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THE ROLE OF CLEANING AND MAINTENANCE IN THE REDUCTION OF BIOLOGICAL CONTAMINATION IN CARPETING

CARPET AS A SINK

When one thinks of the words "biological contamination", many thoughts are conjured up in his/her mind. The most noticeable are thoughts of disease causing germs and bacteria growth. But rarely are these thoughts linked to the soiling and contamination present in a poorly maintained, dirty carpet. Yet we know that carpet acts as a sink, collecting and filtering many things from within the indoor environment. Imagine a tile kitchen floor that was never mopped. How about a public restroom that was never cleaned with a disinfectant. Rarely is carpet thought of as a source of biological contamination. However, if it is not properly maintained, it can become a breeding ground for disease causing bacteria.

SOURCES OF BIOLOGICAL CONTAMINATION

Within the home or building environment there are many potential sources of biological contamination. These include heating and air conditioning systems, heat and moisture , shower heads, household pets, contaminated foods, humans, outdoor contaminants that migrate indoors, dust mites, cockroaches, and water damage. Obviously, the bacteria that culminated from these sources may either migrate to the carpet or literally start there. Whatever the case, carpet can become a breeding ground for bacteria growth, If it is not properly cleaned and maintained, carpet can contribute to health problems.

Specific sources of biological contamination in carpeting include dust mites. Humans shed their skin seven times a year. Dust mites thrive and feed on protein matters such as dead skin. According to the British Textile Technology Group, 83% of household dust comes from human dead skin cells. Dust mites may contribute as a source of biocontamination. Their role is often debated and often overemphasized.

Another obvious source of germs in carpets, but often times ignored by the carpet consumer, are household pets - specifically dogs and cats. Recent surveys by Du Pont indicate that 70% of U.S. homes have a dog or cat or both. Unfortunately, all too often the home's carpeting is used as a disposal ground for urine and feces. Yet, much of the time, this goes untreated and ignored by the homeowner. Imagine what kinds of diseases would grow in a bathroom that was never cleaned or disinfected. That is taking place in many homes' carpeting right now.

A third specific source of biocontamination is the common household food and beverage spills. If some food would spoil if it were left unrefrigerated, then those same food particles would spoil if they were spilled into carpet and left there.

POTENTIAL PROBLEMS FOR A CONTAMINATED CARPET

What potential problems exist from a carpet that contains biocontamination and is left untreated and uncleaned? The obvious one is that disease causing bacteria can thrive and grow, creating at best an unhealthy home, at worst, sickness and disease within the home. Increased allergic reactions and responses are quite common. Dr. Thomas Platts-Mills, Head of Allergic Medicine at the University of Virginia Medical

School, estimates that somewhere between 500,000 to 1,000,000 hospital visits are made each year by patients allergic to biocontaminants. A secondary threat is to the carpet. It will degrade and break down the fibers and backings faster. Its life will be shortened. Finally, there is much evidence supporting the idea that an "unhealthy" atmosphere can lead to a feeling of general malaise. A lack of productivity and effectiveness is the end result!

WHAT IF THE CARPET INDUSTRY IGNORES THIS WHOLE PROBLEM?

We know what some of the potential health and productivity costs of biological contamination are to the carpet consumer. But what about the carpet value chain? What happens if only cleaners pay attention to this problem and it is ignored by fiber producers, carpet mills, and carpet retailers?

Too often, a lack of understanding of the basic values of carpeting has led to a "head in the sand" approach by some within the carpet industry. A proper understanding of the purpose and role of carpeting should make a person realize that it is good that carpet acts as a filter and collection center for contaminants. It traps them where we can remove them through cleaning. Otherwise they would continue to migrate throughout the indoor environment.

Recent attacks on carpeting have focused on the possible effects of chemical off-gassing from new carpeting. Much effort is being extended in researching the effects of new carpeting. But some in the carpet industry continue to ignore the fact that carpeting gets dirty and needs to be adequately maintained. The cost of this ignorance could be great. Liability, health hazards, increased government scrutiny, heightened awareness in the media , and unfounded paranoia by the public are just a few of the potential costs. This could lead to a loss of market share. Whether by consumers choosing other floor covering alternatives or by government regulation or even prohibition of carpeting, we would all lose.

