WONDER MAKERS ENVIRONMENTAL

Information Series

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CLEANING FOR HEALTH

Part 1. The Evolution of Cleaning Practices

Many of us in the cleaning and restoration industry are so busy dealing with the everyday challenges of providing great services to our customers that it is difficult to take time to see where we fit in the long term scheme of the industry. Although an excessive focus backwards can easily result in a non-productive longing for the good old days (which a fair assessment may remind us were not so good after all), a proper understanding of the industry history can be invaluable in anticipating future trends. So, understanding the wisdom of the maxim that *the past is prologue,* the information here is presented to help you evaluate your position in the industry.

A Little History of Cleaning

Cleaning practices have changed over the millennium but, like any other aspects of our society, the pace of change has accelerated dramatically over the last century. In general, major cleaning advancements can be divided into four timeframes:

- 2800 B.C. – 1850's = Dirt and stain removal
- 1850's – 1960's = Detail cleaning for specialized applications
- 1960's – 2000's = Widespread use of antimicrobials
- 2000's – Future? = Holistic approach focused on occupant health

It is somewhat sobering to realize that the cleaning profession is almost 5,000 years old. Archaeological evidence of soap was found in Babylonian clay containers dated at 2800 B.C. Inscriptions on the containers state that the product was made from fats boiled with ashes. An entire soap factory was discovered in the ruins of Pompeii, one of the cities destroyed by the volcanic eruption of Mt. Vesuvius in 79 A.D.

What is more surprising to modern professionals is that initially soap was not for surfaces. While soap was well known in the ancient world, it was liquid and spoiled easily. It was also very harsh and was used primarily for cleaning fabrics rather than skin or hair. There is little record of soaps being used to clean surfaces – even food preparation surfaces – but there was an early recognition that soap had some medicinal use. Some Greek and Roman physicians did recommend washing with soap for skin ailments such as pustules.

Throughout most of history, soap use for personal hygiene was medically motivated. However, short-cuts in manufacturing techniques achieved in the 1800's resulted in a new process by

which soap was cheaper to make. This affordability coincided with observations that rigorous cleaning of surfaces and patients reduced infections.

Florence Nightingale demonstrated this concept most dramatically in hospitals for wounded British soldiers in the Crimea in the 1850's. She led a team of nurses that dramatically improved the survival rate of wounded soldiers. Prior to her emphasis on clean facilities, bedding, and garments a wounded soldier had a better chance of survival in the field than in an army hospital.

Joseph Lister expanded on Pasteur's theory that bacteria cause infection. In 1865, Lister proved the effectiveness of his methods, thus founding modern antiseptic surgery. Using carbolic acid as the antiseptic agent, he devised techniques of applying it so that when used in conjunction with heat sterilization of instruments it brought about dramatic decreases in post-operative fatalities. Until that point more than 50% of surgical patients died of post-operative infections. (Incidentally, Joseph Lister was the personality that prompted the name Listerine for the first bacteria fighting mouthwash.)

For over one hundred years antibacterial products were primarily limited to hospitals and food service facilities. Their use for food service sanitation was given a big boost by the publication of Upton Sinclair's famous book, *The Jungle*, in the early 1900's. Despite this improvement, plain soaps have minimal, if any, antimicrobial activity. In several clinical studies hand washing with plain soap failed to remove bad microorganisms from the hands of hospital personnel. Hand washing with plain soap can actually result in an increase in bacterial counts due to microorganism growth on the wet soap bars being transferred to other users.

The 1960's saw the introduction of antimicrobial soaps such as Dial™ and Safeguard™ for regular use. By the 1990's the number of antimicrobial products on the market exploded with the rapid acceptance of liquid soaps for hand and body washing. Initial marketing of antimicrobial soaps was focused on locker rooms and other public venues.

In the mid-1970's antimicrobial cleaning products for general janitorial and restoration work expanded as the industry started to specialize and adapt to new building finishes such as carpeted floors in locker rooms. Hospital style disinfectants entered the marketplace for odor control and water restoration projects.

Seeing the Connections to Today

While cleaning and restoration has a very long history, rapid change in approaches to cleaning has emerged over the last 8-15 years. The numerous individual approaches to cleaning that are currently being discussed are really just sub-sets or variants of the concept of cleaning for health. As these various individual concepts continue to evolve a holistic approach to maintaining buildings is revolutionizing the cleaning industry. This integration was led by an emphasis on green products and techniques. This includes a growing emphasis on environment-friendly chemicals, reduction of volatile organic compounds (VOCs), and removal of allergens in an effort to deal with the rising number of asthmatics. In addition to incorporating new methods, cleaning for health also provides the answers for the re-emergence of older problems such as bedbugs, dust mites, and influenza.

