Ensuring Safe Patient Access to Medical Marijuana Products in Massachusetts

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Marijuana Products

- Variety of products
- Different intended uses
- Varying cannabinoid content

Edible MIPs

Dried Flower

Concentrates

Non-edible MIPs

Primer: Commercial Marijuana Production

Cultivation

Potential for pesticide use and heavy metal accumulation

Harvest

Potential introduction of microbiological contamination

Processing

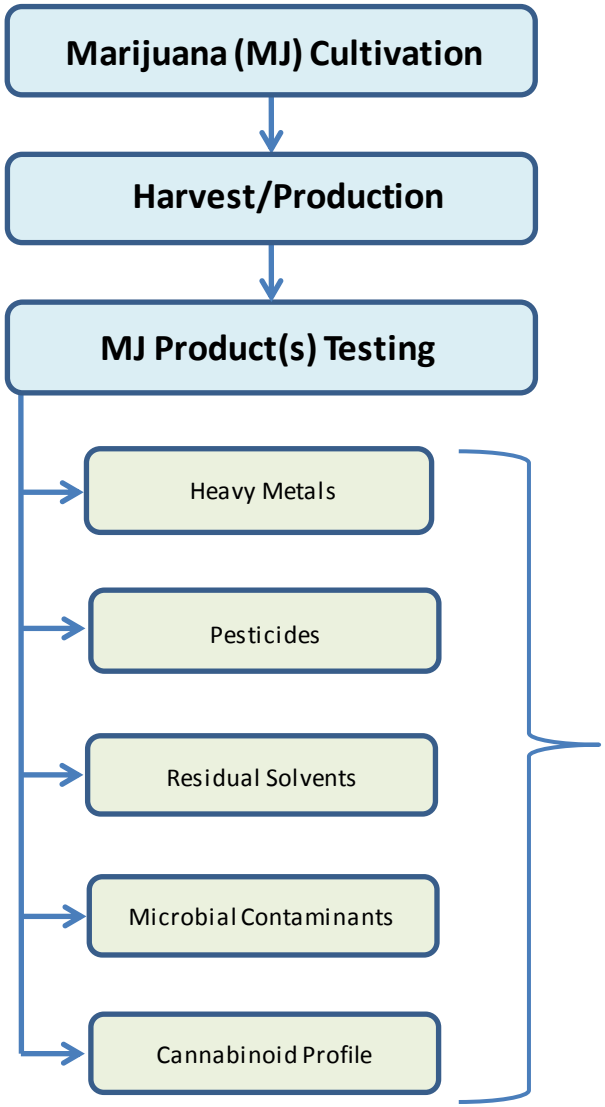
Potential residual solvents from manufacturing of cannabis extracts

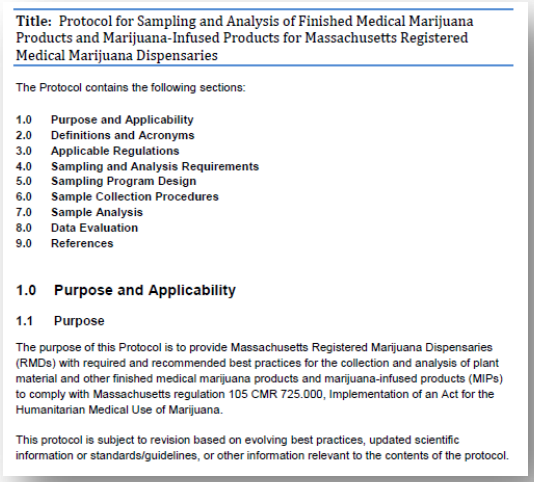
Packaging

Potential microbial contamination from poor sanitary procedures

Retail

DPH Medical Marijuana Product Testing





Title: Protocol for Sampling and Analysis of Finished Medical Marijuana Products and Marijuana-Infused Products for Massachusetts Registered Medical Marijuana Dispensaries

The Protocol contains the following sections:

1.0 Purpose and Applicability
2.0 Definitions and Acronyms
3.0 Applicable Regulations
4.0 Sampling and Analysis Requirements
5.0 Sampling Program Design
6.0 Sample Collection Procedures
7.0 Sample Analysis
8.0 Data Evaluation
9.0 References

1.0 Purpose and Applicability

1.1 Purpose

The purpose of this Protocol is to provide Massachusetts Registered Marijuana Dispensaries (RMDs) with required and recommended best practices for the collection and analysis of plant material and other finished medical marijuana products and marijuana-infused products (MIPs) to comply with Massachusetts regulation 105 CMR 725.000, Implementation of an Act for the Humanitarian Medical Use of Marijuana.

