IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF INDIANA
INDIANAPOLIS DIVISION

3C, LLC d/b/a 3Chi, et al.,	)	CASE NO. 1:23-cv-1115-JRS-MKK
	)	
Plaintiffs,	)	
	)	
vs.	)	
	)	
ATTORNEY GENERAL TODD ROKITA, in his official capacity, et al.,	)	
	)	
Defendants.	)	

EXPERT DECLARATION OF CHRISTOPHER HUDALLA, Ph.D

1. My name is Christopher Hudalla, Ph. D. I am over the age of 18, I am qualified to give this declaration, and I have personal knowledge of the matters set forth herein. My CV is attached to this declaration.

2. In the past four years, I have provided expert testimony in multiple cases related to cannabis, as well as natural and synthetic cannabinoids. I am compensated the rate of $ 375 per hour for my work on this matter. My compensation is not dependent upon the substance of my opinions or the outcome of the case.

3. I submit this expert declaration based upon my personal knowledge and my experience as an analytical chemist with an advanced degree in Analytical Chemistry. I have over 35 years of research experience in both academic and industrial environments. The last 10 years have been focused primarily on cannabis and cannabinoid research, including the oversight and analysis of thousands of consumer samples based on cannabis constituents. The materials I have relied upon in drafting this report are the same types of materials that other experts in my field rely upon when forming opinions on the subject, including peer-reviewed scientific research articles.

4. If called to testify in this matter, I would testify truthfully based on my expert opinion.

I. Qualifications and Experience

5. I am an analytical chemist with Masters and Doctorate degrees in analytical chemistry. I received my degrees from the University of California in Santa Barbara in 2017, which included a two year teaching/research fellowship at the Institut für Physikalishe Chemie, Westfälishche Wilhelms-Universität, Münster, Germany. My graduate research was focused on the development of novel multi-dimension NMR techniques for the characterization of crystalline and amorphous solids. The results and findings from my doctorate research have been included in multiple peer-reviewed journal articles and presented at numerous scientific meetings.

6. I completed a two year post-doctoral research fellowship at the Eppley Cancer Institute within the University of Nebraska Medical Center. The focus of my research was the application of multi-dimensional NMR techniques for the structural and dynamical characterization of proteins and DNA in response to novel chemotherapeutic compounds.

7. I spent 14 years working for Waters Corporation as a research chemist on the development and production of novel chromatographic stationary phases. During my tenure with Waters Corporation, I gained global recognition as an expert in Reversed Phase, HILIC, and Supercritical Fluid Chromatography (SFC). I was co-author on multiple peer-reviewed publications, presented research at numerous technical meetings, and was awarded three patents related to equipment and methodologies related to chromatographic separations.

8. In 2013, I founded ProVerde Laboratories to provide the regulatory required analytical testing for the Massachusetts Cannabis Program. ProVerde was among the first laboratories in the country to receive ISO 17025 accreditation, specifically related to cannabis.

ProVerde is also the only cannabis research entity with membership in the Massachusetts Biotechnology Council. To date, I have overseen the analysis of approximately 120,000 samples of cannabis and cannabis-based raw materials, intermediates and consumer products. Approximately 5,000 of those analyses were based on synthetic cannabinoids such as delta-8-THC, HHC, and THCO. ProVerde laboratories continues to collaborate with other researchers to better understand the nature of these products, with their associated contaminants and synthetic byproducts, and to identify analytical methods appropriate for testing these products to ensure consumer safety.

9. In my role as ProVerde's Chief Scientific Officer, I have worked closely with numerous technology vendors to demonstrate the potential for contaminant removal from these synthetic products, to create delta-8-THC products free from the associated non-natural isomers and byproducts that result from the synthetic processes used to create these products. Those collaborations include:

- Thar Process[1]: with the exploration of preparative purification via Supercritical Fluid Chromatography (SFC) for purification of delta-8-THC products, and the additional isolation of contaminants for further toxicological studies.
- Gilson[2]: the application of Centrifugal Partition Chromatography (CPC) for the isolation and purification of delta-8-THC extracts.
- Advion-Interchim[3]: exploration of the application of Preparative Flash Chromatography for the purification of delta-8-THC extracts. This approach using Flash Purification has demonstrated moderate success at removing synthetic contaminants as shown in Figure 1.

[1] Thar Process: 150 Gamma Dr., Pittsburgh, PA 15238
[2] Gilson: 3000 Parmenter Street, Middleton, WI 53562
[3] Advion-Interchim: 61 Brown Rd., Intaca, NY 14850

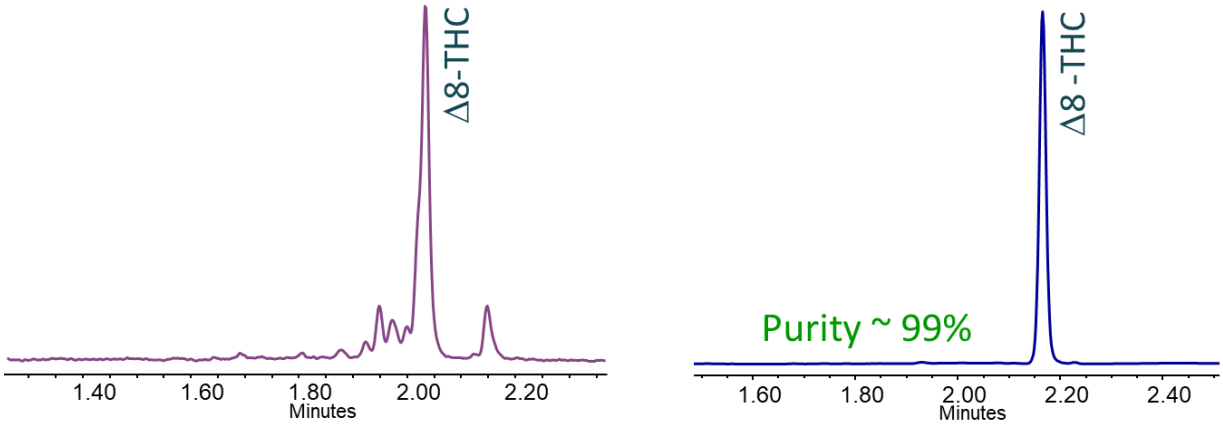


Figure 1 - Comparison of chromatographic results for delta-8-THC extract before (left) and after (right) purification by flash chromatography. Most of the synthetic isomers and byproducts were successfully removed from this extract.

10. The evaluation from the preparative Flash Chromatographic approach (Advion-Interchim) demonstrates the ability to successfully remove many of the synthetic isomers and byproducts created by the isomerization reaction. These results suggest a viable commercial pathway for production of a synthetic Delta-8-THC product without the associated synthetic byproducts and contaminants.

11. The results from this flash purification study have been presented at numerous scientific and industry venues, technical seminars and webinars. However, the overall response received from producers of these synthetic products, is that it would add on to the cost of production, and "nobody is making us do that".

12. ProVerde continues to provide on-going consulting for a small number of producers who are willing to pursue a path of creating a non-contaminated product based on synthetic and/or semi-synthetic cannabinoids.

13. I have been involved with numerous technical/scientific organizations that have been focused on the development of standardized testing methodologies for cannabis testing, focused on ensuring consumer safety. These include the Expert Cannabis Committee within the

United States Pharmacopeia (USP), the CANN Analytical Division within the American Chemical Society (ACS), the Association of Official Analytical Chemists (AOAC), the American Oil Chemists Society (AOCS), the American Society for Testing Materials (ASTM), the Foundation of Cannabis Unified Standards (FOCUS), Americans for Safe Access(ASA), the American Cannabis Laboratory Council (ACLC), the Association of Cannabis Testing Laboratories (ACTL), the National Cannabis Laboratory Council (NCLC), the American Herbal Products Association (AHPA), and the American Herbal Pharmacopeia (AHP).

14. I am on the Cannabis Applied Sciences Advisory Committee for Loyalist College of Applied Arts and Technology, located in Belleville, Ontario, Canada.

15. I have served as advisory consultant to multiple licensed cannabis producers in Canada, Africa and the United States.

16. I have presented my research at more than 70 conference and technical meetings, in multiple countries, including Germany, Australia, Czech Republic, Israel, South Africa, Lesotho, Antigua and Costa Rica.

17. I serve on the technical organizing committees for multiple scientific meetings, including the MJBiz Science Symposium, the Emerald Conference and the Cannabis Science Conference. I have also chaired technical sessions at multiple conferences, including the Emerald Conference, the Eastern Analytical Symposium (EAS) and the Cannabis Science Conference.

18. I have given invited lectures at multiple universities and medical schools including Willamette University, University of Tennessee, St. John's University, University of Nijmegen, Boston University School of Medicine, Morehouse School of Medicine, and the School of Medicine at Louisiana State University.

19. Based on the research I have conducted and presented on behalf of ProVerde Laboratories, I have been voted three years in a row (2020, 2021, and 2022) by my peers as one of the top cannabis researchers globally. I have also been named by the Global Cannabis Times as one of the top 3 most influential cannabis scientists (2023).

II. Summary of Key Positions

20. My opinions are based upon my expertise and the literature and other materials relied upon those in my field.

21. Below is a summary of my key opinions. I will expand on these opinions further.

- Delta-8-THC has been observed naturally in cannabis, but only at trace levels
- The trace levels of natural delta-8-THC are impractical for production scale processing
- Synthetic delta-8-THC has been shown to have therapeutic potential but with a lower level of intoxicating effects compared to delta-9-THC. However, if detla-8-THC dosing is increased, similar levels of intoxicating properties may be achieved.
- Synthetic conversion of CBD to other cannabinoids typically employs toxic reagents to effect the isomerization, which must be removed after the synthesis
- Isomerization of CBD to THC, including delta-8 THC, produces multiple synthetic byproducts
- Most such byproducts are not found naturally in cannabis or other sources
- Many such byproducts have not been identified. No toxicity information is available for these synthetic byproducts
- Isomers matter: Thalidomide as a case study for the importance of isomers and their impact on biological systems

- Conventional High Performance Liquid Chromatography (HPLC) methods, which are used by most analytical testing laboratories, are not sufficient to elucidate all synthetic byproducts

- The DEA has confirmed that delta-8-THC, if extracted from compliant hemp biomass, is exempt from the Federal Controlled Substances Act (CSA)

- However, a 2021 e-mail from DEA Section Chief Terrence Boos clarified that "arriving at delta-8-THC by a chemical reaction starting from CBD makes the delta-8-THC synthetic and therefore, not exempted by the Agricultural Improvement Act (US Farm Bill)." Any quantity of delta-8-THC obtained by chemical means continues to be classified as a Controlled Substance. [4]

- The DEA has not addressed all THC isomers and synthetic byproducts, but has provided guidance that THCO continues to be a schedule I drug, as it does not occur naturally in the cannabis plant.

- By their analogous nature, not existing naturally in cannabis, many of the synthetic byproducts (delta-10-THC, delta-6a10a-THC, delta-8-Iso-THC and delta-4(8)-Iso-THC) would also be deemed controlled substances under the same rationale as THCO.

- Indiana law specifically addresses isomers of THC, both synthetic and natural, and includes these under Schedule I controlled substances in the Indiana Code.

