Analytical Cannabis Digest

OCTOBER, 2020
Issue n. 25

Heavy Metals Found in 90 Percent of Tested Rolling Papers

Brain Injury Patients Who Consume Cannabis Spend Less Time in Intensive Care

Hemp Extract Protects Bees From Pesticide Poisoning

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FOREWORD

Along with the rest of the world, the cannabis industry has been rocked by the wrath of 2020.

The coronavirus pandemic led hundreds of marijuana businesses to enact new social distancing measures, new delivery options, and, for too many, new redundancy packages. But for all the hardship Covid-19 brought to the world of cannabis, there were signs of silver linings. Colorado, Oregon, Illinois and other states, for example, saw record recreational cannabis sales, even during the height of their pandemic restrictions.

But 2020's latest challenge to the cannabis industry, the west coast wildfires, has no such bright side. While the picture won't be full until the end of the season, it's already clear that many farmers in California, Oregon, and Washington have already lost all their crops in the fires' wake.

Catch up on the full wildfire story in this, the 25th issue of the *Analytical Cannabis* digest.

And read on to learn the results of a new study, exclusively shared with *Analytical Cannabis*, that found caffeine, melatonin, and other contaminants in US CBD products. Find out what hemp and CBD businesses make of the DEA's controversial new ruling on THC. And take in the latest cannabis science findings from researchers, including why THC may help prevent colon cancer and how hemp extracts can protect bees from pesticide poisoning.

If you have an idea for a cannabis science related story, or would like to contribute to our coverage of the industry, please feel free to email me at any time – l.mcguinness@analyticalcannabis.com

Leo Bear-McGuinness
Science Editor, Analytical Cannabis

AGILENT TECHNOLOGIES IN THE AGE OF CANNABIS LEGALIZATION IN THE U.S. AND CANADA

Legalization of medicinal and adult recreational use cannabis programs in Canada and most states in the U.S. has led to an ever-expanding need for testing of cannabis flower and cannabinoid products. Regional legislation stipulates what testing is required and not to exceed (action) levels of each chemical in a class. Common testing requirements include cannabinoid profiling and determinations of total Δ^9-tetrahydrocannabinal and total cannabidiol content, quantitation of potentially harmful metals such as lead, cadmium, mercury, and arsenic, measurements of residual pesticides and mycotoxins, quantitation of solvents that may have been used in extraction processes, and terpenes profiling. The legislation does not however harmonize the analytical methodologies nor is there agreement on which compounds, such as residual pesticides, should be regulated or their action levels. To meet these testing challenges, Agilent Technologies has developed highly selective and sensitive applications for each of the required regulatory tests and distilled these into unique eMethods and Cannabis Testing Kits designed to accelerate a laboratories start-up time. These applications have been designed to fit U.S. and Canadian regional needs and incorporate ease of use parameters enabling fast implementation and redundancy across analytical methods such as residual solvent analysis and terpenes analysis. Agilent eMethods enable a complete workflow that includes the proper instrument configuration, sample introduction, separation and detection, data processing, and reporting. The Agilent Cannabis Testing Kits include sample preparation products, columns, and supplies you need to quantify cannabinoids or residual amounts of pesticides and mycotoxins.

During these most turbulent of times, Agilent scientists have been diligently working with cannabis testing laboratories across North America to develop and verify affordable, achievable, reliable, and repeatable testing methods. In the first 6 months of 2020, Agilent has published 5 new application notes, 2 peer-reviewed articles, contributed 3 chapters to upcoming cannabis textbook with major publishers, 6 sponsored webinars, and 2 by-line articles. These materials illustrate Agilent's commitment to our customers success now and in the future. The combination of robust, vetted analytical methodologies, eMethods, Cannabis Testing Kits, and decades of expertise from Agilent scientists and support services vastly accelerates a laboratories time to market and revenue generation.

By Anthony Macherone, Ph.D.
Sr. Scientist and Cannabis Applications Technical Lead,
Agilent Technologies
Visiting Professor, Johns Hopkins University School of Medicine

Agilent

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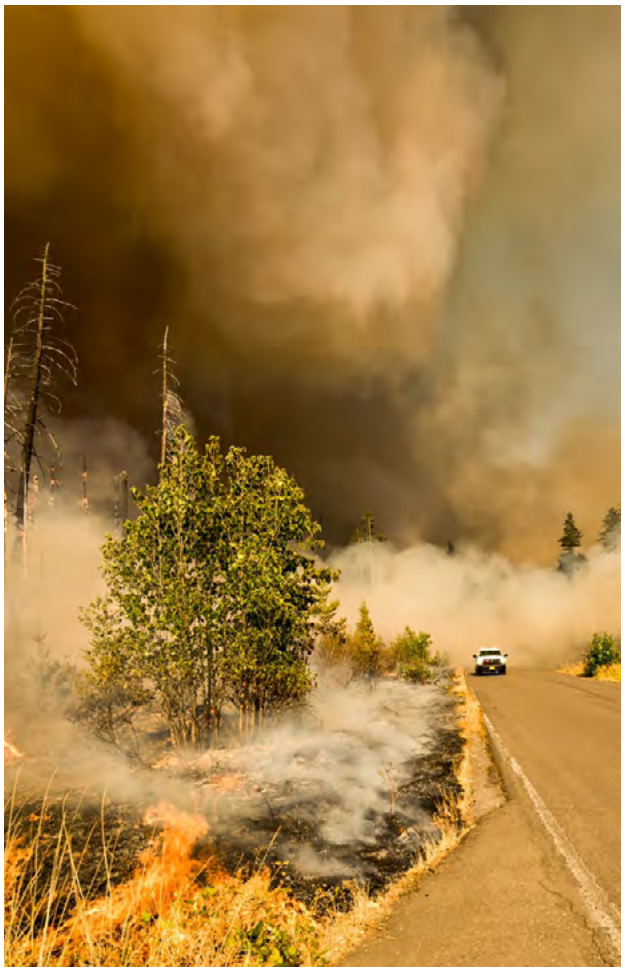
The eMethods simplify and speed up the implementation of cannabis testing applications, reduce risk and increase productivity and profitability in the testing laboratories.

