

Food Safety and Cannabis Infused-Products: Focus on NEHA Activities to Address the Emerging Issue

By Elizabeth Landeen (elandeen@neha.org)

NEHA is leading the charge to bridge the educational and training gaps that exist for local and state food safety programs and regulators related to the safety of cannabis-infused products for consumer consumption. As of January 2, 2018, 29 states and Washington, DC, have legalized medicinal cannabis and eight of those states and Washington, DC, have additionally legalized recreational cannabis (Figure 1). As the legalization of cannabis continues to expand, NEHA has been actively engaged in this topic to better understand the needs of local and state food safety programs, as well as build new and relevant partnerships, develop resources and tools, and provide educational opportunities that are useful and easy to access.

Below are our key priorities and the projects we have been working on to provide local and state food safety programs with needed tools and information to help bridge the gap between regulators and the cannabis industry.

Provide Timely and Easily Assessible Information

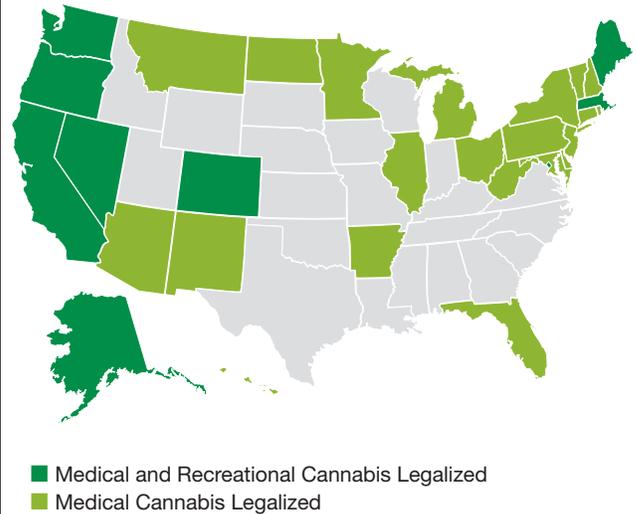
Edible Cannabis Products Webinar Series: Edibles are produced and consumed in communities many local and state food safety agencies serve and protect. With cannabis use growing in acceptability across the country and changing state regulations, legalization of cannabis for medicinal and recreational purposes is becoming more common. While these times are exciting for many, they raise questions about the safety of cannabis-infused products and how they should be regulated and inspected.

NEHA has hosted three different webinars over the past year that address the growing concern about ensuring the safety of cannabis-infused products.

- **Webinar #1—Wonderful World of Edibles...Are They Safe?:** This informative webinar provided participants with a general understanding of edibles. Toxicology, food safety, and environmental health experts talked about the environmental health considerations surrounding edibles, highlighted regulatory challenges, and discussed preventive controls and best practices to minimize food safety risks.
- **Webinar #2—State-Level Variation in the Regulation of Edible Cannabis Products:** Webinar presenters from RTI International focused on emerging policy areas in response to the growing legalization of cannabis. One area of emerging policy is the regulation of cannabis-infused edible products. The other area is how dispensary staff communicate the health and safety risks of edible products to consumers. The webinar was held in collaboration with NEHA, the National Association of County and City Health Officials, and RTI International.
- **Webinar #3—Development of Standards for Cannabis-Infused Products:** Held in collaboration with ASTM International, this webinar focused on ASTM's work in taking the lead to develop

FIGURE 1

States That Have Legalized Cannabis for Medical and Recreational Use



Source: www.newsweek.com/marijuana-legalization-2018-which-states-will-consider-cannabis-laws-year-755282.

standards related to cannabis and cannabis-infused products. Participants learned about ASTM's work to develop standards, the areas in which standards are being developed, the timeline expected for standard development, and how they can get involved. NEHA presented on the cannabis-infused product tools and resources currently under development for state and local regulatory programs.

You can access recordings of these webinars on NEHA's Food Safety website at www.neha.org/node/59142.

Development of Needed Resources

Cannabis-Infused Products Handbook: In the process of being developed, this "101" handbook will provide an overview of cannabis-infused product concepts and a glossary of terms. This useful tool is being created to give food safety professionals not familiar with edibles a better understanding of the terminology, language, acronyms, and concepts.

Guidance for Food Safety Regulations of Cannabis-Infused Products: Does your state or local jurisdiction need to create a cannabis food safety program? Are you looking to improve your current program? NEHA is compiling and developing a guidance document that will serve as a resource and a preliminary document to the development of ASTM's standards. The guidance will include a scan of how states across the country are implementing and regulating edible cannabis products and ensuring food safety

and public health, the pros and cons of these programs, recommendations, and best and model practices. Completion date for the guidance is July 2018.

