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Standard Guide for Cleaning and Disinfection at a Cannabis Cultivation Center[1]

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1. Scope

1.1 The purpose of this guide is to provide a collection of information and a range of options for cleaning and disinfecting a cannabis cultivation center, including the prevention of hazards such as: disease, pests, and contamination.

1.2 This guide addresses techniques and considerations for cleaning, as well as information on disinfection products and techniques.

1.3 This guide is not intended for stewardship of cleaning and housekeeping operations. Refer to Guide E1971 for more information on general janitorial type cleaning.

1.4 This guide does not recommend a specific course of action due to the wide variety of circumstances and differences from one cultivation center to another. As such, it is not possible to describe a set of universal steps that will always be performed (that is, a standard practice); therefore, the user of this guide must decide what is appropriate for a given situation or location.

1.5 This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.6 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D5791 Guide for Using Probability Sampling Methods in Studies of Indoor Air Quality in Buildings

D7338 Guide for Assessment Of Fungal Growth in Buildings

D7391 Test Method for Categorization and Quantification of Airborne Fungal Structures in an Inertial Impaction Sample by Optical Microscopy

D7788 Practice for Collection of Total Airborne Fungal Structures via Inertial Impaction Methodology

D7910 Practice for Collection of Fungal Material From Surfaces by Tape Lift

E1971 Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings

E2590 Guide for Conducting Hazard Analysis-Critical Control Point (HACCP) Evaluations

E2614 Guide for Evaluation of Cleanroom Disinfectants

E3106 Guide for Science-Based and Risk-Based Cleaning Process Development and Validation

F3127 Guide for Validating Cleaning Processes Used During the Manufacture of Medical Devices

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *biosecurity, n*—preventative measures designed to protect crops and property from the entry and spread of pests and diseases.

3.1.2 *cleaning, v*—physical removal of dirt, debris, and other potential contaminants to the extent necessary for further processing or intended use.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.1.3 *contaminant, n*—any material that potentially has adverse impacts on the functioning of, and/or shows an undesirable interaction. A contaminant may be a single component or any combination of components. Examples of possible types of contaminants include: biological or non-biological in nature; living or dead; particles or thin films; solid, liquid, or gas; organic or inorganic. **F3127**

3.1.4 *contact time, n*—predetermined time that a test microorganism is exposed to the activity of a test material.

3.1.5 *control, n*—a state wherein correct procedures are being followed and criteria are being met.

3.1.6 *critical control point (CCP), n*—a step at which control can be applied and which is essential to prevent, eliminate or reduce a hazard to an acceptable level.

3.1.7 *decontamination, n*—the use of physical or chemical means to remove, inactivate, or destroy microorganisms on a surface/item so there are no infectious organisms and the surface/item is rendered safe for handling, use, or disposal.

3.1.8 *disinfectant, n*—a physical or chemical agent or process that destroys pathogenic or potentially pathogenic microorganisms on inanimate surfaces or objects.

3.1.9 *efficacy, n*—the proven performance of a product established under defined conditions.

3.1.10 *fungus (s), fungi (pl.), n*—eukaryotic, heterotrophic, absorptive organisms that usually develop a rather diffuse, branched, tubular body (network of hyphae) and usually reproduce by means of spores (**1**) ;[3] the terms 'mold' and 'mildew' are frequently used by laypersons when referring to various fungal colonization.

3.1.11 *fungal spore, n*—general term for a reproductive structure in fungi; the spore is the structure that may be used for dissemination and reproduction and may be resistant to adverse environmental conditions. **D7338**

3.1.12 *hazard, n*—a biological, chemical or physical agent or condition with the intrinsic capacity to cause an unwanted or adverse effect.

3.1.13 *hazard analysis (HA), n*—the process of collecting and evaluating data and information on hazards and conditions leading to their presence.

3.1.14 *hazard analysis-critical control point (HACCP), n*—a system which identifies, evaluates, and controls hazards which are significant.

