

Cleaning, Indoor Environmental Quality and Health: *A Review of the Scientific Literature*

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Introduction

This review of the scientific literature was created to advise school officials and other interested parties about the relationship between cleaning, indoor environmental quality and health. It was compiled from prior Minnesota Department of Health (MDH) technical papers and consultation reports written for school officials.

Arguably the most *widespread* deficiency in the indoor environmental quality of Minnesota schools, at this time, is inadequate cleaning. While a dirty, dusty, and minimally cleaned school may not constitute an environmental health emergency, it will likely worsen allergy and possibly other symptoms in sensitive building occupants. Virtually every district that the Minnesota Department of Health (MDH) has worked with in the past several years has reported cutting their maintenance budgets, including the numbers of custodians. MDH staff have personally observed the conditions of dozens of schools—dingy, stained, dusty and dirty surfaces were frequently observed. Inadequate cleaning can be obvious, and visual examples are provided in Figure 1. Although many districts have good written cleaning guidelines, typically these guidelines are not implemented due to funding limitations, insufficient numbers of maintenance staff, or inadequate training of staff.

Figure 1. Obvious Examples of Inadequate Cleaning in Schools



It can be difficult to see particulate loading (i.e., dust) on fleecy materials in classrooms (carpet, upholstered furniture, etc), but the dust layer on smooth surfaces that are infrequently disturbed (window ledges, ventilation diffusers, and shelf tops) can provide an impression of room cleanliness.

MDH has conducted two specific consultation studies in the past four years—one in elementary schools and one in child care centers. The goals of these studies were to evaluate facilities, implement Indoor Air Quality (IAQ) Management Plans that emphasized cleaning, and evaluate outcomes associated with implementing these plans. Data from these studies will be submitted for publication in a scientific journal. Findings from these studies are presented in this report, along with findings reported in the scientific literature.

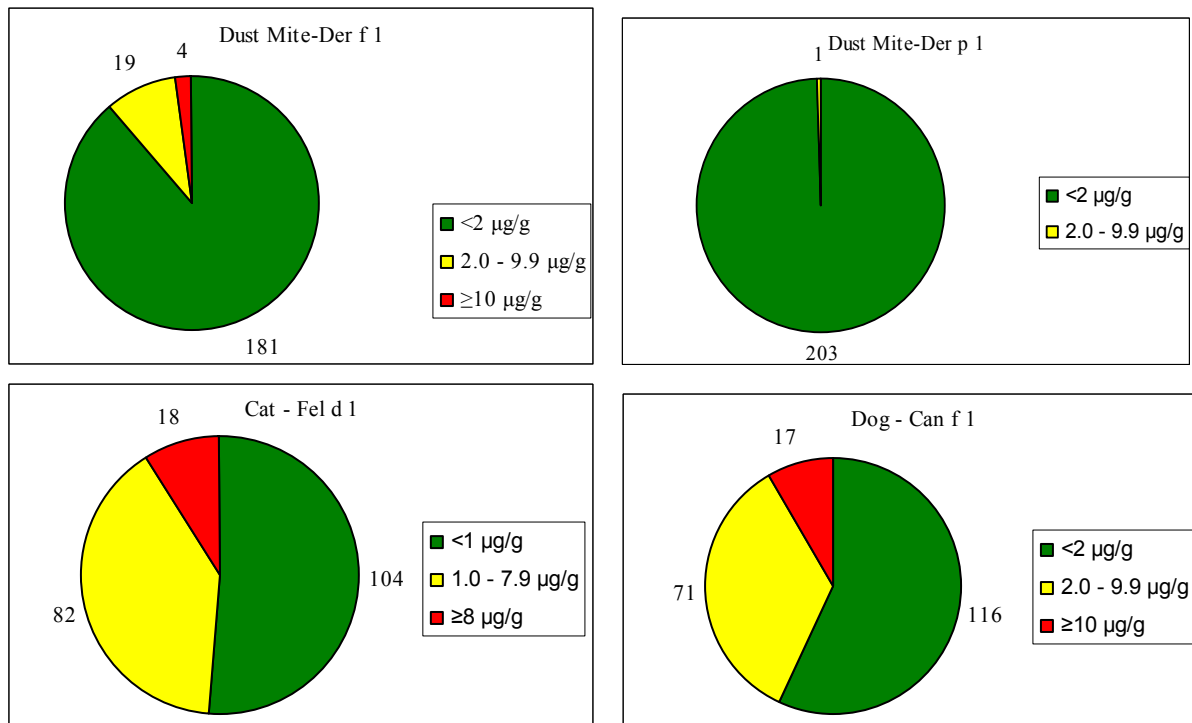
Allergens in Educational Facilities

Allergens are commonly found in schools, and this has been documented in dozens of published studies (reviewed in [1, 2]). The types of allergens that may be found in schools include dust mites, cockroaches, mold, cat, dog, mice, and pollens. The allergens are usually attached to particles. These allergen particles are part of the dust that is suspended in the indoor air and settled on surfaces in schools.

