

Compendium and Comparison of State Medical Cannabis Testing

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Abstract

As of our study date, 31 states & Washington DC, had legalized medical cannabis. Of these, 26 have enacted testing regulations for a) cannabinoid content, b) herbicide and/or pesticide content, c) and/or microbiological (bacteria and/or molds) enumeration. The “and/or” statements show that great variation exists in testing regulations. Documenting safe (for consumer), legal (per state), and correctly labelled (as in FDA “Truth in Labeling” standards) medicine is the goal of testing regulations for medical cannabis. However, no compendium of state testing regulations for contaminants and cannabinoids exists. Presented here is just such a compendium—a database analyzing more than 60 sub-databases. Some of the information available: a) the states which have legalized medicinal cannabis; b) required elements for testing, by state; and c) range of maximum allowable limits, where applicable. The medical conditions for which each state has approved cannabis are also documented. Internet links for documentation are included. Compendium will be updated annually.

Some specifics: 26/31 states test CANNABINOID POTENCY (at least 4 cannabinoids: THCA, delta-9-THC, CBDA, and CBD). In every category, states are identified alphabetically. 25/31 states require MICROBIAL contamination testing (primarily total aerobic bacteria, total yeast & mold, pathogenic *E. coli* & *Salmonella*—as well as carcinogenic mycotoxins). All analytes are specified, e.g. aflatoxin. 20/31 states require METALS testing (14 total metals; all states: arsenic, lead, cadmium, and mercury). 26/31 states require PESTICIDES testing (total of 232 pesticides). Each state’s regulated pesticides, and a database per pesticide, are documented. 23/31 states require SOLVENTS testing (84 possible solvents).

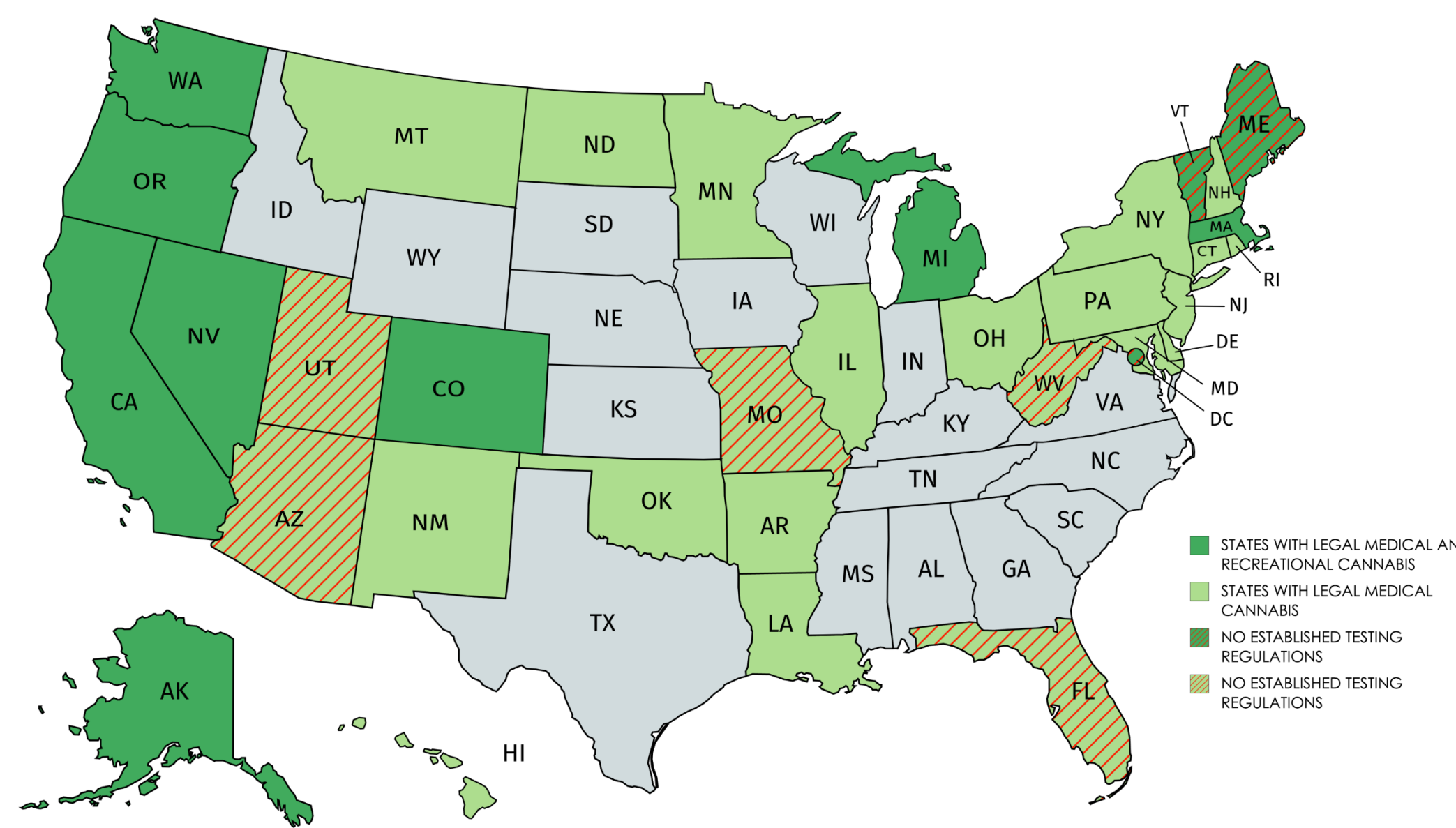
In conclusion, it is hoped that this database will be helpful for states in writing regulations, in producing safe products, accurately labelled for cannabinoid content, and free of contaminants.