Watch video now

Wildfires Threaten the Heartland of America's Cannabis Industry

By Alexander Beadle



Major wildfires are threatening the lives and livelihoods of cannabis industry workers in California and Oregon, as both states continue to be scorched by the worst US wildfire season on record.

In California, the largest wildland blaze in state history is drawing closer to the famed "Emerald Triangle" cannabis farming region, raising concerns over the safety of the thousands of seasonal workers who take part in the harvest.

Meanwhile in Oregon, an estimated one in five cannabis businesses statewide have been ordered by the Oregon Liquor Control Commission to evacuate their premises, citing the threat posed by fast-moving wildfires in the southern part of the state.

August Complex fire endangers multi-billion-dollar CA industry

Already this year multiple cannabis farms in California have lost their crops to local wildfires, a situation that is particularly painful for producers as outdoor crops are not necessarily insured. For those whose crops do survive the weeks or months until the fires can be brought under control, even the proximity of wildfire may still result in damages, as soot contamination is challenging to remove without the use of undesirably harsh chemicals and a smoke-tainted flavor may still be left behind.

To date, California's August Complex fire has blackened around 800,000 acres of land across California and is barely even one-third of the way to being contained. As the blaze continues its push westwards, the August Complex is now on a collision course with the state's Emerald Triangle cannabis farming region, just as preparations were due to begin for the regional cannabis harvest.

"There are thousands of folks that migrate into Mendocino, Humboldt and Trinity counties every year, and they are not familiar with the territory let alone a massive wildland fire knocking at their door," state Senator Mike McGuire, who represents the North Coast, said to the *Santa Rosa Press Democrat*.

The Californian Emerald Triangle is the largest cannabis-producing region in the United States and underpins the state's multi-billion-dollar legal cannabis industry. The financial effects of wildfire damage in this region could be massive for the west coast cannabis industry, but by far the most concerning aspect for the industry is the potential danger to life.

"People should not be weighing economics with health and safety," Mendocino County Sheriff Matt Kendall told the *Santa Rosa Press Democrat*. "We come into this world buck naked with nothing but the love of our parents. There's nothing material on earth worth losing your life over."

Kendall reported that cooler weather and minimal winds have helped firefighters to get equipment and personnel to crucial areas, but that people should be still prepared to evacuate if and when the time comes.

Fires continue to devastate in Oregon

Oregon was one of the first US states, right behind Washington and Colorado, to legalize cannabis. As a result, the state's cannabis sales have come to be a significant revenue generator. Retail sales are continuing to rise year-on-year, from $452.4 million in the first year of legal sales to $725.8 million in 2019. Hemp is also an important cash crop for the region.

Southern Oregon is facing the same grave wildfire threat as California. Multiple fast-moving wildfires have already caused significant damage in the state; Governor Kate Brown told reporters last week that five towns had been "substantially destroyed" by the fires.

Around 62 percent of all Oregon cannabis producers are based in Josephine and Jackson counties, which share a border with California. As serious wildfires continue to break out in the southern Oregon region, evacuation orders have been handed down to 408 cannabis firms (equivalent to around 20 percent of the state's total licensed cannabis businesses) located in at-risk areas. Of these, 73 are cannabis producers, mostly dealing with outdoor farms.

Nathan Howard, president and co-founder of Josephine county's East Fork Cultivars, told *Marijuana Business Daily* that many neighboring farms had already been consumed by the blazes.

"A lot of farms are completely destroyed. A lot of our friends have lost everything down there," Howard said, adding that he did not yet know if East Form Cultivars had burned down or escaped the flames.

"People should not be weighing economics with health and safety. We come into this world buck naked with nothing but the love of our parents. There's nothing material on earth worth losing your life over."

"It's tough," Howard told *Oregon Live*. "I am focusing on us, but I am also wanting to be mindful of people who have lost everything."

"If the fires do engulf a large amount of the valley, if not all of it, based on what we have seen, it is going to be taking out a lot of multi-generational cannabis farmers and infrastructure."♦

Heavy Metals Found in 90 Percent of Tested Rolling Papers, Californian Study Finds

By Alexander Beadle

A new investigation of cannabis rolling papers available in California has found traces of heavy metals in 90 percent of products.

Carried out by the Californian branch of SC Labs, the investigation also found detectable amounts of pesticides in 16 percent of the samples, and five percent registered over the allowable action limits.

The extent of the contamination

SC Labs initiated the tests after one customer reportedly received pesticide traces in their finished products. Shortly after, a second customer reported a similar issue.

Both complaints were made despite the cannabis having previously passed a pesticide screening test.

"We had this cluster of customers that were batch testing pre-rolled joints and failed compliance testing for chlorpyrifos," Josh Wurzer, president and co-founder of SC Labs, told *Analytical Cannabis*.

"All of these customers had pre-tested their plant material and it came up totally clean for all pesticides before rolling them into the joints and submitting them for this batch testing. So, obviously, everyone was a bit surprised and curious as to where the contamination came from."