Allergens accumulate in school dust through different mechanisms. Dust mites are microscopic spider-like creatures that grow and multiply in materials that collect dust; they ingest, among other things, human skin cells that people naturally shed. Mold spores enter from the outdoor environment and may accumulate in buildings, which is also true for pollens. Mold spores can also be found in school dust due to mold growth in a building. Pet allergens are found in schools because they are transferred to schools on the clothes, bags, and other personal items of children and staff [3-8]. Mice allergens have not been reported much in the school literature because sampling for mice allergens has been a recent development and mice were not considered a significant trigger of symptoms. Mice allergens are presumed to be found in schools because they are ubiquitous in homes--one study reported 75% of homes sampled had mice allergens, a result of both infestation and transfer [9]. MDH has seen evidence of mice in schools and infestations have been reported to MDH anecdotally. Cockroach allergens can be found in homes in our region, although it appears to be rare in schools. In MDH's studies, one building reported having had cockroaches and only one sample collected had detectable levels of cockroach allergen.

The levels of allergens measured in schools have, in many studies [1, 2], exceeded risk thresholds for asthma symptoms and sensitization [1, 10-14]. In the school and child care studies, MDH identified elevated cat and dog allergens in several areas and elevated dust mite allergen in a few areas (see Figure 2).

Figure 2. Allergen Levels in Minnesota Schools



Elevated levels of allergens were found in carpet, floor tile, and upholstered furniture in Minnesota elementary schools and child care facilities. The pie charts show the numbers of areas that exceed risk thresholds. Samples were collected in 7 child care centers (60 areas sampled) and 6 schools (144 areas sampled) in Minnesota. Data are expressed in micrograms of allergen per gram floor dust, and then organized into ranges that correspond to proposed risk thresholds [15], defined as follows: green=low, less than levels associated with either sensitization or symptoms; yellow=moderate, levels may contribute to sensitization in predisposed individuals; red=high, levels may contribute to symptoms in sensitized individuals. Cat and dog allergens were frequently present at elevated levels. Dust mite allergens (almost exclusively Der f 1 allergen) were present at elevated levels in some samples.

Health and Learning

Studies have correlated levels of allergens in settled dust and the air of classrooms to respiratory health effects, such as allergy, asthma, and upper respiratory symptoms [3, 8, 10, 16-21]. One in eleven Minnesota children (about 98,000 children) have been diagnosed with asthma and about as many children have wheezing symptoms, some of whom could be undiagnosed asthma cases [22]. About 1/3 of asthmatics suffer from allergic asthma [23]. Moreover, about 11% of the population suffers from allergic rhinitis (i.e., hay fever) [24]. This population of individuals with allergic asthma and allergic rhinitis are the primary group of occupants who are susceptible to allergens that accumulate in schools. There are other types of environmentally induced illnesses that may be affected by indoor environmental pollutants; these are less common (e.g., hypersensitivity pneumonitis, immune suppression, certain sinusitis) or not well accepted by the medical community (e.g., multiple chemical sensitivities). In short, it can be estimated that at least 15-20% of occupants in school buildings may be susceptible to environmental pollutants commonly found in school dust.

Poor IEQ not only affects health, but it may affect student learning, staff productivity and attendance. Good housekeeping protocols that thoroughly removed dust from surfaces was found to have both health and comfort benefits [25, 26]. When building occupants experienced mild symptoms of distress or discomfort (dry eyes, itchy or watery eyes, dry throat, lethargy, headaches, chest tightness), they began to perceive a loss in performance [27]. This performance loss ranged from 3-8% depending on the number of symptoms. In another study, exposure to a reservoir of dust (an old carpet) affected subjects typing, arithmetic, logical, reasoning, memory, and creative thinking skills by 2-6% [28]. While motivation can overcome small burdens of environmental stress, continued environmental stress can drain a person's physical and mental resources, which ultimately can affect performance.