Edibles Webinars Questions and Answers (Q&A) Documents: With so much interest in the three webinars previously mentioned, NEHA felt it would be useful to generate a Q&A document based on the questions submitted during the webinars. These Q&A documents can be accessed with the webinar recordings at www.neha.org/node/59142.

Lead the Way for Food Safety Professionals

Policy Statement on Consumption of Cannabis-Infused Food Products and Food Safety: NEHA neither endorses nor repudiates the use of cannabis. If a jurisdiction is considering enactment of this type of regulation, however, NEHA supports the implementation of regulations that contain sufficient regulatory authority to prevent illness from these items, as well as supports the inclusion of the policies and actions as outline in the policy statement. NEHA's Food Safety Workgroup is in the process of finalizing the statement. Once finalized, the policy will require approval of NEHA's board of directors prior to distribution. If approved, the policy will be distributed in April 2018.

Participation on ASTM's Cannabis Standards Development Committees: NEHA is a leading voice for environmental health and food safety, which is especially important when it comes to creating standards. ASTM has established the Committee D37 on Cannabis (www.astm.org/COMMITTEE/D37.htm) that is made up of several subcommittees. NEHA has representation on each of these subcommittees. Committee members will help to shape the content of standards, hence why it's important to have NEHA at the table as these discussions evolve.

Supporting Organization of the 3rd Annual CannaEast Compliance Summit, January 17–19, 2018: NEHA facilitated a focus group on developing guidance for food safety regulations of cannabis-infused products. The aim of the focus group was to bring together state and local health agencies, which are already addressing these issues and have well established food safety systems in place to address the production and sale of edibles, with those agencies that are in the process of addressing these issues or need to do so in the future. The information gathered from the focus group will provide the framework for the development of NEHA's Guidance for Food Safety Regulations of Cannabis-Infused Products. Based on the focus group findings, NEHA then facilitated a panel session at the conference. The session provided a high-level overview and summary of findings from the focus group; discussed key issues, model practices identified, and other themes that emerged from the focus group; and defined next steps toward the development of the guidance document based on the needs of the regulator community.

NEHA's Annual Educational Conference (AEC) & Exhibition: The NEHA 2017 AEC hosted two sessions focused on the issue of

food safety in cannabis edibles. These sessions were highly attended, which substantiated that this topic is an emerging area for the environmental health professional. Looking forward to the NEHA 2018 AEC and HUD Healthy Homes Conference taking place June 25–28, 2018, in Anaheim, California, the issue of food safety in cannabis edibles will again be a featured topic. Planned sessions will cover topics on cannabis policy, regulations, and standards, as well as unintentional highs and keeping products out of the hands of children. NEHA's Guidance for Food Safety Regulations of Cannabis-Infused Products and the Cannabis-Infused Products Handbook will be launched at the conference. More information about the 2018 AEC can be found at www.neha.org/aec.

Questions and Answers From NEHA's First Edibles Webinar

On June 16, 2017, NEHA hosted the Wonderful World of Edibles...Are They Safe? webinar. Marc A. Nascarella, chief toxicologist and director of the environmental toxicology program at the Massachusetts Department of Public Health, described environmental public health considerations when evaluating cannabis products for levels of cannabinoids, as well as environmental contaminants such as heavy metals, pesticides, residual solvents, and microbial growth. Marlene Gaither, environmental health program manager with the Coconino County Public Health Services District, shared details about the edibles recall in their jurisdiction and the challenges the regulatory system experienced during this highly charged food recall (see this issue's cover article on page 8). Cindy Rice, owner of Eastern Food Safety, Inc., covered preventive controls and best practices that edible producers can put in place to minimize food safety risks and keep consumers safe. These controls and practices can also aid regulators tasked with enforcing regulations and food safety.

With so much interest in this webinar, NEHA felt it would be useful to generate a questions and answers (Q&A) document based on the questions submitted during the webinar. We have also posted the Q&A documents from the other two webinars held on cannabis. These Q&A documents can be accessed with the webinar recordings at www.neha.org/node/59142.

We thought it would be of interest to our readers to print the Q&A from the first webinar.

Q: Do your state regulations require testing for any analytes with maximum allowable limits?

Gaither: Arizona does not require testing for analytes nor are there standards for limits. The only reference in the current rule requires dispensaries to list analytes (herbicides, pesticides, etc.) on the label.