After further analysis, the contamination was traced back to the rolling papers used for the products. As the investigation report says, SC Labs then decided to embark on this wider analysis to "assess the frequency of detection and measure the levels of contamination" in rolling paper products in general.

In total, the study tested over 110 different rolling paper products available online and in local Santa Cruz smoke shops, including rice paper-

based rolling papers, hemp- or cellulose-based rolling papers, pre-rolled cones, and wraps.

Notably, all three of the cellulose-based rolling papers exceeded the action limits for heavy metal detections; each type contained concerning amounts of lead.

Around 22 percent of the wraps tested also returned heavy metal test results that were above the action limits for California, although not to the same extreme levels seen with the cellulose-based products.

As many of these wraps were hemp-based, the team at SC Labs believe that the amounts of heavy metals detected are likely a result of hemp's natural tendency to draw up nutrients from its surrounding soil, which then accumulate in the plant's shoots and leaves.

In total, 58 percent of the wraps contained some levels of pesticides; 21 percent exceeded the state action limits for the relevant pesticide.

What does this mean for the consumer?

While these numbers might appear worrying on the surface, the scientists at SC Labs believe the results to be much more nuanced than they might first appear.

"I want to caution people to not be *too* alarmed over this report," said Wurzer. "The takeaways that I have from this is that there are certain rolling paper categories that have much more contamination – or appear to have much more contamination based on this report – than others."

The cellulose-based papers are of central concern, he says. While none of these products contained detectable limits of pesticides, the amount of harmful lead found in the products is still worrying.

"The cellulose-based rolling papers came in thousands of times over the inhalable limit for lead, basically maxed out the calibration on our instrument," Wurzer explained. "As a consumer, I would be very wary of those products in particular – and until more data came back – I would say cellulose-based rolling papers as a category."

For other rolling paper product types, the final products are likely still safe to consume. Rolling papers only contribute a fractional amount to the overall mass of any pre-roll product, and assuming that the cannabis plant material is free from contaminants, the final product would likely be still well under the actionable contaminant limits, even in states with very tight limits, like California. Although for products like the wraps, a significant portion of which returned positive pesticide and heavy metal detections, it may still be reasonable for consumers to take some caution.

"The takeaways that I have from this is that there are certain rolling paper categories that have much more contamination – or appear to have much more contamination based on this report – than others."

"I would maybe be wary that if I consumed a lot of these wraps every day that maybe I'd want to cut back," Wurzer recommended.

"I'd treat it sort of like how we treat some types of fish that are known to have high levels of mercury. You just limit your intake as a consumer."

Wurzer's report says that consumers should be made aware that rolling papers are not currently regulated like cannabis. Producers of pre-rolled products should also be aware that these rolling papers may be a potential liability when it comes to batch testing, and product manufacturers may wish to re-evaluate their product quality specifications to ensure that what they are producing is as clean and as safe as possible. ♦

Hemp and CBD Businesses Are Concerned About the DEA's New THC Rule

By Alexander Beadle

At the end of August, the US Drug Enforcement Administration (DEA) released new proposed rules for hemp and CBD, which the agency claimed would simply bring the nation's Controlled Substances Act (CSA) in line with current practices under the 2018 Farm Bill.

But while the agency characterizes this change as a routine matter that "merely conforms DEA's regulations[...] that have already taken effect," the move has sparked deep concerns within the American CBD and hemp industries. Many producers believe that these changes could be setting the stage for a future crackdown on the market.

What are the proposed rule changes?

There are four main components to this Interim Final Rule (IFR) put out by the DEA:

New wording which clarifies that reference to "tetrahydrocannabinol" (THC) does not include "any material, compound, mixture, or preparation that falls within the definition of hemp."

The stripping of Schedule V status under the CSA for CBD products approved by the US Food and Drug Administration (FDA) and containing less than 0.1 percent THC.

No longer requiring current import/export permits for hemp and its derivatives.

Updating the definition of "marihuana extract" to exclude substances that contain less than 0.3 percent THC on a dry-weight basis.

Filed on August 21, the IFR was effective immediately, although there is a comment period that will run until October 20, 2020, to allow for feedback.

Why would this impact the legal hemp industry?

The apprehension many hemp workers now have is due the DEA's wording on cannabis extracts and how this might relate to the practicalities of producing hemp extracts.

"They leave out the mention of any interim products," Josh Smith, CEO and chief scientist of Wisconsin-based testing laboratory Premium CBD Labs, told *Analytical Cannabis*.

"Where that runs into a problem now, is that anybody that runs an ethanol extractor, anybody that does any kind of supercritical CO_2 extractions[...] they will create a product that's over 0.3 percent," Smith explained.

"Because you concentrate tens of thousands of plants of hemp into a final product in a couple of barrels, so you will be over 0.3 percent. [The rule change] now makes them illegal and in violation of the Controlled Substances Act."

The concern from the hemp industry is that the DEA might then choose to take enforcement actions

against hemp extract manufacturers during this interim stage, before the producer is able to dilute the extract down to its final compliant product.

Writing in a pair of passionate blog posts last week, hemp attorney Rod Kight argued that "the IFR threatens to destroy the hemp/CBD industry" if this potential crackdown comes to fruition.

The compliance issues presented by these work-in-progress hemp extracts (WIPHEs) has been an "elephant in the room" for some time, Kight writes. But now the issuance of this rule has brought the issue into the spotlight and, in his view, "as usual, the DEA has taken the wrong position."