Reservoirs of Allergens

Surfaces and materials in schools that are not adequately cleaned can become 'reservoirs' of allergens. Occupants are exposed when these reservoirs are disturbed, for example by foot-traffic, occupant activities, or air currents. Floors are the largest reservoir of dust and allergens because of the large horizontal area they cover and due to deposition from foot traffic. Studies have consistently found higher levels of allergens in carpet compared to smooth floors [21, 29-37]. The MDH school study also found significantly higher levels of cat allergen, dog allergen, viable mold, and total dust in classroom carpeting compared to vinyl tile [37] (see Figure 3). Vinyl tile and carpeting in these schools were cleaned and maintained at the same frequencies, and yet the school carpeting was not as clean as the vinyl tile. Some of the ideal maintenance practices necessary to keep carpeting clean were not fully implemented in the schools, due to financial, logistic, and supervisory challenges. The practices that were lacking included deep cleaning carpeting twice a year, replacing carpeting according to manufacturer schedules, thorough daily vacuuming with high quality HEPA-filter vacuum cleaners, and maintaining cleaning equipment. The vinyl floor tiles were not maintained according to recommended guidelines either. MDH concluded that carpeting should be considered in classrooms only if the school administration is willing and committed to implementing and sustaining all the maintenance requirements for the lifetime of the carpet; if not, smooth flooring should be considered as the more practical and forgiving option for superior IAQ.

Figure 3. Comparison of Carpet and Vinyl Floor Tile in Schools

Contaminant	Average Concentration		
	Carpet	Tile	p-value
Cat ($\mu\text{g}/\text{m}^2$)	0.284	0.0137	<0.0001
Dog ($\mu\text{g}/\text{m}^2$)	0.446	0.0300	<0.0001
Dust (g/m^2)	0.269	0.0305	<0.0001
Mold (cfu/m^2)	17900	955	<0.0001

Contaminants were significantly higher in carpeting (79 areas sampled) in schools compared to vinyl floor tile (65 areas sampled). Levels were 9 - 20 times greater in carpet. All the differences were statistically significant (Mann-Whitney U Test). The results are shown in contaminant units per square meter of flooring area. Carpet also had significantly higher levels when contaminants were expressed in contaminant units per gram floor dust. As such, the difference (in units per square meter of allergen) between carpet and vinyl tile is about attributable to both greater dust loading and allergen density per gram dust. The p-values indicate that the probabilities that the difference is due to chance is virtually 0.

Floors are not the only surface that collects dust and allergens—window treatments, furnishings, ventilation diffusers, educational materials, and decorative items are also dust collectors.

- Window treatments are common in schools. They are frequently neglected in the cleaning routine, and can have higher levels of allergens than other areas [4]. The dust and allergens may be resuspended in air whenever the curtains or blinds are moved.
- Studies have found high levels of asthma triggers (cat, dog, settled dust, fine particulates, dust mites, and fungi) in fleecy materials (such as curtains, blankets, stuffed toys, cushions, and upholstered furniture) [4, 38, 39]. The MDH child care study found the highest allergen levels in upholstered furniture (see Figure 4). The difference was probably due to the less frequent cleaning of furniture (and perhaps direct contact with clothing).
- Dust settles on horizontal furnishings, such as shelves, desks, chairs, and counters. Elevated classroom cat and dog allergen levels were associated with open shelves [40] (opposed to closed cupboards). Hard to reach surfaces such as those over six feet from the floor can be the most dusty part of the classroom [41]. These surfaces are usually close to diffusers and the air blowing may resuspend the dust.
- Supply and return ventilation diffusers are also frequently neglected. The lung inflammatory potential of dust from diffusers and other non-floor surfaces was more than three times higher than floors [10]. This suggests the types of particles that adhere to these surfaces are particularly irritating to lung cells. It's important to keep these surfaces clean.

Figure 4. Comparison of Upholstered Furniture and Carpet in Minneapolis Child Care Centers

Contaminant	Median Concentration		
	Carpet	Furniture	p-value
Cat ($\mu\text{g}/\text{m}^2$)	0.420	1.580	0.00071
Dog ($\mu\text{g}/\text{m}^2$)	0.441	1.080	0.0119
Dust (g/m^2)	0.284	0.275	0.325

Cat and dog allergen were significantly higher in upholstered furniture (18 areas sampled) sampled compared to carpeting (42 areas sampled) (Mann-Whitney U Test). Total dust levels, however, were similar in carpet and furniture. As such, the difference between carpet and upholstered furniture is not from a difference in total dust, but due to the difference in concentration of pet allergen per gram dust. Higher furniture concentrations are probably because allergens are transferred directly from clothing to furniture at a greater rate and less frequent cleaning of furniture. Carpet concentrations in child care were similar to the carpet concentrations in school carpets shown in Figure 3 (Mann-Whitney U Test; p-values ranged from 0.2 - 0.8).