This protocol is subject to revision based on evolving best practices, updated scientific information or standards/guidelines, or other information relevant to the contents of the protocol.

https://www.mass.gov/service-details/medical-use-of-marijuana-program-product-testing

Overview

- Labs must be accredited to ISO 17025 by a third party accrediting body;
- Grow media (soil, water) and samples of all retail products (flower, oil, edibles) are tested
- Testing results evaluated according to food and drug industry standards described in DPH protocols
- Testing is required to ensure patient safety and to meet product labeling requirements

Plant parts (e.g., stem, leaf, flower) may accumulate different levels of contaminants

Dried "Flower" Or bud

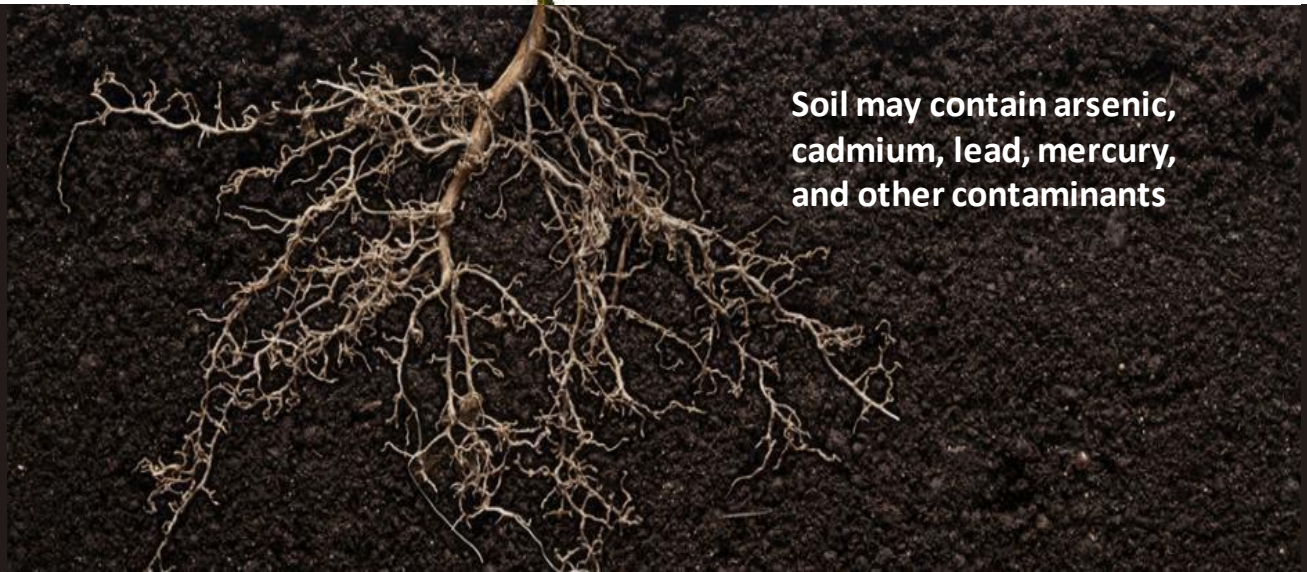
Pesticides and plant growth regulators applied to plant and grow media

Water and amendments applied to plant or plant grown hydroponically in water

Grow media (e.g., soil and water) subject to contaminant testing (e.g., metals, pesticides, bacteriological contaminants)

Microbes (e.g., bacteria and mycotoxins) in the environment

Plant may take up contaminants present in environmental media



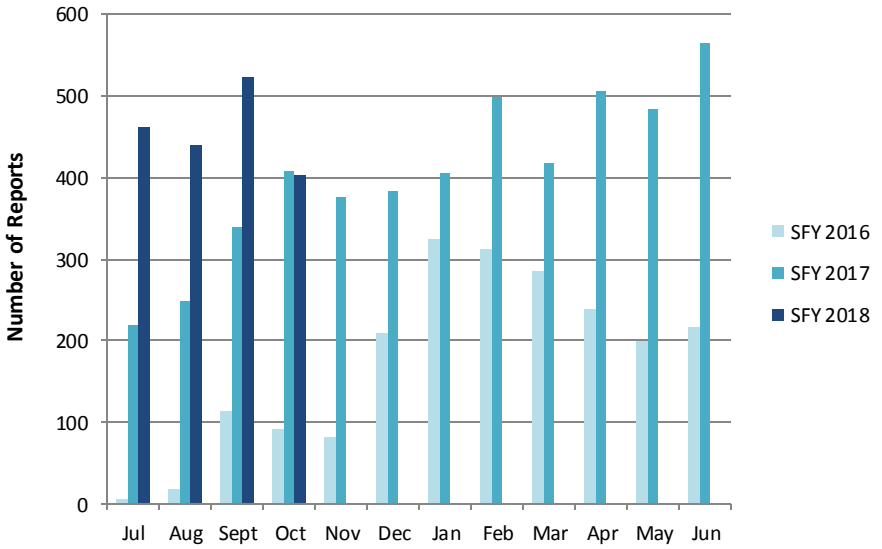
Soil may contain arsenic, cadmium, lead, mercury, and other contaminants

Medical Marijuana Product Safety and Quality Surveillance

Testing Results to Date

Parameter	Samples Tested n
Heavy Metals	3,347
Pesticides	2,234
Residual Solvents	1,030
Microbes	5,440
Cannabinoid Profile	5,606

Monthly Laboratory Reports



Product Characteristics

Product Type	Samples (%)	Reports (%)
Flower	47	51
Concentrate	31	29
MIP	22	20

Comparison of Maximum Concentrations of Heavy Metals in Food[4] and Medical Marijuana Product

HEAVY METAL	MDPH Limit for Marijuana (µg/kg)	Leafy Greens[2] (µg/kg)	Root Crops[3] (µg/kg)	Marijuana Flower[1] (µg/kg)	Marijuana Concentrate[1] (µg/kg)
Arsenic	200	43	43	2,485	491
Cadmium	200	1,088	112	820	156
Lead	500	136	64	48,200	11,400
Mercury	100	18	--	87	110