Background

In the United States, the use, sale, and possession of all forms of cannabis is federally illegal¹. Cannabis is classified as a Schedule I drug, along with heroin, LSD, and cocaine². Moreover, cannabis is considered to have no accepted medical use. This regulation limits rigorous research on cannabis and a lack of scientific evidence poses risk to public health.

California became the first state to legalize cannabis for medical use in 1996 via passage of Proposition 215. Since then, 32 more states, the District of Columbia, Guam, and Puerto Rico have enacted similar laws³.

State propositions and legislation that legalized medical cannabis protect providers and patients from being federally prosecuted³. These states also had to develop required testing regulations without guidance from the federal government. A major objective of these regulations is to minimize consumption of cannabis products with unwanted contaminants and uncertain potency.



Methods

Links to each state’s medical cannabis regulations were used to identify the location of specific information required to build this compendium

Specific information, which included products tested, analytes tested, and their maximum allowable limits, were organized for each state

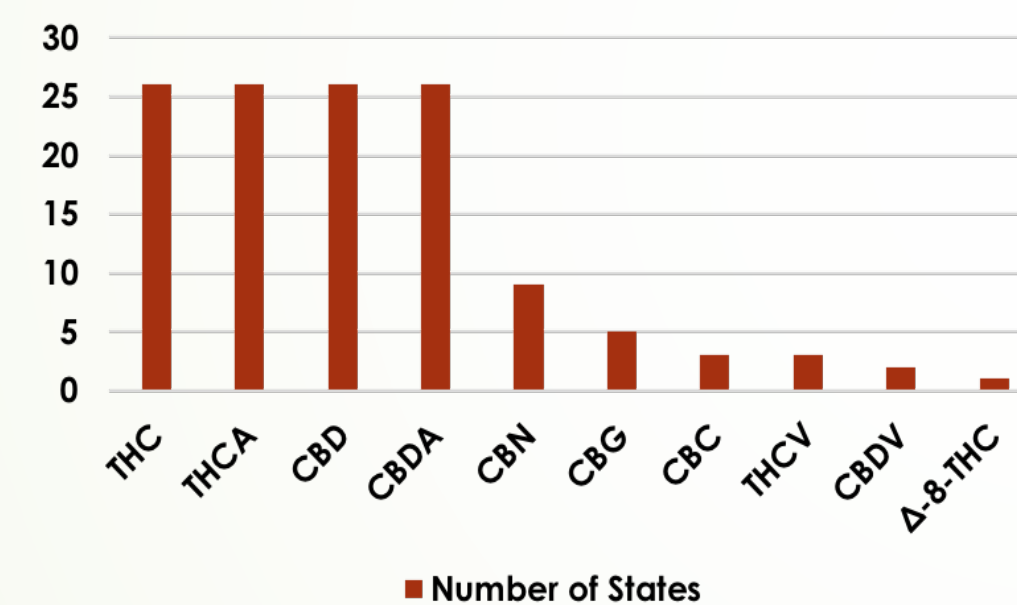
Comparisons were performed to identify the analytes that were most frequently required for testing