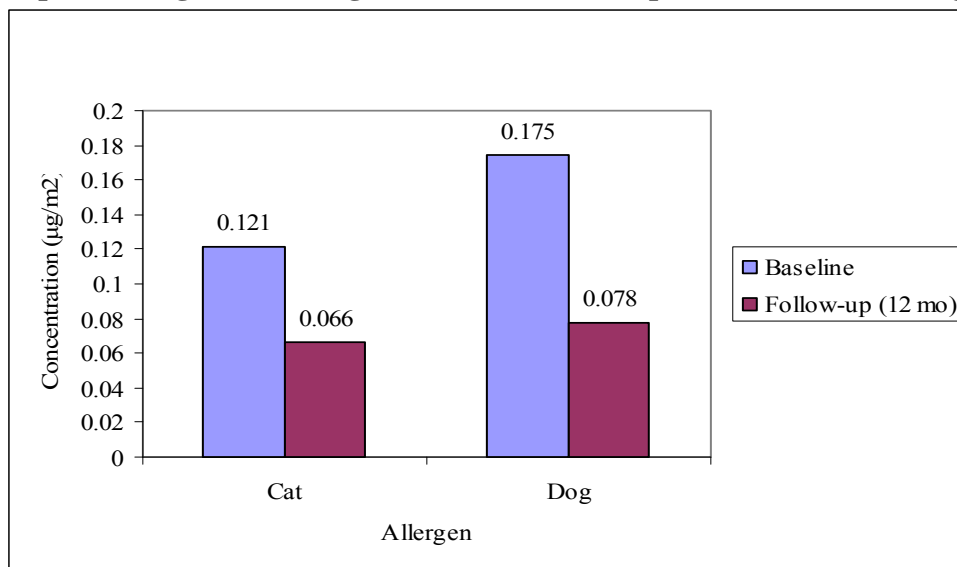
Role of Cleaning

‘Source removal’ is generally the preferred method of controlling environmental hazards. Dilution ventilation and air filtration are other options to control particles, but are not generally as effective as source removal. Regarding indoor allergens and other particulates in schools, source removal refers to thorough, frequent, and efficient cleaning that reduces the dust levels in the various reservoirs in schools.

In MDH’s school study, implementing IAQ Management Plans that emphasized cleaning was associated with a significant decline in levels of allergens present in classrooms [42]. Figure 6 describes the changes implemented in the schools and Figure 5 shows some of the allergen reductions observed. After cleaning improvements were implemented in schools, approximately 70% of areas that were sampled had lower levels of cat and dog allergens. In addition, there were fewer pet allergen levels in the moderate and high ranges for asthma health symptoms. Moreover, staff perception of IAQ improved (see Figure 7), which was statistically significantly in 5 of 6 schools.

Similar findings were observed in the child care study--implementing new IAQ Management Plans that emphasized cleaning was associated with lower allergen concentrations. The practices implemented are also shown in Figure 6 and the changes observed are shown Figure 8. The practices implemented are slightly different than what had been implemented in the MDH school study.

Figure 5. Concentrations of Allergens in Minnesota Schools Before and After Implementing IAQ Management Plans that Emphasized New Cleaning Practices



