

I, DONALD PAUL LAND, PHD, declare:

1. I am a professor of chemistry, forensic science, and biotechnology at the University of California, Davis. I conduct research, teach, and publish in the field of analytical chemistry and forensic science and especially in the field of detection and quantitation of controlled substances. Many of those projects are in collaboration with scientists employed at crime laboratories at local (Sacramento District Attorney Crime Laboratory), state (California Department of Justice) and federal (Drug Enforcement Agency, San Francisco Division; Bureau of Alcohol, Tobacco, Firearms, and Explosives, Walnut Creek, CA) levels. I also design and deliver courses in forensic science at undergraduate and graduate levels and particularly teach the theory and practice of controlled substance identification and quantitation and statistical treatment of such data.
2. I also own, operate, and consult for Steep Hill Labs, Inc. (and co-founded Halent Laboratories), a chain of licensed cannabis testing laboratories with locations in Berkeley, CA, Seattle, WA, Albuquerque, NM, Denver, CO, and Las Vegas, NV. These laboratories satisfy local certification protocols that are largely similar to forensic laboratories.
3. I have provided declarations and advice to attorneys and lawmakers in several states in reference to cases involving controlled substances, patent infringement, and matters related to regulation of controlled substances. I have served as a reviewer for the textbook *Scientific Evidence*, Edward J. Imwinkelried, a textbook cited twice by The Supreme Court of the United States of America in *Daubert v. Merrell Dow Pharmaceuticals*. I have not testified in court. My Curriculum Vitae is attached.
4. I have been asked to review a laboratory file and related documents related to a specific legal case, file number GR14-6092 from Michigan State Police Grand Rapids Forensic Laboratory.
5. Upon review of the data and its accompanying report, it is my opinion that there is an obvious inconsistency between the analytical results contained in the file and the final report issued by the lab.
6. Specifically, the results show that multiple (3) positively identified naturally occurring cannabinoid compounds, at least one of which is known *not* to be psychoactive, were identified in the analysis, but the final report lists only a single compound, delta-1-THC (a.k.a. delta-9-THC). Additionally, several other peaks appear in the chromatogram, are not identified, but are likely to be additional naturally occurring cannabinoids, such as CBG, CBC, and THCV – all of which elute closely in time using most GC methods. Further, the "(origin unknown)" designation is dubious in my opinion, as the identified presence of multiple natural cannabinoid compounds provides clear evidence in support of plant origin, and clear counter evidence contrary to the hypothesis of synthetic origin.
7. There is absolutely no evidence indicated by the analysis detailed in the file that the THC is of synthetic origin - in fact the opposite is true.

- 45 8. There would be no motive for synthesizing and including the additional non-psychoactive  
46 compounds. There would be no monetary gain from the extreme effort and expense required to  
47 synthesize these compounds, as cannabidiol, in particular, is a THC functional antagonist and  
48 reduces the presumed desired psychoactive effects of THC. Only a few naturally occurring  
49 cannabinoids have published synthetic routes, and these other natural cannabinoids identified in  
50 the sample in question are not identified contaminants or byproducts of the synthetic methods  
51 published.
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- 53 9. In addition, on the Laboratory Inspection Request form offered for my review, the  
54 submitting officer, in the "Statements of Fact / Comments (required)" section, first refers to the  
55 sample as "BHO / Butane Hash Oil," and in the second note, requests "Please test residue for  
56 BHO." The submitting officer Vugveteen identified substance as a marijuana extract.
- 57
- 58 10. Indeed, the description of a "brown residue" in the Chain of Custody Report and "brown  
59 crystalline material (hard and sticky)" on the Michigan State Police Drug Analysis form, also  
60 support plant-based origin. Purified delta-9-THC (THC) is a clear, colorless liquid and purified  
61 delta-9-THC Acid (THCA) (the THC plant precursor and indistinguishable from THC using GC-  
62 MS analysis as applied by Michigan State Police crime laboratory staff) would be clear, colorless  
63 "white" crystals. Extracts from cannabis plant material are almost always reddish-yellow-to-  
64 brown/black depending on the degree of purification, with natural pigments proving nearly  
65 impossible to eliminate without significant efforts. Synthetic versions are clear and colorless or  
66 pale yellow and would not contain significant amounts of other naturally occurring cannabinoids  
67 (though sufficient purification of plant extracts could lead to the colorless liquid THC or white  
68 crystalline THCA).
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- 70 11. Plants produce delta-9- THC acid (THCA) and only small amounts of delta-9-THC (THC).  
71 THCA is not psychoactive and generally requires significant heating to convert non-active  
72 THCA into psychoactive THC. Most plant extraction methods (including that for BHO) extract  
73 both forms, THCA and THC, equally well and produce extracts similar in composition to the  
74 nascent mixture produced in the plant material – i.e., mostly THCA. Further, it is relatively easy  
75 to analyze the substance in question using a related chromatography technique – liquid  
76 chromatography – which is now common in crime laboratories across the nation, which *can*  
77 easily differentiate between THCA and THC. While analysis via GC-MS (as employed by the  
78 Michigan State Police crime laboratories) results in chemical decomposition of THCA into  
79 (mostly) THC due to a heated sample inlet, liquid chromatography involves no heating and can  
80 easily distinguish between acid and neutral forms of cannabinoids, including THCA vs THC and  
81 CBDA vs CBD, etc., either by their distinctly differing chromatographic retention times, by their  
82 distinctly different ultra-violet absorption spectra, or by their distinctly different mass spectra.
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- 84 12. The presence of significant amounts of THCA in the original sample would effectively  
85 preclude a determination that the sample was synthetic in origin, as there is no published or  
86 known total synthesis of THCA. No such analysis was performed, and, therefore, the  
87 identification of the sample as emanating from a synthetic source could NOT be proven beyond  
88 reasonable doubt using the data presented, and, in contrast, significant evidence – even without  
89 the additional analysis – leads to a conclusion that the sample is much more likely than not to be  
90 of plant origin. Such analysis could be easily performed in many crime laboratories.

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13. I also reviewed emails and laboratory manual pages provided to me which detailed the testing methodology and reasoning used for the sample analysis and final reporting. The decision that was made to report all substances which contain THC but do not include visible plant parts as schedule 1 THC is inherently contradictory and false on its face. The results of analysis contained in the file clearly indicate that this sample should have been reported as marijuana, and to do otherwise is not based in science. Furthermore, methods exist to easily ascertain the likely source (synthetic or natural) of virtually ANY THC-containing sample beyond a reasonable doubt. In fact, several members of the Michigan State Police crime laboratories staff expressed several of these arguments in the email discussion concerning the data already in hand.

I declare under penalty of perjury of the laws of the State of California that the forgoing is true and correct. Executed this 23rd day of October 2015, at Davis, California.

  
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DONALD PAUL LAND, PHD