Results

26 of the 31 states that have medical cannabis programs require testing of products.

Cannabinoid Content

Testing for Specific Cannabinoids



[All 26 states that require testing conduct cannabinoid profile testing]

Microbial Testing

TOTAL COUNTS:	AEROBIC BACTERIA	YEAST AND MOLD	COLIFORMS
# of states testing	15	17	11
SPECIFIC TESTS:	E. COLI (PATHOGENIC)	SALMONELLA SPP.	ASPERGILLUS SPP.
# of states testing	18	21	4

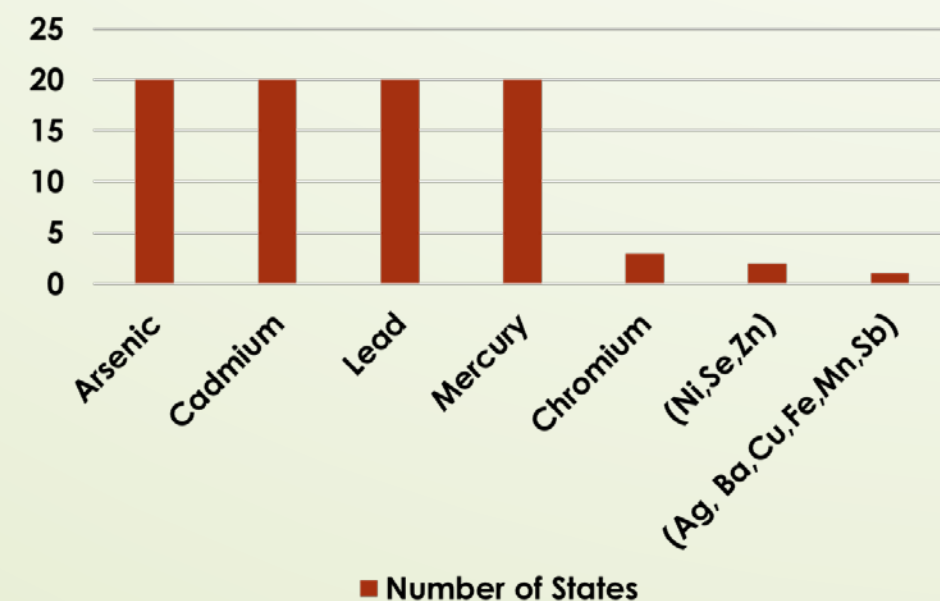
[25 of 26 states conduct some microbial testing]

MYCOTOXINS:	TOTAL AFLATOXINS (B1, B2, G1, G2)	OCHRATOXIN A
# of states testing	21	20

[21 of 26 states conduct mycotoxin testing]

Residual Metals Testing

Testing for Specific Metals



[20 of 26 states conduct residual metals testing]