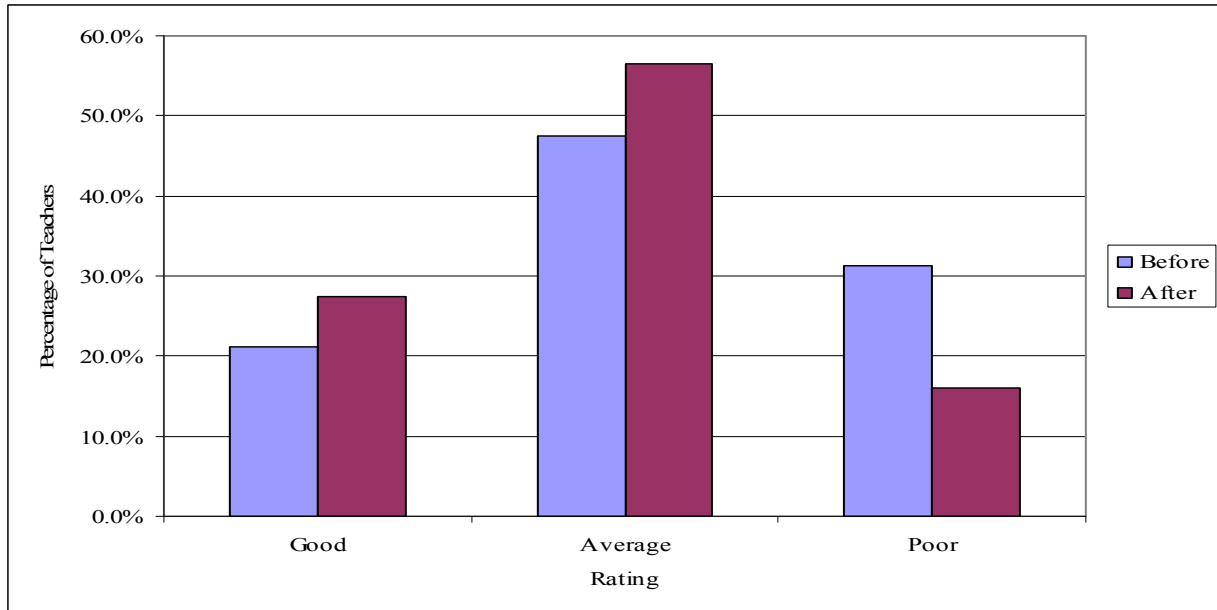
Average cat and dog allergen in settled dust declined after schools implemented IAQ Management Plan recommendations. Most of the implemented recommendations were in the areas of cleaning and housekeeping (see Figure 6 for details). The decline in cat allergen was statistically significant with 50/72 samples lower at follow-up ($p=0.0013$; Sign Test). Similarly, the decline in dog allergen was significant with 49/72 samples lower at follow-up ($p=0.003$; Sign Test). Viable fungi (data not shown) declined from 7,956 colony forming units per m² to 5,435 colony forming units, but the change was not significant ($p=0.29$; Sign Test; data not shown). The change can be attributed primarily to a decline in pet allergen concentrations per gram floor dust and, to a lesser extent, a decline in total dust levels.

Figure 6. Improvements Observed in Schools and Child Care Centers that Implemented IAQ Management Plan Recommendations

Observed Improvement	Schools	Child Care
<i>General Building</i>		
Increased air movement in restrooms	√	
Cleaner building entrance mats	√	
Cleaner ventilation filters	√	√
Superior ventilation filter efficiency	√	
No filter by-pass		√
Larger entrance mats	√	√
Entrance mats installed		√
Cleaner restrooms	√	
Use of HEPA filtered vacuum cleaners		√
Better maintenance of vacuum cleaners		√
Cleaner floors		√
New flooring		√
<i>Classroom</i>		
Cleaner floors	√	√
Cleaner ventilation diffusers	√	√
Cleaner horizontal surfaces (e.g., shelves)		√
Fewer fleecy items	√	√
Less clutter	√	
Fewer stuffed toys	√	
Less open shelving		√
New flooring	√	√
Unobstructed air return	√	
Increased outdoor mechanical air volume	√	
Less use of chalkboards*		√
Food in closed containers*	√	
Fewer plants*	√	