[1]Products tested through October 2017
[2]Leafy greens include: spinach, collards, iceberg lettuce, cabbage, leaf lettuce
[3]Root crops include: potato, carrot, beets, turnip, sweet potato
[4]U.S. Food and Drug Administration Total Diet Study, survey years 1991 - 2011

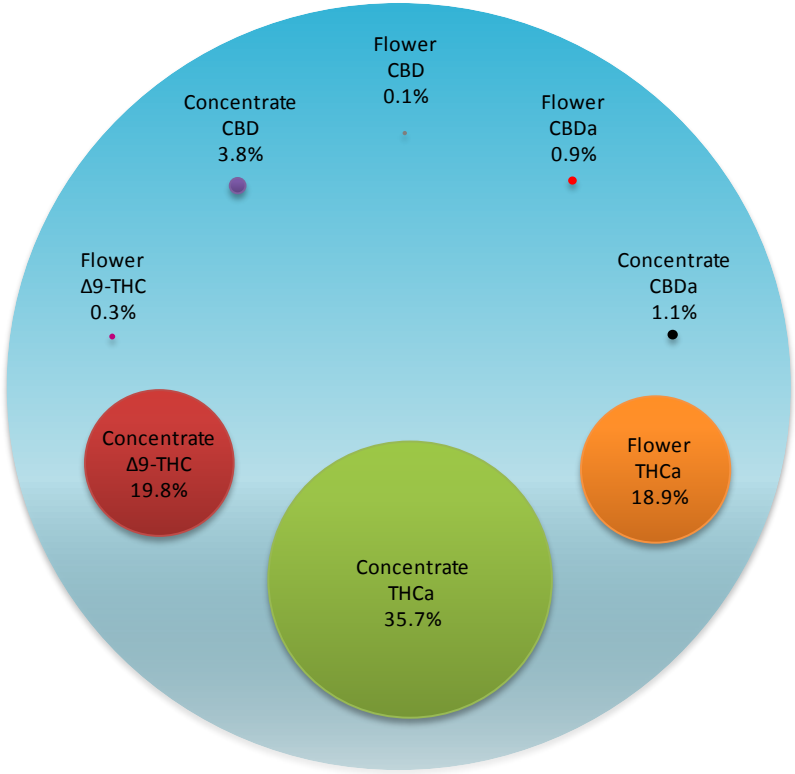
Cannabinoid Concentration and Profile

Cannabis contains approximately 421 different chemical compounds - including 60+ cannabinoids.

- Each is potent at a different amount or combination (i.e., based on the profile of the product).
- Heating or ingestion changes the cannabinoid profile and leads to different effects.
- Each cannabinoid is associated with a different effect (relaxation, anti-nausea, pain relief, etc.).

- THCa detected in 99.8% of flower samples
- Δ^9-THC detected in 98.8% of concentrates
- CBD detected in 82.7% of concentrates

- **In general, marijuana flower products are 19% THC (range: 0.03 – 34.69%)**



Cannabinoid Concentration vs. Dose/Serving

100 grams of flower (25% THC by dry weight)

Processed into 19 grams of concentrate (80% THC by weight)

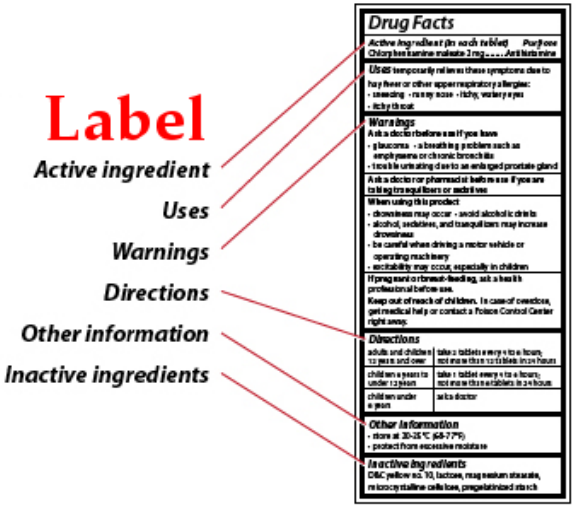
1 gram concentrate incorporated into chocolate to make 80 individual candies