Residual Pesticides Testing

PESTICIDE	# OF STATES TESTING	PESTICIDE	# OF STATES TESTING
Bifenthrin	13	*Flaclobutrazol*	11
Imidacloprid ^{4,5}	13	*Permethrins ⁵	11
Myclobutanil ^{4,6}	13	Spirotetramat	11
Abamectin	12	Trifloxystrobin	11
Bifenazate	12	Dichlorvos (DDVP)	10
Cyfluthrin	12	*Piperonyl butoxide*	10
Etoazolo	12	Acequinocyl	9
Imazali	12	*Chlorpyrifos*	9
Pyrethrins	12	Daminozide (Akar)	9
Spinosad	12	*Malathion*	9
Spiromesifen	12	*Indicates tested positive in cannabis	

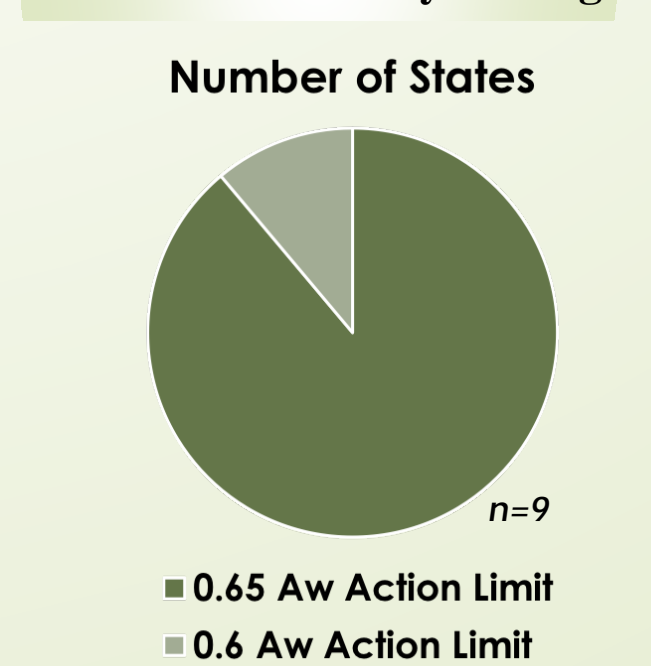
[All 26 states that require testing conduct residual pesticides testing]

Residual Solvents Testing

Solvent	# of States Testing	Solvent	# of States Testing
Butane	16	Propane	12
Heptane	15	Acelone	11
Hexane	15	Pentane	11
Toluene	14	Ethanol	11
Total xylenes	14	Ethyl acetate	9
Benzene	13	Methanol	9

[23 of 26 states conduct residual solvents testing]

Water Activity Testing



[11 of 26 states conduct water activity testing]

Top 21 Pesticides Tested

Top 12 Solvents Tested

Water Activity Can be used to predict and prevent microbial growth

Conclusions

- States that do not require testing may increase the possibility of products that may contain contaminants dangerous to human health.
- Since more than 90% of all cannabinoids are stored in trichomes in the acid form⁷, required testing of cannabis products should include acid and neutral forms.
- Analyses of state testing requirements identified contaminants most frequently tested.
- Contaminant analytes’ maximum allowable limits varied from state to state.
- 22 of 25 states required testing for a different combination of total microbial counts (85%).
- Since total microbial counts do not provide any information concerning pathogenicity, discussions among subject matter experts are suggested to determine the need for this testing.
- All 25 states required testing for a different combination of bacterial and fungal pathogens.
- 11 of 26 states require water activity testing (42%).
- Since high water activity may increase microbial levels in a product, states should consider adding this determination to their test menu.
- 4 metals (arsenic, cadmium, lead, and mercury) are tested by all 20 states.
- Since at least 9 pesticides were detected in cannabis products in different locations, states that do not require testing for these pesticides should consider adding them to their testing menu.
- This database and analyses may be helpful for states in enacting testing regulations to ensure the production of safe products that are accurately labelled for cannabinoid content and free of contaminants.

References

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