Kight also points out further issues regarding some ambiguous language surrounding rules on synthetic cannabinoids. While the rule focusses heavily on delta-9 THC, it says little about delta-8 THC, a cannabinoid that is psychoactive, can be derived from hemp, and is of growing interest to the market. While there are no specific laws governing delta-8 THC, the ambiguity of IFR's wording in restricting synthetic cannabinoids makes it unclear whether hemp-derived delta-8 THC would be included in its enforcement.

Reaction from the industry

If the DEA were to choose to use these potential loopholes to crackdown on hemp extract production, the ramifications for the wider hemp and CBD industry would be massive. Understandably then, those within the industry are voicing their concerns. As of September 9, there are already over 1,950 public comments that have been submitted to the government over this Interim Final Rule.

"I think the more that we talk to people about it, the more they are increasingly worried," Josh Smith told *Analytical Cannabis*. "Some people aren't. I mean, in reality, as a testing lab, could this cause us problems? Yes, because there's always stuff in here that's over point 0.3 percent THC just by the nature of what we do. But it doesn't really hurt us too much."

"But, talking to farmers, talking to the actual small business processors, that's who's starting to get a little worried. And even some lawyers that we've talked to[...] come back to us later and they're like, 'Yeah, this could be a problem.' They're really concerned now that this was kind of [the DEA's] attempt to throw that back under the Controlled Substances Act."

Speaking to *L.A. Weekly* shortly after these concerns were raised, a DEA spokesperson said that the agency was "aware of the concerns of the CBD industry, and is evaluating policy options."

"Congress is supposed to vote on de-scheduling cannabis completely in the US at the end of this month. It won't go anywhere; the senate won't take it up. But, you know, that would solve everything,"

When questioned over the potential for enforcement actions being taken against hemp extraction businesses, Mitchell invoked the current American opioid epidemic and the resurgence of methamphetamine use, saying that the DEA is chiefly concerned with "focusing its resources on disrupting and dismantling the Mexican cartels that are trafficking these deadly substances into and across the nation."

Whether or not these new rules are in fact tied to any intentional future crackdown on hemp business, these ambiguities still present an issue for all producers who want to run fully transparent and compliant operations.

"Congress is supposed to vote on de-scheduling cannabis completely in the US at the end of this month. It won't go anywhere; the senate won't take it up. But, you know, that would solve everything," Smith said.

"If they really, really wanted to fix this, it's a simple fix. Just include interim products in this ruling. There's some other stuff that could be changed, but 90 percent of this just would be adding the ability for an interim product to go above 0.3 percent. And that's it; that would fix 90 percent of the issue." ♦

Hemp or Cannabis? Texas Forensic Lab Adopts New Method to Tell the Difference

By Alexander Beadle

While many companies have suffered an economic hit from the coronavirus (Covid-19) pandemic, the labs that test cannabis products for impurities and potencies are reporting a steady stream of business.

The Houston Forensic Science Center (HFSC) in Texas has adopted a new testing method for differentiating cannabis from legal hemp, making it possible to once again provide state courts with the information needed to proceed with marijuana enforcement cases.

Speaking to *Analytical Cannabis*, the scientists behind the new method explain how it is able to determine whether the Δ^9-THC present in tested material is above or below one percent by weight, and thus whether it is either legal hemp or illicit cannabis.

A better solution for law enforcement

After the 2018 Farm Bill legalized hemp production at the federal level, and the Texas Legislature subsequently adopted House Bill 1325, the state officially defined legal hemp material as cannabis containing less than 0.3 percent Δ^9-THC.

But this language presented a problem for law enforcement. In light of the new legislation, some district attorneys requested that law enforcement agencies involved in cannabis prosecution cases provide lab reports positively identifying evidence as cannabis. But state crime laboratories did not have the capabilities to measure such levels of Δ^9-THC in cannabis products. The expense associated with sending unknown cannabis material to private laboratories often meant this was only done for the largest felony cases.

With this new method in place at HFSC, Houston prosecutors will now be able to use public laboratory test results in cases where plant material has been seized and can be tested. The method is somewhat limited in scope as it is not effective in analyzing waxes, edibles, or other non-plant materials, but the HFSC believes that the method will be able to address the vast majority of cases presented.

Choosing an analysis method

Previously, the international lab standards organization AOAC International has approved an analytical method for measuring Δ^9-THC content in hemp. This method relies on using liquid chromatography-diode array detection (LC-DAD), which involves equipment that is not currently standard in state labs such as the HFSC.

The challenge for analysts here, explains HFSC CEO and president Dr Peter Stout, was to produce a method that can fulfill the needs of law enforcement without requiring significant investment in new equipment or pursuing new accreditation.

"All [forensics labs] are accredited for qualitative analysis. Very, very few labs have drug quantitation as part of their scope of accreditation,

> "When this legislation passed, in addition to all of the other problems that it created, [the state legislature] didn't provide any funding for anybody"

so [we were] trying to devise something that we could fit into the existing accreditation," Stout told *Analytical Cannabis*. "Also, having no foggy clue where this is going to go in the next legislative session, the twists and turns of who's actually going to enforce what, it makes it very difficult to justify adding expensive new equipment."

"So, trying to devise a method using equipment that already we have in existence, we went with gas chromatography mass spectrometry, GCMS, because that's what we use largely qualitatively with most of the drug analyses."

Taking inspiration from a semi-quantitative procedure established by the US Drug Enforcement Administration's Analysis of Drugs Manual, the HFSC adopted the concept of using a one percent semi-quantitative over-or-under decision point for determining whether a material sample should be classified as cannabis or hemp.