REDUCING BIOLOGICAL CONTAMINATION

So how do we correct this situation? How do we reduce biological contamination in carpeting? By periodic professional hot water extraction carpet cleaning - that's how. Sounds simple enough, but science supports us here.

Principles Of Sterilization, Disinfection, Sanitation

Principles of sterilization, disinfection or sanitation teach us that there are five primary reasons for eliminating biocontamination:

1. To prevent the transmission of disease
2. To reduce the growth of allergens
3. To protect materials that may be destroyed by microorganisms
4. To provide a more productive atmosphere
5. To reduce or eliminate odors.

Primary Methods Of Sterilization, Disinfection, Or Sanitization

There are four primary methods to sterilize, disinfect, or sanitize:

1. Destruction of the microorganisms through fire or powerful oxidizing agents
2. Killing or inactivating microorganisms by chemical application or ionizing radiation
3. Intense heat (preferably moist) maintained over 130˚F
4. Physical removal by means of agitation and extraction

Defining What Cleaners And Cleaning Are Capable Of

Am I ringing any bells yet? Before we proceed here, its important to understand what we are and are not capable of accomplishing by cleaning dirty, contaminated carpets. In order to do this, we must understand the definitions of sterilization, disinfection, and sanitization. Sterilization means, "the removal of all life forms of any kind from any object or material". Disinfecting means, "the removal or destruction of those living organisms which many otherwise cause damage or infection. In disinfection, removal of all microorganisms is not necessary, but it is on those which produce undesirable results. Disinfection kills all pathogenic germs." Finally, sanitation means, "control of physical factors in the human environment that could harm development, health, or survival."

Upon close review of the definitions, we as professional cleaners cannot create a sterilized environment, nor would we want to. Through the use of special chemicals, we can apply a disinfectant to a specific surface; but, truthfully, we cannot disinfect the entire surface. But we can sanitize and we do! We contribute to the creation of a healthier, less contaminated environment by "controlling the physical factors in the human environment that could harm development, health or survival." We reduce the biocontaminants in a carpet by cleaning it with hot water extraction cleaning. In order to maximize our effectiveness at sanitizing, we need to closely examine properly using cleaning to accomplish this.

Cleaning As A Biocontaminant Reducing Process

Carpet cleaning must be looked at from three points of view as a process to reduce biological contamination. First, it is corrective. It takes an unhealthy situation and makes it better. Second, it is maintenance. It prevents the development of many microorganisms in the indoor environment. Third, cleaning may be used to immediately treat and remove potentially harmful contamination.

So how can hot water extraction cleaning of a carpet be a sanitizing process? First, by cleaning. The detergents and surfactants sanitize and clean by assisting in physical removal of pollutants and contamination. Secondly, by agitation - both with water and vacuum extraction. This helps in the physical removal of particulates. The water impact dislodges soiling, water flushing supports removal, and the immediate powerful vacuum prevents repenetration and supports biocontaminant removal. In addition, the powerful vacuum reduces drying time. Third, by the temperature of the cleaning solution. Since test studies show that 70˚ to 80˚F temperature is lost between the cleaning unit and when the cleaning solution strikes the carpet, only fuel oil fired heating systems can create temperatures which reach sanitizing levels (consistently maintaining above 130˚F). Fourth, by chemical treatment. E.P.A. registered quaternary disinfectants can assist in correcting and controlling restorative cleaning situations.

The advent of anionic stain resistant chemical treatments has reduced the use of cationic disinfecting chemical solutions and nearly eliminated the use of cationic detergents which contained disinfectants. However, sometimes the reduction of microorganisms should take precedence over the stain resistance. If conditions warrant, disinfecting chemicals should be used. However, this should never be done without the full understanding of the carpet consumers that this application may invalidate their warranty and render almost useless their stain protection. Thankfully, the stain protection can be restored through the application of after market stain resistant treatments such as Du Pont MasterSeries®.

We should also discuss a particular concern of many doctors in reference to the potential ability of cleaning to reduce biological contamination in carpeting. If carpet is serving as a reservoir for the growth of fungi, mold, and mildew, it is not enough simply to kill the mold and mildew. We must also remove the resulting spores from the environment. This should be accomplished by the simple vacuum agitation and rinsing extraction of the cleaning process. This process would collect spores in the waste tank for outside disposal.