- While delta-8-THC is synthesized from hemp-derived CBD, due to the toxic chemicals necessary for synthesis, and the conditions necessary, delta-8-THC products are synthetic rather than natural chemical compounds

- I have tested multiple 3Chi delta-8-THC products, including vape cartridges and intermediate products, and my results consistently indicate the presence of synthetic delta-8 THC in addition to other non-naturally occurring THC isomers and unidentified synthetic byproducts. All delta-8-THC samples evaluated contained one or more of the isomers; delta-8-iso-THC, delta-4(8)-iso-THC, delta-10-THC, and/or delta-6a10a-THC, all of which are

[4] https://healthnews.com/news/is-delta-8-illegal-dea-official-says-yes/

Schedule I substances under the Federal Controlled Substances Act (CSA) as well as under the Indiana Code.

III. Key Positions

A. Trace levels of delta-8-THC are found naturally, but are impractical for production scale processing

22. The cannabis plant produces cannabinoids only in their native acidic form, such as THCA and CBDA. Other compounds like delta-9-THC, delta-8-THC, and CBN are only observed in natural cannabis plant material as a result of natural degradation processes that occur over time on the plant. So while the plant does not produce these compounds, they are found naturally in the plant at fairly low levels.

23. The acidic form of the cannabinoids are more completely converted to their neutral form with additional heating of the plant material, often associated with smoking, vaping or baking with cannabis material. This conversion from the acid to the neutral cannabinoid form is referred to as "decarboxylation," referring to the loss of the carboxylic acid group from the acidic cannabinoid. It is the neutral form, delta-9-THC, which is primarily responsible for the intoxicating properties associated with cannabis. So when smoking marijuana, the heat of combustion is converting the non-intoxicating THCA in the plant material into the intoxicating form of the cannabinoid, the delta-9-THC, which is then inhaled into the lungs, providing the intoxicating or psychoactive response.

24. While the cannabis plant does not naturally produce delta-8-THC, trace amounts have been observed naturally in plant material, and are believed to result from natural degradation of other cannabinoids produced directly by the cannabis plant (THCA).

25. For a ProVerde study of over 17,000 plant samples, 98.5% had no measurable concentrations of delta-8-THC. Of the samples that did contain delta-8-THC, the average concentration was 0.0018% (by weight).

26. Based on the trace levels of delta-8-THC found naturally in cannabis, to produce a single kilogram of natural delta-8-THC distillate, which could be used for processing, approximately 55,000 kilograms of raw plant biomass would be required for extraction.

27. With the cost of raw biomass, combined with the costs of extraction and purification, it is estimated that a single kilogram of natural delta-8-THC distillate would cost between $200M and $500M, making it impractical for commercial production.

B. Delta-8-THC has been shown to have potential for therapeutic applications but with reduced intoxicating properties, relative to delta-9-THC

28. Research studies have shown that delta-8-THC and delta-9-THC have similar pharmacokinetic and pharmacodynamics properties, both interacting with the CB_1 cannabinoid receptors.[5] So, Delta-8-THC has similar intoxicating properties as delta-9 THC, albeit with less potency (believed to be due to the weaker CB_1 cannabinoid receptor affinity, relative to delta-9-THC). The potency of delta-8-THC relative to delta-9-THC can depend on method and route of administration, but is estimated to be 20% to 80% that of delta-9-THC. Accordingly, consumers of delta-8 THC looking for a similar high to delta-9 THC need only consume delta-8 THC products in sufficient quantities.

[5] Tagen, M. and Klumpers, L. Review of Delta-8-Tetrahydrocannabinol (Δ8-THC): Comparative Pharmacology with Δ9-THC. *Br. J. Pharmacol*. 2022;179:3915-3933. doi: 10.1111/bph.15865.

C. Synthetic conversion of CBD to THC requires toxic reagents

29. While natural extraction and processing is prohibitively expensive, THC (both delta-9 and delta-8) can be isomerized (synthesized) from CBD. This was first published in 1941 by Roger Adams.[6]

30. After the passage of the Agriculture Improvement Act of 2018 (AIA), also referred to as the US Farm Bill, production of US hemp increased dramatically, resulting in an over-supply of hemp biomass, and the subsequent hemp-derived CBD isolate. The oversupply of CBD lead to a decrease in market value for CBD raw goods and products. From July of 2019 to March of 2020, the price of CBD isolate dropped more than 60%, from approximately $4,000 to $1,500 per kilogram.[7]

31. The conversion (isomerization) of CBD into a value added THC product was seen as a lifeline to farmers who had excess CBD biomass waiting to be used.[8]

32. The isomerization from CBD to THC can be accomplished via an acid-catalyzed intramolecular cyclization.[9]

33. For this synthesis, the CBD isolate is first dissolved in an organic solvent, such as toluene, hexane, or dichloromethane. These solvents, on their own, are considered toxic, some considered carcinogenic.

34. Once the CBD is dissolved, an acid is added to the mixture to catalyze the isomerization. Typical acids used include hydrochloric acid (HCL), sulfuric acid (H_2SO_4), or

---

[6] Adams, R., Cain, C.K., McPhee, W.D. and Wearn, R.B. Stucture of Cannabidiol. XII. Isomerization of Tetrahydrocannabinols. *Isomerization of Cannabidiol to Tetrahydrocannabinols*. August 1941, page 2209

[7] https://www.mckeany-flavell.com/regional-cbd-isolate-pricing-converges-trends-lower/

[8] Quote from Johnathan Miller from the US https://www.usatoday.com/story/news/health/2023/04/15/what-is-delta-8/11521735002/

[9] Marzullo, P., Foschi, F., Coppini, D.A., Fanchini, F., Manani, L., Rusconi, S., Luzzani, M., and Passarella, D., Cannabidol as the Substrate in Acid-Catalyzed Intramolecular Cyclization. *J. Natural Products*. 2020, 83, 2894-2901.

para-toluene sulfonic acid (pTSA). Many of the acids which may be used would be considered toxic for ingestion or inhalation.

35. The mixture is refluxed[10] at elevated temperature for a period of time, during which the CBD is transformed into different chemical structures. Some preparations include additional metal catalysts which may impact the resulting reaction mixture.

36. After the synthesis, residual solvents, acids and other reagents need to be removed from the synthetic mixture.

37. The removal of these residual toxic reagents can be technically challenging and is often incomplete. Consumer products based on these synthetic cannabinoids are rarely tested for the presence of these residual toxic solvents and reagents used in their processing.

38. Additional transformation of the synthetic THC can yield additional synthetic compounds, many of which have intoxicating properties similar to delta-9-THC.

39. Using hydrogen with additional metal catalysts, the THC double bond (the "delta-8" or "delta-9") can be hydrogenated, or reduced, yielding hexahydrocannabinol (HHC), another cannabinoid with intoxicating properties. There is a small amount of scientific literature that supports the existence of trace amounts of HHC in natural cannabis[11]. Additional researchers have not been able to corroborate this finding, and its existence naturally is still debated in the industry as well as in academia.

40. Using acetic anhydride, or other reagents, the THC molecule can be acetylated to form THC-O-Acetate, often referred to as THCO. Acetylation is a process used widely in the

[10] Reflux involves heating the chemical reaction while continually cooling and condensing the vapor back into the same reaction vessel.

[11] Qureshi, M., Afridi, M., Kanwal, F., and Akram, M. Estimation of Biologically Active Cannabinoids in Cannabis Indica by Gas Chromatography-Mass Spectrometry (GC-MS). World Applied Sciences Journal January 2012. doi: 10.5829/idosi.wasj.2012.19.07.1922.

pharmaceutical industry to increase bioavailability, making it easier for drugs to cross the blood-brain barrier, making them more effective. No peer-reviewed literature evidence could be found to support the existence of THCO in natural cannabis.

D. Isomerization of CBD to THC produces multiple synthetic byproducts

41. The synthetic transformation of CBD to THC is not a singular chemical reaction, but rather a series of parallel competing chemical reactions, resulting in a complex mixture of synthetic products and byproducts.

42. There are more than 35 THC isomers possible, including 4 isomers of delta-9-THC and 4 isomers of delta-8-THC. Of all these possible isomers, only two are observed in nature, one specific form of the delta-9-THC and one specific form of delta-8-THC. When isomerizing CBD to THC, there is little control for which isomers are being created.

43. Some of the common THC isomers formed, either during processing cannabinoid extracts or while performing isomerization reactions, are the delta-10-THC, delta-6a10a-THC, delta-4(8)-iso-THC, and delta-8-iso-THC. While many claim that these are found naturally in cannabis, these claims are not supported in the peer-reviewed scientific literature.[12,13] No scientific literature could be found to document the existence of these isomers in natural cannabis material.

44. Which isomers and byproducts are formed is dependent on the choice of chemical reagents (solvent/acid), the temperature and time of the reaction, the equipment used for the reaction, as well as the addition of other metal catalysts. Because there are almost infinite

[12] Hanus, L., Meyer, S., Muñoz, E., Taglialatela-Scafati, O., and Appendino, G. Phytocannabinoids: A Unified Critical Inventory. *Nat. Prod. Rep*. 2016, 33,1357. doi:10.1039/c6np00074f.

[13] Radwan, M., Chandra, S., Gul, S. and ElSohly, M. Cannabinoids, Phenolics, Terpenes and Alkaloids of Cannabis. *Molecules*, 2021, 26, 2774. doi: 10.3390/molecules26092774.

permutations of starting reagents, equipment and conditions, the potential number of contaminant profiles is difficult to imagine.

45. Significant work has been done to try to understand the chemical structures possible that can result from these synthetic transformations. To date, there has been more than 15 chemical constituents identified, and several that still have not yet been structurally characterized.[14,15,16,17]

46. While some of the resulting synthetic byproducts have recently been identified, to date there is little known about the toxicity of these novel compounds which are not found in nature.

47. My review of chromatographic data collected at ProVerde Labs for two 3Chi vape products were consistent with other synthetic products on the market, with evidence of multiple isomers and un-identified synthetic byproducts observed in the analysis. These examples are shown below in Figure 2.

[14] Geci, M., Scialdone, M., Tishler, J. The Dark Side of Cannabidiol: The Unanticipated Social and Clinical Implications of Synthetic Δ8-THC. *Cannabis and Cannabinoid Res*. 2023 April, 8(2), 270-282. doi:10.1089/can.2022.0126.

[15] Radwan, M., Wanas, A., Gul, W., Ibrahim, E., and ElSohly, M. Isolation and Characterization of Impurities in Commercially Marketed Δ8-THC Products. *J. Nat. Prod*. 2023 April, 28;86(4):822-829. doi: 10.1021/acs.jnatprod.2c01008.

[16] Golombek, P., Müller, M., Barthlott, I., Sproll, C., and Lachenmeier, D. Conversion of Cannabidiol (CBD) into Psychotropic Cannabinoids Including Tetrahydrocannabinol (THC): A Controversy in the Scientific Literature. *Toxics*. 202 Jun 3;8(2):41. doi:10.3390/toxics8020041.