Nascarella: Massachusetts defines testing requirements based on the product type and production process. Finished plant material that is considered a finished medical marijuana product (FMMP) is required to meet defined upper limits for heavy

NEHA NEWS

metals, pesticides, plant growth regulators, and microbiological contaminants. Concentrates and resins that are produced from dried plant material with the use of residual solvents are required to meet defined upper limits for residual solvents. All FMMP, including cannabis-infused products, resins, and concentrates, are required to meet defined upper limits for microbiological contaminants. For additional information, refer to the Protocol for Sampling and Analysis of Finished Medical Marijuana Products and Marijuana-Infused Products for Massachusetts Registered Medical Marijuana Dispensaries at www.mass.gov/service-details/medical-use-of-marijuana-program-product-testing.

Q: Over 90% of all cannabinoids in plant materials are found in the acid form. Do the manufacturers of edibles properly heat extracted cannabinoids to convert the acid forms to neutral forms? For example, tetrahydrocannabinolic acid (THCA) to tetrahydrocannabinol (THC)?

Gaither: Yes, dispensaries that process edibles (medical marijuana edibles) heat the active ingredients so that THC is the primary form.

Q: Could THC be viewed as an unapproved food additive in your state, and thus be embargoed as an adulterated food?

Gaither: Arizona does not consider edibles as an approved food additive, although Coconino County has included edibles in its food code.

Q: How many commercial cannabis analytical laboratories does Arizona have?

Gaither: The number of labs has varied. Currently there are four labs in Arizona that analyze edibles.

Q: Do you require all producers and manufacturers to produce hazard analysis and critical control point (HACCP) plans?

Gaither: Those that only produce low acid foods are required to submit HACCP plans.

Rice: This requirement would vary from state to state. Massachusetts regulations currently recommend producers to develop a food safety plan based on HACCP principles as a best practice. Cannabis-infused products are not recognized by the Food and Drug Administration as a legitimate product, so federal laws do not apply here as they do to other food manufacturers.

Q: Does THC affect the final pH of the processed food?

Gaither: We are currently waiting to receive results from the voluntary recall. Testing results from other states, however, indicate that extractant pH is usually below 4.6.

Q: Would it have been possible to test pH and water activity of the suspected edible products while they were on hold in order to prevent destruction?

Gaither: Yes, if the dispensary had sent it to a lab that tests for THC. The dispensary decided not to do so, however, and recalled all the products.

Rice: Yes, product testing could have been done. Lab testing can take time though, and the product is in jeopardy while the results are being evaluated. The same is true with pathogen testing.

Q: Were the laboratories that tested these products certified in analysis of edibles in Arizona?

Gaither: There are currently no existing standards or third-party certification available for labs that test edibles.

Q: How do processors account for the change in strength of THC (from delta-9-THC to 11-hydroxy-THC) in the gut?

Nascarella: Massachusetts does not define any potency or dosing limits for medical use of cannabis products. Massachusetts requires that all product labels contain the cannabinoid profile, the percentage by dry weight of delta-9-THC (i.e., the weight of the material remaining after it has been thoroughly dried), cannabidiol (CBD), tetrahydrocannabinolic acid (THCa), and cannabidiolic acid (CBDA). It is important to note that not all individuals metabolize delta-9-THC to 11-hydroxy-THC the same due sensitivity differences (e.g., liver function).

Q: Do you have a THC/CBD threshold percentage before you start regulating?

Gaither: No. The edible ordinance is part of Coconino County's food code and all types of food operations are required to be regulated.

Q: Do you feel that microbes can be introduced at the retail level from selling plant material from jars?

Nascarella: Microbiological contaminants are inevitably present in our daily environments. Appropriate packaging and storage principles (e.g., HACCP) should be practiced to prevent the unwanted introduction of microbiological contaminants.

Q: Do you test for mycotoxins in Massachusetts?

Nascarella: Massachusetts requires that all products meet defined upper limits for mycotoxins, including aflatoxin B1, aflatoxin B2, aflatoxin G1, aflatoxin G2, and ochratoxin A. For additional information, refer to the Protocol for Sampling and Analysis of Finished Medical Marijuana Products and Marijuana-Infused Products for Massachusetts Registered Medical Marijuana Dispensaries at www.mass.gov/service-details/medical-use-of-marijuana-program-product-testing.

Q: Cannabis and hemp are known to uptake radiation. Have you seen any instances of this uptake or is it tested?

Nascarella: Massachusetts does not require radionuclide testing in cannabis products.

Q: Could you briefly discuss the changes that led to the decrease of heavy metals in the plant?

Nascarella: The observed reduction of heavy metals in Massachusetts cannabis products is likely the result of both operational improvements in cultivation (e.g., improved grow media), as well as enhanced analytical testing methods and analysis practices to meet the defined upper limit standards.

