



PittCon 2023's Vaping Symposium Confirms the Cannabis Industry Still Has Safety Concerns About Vaping Devices

Article

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I was an invited speaker at a recent cannabis vaping symposium being held at the 2023 Pittsburgh Conference in Philadelphia entitled Vaping – A Closer Look Behind the Smoke Screen. Dr. Eberhardt Kuhn from Shimadzu chaired the session and put together an impressive list of speakers covering many

of the most pressing safety issues facing the vaping industry today. The session, which was almost four hours long, was extremely well attended considering PittCon is an analytical chemistry conference and not a cannabis-focused event. However, it was clear by the many questions and vigorous discussions that the industry is not doing enough to alleviate consumers' concerns.

First I'll give an overview of the session, then I'll give more detailed information about each talk.

Summary of session

The first speaker (Dr. Michelle Peace) talked about how the legalization of cannabis in many states has led to significant regulatory gaps that have enabled the expansion of illicit markets where there are virtually no quality standards. As a result, these jurisdictions have seen a rise in products that are labeled improperly and often contain analogues synthesized from other cannabinoids.

My talk was next and focused on the challenges associated with measuring heavy metals in unused THC vape cartridges, and in particular the difficulties of getting a truly representative sample of such a viscous matrix where the metal particles aren't dispersed homogeneously in the liquid.

The next two speakers (Stephen Goldman and Dr. Kelly Greenwald) also talked about heavy metals, but they focused on the challenges of trying to capture and trap elemental contaminants in the aerosol generated by corrosion of the vape's metal components during the heating/vaping process. As they both work in cannabis testing labs, of particular interest to them was to develop a method to carry out this type of analysis in a routine, high throughput sampling environment.

The final speaker of the session (Jessica Alexander) highlighted a fascinating story about how two consumers got extremely sick from vaping a cannabis extract, which left a white residue on their lips. On further investigation, using high-performance liquid chromatography (HPLC) with photodiode array detection (PDA), they found out that the culprit compound was pine resin, which is used as an inexpensive diluent, but unfortunately can often be misidentified as THC itself. She also talked about how "garage chemists" were synthesizing compounds such as delta-8 THC from legal CBD products and selling on the unregulated, illicit market.

So, let's now take a closer look at each of the talks to get a more detailed understanding of the potential threats being posed by these vaping products.

Chair's opening remarks

Dr. Eberhardt Kuhn opened up the session with an overview of the talks. He highlighted the benefits of vaping, compared to regular smoking, including less smell, consistent doses, and ease of use. He went on to say that there are also some negative effects from vaping cannabis. Harmful ingredients found in vaping products include heavy metals, carcinogens, and micro particulates. These particulates, as well as certain flavorants and other adulterants can cause severe lung damage and disease. He went on to give the main highlights of each speakers' presentations by discussing the latest advances in analysis of vaping products and the composition of the released vapors. Furthermore, he added that a unique feature of this symposium was that the speakers represented "both sides of the law", from those that tested legal products to illegal products (forensic analysis). Specifically, the speakers covered hot topics like metal contamination from vaping devices, detection of adulteration of vapes with toxic chemicals, comparison of smoking vs vaping vs edibles, and forensic approaches to the identification of illegal cannabis vaping products.

The Regulatory Gaps in The Cannabis and E-Cigarette Industries and the Threats to Public Health and Public Safety

Dr. Michelle Peace, Virginia Commonwealth University, Richmond, VA

The legalization/decriminalization of cannabis state-by-state and the passage of the 2018 Farm Bill has led to significant national regulatory gaps that enable the expansion of gray and black markets where no quality assurance standards are required. These unregulated markets have facilitated the rise of products that are labeled improperly and inaccurately and promote the consumption of synthetic analogues. THC isomers and derivatives can be minor natural cannabinoid but are synthesized from CBD to produce high concentration products. Equally troubling is the incidence of microbiological contamination in unregulated products. The cannabis industry, entwined with the e-cigarette industry, is facilitating the discreet public consumption of drugs. The cannabis industry took advantage of the gaps in e-cigarette regulations to make products that precipitated severe lung injuries and deaths with unsafe products. This presentation addressed the variety of products sold without regulatory oversight and contain potentially dangerous substances, the state of regulations for the cannabis and e-cigarette industries, and the public health and public safety issues which are confusing consumers.

The Challenges of Measuring Elemental Contaminants in Cannabis Vaping Liquids and Aerosols

Robert Thomas, Scientific Solutions, Gaithersburg, MD

There has been a great deal of interest in monitoring heavy metals in electronic cannabis delivery systems (ECDS) since it was first reported that, at elevated vaping temperatures, many of these devices were corroding internal components (coils, atomizers, tanks, battery terminals, mouthpieces) made from a variety of metals such as stainless steel (iron, chromium, nickel, molybdenum), brass (copper, zinc), nichrome (nickel, chromium), kanthal (iron, aluminum, chromium) and solder (tin, lead). This presentation examined the fundamentals of vaping, including the process of converting a mixture of cannabinoids and diluent oils into an aerosol and, in particular, the challenges of monitoring elemental contaminants in the vaping liquid in the tank and whether they are transferred to the aerosol when the liquid is heated. In addition, it focused on the difficulties associated with trapping and collecting the aerosol generated from a mixture of cannabinoids and diluents that could be hydrophilic and/or hydrophobic liquids in nature and how best to validate the procedure using standardized test methods developed by the tobacco industry for electronic nicotine delivery systems (ENDS).