1 gram of concentrate = 800 mg THC

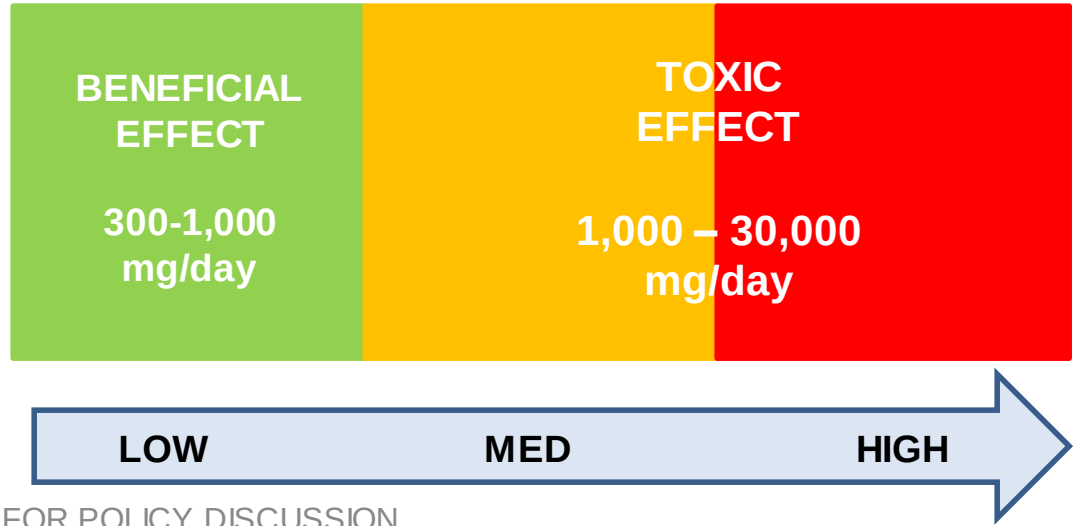
10 mg THC per chocolate (one serving)

Potency is not Dose

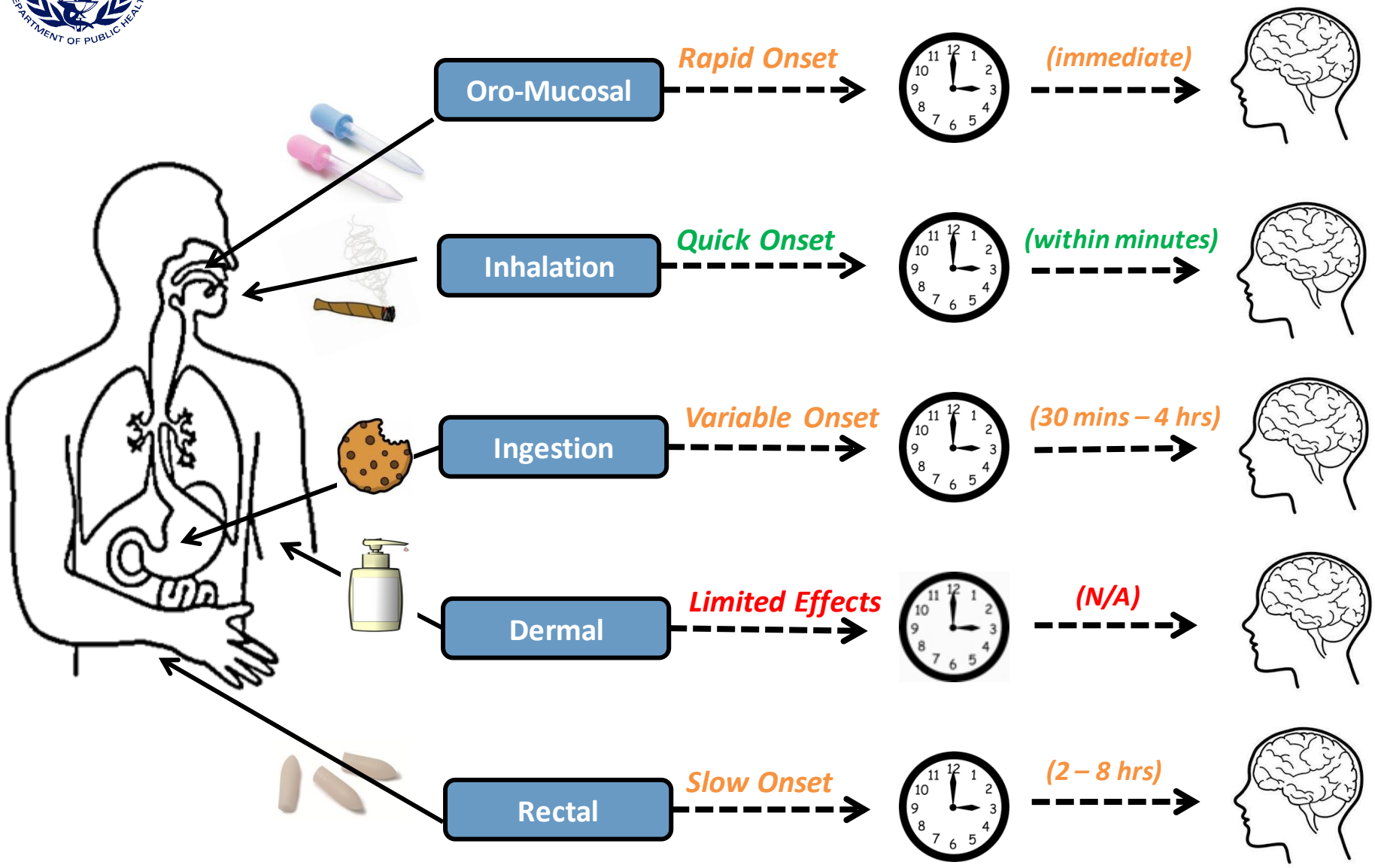
- In pharmacology and medicine
  - **Potency:** Amount of chemical to produce an ***effect*** *of a given* ***intensity.***
  - **Dose:** A ***quantity*** of a chemical administered (either per dose/serving or per day).



Dose determines if a chemical will have a beneficial or harmful effect.



Patterns of Cannabinoid use



NOTE: Onset times are shown for relative comparison. They are approximate and highly variable between individuals.