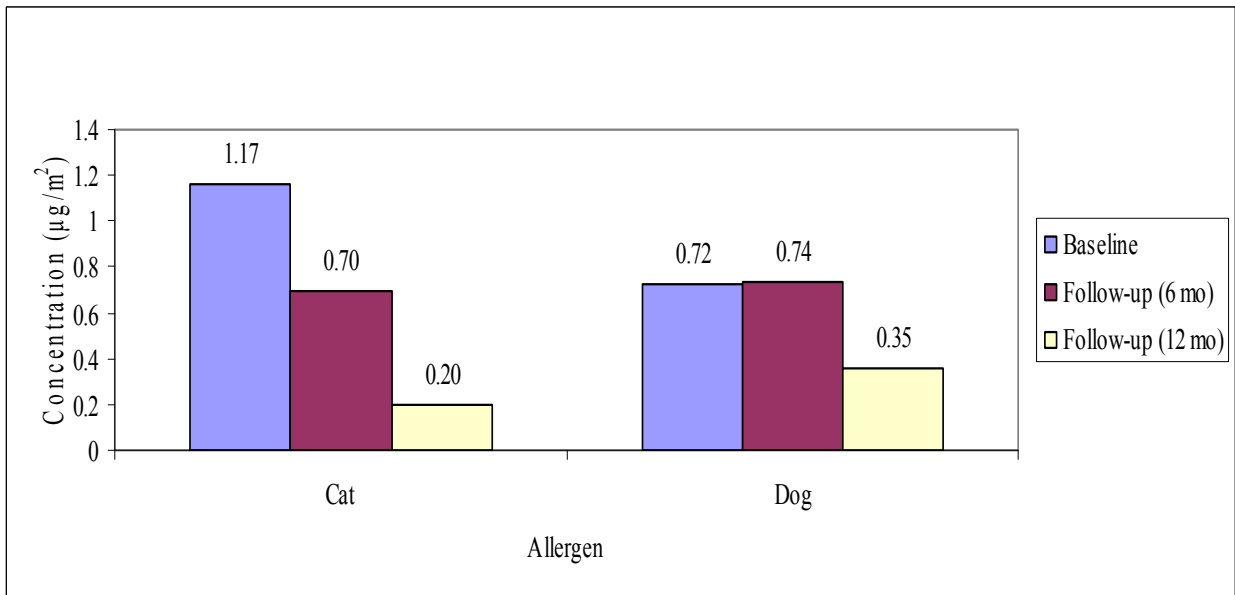
*Schools and child care centers implemented a variety of changes that could impact dust levels including allergens. These were observed during walk-through inspections of the building. Most of the changes are in the areas of cleaning and housekeeping. Note that the last three improvements listed (indicated by *) should only impact total dust levels, not pet allergens). The table shows the sizable improvements that were directly observed in one or more buildings. 'Sizable improvement' is defined as an average of ≥ 0.5 areas where the problem improved. The most prevalent improvement was for classroom dusty horizontal surfaces. The table does not list specific problems that improved in some centers but worsened in other centers, problems that showed only a slight improvement or improvements that were merely reported by building staff.*

Figure 7. Staff Perception of Classroom Air Quality Before and After Implementation of IAQ Management Plans that Emphasized New Cleaning Practices



Teaching staff's perception of air quality improved in schools that implemented IAQ Management Plans that emphasized better cleaning practices. Paper surveys were distributed to teaching staff in the six schools in 2004 and a year later in 2005. About 70% of all eligible staff responded to the surveys.

Figure 8. Concentrations of Allergens in Minneapolis Child Care Centers Before and After Implementing IAQ Management Plans that Emphasized New Cleaning Practices



Average cat and dog allergens in child care declined after child care staff implemented IAQ Management Plan recommendations. Most of implemented recommendations were in the areas of cleaning and housekeeping (see Figure 6 for details). The decline in cat allergen per square meter was significant with 19/20 locations having lower levels by the 12 month follow-up ($p=0.00004$; Sign test). The decline in units ug per gram floor dust was also significant with 18/20 locations lower by the 12 month follow-up. The decline in dog allergen was marginally significant with 15/20 locations having lower levels by the 12 month follow-up ($p=0.041$; Sign test), but the decline in units per gram floor dust was not significant (only 11/20 declined). Overall dust concentrations declined from 0.29 to 0.23 g/m², but the change was not significant (12/20 declined, $p=0.50$; Sign Test). The findings suggests the decline in pet allergens was primarily due to a decrease in allergen per gram dust, but also to a lesser extent due to a change in overall dust amount.

There are several cross-sectional studies in the scientific literature. These studies assessed conditions in different educational facilities at a moment in time and found an association between lower allergen concentrations in buildings that had preferable environmental conditions, especially cleaning and housekeeping factors. For example, child care facilities with allergen avoidance measures in place--no carpeting, daily floor cleaning, weekly laundering of sheets, monthly cleaning of soft toys, and synthetic mattress covers--had low or very low levels of allergens (generally much less than 2 ug/g) compared to regular child care [43]. Other studies have reported a correlation between lower allergen concentrations and increased ventilation [18, 21, 39, 44], newer flooring [45], less open shelves [40], efficient cleaning tools (e.g., new HEPA vacuums) [18, 39, 40, 45, 46], thoroughness of cleaning [18, 39, 40, 47], frequency of cleaning [44, 48], and use of mattress covers [47].

Studies have also introduced changes to schools and child care building and then measured a variety of improvements after some time, which is similar to the MDH studies described above.

- Changes to ventilation, cleaning frequency, cleaning thoroughness, removal of fleecy items, and use of new vacuum cleaners resulted in a 90-95% reduction in cat and dog allergens [49].
- Implementing an effective routine cleaning program involving deep cleaning of flooring, furniture, fixtures, windows, and non-classroom areas, followed by improved routine cleaning was shown to reduce contaminants significantly. Levels of dust, volatile organic chemicals, bacteria, and fungi declined 29% to 84% [38, 50].
- Cleaning of floors and easily accessible horizontal surfaces reduced classroom dust levels by 21-42% [51].
- More frequent cleaning of desk surfaces was associated with less nasal congestion and signs of allergic reactions [17].