Testing of Vapor Emissions in Cannabis Products: Challenges in a High-Volume Testing Environment

Stephen Goldman, Kaycha Labs, Denver, CO

Medicinal and recreational use of cannabinoids from vaping devices is on the increase worldwide. While CBD (cannabidiol) delivery from vape devices is generally similar to the nicotine analogues in vape pens, THC (tetrahydrocannabinol) delivery presents some significant technical problems. A significant feature of THC vaping devices is that as the THC content increases, the viscosity of the oil increases. Before the safety or efficacy of the aerosol delivery of THC devices can be judged, it is necessary to develop well understood models for aerosol creation and delivery. In order to ensure aerosol delivery to any capture system, specific measures must be taken to volatilize the cannabis oil in a meaningful and

representative manner. Different systems were deployed, simple vaping, vaping cannabis oils with various levels of diluents and finally vaping with a preheating stage. Recovery rates onto a glass fiber pad of 90%+ could be achieved with deliveries of approximately two milligrams per puff routinely observed. However, when metals in aerosol are considered, the use of electrostatic precipitation was less successful with recovery rates of between 25% and 40% being achieved with some evidence correlating recovery with total cannabinoid content. A scheme was therefore proposed that mitigated the variable (high) viscosity of cannabis oils and also suggested an alternate trapping method specifically directed towards metals analysis.

Laboratory Developed Method For Heavy Metal Analysis of Vapor Generated by Cannabis Vaporizer

Dr. Kelly Greenland, Keystone State Testing Services, Harrisburg, PA

Inhalation of cannabis vapor is one of the fastest methods for dosing cannabis. However, much remains unknown about the content of the vapor being inhaled. **Cannabis is known to be a bio-remediator** of heavy metals. Additionally, poorly manufactured vaporizers can introduce metals. Keystone state testing has undertaken the objective of generating, analyzing, and quantifying heavy metals in cannabis vapor. This work presented the process developed to generate the cannabis vapor and subsequent extracting contaminants in the vapor, analysis, mathematical conversions for quantitation, and many of the obstacles encountered along the way that posed a unique hurdle to nationalized methods and accuracy of safety testing.

Identification of a Cannabis Extract Adulterant Using PDA Analysis

Jessica Alexander, Land & Seas Laboratory, Wasilla, AK

This presentation highlighted two customers who submitted samples of cannabis extracts to the same cannabis compliance testing laboratory for voluntary analysis. Both relayed the concern that they had consumed a dangerous tainted product based on their physical experiences after smoking the products. Both reported that smoking the concentrate left a white residue on their lips and made them feel sick. Searching for the culprit led to HPLC analyses of unintentional adulterants, such as neem oil, cannabinoid isomer byproducts, and other newly discovered cannabinoids, such as THC-O, as potential candidates. Eventually, the search ended after reading a blog regarding the use of pine sap added to the concentrates. Similar to vitamin E acetate, pine resin can be used as a diluent and thickening agent for cannabis extract oils because it is inexpensive and very accessible adulterant, which can also cause lung injury. But, unlike vitamin E acetate, pine resin can be misidentified as THC itself. Other cannabis chemists doing safety testing need to be informed about the use of pine resin and how to identify it using PDA analysis because of the significant motivation for disreputable producers to use pine resin as an adulterant and the danger it poses to consumers.

Jessica finished her talk with a fascinating account at what she called “garage chemistry”, the practice of converting legal CBD and other cannabinoid-based products into more psychoactive compounds such as delta-8 THC and THC-O acetate, which are highly prized within the illicit marketplace. These products are manufactured by “garage chemists” using solvents, mineral acids, and metal-based catalysts to produce cheap, unregulated compounds to sell on “shady” websites or in hemp/CBD/vape stores with no concern for consumer safety. One site reportedly had over 6,000 subscribers. So who knows how many consultation clients there are learning how to synthesize these products with very little safety testing required.

Final thoughts

When you attend a vaping symposium where there are five talks back-to-back on the same topic, you get to hear a similar message from each speaker that these vaping devices need stricter regulations. The concern about the safety is real and the talks clearly emphasized that the cannabis vaping industry has a long way to go to achieve that safety.

As some of the presentations highlighted, many heavy metals show up in both legal and illicit vaping carts that had never even been used. In and of itself, this finding is of great concern, but the fact that higher levels have been found in older devices suggests that corrosion increases over time.

Furthermore, there is currently no standardized test method to compare different devices and to evaluate whether the metals are making their way into the vaping aerosol and the consumers' lungs. Finally, the session emphasized how the lack of federal scrutiny is allowing adulterated products into the marketplace, which is seriously impacting consumer safety.



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