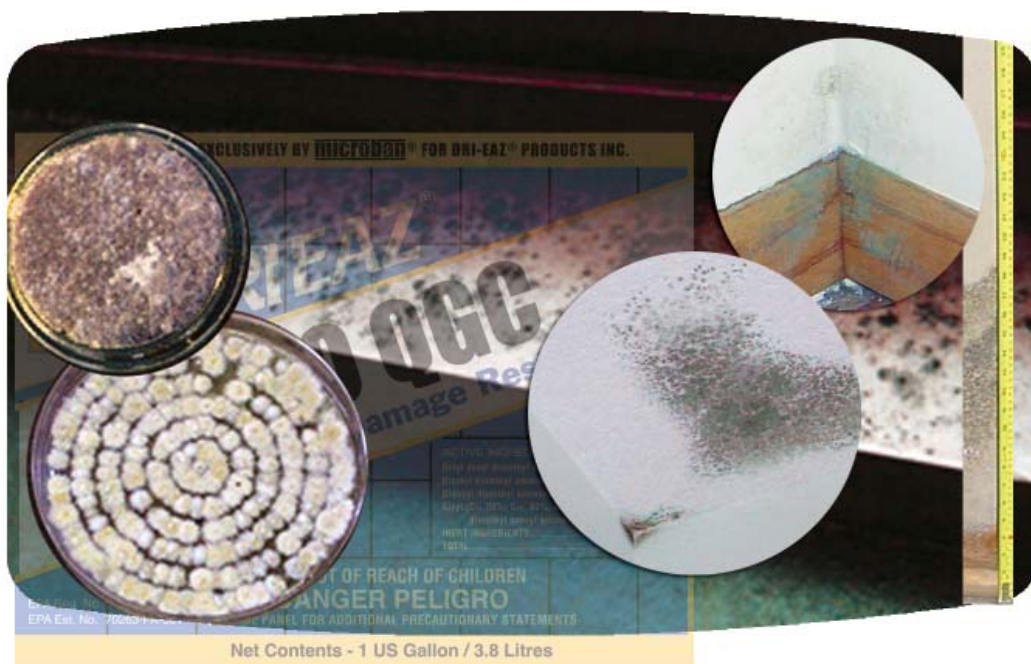


RESIDENTIAL ANTIMICROBIAL PESTICIDE APPLICATOR LICENSE STUDY AND REPORT



Report to the Minnesota Legislature, pursuant to 2007 Laws of Minnesota, Chapter 45, Section 64. Report prepared by the Minnesota Department of Agriculture, Minnesota Department Health and University of Minnesota.

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EXECUTIVE SUMMARY

The Minnesota Department of Agriculture (MDA), Minnesota Department Health (MDH), and University of Minnesota (UM) formed a Work Group to discuss the need for, issues associated with and development and implementation of a new category of MDA licensure for persons who apply for hire antimicrobial pesticides to mitigate or remediate mold in homes, apartments, and other residences.

The Work Group (WG) learned that molds occur ubiquitously in the environment. Under favorable conditions, mold spores can germinate and grow quickly in the open as well as in inaccessible building areas. The primary and essential cause of mold growth is the presence of unwanted, excess and uncontrolled moisture.

The WG learned that a great need exists for educating people who may encounter molds in residences or other structures about managing mold and its causes. The essential need for moisture management is stressed throughout this report.

This study found that the proper use of registered antimicrobial pesticides as a tool for remediation or mitigation of mold problems is- at best- a secondary tool to this necessary moisture reduction or elimination. Attempting a pesticidal remedy without eliminating moisture may create risks with no benefit as the mold will likely return.

A person, even if properly using registered antimicrobial pesticides without recognizing the underlying moisture causation of molds, may indeed put occupants of such affected residences and buildings at unnecessary health risk via use of antimicrobial pesticides. Additionally, occupants and owners may find such pesticide use only a temporary “band aid” rather than a successful mold remediation strategy.

It is uncommon that most healthy persons are adversely affected from low level exposure to molds in their home. However, there are sensitive people generally more susceptible to and for whom low level exposure to mold is more problematic. Persons most susceptible to ill health affects from exposure to molds include people with compromised or suppressed immune systems, people with chronic medical conditions, and children.

The WG recommends that any person hired to apply antimicrobial pesticide to mitigate or remediate mold in a residence be licensed by the MDA as a Commercial Pesticide Applicator. The WG also recommends that the training for licensed applicators include technical background and criteria for recognizing not only problem residential mold but more importantly the underlying cause of mold growth. This new module of training can be incorporated into the existing MDA/UM Extension certification and licensing program. Without such training persons offering to perform such mold control services are often unprepared to recognize and properly remediate or mitigate residential mold problems.

INTRODUCTION

The 2007 Minnesota State Legislature directed the Minnesota Department of Agriculture (MDA) and the Minnesota Department of Health (MDH), in consultation with the University of Minnesota (UM) to study, prepare and present a report to the Legislature on the development and implementation of a new category of license for commercial pesticide applicators who apply antimicrobial pesticides to mitigate or remediate mold in homes, apartments, or other residences.

Meetings of MDA, MDH and UM/UM Extension staff and management occurred February 22 and 23, May 29 and June 8, 2007 to discuss House File 402, to prepare and discuss corresponding fiscal notes, and to identify Work Group (WG) members.

The WG with representative of each agency was assembled and scheduled a series of meetings to discuss this legislative directive, obtain relevant information, consider findings, and develop recommendations. These meetings were held on July 16, August 13, September 13 and October 22, 2007. Additional meeting occurred to draft this report.

An ad hoc advisory group comprised of interested persons, industry, regulatory officials and other stakeholders participated in some meetings and/or provided comments on draft versions of this report. The input offered by this group provided the WG an even broader perspective on managing molds and the issues.

Lists acknowledging participation in the study and report are provided in Appendices 1 and 2.

DIRECTIVE LANGUAGE:

Legislative Session 85, Minnesota Session Laws 2007 - Chapter 45 (H.F. No. 2227) excerpt:¹

Sec. 64 RESIDENTIAL ANTIMICROBIAL PESTICIDE APPLICATOR LICENSE STUDY.

(a) The commissioners of agriculture and health must study the development and implementation of a new category of license for commercial pesticide applicators who apply antimicrobial pesticides for hire to mitigate or remediate mold in homes, apartments, or other residences. The commissioners must seek and obtain consultation with representatives of the University of Minnesota qualified in mold and other fungal microbe pest control. They shall prepare a report which must include:

- (1) a discussion of existing federal and state laws and rules, if any, that govern commercial residential antimicrobial pesticide applicators to control mold;
- (2) a literature review on the need for, and efficacy of, antimicrobial pesticides used in residential settings for mold control and any potential dangers posed by the residential application of these products, particularly to young children and other sensitive persons;
- (3) a survey of the law and process, if any, for licensing commercial residential antimicrobial pesticide mold control applicators in the rest of the United States; and
- (4) recommended procedures for licensing prospective residential antimicrobial pesticide mold control applicators in Minnesota, highlighting provisions that test the applicant's understanding of the efficacy of antimicrobial pesticides and methods for mitigating any potential dangers discovered in the review required in clause (2).

(b) No later than December 1, 2007, the commissioners shall report the results of the study described in paragraph (a) and an implementation plan to the house and senate committees with jurisdiction over agricultural policy and finance and environmental health.

¹ Minnesota House of Representatives. <http://ros.leg.mn/bin/bldbill.php?bill=ccrhf2227.html&session=ls85>.

CONTROLLING MOLD GROWTH: FACTORS AND CHALLENGES

Mold spores are ubiquitous in nature. They are small, lightweight and can be carried easily through air. Everyone is exposed to mold whether indoors and/or outdoors. For most healthy individuals, this background or low level of mold exposure is not a health concern or problematic.

Mold spores germinate and grow quickly under favorable conditions. Moisture is the most important environmental factor leading to spore germination and mold growth. That is why identifying excess moisture in an environment and eliminating it is the key in controlling mold growth.

A mold problem may be simple or complex depending on the associated factors. Removal of growing mold may simply involve wiping an affected area clean after the source of moisture is eliminated. Or may be more complex requiring significant expertise to eliminate excess moisture, dry out building materials and other items and removal of mold contaminated materials that can not be cleaned. Only after mechanical controls fail or when specific circumstances warrant should antimicrobial pesticide² use be considered as an option.

The WG used the legislative directive and testimony from legislative hearings as guidance for its inquiry and study. The testimony included personal experiences encountered by citizens who had mold problems in their homes.

One homeowner, who testified before the legislature, described to the WG a water intrusion catastrophe affecting the entire home that resulted from a contractor's failure to properly cover a roof under repair, and the subsequent restoration efforts. The homeowner contracted initially with a service company to clean and dry the home. The company used fans and cut holes in sheet-rock as means to dry the home, and also sprayed an "antifungal" spray in the lower level of the house. The homeowner did not receive any written or verbal information on what was sprayed. The company removed its fans after only two days and before drying was completed because of a dispute over fees.

Dissatisfied with the still wet home, the homeowner's insurance company hired another company. This second contractor according to the homeowner conducted no tests and did little about eliminating the moisture. They immediately started to paint (water stains) with anti-fungal paints on the ceiling and walls and pulled out carpets that had gotten wet. Despite these efforts a significant mold bloom occurred in the home soon after and the family began to feel and report adverse health effects.

The homeowner fired this company and sought advice from an independent expert. The homeowners had to vacate their now uninhabitable home for health reasons. A third remediation company tore out walls, ceilings, flooring, and dried the home completely, as advised.

This case illustrates many of the key issues identified by the WG: the nature of mold and its growth, the lack of consumer education and protection, the availability and reliability of expert services, the regulation of service providers and the lack of information leading to informed and worthwhile choices.

The MDH does not specifically track the number of homeowner phone calls received by MN state government agencies regarding the safety of chemicals used to manage mold in residences. However, MDH reports anecdotally that it regularly fields mold-related calls from citizens concerned about the health effects of mold after observing it grow in their homes or after a treatment to mitigate or remediate mold is made. Based on this evidence the MDH supports public education about causes and effects of mold in residences, and the limited benefits of using pesticide treatments for control of that mold.

2 U.S. Environmental Protection Agency. What Are Antimicrobial Pesticides? http://www.epa.gov/oppad001/ad_info.htm

The following are examples of mold related telephone calls received by MDH:

Example 1: MDH received reports that persons used undiluted chlorine bleach to kill microorganisms left behind after the 2007 flooding in Rushford, Minnesota. MDH issued warnings about the dangers of using undiluted chlorine bleach and promoted a previous MDH recommendation to homeowners to mix ¼-½ cup of household bleach (sodium hypochlorite) with 1 gallon of water to make a disinfecting solution.

Homeowners may use “home remedies” in their own homes for pesticidal purposes even though the product may not be regulated as a pesticide. Any MDA future licensing requirements resulting from this study and report would not further regulate the use of such home remedies by homeowners, pesticidal in nature or otherwise, in residential settings.

Example 2: An MDH indoor air quality staff was contacted by a homeowner who had hired a service company to clean and treat mold discovered during a bathroom remodeling project. The contractor reportedly applied Milgo QGC (U.S. EPA Registration Number³ 70263-6-53440, manufactured by Dri Eaz Products Inc.) a quaternary ammonium compound (see Appendix 3 for Milgo QGC specimen label), to treat mold in the water damaged area. The product’s pesticide label⁴ states it is labeled for industrial, institutional and hospital use; the product is not labeled for use in homes. The homeowner, who is currently undergoing treatment for cancer, reported severe respiratory tract irritancy and headaches possibly associated with the treatment.

The Minnesota Pesticide Control Law⁵ requires a person to obtain a Commercial Pesticide Applicator license prior to applying pesticides for hire. Any person, including MDA Licensed Commercial Pesticide Applicators, must use EPA/MDA registered pesticide⁶ when applying pesticide for hire. Additionally, persons must complete an application record and provide a copy to the customer for any application of pesticide made for hire. Finally, the pesticide must be used in accordance with the label’s directions.

DEFINITIONS AND SCOPE OF THIS STUDY AND REPORT

For the purposes of this study and report, “mold” as referenced herein is limited to mold caused by fungi found on or in building materials, carpets, furniture and similar items located inside homes, apartments, or other residences: including but not limited to carpets, furniture and similar items. This includes basidiomycetes fungi that cause “wood rot”.

“Remediation” means tactics used to remedy a mold infestation, while “mitigation” means lessening a mold infestation. Remediation and mitigation can be achieved by a variety of activities. Antimicrobials are sometimes used to prevent mold growth. A mold preventative treatment of building materials with antimicrobial pesticides to prevent mold growth is not covered by this legislative directive. This includes the use of mold preventive paints designed to be used in residential bathrooms by homeowners. MDA may address commercial uses of antimicrobials that are preventative in nature within its existing licensing program.

Prolonged or high level occupational exposure to mold and the diseases most likely associated with exposure to molds in non-residential settings or occupational settings are not addressed in the report.