Implementing a broad spectrum of environmental interventions can yield a significant reduction in levels of indoor contaminants. A cleaning program that involves thorough, frequent, and efficient cleaning of rooms is critical to creating a healthful school environment. This is not to suggest that cleaning is the only or best way to deal with certain specific problems. Where there are infestations of dust mites, pests, or microbial growth these organisms should be remediated through various other means; cleaning should also be a component of remediation in removing residual contamination.

Actions School Staff Can Take

A school or district maintenance department can implement a variety of changes to improve the indoor environment. It is recommended that school officials complete a thorough review of their custodial operations, including staff levels, cleaning tools, staff times dedicated to cleaning areas, and staff training needs. The following are general guidelines for maintenance programs to consider as part of their cleaning and house-keeping program.

- Floors should be cleaned daily, including all exposed surface areas (not just high traffic areas).
- Food prep areas, tabletops, desktops, door handles, and other frequent contact surfaces should also be cleaned frequently, preferably daily.
- Other surfaces should also be cleaned periodically (monthly, quarterly) such as furniture, shelves, cupboard tops, window ledges, ventilation diffusers, storage areas, etc.
- For superior efficiency, a microfiber cloth and HEPA filter vacuum should be used for cleaning hard surfaces and carpet [52].

- If there are too many open shelves to clean or they're hard to reach, enclosed storage units should be considered (such as cabinets, plastic containers, etc).
- When replacing curtains and horizontal blinds, consider replacing with non-fleecy vertical blinds; if curtains must be used, use synthetic rather than natural fabrics [53].
- Fleecy items (bedding, stuffed toys, clothing, pillow covers) should be laundered where possible.
- Materials that can't be laundered should be dry cleaned, vacuumed, and/or placed in a dryer on hot air or replaced with items that can be laundered [39].
- The interior of ovens should also be reasonably clean. Food debris covering the interior burns during oven operation, which produces soot (fin particles).

Teachers and other staff also play a critical role in facilitating cleaning. Teachers' efforts will save custodians time and increase the efficiency of their work. The following are general guidelines for school administrators to consider as part of their teacher policies.

- Teachers should minimize clutter. Books, projects, and games stacked on floors and counters that are infrequently used can be defined as clutter. Cluttered surfaces cannot be cleaned. Adequate enclosed storage space for these items should be provided, but teachers must also avoid keeping items that probably won't be used.
- Staff should minimize fleecy items on display, such as stuffed toys, decorative items, and hanging items. These items can collect dust and act as reservoirs of dust, releasing particle from time to time. Fleecy toys that are routinely handled can collect skin cells, which are a primary food source for dust mites. These stuffed toys should be routinely cleaned or removed.
- Second hand furniture should not be permitted in the school, because these can be loaded with pet allergens and mold spores from the previous owner's home.
- Students and staff can help custodians with cleaning by placing chairs on tables or stacking in a corner and placing trash cans in the hallway for pickup
- Eating in classrooms should be minimized, and teachers should clean food debris on tables and other surfaces
- Teachers should maintain animal habitats and properly care for plants, to prevent messes and water and urine from soaking carpets and other materials.

Calculating the Number of Custodians for Cleaning

It is difficult to create a healthful school environment without adequate custodial staff. Custodians perform routine cleaning and maintenance work that is essential to controlling allergens and irritants that are present in schools. These contaminants settle onto surfaces that need to be thoroughly cleaned to minimize students and staff exposure.

The Minnesota Department of Health has recommended one custodian per 25,000 sq ft in schools. This is an approximate ratio based on information from national organization described in best practices and conference proceedings. The ratio does not factor the types of rooms and floor coverings present. It should be viewed as the lower end for minimally adequate cleaning. In MDH's school study, most schools were above this ratio (see Figure 9).

There are technical methods to calculate staffing needs, which factors various features of a school. The amount of cleaning needed for a room depends on: the type of flooring, the number of hours it is used; the number of students; the amount of dust collecting furnishings, materials, and clutter; and the presence of plants, animals, and activities. Some maintenance supply vendors offer services to develop detailed maintenance plans for schools, including calculating

the proper number of staff. In our experience, facilities management companies and professional associations recommend between 10,000 and 25,000 square feet per full-time custodian as the ideal ratio.