"We went with one percent because we're trying to avoid issues of analytical variants around that point three [percent]. Basically, if you think about the logic of it, everything's devised in there to be as lenient towards the defendant, so we know we are not polarizing the material," Stout explained.

"You've got a material that departs the farm with appropriate agricultural testing, that say has Δ^9-THC content in the fiber of 0.29 percent. Things happen, material's seized by law enforcement, material comes to me in the laboratory," Stout said.

"Because there is no actual definition of what 'dry' is [in dry weight], we're all left to our own devices. I can easily say I'm going to stuff [the material] in the oven and cook it at 50°C for two weeks. It'll be good and dry by then; I probably will have reduced the weight by half and I will have decarboxylated just about all the THCA to THC. That could easily mean that material now exceeds that one percent level, and in the criminal setting that material is now marijuana. That doesn't work."

The HFSC lab tests the material they receive without any additional drying steps. Starting out with a macroscopic inspection of the material to identify any cystolithic hairs and a simple Duquenois-Levine color test to confirm the presence of cannabinoids, the analysts then follow with the new GCMS-based testing method, using deuterated Δ^9-THC as an internal standard to identify and measure the Δ^9-THC content in a given sample.

The future of forensic testing

HFSC is aware that this new method is limited in scope by virtue of using a one percent over-or-under decision point in its analysis. As a result, stakeholders will be asked to acknowledge these limitations in an end-user agreement, and HFSC will also note this on all final reports. But the method does represent a much more practical cannabis testing solution for law enforcement agencies in Houston, and one which has been developed effectively without external funding.

"When this legislation passed, in addition to all of the other problems that it created, [the state legislature] didn't provide any funding for anybody," Ramit Plushnick-Masti, director of communications and public information officer at HFSC, told *Analytical Cannabis*. "They said this is going to make money. So, the crime labs have received no money to actually be able to assist with the enforcement side of things for what remains a controlled substance."

"So, Texas' legislature, which meets every two years for six months, they will start their new session in January 2021. The hope would be that this would come up again, and that they would actually this time provide some resources. If they want to continue enforcing this law, then they need to step up and provide some resources." ♦

Caffeine, Melatonin and Other Contaminants Found in US CBD Products

By Alexander Beadle

A new study of 21 American CBD products, currently in preprint, has found evidence that many products are mislabeled, contaminated, and deliberately adulterated.

The study, which was shared with *Analytical Cannabis* ahead of peer review, adds to the growing body of evidence that many CBD products are misrepresented by bad actors in the industry.

Around half of the products studied were affected in some way

Before the CBD products were even analyzed, two were already deemed to be misleading; both CBD items displayed the words "FDA Approved" on their packaging, yet non-prescription CBD products have never been endorsed by the FDA.

Following the packaging inspection, all 21 products were studied further using ultra-high pressure liquid chromatography (UHPLC) coupled high resolution accurate mass spectrometry (HRAM).

Although determining the absolute quantities of cannabinoids present in each product was not within the initial scope of work, study author Dr Ben Orsburn notes in his preprint paper that most of the products did not show any quantifiable levels of THC in their resultant spectra. However, four products did contain THC above the limit of detection. From examining the area under each peak, it is believed that some of these products may be over the federally mandated maximum THC allowance in such products.

In total, 11 of the 21 commercially available products appeared to be affected by some sort of misrepresentation, contamination, or possible adulteration.

The most common contaminant detected, erucamide, is a surfactant commonly used

in manufacturing, which is already a well-characterized leachable contaminant in pharmaceutical products.

Other substances detected are more concerning. Polyethylene glycols N14 and N15 were identified "with high confidence" in two samples. The presence and safety of such polyethylene glycols (PEGs) has been questioned before in relation to cannabis vape products, where the PEGs are liable to degrade into more harmful compounds when vaporized.

The over-the-counter sleep supplement melatonin was found in two samples, and the stimulant caffeine was found in one. Valpromide, an antiepileptic and antipsychotic drug marketed in some European countries, was also detected.

"[The data] is so convincing; it's 100 percent sequence coverage for this prescription medication – and I don't know why that makes sense for it to be there," study author Dr Ben Orsburn told *Analytical Cannabis*.

"I mean, if you're marketing a CBD product for relaxation and helping you sleep and you put a bunch of melatonin in it, then that makes sense for why that's there. So, it seems a little more nefarious that here is the potential that somebody is just doing a little chemistry experiment and not really thinking about it too much," said Orsburn.

Possible fentanyl analog found in one product

Most concerningly, the non-targeted screening appears to have detected some amounts of fluorofentanyl, a synthetic opioid and Schedule I compound, in one mail order product obtained for the study.

"When I found something that looked like fentanyl, I was like, 'OK, stop,'" Orsburn recalled.

"You need to have special licenses to even get the positive controls to test [for fentanyl]," he explained. "We looked into that, and we actually tried to obtain more of those products so that we could send it onto somebody who did, but we have not been successful in re-obtaining this mail order product."

"So, I can't say that it's absolutely true, but my gosh, it looks really convincing."

Orsburn also told *Analytical Cannabis* that some of the mismatched fluorofentanyl ions might indicate the presence of a second fluorofentanyl isomer, 4-fluorofentanyl.

"What I don't really go into in the paper – because I just thought it was kind of out of scope and really hard to visualize – is that I've got a lot of mismatched fragment ions that don't make a lot of sense there in terms of the proposed 3-fluorofentanyl. But a lot of those fragment ions that show up in figure four [in the preprint paper] actually also match 4-fluorofentanyl. So, if it was this [fluorofentanyl], and it was a mix of these two isotopes, then the score of this molecule actually goes up dramatically."