Inhaling versus Ingesting

- **Smoking/Inhalation**
  - Travels rapidly to brain - effects within minutes
  - Rapidly dissipate - 30 to 60 min
  - User able to adjust "titrate" dose
  - highly variable between individuals based on technique

- **Eating/Ingestion**
  - Metabolized by liver to active form of THC
  - Effects noticeable 30 minutes - 2 hours and last several hours
  - Difficult to titrate dose due to delayed onset

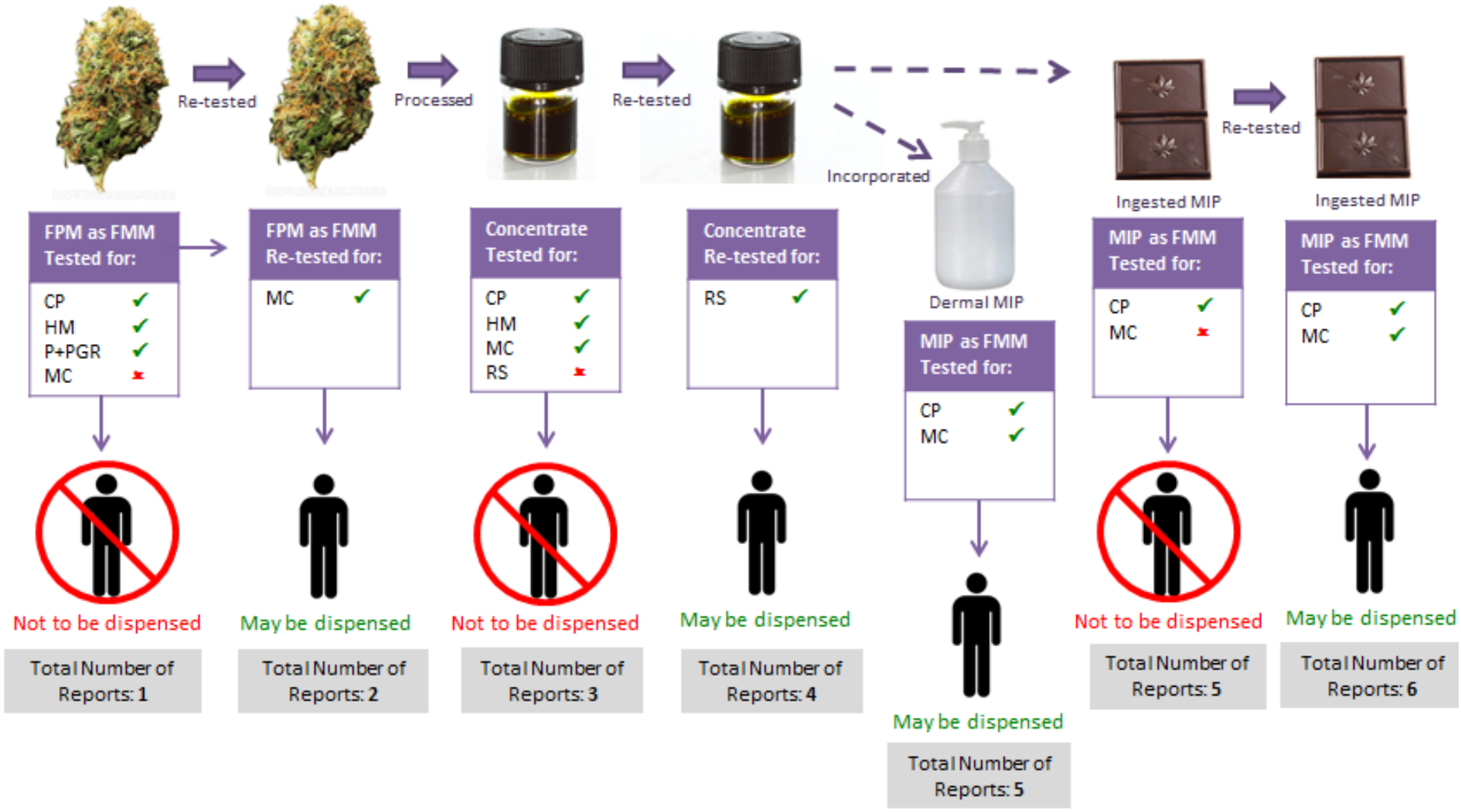
Eating 10 mg of THC is NOT the same as smoking 10 mg of THC.

10 mg THC

≠

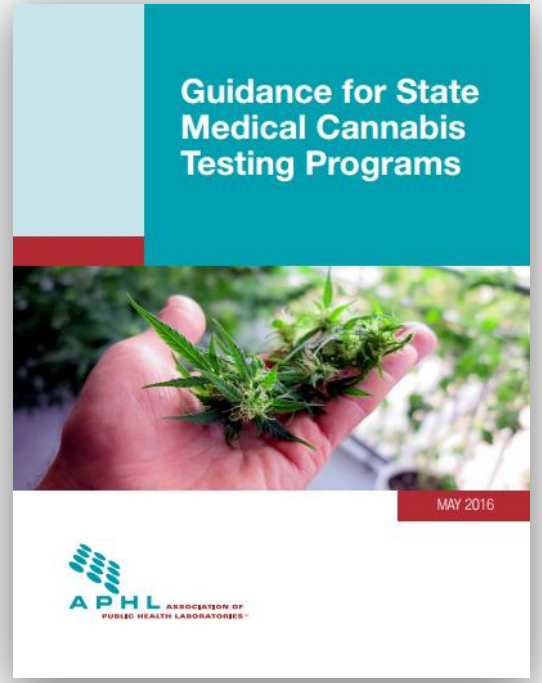
10 mg THC
(0.1 grams marijuana at 10% THC)