3 U.S. Environmental Protection Agency. Label Review Manual Chapter 14: Identification Numbers. <http://www.epa.gov/oppfead1/labeling/lrm/chap-14.htm>

4 U.S. Environmental Protection Agency. Pesticide Product Label System (PPLS). <http://www.epa.gov/pesticides/pestlabels/>.

5 Minnesota Statutes 2007 Chapter 18B. Pesticide Control. http://www.revisor.leg.state.mn.us/bin/getpub.php?pubtype=STAT_CHAP&year=2007§ion=18B

6 Minnesota Department of Agriculture. Pesticide Registration Requirements FAQs. <http://www.mda.state.mn.us/licensing/pestfert/pesticideregistration.htm>

This study and report does not address nonpesticidal activities such as cleaning, scraping or wiping mold away. Janitors and other cleaning services may use antimicrobial products in the course of cleaning mold from a bathroom or kitchen surface, and home remodelers from a wall space. Such usage by cleaning service personnel contracted for service in a residential or commercial setting is not a pesticide application, nor is cleaning covered by this legislative directive.

There are approximately 40 companies listed in the Twin Cities yellow pages as “Mold, Mildew, Moisture Control” specialists, and another 85 companies listed under “Water Damage Restoration”. It was unclear to the WG how many of these businesses use pesticides as part of their remediation/mitigation processes, and it is at first glance impossible to know how many are using EPA registered pesticides while providing services. MDA conducted a quick survey with selected companies to determine their use patterns and level of employee training (see Appendix 4).

BACKGROUND: MOLDS, PESTICIDE REGULATIONS AND ANTIMICROBIALS, AND MOLD REMEDIATION AND MITIGATION

MOLDS

Mold is a common name for certain fungi, although not all fungi are molds. More than a thousand of species of indoor mold have been identified. Molds reproduce by spores and are spread by their distribution. Spores germinate and mold grows in the open as well as in inaccessible areas inside a building within as little as 12 to 24 hours when favorable conditions of moisture, nutrients, and temperature exist.⁷

Typically, the primary factor causing mold growth is excess moisture. A moisture laden environment conducive to mold growth can result from standing water to excess and uncontrolled relative humidity. The key to controlling mold growth is correcting the problem that is causing a moist environment by identifying and drying wet areas thoroughly and as quickly as possible with fans, dehumidifiers or ventilation.

Conditions conducive to mold growth are water leaks in roofs, windows, or plumbing and other places where excess moisture exists or collects, or excess humidity and wetness on walls, floors or surfaces. Unabated water intrusions resulting from a catastrophe of nature or a structural deficiency can also result in mold blooms unless resolved quickly. In the case of a catastrophic water inundation, gross removal of all saturated or water-logged building materials is in most cases necessary to achieve adequate dryness.

Growing mold often looks like different colored spots on a surface, and can smell musty. Mold grows well on building materials like wood products, insulation, and drywall, and can also grow on carpet, fabric, paper products, tiles, paints, wallpaper, and upholstery. Mold growing on interior surfaces of homes and structures is unwanted and can be a potentially injurious organism to people and property.

PESTICIDE REGULATIONS AND ANTIMICROBIALS

Any product that claims to prevent, destroy, repel, or mitigate a pest, such as growing mold, is classified and regulated as a pesticide. Pesticides used according to their label offer benefits because of their ability to control organisms, insects, weeds, or other pests while minimizing risks to humans, the environment and non-target species. Pesticides also pose risks because of their nature to kill or otherwise adversely affect targeted organisms, particularly when not applied according to label directions.

⁷ Minnesota Department of Health. Mold in Homes. <http://www.health.state.mn.us/divs/eh/indoorair/mold/index.html>

Applications of cleaning products that do not make pesticidal claims are not regulated in the same manner as a pesticide. Using an antimicrobial as a **cleaning** agent is NOT a pesticide application when no pesticidal claims are made or implied and such use does not require a license under MN law.

Under the federal pesticide law known as the Federal Insecticide Fungicide and Rodenticide Act⁸ (FIFRA) and state pesticide law all pesticides must be registered with both the U.S. Environmental Protection Agency (EPA) and state government before they can be sold, distributed or used.

Pesticide registration⁹ is a process through which EPA examines the ingredients of a pesticide; the site or crop on which it is to be used; the amount, frequency and timing of its use; and storage and disposal practices. EPA evaluates the pesticide to ensure that it will not have unreasonable, adverse effects on humans, the environment and non-target species.

Federal pesticide product registration also involves development of risk management strategies and creation of a pesticide label to protect applicators, the general public and the environment from unintended results of pesticide use. Pesticide manufacturers and regulatory agencies convey these management strategies and other important safety and use information to pesticide users via a product label.

The pesticide label provides directions for achieving maximum or promised performance while minimizing risks to human health and the environment. The label also defines application site(s), identifies use restrictions and provides other required information. Persons who use a pesticide have a responsibility to read, understand and follow the label directions. It is a violation of federal and MN law to apply a pesticide in a manner that is not consistent with label directions.

The EPA reports that more than 5,000 antimicrobial pesticides are currently registered for use in the US. The MDA has 3,000 pesticides listed as antimicrobial and registered for use in the state. Many of these products are biocides or a type of antimicrobial that exhibits broad spectrum efficacy on bacteria, viruses, fungi and other microorganisms. Drugs used to control microorganisms in or on humans or animals are regulated by the federal Food and Drug Agency (FDA) and are not considered pesticides.

Antimicrobials are the largest single type of registered pesticides (in comparison with other types of pesticides like herbicides and insecticides). The EPA identifies three main types of biocides/antimicrobials:

- Sterilizers – used to destroy or eliminate all forms of microbial life including fungi, viruses, and all forms of bacteria and their spores.
- Disinfectants – used on hard inanimate surfaces and objects to destroy or irreversibly inactivate infectious fungi and bacteria but not necessarily their spores.
- Sanitizers - used to reduce, but not necessarily eliminate, microorganisms from the inanimate environment to levels considered safe as determined by public health codes or regulations.

Under certain circumstances, pesticides may be an appropriate tool to mitigate or remediate mold. Antimicrobial products for use on mold can be identified and chosen by reading the product's label for specified site(s) of application. Only products with labels that specify use in residential sites for control of molds can be used for that purpose. The number of antimicrobials labeled for use in homes or residences to control mold is a small subset of all biocides registered for use.

An example of a product that would be used to manage mold on surfaces inside of a residence is BBJ Micro Biocide (U.S. EPA Registration Number 67212-1, manufactured by BBJ Environmental Solutions) (see Appendix 5 for BBJ Micro Biocide specimen label). This product is labeled for use on floors and walls in residences and elsewhere.

8 U.S. Environmental Protection Agency. Federal Insecticide, Fungicide, and Rodenticide Act. <http://www.epa.gov/region5/defs/html/fifra.htm>

9 U.S. Environmental Protection Agency. Registering Pesticides. <http://www.epa.gov/pesticides/regulating/registering/index.htm>

A product labeled for use as a preventative treatment and to manage discovered mold is Mold-Ram (U.S. EPA Registration Number 72340-1, manufactured by Sostram Corporation) (see Appendix 6 for Mold-Ram specimen label). This product is labeled for use on wood, wallboard, concrete or masonry building materials in buildings when treated interior surfaces are subsequently covered with over-layment materials such as wallpaper, paint or similar coatings.

NOTE: Any references to any organizations, specific commercial products, processes, or service by trade name, trademark, manufacturer, or otherwise, contained in this report does not constitute or imply its endorsement or recommendation by the MDA, MDH or UM.

MOLD REMEDIATION AND MITIGATION

Mold remediation/mitigation is much like managing other pests in that a combination of tactics works best. Often pesticides are not the first choice. This type of strategy is commonly known as Integrated Pest Management¹⁰ (IPM).

The use of an IPM approach is especially critical as mold problems must be addressed promptly – often in a matter of hours - after floods, roof failures and other instances of significant residential water damage. Using an IPM approach first dictates scouting or accurate identification of the pest problem and its causes and then selecting one or a combination of effective control practices that resolve the pest problem while maximizing protection of health and the environment. In the case of molds in or on structures, these options may include:

- Recognize and identify mold by smell or sight;
- Document the scope of the problem;
- Find and eliminate the source of moisture;
- Dry and maintain an environment free of excess moisture;
- Remove and replace saturated building materials;
- Assess situation and evaluate if pesticide treatment is needed;
- Wipe, scrape and clean visible mold from affected area;
- Paint, coat or seal building materials when conditions indicate;
- Treat mold with a labeled pesticide; and/or
- Consult with an expert.

Many mold problems occurring in residences are minor, however some mold problems can be quite complex in nature requiring specialized expertise and techniques, such as a trained service professional, expert consultant, and specific control strategies and tools. Homeowners and others must be quick to identify a concern and recognize the need for remediation and mitigation services and initiate good communications with others involved including insurance companies, contractors, carpenters and others in the building trades.

Some mold populations may have existed for some time, revealed only by removal of carpet or by remodeling work. Other populations may appear suddenly as a result of improved growing conditions. Measures to abate growing mold may range from simply wiping the mold with a detergent or bleach solution to scraping. More complex mold problems may require contracting for-hire services with the expertise, equipment and competency to manage the mold.

¹⁰ U.S. Environmental Protection Agency. Integrated Pest Management (IPM) Principles. <http://www.epa.gov/pesticides/factsheets/ipm.htm>

A fundamental aspect to solving a mold problem regardless of its nature is eliminating the source of moisture and drying the surrounding environment. Ventilation or removal of saturated building materials may be required to dry the environment adequately to prevent further or future mold growth. Sometimes when gross removal of wet materials is inadequate or impractical other strategies may be warranted.

Restoration companies may use antimicrobial pesticides in some cases to mitigate or remediate mold. Such commercial pesticide activities and persons involved meet the criteria of service for hire requiring an MDA license. Anti-fungal paints or coatings with encapsulated fungicides may be applied to encase materials left in place that are susceptible to molds. Applications of these coatings are not regulated as pesticide applications and would not require a license.

Air “cleaning” devices that produce Ozone¹¹ as a cleaning/disinfecting agent are not effective for cleaning mold and removing mold spores from indoor air, and can actually be harmful to health (see Appendix 7).

11 U.S. Environmental Protection Agency. Ozone. <http://www.epa.gov/ozone/>



REVIEW OF EXISTING FEDERAL AND STATE LAWS GOVERNING COMMERCIAL RESIDENTIAL ANTIMICROBIAL PESTICIDE MOLD REMEDIATION AND MITIGATION

Pesticides are regulated by both federal and state pesticide registration, and particularly by use directions on the product label. The commonly used phrase ‘The label is the law’ reflects the fact that directions on a pesticide label carry the force of both federal and state law.

EPA has three primary pesticide product classifications:¹² 1) restricted use pesticide (RUP); 2) general use pesticides (GUP); and 3) unclassified pesticides. EPA classifies a pesticide as a RUP if the use of the pesticide might result in an unreasonable, adverse effect on human health and/or the environment. Only dealers licensed by MDA can sell RUPs and only a certified or licensed person may purchase and use an RUP. Federal law contemplates and assumes that application by trained persons according to label directions protect against such effects.¹³

Antimicrobial pesticides applied to mitigate or remediate mold in residences are classified as mostly unclassified pesticides. Very few (if any) antimicrobial pesticides are classified as RUPs. In fact, the WG could find only unclassified pesticides labeled for use to control mold in residences.

Federally, commercial pesticide use of RUP is regulated by applicator license requirements. Federal regulations do not require most occupational users of pesticides to be certified or licensed to apply a non RUP pesticide. In federal terms, certification means a person is authorized to use or supervise the use of a restricted use pesticide.¹⁴

FIFRA defines “Certified Private Applicators” and “Commercial Applicators”. A Certified Private Applicator may purchase, use, or supervise the use of an RUP on owned or rented property, on the employer’s property, or on the property of another when no compensation is exchanged; these are mostly farmers. A Commercial Applicator may use or supervise the use of an RUP on property other than defined for a Private Applicator, essentially, use for hire on other’s property.

Minnesota and most other states regulate occupational pesticide applicators more strictly than does the federal pesticide law. The MN Pesticide Control Law requires that any person in MN applying a pesticide for hire be licensed, or applying an RUP be either licensed or certified. MN law does not allow unlicensed persons to apply RUP or pesticides for hire under the supervision of a licensed/certified applicator.

Any person who applies pesticide for hire is required to keep a record of the application. The record must include all required information and the customer must be provided with a copy of the completed record. The MDA provides sample records that illustrate the requirement of the law which include information about the product applied and the applicator.¹⁵

MDA issues three types of applicator licenses: Commercial Pesticide Applicator, Noncommercial Pesticide Applicator, and Structural Pest Control Applicator. MDA does not issue business licenses for companies employing Commercial and Noncommercial Pesticide Applicators, as is the case in some states. That being the case, MDA does however issue a business license to companies employing Structural Pest

12 U.S. Environmental Protection Agency. Label Review Manual Chapter 6: Use Classification. <http://www.epa.gov/oppfead1/labeling/lrm/chap-06.htm>.

13 National Association of State Departments of Agriculture Foundation. National Pesticide Applicator Certification Core Manual. Chapter 2, page 20. <http://www.nasda.org/cms/7193/13692.aspx>.