[17] Kiselak, T., Koerber, R., Verbeck, G. Synthetic Route Sourcing of Illicit at Home Cannabidiol (CBD) Isomerization to Psychoactive Cannabinoids using Ion Mobility-Coupled-LC-MS/MS. *Forensic Sci. Int*. 2020 Mar; 308:110173. Doi: 10.1016/j.forsciint.2020.110173.

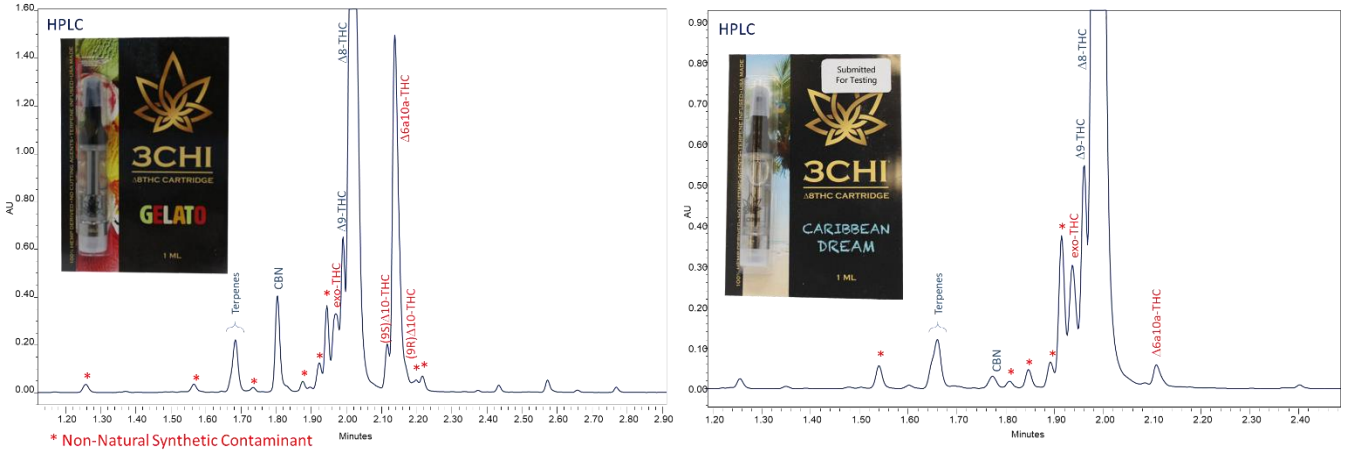


Figure 2 - Comparison of chromatographic results for a 3Chi vape cartridges, Gelato (left) and Caribbean Dream (right). Multiple non-natural isomers and synthetic byproducts were observed in both samples, marked in red.

48. These results indicate that in addition to the delta-8-THC which was the target of the synthetic process, evidence is observed for delta-9-THC, as well as other non-naturally occurring isomers, like delta-10-THC and/or deltal-6a10a-THC. There are additional signals that are due to other unidentified isomers or synthetic byproducts.

49. As these isomers and synthetic byproducts are not found in nature, their existence is only the results of synthetic processes, with chemical structures different from, but similar to both delta-8-THC and delta-9-THC, making them "synthetic equivalents" to the substances contained in the plant, and therefore a Schedule I controlled substance [See Ind. Code 35-48-2-4(d)(31)].

50. The presence of these unknown byproducts and their status as a controlled substance was notated on a certificate of analysis from ProVerde provided to 3Chi for the analysis of one of their samples submitted for testing in June of 2021 (COA #95557).

E. Isomers (chirality) matter: Thalidomide as a case study

51. In chemistry, stereoisomers are chemical compounds which are composed of the same atoms, connected in the same sequence, but differ only in their three-dimensional arrangement in space.

52. Chiral molecules, also referred to as enantiomers, are a special class of stereoisomers, for which the stereoisomer pairs exist as non-superimposable mirror images. The human hands, left and right, provide a good teaching example of non-superimposable mirror images.

53. Chiral compounds are common in biological systems with examples including DNA, proteins, peptides, sugars, terpenes and cannabinoids. Different chiral structures exhibit different biological responses. Drug response is often dependent on the 3-dimensional interactions of the drug within the human body.

54. As an example, one of the common synthetic byproducts of CBD isomerization is the THC isomer delta-6a10a-THC, which can exist as a chiral pair, denoted by (1S)-delta-6a10a-THC or (1R)-delta-6a10a-THC. Studies have shown that the (1S) isomer is psychoactive, while the (1R) isomer is not.[18]

55. Thalidomide is a pharmaceutical drug first marketed in 1957 in West Germany. It was shown to be effective in treating anxiety, insomnia, and tension. It was widely prescribed to pregnant women for morning sickness.

[18] Hollister, L., Gillespie, H., Mechoulam, R., and Srebnik, M. Human Pharmacology of 1S and 1R Enantiomers of delta-3-tetrahydrocannabinol. *Psychoppharmacology*. 1987, 92:505-507. Note: delta-3-THC, based on an older numbering system, is the same as delta-6a10a-THC under the more current numbering convention.

56. The chemical structure for thalidomide has only two isomeric structures, "R" and "S". These isomers are a special class of isomers called enantiomers, with different 3-dimensional spatial arrangement of atoms, which gives the chemical structure chiral properties.

57. While one Thalidomide isomers (R) was responsible for the sedative effects, the other isomer (S) was later found to be teratogenic, resulting in numerous birth defects and deaths.[19]

58. It is estimated that 10,000 infants were affected, with approximately 40% who died shortly after birth. Surviving infants had severe defects in limbs, eyes, urinary tracts and hearts.

59. While thalidomide was prescribed in multiple countries, including Germany, Britain, Australia and Canada, the drug was not approved by the FDA, and was prevented from distribution in the US.

60. Of the many THC isomers conceivable, many of these isomers would be considered chiral molecules. Because most of these isomers have not been studied, their toxicity is unknown. The case of thalidomide's toxic isomers demonstrates the serious consequences of not identifying and studying the safety of THC isomers.

F. Conventional analytical methods do not elucidate all synthetic byproducts

61. Reverse Phase High Performance Liquid Chromatography (RP-HPLC) is the most common method utilized for the analysis of cannabinoids and cannabis based products. More current analytical methods employ a higher pressure chromatographic system (UHPLC), based on the same chromatographic theory, yielding the same or better resolving power as conventional

[19] Rehman, W., Arfons, L., and Lazarus, H. The Rise, Fall and Subsequent Triumph of Thalidomide: Lessons Learned in Drug Development. *Ther. Adv. Hematol*. 2011 Oct: 2(5): 291-308.

HPLC, but in a shorter period of time. Typical UHPLC methods are 3 to 5 times faster than comparative HPLC methods, with similar resolving power.

62. Compounds are separated in a fluidic path by their chemical interactions with a stationary phase bed (HPLC column). As the chemical compounds are separated and eluted from the chromatographic system, they are detected, typically with a UV or Mass Spectrometric detector. The time it takes a compound to pass through the chromatographic system is referred to as the compound's chromatographic retention time (t_R).

63. If two or more compounds interact with the stationary phase in a similar manner, it is possible that the compounds are eluted from the chromatographic system at the same retention time, such that the signal recorded is a superposition of the chemical compounds. This is referred to in chromatography as a "co-elution" of signals.

64. Recently, we have demonstrated that two synthetic byproducts from the isomerization of CBD to THC (delta-8-iso-THC and delta-4(8)-iso-THC), under most standard HPLC conditions, co-elute with the primary delta-8-THC signal. As a result, the individual concentrations of these two synthetic byproducts are being captured and quantitated as part of the primary delta-8-THC signal, resulting in an over-estimation of purity for those products.

65. The presence of these synthetic contaminants in their products is not unknown to the producer 3Chi, as they highlight on their website the development of their proprietary chromatographic method aimed at resolving at least one of these contaminants. Their "D-Spec" method claims to be able to resolve the delta-4(8)-iso-THC from the delta-9, detla-8 and delta-11-THC isomers. Their included graphical simulation for this method includes three unidentified signals marked with a "?", acknowledging these additional unidentified chemical constituents in their products. Their method does not address the delta-8-iso-THC isomer, but several of the

laboratory COAs posted for their products online contain quantitative values for both of these non-natural synthetic byproducts in their commercial products. As these chemical compounds are not found in nature, and have not yet been studied, there is no available toxicity information for these synthetic contaminants.

66. Under an orthogonal analytical approach, utilizing Gas Chromatography (GC), those synthetic byproducts are easily resolved, and can be identified, distinctly from the signal due to the delta-8-THC compound. This is demonstrated in Figure 3, which shows the chromatographic co-elution of synthetic byproducts with the main signal from the delta-8-THC under LC conditions, which are further resolve when utilizing GC methodologies for the analysis.

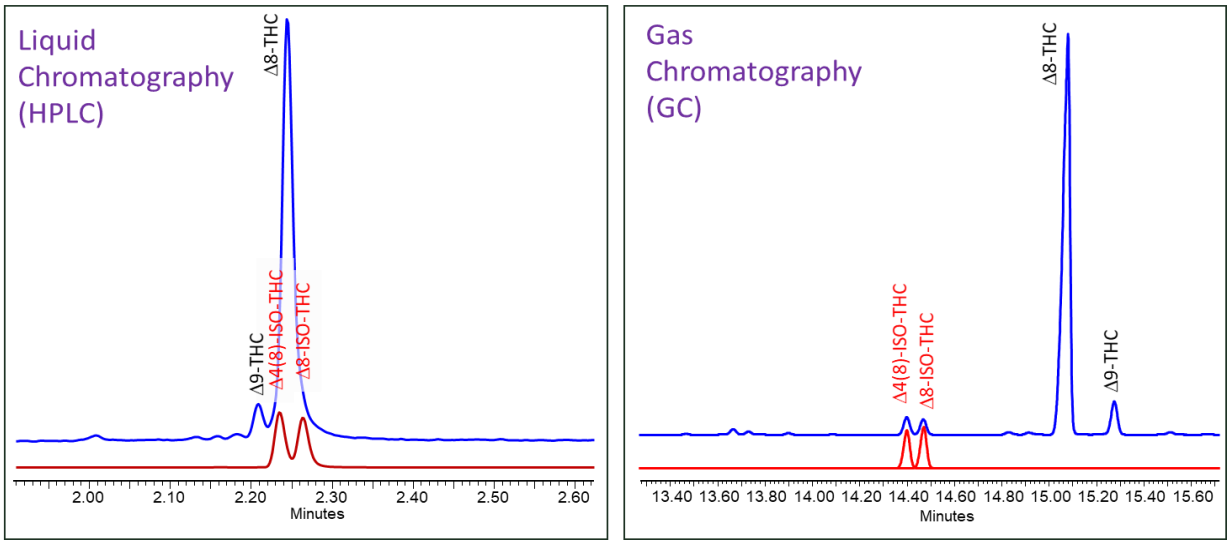


Figure 3 - Comparison of chromatographic results for delta-8-THC by Liquid Chromatography (left) and Gas Chromatography (right). Due to chromatographic co-elution of synthetic byproducts by HPLC, these contaminants are not detected by HPLC, and result in over-estimation of the delta-8-THC content and purity for those samples. These contaminants are easily resolved using Gas Chromatography.

67. A re-analysis by Gas Chromatography, for samples previously tested by HPLC, revealed concentrations of these two synthetic byproducts in almost every sample tested.