Primer: Commercial Marijuana Product Testing



Legend: FPM: Finished Plant Material, **FMM**: Finished Medical Marijuana Product, **CP**: Cannabinoid Profile, **HM**: Heavy Metals, **P+PGR**: Pesticide + Plant Growth Regulators, **MC**: Microbiological Contaminants, **RS**: Residual Solvents

National Leadership to Ensure Product Safety and Quality



CDC Foundation
Together our impact is greater

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information or standards/guidelir

Title: Interim Quality Assurance and Quality Control Guidance for Analytical Testing Laboratories Performing Analyses of Finished Medical Marijuana Products and Marijuana-Infused Products in Massachusetts

The Protocol contains the following sections:

1.0 Introduction
2.0 Method Validation
3.0 Quality Control Sampl
4.0 Treatment of Out of Sp
5.0 Daily Balance Checks
6.0 Labeling Chemicals, R
7.0 Software Implementati
8.0 Reporting Results
9.0 Development of QAPP
10.0 References

1.0 Introduction

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Medical Use of Marijuana Progr
Sampling and Analysis of Finish
for Massachusetts Registered M
Analysis of Environmental Medi
and established best practices.
informed by guidance and regul
CFR Part 211, Subpart I (Curre
Pharmaceutical Products, Labo
general chapters and methods,
and the international standard r

Title: Protocol for the Safe Preparation and Handling of Finished Medical Marijuana Products and Marijuana-infused Products for Massachusetts Registered Medical Marijuana Dispensaries

The Protocol contains the following sections:

1.0 Purpose and Applicability
2.0 Definitions and Acronyms
3.0 Applicable Regulations
4.0 Worker Sanitation
5.0 Workplace and Equipment Sanitation
6.0 Production Processes
7.0 Product Packaging, Labelling, Storage, and Transportation
8.0 References

1. Purpose and Applicability

1.1 Purpose

The purpose of this Protocol is to provide Massachusetts Registered Marijuana Dispensaries (RMDs) with required and recommended best practices for the safe preparation and handling of finished medical marijuana (MMJ) products and marijuana-infused products (MIPs) to avoid common foodborne illness caused by pathogenic bacteria and fungus, chemicals, or potential allergens. This Protocol supports compliance with Massachusetts regulation 105 CMR 725.000, Implementation of an Act for the Humanitarian Medical Use of Marijuana, and in particular with the provisions listed in Section 3.

This protocol is subject to revision based on evolving best practices, updated scientific information or standards/guidelines, or other information relevant to the contents of the protocol.

1.2 Applicability and Scope

This protocol applies only to Massachusetts RMD operations that prepare, handle and/or sell finished MMJ products and MIPs. This protocol addresses all MMJ products and MIPs, including all edible and non-edible products. MMJ products that are not edible could still pose a patient health risk due to the presence of microbes or allergens introduced by improper preparation, handling, or storage of the components of the MMJ product or MIP or its ingredients. This protocol focuses on the safety and preparation required for successful preparation and production of MMJ products and/or MIPs under Massachusetts requirements.

This protocol is not intended to apply to:

- Hardship cultivation registration
- Cultivation operations
- Sampling and analysis of environmental media

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Taking Root: Cannabis Public Health and Safety

Marc A. Nascarella, PhD

Massachusetts Department of Public Health

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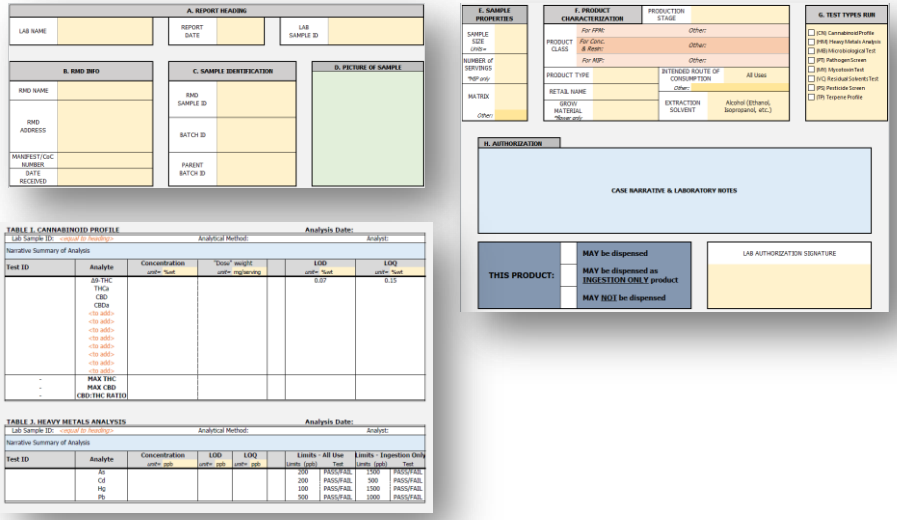
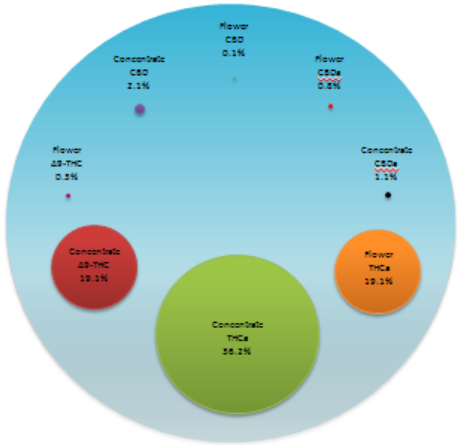
Medical Marijuana Product Testing at DPH

