



Vape Cartridges and the Cannabis Industry: We Should – and Can – Do Better to Address Lead Contamination

As cannabis legalization escalates across the nation and around the world, governmental agencies have struggled to keep up with the industry's technological innovation. In recent months, media reports of a "national vaping crisis" have made it clear that consumers are concerned and fearful of the safety of the current state of the industry. Despite the fact that legal cannabis products are – outside of FDA-approved pharmaceuticals – the most tested and regulated product American consumers can buy, the industry continues to struggle to gain the confidence of consumers.

It needs to be made clear that nearly all of the negative media reports regarding the vaping risks focus on nicotine-based and e-juice products – mostly unregulated and untested. However, the legal cannabis industry is caught in the media undertow of the health issue. According to the CDC, there have been 80 confirmed and probable cases in 36 states of "severe acute respiratory distress syndrome" tied to inhaled drug aerosol. Fatal incidents have been reported in California, Illinois, Indiana, Kansas, Minnesota and Oregon.

It is essential that the cannabis industry takes a leadership position in educating the public, the media and governmental agencies regarding the current crisis. Now is also the time to unequivocally state the steps the industry is taking to protect the cannabis consumer.

The vaporization of cannabis concentrates is one of the fastest growing segments in the industry. While vaporization is considered a safer and more convenient method of inhalation than smoking combustible cannabis plant material, significant health risks still exist with vaping. A preponderance of studies demonstrates that the existence of heavy metals in vaporized oil is an unnecessary health risk the industry is imposing on trusting consumers.

The cannabis industry must do better. Atlas Technology Manufacturing ('Atlas') a producer of vape cartridges based in Tukwila, Washington with wide distribution and millions of units sold in Washington, Oregon, Nevada and California – believes that the industry must aggressively pursue a lead-free standard to protect consumers from potential negative health effects related to vaping cannabis concentrates. Some states, and California in particular, have already instituted strict rules regarding heavy metals. Vape cartridge manufacturers should take it upon themselves to not only meet those regulatory requirements but exceed them. It's in the best interest of consumers – and the entire cannabis industry. If the industry wants to position vaping as a healthier and more convenient alternative to smoking cannabis flower, it is incumbent upon everyone to work diligently to deliver the healthiest array of products possible.

Even before the current media coverage of nicotine-based and e-juice vaping health concerns, the cannabis industry was vulnerable to negative coverage because of the existence of lead and other heavy metals in some products. Even the strictest heavy metal standards in California allow for the presence of low amounts of lead. Processors and consumers for the most part are unaware that products that passed state regulatory requirements contained small amounts of heavy metals.

The regulatory standard for detectable levels of lead must be zero. Now is the time to escalate the move to lead-free cartridges – making our products safer than legally required. The legal cannabis industry should not wait for regulators to rewrite standards; the industry can and should take a pre-emptive step to regain consumer confidence and protect the very people we are committed to helping.

The Future of the Vaping Sector:

The rapid growth of cannabis concentrates has helped fuel the cannabis industry, and that growth will continue for the foreseeable future. According to a report by ArcView Market Research in conjunction with BDS Analytics, consumer spending on cannabis concentrates in the United States was estimated at \$3 billion in 2018 – a 49 percent increase from the previous year's sales. By 2022, ArcView forecasts that Americans will spend \$8.4 billion on concentrate products. For comparison, ArcView estimates that flower sales will be \$8.5 billion in 2022.

Currently, the prefilled vape cartridge segment accounts for nearly 60 percent of all concentrate sales – and that percentage is expected to increase as vaping becomes even more ubiquitous in the United States.

Research suggests that there are many reasons consumers are opting for vaporization over smoking cannabis flower. Among the leading factors:

- Discretion: Vaping allows for inhalation without the distinctive cannabis odor.
- Ease of use: Vape pens require little to no preparation.
- Portability: Vape pens allow for convenient use away from the home.
- Health: Vaporization in moderation has been found to be better for your body than smoking combustible cannabis plant matter.

Media Reports of Lead in Vape Cartridges and the Repercussions:

Consumers have been bombarded with news reports of vape cartridges containing lead and are questioning the inherent health risks. The media attention reached a crescendo earlier this year when California's stringent testing rules went into effect. Beginning January 2019, cannabis oil contained inside vape cartridges in California could not contain lead exceeding 0.5 parts per million (ppm). By comparison, the state of Washington's limit is 1.2 ppm; Oregon does not prohibit heavy metals in cannabis vape products.

