



## TREATMENT OF BOOKS WITH THE ÆGIS MICROBE SHIELD™ PROGRAM

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### INTRODUCTION

Books and microorganisms come hand-in-hand under most normal environmental and use situations. Microorganisms from environmental and human sources include the full variety of germs, bacteria, fungi, mold, mildew, yeast, viruses, and other one celled organisms. Most of the time such contamination is normal and of little consequence to the books or to the users of books. Yet, when environmental conditions of moisture and humidity allow, certain of these organisms may flourish and cause severe problems.

Microorganisms need moisture, nutrients, proper temperatures, and receptive surfaces for their existence and proliferation. Books, because of their materials of construction and the environments that they are usually stored in, provide an ideal amplification site and/or reservoir for a great variety of microorganisms. Leather bound books, books with various binder glues, and cover adhesives along with the nature of the various papers, inks, ink fixatives, and ink carriers used for books and their cover jackets provide an interesting variety of nutrients and receptive surfaces for microbial growth. High humidity situations or floods are extremes that allow fungal contaminants to grow rapidly (bloom) and cause severe problems to the books and to those that work in their proximity.

The deterioration, odors, staining, and human health risks associated with the presence of these organisms are well documented and demand that remediation and protection strategies be put in place as soon as problems arise. Or, preventative strategies need to be put in place such that the blooming growth is not allowed, even when the environmental conditions are favorable.

Conventional methods have relied very heavily on the controlling of humidity and temperature in the general environment of the books. This has been generally effective but the reality of upsets of the mechanical systems or in catastrophic events such as floods, severe weather, or broken pipes has to be faced, planned for, and reacted to when they occur. Use of preservatives such as orthophenylphenol or in the "old days" various organotin, organomercury, and chlorinated phenols was common. With our modern knowledge of the toxicity of these materials, the later of these, are no longer used.

When using antimicrobials, disinfectants, or preservatives to do the remediation or protection of books the safety to people and the environment as well as the short and long-term effectiveness needs to be considered.

The ÆGIS Microbe Shield Program has proven to be an effective antimicrobial protectant for books that have been in a disaster or ones that are at risk because of the build-up of microbial contamination and the conditions for microbial growth. As part of a program that includes cleaning

and disinfection and proper environmental controls, the ÆGIS Microbe Shield Treatment is the best and most economical way to restore and the only practical way to provide long-term protection from microbial attack on the surface of books.

No one wants to have the environmental upsets that lead to the destructive and dangerous problems of microbial contamination; but, the fact is, that all buildings regardless of geographical location or architectural design are destined to have normal build-ups of microorganisms or catastrophic events that magnify problems from microorganisms.

The examples are varied:

A Kentucky junior high school that had foundation and air circulation problems in their core located library was a classic example of a contaminated library and building that led to contaminated books. This fully carpeted library had a build-up of fungal contamination in the carpeting that provided a dose of contaminants that bloomed on the books located on the lower shelves when the humidity in the building was increased because of climatic conditions that included heavy rains and the build-up of water in the soil and the slab of the building. Treatment of the carpeting and the books was done using normal treatment protocols. The edges of the books were inspected and the ones with severe growth were cleaned and totally treated but the great majority of the books were only treated on the exposed edges as they sat on the shelves. This elimination of the background contamination and the treatment of the books saved almost all of these books. The drainage of the foundation of the building was upgraded and a broken sewer pipe under the building was fixed. The ÆGIS Microbe Shield Program was an essential tool in the remediation and protection of these books and the people using the books and library. Cost in 1988, less than \$5,000.

The Baltimore elementary school where a custodian went on summer vacation and the delicate balance of air circulation and temperature control previously maintained went out of balance and no one reacted became an example of an “out-of-sight, out-of-mind” element of the building that became a serious problem. This was a situation where the contamination had built up over a period of years and was being kept in check by conventional methods but was constantly on the edge of being a serious problem. When the air handler servicing this area went down in the heat and humidity of an August in Baltimore and the custodian was not there to react, the fungus bloomed and formed “carpets” of mold on the books and other surfaces within one week. The humidity buildup and tremendous bloom of fungal contamination was worse in this carpeted, second floor core of the building area but many other areas of this building also had serious levels of contamination and the HVAC and supply and return duct systems were found to be very dirty and contaminated. Professional cleaning of the building was done as per ÆGIS Environments directions. Treatment of the ducts and all of the environmental surfaces with the ÆGIS Antimicrobial restored the facility to full operation in two weeks. This included cleaning and testing of all of the duct work in the system servicing this area and the cleaning and the treatment of the entire two story building with the ÆGIS Antimicrobial.

A Tampa area junior college library building, under normal operating conditions, allowed for the steady build-up of fungal contaminants. A prolonged period of inclement weather, which seems normal in Tampa, allowed for enough of a humidity build-up that the fungi present bloomed and the seriousness of their problems became evident. Several of the staff people had suffered considerable discomfort in this work environment. The shelves and carpeting in this facility were all treated with the ÆGIS Microbe Shield Treatment. Over 10,000 books were treated and put back into service and occupant complaints all stopped.

An example, again, of where the slow build-up of microbiological contamination gave rise to a serious problem, occurred at an Indiana university that had a very valuable archive of church treasures and a library of contaminated books. Using a wash of orthophenylphenol and treatment of the general environment and the books with the ÆGIS Antimicrobial, the existing problems with mold and mildew were solved, the discomfort of the staff was relieved, and the return of the problems has been prevented.