Q: Is there a difference in heavy metal absorption depending on the grow medium, e.g., hydroponics, aeroponic, or aquaponic?

Nascarella: This difference has not been investigated by the Massachusetts Department of Public Health.

Q: Do you plan to increase the number of pesticides that you test for to be similar to the list that California tests for?

Nascarella: Massachusetts does not allow the use of pesticides or plant growth regulators during the cultivation of cannabis. At a minimum, products must meet the defined upper limit for pesticides and plant growth regulators for the nine most commonly abused pesticides in cannabis cultivation. For additional information, refer to the Protocol for Sampling and Analysis of Finished Medical Marijuana Products and Marijuana-Infused Products for Massachusetts Registered Medical Marijuana Dispensaries at www.mass.gov/service-details/medical-use-of-marijuana-program-product-testing.

Q: Are biological residues, such as rust mite bodies, tested?

Nascarella: Massachusetts does not require biological residue testing related to cannabis products.

Q: Do laboratories have validated methods for each cannabis matrix tested, such as the plant, concentrates, dermal products, and edibles?

Nascarella: All medical use of cannabis products intended for dispensation in Massachusetts must be tested at an independent analytical testing laboratory that is accredited to International Organization for Standardization (ISO) 17025 by a third-party accrediting body and in compliance with the analytical testing requirements in the Protocol for Sampling and Analysis of Finished Medical Marijuana Products and Marijuana-Infused Products for Massachusetts Registered Medical Marijuana Dispensaries at www.mass.gov/service-details/medical-use-of-marijuana-program-product-testing. Independent testing laboratories are responsible for validating their own methods in accordance with Massachusetts regulation.

Q: What part of the plant accumulates the most heavy metals?

Nascarella: Some studies have found that the leaves of the plant tend to accumulate the highest concentration of heavy metals when compared to other plant parts (e.g., seeds, fibers, and hurds) (Eboh & Thomas, 2005; Linger, Müssig, Fischer, & Kobert, 2002). Another study found that the roots of the plant contained higher

concentrations of cadmium compared to the leaves (Linger, Ostwald, & Haensler, 2005).

References

Eboh, L.O., & Thomas, B.E. (2005). Analysis of heavy metal content in cannabis leaf and seed cultivated in southern part of Nigeria. *Pakistan Journal of Nutrition*, 4(5), 349–351.

Linger, P., Müssig, J., Fischer, H., & Kobert, J. (2002). Industrial hemp (*Cannabis sativa* L.) growing on heavy metal contaminated soil: Fibre quality and phytoremediation potential. *Industrial Crops and Products*, 16(1), 33–42.

Linger, P., Ostwald, A., & Haensler, J. (2005). *Cannabis sativa* L. growing on heavy metal contaminated soil: Growth, cadmium uptake and photosynthesis. *Biologia Plantarum*, 49(4), 567–576.

Q: Leafy greens and other produce products have been implicated in many recent foodborne illness outbreaks. You discussed mold in the webinar, but do you conduct any bacterial speciation on microbial contamination of cannabis?

Nascarella: Massachusetts requires that all products meet the defined upper limits for total viable aerobic bacteria, total yeast and mold, total coliforms, bile tolerant gram-negative bacteria, *E. coli* (pathogenic strains), and *Salmonella* species. For additional information, refer to the Protocol for Sampling and Analysis of Finished Medical Marijuana Products and Marijuana-Infused Products for Massachusetts Registered Medical Marijuana Dispensaries at www.mass.gov/service-details/medical-use-of-marijuana-program-product-testing.

Q: Do you feel that cannabis-infused products would better be regulated by food or nutraceutical regulations?

Rice: It seems that it would be best to incorporate the two areas, if possible. Food handling and testing procedures are critical to the safety of the food products, which would come under the jurisdiction of food regulators. Dosage controls are also important, however, in the case of medicinal applications, which would be typical controls and regulations of the nutraceutical industry.

Q: Do state inspections apply to retail products as well as medicinal product?

Rice: In Massachusetts, the state inspections apply to the medicinal products currently sold in the retail dispensaries. 🐼

Did You Know?

You can get more involved with NEHA by checking out www.neha.org/membership-communities/get-involved. Volunteering is a good way to make a positive contribution to the profession and get to know your association. Volunteers can serve NEHA in a variety of ways, such as a subject matter expert, peer reviewer for the *Journal*, credential exam reviewer, and social media contributor.