14 U.S. Environmental Protection Agency. Restricted and Canceled Uses. <http://www.epa.gov/pesticides/regulating/restricted.htm>.

15 Minnesota Department of Agriculture. Pesticide Applicator Licensing. Pesticide Application Records (Sample). <http://www.mda.state.mn.us/licensing/pestfert/pesticideapplicator.htm>

Control Applicators.^{16 17} The MDA web site provides search capability enabling the general public to identify licensed applicators as well as labeled and registered pesticide products.¹⁸

License applicants must complete and submit a license application form, and pay the license application fees. Applicants for the Commercial Pesticide Applicator License must also meet financial responsibility minimum requirements. Typically, applicants do this by securing a general liability insurance policy.

MN license applicants must demonstrate competency by passing monitored closed book exams. The exams are based on basic knowledge and principles common to all pesticide applicators and specialized knowledge required for particular categories of applications.

MDA, in collaboration with the UM Extension, has established a certification process in parallel with this licensing. The UM Extension, with input from industry experts, regulators and others, develops study manuals to assist persons in preparing for required examinations. The desired outcomes of certification, training, examinations and licensing are that people and the environment are protected and pesticides are applied safely and properly.

Once licensed, MDA licensees must attend recertification training (5-6 hour workshops) to maintain and renew their annual license upon expiration. Professional sponsoring organizations and UM Extension establish training agendas that meet MDA recertification standards. The MDA approves all training and monitors attendance at all training workshops.

Federal regulations identify 11 such categories of application (ag crops, forestry, ornamental & turf, aquatic and so on). MDA has established a 'Core' category and 17 separate, specific subject categories (field crop, aquatic, rights-of-way, seed treatment, mosquito control, fumigation and so on) of application.¹⁹

MDA created an "Antimicrobial" category of use several years ago because of a perceived need to train people making antimicrobial pesticide applications to internal and external surfaces of air handling (HVAC) duct work, and for treatment of water cooling towers in industrial, institutional or commercial property. MDA also has a "Wood Preservatives Category" for licensing people making pesticide treatments to utility poles, pressure treated wood, or other construction materials. MDA also licenses Structural Pest Control Applicators (also known as "Exterminators").

As of November 2007, MDA issued licenses to persons applying pesticides for the purposes of "Antimicrobial", "Wood Preservatives" or Structural Pest Control after successful completion of certification examinations or training as follows:

- 11 licensees with "Antimicrobial Category" (7 different companies):
- 51 licensees with "Wood Preservatives Category" (14 different companies); and
- 730 licensees for Structural Pest Control (130 Structural Pest Control Companies).

Similarities exist between the sites, work, and/or products utilized by the MDA licensed persons noted above. These licensed applications resemble in many facets the applications offered by currently unlicensed, unregulated persons to mitigate and remediate residential mold problems.

A trained, knowledgeable and licensed individual applying a pesticide promotes effective and proper pesticide use. Admittedly, there are some types of pesticide applications for which MDA has not developed a commercial licensing category. Use of antimicrobials for mold mitigation or remediation in residences is an example.

16 Minnesota Rules, Chapter 1505.1240. Financial Responsibility. <http://www.revisor.leg.state.mn.us/arule/1505/1240.html>.

17 Minnesota Rules, Chapter 1505.1250. Limits of Liability. <http://www.revisor.leg.state.mn.us/arule/1505/1240.html>.

18 Minnesota Department of Agriculture. Licensing Lookup. <http://www.mda.state.mn.us/licensing/online/default.htm>.

19 Minnesota Department of Agriculture. Pesticide Applicator Licensing Program. Pesticide Applicator Licensing Categories. <http://www.mda.state.mn.us/news/publications/licensing/pest&fert/categorydfns.pdf>.

MDA acknowledges the fact that not all persons applying pesticides for hire in Minnesota, including persons applying antimicrobial pesticides commercially for mold control purposes are licensed. MDA inspection, compliance monitoring, and enforcement programs pursue reports, tips or other information to bring compliance assistance information to the attention of these persons. Often, these persons and others unknown to MDA are not aware of the license requirement.

Licensing programs have administrative and resource costs. Developing and publishing technical study materials, developing examinations and providing opportunities for testing- all provide continuing and difficult challenges for existing MDA and UM Extension program resources. It is the responsibility of MDA and UM Extension to develop and maintain training and testing for different pesticide use categories, however a point of diminishing returns is reached when one considers a proposal to license each and all types of pesticide applications and applicators.

Nationally, there is a trend among the states' pesticide applicator licensing programs towards "category consolidation". Other states are consolidating numerous minor categories of use into an aggregate category that spans a variety of topics. The WG could only find a very small number of states having an antimicrobial use category, and little or no training in the area of mold remediation and mitigation. Some states even reported that they had no intention of creating a separate mold remediation and mitigation use category citing costs and demands on resources.

Requiring persons who oversee or direct the remedy of a complex growing mold problem to demonstrate a degree of competency in the field offers consumers a degree of protection from the unqualified and unscrupulous. The MDA applicator license is one such measure of qualification and regulatory tool that can oversee behavior and establish a level of professionalism for the work performed, although other certifications exist that reflect competency.

Certified Industrial Hygienists, Certified Safety Professionals, and Professional Engineers may be useful and contracted to assist in the remediation or mitigation of mold problems in residential structures. Such specific licenses or certifications require specific educational and/or work experience, and testing. Continuing education is required. If a person or persons are not acting within the professional boundaries of that certification or licensure, they may be reprimanded and/or have their license or certification revoked (see Appendix 8).



A LITERATURE REVIEW ON THE NEED FOR, AND EFFICACY OF, ANTIMICROBIAL PESTICIDES USED IN RESIDENTIAL SETTINGS FOR MOLD CONTROL AND ANY POTENTIAL DANGERS POSED BY THE RESIDENTIAL APPLICATION NEAR YOUNG CHILDREN AND OTHER SENSITIVE PERSONS

Everyone is exposed to mold in both indoor and outdoor environments. The effect of mold on people can vary. Individual differences may account for the wide variability in human responses to mold exposures.

The greater the exposure, the more likely one could become ill from that exposure. Some, but not all mold is capable of causing disease in humans, yet science currently does not have good dose/response data for various types of mold exposures. MDH considers it prudent public health practice to minimize exposures to mold, especially for susceptible groups.

There are three typical routes of mold exposure: namely respiratory (inhalation), skin contact (dermal) and/or ingestion. It is uncommon that healthy individuals would become infected from low level exposures to molds in their homes. For most healthy individuals, this low level mold exposure is not harmful and the human body will prevent fungi from colonizing and actively growing.

There are however individuals within the population that are generally more susceptible to and for whom exposure to mold is more problematic. Evidence suggests that people with compromised immune systems or those who take medications to suppress their immune systems are at greatest risk for developing fungal infections when exposures to molds occur.²⁰ Examples include people undergoing chemo-therapy treatment for cancer, people with Human Immunodeficiency Virus (HIV), and organ transplant patients.

Others at risk include, people with certain chronic medical conditions, such as asthma, emphysema, diabetes, may also be at higher risk than the general healthy population when exposed to molds. For persons with mold sensitivity, molds can cause nasal congestion, throat irritation, coughing or wheezing, eye irritation, or, in some cases, skin irritation. Finally, children may be at risk from exposure to mold because their bodily systems are still developing, they eat more, drink more, and breathe more in proportion to their body size and their behavior in general may result in greater exposure to molds.

According to the Institute of Medicine, there is inadequate or insufficient evidence to determine whether an association exists between the exposure to damp indoor (mold prone) environments, and skin symptoms, gastrointestinal tract problems, fatigue, neuropsychiatric symptoms, cancer, reproductive effects, rheumatologic and other immune diseases, airflow obstruction in otherwise healthy individuals, mucous membrane irritation syndrome, chronic obstructive pulmonary disease, inhalation fevers for non-occupational exposures, lower respiratory illness in otherwise healthy adults, and acute idiopathic pulmonary hemorrhage in infants.²¹

According to Centers for Disease Control and Prevention (CDC) and other prominent health organizations, "Many of the major noninfectious health effects of mold exposure have an immunologic (i.e., allergic) basis."²² The most common allergy-type symptoms include nasal and sinus congestion, cough, wheezing or breathing difficulties, skin and eye irritation, sore throat and upper respiratory infections.

20 American College of Occupational and Environmental Medicine. Adverse Human Health Effects Associated with Molds in the Indoor Environment. Copyright 2002. <http://www.acoem.org/guidelines.aspx?id=850>.

21 Institute of Medicine of the National Academies. *Damp Indoor Spaces and Health..* Copyright 2004 by the National Academy of Sciences pp. 8-10. The National Academies Press, Washington, D.C., www.nap.edu.

22 Centers for Disease Control and Prevention. MMWR Recommendations and Reports. *Mold Prevention Strategies and Possible Health Effects in the Aftermath of Hurricanes and Major Floods*. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5508a1.htm>.

There is a great deal of debate among experts as to need for, efficacy of, and benefit of using antimicrobial pesticides. A search of peer reviewed journals about the use of biocides and/or antimicrobials to clean up and/or manage further mold growth revealed little conclusive information.

An internet/literature search produced limited recommendations for the use of antimicrobial pesticides for residential mitigation of mold apart from product claims promoting products benefits. Professional organizations such as the American Industrial Hygiene Association do not overtly recommend the use of antimicrobials or fungicides in the mitigation of mold from indoor environments, although some of its members use these products after mitigating detectable mold and correcting the underlying moisture issues.

Leading government organizations including the CDC, EPA and the City of New York, all prescribe to the need for correcting water problems and do not recommend pesticides as a primary means of cleaning or controlling mold in residential settings. In a 2006 document, the CDC provided the following reasons for not using antimicrobial pesticides for the control of mold indoors.²³

- 1) People can have adverse health reactions to even “dead” mold. Mold does not need to be actively growing and alive to be an allergen to people.
- 2) The chemicals themselves can be an added health risk to individuals, in particular, sensitive individuals for whom these chemicals are intended to protect (the immuno-compromised, chronically ill, the very young and the very old).
- 3) Most chemicals are questionable as to their effectiveness against the broad category of “molds” and “fungus”; and
- 4) The primary method to prevent further mold colonization is to keep building materials dry and free from excess moisture.

The use of antimicrobial pesticides is addressed in a book on Bioaerosols published by the American Conference of Governmental Industrial Hygienists (ACGIH), which states:²⁴

Active measures to control microbial growth in buildings may involve the use of biocides and antimicrobial agents in addition to moisture and temperature control. Biocides are used a) to treat flooding with sewage, b) to control legionellae in water-cooled, heat transfer equipment and to treat equipment associated with outbreaks of legionellosis, and c) to treat microbial contamination. Biocides and antimicrobial agents may play a role in treating and preventing microbial growth in other areas, although not as substitutes for proper building construction, maintenance, use, management, and other appropriate control measures.

The debate reinforces the WGs' assertions that situations where the use of antimicrobial pesticides is warranted are limited in nature and only after the underlying moisture causation has been corrected and/or controlled.

The following statements from EPA regarding efficacy of antimicrobial pesticides results from communication between MDA and EPA as noted below.²⁵

The assessment of the environmental and human health effects of antimicrobial pesticide use is the responsibility of the EPA as part of its product registration review process. Currently, product efficacy data are not required to be submitted to the EPA. In most cases, the product registrants (manufacturers, in many cases) are only required to generate such data and maintain it in their files.

23 Centers for Disease and Control, (CDC). *Mold Prevention Strategies and Possible health Effects in the Aftermath of Hurricanes and Major Floods*. MMWR, June 9, 2006.

24 Macher, Janet; Ammann, Harriet; Burge, Harriet; Milton, Donald; and Morey, Philip. Bioaerosols: Assessment and Control. ACGIH, 1999.

25 Personal Communications, Paul Liemandt, MDA and Laura Bailey, US EPA, Special Asst. to the Director, Antimicrobials Division, US EPA/OPP, July 7, 2007 and November 14, 2007.

According to EPA regulations, product efficacy data are required for products bearing claims for control of microorganisms which pose a threat to human health, and these data are submitted to EPA for product registration. Pesticide products bearing claims expressly for control of microorganisms not directly related to human health do not require supporting efficacy data to be submitted to EPA. In the case of mold, EPA historically has not required efficacy data to be submitted to the Agency, but the product registrant manufacturers are required to generate such data and maintain it in its files.

EPA has recently proposed a mold guidance policy that considers mold to be a microorganism which may pose a threat to human health (public health concern) and the applicant for antimicrobial product registration would be required to submit efficacy data to the EPA, or alternatively to utilize one of several other options to ensure that efficacy and other related issues are addressed.