3.1.15 *hypha (s), hyphae (pl.), n*—tubular filament of fungal cells; the basic vegetative structure of the body of fungi (excluding yeasts). **D7338**

3.1.16 *integrated pest management (IPM), n*—an ecologically-based strategy that focuses on the long-term management of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties with minimal impact on human health, the environment and non-target organisms.

3.1.17 *organic load, n*—the level of organic material (that is, soil, nutrients, residues, plant material, viruses, fungi, and so forth) on an item or in an area.

3.1.18 *pest, n*—something that causes damage or interferes; it can be a plant, vertebrate, invertebrate, nematode, pathogen, or any other unwanted organism.

3.1.19 *residue, n*—a substance present on the surface of an item or embedded therein that is not explicitly recognized and defined as part of the item specification; it includes processing-based residues as well as contamination by environmental factors (adsorbates).

3.1.20 *sanitizer, n*—chemical or physical agent(s) used to reduce the number of microorganisms to a level judged to be appropriate for a defined purpose and/or claim.

3.1.21 *soil load, n*—a chemical or physical material(s) included in a test procedure to simulate an organic load, conditions, or use. **E2614**

4. Summary of Guide

4.1 This guide is a collection of information provided to increase the awareness of cleaning and disinfection techniques and products for cannabis cultivation facilities.

5. Significance and Use

5.1 Cleaning and disinfecting are referred to as preventative actions. For example, washing hands prevents illnesses and the spread of infections to others (**2**). There are even laws written around this. In the United States under federal law, you are entitled to a safe workplace. Your employer must provide a workplace free of known health and safety hazards (**3**). In Canada, the Canadian Center for Occupational Health and Safety (CCOHS) indicates that poor housekeeping practices frequently contribute to incidents (**4**). More directly, it is very intuitive that a clean environment is advantageous regardless of the task at hand. Within a cultivation setting, cleaning and disinfection can also be used to prevent hazards such as: disease, pests, and contamination.

5.2 Cleaning and disinfecting are essential for cultivation biosecurity and can be utilized in many ways. For example, cleaning and disinfection can be incorporated into integrated pest management (IPM) programs, as scheduled maintenance (weekly floor cleaning), for specific events (prior to filling dry and cure spaces), or at critical control points (CCP) (elevated fungal spore counts). This is an efficient, low-cost way to get rid of current pests and disease issues and to help prevent future issues or carry over between crop cycles (**5**).

5.3 This guide presents information on techniques and products used for cleaning, disinfection, and mitigation of hazards.

5.4 There are many important steps to any cleaning and disinfecting process. Those steps and some important concepts will be discussed. Biosecurity is an integral investment. Costs associated with labor, chemicals, and loss in crop yield are many times greater than the cost of prevention through cleaning and disinfecting a cultivation facility. Without proper measures, pest pressures increase, which can lead to unnecessary pesticide use. Prevention is also easier than addressing an

[3] The boldface numbers in parentheses refer to the list of references at the end of this standard.

outbreak situation. The goal is not necessarily to completely sterilize the environment, but rather to decrease hazards to a point at which outbreaks and disease transmissions do not occur.

6. Identification Evaluation and Monitoring of Hazards

6.1 A hazard is defined as a biological, chemical, or physical agent or condition with the intrinsic capacity to cause an unwanted or adverse effect.

6.2 Thorough examination of a cultivation operation gives a good indication of where, when, and how hazards tend to accumulate. In all instances, environmental factors, organic load, and/or mineral deposits are major contributing factors.

6.3 Develop a program for the identification, evaluation, and monitoring of hazards. The program should be tailored to systematically identify the CCPs in which hazards can occur and either be prevented, reduced, or maintained at acceptable levels. Also include the potential causes of each hazard, Guide E3106. Similar programs have been developed for other industries and crops. This includes Hazard Analysis-Critical Control Point (HACCP) programs adopted and integrated in food manufacturing and cultivation industries (**6**). For further insight on these type programs, refer to Guide E2590.