68. My recent analysis of a 3Chi Platinum delta-8-THC (Δ8) vape cartridge, performed at ProVerde Labs, evaluating the differences between LC and GC methodologies, showed similar chromatographic performance, for which multiple contaminant signals were observed under GC conditions, which were not visible by HPLC analysis (Figure 4). The analysis utilizing GC methodologies revealed, in addition to multiple unidentified synthetic byproducts, the presence of both delta-4(8)-iso-THC and delta-8-iso-THC, both of which are not found naturally in cannabis. In addition, a significant signal due to delta-8-THCV was observed at concentrations that would only be consistent with a synthetic product.

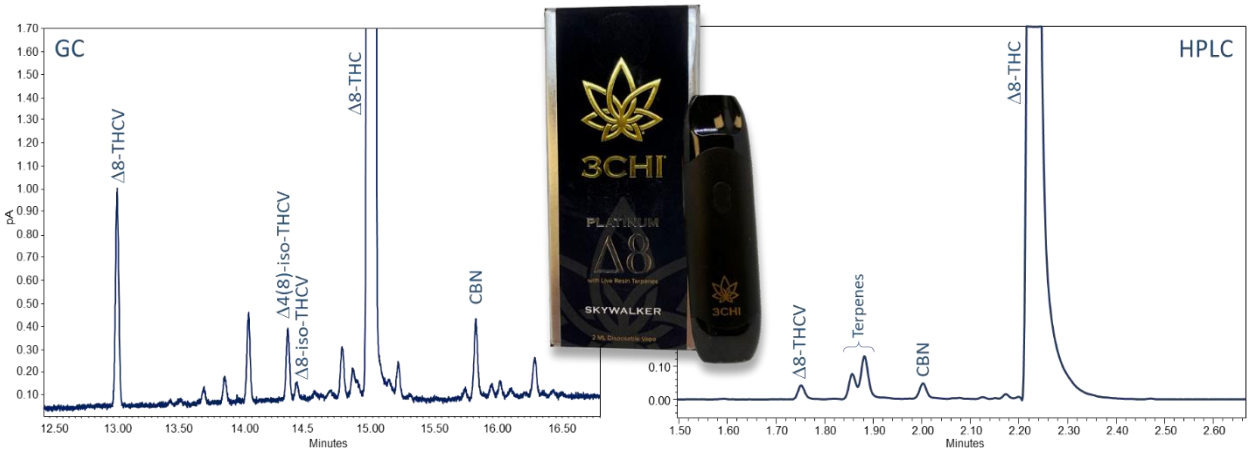


Figure 4 - Comparison of chromatographic results for a 3Chi Platinum delta-8 vape cartridge by Gas Chromatography (left) and Liquid Chromatography (right).

G. Delta-8-THC products are synthetic rather than natural

69. The term "synthetic" refers to chemical compounds created through a chemical process by human agency, as opposed to those of natural origin.

70. Synthetic compounds may imitate natural products, for instance Dronabinol, a synthetic delta-9-THC pharmaceutical used for the treatment of HIV/AIDs-induced anorexia and chemotherapy-induce nausea and vomiting.[20]

[20] https://www.ncbi.nlm.nih.gov/books/NBK557531/

71. Synthetic compounds may represent novel chemical compounds not found in nature, such as detla-9-THC-Acetate (THCO) or delta-8-iso-THC.

72. Synthetic compounds can be created by intention, or accidentally during various chemical processing activities.

73. The conditions necessary to convert CBD to THC involve a combination of starting materials, acidic environments at elevated temperatures that would not be found in nature. All of the delta-8-THC products tested to date by ProVerde Laboratories represent complex synthetic mixtures that include examples for each of the synthetic examples described above; synthetic versions of naturally occurring compounds, novel compounds not found in nature, as well as examples of intentional and accidental chemical syntheses.

H. The DEA's positions on delta-8-THC and other synthetic compounds

74. Delta-8-THC is specifically called out on the DEA list of Schedule I controlled substances.[21]

75. As a synthetic cannabinoid, delta-8-THC would also meet the criteria for classification as a Schedule I controlled substance.

76. Under the 1986 Federal Analogue Act, 21 U.S.C. § 813, as an analogue of delta-9-THC, delta-8-THC would be considered a Schedule I controlled substance.[22]

77. In 2020, the DEA issued an interim final rule that states that all synthetically derived tetrahydrocannabinols remain Schedule I controlled substances.[23]

[21] https://www.deadiversion.usdoj.gov/schedules/orangebook/c_cs_alpha.pdf
[22] https://www.govinfo.gov/content/pkg/USCODE-2010-title21/html/USCODE-2010-title21-chap13-subchapI-partB-sec813.htm
[23] https://www.federalregister.gov/documents/2020/08/21/2020-17356/implementation-of-the-agriculture-improvement-act-of-2018

78. In 2021, in a letter to the Alabama Board of Pharmacy, the DEA stated that delta-8-THC produced from non-cannabis materials continue to be controlled under the CSA, but tetrahydrocannabinols, including delta-8-THC, extracted from hemp that meet the delta-9-THC concentration limits would be exempt from the CSA.[24]

79. A subsequent letter followed that guidance, with the additional clarification that delta-8-THC, produced by a chemical reaction, resulting in a synthetic form of the delta-8-THC, would not be exempted under the US Farm Bill and would remain a controlled substance. Specifically, the letter addressed the synthetic conversion of CBD to THC.[25]

80. In February of 2023, in a response letter to an inquiry, the DEA clarified that the acetate esters of delta-8-THC and delta-9-THC (THCO), are not hemp, but remain Schedule I controlled substances under the CSA. This distinction was justified based on the findings that these chemical compounds do not naturally occur in hemp.[26]

81. Indiana Code Section 35-48-2-4(d)(31) specifically includes as controlled substances:[27]

> "Tetrahydrocannabinols, including synthetic equivalents of the substances contained in the plant, or in the resinous extractives of Cannabis, sp. and synthetic substances, derivatives and their isomers with similar chemical structure and pharmacological activity such as:
>
> (A) π^1 cis or trans tetrahydrocannabinol, and their optical isomers [Δ9-THC][28];
>
> (B) π^6 cis or trans tetrahydrocannabinol, and their optical isomers [Δ8-THC]; and

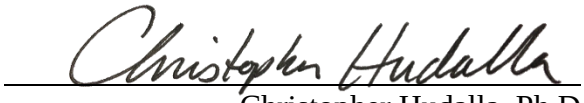
[24] https://us.eversheds-sutherland.com/portalresource/ALBOP-synthetic-delta8-THC-21-7520-signed.pdf
[25] https://healthnews.com/news/is-delta-8-illegal-dea-official-says-yes/
[26] https://cannabusiness.law/wp-content/uploads/DEA-THCO-response-to-Kight.pdf
[27] https://codes.findlaw.com/in/title-35-criminal-law-and-procedure/in-code-sect-35-48-2-4
[28] Specific isomers with π-bond designations represent an older naming convention, while isomers noted in brackets [ ], with Δ-bond or "delta" designations, represent the most current naming convention for cannabinoids isomers.

(C) $\pi^{3,4}$ cis or trans tetrahydrocannabinol and their optical isomers. [Δ6a10a-THC]"

82. Accordingly, many of the isomers observed in 3Chi and other semi-synthetic products, including delta-10-THC, delta-6a10a-THC, delta-8-iso-THC and delta-4(8)-iso-THC, which are not found naturally in cannabis, and only produced synthetically, would fall within the definition of a Schedule I compound under the Federal CSA as well as the Indiana Code.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 11th, 2023.



Christopher Hudalla, Ph.D

CURRICULUM VITAE

Christopher J. Hudalla, Ph.D.

PROFILE

Ph. D. chemist with a solid record in analytical and inorganic chemistry, specializing in chromatography (HPLC/UPLC/SFC/UPC^2/GC) and NMR spectroscopy (solid and liquid state). Experienced with a variety of additional analytical techniques, including, ICPMS, TXRF, FTIR, UV/VIS, SEM, EDS, TGA, DSC, AA, Mass Spec (GC/MS, and LC/MS/MS). Exceptional organizational and communication skills.

WORK EXPERIENCE AND EDUCATION

Founder and Chief Scientific Officer

ProVerde Laboratories, Inc. - Milford, MA September 2013 – Present

Responsible for all aspects of establishing and building an analytical testing and formulation laboratory

- Worked with state regulatory agencies to define testing requirements for the emerging Medical Marijuana Industry.
- Assumed primary responsibility for laboratory infrastructure, overseeing instrument purchases and build-out of a 16,000 Sq. Ft. state-of-the-art analytical testing laboratory facility.
- Worked with key market stakeholders to evaluate the market needs and develop applications and services to meet those needs.
- Performed method development and validation for testing protocols to meet customer requirements.
- Developed and optimized proprietary methods for the extraction of cannabinoid using supercritical fluid extraction technology with carbon dioxide as the primary solvent.
- Responsible for product research and development, including the development of methodologies for the separation and purification of individual cannabinoids for the preparation of custom formulations.
- Developed and implemented laboratory procedures and documentation to fulfill the requirement of ISO 17025 certification.
- Worked with an industry trade association within the national framework to lobby for changes in federal policies regarding banking and taxation for the cannabis industry.
- Participated with national organizations to work towards standardization of testing and processing methodologies and protocols within the cannabis industry.
- Presented world-wide on cannabis based topics including analytical testing, extraction, formulation and commonly encountered contaminants.

Development of formulated consumer products for cannabis use.

- Developed the concept for individual terpene formulations, based on natural cannabis terpene profiles. Terpene formulations can be used in the preparation of vaporizer products to increase or modulate the effects of cannabis use.
- Developed a formulation for a cannabis based topical, based on cannabinoid constituents targeting inflammation and pain. Product has been reported beneficial for a variety of conditions, including neuralgia, arthritis, migraines, as well as general pain and swelling. Product was part of a clinical study on cannabis with Harvard Medical School.

Cannabis Expert Committee
United States Pharmacopeia (USP) September 2016 – Present

- Provide insight to existing testing methodologies for the cannabis industry.
- Review state by state regulatory requirements.
- Provide real data on failure rates for existing testing requirements in regard to regulatory limits.
- Make recommendations for testing requirements and appropriate limits

Cannabis Applied Science Program Advisory Committee
Loyalist College of Applied Arts and Technology – Ontario Canada February 2018 – Present

- Provide input to curriculum development.
- Participate in steering committee activities.
- Provided consultation on industry needs and best practices.

Scientific Advisor
ABcann Global
2016 – 2018

Providing technical guidance for cannabis applications and operations
- Provide technical details for the operation of testing and production facilities for GMP production of cannabis and cannabis infused products.
- Help create a business plan and production projections based on current and future cultivation production.
- Specified equipment and necessary infrastructure for the extraction of cannabis raw materials.
- Provided SOPs and training for the operation of analytical instrumentation
- Provided product formulation concepts, including recommendations for administration and dosing of cannabis based products.