EPA presented its proposed new mold guidance policy for antimicrobial pesticides at a public workshop in May, 2007. The following points are excerpted as pertinent from that presentation:

- There are over 1,000 antimicrobial pesticide products registered with EPA with mold and/or mildew control claims. Most are registered to control mold growth for aesthetic purposes. Submission of efficacy data is not now required under federal law (40 CFR 158.640 400).
- EPA's draft policy guidance focuses on mold products used indoors. It will include sections on product labeling and efficacy data requirements and frequently asked questions.
 - Product labeling options would include a disclaimer to the user that the product is intended to control mold growth for aesthetic purposes only (option).
 - Such a disclaimer would not be required if good acceptable data are submitted to demonstrate the product is efficacious against mold (option).
 - Or, the product label would simply delete mold control claims.
- In regard to product labeling, the applicant provides efficacy data to support claims of residual and/or prevention activity.
- All antimicrobial products for mold control may list fungi that potentially pose threat to human health, and efficacy data to support stated control claims must be submitted to EPA.
 - Note: EPA has identified certain species (potential public health issue fungi) that may be listed on labels.
- Depending on the use, products may be required to include on the label a comprehensive cleaning program. The remediation steps listed on the product label are to be taken prior to the pesticide product use.
- Recommendations have been received and reviewed by a scientific expert panel, and public comment has been and will be solicited.

In addition to proposing this policy guidance, EPA is updating its guidelines for risk assessment and product performance. EPA's mold guidance policy, once in place and finalized will be posted to its Antimicrobial Division/Office of Pesticide Program website.²⁶

The efficacy of antimicrobial pesticides can be tested both in a laboratory under controlled conditions, as well as in place or "in situ." Claims of antimicrobial efficacy may be verified through use of published standard methods with reference microbes at specific exposures. Accurate testing is necessary as part of EPA registration and for antimicrobial pesticide label claims and directions for use.

A general search for published articles regarding antimicrobial efficacy for controlling mold yielded hundreds of studies, using many different active ingredients, under many different conditions, including

26 U.S. Environmental Protection Agency. Regulating Antimicrobial Pesticides. <http://www.epa.gov/oppad001/>.

studies investigating the growth of mold on a variety of media. While studies involving wall board and other building materials exist, they are limited in number and very specific and of unknown value when generalized to all residential situations.

One problem drawing definitive conclusions from the available mold control efficacy studies is the unique nature of each environment and its associated and related unique factors. Any close examination of conditions within a residence or a commercial building reveals multiple and different causations of an existing moisture problem, such as source and degrees of water intrusion, duration of condition, air movement, or other mitigating factors. Additionally, there are hundreds of different active ingredients in and formulations of products to treat mold and more than a thousand species of mold with wide and varied optimal growth conditions. The multitude of variables makes it difficult to design a study to address all of these variables in combination that simulate true-life situations.

The WG concludes that the judicious use of antimicrobial pesticides is a supportive activity and without effective moisture control successful mold remediation and mitigation will not occur. A person even if properly using registered antimicrobial pesticides without recognizing the underlying moisture causation of molds, may indeed cause unnecessary health risk via use misuse of antimicrobial pesticides to residents or occupants. Some of the factors leading to risk from antimicrobial use are listed below:

Source

Chemical used (labeled, inherent chemical toxicity)
Where chemical is used or applied
Chemical reactions with other chemicals in the environment
Length of effectiveness
Residual, persistence in environment (half-life of chemical)

Occupant

Age (very young and the very old are often the most susceptible)
Sex (male; female; pregnancy status)
Health status (immuno-compromised individuals are at higher risk: cancer treatment; HIV; autoimmune disease; transplant recipients)
Pre-existing disease (diabetes; asthma and other pulmonary diseases; allergies)
Behavior (example: pica behavior of children)
Pets (may get into chemicals and could also carry in inadvertently on paws, etc.)

Delivery

How chemical is used (amount/dilution/following directions)
Proximity to humans, children
Chemical formulation (liquid, gas, solid and size of particulate)
Application site (fabrics; hard surfaces; surfaces used for food preparation)
Method of application (sprayed on; fogging; painted on; dusted or applied in a dry state)
Building mechanics such as temperature, humidity, air pressure and air flow

According to the World Health Organization (WHO), children face serious health risks from exposure to environmental hazards. Over forty percent (40%) of the global burden of disease attributed to environmental factors falls on children below five years of age, who account for only about ten percent (10%) of the world's population. Environmental risk factors often act in concert, and their effects are exacerbated by adverse social and economic conditions, particularly conflict, poverty and malnutrition. There is new knowledge about the special susceptibility of children to environmental risks: action needs to be taken to allow them to grow up and develop in good health and to contribute to economic and social development.²⁷

27 World Health Organization. New WHO report tackles children's environmental health. <http://www.who.int/mediacentre/news/notes/2007/np27/en/index.html>.

“Children are not just small adults” said Dr Terri Damstra, WHO’s team leader for the Interregional Research Unit. “Children are especially vulnerable and respond differently from adults when exposed to environmental factors, and this response may differ according to the different periods of development they are going through. For example, their lungs are not fully developed at birth, or even at the age of eight, and lung maturation may be altered by air pollutants that induce acute respiratory effects in childhood and may be the origin of chronic respiratory disease later in life.”

Air and water contaminants, pesticides in food, lead in soil, as well many other threats which alter the delicate organism of a growing child may cause or worsen disease and induce developmental problems. Over 30% of the global burden of disease in children can be attributed to environmental factors.

Children have different susceptibilities during different life stages, due to their dynamic growth and developmental processes. Some examples of health effects resulting from developmental exposures prenatally and at birth include miscarriage, still birth, low birth weight and birth defects; in young children, infant mortality, asthma, neurobehavioral and immune impairment; and in adolescents, precocious or delayed puberty. Emerging evidence suggests that an increased risk of certain diseases in adults such as cancer and heart disease can result in part from exposures to certain environmental chemicals during childhood.

In short, scientists know that children can be more susceptible to some chemical exposures than healthy adults and people with compromised immune systems may exhibit special sensitivities.

Antimicrobial pesticides applied to residential properties fall into several major classes. General health risk information about these classes of chemicals is available (see Appendix 9).

The EPA continues to complete “Reregistration Eligibility Decisions” or REDs for pesticide active ingredient risk assessments.²⁸ Although updated information is not yet available for every antimicrobial pesticide currently used, risk assessments are being completed and detailed health (as well as environmental) risk data will become more and more accessible in the future.

Information is currently available for the aliphatic alkyl quaternaries or Didecyl Dimethyl Ammonium Chloride (DDAC) -- five structurally similar quaternary ammonium compounds that were reviewed. As more of this type of data becomes available, it will be easier to thoroughly evaluate the health risk/benefits from using these types of compounds in residential settings.

28 U.S. Environmental Protection Agency. Pesticide Tolerance Reassessment and Reregistration. <http://www.epa.gov/pesticides/reregistration/index.htm>.

SURVEY OF THE STATE AND FEDERAL LAW REGULATING COMMERCIAL RESIDENTIAL ANTIMICROBIAL PESTICIDE MOLD CONTROL APPLICATORS IN UNITED STATES

The MDA and UM Extension staff surveyed other states' pesticide regulatory programs to determine their regulations, policies and practices related to residential mold control. Most states do not have licensure for persons applying pesticide to mitigate or remediate mold (see Appendix 10). The WG found that only Georgia, Louisiana, and Maine certify applicators in antimicrobial / mold specific category (see Appendix 11).

The Georgia Department of Agriculture has an "Antimicrobial Pest Control Category" for commercial applicators who apply antimicrobial pesticides. Persons must pass a written examination of practical knowledge on the use of pesticides to control undesirable or harmful microbes in homes, institutions, medical facilities, industrial and other sites. There appears to be little mold-in-structures content in the training or testing materials. Persons must renew licenses every 5 years through approved training.

The Louisiana Department of Agriculture and Forestry has a "Microbial Pest Control Category" for commercial applicators engaged in antimicrobial pest control using Restricted Use classified pesticides. Prior to Hurricane Katrina, this was a licensing category primarily for persons applying antimicrobials to HVAC systems. Post Katrina, the category now includes "for hire" applicators who apply pesticides to control molds in homes and other buildings. No training is required prior to taking the initial licensing examination. Recertification by either attending an approved workshop or retaking the examination is required every three years. Dr. Mary Grodner, Louisiana State University Extension Pesticide Safety Coordinator, conducts a 6 hour recertification workshop once every three years with substantial content on mold in homes and other buildings. Louisiana uses a 1970s EPA antimicrobial manual as the license category manual.

Louisiana State University housing specialist, Dr. Claudett Reichel provides state leadership on managing molds in buildings and has been a speaker at the recertification workshop. Dr. Reichel has also been successful in receiving grants to build a demonstration house showcasing how to hurricane proof houses and reduce mold problems. Seminars for people in the building trades, associated industries and for homeowners are held in the demonstration house. These seminars are not part of the state licensing program but have proven to be an effective outreach forum on proper management of mold in buildings.

The Maine Board of Pesticides Control has a "Disinfectant and Biocide Treatments Category" for biocide treatments in paper mills, swimming pools and mold remediation. Persons must pass a core and category specific examination. Certification is required every 6 years. Persons must obtain from 12-18 credit hours depending on level of licensure and supervision. At least 3 of the credit hours must come from at least one of the categories in which the person holds a credential and at least one credit hour must cover toxicology/ environmental science or ecology. Importantly, the manual and training for the category contains very little content on molds in buildings.

Several states - including Minnesota - have an antimicrobial category of use for application of antimicrobial pesticide to cooling tower or HVAC ductwork (see Appendix 12). MDA requires applicants for this license to test and train on specific material developed for these uses.

In some instances state pesticide laws exclude the use of antimicrobials and disinfectants from state pesticide regulation. The North Carolina Pesticide Law, for example, excludes from regulation any person who applies antimicrobial pesticides that are not a Restricted Use Pesticide and are not being used for agricultural, horticultural, or forestry purposes.²⁹ North Carolina does not license or certify persons

29 North Carolina General Assembly 2007- 2008 Session. NC General Statutes. <http://www.ncga.state.nc.us/gascripts/Statutes/Statutes.asp>.

who apply antimicrobials for any reason, including mold control. Other states are contemplating similar language to likewise exempt antimicrobial, or mold control applicators and applications from licensing regulations.

The Wisconsin Department of Agriculture, Trade and Consumer Protection require persons applying pesticide for mold control first obtain a Structural Applicators license. This license is issued for uses in or around human dwellings. In Indiana, the Office of the Indiana State Chemist requires that persons applying pesticide for mold control license only in a “Core” category. Neither the Wisconsin nor Indiana licensure related testing and training includes information related to mold control.

LICENSING OPTIONS

Several options for licensing residential antimicrobial pesticide mold control applicators in Minnesota were discussed as part of the study. The options detailed below were considered and deemed insufficient. Consequently, the WG does not recommend any of the following:

1. Maintain the status quo – initiate no new licensure requirements.
2. Require a “non-pesticide certification” issued by a creditable organization for persons using antimicrobial use to mitigate or remediate mold.
3. Exclude antimicrobial pesticide applications from any license requirements in new statutory language.
4. Require persons applying antimicrobial pesticides for hire to test and train in core principals only with no specific mold remediation/mitigation training.
5. Establish a new and narrowly focused license requirement with specific training and examination for antimicrobial use to mitigate or remediate mold.

RECOMMENDED LICENSURE

The WG by consensus agreement recommends that all persons in MN who apply antimicrobial pesticide for hire for mold mitigation or remediation in residences be licensed as MN Commercial Pesticide Applicators.³⁰ The MN Pesticide Control Law requires such persons pass a closed book and monitored certification examination, and participate in training.

The WG concludes that both the general public and persons commercially applying antimicrobial pesticides to remediate or mitigate mold will benefit from such licensure, and recommends revision and enhancement of training and examinations of the existing MDA Antimicrobial Category as appropriate and necessary to incorporate mold specific information.

IMPLEMENTATION OF RECOMMENDED LICENSURE

MDA will make efforts to identify persons performing or wishing to perform such applications and who would therefore need a license. Pursuant to the MN Pesticide Control Law, MDA does not permit employees to work under the license of another; all persons performing for hire services will need to be individually licensed.

30 Minnesota Statutes 2007 Chapter 18B. 33 Commercial Applicator License. <http://www.revisor.leg.state.mn.us/bin/getpub.php?type=s&year=current&num=18B.33>.

If this recommendation is adopted, MDA, in collaboration with the UM Extension will revise and amend the current MDA “Antimicrobial Category” of license to include persons occupationally applying antimicrobial pesticide for mold control in residences.

UM Extension, in collaboration with identified industry and scientific mold experts will analyze tasks and develop learning objectives in the revision of the “Antimicrobial Category” so it includes principals of effective mold mitigation and remediation. The study materials will be rewritten by UM Extension to assist persons in preparing for certification examinations. MDA will rewrite the exam based on the revised study materials to determine if a person meets minimum qualifications of competency to be issued a license.

By successfully qualifying for MDA licensure, a person will demonstrate a minimum proficiency to apply pesticides safely and properly, and therefore is qualified to obtain a license. Additionally, licensed persons must attend recertification training in order to renew and maintain a license. Recertification provides continuing training that provides the applicator with information regarding changing technology and helps ensure a continuing level of competence.

The MDA approves recertification training content that meets the recertification standards. These efforts respond to specific needs and involve members of the affected industries (as in this report and study).