Let's now compare how hot water extraction cleaning meets the "methods of sanitizing" discussed earlier. Cleaning does not destroy the microorganisms through fire or oxidation. However, we can contribute to the sanitizing process by the application of a disinfecting chemical. We can use quaternary disinfectants or residual anti-microbials. By the application of hot cleaning solutions which maintain at least 130˚F during the cleaning process, we are contributing to the sanitizing process . Finally by means of agitation and extraction with water and air flow, we are enhancing physical removal of biocontaminants.

What About Other Carpet Cleaning Methods?

Do they reduce biological contamination in carpeting? Look at the methods of sanitizing and compare:

Dry Powder Cleaning (Absorbent Compound Method):

1. Does not destroy microorganisms through fire or powerful oxidizing agents.
2. Does not use disinfecting quaternary disinfectants except in problem situations. (Cleaning method discourages application of water based chemicals.)
3. Does not use temperature or heat
4. Some physical removal is accomplished in the vacuuming process; however, much of the cleaning chemical is left behind. The carrying agent of this chemical may b e

cellulosic matter such as ground up corn cob. Some physical removal is accomplished by absorption by the carrying agent of some contamination that is removed in subsequent vacuuming.

Spin Bonnet Cleaning:

1. Does not destroy microorganisms through fire or oxidizing agents
2. Can use disinfecting quaternary disinfectants. However, application of additional water based cleaning solutions is discouraged except during problem cleaning.
3. Does not use temperature or heat.
4. Some physical removal is accomplished by the absorption of contaminants into the spin bonnet.

Dry Foam Shampoo:

1. Does not destroy microorganisms through fire or oxidizing agents.
2. Does not use disinfecting agents. This cleaning method discourages the application of water based chemicals except in problem situations.
3. Does not use temperature or heat
4. Accomplishes some physical removal through dry vacuum extraction

Shampoo:

1. Does not destroy microorganisms through fire or oxidizing agents.
2. Can use disinfecting agents
3. Does not use temperature or heat
4. Very little, if any, extraction is used

Low Temperature, Low Pressure Hot Water Extraction Cleaning:

1. Does not destroy microorganisms through fire or oxidizing agents.
2. Can use disinfecting agents
3. Discourages the use of temperature or heat above 110˚F at the carpet
4. Accomplishes some physical removal. However, success is reduced in comparison to higher pressure hot water extraction cleaning because only low pressure water agitation is used.

You can see that although other carpet cleaning methods do accomplish some reduction in biological contaminants, none can be nearly as effective as hot water extraction cleaning. When looking strictly at principles of reducing biological contamination as outlined by Banerjee and Cheremisnoff in their book, Sterilization Systems, or by the Principles of Sanitation established by the Food Processors Institute, this becomes obvious. Arguing against these principles is arguing against the scientific principles of sanitization.

WHAT LEVEL OF CONTAMINATION CAN WE REMOVE?

How much of this biological contamination do we remove? How great of a contribution can we make to improving indoor air quality? Everyone has an opinion it seems. The truth is that the recently established IICUC Standard S001-1991 was an integral first step in finding out. Now independent scientific can be used with each cleaning method to demonstrate their effectiveness at reducing biological contamination. For now, we can simply apply what we now using established scientific principle. Effective, safe carpet cleaning programs need to be implemented in all buildings with carpeting. Obviously, we should not neglect regular home and business maintenance of carpets. Periodic vacuuming plays an integral part in the physical removal of contaminants and preventing the build-up of some of these contaminants. With the advent of smaller size micron collection bags, the value of vacuuming has increased significantly. Long term, independent scientific testing will help us to determine how much we can reduce contamination, whether it was a "real" health threat to begin with, and what the very best way is to reduce it.

As you can see, however, existing science really does support the fact that regular cleaning and maintenance of carpeting does contribute to a reduction of biological contamination within that carpeting. Whether you approach it by the methods of sanitizing or the principles of hot water extraction cleaning, you can only reach one conclusion; cleaning and maintenance of carpeting plays an absolutely necessary role in the reduction of biocontaminants within the indoor environment.

ABOUT THE AUTHOR:

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References

Banerjee, Kasinath and Cheremisnoff, Paul N. Sterilization System,. Technomic Publishing, © 1985, pages 1-5.

Glossary of Environmental Terms, United States Environmental Protection Agency, Office of Public Affairs, March 1988.

Principles of Sanitization, Food Processors Institute