Figure 9. Ratio of School Size to Number of Custodians

School	Custodians (FTE)	Square Footage	Ratio
1	3	69,000	23,000
2	3	96,000	32,000
3	5.25	150,000	28,571
4	1.5	56,158	37,439
5	5	148,000	29,600
6	1.38	103,000	74,909
Average	3.19	103,693	37,587

Data provided by school administrators as part of MDH’s school study.

The APPA has a best practice resource entitled “Custodial Staffing Guidelines for Educational Facilities” (available through www.appa.org). This resource provides guidance for calculating the number of custodians necessary to create a healthful school. A school can be categorized regarding its cleanliness using APPA criteria as described in Figure 10. The APPA recommends schools strive for a Level 2 (“Ordinary Tidiness”) maintenance condition. This corresponds to approximately 15,000 sq feet per custodian for a typical school where over 80% of the square footage is classrooms, hallway, cafeteria, gym, and offices. The exact ratio for a particular school will depend on the size of different areas and the types of flooring. Each school should calculate their own unique needs. The Rochester Public Schools has been using this system to evaluate the cleaning program and outcomes in its buildings.

Conclusions

Allergens are commonly found in schools and may contribute to respiratory and other health symptoms, especially among student and staff with allergic asthma, allergic rhinitis, and possibly other respiratory conditions. MDH’s studies identified the presence of elevated allergens in some areas Minnesota schools and child care centers, and similar findings have been reported in the scientific literature. Moreover, MDH’s studies found that improving cleaning practices reduced dust and allergen levels in Minnesota educational facilities. The scientific literature has also identified a clear association between cleaning and levels of allergens. School administrators are encouraged to review their custodial and associated practices and policies. An effective cleaning program should be a key component to fostering a healthful and productive learning environment.

Figure 10. APPA Definitions for Cleanliness Goals

Level 1—Orderly Spotlessness

- Floors and base moldings shine and/or are bright and clean; colors are fresh. There is no buildup in corners or along walls.
- All vertical and horizontal surfaces have a freshly cleaned or polished appearance and have no accumulation of dust, dirt, marks, streaks, smudges, or fingerprints. Lights all work and fixtures are clean.
- Washroom and shower fixtures and tile gleam and are odor-free. Supplies are adequate.
- Trash containers and pencil sharpeners hold only daily waste, are clean and odor-free.

Level 2—Ordinary Tidiness

- Floors and base moldings shine and/or are bright and clean. There is no buildup in corners or along walls, but there can be up to two days worth of dust, dirt, stains, or streaks.
- All vertical and horizontal surfaces are clean, but marks, dust, smudges, and fingerprints are noticeable upon close observation. Lights all work and fixtures are clean.
- Washroom and shower fixtures and tile gleam and are odor-free. Supplies are adequate.
- Trash containers and pencil sharpeners hold only daily waste, are clean and odor-free.

Level 3—Casual Inattention

- Floors are swept or vacuumed clean, but upon close observation there can be stains. A buildup of dirt and/or floor finish in corners and along walls can be seen.
- There are dull spots and/or matted carpet in walking lanes. There are streaks or splashes on base molding.
- All vertical and horizontal surfaces have obvious dust, dirt, marks, smudges, and fingerprints. Lamps all work and fixtures are clean.
- Trash containers and pencil sharpeners hold only daily waste, are clean and odor-free.

Level 4—Moderate Dinginess

- Floors are swept or vacuumed clean, but are dull, dingy, and stained. There is a noticeable buildup of dirt and/or floor finish in corners and along walls.
- There is a dull path and/or obviously matted carpet in the walking lanes. Base molding is dull and dingy with streaks or splashes.
- All vertical and horizontal surfaces have conspicuous dust, dirt, smudges, fingerprints, and marks. Lamp fixtures are dirty and some lamps (up to 5 percent) are burned out.
- Trash containers and pencil sharpeners have old trash and shavings. They are stained and marked. Trash containers smell sour.

Level 5—Unkempt Neglect

- Floors and carpets are dull, dirty, dingy, scuffed, and/or matted, There is a conspicuous buildup of old dirt and/or floor finish in corners and along walls. Base molding is dirty, stained, and streaked. Gum, stains, dirt, dust balls, and trash are broadcast.
- All vertical and horizontal surfaces have major accumulations of dust, dirt, smudges, and fingerprints, all of which will be difficult to remove. Lack of attention is obvious.
- Light fixtures are dirty with dust balls and flies. Many lamps (more than 5 percent) are burned out.
- Trash containers and pencil sharpeners overflow. They are stained and marked. Trash containers smell sour.

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