The desired outcomes of initial certification and recertification training are pesticide applications made safely and properly. Trained persons are better equipped to recognize causes, and evaluate responses including the need for and benefit of pesticide use. They will also be alerted to methods for mitigating any potential dangers discovered related to the use of these products.

A detailed plan and timeline for implementation of this recommendation, and those additional issues discussed, need to be considered and further developed. Consideration of costs are critical as is additional cooperators and regulated clientele.

Costs for developing and implementing the various training, examinations, and certification models are variable. Categories of expenses are as follows:

- Outreach
- Development of Study Materials
- Development of Exam
- Printing and Distribution
- Licensing Unit Administrative and Staffing Expenses
- Enforcement and Inspection

A small amount of revenue will be generated for MDA from additional licenses issued. UM Extension will also benefit from the purchase of training manuals, and enrollment in training programs. It is unclear at this time how many persons will obtain the license as recommended in this report.

ADDITIONAL ISSUES

The WG also identified the following issues outside the scope of this study that are important to the issue of managing molds in residences or other structures:

1. Recommend MDA expand the existing licensure policy for persons who commercially apply antimicrobial pesticide to industrial/institutional duct work to include commercial applications to residential duct work.

-
2. Recommend MDA expand existing licensure policy for persons who commercially apply wood preservatives to include commercial application of antimicrobials as mold preventative pre-treatment to building materials.
 3. Recognize mold problems exist in residential and non-residential buildings such as schools, medical facilities, businesses, transportation vehicles, commercial buildings and other structures. Licensure of applicators applying pesticides for molds in these “non residential” settings and in particular sensitive sites should also be considered by MDA.
 4. Recognize need for consumer education about the nature of mold so people can make informed choices about mold remediation and mitigation measures. The information should help people recognize when additional expertise is needed, especially when faced with a complex or severe mold problem so that all remediation and mitigation options are appropriately considered.
 5. Recognize need for training about the capability and proper use of antimicrobial pesticides so the public better understands the risks and benefits of pesticide use, and that in many cases pesticide use may be avoided if sound water management methods are practiced.
 6. Agree need does not exist to license people doing routine cleaning such as janitors, building maintenance engineers, commercial cleaning service employees, remodeling contractors and others and recommend that MDA not license commercial cleaning personnel that make no pesticide claims for their services.



APPENDIX

1. WORK GROUP MEMBERS.

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APPENDIX

2. OTHER INTERESTED PERSONS, INDUSTRY, REGULATORY OFFICIALS AND OTHER STAKEHOLDERS THAT PARTICIPATED IN THE STUDY.

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APPENDIX

3. MILGO QGC, U.S. EPA REGISTRATION NUMBER 70263-6-53440, MANUFACTURED BY DRI-EAZ PRODUCTS INC. SPECIMEN LABEL.

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Net Contents - 1 US Gallon / 3.8 Litres

Sold by:

Milgo QGC is for use on the following hard non-porous surfaces: countertops, stovetops, sinks, appliances, refrigerators, tables, picnic tables, outdoor furniture, chairs, desks, telephones, highchairs, bed frames, washable walls, cabinets, doorknobs, telephones, shower stalls, tubs and glazed ceramic tiles, whirlpool bath tubs, glazed porcelain tiling, garbage cans, exhaust fans, refrigerated storage and display equipment, coils and drain pans of air conditioning and refrigeration equipment and heat pumps, stainless steel, enameled surfaces, finished woodwork, Formica, vinyl and plastic upholstery, bathtubs, shower stalls, sinks, and bathroom fixtures, walls, kennel runs, cages, floors, conductive flooring and other hard non-porous surfaces (such as metal, stainless steel, glazed porcelain, glazed ceramic, fiberglass and plastic). **Milgo QGC** is a one-step disinfectant cleaner that is effective against a broad spectrum of bacteria, is virucidal* (including HIV-1, the AIDS virus), fungicidal, and inhibits the growth of mold and mildew and their odors when used as directed. **Milgo QGC** is an effective fungicide against Trichophyton mentagrophytes (the athlete's foot fungus) when used on surfaces in areas such as locker rooms, dressing rooms, shower and bath areas, exercise facilities. **Milgo QGC** kills *Pseudomonas aeruginosa* (*Pseudomonas*), *Staphylococcus aureus* (*Staph*), Methicillin Resistant *Staphylococcus aureus* (MRSA), *Salmonella choleraesuis* (*Salmonella*), *Escherichia coli* (*E. coli*), *Klebsiella pneumoniae* (*Klebsiella*), *Salmonella typhi* (*Salmonella*), *Serratia marcescens* (*Serratia*), *Shigella dysenteriae* (*Shigella*), *Streptococcus faecalis* (*Enterococcus faecalis*), *Streptococcus pyogenes* (*Strep*), *Brevibacterium ammoniagenes* (*Brevibacterium*), HIV-1 (the AIDS virus), Herpes Simplex Virus Types 1 & 2 (Herpes), Influenza Type A/Brazil (Influenza), Adenovirus Type 5 (Adenovirus) at 1:16 dilution (8 ounces per gallon), Vaccinia (Pox virus), Trichophyton mentagrophytes (the Athlete's Foot Fungus). **Milgo QGC** reduces 99.99% of *Staphylococcus aureus*, and *Klebsiella pneumoniae* in 60 seconds. **Milgo QGC** meets EPA efficacy standards for hospital disinfectants. **Milgo QGC** is a Hospital Disinfectant at 1:64 dilution (2 ounces per gallon), bactericidal according to the AOAC Use-Dilution Test method, Fungicidal according to the AOAC fungicidal test, Virucidal* according to the qualification, modified in the presence of 400 ppm hard water plus 5% organic serum against: *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Salmonella typhi*, *Staphylococcus aureus*-MRSA, *Serratia marcescens*, *Salmonella choleraesuis*, *Shigella dysenteriae*, *Brevibacterium ammoniagenes*, *Streptococcus faecalis*, *Enterobacter aerogenes*, *Streptococcus pyogenes*, *Escherichia coli*, *Trichophyton mentagrophytes* (the athlete's foot fungus), *Klebsiella pneumoniae*, *HIV-1 (AIDS virus), *Influenza A/Brazil, *Herpes Simplex Type 1, *Vaccinia, *Herpes Simplex Type 2, *Adenovirus Type 5 at 1:16 dilution (8 ounces per gallon). **Milgo QGC** is a mildewstat at 1:64 dilution (2 ounces per gallon) and will effectively inhibit the growth of mold and mildew and the odors caused by them when applied to hard, non-porous surfaces (as indicated in the "Directions for Use" section of this label).

PELIGRO: Si no sabe el inglés, solicite instrucciones a su supervisor antes de usar este producto. **DIRECCIONES FOR USE:** It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. **Instrucciones de uso:** El empleo de este producto de manera contraria a lo indicado en su etiqueta constituye una violación de la Ley Federal.)

This product is not to be used as a terminal sterilant/high level disinfectant on any surface or instrument that (1) is introduced directly into the human body, either into or in contact with the bloodstream or normally sterile areas of the body, or (2) contacts intact mucous membranes but which does not ordinarily penetrate the blood barrier or otherwise enter normally sterile areas of the body. This product may be used to pre-clean or decontaminate critical or semi-critical medical devices prior to sterilization or high level disinfection.

APPENDIX

4. SUMMARY OF PHONE CALLS WITH LOCAL CLEANING SERVICE COMPANIES CONDUCTED BY TELEPHONE DURING MAY, 2007.

Business	Address	City	Telephone Number
Coit Services of Minneapolis – St. Paul, MN	11100 Hampshire Avenue South	Bloomington, MN 55438	952-944-9433
Mavo System	4330 Centerville Road	White Bear, MN 55127	763-788-7713
Webster Home Services, Inc.	9320 Evergreen Boulevard NW, Suite A	Coon Rapids, MN 55433	763-560-2013
Vac System Industries	1800 East Cliff Road, Suite 11	Burnsville, MN 55337	952-808-1616
Advanced Environmental Restoration	755 4 th Street NW	New Brighton, MN 55112	651-587-2187
Trinity Environmental Specialists, Inc	1925 Oakcrest Avenue, Suite 1	Roseville, MN 55112	651-631-3263
EnvironBate – Metro	3301 East 26 th Street	Minneapolis, MN 55406	612-729-1080
Steamatic of the Twin Cities	666 Transfer Road, Suite 14	St. Paul, MN 55114	651-481-4991

1. Do you do application of microbial pesticides in homes, apartments or other residences for mold?

- 1 Coit - No
- 2 Mavo - No
- 3 Webster Home Services - Yes, restoration projects
- 4 VAC System Industries - Yes
- 5 Advanced Environmental - Yes
- 6 Trinity - Commercial only, do maybe 5% residential
- 7 Envirobate - No
- 8 Steamatic of the TC - No

2. What area in homes are your products applied?

- 1 Carpets or floors, walls, heating and AC ducts
- 2 Anywhere
- 3 Ducts for air flow
- 4 Basements, ducts
- 5 Basement floors and walls
- 6 Walls and floors
- 7 None
- 8 Ducts

3. What products are used?

- 1 Microban
- 2 Fosters 40-20, bleach
- 3 Sporidican, Oxine, Basic G by Shaklee, Fosters 40-20
- 4 Fosters
- 5 Fosters 40-8-, Microban, Envirowash through API
- 6 Quaternary ammonium
- 7 Premawash, Premawhite, a Zinzar product
- 8 Benefect

4. Are the products EPA registered?

- 1 Thinks it is
- 2 Yes
- 3 Yes
- 4 Yes
- 5 Yes
- 6 Yes
- 7 Yes
- 8

5. How are the products applied?

- 1 Spray
- 2 Paint
- 3 Fogging
- 4 Fogging and spray
- 5 Spray
- 6 Spray with garden sprayer
- 7 With rag or brush
- 8 Fogged into ducts or sprayed

6. How many applicators do you employ?

- 1 3
- 2 1-20
- 3 2-3
- 4 35 supervisors, techs don't apply
- 5 3
- 6 2
- 7 1
- 8

7. What type of training do applicators get? Any certification?

- 1 Water mitigation training; S 500, S520 mold
- 2
- 3 3 mos. Training, cleaning coils, air system cleaning
- 4 On the job and in house, National Association of Duct Cleaners
- 5
- 6 Certified mold remediators
- 7 Certified air system cleaning specialist, hazardous waste remover, lead remover
- 8 Training for duct cleaning

8. Describe any other types of remedies.

- 1 Yes, ultra violet light purification system
- 2
- 3 Clean well
- 4 Bleach and water
- 5 no
- 6 Isolate, HEPA filtered equipment
- 7 Soap, water bleach
- 8

9. Besides homes where else are microbial pesticides applied?

- 1 Restaurants and office buildings
- 2
- 3
- 4 Hospital, industrial facilities, offices, food processing facilities
- 5
- 6
- 7 For mold remediation, anyone who calls
- 8 Does not do commercial

10. Do you do this work?

- 1
- 2
- 3
- 4 5% of the time
- 5 No, only does duct cleaning
- 6
- 7 No
- 8

Additional comments:

We don't use Foster 40 anymore because of the licensing requirements. I license one applicator to follow the rules; I take pride in following the rules. Many companies do the work, but are not licensed. Test has nothing to do with mold remediation.

APPENDIX

5. BBJ MICRO BIOCIDES, U.S. EPA REGISTRATION NUMBER 67212-1, MANUFACTURED BY BBJ ENVIRONMENTAL SOLUTIONS SPECIMEN LABEL.

EPA Reg. Number 67212-1
EPA Est. Number 67212-FL-001

BBJ MICRO BIOCIDES

FOR FLOORS AND WALLS

INDUSTRIAL • COMMERCIAL • RESIDENTIAL

- Bacteriostat
- Fungistat (mold and mildew)
- Mildewstat - Deodorizer
- Eliminates odors associated with bacteria, mold, mildew, smoke, animals, cooking, spoilage, musty and other odors
- Will not damage most surfaces

BBJ Environmental Solutions, Inc.
Tampa, Florida 33619
Questions? 1-800-889-2251

DILUTE CONTENTS OF THIS PACKAGE BEFORE USE

ACTIVE INGREDIENTS:	2-Bromo-2-nitropropane-1, 3-diol	95.0%
INERT INGREDIENTS:		5.0%
TOTAL		100.0%

KEEP OUT OF REACH OF CHILDREN **DANGER:** SEE ATTACHED BOOKLET FOR PRECAUTIONARY STATEMENTS. DIRECTIONS FOR USE ARE CONTAINED IN THE ATTACHED BOOKLET AND MUST BE READ COMPLETELY PRIOR TO USING THIS PRODUCT. IF THE BOOKLET IS MISSING, RETURN THIS PRODUCT TO THE PLACE OF PURCHASE AND OBTAIN A REPLACEMENT PACKAGE.

NET CONTENTS: 0.07 OZ. (2.0 g) (MAKES UP TO 5 GALLONS)

EPA Reg. Number 67212-1
EPA Est. Number 67212-FL-001

BBJ MICRO BIOCIDES

FOR FLOORS AND WALLS DILUENT

For use with BBJ MICROBIOCIDE FOR FLOORS AND WALLS
Follow directions for mixing, use, storage, and disposal on the BBJ MICROBIOCIDE FOR FLOORS AND WALLS label.