Standardized Laboratory Reporting

- Accurate laboratory records across all laboratories using a universally accepted ISO format
- Development of standardized tools for patients and providers





Product Safety and Quality Surveillance

- National leader in evaluating contaminants and cannabinoids
- Comprehensive marijuana product evaluation

Standards for Potential Contaminants

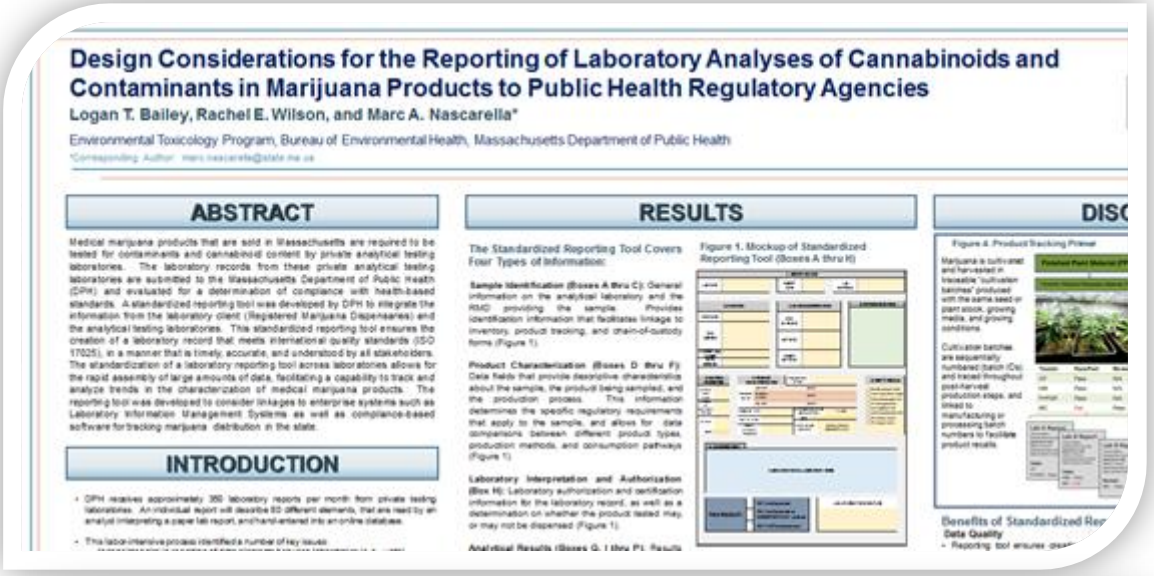
- No established standards for hydrocarbons used in marijuana concentrate extractions
- DPH developed upper limit residual solvent standards for evaluating levels of contaminants
- Based on risk assessment of daily food consumption, daily oil consumption estimates, and an estimate of fried food intake

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC HEALTH

2017 APHL® ANNUAL MEETING

and eleventh government environmental laboratory conference

June 11–14, 2017
Providence, RI
Rhode Island Convention Center



Design Considerations for the Reporting of Laboratory Analyses of Cannabinoids and Contaminants in Marijuana Products to Public Health Regulatory Agencies

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Environmental Toxicology Program, Bureau of Environmental Health, Massachusetts Department of Public Health

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ABSTRACT

Medical marijuana products that are sold in Massachusetts are required to be tested for contaminants and cannabinoid content by private analytical testing laboratories. The laboratory records from these private analytical testing laboratories are submitted to the Massachusetts Department of Public Health (DPH) and evaluated for a determination of compliance with health-based standards. A standardized reporting tool was developed by DPH to integrate the information from the laboratory client (Registered Marijuana Dispensaries) and the analytical testing laboratories. This standardized reporting tool ensures the creation of a laboratory record that meets international quality standards (ISO 17025), in a manner that is timely, accurate, and understood by all stakeholders. The standardization of a laboratory reporting tool across laboratories allows for the rapid assembly of large amounts of data, facilitating a capability to track and analyze trends in the characterization of medical marijuana products. The reporting tool was developed to consider linkages to enterprise systems such as Laboratory Information Management Systems as well as compliance-based software for tracking marijuana distribution in the state.

INTRODUCTION

- DPH receives approximately 350 laboratory reports per month from private testing laboratories. An individual report will describe 60 different elements, that are read by an analyst interpreting a paper lab report, and hand-entered into an online database.
- This labor-intensive process identified a number of key issues

RESULTS

The Standardized Reporting Tool Covers Four Types of Information:

Sample Identification (Boxes A thru C): General information on the analytical laboratory and the RMD providing the sample. Provides identification information that facilitates linkage to inventory, product tracking, and chain-of-custody forms (Figure 1).