While the sensational headlines are alarming and caused consumer trepidation, the reality is that many vape cartridges meet California's tough requirement. Only a small number of the cartridges since January 1 are failing the California protocols. But most of the approved cartridges still contain 0.4 or 0.3 parts per million, just below the California legal limit.

But is just below the California limit acceptable? A unanimous scientific consensus exists including both the World Health Organization and the Centers for Disease Control, **there is no safe level of exposure to lead**. The CDC considers lead a neurotoxin that, if consumed, is potentially fatal. It can also cause:

- Decreased IQ
- High blood pressure
- Joint and muscle pain
- Headaches
- Abdominal pain
- Mood disorders
- Difficulties in memory or concentration.

For pregnant women, lead exposure can directly cause miscarriage or premature birth and may adversely affect the health of the child even if the child is carried to term and otherwise born without complications.

The presence of lead is outlawed in paint, gasoline, toys and other common consumer products.

In Search of a Lead-Free Cartridge

California's strict regulations – and the ensuing controversy over contaminated cannabis vape concentrates – served as a wake-up call for the industry. Atlas applauds California's efforts to protect consumers from harmful heavy metals. But it is our position that we should strive to exceed the legal requirements. After multiple attempts, Atlas created the Atlas A3 Lead-Free Vape Cartridge a state-of-the-art, non-corrosive high terpene vape cartridge that contains no detectable levels of lead. Following months of internal testing, Atlas commissioned two independent testing labs to verify our results; one lab to test the metal components in the vape cartridge manufacturing and the second to test the cartridges cannabis oil for the presence of lead. We also submitted to the two research labs the leading vape cartridge currently on the market for a comparison.

Test No. 1: Testing for lead in the components used in vape cartridge manufacturing. X-Ray Fluorescent Spectrometry [XRF] Analysis Conducted by Lab/Cor Materials, LLC.

Dr. Robert M. Fisher from Lab/Cor Materials has no affiliation with the cannabis industry, was selected for his expertise in testing metals. He received his PhD in materials science from Cambridge University and has over four decades of experience in his field. He was part of the Apollo Space Program, the US Department of Energy's Lawrence Livermore Laboratory and several top universities including University of Washington and University of California, Berkeley.

The testing method selected by Dr. Fisher to determine the concentration of lead levels in every component of the cartridges was X-Ray Fluorescence Spectrometry [XRF].

Dr. Fisher disassembled two vape cartridges:

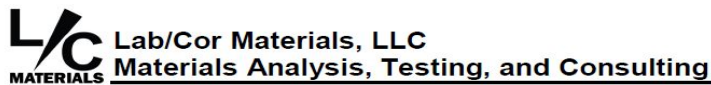
- Atlas A3 Lead-Free Vape Cartridge
- Jupiter L6 Glass C-Cell Vape Cartridge



The components included:

- Oil Inlet Pipe
- Screw Thread
- Tip
- Tip Base
- Ceramic Heating Element
- Wire Leads to Heating Element
- Cotton Filter
- Oil Tank

Results: According to Dr. Fisher’s findings, none of the components in the Atlas A3 Lead-Free Vape Cartridge contained any detectable levels of lead (no lead). Four of the components in the Jupiter L6 Glass C-Cell Vape Cartridge contained detectable levels of lead, including “high level” of lead in the cartridge’s Oil Inlet Pipe.



Materials Analysis of Vape Pen Cartridges

2 Vape Pen Cartridges were received on June 18, 2019. They were disassembled and analyzed by XRF to determine the concentration of various heavy metals, particularly lead, that had the potential to end up leaching into the vapor. The results are presented below.

Table 1: Test Results.

Sample Description	Atlas A3 Lead-Free Vape Cartridge (LCM ID: 19.061803 - 01)	Jupiter L6 Glass C-Cell Vape Cartridge (LCM ID: 19.061803 -02)
Oil Inlet Pipe	no lead	high (1-2% Pb)
Screw Thread	no lead	medium (0-1%)
Tip	no lead	no lead
Tip Base	no lead	no lead
Ceramic Heating Element	no lead	low (<1%)
Wire leads to heating element	no lead	low (<1%)
Filter (cotton)	no lead	no lead
Oil Tank	no lead	no lead

Test No. 2: Testing for presence of lead in the vape cartridge cannabis oil. Inductively Coupled Plasma Mass Spectrometry [ICPMS] Analysis Conducted by Medicine Creek Analytics.

Medicine Creek Analytics, a full-service cannabis analysis laboratory located near Seattle, provides a full menu of Washington State I-502 compliance testing including pesticides and heavy metals. Medicine Creek is currently the only lab in Washington state certified for testing heavy metals in cannabis products.