## **HOW TO USE**

Generally the ÆGIS Microbe Shield Treatment can be effectively used by itself, but, it is most effective when it is part of a system that utilizes cleaning, disinfecting, and then treatment with the ÆGIS Antimicrobial. It is also essential to fully assess the sources of the fungal contamination from the air handling system, the general environmental surfaces, or from the habits and practices of the staff or users. Repairing the surfaces and solving any water or moisture problems has to be part of the total solution.

When setting up the total job of treating books, provisions need to be made to isolate the work areas into “clean” and “dirty” areas. It is beneficial in more heavily contaminated situations to build isolation areas to protect the surrounding areas and to provide clear isolation from one task to another. There is little benefit gained from cleaning a batch of books and then bringing them back into a contaminated area. Transport of the books from one area to another needs to be done in ways that minimize any chances of significant cross-contamination to other areas of the building. This is best facilitated by keeping the books in the library or book storage area where the problem exists. But, sometimes, it is best done at a remote area such as outdoors or in a gymnasium. Use of a school's common area or cafeteria should be avoided and only used if isolation of the general surfaces and furnishings in the space can be protected from contamination.

Usually it is beneficial to train several people in your crew as sorters. These people are responsible for determining the severity of the contamination and the protocol of treatment to be used and the warranties that may not be extended. These people need to assess the dust jackets (usually removed and thrown away with management's and the librarian's approval in writing) and the contamination of the books. Observations should be made for fungal or water spots that indicate old, existing, or potential problems. Surfaces checked need to include the cover and the spine, outside and inside, and the pages in the center of the book. Most of the tell-tale problems

are associated with the glue or adhesive areas in the spine or the covers, so these should be checked. In the case of thicker books that show deterioration or staining of the spine, it is difficult to assure total treatment into the full depth of the book. Separation of the cover from the bound pages may have microbial growth that is not accessible for cleaning or treating. Realistic expectations for the salvage of such books needs to be had by all and the warranties on such books need to be limited to, "best efforts." Of course there are also situations where the books have been totally soaked and maybe are still wet. Such books should be set aside and arrangements should be made for the librarian to sort through these and decide what should or should not be saved. In some cases, it is appropriate to try to recover such books by using freeze drying techniques or aggressive desiccation techniques.

All materials used in the cleaning-treating procedures (rags, wipes, gloves, masks, covers, etc.) should be bagged and sent to landfill or to an incinerator. The drying equipment should be wiped down with disinfectants. The *ÆGIS* Microbe Shield Treatment must be handled in accordance with its EPA registered labeling and use and disposal instructions. All workers must be instructed in proper use of the materials and the goals of the project, and required to use good personal hygiene practices during and after their work sessions including break times and before meals.

### **LIGHT GROWTH SITUATION**

Often, when visible growth on the books is minimal or only on a few of the library's books, the *ÆGIS* Microbe Shield can be spray applied in a fine spray to the edges or full covers of the books. It is essential to remove the dust jackets and these are seldom able to be saved using the *ÆGIS* technology, although freeze drying restoration can often be used for materials that are valuable enough for such techniques. Use concentrations for this type of application are best done at the three ounces per gallon. The target surfaces only need to be made damp for effective treatment. Drying needs to be done as quickly as possible considering the nature of the books, the surrounding woodwork, and other building materials and furnishings. This sometimes requires removing the books from the shelves and all of the associated efforts and costs.

### **HEAVY GROWTH SITUATION**

When growth is more visible, it is essential that the books be cleaned. The protections for employees and other areas of the building need to be thoroughly implemented for this situation. Proper training and use of the sorters is very important to the success when heavy growth is encountered.

All visible mold must be wiped with the most aggressive cleaner available for use on books. This could be a hospital cleaner/disinfectant or one or another of the commercially available household or bathroom cleaner/disinfectants. It is essential that your workers wear proper protection when using these materials and when working around high concentrations of fungal contamination. The use of these materials must be done from large droplet sprays that are then wiped on all of the

stained areas but at least on the binder and the insides of each cover. Dust jackets must be removed and are generally thrown away. The rags, sponges, or multiple use wipes used for this process must be kept relatively clean to get the maximum benefits from this cleaning and disinfection process. These wipes should always be rinsed in fresh water and never allowed to contaminate the cleaning solution. Drying needs to be done efficiently. This can mean standing the books up in front of fans or desiccation equipment, hanging them on a line with covers supported open in the sun or in a “dry” environment, passing through a heat lamp or forced air drying chamber, or any variation of these or other efficient drying techniques. The ÆGIS Antimicrobial Treatment can be applied, again by spray and wipe, either in a separate process after the drying or just before the drying is done. In either case the ÆGIS treated books must be dried.

### **GENERAL ENVIRONMENT**

Attention to the general environment and the air handling system must be part of any successful book treatment job. Treatment of the surrounding areas (cleaning as necessary and use of the ÆGIS Microbe Shield Treatment) including behind, under, and on the shelves and other furnishings (chairs, desks, tables, pictures, wall hangings, etc.) must be done.

It is very difficult to run a job treating books for less than \$1.00/book. Depending on the number of books and the way that your crews can be managed (travel, room, board, general mobilization, etc., expenses), this price might be upwards to \$2.00/book. In either case, the value of the books usually justifies the care and thoroughness of this process and the value. The surrounding areas should be treated at your standard rates including the wipe down and pretreatment charges necessary to cover your costs. It is often beneficial to offset some of the costs by letting the school or the library provide the labor needed for transporting and or cleaning the books.

Warrantees are usually limited to one year because the use/abuse patterns of the books cannot be controlled and as noted above, often the warranty should only be a “best effort.”

**ÆGIS Environments**  
**Midland, MI 48642**  
**T: 517-832-8180 ! F: 517-832-7572**