Product Characterization (Boxes D thru F): Data fields that provide descriptive characteristics about the sample, the product being sampled, and the production process. This information determines the specific regulatory requirements that apply to the sample, and allows for data comparisons between different product types, production methods, and consumption pathways (Figure 1).

Laboratory Interpretation and Authorization (Box H): Laboratory authorization and certification information for the laboratory record, as well as a determination on whether the product tested may, or may not be dispensed (Figure 1).

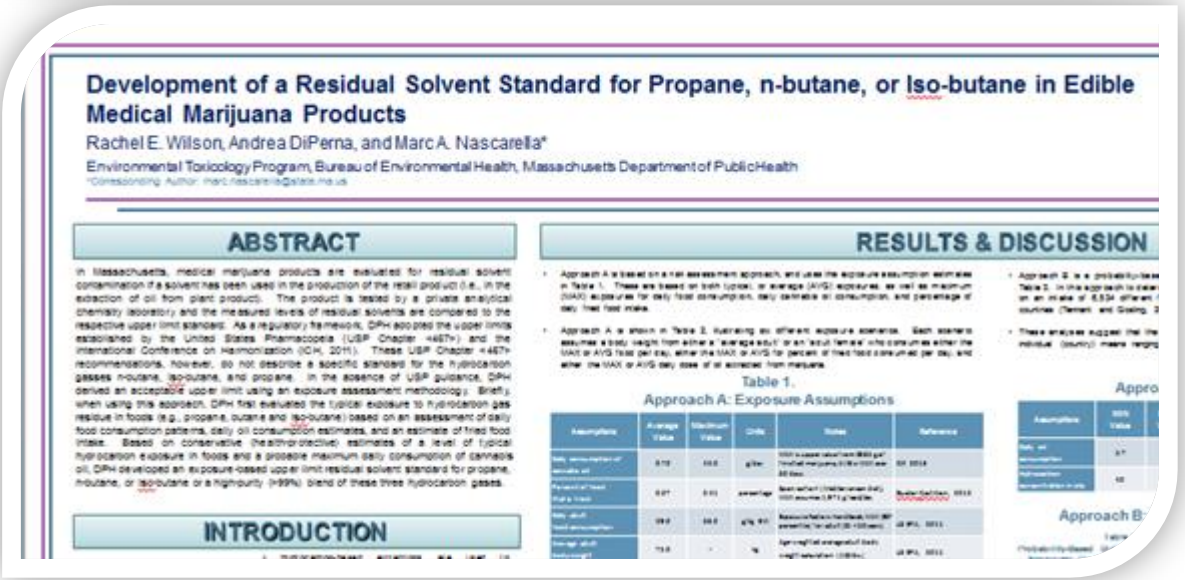
Figure 1. Mockup of Standardized Reporting Tool (Boxes A thru H)

DISC

Figure 4. Product Tracking Primer

Benefits of Standardized Re
Data Quality
- Reporting tool ensures

paper
P-78



Development of a Residual Solvent Standard for Propane, n-butane, or Iso-butane in Edible Medical Marijuana Products

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*Corresponding Author: marc.nascarella@state.ma.us

ABSTRACT

In Massachusetts, medical marijuana products are evaluated for residual solvent contamination if a solvent has been used in the production of the retail product (i.e., in the extraction of oil from plant product). The product is tested by a private analytical chemistry laboratory and the measured levels of residual solvents are compared to the respective upper limit standard. As a regulatory framework, DPH adopted the upper limits established by the United States Pharmacopeia (USP Chapter <467>) and the International Conference on Harmonization (ICH, 2011). These USP Chapter <467> recommendations, however, do not describe a specific standard for the hydrocarbon gasses n-butane, iso-butane, and propane. In the absence of USP guidance, DPH derived an acceptable upper limit using an exposure assessment methodology. Briefly, when using this approach, DPH first evaluated the typical exposure to hydrocarbon gas residue in foods (e.g., propane, butane and iso-butane) based on an assessment of daily food consumption patterns, daily oil consumption estimates, and an estimate of fried food intake. Based on conservative (health-protective) estimates of a level of typical hydrocarbon exposure in foods and a probable maximum daily consumption of cannabis oil, DPH developed an exposure-based upper limit residual solvent standard for propane, n-butane, or iso-butane or a high-purity (>99%) blend of these three hydrocarbon gasses.

INTRODUCTION

RESULTS & DISCUSSION

- Approach A is based on a risk assessment approach, and uses the exposure assumption estimates in Table 1. These are based on both typical, or average (AVG) exposures, as well as maximum (MAX) exposures for daily food consumption, daily estimates of consumption, and percentage of daily fried food intake.
- Approach A is shown in Table 2, illustrating six different exposure scenarios. Each scenario assumes a body weight from either a 'average adult' or an 'adult female' who consumes either the MAX or AVG food per day, either the MAX or AVG fat percent of fried food consumed per day, and either the MAX or AVG daily dose of oil extracted from marijuana.

Table 1.
Approach A: Exposure Assumptions

Assumptions	Average Value	Maximum Value	Units	Notes	Reference

- Approach B is a probabilistic-based

Appro

Assumptions	95% Value

Approach B:

paper
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