Use only according to label directions.

PRECAUTIONARY STATEMENTS:
Hazards to Humans and Domestic Animals:
Eye Contact: May cause irritation.

Seller makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risk of use and/or handling of this material when such use is contrary to directions.

In the event of an emergency, call toll free (day or night) 1-800-889-2251

NET CONTENTS: 8 FL.OZ.
CONTAINS: SOLVENT 100%

BBJ Environmental Solutions, Inc.
Tampa, Florida 33619
Questions? 1-800-889-2251

7 90759 00440 3

EPA Reg. Number 67212-1
EPA Est. Number 67212-FL-001

BBJ MICRO BIOCIDES

FOR AIR DUCTS

INDUSTRIAL • COMMERCIAL • RESIDENTIAL

- Bacteriostat
- Fungistat (mold and mildew)
- Mildewstat - Deodorizer
- Controls and inhibits odor causing bacteria, fungi and other odor causing organisms in air ducts

BBJ Environmental Solutions, Inc.
Tampa, Florida 33619
Questions? 1-800-889-2251

DILUTE CONTENTS OF THIS PACKAGE BEFORE USE

ACTIVE INGREDIENTS:	2-Bromo-2-nitropropane-1, 3-diol	95.0%
INERT INGREDIENTS:		5.0%
TOTAL		100.0%

KEEP OUT OF REACH OF CHILDREN **DANGER:** SEE ATTACHED BOOKLET FOR PRECAUTIONARY STATEMENTS. DIRECTIONS FOR USE ARE CONTAINED IN THE ATTACHED BOOKLET AND MUST BE READ COMPLETELY PRIOR TO USING THIS PRODUCT. IF THE BOOKLET IS MISSING, RETURN THIS PRODUCT TO THE PLACE OF PURCHASE AND OBTAIN A REPLACEMENT PACKAGE.

NET CONTENTS: 0.14 OZ. (4.0 g) (MAKES UP TO 5 GALLONS)

Patent Pending

BBJ MICRO BIOCIDES

FOR AIR DUCTS DILUENT

For use with BBJ MICROBIOCIDE FOR AIR DUCTS
Follow directions for mixing, use, storage, and disposal on the BBJ MICROBIOCIDE FOR AIR DUCTS label.

Use only according to label directions.

PRECAUTIONARY STATEMENTS:
Hazards to Humans and Domestic Animals:
Eye Contact: May cause irritation.

Seller makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risk of use and/or handling of this material when such use is contrary to directions.

In the event of an emergency, call toll free (day or night) 1-800-889-2251

NET CONTENTS: 15 FL.OZ.
CONTAINS: SOLVENT 100%

BBJ Environmental Solutions, Inc.
Tampa, Florida 33619
Questions? 1-800-889-2251

7 90759 00460 1

EPA Reg. Number 67212-1
EPA Est. Number 67212-FL-001

BBJ MICRO BIOCIDES

FOR HVAC/R EQUIPMENT

INDUSTRIAL • COMMERCIAL • RESIDENTIAL

- Bacteriostat
- Fungistat (mold and mildew)
- Mildewstat - Deodorizer
- Eliminates odors associated with bacteria, mold, mildew, smoke, animals, cooking, spoilage, musty and other odors

BBJ Environmental Solutions, Inc.
Tampa, Florida 33619
Questions? 1-800-889-2251

DILUTE CONTENTS OF THIS PACKAGE BEFORE USE

ACTIVE INGREDIENTS:	2-Bromo-2-nitropropane-1, 3-diol	95.0%
INERT INGREDIENTS:		5.0%
TOTAL		100.0%

KEEP OUT OF REACH OF CHILDREN **DANGER:** SEE ATTACHED BOOKLET FOR PRECAUTIONARY STATEMENTS. DIRECTIONS FOR USE ARE CONTAINED IN THE ATTACHED BOOKLET AND MUST BE READ COMPLETELY PRIOR TO USING THIS PRODUCT. IF THE BOOKLET IS MISSING, RETURN THIS PRODUCT TO THE PLACE OF PURCHASE AND OBTAIN A REPLACEMENT PACKAGE.

NET CONTENTS: 0.14 OZ. (4.0 g) (MAKES UP TO 5 GALLONS)

EPA Reg. Number 67212-1
EPA Est. Number 67212-FL-001

BBJ MICRO BIOCIDES

FOR HVAC/R EQUIPMENT DILUENT

For use with BBJ MICROBIOCIDE FOR HVAC/R EQUIPMENT
Follow directions for mixing, use, storage, and disposal on the BBJ MICROBIOCIDE FOR HVAC/R EQUIPMENT label.

Use only according to label directions.

PRECAUTIONARY STATEMENTS:
Hazards to Humans and Domestic Animals:
Eye Contact: May cause irritation.

Seller makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risk of use and/or handling of this material when such use is contrary to directions.

In the event of an emergency, call toll free (day or night) 1-800-889-2251

NET CONTENTS: 15 FL.OZ.
CONTAINS: SOLVENT 100%

BBJ Environmental Solutions, Inc.
Tampa, Florida 33619
Questions? 1-800-889-2251

7 90759 00430 4

APPENDIX

6. MOLD-RAM, U.S. EPA REGISTRATION NUMBER 72340-1, MANUFACTURED BY SOSTRAM CORPORATION SPECIMEN LABEL.

MOLD-RAM
FUNGICIDE

For Mold and Mildew on Wood, Wallboard,
Concrete and Masonry (Cinder) Block
Construction Materials in Buildings

ACTIVE INGREDIENT:
Chlorothalonil (tetrachloroisophthalonitrile).....40.4%
OTHER INGREDIENTS:..... 59.6%
TOTAL:.....100.0%
Contains 4.17 pounds chlorothalonil active ingredient per gallon.

KEEP OUT OF REACH OF CHILDREN
WARNING – AVISO
Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)
See Back Panel For First Aid Information

EPA REG. NO. 72304-1
EPA EST. NO. 37429-GA-2
NET CONTENTS: 32 Ounces

See Inside Booklet For Additional Precautionary Statements And Directions For Use

MOLD-RAM is a trademark of SOSTRAM CORPORATION

SOSTRAM CORPORATION
2000 Industrial Center Parkway
State 29015
Raleigh, NC 27607

APPENDIX

7. OZONE.

Air “cleaning” devices that produce ozone as a cleaning/disinfecting agent are not effective for cleaning mold and removing mold spores from indoor air, and can actually be harmful to health. Exposure to ozone can damage airway tissues by causing inflammation and irritation of respiratory tract tissues and chronic exposures to ozone can cause permanent lung damage. Ozone may also exacerbate asthma and may increase the risk of death in susceptible populations. Ozone is regulated at a level of 80 parts per billion as an 8-hour standard in outdoor air. The health effects indoors may be most harmful because there are more chemicals for the ozone to react with indoors.

Although the odor may provide a sense of “clean” the respiratory irritancy properties remain and it is never a good idea to intentionally produce ozone in indoor environments. Secondly, the amounts or concentrations that may be effective in ozone being used as a biocide/fungicide would be so high that it would be dangerous to humans to be exposed to ozone at those concentrations. In response to the widespread misuse of ozone-emitting air cleaning devices, on September 27, 2007, the California Air Resources Board unanimously approved a regulation that limits the ozone emission concentration from indoor air cleaning devices to 0.050 ppm, or 50 ppb.

APPENDIX

8. NONPESTICIDAL CERTIFICATIONS.

Professional Engineer (PE): The “Minnesota Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience, and Interior Design” examines, licenses, and regulates the practice of Professional Engineers. A person must be licensed or certified before being permitted to offer professional engineering services to the public in Minnesota. The Board’s program for administering the law is comprised of (1) administering exams; (2) issuing and renewing licenses and certificates; and (3) regulating the professions by enforcing the Board’s statutes and rules.

This Board was established to protect the public and ensure that persons practicing professional engineering meet and maintain the qualifications, standards, and professionalism required to competently practice their profession in Minnesota. The Board investigates complaints from members of the public against licensed or certified professionals and/or individuals who are practicing one of the above professions without a license.

Certified Industrial Hygienist (CIH): National certification program overseen by the American Board of Industrial Hygiene (ABIH) which was comprised of input from the American Industrial Hygiene Association (AIHA) and the American Conference of Governmental Industrial Hygienists (ACGIH). Much like the Professional Engineer, the Industrial Hygiene (IH) professional traditionally has demonstrated competence by a combination of education, training, and experience. This knowledge is used to anticipate when a hazardous condition could occur to cause an adverse health effect on a worker or the environment. The IH must be able to recognize conditions that could lead to adverse health effects to workers or a community population.

A CIH has training in the basic sciences including occupational disease, illness, injury and surveillance (biostatistics, epidemiology, toxicology); health hazards (ergonomics/human factors, physical stressors, biological stressors, chemical stressors); work environments (indoor air, industrial processes); program management principles (investigation methods, ethics, risk communication, guidelines and standards, data management and integration, emergency response); evaluation practices (instrumentation, sampling methods/techniques, analytical chemistry); hazard controls (engineering, PPE, administrative); and community stressors (air pollution, hazardous waste).

To become certified, one must pass an exam and provide proof of training and experience, much like the PE must do to obtain his/her licensure.

Certified Safety Professional (CSP): A CSP is engaged in the prevention of accidents, incidents, and events that harm people, property, or the environment. CSP use qualitative and quantitative analysis of simple and complex products, systems, operations, and activities to identify hazards. They evaluate the hazards to identify what events can occur and the likelihood of occurrence, severity of results, risk (a combination of probability and severity), and cost. They identify what controls are appropriate and their cost and effectiveness. Safety professionals make recommendations to managers, designers, employers, government agencies, and others. Controls may involve administrative controls (such as plans, policies, procedures, training, etc.) and engineering controls (such as safety features and systems, fail-safe features, barriers, and other forms of protection). Safety professionals may manage and implement controls.

Besides knowledge of a wide range of hazards, controls, and safety assessment methods, CSPs must have knowledge of physical, chemical, biological and behavioral sciences, mathematics, business, training and educational techniques, engineering concepts, and particular kinds of operations (construction, manufacturing, transportation, etc.).

To become certified, one must pass an exam and provide proof of training, education and experience, just as the CIH certification and PE licensure listed above.

APPENDIX

9. MAJOR CLASSES OF ANTIMICROBIALS AND THEIR TOXICITY.

The following are the major classes of antimicrobials:

Quaternary Ammonium Compounds (“Quats”)

Alcohols – ethanol, methanol, isopropanol

Aldehydes – formaldehyde and glutaraldehyde

Halogens – chlorine, hypochlorite, chloramines, iodine, fluorine and bromine.

Heavy metals – copper, silver, zinc

Phenols and derivatives – ex. Lysol

Peroxides – hydrogen peroxide

Quaternary Ammonium Compounds (“Quats”)

Quats are the active ingredients found in sanitizers and disinfectants for homes, farms, hospitals, offices, schools, daycares, hotels/motels and other institutions. They are used in water cooling towers, on food contact surfaces, equipment found in dairies and food-processing plants. They are also used in fabrics, carpets, curtains, fiberfill for upholstery, furniture, plastics, leather materials, paints, floor coverings, building materials, and are used in eye and nasal preparations, shampoos, cosmetics, and topical antiseptics.

Quats are such a large group of chemicals that there is some risk in generalizing, but it is important to look at this group of chemicals as a whole.

TOXICITY

Acute – Concentrated quats are corrosive to the skin, can be harmful if swallowed, are eye irritants, and may cause respiratory tract irritation if inhaled. Label warnings and PPE address these hazards. Formulated quat preparations are of low acute toxicity because of the low concentration used. Humans are often directly exposed through use in disinfectants, sanitization of food contact surfaces, shampoos, cosmetics, and countless other treated articles.

Chronic – Quats are not known to be carcinogenic, mutagenic, or teratogenic and the risks from chronic exposure to low levels of quats could probably be considered minimal and without consequence to human health.

Ecotoxicity – A great many of the quats are used primarily indoors and exposure to the environment would be extremely minimal. Pesticide products designed primarily for indoor use are not required to carry the “Environmental Hazards” statement on the label. In general, quats are considered to be biodegradable, do not bioaccumulate, have short half lives, rapidly become biologically inert in the presence of organic matter and their influence on the environment is generally considered not significant. Quats are toxic to fish and aquatic invertebrates. Discharge of effluent containing quat compounds does occur in industrial settings. The risk of acute exposure to aquatic organisms is mitigated by precautionary labeling and the requirement of having National Pollutant Discharge Elimination System permits which ensures discharge levels that will not pose adverse effects on non-target organisms. In the event of a spill, many quats may be de-activated by the addition of an anionic surfactant like soap.

Child Exposures - Although EPA may, in the future, refine exposure estimates for Aliphatic Alkyl Quats based on more sophisticated modeling techniques, the current exposure assessment is based on a combination of conservative assumptions that is likely to overstate exposure from food to Aliphatic Alkyl Quats.