Scientific Advisor
Ianthus Captial Investments
2014 – 2018

Providing technical guidance for cannabis applications and operations

- Contribute to license application, providing technical details for the operation of testing and production facilities for GMP production of cannabis and cannabis infused products.
- Help create a business plan including cultivation and production projections.
- Specified equipment and necessary infrastructure for the extraction of cannabis raw materials.
- Provided product formulation concepts, including recommendations for administration and dosing of cannabis based products.

Principal Applications Chemist – Chemistry Applied Technologies
Waters Corporation - Milford, MA October 2010 – September 2013

Development of applications to highlight the functionality of novel chromatographic stationary phases

- Work with commercialization team to evaluate market needs and develop applications to meet those needs.
- Produce proof-statements demonstrating performance of newly commercialized products.
- Work with internal sales, technical support and external customer base to provide guidance in the use of new products.
- Prepare and deliver presentations to internal and external groups (team meetings, technical meetings and conferences).

Work with product development team in the research and development of chemistries for Supercritical Fluid Chromatography (SFC) and UltraPerformance Convergence Chromatography (UPC^2)

- Evaluate prototype stationary phases under SFC and UPC^2 conditions.
- Evaluate performance of newly designed instrumentation and provide feedback to instrument development team.
- Developed novel method for the separation of steroids and steroid derivatives utilizing UPC^2 technology.
- Prepare and present customer facing scientific based collateral to inform and educate customer base on state of the art technology and its applications.

Participate in management of laboratory activities

- Provide supervision for up to two direct reports and general direction for lab personnel, monitoring progress and providing performance reviews.
- Oversee laboratory maintenance and calibration schedules to insure compliance to ISO guidelines.
- Participate in the budget process for acquisition of capital equipment and laboratory supplies.

Senior Scientist - Evaluations Laboratory
Waters Corporation - Milford, MA May 2007 – October 2010

Evaluation of prototype column chemistries for Supercritical Fluid Chromatography (SFC) applications.

- Evaluate customer needs and applications for SFC separations
- Perform detailed analysis of commercially available and prototype stationary phases under SFC conditions

Investigate the nature and extent of chromatographic column bleed under Mass Spec conditions.

- Developed a testing protocol to asses and quantitate the levels of column bleed observed under LC conditions using Mass Spec detection

Development of HPLC and UPLC methods for the separation of carbohydrates on novel prototype chromatographic chemistries.

- Interface with project managers, marketing, and customers, to understand the market place needs and work with instrument engineers and synthetic chemists to develop products which fulfill those attributes.
- Work with synthetic chemists to evaluate prototypical materials resulting in rational direction for future synthetic efforts.
- Utilize Design of Experiments (DOE) to investigate research space to better understand systems studied.
- Provide weekly presentations to update other project team members on the current project status.
- Participate in the continual development and implementation of SOP's for GMP/GLP compliance, conforming to ISO 13485.
- Provide supervision for two direct reports and general direction for lab personnel, monitoring progress and providing performance reviews.
- Responsible for departmental server used to back up all data files.

Senior Scientist - Analytical Laboratory
Waters Corporation - Milford, MA March 2000 - May-2007

Provide analytical services supporting all aspects of HPLC instrument manufacture including chemistry and instrument R & D, and customer support.

- Principle responsibility is the operation and maintenance of 300MHz NMR spectrometer, providing solid and liquid state NMR analyses for chemical R & D in the design of novel chromatographic materials and bio-analytical reagents. Application of 1D and 2D NMR techniques for the identification and characterization of synthetic products and intermediates.
- Develop and implement multiple analytical techniques for additional analyses including; HPLC, FTIR, UV/VIS, SEM, EDS, GC, TGA and Mass Spec in the analyses of polymers, organic and inorganic compounds.
- Actively work with design engineers to address instrumental issues to improve next generation instrumentation.
- Work synergistically with manufacturing engineers to address issues of contamination arising during the manufacturing process, including building an FTIR database of manufacturing environment and instrument component contaminants.

- Consult with product engineers to address customer issues such as contamination in the field.
- Act as a lead investigator to evaluate new technological opportunities including building a business plan and timeline for design and production of new instrumentation.
- Wrote and implemented instrument calibration and validation SOPS for GMP/GLP compliance, conforming to ISO 13485.
- Implementation of a scientific data management system to database and back-up analytical results collected on a department wide basis.
- Supervise one direct report, to include the training and mentoring in application and theory of NMR spectroscopy as well as FTIR and HPLC chemical concepts.

Postdoctoral Fellow
University of Nebraska Medical Center - Omaha, NE October 1997 - March 2000
Research Advisor: Dr. William Gmeiner

Application of single and multi-dimensional NMR techniques for the structural and dynamical characterization of Proteins and DNA.
- Expressed and purified proteins in *E coli.* using liquid chromatography techniques.
- Collected multi-dimensional NMR spectra obtaining structural information for proteins and DNA.
- Analyzed NMR data using a variety of processing and molecular modeling software.
- Developed a novel 2-dimensional NMR technique for measuring protein and DNA diffusion to be utilized in ligand binding studies.
- Responsible for maintenance and repair of NMR spectrometers and probes.

Ph.D. and M.Sc. Research
University of California - Santa Barbara, CA September 1992 - April 1995
Westfälische Wilhelms-Universität - April 1995 - November 1996
Institut für Physikalische Chemie, Münster, Germany
Ph.D. Supervisor: Prof. Hellmut Eckert

Research Thesis: The Application and Development of Single and Double Resonance Solid State NMR Techniques for the Characterization of Inorganic Materials Including Glasses, Mesopores, and Zeolites.
- Synthesized and characterized air sensitive semi-conductors and chalcogenide glasses.
- Utilized TGA, DSC, and X-ray powder diffraction in addition to solid state NMR for characterization of novel materials.
- Applied existing multinuclear solid state NMR experiments to non-traditional systems.
- Maintained and scheduled use of NMR spectrometers.

Teaching Assistant
Department of Chemistry September 1990 - April 1995
University of California - Santa Barbara, CA November 1996 - October 1997

Taught General Chemistry and upper division Analytical Chemistry laboratory courses.

- Prepared and presented weekly lectures and quizzes and instructed in laboratory techniques.
- Responsible for maintenance and instruction in the use of DSC, TGA, IR, AA, Ion Chromatography, Spectrophotometer, and Sold State NMR Spectrometer.
- Evaluated student course work and assigned final grades.

Teaching Assistant
Westfälische Wilhelms-Universität - April 1995 - November 1996
Institut für Physikalische Chemie, Münster, Germany

Supervised upper division physical chemistry laboratories.

- Mentored students in solving physical chemistry problems.
- Instructed students in theory and use of Solid State NMR Spectrometer for the study of glass compositions.
- Assigned final course grades.

B.Sc. Studies
Northern Arizona University - Flagstaff, AZ September 1988 - May 1990
Research Advisor: Prof. Robert Zoellner.
Undergraduate research topic: Metal Vapor Synthesis.

EXPERT WITNESS – HEMP/CANNABIS CHEMISTRY AND ANALYTICS
Warren County Ohio – March 2018
Successfully argued for the distinction between THC from cannabis vs industrial hemp. All charges dropped for four defendants.

UNITED STATES PHARMACOPEIA (USP) – CANNABIS EXPERT COMMMITTEE
August 2016 – Present
Working towards the development of standardized methods for quality assessment of cannabis and related consumer products

HONORS, AWARDS and PROFESSIONAL AFFILIATIONS
Member – American Chemical Society
Member – AOAC, AOCS
Global Cannabis Times – Top 3 most influential cannabis scientists - 2023
Cannabis Scientists "Power List" – 2020, 2021, and 2022
Outstanding Paper Award, 2021 – *Agrosystems, Geosciences & Environment*
NIH CRTP Training Grant/Fellowship recipient - 1998 and 1999

PATENTS
US 62/643,668 – Application March 15th, 2018
Discrete Extract Collection System for CO_2-Based Fluid Extraction

US 9,733,222 – August 15th, 2017
Rapid Analysis of Steroids and Steroid Derivatives

US 2016/0136544 – May 19th, 2016
Methodology for Scaling Methods Between Supercritical Fluid Chromatography Systems

PUBLICATIONS

"We Believe in Unicorns (and Delta-8)", C.J. Hudalla, the Cannabis Scientist, Feature Article, November, 2021.

"Quantitative Trait Loci Controlling Agronomic and Biochemical Traits in *Cannabis sativa*", P. Woods, B.J. Campbell, T.J. Nicodemus, E.B. Cahoon, J.L. Mullen, C.J. Hudalla, and J.K. McKay, J. Genetics, Submitted February, 2021.

"Cannabis Inflorescence of Medical Purposes: USP Considerations for Quality Attributes", N.D. Sarma, A. Waye, M.A. ElSohly, P.N. Brown, S. Elzinga, H.E. Johnson, R.J. Marles, J.E. Melanson, E. Russo, L. Deyton, C. Hudalla, G.A. Vrdoljak, J.H. Wurzer, I.A. Khan, N.C.Kim, and G.I Giancaspro, J. Natural Products, April 13th, 2020.

"Cannabinoid, Terpene, and Heavy Metal Analysis of 29 Over the Counter Commercial Veterinary Hemp Supplements", Wakshlag, J.J., Cital, S., Eaton, S.J., Prussin, R., and Hudalla, C.J., Veterinary Medicine: Research and Reports, 2020:11.

"Genotype-by-Environment Interactions of Industrial Hemp (Cannabis sativa, L.) Varieties Highlight Diverse Responses to Environmental Factors", Campbell, B.J., Berrada, A.Y., Hudalla, C.J., Amaducci, S., McKay, J.K., Agrosystems, Geosciences & Environment, July 11th, 2019.

"Determination of Pesticide and Mycotoxin Residues in Dried Cannabis Flower: LC-MS/MS and GC-MS/MS Methodology to Meet the Recommended AOAC Regulatory Requirements of US States and Canada", K. Tran, M. Young, K. Organtini, M. Twohig and C. Hudalla, Waters Application Note, February, 2019.

"Metagenomic Analysis of Medicinal Cannabis Samples; Pathogenic Bacteria, Toxigenic Fungi, and Beneficial Microbes Grow in culture-Based Yeast and Mold Tests", Kevin McKernan, Jessica Spangler, Yvonne Helbert, Ryan Lynch, Adrian Devitt-Lee, Lei Zhang, Wendell Orphe, Jason Warner, Theodore Foss, Christopher Hudalla, Matthew Silva, and Douglas Smith. F1000 Research, 2016, 5:2471.

"A Scaling Strategy in Supercritical Fluid Chromatography. I. Theory for Isocratic Systems", Abhijit Tarafder, Christopher J. Hudalla, Pamela Iraneta and Kenneth Fountain. J. Chrom. A., 2014, 1362, 278-293.

"A New Separation Tool for a Broad Range of Analytical Challenges", Christopher J. Hudalla and Patrick D. McDonald. Chromatography Today, August/November 2012, 18-20.

"UltraPerformance Convergence Chromatography (UPC^2): A New Separation Tool for a Broad Range of Analytical Challenges", Christopher J. Hudalla, Jeff Bieszki, Andrew Aubin, Michael Jones, Rui Chen and Kenneth Fountain. GIT Laboratory Journal (Cover Story), Volume 16, August 2012, 24-25.

