

Draft

I, DONALD PAUL LAND, PH.D. declare

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.

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 multiple states and several nations. These laboratories satisfy local certification protocols that are largely similar to forensic laboratories.

I consult for Front Range Biosciences, a diverse group of biotech researchers, plant scientists and modern farming experts working together to grow the highest performing hemp, coffee and other high-value crops. I also consult for Pure Jamaican, a legal, licensed, vertically integrated cannabis and hemp pharmaceutical company producing Active Pharmaceutical Ingredients by isolation and purification from cannabis and hemp plants in Jamaica.

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 testified in court as an expert witness several times. My Curriculum Vitae is attached

“Hemp” is legal to possess and consume. The term “Hemp,” however, is not a scientific term. It is defined legally, in part, as the plant species *Cannabis Sativa* L. that contains less than 0.3%  $\Delta$ 9-Tetrahydrocannabinol (THC), or a combination of  $\Delta$ 9-Tetrahydrocannabinol and  $\Delta$ 9-Tetrahydrocannabinolic Acid (THCA), on a dry weight basis in harvested flowers. The vast majority of *Cannabis* cultivars legally grown as “hemp” are those whose genotypes do not possess genes to allow the production of the enzyme, THCA Synthase (THCAS), needed to convert a common precursor, Cannabigerolic Acid (CBGA), to THCA, which would subsequently decarboxylate to produce THC. Instead, the vast majority of “hemp” plants contain genetics to produce Cannabidiolic Acid Synthase (CBDAS) which converts CBGA into CBDA and, subsequent

to decarboxylation, cannabidiol (CBD). However, the enzyme CBDAS is not 100% selective. In thousands and thousands of “hemp” samples containing CBDA and CBD (every such sample ever tested), small amounts of THCA and THC are observed upon testing. This is because the CBDAS enzyme produces about one THCA molecule for every 20-30 CBDA molecules. That is, about 3-5% of the output of the CBDAS enzyme is, in fact THCA. Thus, every single “hemp” or *Cannabis* sample with CBDA and CBD will also contain THCA and THC. (Elucidation of structure-function relationship of THCA and CBDA synthase from *Cannabis sativa* L. Bastian Zirpel, Oliver Kayser, Felix Stehle. *J Biotechnol.* 2018 Oct 20;284:17-26. doi: 10.1016/j.jbiotec.2018.07.031. Epub 2018 Jul 24).

Most CBD-containing products are sold as dietary supplements containing no specific claims of medicinal benefits and thus are not closely regulated by the U.S. Food and Drug Administration or other regulatory body. The DEA and USDA regulate the agricultural production of “hemp,” but exert little oversight into the derived products that enter the retail market. Numerous recent published studies show that such CBD-containing hemp-derived products suffer from inaccurate labelling and formulations, such that many of these products contain significant levels of THC. In a July 2020 USFDA Report to the U.S. House Committee on Appropriations and the U.S. Senate Committee on Appropriations regarding the “Sampling Study of the Current Cannabidiol Marketplace to Determine the Extent That Products are Mislabeled or Adulterated,” of the 256 products tested between 2014 and July 2020, over half (133) were found to contain detectable levels of THC.

Moreover, numerous published studies show that humans who ingest hemp-derived products with small amounts of THC present do sometimes show significant levels of THC (levels in excess of the 41 ng/mL reported here) in their urine thereafter. Constantino, et al., tested 7 subjects after administering hemp oil and three of the seven produced urine samples that tested at or above the 41 ng/mL level [Subject 2 (39.2 ng/mL), Subject 3 (78.6 ng/mL), and Subject 6 (60.7 ng/mL)]. (Hemp Oil Ingestion Causes Positive Urine Tests for  $\Delta^9$ -Tetrahydrocannabinol Carboxylic Acid. *Journal of Analytical Toxicology*, Vol. 21, October 1997. Anthony Costantino, Richard H. Schwartz and Philip Kaplan.) Struempfer, et al. administered a commercially available health food product of cold-pressed hemp seed oil ingested by one volunteer twice a day for 4 1/2 days (135 mL total). Urine specimens collected from the volunteer were subjected to standard workplace urine drug testing procedures, and the following concentrations of 11-nor- $\Delta^9$ -tetrahydrocannabinol carboxylic acid (9-THCA) were detected: 41 ng/mL 9-THCA at 45 h, 49 ng/mL at 69 h, and 55 ng/mL at 93 h. Ingestion was discontinued after 93 h, and the following concentrations were detected: 68 ng/mL at 108 h, 57 ng/mL at 117 h, 31 ng/mL at 126 h, and 20 ng/mL at 142 h. The first specimen that tested negative (50 ng/mL initial immunoassay test, 15 ng/mL confirmatory gas chromatographic-mass spectrometric test) was at 146 h, which was 53 h after the last hemp seed oil ingestion. (A positive cannabinoids workplace drug test following the ingestion of commercially available hemp seed oil. R. E. Struempfer, G. Nelson, F. M. Urry. *J. Anal. Toxicol.* Jul-Aug 1997;21(4):283-5. doi: 10.1093/jat/21.4.283.) In a study by Johns Hopkins researchers, two of 6 adults tested

positive for THC after consuming hemp products. (Urinary Pharmacokinetic Profile of Cannabinoids Following Administration of Vaporized and Oral Cannabidiol and Vaporized CBD-Dominant Cannabis. Tory R Spindle, Edward J Cone, David Kuntz, John M Mitchell, George E Bigelow, Ronald Flegel, Ryan Vandrey. *Journal of Analytical Toxicology*, Volume 44, Issue 2, March 2020, Pages 109–125, <https://doi.org/10.1093/jat/bkz080>)

In my opinion, a level of urine THC of 41 ng/mL, as reported, could easily be attributed to ingestion of legally purchased hemp-derived products.

I declare under penalty of perjury of the laws of the State of California that the forgoing is true and correct. Executed this 12th day of January 2021, at Davis, California.

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DONALD PAUL LAND, PHD

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