There is no evidence that Aliphatic Alkyl Quats result in increased prenatal or postnatal sensitivity (rats and rabbits— two-generation reproduction study). EPA has determined that reliable data show that it would be safe for infants and children to reduce the FQPA safety factor to 1X from the default of 10X. That decision is based on the following findings: 1) The toxicity database for Aliphatic Alkyl Quats is complete for assessing risk to infants and children under the FFQCA; 2) There is no indication that Aliphatic Alkyl Quats are neurotoxic chemicals and there is no need for a developmental neurotoxicity study or additional uncertainty factors to account for neurotoxicity; 3) There is no evidence that Aliphatic Alkyl Quats result in increased susceptibility in in-utero rats or rabbits in the prenatal developmental studies or in young rats in the two-generation reproduction study; and 4) There are no residual uncertainties identified in the exposure databases.³¹

Alcohols – ethanol, methanol, isopropanol

Alcohols have been used as disinfectants for many years. The most commonly used alcohol is a 70% solution of isopropanol or isopropyl alcohol (IPA).

TOXICITY

Acute – IPA, is a “slightly toxic” central nervous system toxicant. It is absorbed by both skin and inhalation. IPA may also produce mild hepatic (liver) injury with acute exposures. The most commonly experienced effects include eye, nose and throat irritation, drowsiness, dizziness as IPA can depress the central nervous system depressant. Dermal contact may result in dry cracking skin.

Chronic – Not known as a carcinogen, endocrine disruptor, reproductive or developmental toxicant.

Ecotoxicity – IPA is listed as “not acutely toxic” to crustaceans, fish, insects, and zooplankton.

Child Exposures – Alcohols are the most common accidental toxic ingestions by children younger than 5 years. However, because of deliberate ingestions (e.g., suicide attempts, recreational use/misuse), toxic ingestions may occur at any age. No other particular concerns were found.

Aldehydes – formaldehyde and glutaraldehyde

Formaldehyde and glutaraldehyde are the two aldehydes most commonly used as disinfectants. Glutaraldehyde is often prepared in a 2% concentration and is slightly alkaline. The Registration Eligibility Decision (RED) for glutaraldehyde was due in September of 2007 and the RED for formaldehyde is due in September of 2008. In regards to formaldehyde, a major source is the air that we breathe every day. Besides smog, automobile exhaust from cars without catalytic converters or those using oxygenated gasoline also contain formaldehyde. At home, formaldehyde is produced by cigarettes and other tobacco products, gas cookers, and open fireplaces. It is also used as a preservative in some foods, such as some types of Italian cheeses, dried foods, and fish. Formaldehyde is found in many products used every day around the house, such as antiseptics, medicines, cosmetics, dish-washing liquids, fabric softeners, shoe-care agents, carpet cleaners, glues and adhesives, lacquers, paper, plastics, and some types of wood products. Some people are exposed to higher levels of formaldehyde if they live in a new mobile home, as formaldehyde is given off as a gas from the manufactured wood products used in these homes.³²

Formaldehyde is used in many industries. It is used in the production of fertilizer, paper, plywood, and urea-formaldehyde resins. It is present in the air in iron foundries. It is also used in the production of cosmetics and sugar, in well-drilling fluids, in agriculture as a preservative for grains and seed dressings, in the

31 U.S. Environmental Protection Agency. Residues of Quaternary Ammonium Compounds di-n-Alkyl (C₈₋₁₀) dimethyl Ammonium chloride, Exemption from the Requirement of a Tolerance. <http://www.epa.gov/fedrgstr/EPA-PEST/2007/September/Day-06/p17634.htm>.

32 Department of Human Health and Services. Agency for Toxicity Substances and Disease Directory. Public Health Statement for Formaldehyde. <http://www.atsdr.cdc.gov/toxprofiles/phs111.html>.

rubber industry in the production of latex, in leather tanning, in wood preservation, and in photographic film production. Formaldehyde is combined with methanol and buffers to make embalming fluid. Formaldehyde is also used in many hospitals and laboratories to preserve tissue specimens.

TOXICITY

Acute – Formaldehyde is an irritant to the eyes, nose, throat, and respiratory system. Glutaraldehyde is irritating to the eyes and skin and can cause irritation to the respiratory system, resulting in rhinitis, coughing, and asthma. Glutaraldehyde is also reported, although rarely, in palpitations and tachycardia in humans.³³ Formaldehyde is discussed below because it is more commonly found in daily exposures and there is more toxicology data available for this chemical.

Chronic – Mutagenic activity of formaldehyde has been demonstrated in viruses, *Escherichia coli*, *Pseudomonas fluorescens*, *Salmonella typhimurium* and certain strains of yeast, fungi, *Drosophila*, grasshopper and mammalian cells (Ulsamer et al., 1984). Formaldehyde has been shown to cause gene mutations, single strand breaks in DNA, DNA-protein cross links, sister chromatid exchanges and chromosomal aberrations. Formaldehyde produces in vitro transformation in BALB/c 3T3 mouse cells, BHK21 hamster cells and C3H-10T1/2 mouse cells, enhances the transformation of Syrian hamster embryo cells by SA7 adenovirus, and inhibits DNA repair (Consensus Workshop on Formaldehyde, 1984).

Formaldehyde is recognized as a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals. Human data include nine studies that show statistically significant associations between site-specific respiratory neoplasm and exposure to formaldehyde or formaldehyde-containing products. An increased incidence of nasal squamous cell carcinomas was observed in long-term inhalation studies in rats and in mice. The classification is supported by in vitro genotoxicity data and formaldehyde's structural relationships to other carcinogenic aldehydes such as acetaldehyde.³⁴

Ecotoxicity –

- Formaldehyde dissolves easily but does not last a long time in water.
- Most formaldehyde in the air breaks down during the day.
- The breakdown products of formaldehyde are formic acid and carbon monoxide.
- Formaldehyde does not build up in plants and animals.

Child Exposures – Children and adults are likely to be exposed to formaldehyde in the same way. The most common way for children to be exposed to formaldehyde is by breathing it. A small number of studies have looked at the health effects of formaldehyde in children. It is very likely that breathing formaldehyde will result in nose and eye irritation (burning feeling, itchy, tearing, and sore throat). We do not know if the irritation would occur at lower concentrations in children than in adults. Studies in animals suggest that formaldehyde will not cause birth defects in humans. Inhaled formaldehyde or formaldehyde applied to the skin is not likely to be transferred from mother to child in breast milk or to reach the developing fetus.³⁵

Halogens – chlorine, hypochlorite, chloramines, iodine, fluorine and bromine.

Iodine and chlorine are the two halogens that are most commonly used as antiseptics or disinfectants. Molecular *iodine* damages microorganisms by protein denaturation and the *hypochlorite ion* is a strong oxidizing agent and is the active ingredient of Clorox® bleach. Bromine has become a popular antimicrobial in more recent years. Sodium hypochlorite (household bleach) is the most commonly used of these compounds and therefore is used as an example of a halogen.

Sodium and calcium hypochlorite are used primarily as bleaching agents or disinfectants. They are

33 U.S. Environmental Protection Agency. Recognition and Management of Pesticide Poisonings. EPA 735-R-98-003, Fifth Edition. September 1999.

34 U.S. Environmental Protection Agency. Formaldehyde. Integrated Risk Information System (IRIS) data base. <http://www.epa.gov/iris/subst/0419.htm#carc>.

35 Department of Human Health and Services. Agency for Toxicity Substances and Disease Directory. Public Health Statement for Formaldehyde. <http://www.atsdr.cdc.gov/toxprofiles/phs111.html>.

components of commercial bleaches, cleaning solutions, and disinfectants for drinking water and waste water purification systems and swimming pools. The general public can be exposed to small amounts of sodium and calcium hypochlorite by using household products that contain these chemicals.

TOXICITY

Acute - Effects of iodine and chlorine include irritation to the eyes, skin, and nose. Exposure to high levels can result in severe corrosive damage to the eyes, skin, respiratory and gastrointestinal tissues and can be fatal. Exposures to iodine could cause chest tightness and dermal exposure can result in skin burns and rash. Exposure to chlorine can result in pulmonary edema. Contact of strong hypochlorite solutions with your skin may cause burning pain, inflammation, and blisters. Contact of the eye with mild bleach solutions may cause mild and transitory irritation. More concentrated solutions may cause severe eye injuries. Long-term exposure to low levels of hypochlorite can cause dermal irritation.

Chronic - We do not know if exposure to chlorine can result in reproductive effects. The International Agency for Research on Cancer (IARC) has determined that hypochlorite salts are not classifiable as to their carcinogenicity to humans.

Ecotoxicity –

- When released to air, sodium and calcium hypochlorite are broken down by sunlight and compounds commonly found in the air.
- In water and soil, sodium and calcium hypochlorite separate into sodium, calcium and hypochlorite ions (an ion is an electrically charged atom or molecule). These ions may react with other substances found in the water.
- Sodium and calcium hypochlorite do not accumulate in the food chain.³⁶

Child Exposures - Children are probably affected by exposure to sodium and calcium hypochlorite in the same ways as adults. We do not know whether children differ from adults in their susceptibility to sodium and calcium hypochlorite. In general, children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways.

We do not know if exposure to sodium and calcium hypochlorite can result in birth defects or other developmental effects.

Heavy metals – copper, mercury, silver, zinc

Metallic silver, mercury, copper, and zinc as well as salts of these metals (i.e., silver nitrate, mercuric chloride, copper sulfate, zinc chloride, and zinc oxide) have antimicrobial activities and are used for various purposes.

The mercurial fungicides are among the most toxic pesticides ever developed, for both chronic and acute hazards. Epidemics of severe, often fatal, neurologic disease have occurred when indigent residents of less developed countries consumed methyl mercury-treated grain intended for planting of crops. Poisoning has also occurred from eating meat from animals fed mercury-treated seed.³⁷

In recent years there has been a new interest in using “silver ions” as an antimicrobial. Silver ions were planned for use in clothes washing machines, EPA has determined that these machines will be regulated as

36 Department of Human Health and Services. Agency for Toxicity Substances and Disease Directory. Tox FAQs for Calcium Hypochlorite/Sodium Hypochlorite. <http://www.atsdr.cdc.gov/tfacts184.html>.

37 U.S. Environmental Protection Agency. Recognition and Management of Pesticide Poisonings, Office of Prevention, Pesticides and Toxic Substances. EPA 735-R-98-003. 1999. p. 148.

pesticides if the machines contain silver or other substances, and if they generate ions of those substances for express pesticidal purposes. EPA is now considering this use to be regulated as a pesticide.³⁸

Under FIFRA, a product that uses only physical or mechanical means to trap, destroy, repel, or mitigate a pest (including microbial pests) is a device and is not required to be registered (though its production and labeling are regulated). However, if the product incorporates a substance or mixture of substances intended to prevent, destroy, repel, or mitigate pests, then it is considered to be a pesticide and is required to be registered. Determinations as to whether a product is a device or pesticide are made on a case-by-case basis, EPA said. The silver-ion-generating washing machine is marketed with claims that it will kill bacteria on clothing. Silver is already regulated as a pesticide active ingredient in other registered products.

Phenols and derivatives – ex. Lysol

Phenol is used primarily in the production of phenolic resins and in the manufacture of nylon and other synthetic fibers. It is also used in slimicides (chemicals that kill bacteria and fungi in slimes), as a disinfectant and antiseptic, and in medicinal preparations such as mouthwash and sore throat lozenges.³⁹ You can taste and smell phenol at levels lower than those that are associated with harmful effects. Phenol evaporates more slowly than water, and a moderate amount can form a solution with water.

The phenols act by disrupting membranes and denaturing proteins and these chemicals are especially good at disinfecting in the presence of biological fluids. They are long lasting and stable. Cresols are an important group of phenolics and are the active ingredient in Lysol®. Chlorhexidine is a related compound that, when combined with detergent or alcohol, is used as a surgical scrub.

TOXICITY

Acute – Acute exposure to phenol in the air can cause respiratory irritation, headaches, and burning eyes. People who had skin exposure to high amounts of phenol had skin burns, liver damage, dark urine, irregular heart beat, and some died. Ingestion of high concentrations of phenol has resulted in internal burns and death. The effects of prolonged exposure to low levels of phenol in air or of ingestion of low levels of phenol are uncertain because almost always there has been simultaneous exposure to other chemicals.

In animals, breathing air with high levels of phenol resulted in irritation of the lungs. Repeated exposures induced muscle tremors and loss of coordination. Exposure to high concentrations of phenol in the air for several weeks caused paralysis and severe injury to the heart, liver, kidneys, and lungs, and in some cases, death. Some animals that drank water with very high concentrations of phenol suffered muscle tremors and loss of coordination.

Chronic – Carcinogenicity - It is not known if phenol causes cancer in humans. Cancer developed in mice when phenol was applied to the skin several times per week for the lifetime of the animal. Phenol did not cause cancer in mice or rats that drank water containing it for 2 years. The International Agency for Research on Cancer (IARC) and the EPA have determined that phenol is not classifiable as to its carcinogenicity to humans.

