENSOR News* we discussed the association between disinfectants used in cleaning products and asthma. The issue with asthma and cleaning products is broader than concerns that are limited solely to the potential health effects of disinfectants. Cleaning as a profession and the use of cleaning agents in homes has been associated with both the development of new onset asthma and aggravation of pre-existing asthma.

The title of this newsletter was the title of an editorial in the *American Journal of Respiratory and Critical*

*Care Medicine*, which commented on the results from a European Community Respiratory Health Study (1). That study found the highest risk for development of new onset asthma was among individuals, usually women, who used three or more spray products in their home, four or more days per week (2). The study had a strong methodology with a longitudinal design, large sample size and standardized data acquisition. Outcomes studied included current asthma, current wheeze and physician-diagnosed asthma. Table 1 shows disease and symptom outcomes by type of cleaning agent.

**TABLE 1. ASSOCIATIONS BETWEEN THE USE OF CLEANING PRODUCTS AT LEAST WEEKLY AND THE INCIDENCE OF ASTHMA (n = 3,503)**

<b>Cleaning Product</b>	<b>Use <math>\geq</math> 1 d/wk Among All Participants (%)</b>	<b>Current Asthma RR (95% CI)</b>	<b>Current Wheeze RR (95% CI)</b>	<b>Physician-Diagnosed Asthma RR (95% CI)</b>
<b>Washing powders</b>	78.6	1.10 (0.75–1.63)	1.28 (0.91–1.81)	0.82 (0.43–1.54)
<b>Liquid multiuse cleaning products</b>	83.1	0.94 (0.64–1.38)	0.97 (0.70–1.35)	0.98 (0.52–1.86)
<b>Bleach</b>	28.0	1.22 (0.83–1.80)	1.30 (0.90–1.87)	1.10 (0.56–2.17)
<b>Furniture sprays</b>	11.6	1.49 (0.99–2.23)	1.46 (0.98–2.19)	2.46 (1.26–4.80)
<b>Glass-cleaning sprays</b>	22.1	1.35 (0.98–1.85)	1.49 (1.12–2.00)	1.43 (0.84–2.44)
<b>Air-refreshing sprays</b>	16.2	1.71 (1.22–2.39)	1.36 (0.98–1.88)	1.46 (0.78–2.70)
<b>Any spray</b>	42.1	1.49 (1.12–1.99)	1.39 (1.06–1.80)	1.28 (0.78–2.09)
<b>Any perfumed or scented product</b>	67.8	1.09 (0.78–1.50)	1.11 (0.83–1.49)	1.29 (0.74–2.26)

Adapted, Zock et al, 2007

Table 2 shows increasing risk by increasing frequency of use of spray cleaning agents.

**TABLE 2. DOSE-RESPONSE RELATIONSHIPS BETWEEN THE USE OF HOUSEHOLD CLEANING SPRAYS AND THE INCIDENCE OF ASTHMA (n =3,484)**

Category	Frequency, n (%)	Current Asthma RR (95% CI)	Current Wheeze RR (95% CI)	Physician-Diagnosed Asthma HR (95% CI)
Use of sprays < 1 d/wk	2,016 (57.9)	1.00 (referent)	1.00 (referent)	1.00 (referent)
Use of sprays 1-3 d/wk	933 (26.8)	1.36 (0.99–1.89)	1.55 (1.17–2.06)	0.93 (0.51–1.67)
Use of sprays 4-7 d/wk	535 (15.4)	1.75 (1.21–2.54)*	1.08 (0.73–1.59)	2.11 (1.15–3.89)*
One type of spray used $\geq$ 1 d/wk	913 (26.2)	1.37 (0.99–1.90)	1.25 (0.92–1.69)	0.97 (0.53–1.77)
Two types of sprays used $\geq$ 1 d/wk	355 (10.2)	1.45 (0.92–2.27)	1.63 (1.10–2.41)	1.47 (0.70–3.06)
Three or more types of sprays used $\geq$ 1 d/wk	200 (5.7)	2.40 (1.47–3.91)*	1.80 (1.11–2.94)*	2.96 (1.33–6.56)*

\*linear trend <p.05

Adapted, Zock et al , 2007

Table 3 summarizes studies showing asthma among individuals whose job is cleaning. These include: housekeepers in hotels and hospitals; custodians in schools, offices and industrial facilities; and house cleaners.

**TABLE 3. STUDIES OF PROFESSIONAL CLEANERS**

Increased Risk of Asthma in Studies from Europe, Singapore, and South Africa Am J Ind Med 1994; 25:709-718 Lancet 1999; 353:1750-1754 South Africa Med J 2000; 90:884-888
Increased Risk of Asthma Limited to Private Home Cleaners-Spain Scan J Work Environ Health 2001; 27:76-81
Increased Risk of Asthma, from Many Industries-Food and Basic Metal Mfg Highest Eur Resp J 2002; 19:90-95
More Chronic Bronchitis, Lower Lung Function Eur Resp J 2002; 20:679-685
Increased Asthma Deaths-Hotel Clerks/Housekeepers/Butlers, Private Household Cleaners & Servants DHHS (NIOSH) #2000-105;2000

Table 4 shows additional data consistent with the risk of respiratory problems from exposure to cleaning agents. This additional information describes how poison control centers frequently receive calls related to cleaning agent exposures, as well as the presence of known sensitizers in cleaning compounds in addition to disinfectants that are known to be sensitizers.

**TABLE 4. DATA CONSISTENT WITH RISK OF ASTHMA FROM CLEANING AGENTS**

Cleaning Agents are the 2nd or 3rd most common exposure among adults who are reported to the American Association of Poison Control Centers Toxic Exposure Surveillance System (70,000–80,000 reports/year, 9–10% of all reports/year) (3)
Multiple sensitizers in cleaning compounds (4) <b>Aliphatic polyamines:</b> ethylene diamine; diethylene triamine; triethylene tetramine <b>Ethanolamines:</b> monoethanolamine; triethanolamine
Risk of persistent wheezing in young children up to the age of 3.5 years, associated with use of cleaning agents by their mothers when pregnant (5)
Reduced breathing function associated with blood level of chemical found in air fresheners, toilet bowl deodorants, and mothballs (6)

Multiple biologic mechanisms may be responsible for the association of asthma with cleaning products. First, inappropriate mixing of a cleaning product containing bleach with a cleaning product containing an acid or ammonia will release chlorine or chloramines. These irritants at sufficiently high exposures will cause Reactive Airways Dysfunction Syndrome (RADS). Second, chronic low-level exposures to irritants in cleaning agents may cause inflammatory changes and asthma. Third, individuals may become allergic to the sensitizers in cleaning products. There is no pre-testing of the ingredients of cleaning agents to determine if they cause asthma, so in addition to the known sensitizers, there are presumably additional ingredients that can cause asthma. Fourth, individuals who clean would be exposed to dust

and dust mites and some disinfectants have been shown in both animal and human studies to increase the risk of airway reactivity after exposure to a known allergen (7).

The widespread use of and exposure to cleaning agents at home and work points to the importance of the clinician's role in considering these agents as asthma triggers. A further consideration is that the exposure may occur not because the patient is using a cleaning product but because they are in the work area or the home when a cleaning product is being used by someone else. The lack of pre-testing of these products for their ability to cause asthma means that clinicians need to rely on their clinical histories and pulmonary function testing results to recognize new associations.

**KEY REFERENCES**

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# News

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v20n3: Clean as a Whistle, But What About that Wheeze

\*PS Remember to report all cases of occupational disease!

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