Baubiology
The next level of a holistic approach to cleaning appears to be a concept called baubiology (pronounced "bow–biology" like a bow and arrow). It is the study of how buildings impact the people who occupy them. This concept has developed in the last decade in Germany. It is an attempt to link all of the factors of building design, construction, and maintenance into a unified whole to provide the best living experience for the occupants. It covers a whole range of disciplines from the hard sciences related to products off-gassing and contaminant levels to semi-spiritual aspects such as feng shui.

Baubiology is not just about reducing the toxicity of individual building materials, but calls for a total approach to a healthy living environment. The practitioners of baubiology examine lessons from the past but are future focused. They have learned that the combination of building materials, furnishings, and cleaning can create positive or negative synergies.

A Bad Cleaning Synergy
A wonderful example of a building that should have been renovated by a baubiology student was an elementary school in the Midwest. The principal called in a panic after entering the building on a Monday morning and finding luxurious mold growth on the school carpet after annual carpet cleaning over the weekend. The combination of the outdoor temperature and humidity levels, extra moisture from the cleaning process and a new HVAC system created a tipping point – the straw that broke the camel's back. In that case a new air conditioning system had been installed. The high outside humidity (96-98%) meant that all of the drying capability had to be provided by the HVAC unit or ancillary dehumidifiers. Unfortunately, the new AC unit was oversized, which meant that the unit was short-cycling and cooling the floor without dehumidifying. As such, the carpet remained wet because the HVAC system created such short bursts of cold air that the floor level could not warm up to dry properly.

The Future is Now
Like it or not, expectations are growing that structures be cleaned properly to enhance occupant health. Cleaning and restoration professionals can meet that challenge if they understand their history and look forward to embracing the changes that are coming.

Part 2. Societal Pressures that are Accelerating the Demand for Cleaning for Health

I introduced the concept of Cleaning for Health in Part 1 by providing some historical perspective and a description of the main elements of this emerging trend in the cleaning and restoration field. However, the practical difficulty for contractors trying to survive in a competitive world is how to best determine which trends will be long lived and have a major impact on their operation. Proper prognostication of such trends allows cleaning and restoration professionals to be aware of the trend early enough to shape its development in a positive fashion, and to focus their time and educational efforts so that they remain industry leaders through the changes.

So how do we evaluate changes in our industry to determine which ones are truly important trends? Perhaps the best approach is to evaluate such opportunities in the light of broad societal patterns. An evaluation that shows that a particular movement in the cleaning and restoration industry is an outgrowth of a number of changing aspects of our culture has a good likelihood of developing into a sustaining trend. With that in mind let's consider the concept of Cleaning for Health in the light of eleven major forces in our culture today.

1. Information Age

There is no longer any doubt that we are in the midst of a historical revolution in regards to the availability and sharing of information. Data on the most arcane of subjects can be accessed in moments. Dissemination is no longer controlled by an educated upper class or filtered by traditional media entities such as newspaper writers or television reporters. Although access to information in the industrial world is now unparalleled, people still have to be motivated to find and use the information that is available.

This information age will have a growing impact on the trend of Cleaning for Health. Individuals are motivated to seek answers when their personal health or comfort is jeopardized. With the wide array of positive influences that Cleaning for Health can have, from the selection of greener cleaning methods for those who are chemically sensitized to dust mitigation techniques for the severely allergic, being able to get answers to real problems will fuel efforts at greater cleaning efficiencies.

2. Scientific Research

Hand in hand with the availability of information is the production of additional data through research. Nor is research strictly confined to professional scientists. Investigation of methods to improve the effectiveness and efficiency of cleaning procedures is being undertaken by a host of industry organizations and individual contractors.