"Basic Principles for Purification Using Supercritical Fluid Chromatography", Jo-Ann Jablonski, Steven Collier, Christopher J. Hudalla, Damian Morrison and Kenneth Fountain. LCGC - Chromatography, November 1, 2010.

"Overcoming Challenges in Carbohydrate Separations", Doug McCabe and Christopher J. Hudalla. Separation Science, 2010, 2, 2-7.

"Influence of Pressure on the Retention of Sugars in Hydrophilic Interaction Chromatography", Uwe Neue, Christopher J. Hudalla, and Pamela Iraneta. Journal of Separation Science, 2010, 33, 838-840.

"Development of an Accelerated Low pH Reversed-Phase Liquid Chromatography Column Stability Test", Brian C. Trammell, Cheryl A. Boissel, Christina Carignan, Daniel J. O'Shea, Christopher J. Hudalla, Pamela C. Iraneta and Uwe D. Neue. Journal of Chromatography A, 2004, 1060, 153-163.

"Synthesis and Surface Chemistry of Spherical Mesoporous Organic-Inorganic Hybrid Particles with an Integrated Alcohol Functionality on the Pore Surface". J. Ding, C. Hudalla, J. Cook, D. Walsh, C. Boissel, P. Iraneta, and J. O'Gara. Chemistry of Materials, 2004, 16, 670-681.

"Characterization and Evaluation of C_{18} HPLC Stationary Phases Based on Ethyl-Bridged Hybrid Organic/Inorganic Particles", K. Wyndham, J. O'Gara, T. Walter, K. Glose, N. Lawrence, B. Alden, G. Izzo, C. Hudalla, and P. Iraneta. Analytical Chemistry, 2003, 75, 6781-6788.

"Characterization of highly spherical porous hybrid organic/inorganic particles", K. Wyndham, J. O'Gara, T. Walter, K. Glose, N. Arpin, C. Hudalla, Y. Xu, and G. Izzo. Polymeric Materials Science and Engineering, 2002, Volume: 87, Page: 275-276.

"Effects of fundamental properties of high performance liquid chromatographic packing materials on column hydrophobicity and hydrophilic selectivity", Y. Xu, C. J. Hudalla, T. P. Brady, B. A. Alden, P. A. David, T. H. Walter. Abstracts of Papers of the American Chemical Society, 2001, Volume: 222, Page U87.

"Binding of ethidium to DNA measured using a 2D diffusion-modulated gradient COSY NMR experiment", W. H. Gmeiner, C. J. Hudalla, A. M. Soto, L. Marky. FEBS Lett., 2000, Volume: 465 , Number: 2,3 , Page: 148-152.

"Molecular Diffusion Measured Using ^{31}P NMR", C. Hudalla and W. H. Gmeiner. NMR Newsletter, 476, 9-10, 1998.

"Glass-Formation and Local Structure in the Ternary System P-Se-Al. Solid State NMR Studies", C. Hudalla, B. Weber, and H. Eckert. J. Noncryst. Solids, 224, 69-79, 1998.

"Synthesis and Structural Characterization of Mixed Aluminum-Gallium-Offretites", A. Wölker, C. Hudalla, H. Eckert, A. Auroux , M. L. Occelli. Solid State NMR, 9, 143-153, 1997.

"The Effects of Lattice Composition on the Physicochemical Properties of H-Offretite Crystals", M. L. Occelli, H. Eckert, C. Hudalla, A. Auroux, P. Ritz, P. S. Iyer, Microporous Materials, 10, 123-135, 1997.

"Structural Studies of $ZrV_{2-x}P_xO_7$ Solid Solutions Using ^{31}P-{^{51}V} and ^{51}V-{^{31}P} Rotational Echo Double Resonance NMR", C. Hudalla, H. Eckert, and R. Dupree. J. Phys. Chem, 100, 15986-15991, 1996.

"Acidic Properties of Gallosilicate Molecular Sieves with the Offretite Structure", M. L. Occelli, H. Eckert, C. Hudalla, A. Auroux, P. Ritz, and P. S. Iyer. Proceedings of the 11th International Zeolite Conference, Seoul, Korea, August 12-17, 1995.

"Solid State NMR Chemical Shifts of Chalcogenides and Pnictides", Hellmut Eckert, Kelly Moran, Deanna Franke, and Christopher J. Hudalla. NATO. ASI Series C, "the Calculation of NMR Shielding Constants and their use in the Determination of the Geometric and Electronic Structures of Molecules and Solids", 386, Kluwer Academic Publishers, 1993.

"Spectral Editing in MAS-NMR of Aprotic Solids. ^{31}P-^{113}Cd Cross-Polarization and Heteronuclear Double Quantum Filtering Studies in II-IV-V_2 Semiconductor Alloys", Deanna Franke, Christopher J. Hudalla, and Hellmut Eckert. Solid State NMR, 1, 297-306, 1992.

"^{31}P-^{113}Cd and ^{31}P-^{29}Si CP/MAS-NMR in Inorganic Semiconductors", Deanna Franke, Christopher J. Hudalla, Robert Maxwell, and Hellmut Eckert. J. Phys. Chem., 96(19), 7506-7509, 1992.

"Heteronuclear X-Y Double Quantum MAS-NMR in Crystalline Inorganic Solids. Applications for Indirect Detection and Spectral Editing of Rare-Spin Resonances", Deanna Franke, Christopher J. Hudalla, and Hellmut Eckert. Solid State NMR, 1(1), 33-40, 1992.

PRESENTATIONS

Christopher J. Hudalla, Andrew Aubin and Jason Dunne, "The Art of Potency Plumping". Cannabis Science Conference East, Providence, RI, September 22nd, 2023.

Christopher J. Hudalla, Chris Riley, Malcolm Boyce and William Lanier, "LCMS Analysis of Phospholipids for the Degumming Optimization for Hemp/Cannabis Extracts". Cannabis Science Conference East, Providence, RI, September 22nd, 2023.

Christopher J. Hudalla, "The Dirt on Delta 8-THC; The Reality of Unchecked Chemistry". AOAC Midwest Meeting, Madison, WI, June 14th, 2023.

Christopher J. Hudalla, Lezli Engelking and Lisa Ramsey, "Cannabis, Hemp and Delta-8". Central Atlantic States Association Conference [CASA], Pittsburgh, PA, May 3rd, 2023.

Christopher J. Hudalla, Andrew Aubin, Chris Riley, Malcolm Boyce and William Lanier, "LCMS Analysis of Phospholipids for the Degumming Optimization for Hemp/Cannabis Extracts". AOCS Conference, Denver, CO, May 1st, 2023.

Christopher J. Hudalla, Heather Krug, Nicole Leja, and Patrick Bird, "Integrated Risk Management Strategies and Data Analysis to Reduce Microbial Product Failure Rates". Panel - Cannabis Science Conference, Portland, OR, April 20th, 2023.

Christopher J. Hudalla, Asa Waldstein, Marielle Weintraub, Jackie Bowen, and Holly Bell, "Certifications, COAs, Compliance & Claims". Panel – NoCo Hemp Conference, Colorado Springs, CO, March 29th, 2023.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Keeping up With Changing Landscapes". Morehouse School of Medicine – Virtual Lecture, March 18th, 2023.

Christopher J. Hudalla and Lezli Engelking, "Changing Potency Landscapes: The Emergence of Synthetic Cannabinoids". Louisiana Sanitarian Conference, Baton Rouge, LA, March 15th, 2023.

Christopher J. Hudalla, Josh Wurzer, Andrew Pardo and Shayda Torabi. "The Future of Chemically Derived Cannabinoids". Panel: South by Southwest [SXSW] – Austin, TX, March 12th, 2023.

Christopher J. Hudalla – Opening Introduction. Emerald Conference, San Diego, CA, March 1sh, 2023.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Consumer Safety vs Regulatory Requirements". ASTM/USP Workshop on Cannabis Product Quality – Virtual Meeting, December 8th, 2022.

Christopher J. Hudalla, Andrew Aubin, Jason Dunne, Chris Riley and Marian Twohig, "Changing Potency Landscapes: Emergence of Synthetic Cannabinoids". Analytical Cannabis Webinar, October 13th, 2022.

Christopher J. Hudalla, Andrew Aubin, Jason Dunne, Chris Riley and Marian Twohig, "Hemp Derivatives and Isomers: Exploitation of an Unintended Loophole". Cannabis Science Conference - East, Baltimore, MD, September 15th, 2022.

Christopher J. Hudalla, Lezli Engelking, Marielle Weintraub, Brett Goldman and Steve Bevan, "Hemp Derivatives and Isomers: Exploitation of an Unintended Loophole". Association of Food and Drug Officials (AFDO) Conference, Phoenix, AZ, June 14th, 2022.

Christopher J. Hudalla, "Hemp Derivatives and Isomers: Exploitation of an Unintended Loophole". Southeastern Hemp and Medical Cannabis Conference (SHMC), Atlanta, GA, May 14th, 2022.

Christopher J. Hudalla, "Hemp Derivatives and Isomers: Exploitation of an Unintended Loophole". American Chemical Society Meeting, San Diego, CA, March 23rd, 2022.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Quality Assurance Documented Through Quality Analytical Testing", Cannabis Science & Industry Congress, San Jose, Costa Rica, January 27-29, 2022.

Christopher J. Hudalla, "The Rise of Delta-8: Current Concerns vs Future Optimism". MJ Biz Conference, Science Symposium, Las Vegas, NV, October 19th, 2021.

Christopher J. Hudalla, "Analytical Testing to Ensure Cannabis Quality and Safety: The Good, The Bad & The Ugly". Cannabis Science and Technology Webinar, September 14th, 2021.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Keeping up with emerging contaminants during COVID-19". AOAC Annual Meeting & Exposition, Boston, MA, September 1st, 2021.

Christopher J. Hudalla, "Latest Breakthroughs, Best Practices, Latest Trends", invited panelists, International Hemp Summit, Virtual Meeting, July 22nd, 2021.

Christopher J. Hudalla, "Analytical Testing for the Hemp Industry: Quality Assurance Documented Through Quality Analytical Testing", University of Tennessee Hemp Products & Animal Health Conference, Knoxville, TN, May 18-19, 2021.

Christopher J. Hudalla, James Roush, Chris Riley, and Jarec Rondeau "Analytical Testing for the Cannabis Industry: Ensuring Consumer Safety in a Rapidly Changing Environment". Eastern Analytical Symposium (EAS), Virtual Meeting, November 16-19, 2020.

Christopher J. Hudalla, Alena Rodriguez and Andrew Hall "How to Find Your Next Lab Testing Facility". National Cannabis Industry Association (NCIA), Virtual Meeting, November 12, 2020.

Christopher J. Hudalla, "Rumpelstiltskin's Modern Day Fairytale: The Allure and Hazards of Delta-8-THC". The Analytical Cannabis Expo, Virtual Meeting, October 6th, 2020.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Keeping up with Emerging Contaminants". United Scientific Group – Online Meeting on Medical Cannabis, Virtual Meeting, June 9th, 2020.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Keeping up with Emerging Contaminants". Waters Virtual ASMS Program, Virtual Meeting, May 28th, 2020.