"Obviously, that's really scary," he stressed. "It's just crazy; it doesn't belong there."

"When I found something that looked like fentanyl, I was like, 'OK, stop.'"

What is non-targeted screening?

The analysis technique used in this screening study, non-targeted screening, is not seen so commonly in the cannabis industry, but it is a mainstay in the pharmaceuticals sector and in toxicology analysis. Its appeal as an analytical tool hinges on its ability to identify hundreds or even thousands of compounds in a single sample.

"[With] targeted mass spectrometry when you're looking for a pesticide, the instrument is only looking for the mass of that pesticide and two known fragment ions that would come from that pesticide," Orsburn explained.

"In non-targeted screening, you actually just open up the whole mass range and you look at everything. Anything that ionizes and is visible, you create a peak for. You compare the peaks of

everything you see, and you look at the things that are quantitatively very different in, for example, one product versus all the other products. And then when you look at that one ion that is clearly different between everything else, then you can focus in on the question of 'what is that ion?'"

In Orsburn's study, the resulting peaks from each sample run were searched against six different spectral libraries. No database is fully comprehensive, so this served to increase the likelihood of finding a match, but also as a way to draw increased confidence in a result if the same match was found across different complementary libraries. These matches were verified once more by manually comparing the experimental data and the relevant library spectra.

Where does the industry go from here?

Such findings make for concerning reading. But for the good actors in the industry, there may not be so much to worry about. Following good manufacturing practice (GMP) and all local regulations should likely be enough to avoid problems like this, Orsburn believes.

"Accidents happen, and sometimes you don't control your whole supply chain – maybe you're a producer and you're purchasing a lot of material from other farms – there I do think that non-targeted screening would be really valuable," he said.

"I think that, on its own, just following good manufacturing practices and not cutting corners, I don't think that we're going to see problems like this."

Orsburn also told *Analytical Cannabis* that he is currently working on a way to make all of his data publicly available for other interested scientists to view.

"I'm a big open data advocate; so one of the things that we did make clear in this preprint is that I'm working on a way right now to make all of these data files available – it's just really big."

"But I will do my best to make all of this publicly available, so that anybody else can check my work. And I would be thrilled to find out that this isn't really fluorofentanyl." ♦

Cannabis Research Has Attracted $1.56 Billion in Funding Since 2000

By Alexander Beadle

Funding given to cannabis research in the United States, Canada, and the United Kingdom totaled more than $1.5 billion US dollars between the year 2000 and 2018, a new analysis has found.

Under close review, analysts found that significantly more funding was given to research into the negative effects of cannabis and cannabis misuse than on its medical and therapeutic uses.

More than $1.4 billion goes to American research projects

The analysis stems from a newly released database of grant data compiled by Jim Hudson, a consultant expert specializing in health research. Hudson collected and collated publicly available data from 50 major funders, including the likes of the US National Institutes of Health, the European Research Council, and a number of charities such as the Multiple Sclerosis Society.

They found that the total amount of cannabis research funding made available increased substantially year-on-year over the course of the last two decades. In the year 2000, less than $31 million went towards cannabis research projects. But by 2018, this annual figure had grown to over

$151 million.

While the vast majority of that funding came in the form of project grants, several hundred million was spent on career grants, program grants, training, and assorted infrastructure over the analysis period.

The lion's share of research funding went to research projects based in the US; American researchers received a total of over $1.4 billion between 2000 and 2018.

British research projects were the next most funded, attracting a total of $39.9 million. This figure was narrowly followed by the Canadian research project total of $36.1 million.

The database does look at some funding data for other countries; the European Research Council gives out grants Europe-wide and the EuropePMC's open-access repository includes data on other European funders. But due to the limited data coverage for these other countries, the analysis chose to stick with a focus on the US, UK, and Canadian projects.

In terms of funding sources by organization, the US National Institutes of Health (NIH) lead the way, contributing a massive $1.47 billion in funding for cannabis-related research. Other big contributors included the Canadian Institutes of Health (CIHR), which gave $24.8 million, and the UK Medical Research Council (MRC), which raised $24.8 million.

What is being studied?

One important piece of nuance to keep in mind is that not all cannabis research is one hundred percent focused on cannabis; cannabis can be relevant to wider studies on drug use, addiction, health, and physiology.

In order to properly determine what should count as cannabis research and which cannabis research areas are receiving funds, the database analysis assigned a weighting score to each relevant funding grant. These weights reflected whether a study was:

- Completely focused on cannabis.
- Cannabis featured as one of two or three major focal points.
- Cannabis was one of many topics or not of central importance.
- Cannabis was a very minor focus or only mentioned in passing.
- The analysis found that between 2000 and 2018, the top-funded categories of cannabis research were, in descending order:
- The effects of cannabis use.
- The function of the body's endocannabinoid system.
- Specific cannabinoids as potential medical treatments.
- The treatment of cannabis abuse/misuse/dependence.

"I am not aware of any compound in the history of drug development that is so widely used for medicinal purposes, yet still regulated [in this way]. I think the need and the market will, in its own right, push for reform."

Upon closer analysis, it was seen that significantly more funding was given to researching the negative effects of cannabis and

cannabis misuse than on the medical and therapeutic use of cannabis and its derived cannabinoids. As the majority of total funding came from the US NIH, this focus could be interpreted as a bias of the federal organization.

"The government's budget is a political statement about what we value as a society," wrote Daniel Mallinson, a cannabis policy researcher at Pennsylvania State University, who reviewed the funding data for *Science*. "The fact that most of the cannabis money is going to drug abuse and probably to cannabis use disorder versus medical purposes – that says something."