Groups such as the Science Advisory Council of the Cleaning Industry Research Institute (SAC/CIRI) are serving a dual purpose by conducting original research and acting as a forum to integrate a myriad of small case studies into an understandable whole. Time and time again this research has demonstrated the value of implementing procedures associated with Cleaning for Health. One study completed in 2002 that was published in the *Journal of Infection Control* registered startling improvements at one New York City daycare center. The primary changes involved the use of HEPA vacuums and damp microfiber cloths in place of sweeping and dry dusting. It also included twice yearly carpet and furniture extraction cleaning. That study documented:

- Number of illnesses reduced 24%
- Antibiotic usage decreased 24%
- Doctor visits down by 34%
- Absenteeism reduced 46%

3. Public Awareness

Another benefit of research beyond development of new information is the public awareness that it brings to the subject matter. The idea of Cleaning for Health has started to move beyond the medical community to the public at large. For years allergists have been advising their patients

about housekeeping techniques that they could utilize to reduce the number of allergens in their homes. This concept of doctors advocating specific cleaning techniques has now migrated to other medical specialties. In particular, oncologists (cancer specialists) have begun to encourage patients to improve their home environment with specialized cleaning in order to improve the outcome of chemotherapy and other cancer treatments that impact the immune system.

Public awareness of proper Cleaning for Health considerations is also magnified every time an outbreak of infectious disease such as influenza (norovirus) or antibiotic-resistant bacteria makes the news.

4. Aging of Overall Population

The graying of America is a demographic consideration that bodes well for the development of Cleaning for Health as a long term trend. With the baby boomers moving into retirement a large bubble of the population is reaching the age where health concerns become more prominent. This segment of the population is also well educated and generally has enough disposable income to implement the simple changes that are often prescribed as part of a Cleaning for Health regimen, such as purchasing HEPA filtered vacuums, using antimicrobials, and hiring professionals to regularly clean carpet and upholstery.

5. Health Consciousness

It is not just the aging portion of the population who are health conscious. The continuing battle to control healthcare costs while providing ever more effective medical services is leading to continued interest in prevention as a key component of health care. Cleaning for Health is right in the middle of this movement, particularly as more research confirms the synergism between various contaminants.

For example, researchers were hard pressed for many years to explain the connection reported by many occupants between mold-contaminated environments and a bewildering array of health symptoms like excessive fatigue, memory loss, increased tumor production, etc. The allergens or mycotoxins associated with inhalation of spores from such environments just did not appear to be great enough to explain the symptoms that were documented both anecdotally and within a number of well-controlled studies of damp environments. Recent scientific findings now link many of these symptoms to exposure to a combination of mold and bacteria. Of course, proper cleaning techniques are often effective at controlling both of these microscopic contaminants.

6. Environmental Consciousness

Whether it ultimately proves to be caused by humans or a natural cycle, discussions about global warming have raised environmental consciousness to new heights in the western world. These regularly discussed concerns about our environment have a trickle down effect on many of the components of Cleaning for Health. In particular, the industry move toward green chemicals (*i.e.*, products that reduce non-renewable components while improving safety for both user and occupant) is a benefit of the public's push toward enhanced environmental stewardship.

7. Gen-X and Next Gen Employees

Quite a bit has been written about the different approach to work that Next Gen and Gen-X employees exhibit. Although we must be careful not to stereotype entire generations of workers,

certain overall realities are becoming evident. For many employees who were raised in an era of accelerated change, the prospect of alterations in major life circumstances, including change of employment, is not the same frightening prospect that it was for many past generations. While some employers mistakenly read this as a group of employees who have less loyalty to their workplace, the reality is that the employees are loyal to organizations who meet their needs, and they are willing to change in order to find such an organization. Increasingly, one of the needs of Gen-X and Next Gen workers is a safe and healthful workplace. Many younger employees are unwilling to sacrifice their health and comfort for a job. As such, Cleaning for Health in the workplace will gain additional momentum along with ancillary services such as indoor air quality investigations and mold remediation.

8. Potential Liability

Building owners who fail to keep up with the trends in regards to enhanced cleaning are at risk beyond just losing good employees. Building problems that have resulted in verifiable cases of building related illness (BRI) or less specific sick building syndrome (SBS) carry with them the potential for legal liability. America is the world's leader in class action lawsuits and building owners who fail to appreciate the collective power of a group of injured or ill occupants put both their reputations and their fortunes at risk. A property that earns a reputation as an unhealthful location can lead to reduced rents for years, if not decades.

9. Economy and Slow Home Sales

Turmoil in the financial marketplace based on the collapse of the housing market may signal a retrenchment of real estate prices for a number of years. Such a market can be an advantage for individuals offering Cleaning for Health services since homeowners who are not able to upgrade by selling and moving may instead improve their existing housing stock through remodeling and cleaning. The difficult real estate market is also a boon for cleaning service providers as a buyers market makes it more important for sellers to present their property in the best possible light. Residences that are supported by documentation that they have been inspected for environmental problems and cleaned for maximum occupant health are in a better position to sell.