6.4 *Fungi:*

6.4.1 Fungi constitute over 25 % of the world's biomass and are naturally present in all indoor and outdoor environments. Fungi spores are ubiquitous in air and settled dust. See Guide D7338. Fungi are dispersed in the environment in several ways and their dispersion depends on numerous conditions or fungal features. Moreover, production and spore release vary drastically from species to species, which influences distribution in the air and on surfaces (**7**). Relative humidity (RH) and temperature (T) are the most important environmental parameters regulating spore production (**8**).

6.4.2 Fungi can be classified into two groups: those that release spores during dry, windy conditions, for example, *Alternaria* and *Cladosporium*, and those that release spores when ambient humidity is high, for example, *aspergillus* and *oidium*(**9**). Spore release of *Botrytis* was promoted largely by declining RH, increasing T, and rain but occasionally by increased RH (**10**). All the above-named fungi are known plant pathogens. In particular, strains of *aspergillus* are a major concern due to the possible formation of mycotoxins, which are toxic to humans.

6.4.3 Fungi monitoring should be done throughout the facility. Collection of total airborne fungal structures can be accomplished with inertial impaction methodologies. See Practice D7788. In addition, surface fungal material can be determined by tape lift methods. See Practice D7910. Neither of these two methods requires professional expertise, but it is recommended they be done by a Certified Industrial Hygienist with experience in mold assessment and abatement. For the analysis (spore identification) and enumeration (concentration of spores in number of spores per volume of air), professional expertise is needed. See Test Method D7391 and Guide D5791.

6.4.4 Monitoring for fungi is especially important in areas with flowering plants. Spikes in spore counts usually appear during the early stages of flower. Trimming areas and dry and cure spaces typically have elevated spore counts due to the large amount and physical manipulation of plants and flower. Cross-contamination from these areas can easily occur if proper prevention is not considered. Threshold spore concentrations in air and spore identification data should be considered as a CCP. When the threshold has been met, either increase the scheduled maintenance or add a disinfection protocol with a disinfectant that has claims against the specific fungi identified. Pesticide use should only be considered as a last resort.

7. Cleaning

7.1 Cleaning involves the physical removal of all unwanted materials such as; soil, dirt, dust, debris, and organic materials. The goal is to remove as much material as possible before disinfecting. Thoroughly cleaning has been estimated to remove over 90 % of bacteria from surfaces (**11**). Disease-causing organisms, molds, and spores can be lodged on rafters, window ledges, grow lights, containers, tops of overhead piping, and folds in plastic, among other areas.

7.2 Physical removal is best achieved using a broom, shovel, scraper, and/or vacuum cleaner. Beware of the exhaust from a vacuum; mold spores and other airborne contaminants may be too small for the filter of most vacuums. HEPA (high efficiency particulate air) type filters are recommended. To qualify as HEPA by industry standards, an air filter must remove (from the air that passes through) 99.97 % of particles that have a size greater-than-or-equal-to 0.3 µm (**12**).

7.3 Remove larger material first, and then begin at the top of the space and work down, removing piles as they build up. Sweep down walls and internal structures and clean the floor of all unwanted materials and organic matter.

7.4 The process of cleaning before disinfecting a cultivation facility and equipment should not be overlooked as not doing so leads to a buildup of residues that contain organic material and mineral salt deposits. The presence of these residues can harbor microorganisms for long periods of time and interfere with the antimicrobial activity of disinfectants. Most commonly, interference occurs by means of a chemical reaction between the disinfectant and the residue, resulting in a complex that either has less of the active disinfectant or is completely ineffective. Alternatively, these residues can protect microorganisms from attack by acting as a physical barrier, protecting them from the action of the disinfectant (**13**).

7.5 Residues can be visible or invisible and alkaline or acidic. The primary source comes from the products that are grown, handled, and/or used within a given cultivation operation. High-pressure power-washing with soap and water is an option. Soap is especially useful in removing greasy deposits. However, thorough rinsing is needed because soap residues can inactivate certain disinfectants. Extra care should be taken when cleaning areas with porous and/or textured surfaces, such as concrete and wood, under benches, and cracks or small spaces between equipment and structures.

7.6 Mineral salts from water residue, algal growth, nutrient solutions, and cleaning compounds contribute to residues left