Research topic funding for the UK, like in the US, was similarly dominated by topics surrounding the potential harms of cannabis. However, in Canada, the top-funded research category was endocannabinoid research, which accounted for around 43 percent of all Canadian funding. There was also interesting variation in funding focus noted between different organizations and national institutes; more than one-third of the funding provided by the Natural Science and Engineering Research Council went towards research focused on improving the commercialization of cannabis.

There were also some interesting geographic variations in cannabis research funding uncovered within the US. While the overall funding patterns in the US were very similar to the general patterns observed due to American projects receiving most of the funds, there was some notable state-level variance. For example, states which had fully legalized cannabis by 2019 were more likely to have received funds for the study of cannabis as a medical treatment.

The analysis also found that relative overall funding levels for projects focused on preventing cannabis use/abuse decreased over the years, while relative funding for those looking at cannabis and cannabinoids as a treatment for specific medical conditions increased.

Barriers to cannabis research

Notably, the analysis found that research on cannabinoids as a medical treatment received over 15 times more funding than research into treatments using cannabis itself.

The analysis does not speculate on any possible causes for this, but the nature of the data would imply that current American restrictions on cannabis research are playing a large part in this imbalance.

Cannabis' status as a Schedule I drug means that researchers must go through a long and burdensome application process to get the necessary licenses to study the drug. By being a Schedule I drug, cannabis also comes with the associated assertion that the plant has "no currently accepted medical use." And so, despite the existence of many state-level medical cannabis programs, it can be difficult for researchers to secure funding for medical research projects.

Even if a license and funding could be guaranteed, under current rules, researchers would only be permitted to use cannabis supplied by a singular authorized cultivation site, based within the University of Mississippi. The cannabis material supplied by this site has been criticized for being genetically closer to hemp than the cannabis strains currently available in state-legal markets and for its alleged poor quality.

But since the US Food and Drug Administration issued new draft guidance aimed at encouraging cannabis-related clinical research, and the Drug Enforcement Administration is seemingly on the path to improving cannabis access for researchers, there is cautious optimism among the research community that the tide could be changing.

"I have a lot of hope. The need is so clear," Dr Joshua Levy, an assistant professor of otolaryngology and director of resident research at Emory University's Department of Otolaryngology, told *Analytical Cannabis* last month.

"I am not aware of any compound in the history of drug development that is so widely used for medicinal purposes, yet still regulated [in this way]. I think the need and the market will, in its own right, push for reform." ♦

Brain Injury Patients Who Consumed Cannabis Spent Less Time in Intensive Care, Study Finds

By Alexander Beadle

Trauma patients who consumed cannabis pre-injury may recover from their trauma more quickly than their cannabis-free counterparts, according to the results of a new retrospective review.

The study, published in the *Journal of Surgical Research*, reviewed patient data from two large regional trauma centers and found that some trauma patients who tested positive for THC, the major intoxicant in cannabis, went on to spend less time in hospital or in intensive care.

TBI and severely injured patients spend less time in recovery

The deidentified patient data used in the retrospective review came from patients admitted between 2014 and 2018 to two American College of Surgeons-accredited trauma centers similar in terms of location and sociodemographic.

After excluding data from patients under the age of 18, those who were not drug tested, or those who screened positive for other substances, the researchers were left with 4,849 patient records to examine. Of these, just under one-third of the remaining patients tested positive for THC.

The researchers used multivariable binary logistic regression analysis to examine any potential effect of preinjury cannabis use on trauma patient outcomes, and saw several trends deemed statistically significant.

THC-positive trauma patients with traumatic brain injury (TBI) had a median length of stay in hospital that was two days shorter than their THC-negative counterparts. These THC-positive TBI patients also needed less time on mechanical ventilation, spending a median of one less day on the apparatus.

Patients who were more severely injured – as assessed by an established medical tool, the Injury Severity Score – and who tested THC-positive also spent a lower amount of time in the intensive care unit and had a reduced mortality rate (19.3

percent mortality versus 25 percent) compared to non-users.

Overall mortality first appeared to be also lower for the THC-positive patients. But, notably, this trend disappeared following the multivariate analysis.

While the researchers do note that the study design does not allow for establishing causation, they hypothesize that the initial reduction in mortality could have been because the patients in the cannabis-consuming cohort were generally younger patients. With a 15-year age gap between the median age for the THC-positive and -negative cohorts, the researchers suggest that the younger cannabis users may just be "more physically robust" and so be more able to recover quickly. Although, the study's authors cannot completely rule out the possibility that cannabis use could have afforded some protective effect.

Why would cannabis use affect traumatic injury recovery?

At first glance, there might not seem to be any obvious link between cannabis use and the potential recovery and outcomes of sustaining a traumatic injury. But beneath the surface, there is a lot of complex biology at play.

Traumatic injury elicits a rapid innate immune response as the body immediately tries to counteract disruption from the breaking of the skin, the breaking of cell membranes, and injury to organs. As a part of this, the body will trigger an inflammatory response. In some cases, a poor balance of this pro- and anti-inflammatory action may lead to the development of systemic inflammatory response syndrome (SIRS), which can damage the organs not damaged by the initial traumatic injury, eventually leading to multiorgan dysfunction.

THC and CBD, the major cannabinoids in cannabis, have both been shown to display some significant anti-inflammatory and immunomodulatory effects. As the trends identified in this study demonstrate, it is possible that with the use of cannabis pre-injury the presence of these cannabinoids in the body may offer some protection against the effects of the posttraumatic immune response. Though again, further studies will be needed to properly determine whether such a protective effect exists.