10. Energy Efficiency

Although prices have moderated somewhat, the spike in energy costs during the first part of 2008 reminded everyone of the importance of energy efficiency. But the push for such efficiency has its drawbacks, particularly in the building industry. Generally, structures are built to last 40 to 100 years. The introduction of new building materials, both structural and finish, that appear to have major benefits when installed may cause unintended consequences over time.

One of the best examples of this is the use of Engineered Insulation Finish Systems (EIFS) in residential construction. This combination of Styrofoam insulation and stucco-style coating was originally designed for installation on the outside of masonry structures. When it became popular for residential construction it was applied to an exterior sheeting of plywood or OSB. Unfortunately, these sheathing materials were not resistant to the moisture that inevitably found way through the stucco coating. Many such homes that were constructed without an appropriate drainage plane behind the insulation are now rotting from the inside out. Another unexpected and serious consequence of installing EIFS on residential structures is that some insurance companies

may not provide fire insurance coverage due to the lack of adequate fire-resistance inherent in the materials.

Of course, there is a health component to such situations as well. Trapped water on cellulose building materials is going to create mold. But even if the mold is inside the wall system some of the spores and odors will migrate to the inside of the building. While the primary fix for such a problem is removal and replacement of damaged materials in a fashion that prevents additional water intrusion, interior cleaning and air scrubbing can often buy needed time for the occupants so that they can deal with the problem in a more reasonable fashion.

11. Introduction of New Building Materials

Energy efficiency pressures, as well as a growing competition for wood if technological improvements show that cellulose materials can be a useful base for alternative fuels, will likely accelerate the introduction of new building materials into both commercial and residential structures. While progress in the area of new building materials is good, it often takes several years (sometimes even decades) to determine just how well these products are performing in real conditions as compared to laboratory simulations. It is also clear that even the best building materials must be installed properly to function at their maximum potential. This is especially problematic when materials with different expansion and contraction properties are butted together and must be sealed or flashed appropriately to keep water out.

If past history is any guide (see previous section) such construction details for new products are often misunderstood. This means that the potential for long-term leakage into buildings will likely continue with the attendant health problems that have been documented by the Institute for Occupational Medicine (IOM) and other international groups.

Cleaning for Health – An Industry Trend for the Future

These societal changes, and many more that we do not have space to detail, all point toward Cleaning for Health growing in importance over the next two decades. Although there will certainly be times of faster growth and times of more modest advance, the trend line for contractors that master and promote such skills will be moving upward for a long time to come.

Part 3. The Practical Implications of Cleaning for Health

The concept of Cleaning for Health impacts all areas of our industry including cleaning, janitorial services, infection control, restoration, and remediation. In some respects the broad implications of the idea work against its adoption as it is difficult for individuals to focus on specific aspects that could have a positive impact on their business and their clients.

This overarching connection that sometimes overwhelms the practical details was driven home in a presentation Carl Grimes made at an RIA technical conference. He presented some fascinating information regarding the psychology of indoor air quality (IAQ) cases. He explained that disconnects often develop because cleaning restoration contractors that are dealing with healthcare facility clients are not medical experts, and the medical experts are generally outside their area of expertise when they talk about building issues. Carl went on to offer some eye-

opening statistics regarding the number of individuals in the U.S. with underlying medical issues who could be harmed by improper cleaning or restoration efforts. Conversely, the following populations could be assisted by industry practitioners who understand concepts of Cleaning for Health and can apply them appropriately.

Risk populations in the United States that could benefit from Cleaning for Health practices

- Immune suppressed individuals – 9% or 25,000,000 people (cancer patients, HIV infected individuals, transplant recipients, etc. with an estimated 50% living in their homes rather than in medical treatment facilities)
- Asthmatics – 8-15% of the population
- Individuals with substantial allergies – 12-30% of the population

In an effort to help turn some of this big picture information into practical implementations steps, I offer these suggestions gleaned from an entire career in the safety and health arena.

Building and Home Owners

1. Change furnace filters on a monthly basis. Move up to pleated filters instead of low resistance fiberglass filters.
2. Vacuum instead of sweep.
3. Use a HEPA filtered vacuum.
4. Never mix chemicals in an effort to create a more effective cleaning product.
5. Do not use an air filtration or odor removal device that generates ozone.
6. Have your carpets professionally extraction cleaned every year.
7. Have your upholstered furniture professionally extraction cleaned every 5 years.
8. Use a trained and experienced mold remediation company for any problem where visible fungal growth is greater than 10 square feet. If there are at-risk occupants in the house (see list above) consider using a professional remediation contractor for any size mold problem.
9. Have your ducts professionally cleaned every decade—more frequently if the home experiences a fire or other form of contamination.
10. Consider the potential for water leaks when remodeling underground spaces such as basements. Use materials that do not support fungal growth, such as metal studs, fiberglass faced gypsum board, fiberglass ceiling tiles, and fungal inhibiting paint.
11. Treat every water intrusion incident with the same speed and seriousness as if it were a fire.