Promoting the Sustainable Growth of Cannabis

By Kristen Ruby-Cisneros (kruby@neha.org)

The legalization of cannabis for either medical or recreational purposes is growing (pardon the pun) in the U.S. Currently, 29 states and Washington, DC, have legalized cannabis for medical use. Eight of those states and Washington, DC, have legalized cannabis for recreational use (see Figure 1 on page 52). Vermont recently passed legislation to legalize recreational cannabis, which will go into effect July 1, 2018. Six other states—New Jersey, Michigan, Delaware, Rhode Island, Connecticut, and Ohio—are currently considering legislation to legalize recreational cannabis. Five other states—Oklahoma, Kentucky, South Dakota, Utah, and Missouri—are looking into the legalization of cannabis for medical use (Sanders, 2018).

It is estimated that there was a total of 20,000–28,000 cannabis business in the U.S. in 2017. Of that number, there are an estimated 2,500–3,500 wholesale cultivators (cannabis growers) (Statista, 2018). The cultivation of cannabis is energy intensive and expensive, which is driving industry leaders to strive for environmental sustainability. In terms of energy use, legalized indoor cultivation of cannabis accounts for an estimated 1% of total electricity use in the U.S. (Andrle, 2017). On a per-square-foot basis, it takes 356% more energy to run a cannabis operation than it takes to operate a hospital (Mills, 2012). Along with high energy consumption, the cultivation of cannabis raises concerns about water consumption, pests and pesticide use, odor control, and waste generation.

I had the opportunity to meet one industry leader who is advocating for sustainability in the cultivation industry, and who is implementing these practices into her business. Amy Andrle, co-owner of LEagle Services (www.leagledenver.com), is leading the way in providing a sustainability framework for other cultivators to follow. LEagle is the first and only cannabis retail facility to receive the city of Denver's Certifiably Green certification. Their business is also a zero-waste facility. I spoke with Andrle and toured the LEagle Services facility last year to learn more about what they are doing to be sustainable.

The cultivation operation at LEagle is fascinating. The facility is located in a warehouse outside of downtown Denver. The front of the building is occupied by the retail operations of the business. Stepping beyond the retail store, you find yourself entering the cultivation facilities of the warehouse. Prior to entering the grow room, I had to wipe my shoes on a biocide mat to remove any outside biological contaminants. The grow room is broken down into different sections and separate rooms, depending on the current lifecycle stage of the plants. Learning about cannabis cultivation was interesting, but what is of interest to those in environmental health is the work they are doing to strive towards sustainability.

Their sustainability efforts focus on energy conservation (specifically lighting); heating, ventilating, and air conditioning (HVAC) systems for odor control, integrated pest management (IPM), water conservation, recycling, and resource management. For example, they use Organic Materials Review Institute rated pesticides that are derived from all-natural ingredients and contain no synthetics.



Cannabis plants in the vegetation stage of growth. Photo courtesy of LEagle Services/Shawna McGregor, The Rosen Group.

Their IPM system is rooted in these nonsynthetic pesticides and clean cultural practices.

One novel way they conserve energy is by storing overnight the water they intend to use for plant application. Water temperature is important to the cultivation of cannabis and should be around 70° F. Cold water is hosed into their storage tanks in the evening so that the water will be at room temperature the next day when applied to the plants. This practice saves energy by not having to heat the water to the desired temperature.

Local government agencies are also stepping in to promote sustainability within this industry. In early 2016, the Denver Department of Public Health and Environment (DDPHE) developed the Cannabis Sustainability Workgroup to determine best practices and develop educational resources for the industry. The workgroup released the Cannabis Environmental Best Practices Guide in October 2017. The purpose of the guide is to provide cannabis cultivation businesses with a snapshot of relevant sustainable practices and a starting point for process optimization techniques that facilitate continual improvement. The guide is posted online at www.denvergov.org/content/denvergov/en/environmental-health/environmental-quality/cannabis-sustainability.html.

While environmental health professionals might not have a voice in terms of regulating the cannabis cultivation industry, they can promote sustainability to the industry. As DDPHE is showing, environmental health can take the lead in providing education and training to this industry to support sustainability. 🐾

References

- Andrle, A. (2017, April 14). Making the cannabis industry green(er). *The Denver Post*. Retrieved from <https://www.denverpost.com/2017/04/14/making-the-cannabis-industry-greener>
- Mills, E. (2012). The carbon footprint of indoor Cannabis production. *Energy Policy*, 46, 58–67.
- Sanders, L. (2018, January 1). Marijuana legalization 2018: Which states might consider cannabis laws this year? *Newsweek*. Retrieved from <http://www.newsweek.com/marijuana-legalization-2018-which-states-will-consider-cannabis-laws-year-755282>
- Statista. (2018). *Number of cannabis businesses in the U.S. as of 2017*. Retrieved from <https://www.statista.com/statistics/596641/us-cannabis-businesses-number>