James Roe former Steep Hill Labs Scientific Director & Group Leader in Tukwila, WA provided a summary of the reports received from Medicine Creek.

The laboratory analyzed oil that had been contained in each of the cartridges tested in the XRF study using a certified protocol consisting of acid digestion of the oil and subsequent analysis for metals by Inductively Coupled Plasma Mass Spectrometry [ICPMS]. Medicine Creek analyzed the cannabis oil content of two vape cartridges:

- Atlas A3 Lead-Free Vape Cartridge
- Jupiter L6 Glass C-Cell Vape Cartridge

This test was designed to assess if any latent heavy metals contained in the cartridges could leach into the cannabis oil contained within. *In other words, if lead was present in the components of the cartridge, would the cannabis oil become tainted? And if so, were the levels above regulatory specifications?*

It is important to understand that states do not regulate cartridges for heavy metals – only the concentrated cannabis oil requires testing. We wanted to decipher whether the once-clean cannabis oil could become contaminated over time.

Results: According to the ICPMS findings, there was no detectable lead (ND) in the oil contained in the Atlas A3 Lead-Free Vape Cartridge. The oil in the Jupiter L6 Glass C-Cell Vape Cartridge was found to have significant levels of lead. In fact, the oil contained in the Jupiter cartridge was 1.6 times above the legal California limit.

Medicine Creek Analytics Certificate of Analysis

3700 Pacific HWY E, Ste 400, Fife, WA 98424
 WA State I502 Certification 0018 | ISO 17025 91428 | Accreditation #91428

Sample **Atlas A3 LF Vape Cart**



#COC/INVOICE: 1022-19

Laboratory ID 190618-022	Matrix Concentrate
Tested for Atlas Technology LLC	
Sampled -	Received Jun 18, 2019
Reported Jun 20, 2019	
Analyses executed MET	

MET - Heavy Metals Detection Analysis

Analyzed Jun 20, 2019 | Instrument ICP-MS

Analyte	LOD ug/5g	LOQ ug/5g	Result ug/5g	WRL ug/5g	Analyte	LOD ug/5g	LOQ ug/5g	Result ug/5g	WRL ug/5g
Arsenic (As)	0.02	0.06	ND	10	Cadmium (Cd)	0.01	0.04	ND	4.1
Lead (Pb)	0.01	0.02	ND	6	Mercury (Hg)	0.02	0.07	ND	2

Medicine Creek Analytics Certificate of Analysis

3700 Pacific HWY E, Ste 400, Fife, WA 98424
 WA State I502 Certification 0018 | ISO 17025 91428 | Accreditation #91428

Sample **Jupiter Glass Vape Cart**



#COC/INVOICE: 1022-19

Laboratory ID 190618-023	Matrix Concentrate
Tested for Atlas Technology LLC	
Sampled -	Received Jun 18, 2019
Reported Jun 20, 2019	
Analyses executed MET	

MET - Heavy Metals Detection Analysis

Analyzed Jun 20, 2019 | Instrument ICP-MS

Analyte	LOD ug/5g	LOQ ug/5g	Result ug/5g	WRL ug/5g	Analyte	LOD ug/5g	LOQ ug/5g	Result ug/5g	WRL ug/5g
Arsenic (As)	0.02	0.06	ND	10	Cadmium (Cd)	0.01	0.04	ND	4.1
Lead (Pb)	0.01	0.02	3.93	6	Mercury (Hg)	0.02	0.07	ND	2

Conclusions:

We commend California for establishing the highest standards for vaping cartridges. It is the right thing to do for the consumer and the future of the cannabis industry. However, Atlas is committed to taking an even more stringent position when it comes to heavy metals.

Transitioning to lead-free cartridges is something the industry can – and must – address immediately. Not only will it improve consumer confidence, it will demonstrate to the world that the industry cares about the health of those who choose to vape. It is a visible action that will show regulators, the media and, most importantly, our consumers that health matters. Creating a standard that exceeds regulatory requirements will make it crystal clear that the legal cannabis industry cares more about consumer safety than its bottom line.

As other states – and nations – introduce legalized cannabis products to the consumer marketplace, it is incumbent upon the industry to provide the safest, healthiest products possible. California may have set the regulatory standard, but Atlas is setting the industry standard and that standard (validated by two independent labs) can and should be lead-free.

Cannabis brands that use the Atlas A3 Lead-Free Vape Cartridge can be identified by the following symbol on the packaging to make it easy for store staff and consumers to identify at retail.



For more information on the Atlas A3 Lead-Free Vape Cartridge visit leadfreevapecarts.com.

To purchase the Atlas A3 Ceramic Lead-Free Vape Cartridge contact:

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