Cleaning and Custodial Companies

1. Clean the building as a whole, not as unrelated components. Cleaning and maintenance in one area of the building can impact other areas.
2. Adopt a system of cleaning based on type of hazard rather than specific area of a building. For example, cleaning tools such as mops should not be used in bathrooms and then in a kitchen.
3. Take advantage of the universal color code that has been adopted for cleaning equipment and supplies to prevent cross contamination:
    - Red: high risk (toilets, bathroom floors, biohazard)
    - Yellow: specialty (labs, general restroom, locker rooms)

- Green: kitchen and food service
- Blue: general (halls, offices, guest rooms, classrooms)

4. Switch to microfiber mops rather than string or sponge mops. They can save money and labor and can reduce the amount of cleaning chemicals needed.
5. Replace cleaning sponges with disposable or washable cloths.
6. Change cleaning cloths and change flat mops after each restroom cleaning.
7. Learn about no-touch bathroom cleaning systems and encourage clients to design their facilities for such systems in new construction and remodeling. Spray cleaning foams and steam systems are the two most popular no-touch cleaning systems utilized for restrooms.
8. Use HEPA filtered or multi-filtered vacuums that capture particles down to 1 micron in size. Change filters and bags often, and clean the inside and outside of the vacuum when servicing the filters.
9. Substitute microfiber wiping cloths for feather or lamb dusters.
10. If moving toward green all-purpose commercial cleaning products, select those certified by independent, third-party certifiers such as EcoLogo and Green Seal.
11. Provide detailed training and frequent re-training to all cleaning personnel along with adequate supervision. The best equipment, chemicals, and systems are useless if applied incorrectly.
12. Follow label directions for chemical use. For biocides, the EPA information on the label supersedes the OSHA information on the MSDS.

Builders, Commercial Building Owners, and Maintenance Managers

1. Call in professional restoration or remediation contractors for every flooding, sewage backflow, fire, or mold project, no matter how small. It is critical to correct such problems properly and quickly to minimize health threats to the occupants. Evaluate and engage a competent company with an emergency service agreement before an incident occurs so that you control costs and quality.
2. If there is an outbreak of infectious disease, rather than over-reacting with disinfectants throughout the structure, target specific high-risk touch points and focus on eliminating the spread of disease rather than trying to kill every microorganism in the building.
3. When building or renovating do not install paper-faced products–not even green board or other products advertised as water resistant–in areas likely to have water exposure such as bathrooms and basement walls.
4. Remove and replace water-stained ceiling tiles immediately upon identification. Identify and correct the source of the water intrusion to prevent damage to other tiles and materials.
5. Utilize new building wraps (such as Dupont's Typar), which act as an air and moisture barrier but allow water vapor to migrate out of the wall cavity to the outside.
6. Match a moisture releasing wall and roof wrap with a ventilating self-draining rain screen (such as Home Slicker) installed under the exterior siding and roofing.
7. Insulate wall cavities and attics with products that are designed to reduce fungal growth.
8. Do not block air entry or exit paths in attics and ensure that there is enough ventilation to accommodate the size of the space.
9. Dry down and clean construction materials that get wet or moldy during the building process.

10. Install bathroom and kitchen fans that exhaust directly to the outside. Never vent them into an attic.
11. During initial construction or renovation equip all public restrooms with no-touch equipment such as toilets, water faucets, soap dispensers and towel dispensers.
12. Clean humidifier elements, AC coils, and condensate pans on an annual basis.
13. Focus on prevention as well as response. Limit the amount of pollutants entering the building, particularly through entranceways, by the use of walk-off mats or sticky mats at construction entry points as well as proper filtration of outdoor air.
14. Treat all occupant complaints seriously, especially those related to indoor air quality.

