

Environmental Microbiology of Carpet Myths, Mysteries, and Mold Spores

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Today, many indoor air quality (IAQ) consultants and interior furnishing specifiers are reluctant to specify carpet, primarily based on perception rather than scientific facts. Many of these individuals view carpet as a harbinger of chemical and biological emissions that contribute to poor IAQ. Recent studies have shown that carpet can be a beneficial flooring surface for both educational and health care environments. This article will review select studies, explore the microbiology of carpet, and dispel many of the negative perceptions related to carpet in these markets.

A study by Dr. Michael Berry (retired EPA Indoor Air Quality Scientist and professor at University of North Carolina) found that carpet in schools, when appropriately maintained, did not contribute negatively to IAQ. These findings are outlined in the renovation study of Charles Young Elementary School in Washington D.C.¹ Biopollutants and volatile organic compounds (VOCs) were among the environmental factors studied in the renovation of the school. Measurements of airborne microorganisms were taken in the most health-sensitive areas of the school; a carpeted pre-K area and a lunch room area with hard floors. According to Dr. Berry, "IAQ levels in the school, none of which indicated a problem, tended to be higher over hard surfaces than over carpet. This finding reinforced and validated the decision to specify carpet throughout the building for comfort and noise control." Dr. Berry also extolled the principle of "clean for health first." The primary objective of all cleaning in schools should be

to guard the health of the occupants. Cleaning should complement, not replace, basic hygiene practices such as frequent hand washing, surface disinfection, effective waste disposal, and management of communicable disease. Steps to minimize human exposure to pollutants include the use of walk off mats at entrances to trap pollutants, use of high efficiency filters on vacuums, immediate cleaning of body fluid spills, and use of non-toxic cleaning agents. In summary, Dr. Berry states, "Carpet floor coverings are essential in making the classrooms work." For example, student reading skills have greatly improved because of open classes and flexibility of teaching associated with total usable space that includes the floors. An ability to communicate between student and teacher is possible only with good sound control. Classrooms at Charles Young have estimated sound levels that range been 58 and 65 decibels. Normal speech can be easily heard throughout the school building. The use of carpet in the Charles Young School makes satisfactory sound control simple and economical to achieve. Research has shown that "without carpet, effective sound control in open space classrooms is virtually impossible to achieve" (School Facilities and Transportation Division, State of California, 1986)².

Dr. Alan Hedge of Cornell University echoed statements from Dr. Berry. He states, "Concerns that carpeting in schools is contributing to an increase in respiratory problems, allergies, and asthma in schools are unfounded. As long as schools keep floors clean and use high efficiency microfiltration vacuum bags, carpets can be a healthy, safe and economical floor covering in schools and day care centers."³ Dr. Hedge reported that carpet can improve IAQ because it

captures and holds dirt, contaminants and allergens that would otherwise become airborne. He also reported that carpet can improve classroom acoustics and promote child safety by protecting against slips and falls. Dr. Hedge also referred to the Swedish data which cited the banning of carpet in schools in the late 1980's only to result in skyrocketing asthma rates in children ever since; an unexpected result. Swedish professors Shishoo and Börjesson argued that the removal and decline of carpet usage did not mean improved conditions for allergic patients⁴.

The CDC reviewed carpet use in health care and found that it has been used both in public and patient care areas for over thirty years⁵. The CDC also found that carpet provides superior acoustics and a more "humanizing-homelike" environment for the healing process. Findings regarding the microbial ecology of carpet include that "carpets accumulate a diverse population of bacteria and fungi (mainly dormant spores) that are temporarily reduced following cleaning only to accumulate (due to traffic and non-sterile air) to a steady state level between cleanings." Key points made by the CDC include that carpets do not influence hospital acquired infection rates and use of carpet tiles is advised when carpeting is specified in areas where spills are likely to occur. The CDC states that carpet tiles can be removed, isolated, cleaned and replaced. Modular carpet also provides for effective disinfection of the sub-floor level, something that other soft surface flooring products will never achieve.

The microbial ecology of carpets really parallels the microbial ecology of air filters. Air filters are three dimensional porous structures meant to trap and hold airborne contaminants, including dirt, pollen, allergens and microbial spores. Carpet tiles are the same in that they are also three dimensional, porous structures (disregarding the structured backing) which since “gravity works”, trap and hold these airborne or occupant borne contaminants. While air filters often contain components such as cotton fibers and cardboard frames that make them susceptible to microbial colonization, modern synthetic carpet tile has few components susceptible to such growth. Moisture is the number one limiting factor that determines if the spores of bacteria or mold will germinate and grow. Knowing this, it makes sense to inhibit growth at or in components that hold moisture. Interface, for this reason, incorporates Intersept[®] at the base of the carpet fibers, at the primary backing layer. Intersept inhibits microbial spore germination and active growth, thus keeping the carpet more hygienic between normal cleaning procedures. The only situations where active mold colonization was noted on synthetic carpets was when it was overly soiled and allowed to remain wet for extended periods (>72 hours).

Perception/Myth 1: “Carpet emits harmful, irritating chemicals.”

Fact: Interface has worked with raw material suppliers and processes to ensure that our carpet tile meets or exceeds the requirements of the CRI Green Label Indoor Air Quality Test Protocol, the State of Washington protocol, and the California High Performance Schools Initiative criteria.

Perception/Myth 2: “Carpet grows mold and bacteria.”

Well maintained carpet does not “grow” mold and bacteria. It accumulates dormant mold and bacterial spores, which in the absence of sufficient moisture and food, cannot grow. Furthermore, carpet holds these spores until they can be removed by vacuuming and deep extraction cleaning.

Perception/Myth 3: “Carpets cause asthma and allergy symptoms to worsen.”

These perceptions were not validated in the monitoring of asthma in children following the removal of carpets from schools in Sweden. In fact, these symptoms worsened following the removal of carpets.

Perception/Myth 4: “Carpets are not suited for school environments.”

Carpet tile improves several aspects of the learning environment, including safety (reduced slips and falls), hearing and comprehension, (improved acoustics leads to better learning), sight, (reduced glare as compared to hard and shiny floors), and student morale, (higher design aesthetics and school pride because it is more like home).

Perception/Myth 5: “Carpet is dirty, causes infections, and not suited for the health care environment.”

Carpet tile, when properly constructed, preserved, and maintained with methods that minimize dust dispersal, are quite suitable for the healing environment.

Carpets lower background noise, provide a warmer interior (both thermally and aesthetically), and reduce slips and falls among the elderly or infirmed.

While carpet is not suited for every application within education and health care (food preparation or operating theaters), Interface carpet tile with structured backing, Intersept antimicrobial, solution dyed nylon fiber, and superior design and sustainable attributes found in the I² collection represents the “best of the best” soft surface flooring for these challenging environments.

References:

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