38 U.S. Environmental Protection Agency. Pesticide Registration; Clarification for Ion-Generating Equipment. <http://www.epa.gov/fedrgstr/EPA-PEST/2007/September/Day-21/p18591.htm>.

39 Department of Human Health and Services. Agency for Toxicity Substances and Disease Directory. Tox FAQs for Hydrogen Peroxide. <http://www.atsdr.cdc.gov/tfacts115.html>.

Ecotoxicity – Following small, single releases, phenol is rapidly removed from the air (generally, half is removed in less than a day).

- Phenol generally remains in the soil only about 2 to 5 days.
- Phenol can remain in water for a week or more.
- Larger or repeated releases of phenol can remain in the air, water, and soil for much longer periods of time.
- Small amounts of phenol may be found in organisms that live in contaminated water.
- Phenol does not build up in fish, other animals, or plants.
-

Child Exposures – Children are at greater risk of accidentally ingesting or spilling on their skin home products that contain phenol. Vomiting and lethargy were the most frequent signs of toxicity observed in children who accidentally ingested phenol and were treated at a poison control center.

Phenol has caused minor birth defects and low birth weight in animals generally at exposure levels that also were toxic to the pregnant mothers.⁴⁰

Peroxides – hydrogen peroxide

Hydrogen peroxide and ozone are examples of compounds whose antimicrobial activity stems from their oxidation of cellular components.

Hydrogen peroxide is a colorless liquid at room temperature with a bitter taste. Small amounts of gaseous hydrogen peroxide occur naturally in the air. Hydrogen peroxide is unstable, decomposing readily to oxygen and water with release of heat. Although nonflammable, it is a powerful oxidizing agent that can cause spontaneous combustion when it comes in contact with organic material.

Hydrogen peroxide is found in many households at low concentrations (3-9%) for medicinal applications and as a clothes and hair bleach. In industry, hydrogen peroxide in higher concentrations is used as bleach for textiles and paper, as a component of rocket fuels, and for producing foam rubber and organic chemicals.

TOXICITY

Acute – Hydrogen peroxide is an eye, nose and throat irritant. Low exposure may occur from use at home; higher exposures may occur from industrial use. Exposure to hydrogen peroxide can cause irritation of the eyes, throat, respiratory airway, and skin. Inhalation of household strength hydrogen peroxide (3%) can cause respiratory irritation. Exposure to household strength hydrogen peroxide can cause mild ocular irritation. Inhalation of vapors from concentrated (higher than 10%) solutions may result in severe pulmonary irritation.

Ingestion of dilute solutions of hydrogen peroxide may result in vomiting, mild gastrointestinal irritation, gastric distension, and on rare occasions, gastrointestinal erosions or embolism (blockage of blood vessels by air bubbles). Ingestion of solutions of 10-20% strength produces similar symptoms, but exposed tissues may also be burned. Ingestion of even more concentrated solutions, in addition to the above, may also induce rapid loss of consciousness followed by respiratory paralysis.

Eye exposure to 3% hydrogen peroxide may result in pain and irritation, but severe injury is rare. More concentrated solution may result in ulceration or perforation of the cornea. Skin contact can cause irritation and temporary bleaching of the skin and hair. Contact with concentrated solutions may cause severe skin burns with blisters.

40 Department of Human Health and Services. Agency for Toxicity Substances and Disease Directory. Tox FAQs for Hydrogen Phenol. <http://www.atsdr.cdc.gov/tfacts115.html>.

We do not know if exposure to hydrogen peroxide may affect reproduction in humans.⁴¹

Chronic – Cancer - The International Agency for Research on Cancer (IARC) has determined that hydrogen peroxide is not classifiable as to its carcinogenicity to humans.

Ecotoxicity – Hydrogen peroxide released to the atmosphere will react very rapidly with other compounds found in air.

- Hydrogen peroxide breaks down rapidly in water.
- If released to soil, hydrogen peroxide will be broken down by reacting with other compounds.
- Hydrogen peroxide does not accumulate in the food chain.
-

Child Exposures – There are no studies on the health effects of children exposed to hydrogen peroxide. Documented cases of children being accidentally exposed to hydrogen peroxide have described effects similar to those observed in adults. We do not know if exposure to hydrogen peroxide may result in birth defects or other developmental effects in people.

41 Department of Human Health and Services. Agency for Toxicity Substances and Disease Directory. Tox FAQs for Hydrogen Peroxide. <http://www.atsdr.cdc.gov/tfacts174.html>.

APPENDIX

10. STATES WITH NO SPECIFIC ANTIMICROBIAL OR COOLING TOWER COMMERCIAL PESTICIDE APPLICATOR LICENSE CATEGORY (EPA CAPRD WEB SITE REPORTING YEAR 2006).

1. Alabama
2. Alaska
3. Arizona
4. Arkansas
5. California
6. Colorado
7. Florida
8. Hawaii
9. Idaho
10. Illinois
11. Indiana
12. Iowa
13. Kansas
14. Kentucky
15. Maryland
16. Massachusetts
17. Mississippi
18. Missouri
19. Montana
20. Nebraska
21. Nevada
22. North Carolina
23. North Dakota
24. Ohio
25. Oklahoma
26. Oregon
27. Pennsylvania
28. Rhode Island
29. South Carolina
30. South Dakota
31. Texas
32. Utah
33. Virginia
34. Washington
35. West Virginia
36. Wisconsin
37. Wyoming

APPENDIX

11. STATES WITH AN ESTABLISHED ANTIMICROBIAL COMMERCIAL PESTICIDE APPLICATOR LICENSE CATEGORY FOR MOLD CONTROL (EPA CAPRD WEB SITE REPORTING YEAR 2006).

State License Category

Georgia Antimicrobial Pest Control Category.

Category for commercial applicators applying antimicrobial pesticides (Disinfectants, Sanitizers, Algaecides, Fungicides, etc.). Douglas Jones, Agriculture Manager III, Plant Industry Division, Georgia Department of Agriculture, 19 MLK Jr. Dr., Suite 543, Atlanta, GA 30334, djones@agr.state.ga.us, p 404/656-4958, f 404/657-8378. Web site = <http://agr.georgia.gov/02/doa/home/0,2473,38902732,00.html>.

Pesticide Applicator Training. Paul Guillebeau, Professor, Extension IPM and Pesticide Coordinator, 413 Biological Sciences Building Athens, GA 30602-1765, bugman@uga.edu , p 706/542-2816, f 706/542-3872. Website = <http://pubs.caes.uga.edu/caespubs/Pesticideapplicator/pest-home.html>.

Louisiana Public Health (Category 8), Microbial Pest Control (Subcategory 8e).

Category for commercial applicators engaged in antimicrobial pest control using restricted use pesticides. Bobby Simoneaux, Director of Pesticides and Environmental Programs, Office of Agricultural and Environmental Sciences, Louisiana Department of Agriculture and Forestry, P.O. Box 3596, Baton Rouge, LA 70821-3596, bobby_s@ldaf.state.la.us, p 225/925-3763, f 225-925-3760. Web site = <http://www.ldaf.state.la.us/>.

Pesticide Safety Education. Mary Grodner, Professor, Extension Specialist, Louisiana State University Agricultural Center, Louisiana State University. LSU Department of Entomology, 404 Life Sciences Building, Baton Rouge, LA. 70803, p 225/578-2180. Web site = mgrodner@agcenter.lsu.edu.

Maine Industrial, Institutional, Structural and Health Related (Category 7), Disinfectant and Biocide Treatments (Category 7C).

Category for biocide application in paper mills to swimming pool treatments including 4 or 5 mold remediation companies. Currently license 21 businesses and 54 individual applicators in the 7C microbial & disinfectant sub-category. Gary Fish, Certification Specialist, Maine Board of Pesticides Control, 28 State House Station, Augusta, ME 04333-0028, gary.fish@maine.gov, p 207/287-7545, f 207/624-5020. Web site = <http://agriculture.nh.gov/index.htm>.

University of Maine Pest Management Office. James Dill. 491 College Avenue, Orono, ME 04473-1295. jdill@UMxt.maine.edu , p 207/581-3880 f 207/581-3881. Web site = <http://www.UMxt.maine.edu/topics/pest.htm>.

APPENDIX

12. STATES WITH AN ANTIMICROBIAL OR COOLING TOWER COMMERCIAL PESTICIDE APPLICATOR LICENSE CATEGORY (EPA CAPRD WEB SITE REPORTING YEAR 2006).

State	License Category
Connecticut	Industrial, Institutional, Structural and Health Related (Category 7), Cooling Tower (Subcategory 7i). Subcategory for use of pesticides to control pests in non-potable cooling waters and in water or slurries used in industrial processing; in, on or around human dwellings, commercial establishments, institutions, industrial establishments and any other structures. Linda E. Schmidt, Certification and Training Coordinator, Department of Environmental Protection, 79 Elm St., Hartford, CT 06106, linda.schmidt@po.state.ct.us, p 860/424-3319, f 860/424-4060.
Delaware	Industrial, Institutional, Structural and Health Related (Category 7), Cooling Tower Pest Control (Subcategory 7F). Subcategory for commercial applicators using or supervising the use of pesticides to control microbial and other pests in cooling towers or related areas. W. Larry Towle, Agricultural Specialist, Delaware Department of Agriculture, 2320 South DuPont Highway, Dover, DE 19901, larry.towle@state.de.us, p 302/698-4569, f 302/697-4483.
Minnesota	Antimicrobial Category. Category for commercial applicators applying pesticides to cooling towers, interior or exterior surfaces of ventilation duct work and appurtenances in industrial, institutional and commercial property. Joseph Spitzmueller, Supervisor Licensing and Certification Unit, Minnesota Department of Agriculture, PFMD, 625 Robert St. N, St. Paul, MN 55155-2538, joseph.spitzmueller@state.mn.us, p 651/201-6615, f 651/201-6105.
New Mexico	Cooling Towers (Category 11B). Category for use of biocides in cooling towers. Marjorie Lewis, Certification and Outreach Specialist, New Mexico Department of Agriculture, P.O. Box 30005, MSC 3AQ, Las Cruces, NM 88003, mlewis@nmda.nmsu.edu, p 505/646-2133. f 505/646-5977.
New York	Cooling Towers, Pulp and Paper Process (Category 7G). Category for commercial. Margaret O'Neil, Chief, Pesticide Reporting & Certification Section, New York State Department of Environmental Conservation, 625 Broadway, Albany, NY 12233-7254, meoneil@gw.dec.state.ny.us, p 518/402-8748. f 518/402-9024.
Tennessee	Microbials. Category for commercial applicators using or supervising the use of antimicrobial agents to control microorganisms (bacteria, fungi, algae and viruses) in cooling towers and swimming pools. Kathy Booker, Pesticides Administrator, Tennessee Department of Agriculture, Porter Building, P.O. Box 40627, Nashville, TN 37204, kathy.booker@state.tn.us, p 615/837-5148. f 615/837-5012.
Vermont	Industrial, Institutional, Structural and Health Related (Category 7), Antimicrobial Pest Control (Subcategory 7E). Subcategory for use of pesticides to control pests in non-potable cooling waters and in water or slurries used in industrial processing, in, on or around human dwellings, commercial establishments, institutions, industrial establishments and any others structures. Matthew H. Wood, Pesticide Certification and Training Coordinator, Vermont Agency of Agriculture, 116 State St. Drawer 20, Montpelier, VT 05620, matthew.wood@state.vt.us, p 802/828-3482, f 802/828-1410.

New Jersey	Cooling Water (Category 8D). For use of antimicrobial agents, algaecides, etc. in the waters of cooling towers and other devices that use water for cooling. Sterilization (Category 12B). Ralph C. Smith, Chief, Bureau of Pesticide Operations, Department of Environmental Protection, P.O. Box 411, Trenton, NJ 08625-0411, ralph.smith@dep.state.nj.us, p 609/984-6647, f 609/984-6555. Web site = http://www.state.nj.us/dep/ . A person may apply pesticides as part of his/her job or on a for-hire basis as a Pesticide Operator. The Pesticide Operator must work under the direct supervision of a Commercial Pesticide Applicator who does not have to be present for a Pesticide Operator to apply most pesticides.
Michigan	Microbial Pest Management Category. Category for commercial applicators using pesticides in any of the following to manage bacteria, fungi, algae, or viruses: (i) Cooling towers; (ii) Air washers; (iii) Evaporative condensers; (iv) Pulp and paper mills; (v) Sewer treatment; (vi) Other applications. Larry Swain, Certification Program Manager, Michigan Department of Agriculture - PPPM Division, P.O. Box 30017, Lansing, MI 48909, swainl@michigan.gov, p 517/373-3187, f 517/335-4540.
New Hampshire	Industrial, Institutional, Structural and Health Related (Category 7), Microbial Pest Control (Category F8). Commercial. Darlene Lawrence, Certification Coordinator, New Hampshire Department of Agriculture, Markets, & Food, Division of Pesticide Control, 25 Capitol St. PO Box 2042, Concord, NH 03302, pesticides@agr.state.nh.us, p 603/271-3550, f 603/271-1109. Web site = http://agriculture.nh.gov/index.htm .

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