Christopher J. Hudalla, "Cutting Through the Haze of Vaping: A Townhall on Vaping Products and Inhalants". Discussion Leader: AOAC Meeting 2020, Gaithersburg, MD, March 11th, 2020.

Christopher J. Hudalla, James Roush, and Marian Twohig, "Analytical Testing for the Cannabis Industry: Keeping Up with a Rapidly Changing Technological Environment". Invited Speaker: Pittcon 2020, Chicago, IL, March 4th, 2020.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: The Importance of Testing and Safety". Invited Speaker: Industrial Hemp Summit, Danville, VA, February 22nd, 2020.

Kim Tran, Marian Twohig, Kari Organtini, Michael S. Young, Naren Meruva, Kenneth Rosnack, Sarah Dowd, Rebecca Stevens, James Roush, Christopher Hudalla, "Determination of Pesticides and Mycotoxins in Cannabis using a Simple Extraction Procedure with dSPE cleanup and LC-MS/MS". Poster Presentation: ASMS, Atlanta, GA, June 2nd-6th, 2019.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Navigating a Complex Road Map". Keynote Speaker: American Chemical Society - NSCRC, Boston, MA, May 4th, 2019.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: From Chaos to Standards". Presentation: National Clinical Conference on Cannabis Therapeutics, Tampa, Florida, April 13th, 2019.

Christopher J. Hudalla, "Variability in Cannabis Testing: Intra- and Inter-Laboratory Discrepancies in Test Results". Presentation: Analytical Cannabis Expo, San Francisco, CA, April 3rd, 2019.

Christopher J. Hudalla, "Solvent Free, Safer, Greener extraction of Medicinal Cannabis: Analysis and Preparation of Cannabis-Based Natural Therapeutics". Presentation: Australian Medical Cannabis Conference, Melbourne, Australia, March 26th, 2019.

Christopher J. Hudalla and Rebecca Stevens, "Cannabis as Plant and as Medicine: Basics and Current Challenges for a Growing Industry". Presentation: Rhode Island Judicial Conference, Bristol, RI, March 15th, 2019.

Christopher J. Hudalla, "Cannabis Cultivation, Extraction and Processing: Optimization and Innovation". Session Chair: Emerald Conference, San Diego, CA, March 1st, 2019.

Christopher J. Hudalla, "Analytical Testing for the Hemp Industry: Monitoring Cultivation, Extraction and Processing". Presentation: US Hemp Expo, Rochester, MN, Feb. 25th, 2019.

Christopher J. Hudalla, "Analytical Testing for the Hemp Industry: Quality Assurance Documented Through Quality Analytical Testing". Presentation: Southern Hemp Expo, Myrtle Beach, SC, Nov. 26th, 2018.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Challenges in Testing". Presentation: MJ Biz Conference, Las Vegas, NV, Nov. 13th, 2018.

Christopher J. Hudalla, "Heavy Metal Contaminants in Cannabis: Regulation to Remediation". Presentation: American Chemical Society Meeting, Boston, MA, August 20th, 2018.

Christopher J. Hudalla, "Analytical Testing for the Hemp Industry: Quality Assurance Documented Through Quality Analytical Testing". Presentation: Pacific Rim Hemp Conference, Vancouver, Canada, July 19th, 2018.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Consumer Safety vs Regulatory Requirements". Presentation: Mid-America Cannabis Conference, Oklahoma City, OK, June 2nd, 2018.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Quality Assurance Documented Through Quality Analytical Testing". Presentation: MediGrow Cannabis Conference, Maseru, Lesotho, March 13th, 2018.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Consumer Safety vs. Regulatory Requirements". Keynote Lecture: Isranalytica 2018, Tel Aviv, Israel, January 24th, 2018.

Christopher J. Hudalla and John MacKay, "Practical Innovations in the Science of Cannabis". Invited Oral Presentation: Cannabis Business Executive Convention (CBEC), Boston, MA, September 12th, 2017.

Christopher J. Hudalla, "Cannabis: Impurities and Quality Control". Invited Oral Presentation: Cannabis World Congress and Business Exposition (CWCBE), New York, NY, June 15th, 2017.

Christopher J. Hudalla, "Cannabis Chemistry: Analytical Testing, Contaminants and Regulatory Requirements". Invited Oral Presentation: United Patients Group Summit, Baltimore, MD, June 3rd, 2017.

Christopher J. Hudalla, "Cannabis Contaminants: Practical Considerations vs. Regulatory Requirements". Invited Oral Presentation: AOCS Annual Meeting, Orlando, FL, May 1st, 2017.

Christopher J. Hudalla, "Cannabis Contaminants: Practical Considerations vs. Regulatory Requirements". Oral Presentation: CannMed Cannabinoid Medicine Conference, Cambridge MA, April 11th, 2017.

Christopher J. Hudalla, "Applications of Supercritical Fluid Technologies for the Analysis, Extraction and Isolation of Cannabinoids for Cannabis-Based Therapeutics". Invited Oral Presentation: American Chemical Society Meeting, San Francisco, CA, April 4th, 2017.

Christopher J. Hudalla, "Cannabis Contaminants: Practical Considerations vs Regulatory Requirements". Invited Oral Presentation: Emerald Conference, San Diego, CA, February 3rd, 2017.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Consumer Safety vs. Regulatory Requirements". Invited Oral Presentation: Eastern Analytical Symposium (EAS), Somerset, NJ, November 16th, 2016.

Christopher J. Hudalla, "Cannabis Explosion: Overview of Current Analytical Methods Employed in Cannabis Testing". Invited Oral Presentation: Shimadzu Workshop, Northeastern Association of Forensic Scientists (NEAFS), Atlantic City, NJ, October 12th, 2016.

Christopher J. Hudalla, "Heavy Metal Contaminants in Cannabis: Regulation to Remediation". Invited Oral Presentation: Cannabis Science Conference (CannCon), Portland, OR, October 6th, 2016.

Christopher J. Hudalla, "Overview of Current Methods Employed in Cannabis Testing". Invited Oral Presentation: International Association for Food Protection (IAFP), St. Louis, MO, August 3rd, 2016.

Christopher J. Hudalla, "Testing: Better Medicine/Better Living" and "R&D and Extraction: Assuring Quality in Cannabis Production". Invited Oral Presentations: MedCann.Biz Meeting, San Juan, Puerto Rico, June 28th - 29th, 2016.

Christopher J. Hudalla, "Using Supercritical Fluids for the Extraction, Analysis and Purification of Cannabis/Hemp-Based Natural Therapeutics". Invited Oral Presentation: European Industrial Hemp Association (EIHA), Wesseling, Germany, June 2nd, 2016.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Consumer Safety vs. Regulatory Requirements". Invited Oral Presentation: ASA Unity Conference, Washington D.C., March 19th, 2016.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Consumer Safety vs. Regulatory Requirements". Invited Oral Presentation: American Chemical Society Meeting, San Diego, CA, March 4th, 2016.

Christopher J. Hudalla, "Utilizing SFE and SFC for Extraction and Isolation of Cannabinoids". Invited Oral Presentation: Pittcon 2016, Atlanta, GA, March 4th, 2016.

Christopher J. Hudalla, "Development of an SFX Workflow for the Analysis and Preparation of Cannabis-Based Natural Therapeutics". Invited Oral Presentation: EU Symposium on Supercritical Fluid Technologies, Prague, Czech Republic, December 4th, 2015.

Christopher J. Hudalla, "Applications of Supercritical CO_2 for the Analysis and Preparation of Cannabis as a Natural Therapeutic". Session Chair: Eastern Analytical Symposium (EAS), Somerset, NJ, November 18th, 2015.

Christopher J. Hudalla, "Development of an SFX Workflow for the Analysis and Preparation of Cannabis Based, Natural Therapeutics". Invited Oral Presentation: American Herbal Products Association (AHPA) Botanical Congress, Las Vegas, NV, October 9th, 2015.

Christopher J. Hudalla, "Development of an SFX Workflow for the Analysis and Preparation of Cannabis Based, Natural Therapeutics". Invited Oral Presentation: 9th International Conference on Packed Column SFC, Philadelphia, PA, July 22nd, 2015.

Christopher J. Hudalla, "Application of Supercritical Fluid Technologies to the Analysis, Extraction and Purification of Cannabinoids". Invited Oral Presentation: Waters Global SFC and Related Technologies User Meeting, Philadelphia, PA, July 21st, 2015.

Christopher J. Hudalla, "Chromatographic Methodologies: An Integral Component of the Budding Cannabis Industry". Webinar Presentation: LCGC Webinar Series, June 12th, 2015.

Christopher J. Hudalla, "Cannabis Chemistry 201". Webinar Presentation: American Chemical Society Webinar Series, November 6th, 2014.

Christopher J. Hudalla, "Supercritical CO_2 Meets Cannabis: New Tools for a Budding Industry". Oral Presentation: Boston Areas SFC User's Meeting, Cambridge, MA, September 25th, 2014.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: A New Era Presents New Opportunities. Oral Presentation: International Pharmacological Academy: Marihuana for Medical Purposes (IPA-MMP), Toronto, Canada, September 16th, 2014.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Application of UltraPerformance Convergence Chromatography". Oral Presentation: Conference on Small Molecule Science (CoSMoS), Williamsburg, VA, August 12th, 2014.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry: Application of UltraPerformance Convergence Chromatography (UPC^2)". Poster Presentation: Conference on High Pressure Liquid Chromatography (HPLC), New Orleans, LA, May 14th, 2014.

Christopher J. Hudalla, "Cannabis Chemistry 101". Webinar Presentation: American Chemical Society Webinar Series, May 1st, 2014.

Christopher J. Hudalla, "Analytical Testing for the Cannabis Industry". Oral Presentation: Northeastern CannaBusiness Symposium, Boston, MA, March 15th, 2014.

Christopher J. Hudalla, "Development of a Strategy to Transfer SFC Methods from Analytical to Preparative Scale". Oral Presentation: Eastern Analytical Symposium, Somerset, NJ, August 18th, 2013.

Christopher J. Hudalla, "Applications of Convergence Chromatography for Clinical Research". Oral Presentation: Clinical Research Symposium, Neuroscience Center of Excellence, School of Medicine Louisiana State University Health Science Center, New Orleans, LA, August 14 , 2013.

Christopher J. Hudalla, "Novel Applications of UltraPerformance Convergence Chromatography (UPC^2)". Oral Presentation: 7th International Conference on Packed Column SFC, Boston, MA, July 12 , 2013.

Christopher J. Hudalla, Andrew Peck, Stuart Chadwick, Fiona Liddicoat, and Kenneth J. Fountain, "Rapid Analysis of Endogenous Steroids for Clinical Research using UPC^2 MS/MS". Poster: American Society of Mass Spectrometry (ASMS) meeting, Minneapolis, MN, June , 2013.

Hudalla, Andrew Peck, Stuart Chadwick, Fiona Liddicoat, and Kenneth J. Fountain, "Rapid Analysis of Endogenous Steroids for Clinical Research using UPC^2 MS/MS". Poster: Mass Spec for Applied Clinical Laboratories (MSACL) meeting, San Diego, CA, February , 2013.