Restoration and Remediation Contractors

1. Understand that there is a standard of care that guides your actions. Even with specific government regulations the standard of care is not defined by a single document. You have a continuing duty to your clients to keep up with changes in the industry standard.
2. Isolate any visible fungal contamination during water loss or other restoration projects.
3. Do not utilize air moving equipment such as fans or dryers in areas where fungal contamination has been identified or is suspected.
4. Do not use bleach to address fungal or bacterial issues.
5. Set up isolation barriers and HEPA-filtered negative pressure engineering controls for any size fungal or bacterial contamination project in occupied areas of a building. Remember, you are a professional, not a do-it-yourself weekend warrior.
6. Always have a clear scope of work and an endpoint that all interested parties (*i.e.*, building owner, insurance company, consultant, etc.) agree upon before you start work.
7. Be informed before utilizing new products and technologies. Manufacturers and sales representative tend to emphasize the positives and hide the negatives. Make sure the item or process is acceptable under the existing standard of care.
8. Maintain remediation equipment in top-notch condition. How can you be trusted to clean someone's home or building if cannot even clean your own equipment?
9. Clean surfaces using the "HEPA sandwich" approach. (HEPA vacuum, wet clean or damp wipe, finish with a second HEPA vacuuming after the surface is dry.)

Indoor Environmental Consultants and IAQ Investigators

1. Look at the big picture and consider the concept of synergy (*i.e.,* how a number of little actions or conditions can add up to bigger problems than anticipated) during every investigation.
2. Keep a focus on protecting the health of individuals. Remember that people are more important than property and profits.
3. Do not collect a sample until you have a specific question that the sample results can answer and comparison criteria that you can use to evaluate the results.
4. Begin all complaint investigations with the assumption that the impacted individual(s) are correct; even if you cannot smell the odor or sense the problem that the occupant explains.
5. Look for the cause of the problem, don't simply address the symptoms. For example, all fungal contamination problems have a moisture source that must be identified and corrected in order to prevent recurrence.

6. Document your findings properly and explain your conclusions using evidence from collected data and reference materials in a logical chain so that the lay person can see the connections.

Medical Practitioners

1. Consider the environment of care both at the treatment center and the patient's residence and workplace. Encourage at-risk patients to have their homes evaluated for environmental hazards before they are released back into that environment for recuperation.
2. Conduct regular testing (annually and after any water intrusion or construction activities) to verify that the medical facilities have a *normal* fungal and bacterial ecology. Use testing to ensure that actual treatment areas have a *cleaner than normal* fungal and bacterial ecology.
3. Have the medical facility duct system cleaned on a regular basis by trained and experienced professionals who follow NADCA guidelines and understand the intricacies of commercial HVAC systems. Duct systems in treatment areas should be cleaned every one to two years while systems in patient care areas every five years and general areas every decade.
4. Pay special attention to the selection/use/rotation of chemicals for sanitization and infection control.
5. Install finish surfaces and equipment during remodeling projects with built-in anti-microbial properties such as copper impregnated metal rather than stainless steel and pour-in-place counter surfaces that incorporate nano-particles.
6. Consider purchasing water resistant electronics for shared equipment (*i.e.*, keyboards, mice, etc.) so that they can be properly disinfected on a daily basis.
7. Screen all patients for methicillin-resistant *Staphylococcus aureus* (MRSA) upon initial treatment or admittance. Segregate patients with positive MRSA tests from other patients to minimize the spread of antibiotic-resistant infections.
8. Encourage frequent hand washing through staff training and the provision of cleaning/sanitizing supplies.

Although these are called my ideas, they have been extracted from countless books, technical articles, presentations, classes, discussions, and project experiences. I owe a tremendous debt of gratitude to all the professionals who have shared their ideas with me and hope that these suggestions generate even more ideas. Feel free to contact me at Wonder Makers (map@wondermakers.com or 269-382-4154) if you have any other suggestions or comments. I will act as a conduit for the best ideas and update the list in a future article. Together we can help move Cleaning for Health from concept to everyday reality.

About the Author:
Michael A. Pinto currently serves as Chief Executive Officer of Wonder Makers Environmental, Inc. He is a nationally recognized expert in the areas of indoor air quality and biological contamination. His educational background includes a Bachelor of Science degree in philosophy and a Masters Degree in public administration. Michael holds numerous other certifications including Certified Safety Professional (CSP) and Certified Mold Professional (CMP). He is an instructor of three levels of RIA-certified mold remediation training that is conducted around the country and internationally. Michael is the author of three books, including Fungal Contamination: A Comprehensive Guide for Remediation, over one hundred technical articles, and 18 commercial training programs. He can be reached at 269-382-4154 or map@wondermakers.com.