Manisha A. Patel, Christopher J. Hudalla, Mark A. Hardink, Frank W. Riley, Loren Wrisely, and Mehdi Ashraf-Khorassani, "Separation of Ten Ionic Sulfated Estrogens by Packed Column Supercritical Fluid Chromatography". Oral Presentation: Eastern Analytical Symposium (EAS), Somerset, NJ, November, 2012.

Christopher J. Hudalla, Jacob N. Fairchild, Kenneth J. Fountain, Jason F. Hill, Pamela C. Iraneta and Kaori Taguchi, "Evaluation of Sub-2µm Silica and Hybrid Particles for Ultra Performance SFC (UPSFC) Applications". Oral Presentation: Eastern Analytical Symposium (EAS), Somerset, NJ, November, 2011.

Christopher J. Hudalla, Daryl Brousmiche, Stephen Collier, Jacob Fairchild, Kenneth Fountain, Jason Hill, Pamela Iraneta, and Jo-Ann Jablonski, "Evaluation of Sub-2µm Silica and Hybrid Particles for SFC Applications". Poster: HPLC Conference, Budapest, Hungary, June 20-23, 2011.

Jo-Ann Jablonski, Christopher J. Hudalla, Kenneth Fountain, Steven Collier and Damian Morrison, "Optimizing Chromatographic Media using Supercritical Fluid Chromatography for Preparative Applications". Poster: HPLC Conference, Budapest, Hungary, June 20-23, 2011.

Christopher J. Hudalla, Daryl Brousmiche, Stephen Collier, Jacob Fairchild, Kenneth Fountain, Jason Hill, Pamela Iraneta, and Jo-Ann Jablonski, "Evaluation of Sub-2µm Silica and Hybrid Particles for SFC Applications". Poster: SFC Conference, New York, New York, July 20-22, 2011.

Christopher J. Hudalla, Pamela Iraneta, Paul Smith, Dan Walsh, and Kevin Wyndham, "Chromatographic Analysis of Natural Sweeteners: UPLC Applications for the Analysis of Food & Beverage Products". Invited oral presentation, American Chemical Society Meeting, Anaheim, CA, March 30th, 2011.

Jo-Ann M. Jablonski, Christopher J. Hudalla, Kenneth J. Fountain, Steven M. Collier, and Damian Morrison, "Optimizing Chromatographic Media and Separation Conditions Using Supercritical Fluid Chromatography". Poster: Pittcon Conference, Atlanta, GA, March 13-18, 2011.

Christopher J. Hudalla, "Chromatographic Analysis of Carbohydrates: How Sweet It Is!!" Invited seminar at Willamette University, Salem, Oregon, November 8th, 2010

Christopher J. Hudalla, Cheryl Boissel, Pamela Iraneta, Dan Walsh, and Kevin Wyndham, "Methods of Identification of Adulterated Food Products Based on Carbohydrate Profiles by UPLC". Poster: American Chemical Society Meeting, Boston, MA, August 22-26, 2010.

Christopher J. Hudalla, Jim Cook, Mike Dion, Pamela Iraneta, Paul Smith, Dan Walsh, and Kevin Wyndham, "UPLC Analysis of Carbohydrates: Applications for Saccharide Analysis in Food & Beverage Products and Pharmaceutical Excipients". Poster: AOAC Meeting, Philadelphia, PA, September 13-16, 2009.

Christopher J. Hudalla, Jim Cook, Mike Dion, Kenneth Fountain, Pamela Iraneta, Paul Smith, Daniel Walsh, and Kevin Wyndham, "UPLC Analysis of Carbohydrates: Applications for Saccharide Analysis in Food & Beverage Products using ELS or MS Detection". Poster: HPLC Conference, Dresden, Germany, June 28-July 2, 2009.

Christopher J. Hudalla, Cheryl Boissel, Tom Buckley, Jim Cook, Pam Iraneta, Dan Walsh, and Kevin Wyndham, "Development of UPLC Columns and Methods for Carbohydrates: Applications to Saccharide Analysis", Poster: Pittcon 2009 Conference, Chicago, IL, March 8-13, 2009.

Christopher J. Hudalla, "Evaluation of Animal Feeds: Carbohydrate Analysis on BEH Amide Prototypes" Invited talk: Meeting of the American Association of Feed Control Officials (AAFCO), Tucson, AZ, January 21st, 2009.

Christopher J. Hudalla, Cheryl Boissel, Tom Buckley, Jim Cook, Pam Iraneta, Dan Walsh, and Kevin Wyndham, "Development of UPLC Columns and Methods for Carbohydrates: Applications to Saccharide Analysis". Poster: AOAC Meeting, Dallas, TX, September 21-24, 2008.

Christopher J. Hudalla. "Automation techniques in Solid State NMR", Invited speaker: Bruker NMR Users Meeting, Chelmsford, MA, October 12, 2001.

Christopher J. Hudalla. "^{29}Si CPMAS is Not Fun, But Automation Makes it Bearable; Solid State NMR Investigations of Chromatographic Materials", Invited speaker: Bruker Symposium on Solid State NMR, Denver, CO, July 29, 2001.

Christopher J. Hudalla, J. William Lown, and William Gmeiner. "Specific Binding of Lexitropsins to Okazaki Fragments Studies by PFG NMR". Poster: The Eleventh Conversation in the Discipline Biomolecular Stereodynamics, Albany, NY, June 15-19, 1999.

Christopher J. Hudalla and William Gmeiner. "Temperature Dependent Diffusion Characteristics of Okazaki Fragments Studied by ^{1}H and ^{31}P NMR", UNMC research symposium, June 1999.

Christopher J. Hudalla. "NMR Studies of Hck Activation via Inter- and Intra-molecular Interactions", Invited speaker: St. John's University, Collegeville, MN, March 24, 1999.

Christopher J. Hudalla, Shawn Alderman, Thomas Smithgall, and William Gmeiner. "^{19}F NMR Studies of the Intermolecular Interaction Between Hck [SH32L] and the HIV-1 Protein, Nef.". Poster: Experimental NMR Conference, Orlando, FL, March 3, 1999.

Christopher J. Hudalla, Thomas Smithgall, and William Gmeiner. "^{19}F NMR Studies of the Intramolecular Interactions of SH3 and L2k in Hck [SH32L]". Poster: Keystone Symposium on Frontiers of NMR in Molecular Biology VI, Breckenridge, Colorado, January 9-15, 1999.

Christopher J. Hudalla, Thomas Smithgall, and William Gmeiner. "NMR Structures of Intramolecularly Complexed Hck SH3". Poster: Experimental NMR Conference, Asilomar, California, March 22-27, 1998.

Christopher J. Hudalla and Hellmut Eckert. "The Application of Heteronuclear Double Resonance NMR Techniques for Structural Studies of Solid State Inorganic Materials". Invited speaker: University of Nijmegen, Nijmegen, Netherlands, Nov. 18, 1996.

LEGAL ACTIVITIES

Plaintiff: State of Ohio
Defendant: Marcus Vickers
Akron, OH
Case No. CR-2020-03-0806 and CR-2020-08-2036
Case Description: Illegal possession and distribution of a controlled substance
Participation: Activities for Plaintiff, including analysis of confiscated marijuana products, and preparation for potential expert witness testimony.
Case status: Case ended as defendant pled out.

Plaintiff: Kentucky Hemp Association
Defendants: Quarles and Burnett (Kentucky Department of Agriculture)
Burlington, KY
Boone Circuit Court: Civil Action No. 21-CI-836
Case Description: Status of Delta-8-THC, Should it be regulated as hemp?
Participation: Activities for Defendants, including consulting, review of test records, review opposing export witness credentials
Deposition for Plaintiff 11/29/2021
Trial 12/16/2021
Case status: Inactive

Plaintiff: State of Ohio
Defendants: Suzanne Billings, Scott Siegel and Timothy Cavinder
Warren County, Ohio
Case No. 16CR032398
Case Description: Trafficking in Hashish
Participation: Activities for Defendants, including consulting, review of test records, review of crime lab data
Case status: Trial 3/26/2018

Plaintiff: A1 Wholesalers, Inc.
Defendant: Golden Global Goods, Inc. d/b/a Rocky Mountain Soda Company
District Court, county of Denver, State of Colorado
Case No. 20CV31555
Case Description: Product manufacturing dispute
Participation: Activities for Plaintiff, including consulting, review of deposition, deposition 4/8/2021
Case status: Case settled before trial

American Arbitration Association
Claimant: Centuria Natural Foods
Respondent: Hopes Extract Corporation of America (HECA)
Los Angeles, California
Case No. 01-18-0000-31110
Case Description: Product manufacturing dispute
Participation: Activities for Respondent, including consulting, review of depositions, review of analytical test results, arbitration expert witness: 11/14/2018
Case status: Inactive

United States Patent and Trademark Office
Opposer: Canna-Pet, LLC
Applicant: Canna Companion, LLC
Opposition Number: 91221217
Case Description: Federal Trademark Case
Participation: Activities for opposer, including consulting, review of expert witness statements, provide expert witness report
Case status: Inactive

US Navy Military Separation Board
Defendant: Name withheld
Case Description: Service member tested positive for THC after use of hemp products with CBD

Participation: Activities for defendant, including telephonic testimony regarding hemp products 11/13/2017
Case status: Inactive

Plaintiff: Michael Davis
Defendant: CBD American Shaman, LLC
United States District Court for the Southern District of Florida
Case No. 0:20-cv-60897
Case Description: Product quality dispute
Participation: Activities for Defendant, including review laboratory test results
Case status: Inactive

Plaintiff: Orochem Technologies, Inc.
Defendant: Whole Hemp Company, LLC
United States District Court for the Northern District of Illinois
Case No. 1:17-cv-6983
Participation: Activities for Plaintiff, including subpoena for communications
Case status: Inactive

Plaintiff: Key Compounds LLC and Alexander Reyter
Defendant: Phasex Corporation and Hans Schonemann
United States District Court for the District of Oregon – Eugene Division
Case No. 6:20-cv-680
Participation: Activities for Defendant, including provided laboratory testing of products disputed
Case status: Inactive

Plaintiff: State of Ohio, Warren County
Defendants: Kasie Lyn Baker, John Widmyer, and Brian Jankovich
State of Ohio, Warren County Common Pleas Court
Case No. 16CR32394
Participation: Activities for Defendants, including March 2018 provided laboratory testing of confiscated products, reviewed crime lab analytical data, provided summary report
Case status: Inactive

Plaintiff: State of Ohio, Warren County
Defendant: David DeLeon
State of Ohio, Warren County Common Pleas Court
Case No. 18CR34910
Participation: Activities for Defendants, including provided laboratory testing of confiscated products, reviewed crime lab analytical data, provided summary report
Case status: Inactive

Submitting Agency: Bergen County Prosecutor's Office
Defendants: William Stayback
New Jersey State Police Office of Forensic Sciences
Case No. BCP1800706
Participation: Activities for Defendant, including provided review and report of analytical data generated by state police forensics laboratory
Case status: Inactive

Plaintiff: Commonwealth of Massachusetts
Defendant: David Njuguna
Charges: Manslaughter regarding auto accident after marijuana consumption
Worchester Superior Court
Case No.1685CR00167
Participation: Activities for the court, including provided laboratory testing certificates as part of court case
Case status: Inactive