Cannabis and trauma

The effect of cannabis on recovery from traumatic injury has become a topic of some prominence in recent years.

THC-positive trauma patients with traumatic brain injury (TBI) had a median length of stay in hospital that was two days shorter than their THC-negative counterparts.

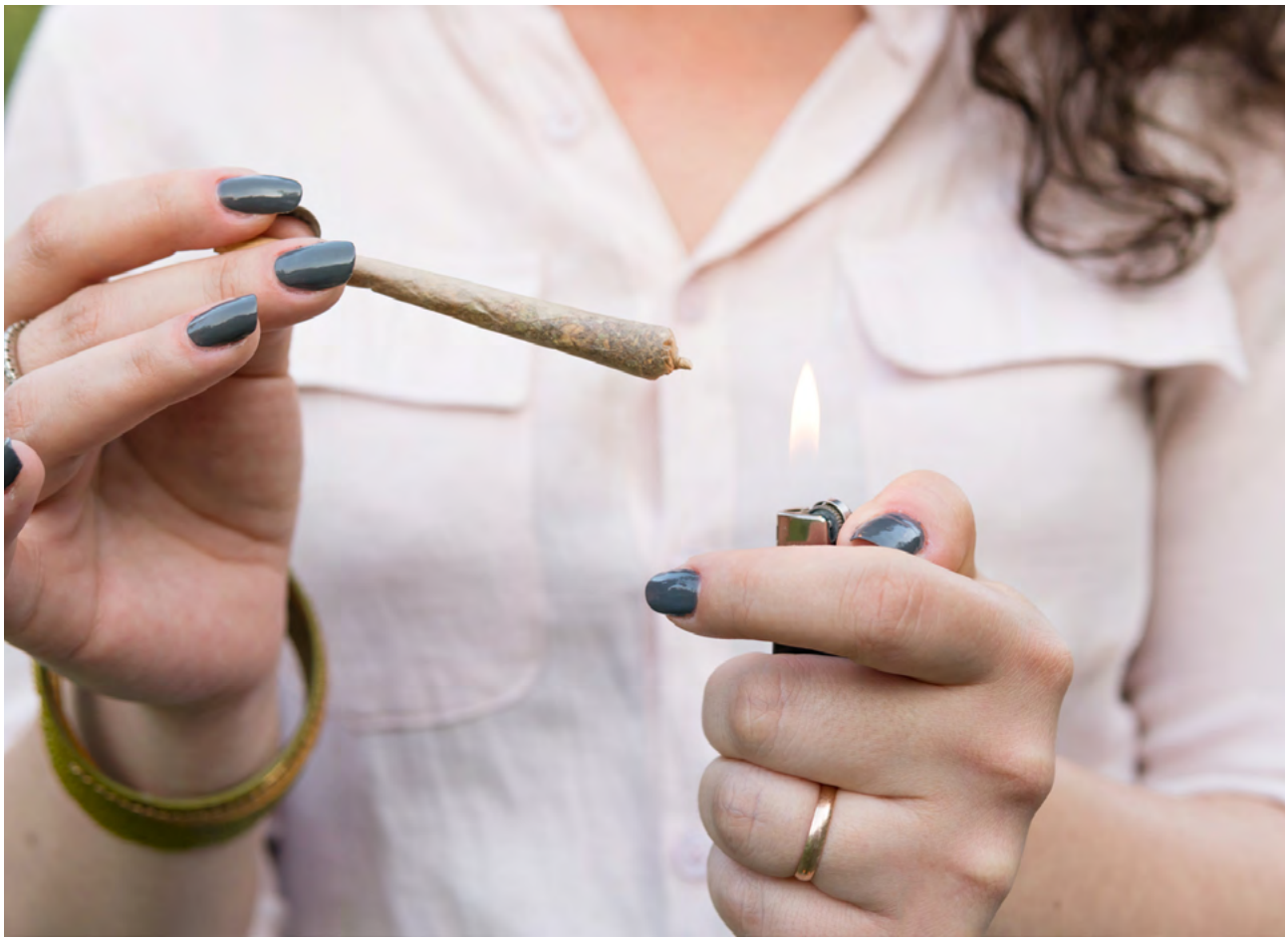
In 2019, the Flowering HOPE Foundation and Clover Leaf University launched the first American clinical study to investigate the effects of plant-derived cannabinoids supplements in patients recovering from traumatic brain injury.

Earlier this year, researchers at the University of Miami Miller School of Medicine received a grant worth $1.6 million from a psychedelics research company to fund further studies into the use of CBD and the psychedelic compound psilocybin on mild traumatic brain injury (mTBI) and post-traumatic stress disorder.

Having already researched the effects of CBD on brain injury for several years, the Miami researchers believe in the compound's ability to minimize some of the subsequent conditions that commonly result from mTBI, such as cognitive and memory issues. With some studies indicating psilocybin's potential usefulness in altering fear conditioning, and the common co-occurrence of mTBI and PTSD following traumatic injury, the scientists hope to develop a useful combination treatment that can effectively assist in both physical and psychological recovery after traumatic injury. ♦

Moderate Cannabis Use May Still Affect Verbal Memory, Sibling Study Finds

By Alexander Beadle



Moderate cannabis consumption in adolescence may adversely affect verbal memory, according to researchers from the University of Colorado School of Medicine.

In their new study, published in *Addiction*, the researchers compared data from adolescent siblings to determine the potential impact of early or frequent cannabis use on cognitive function.

The researchers say their findings cannot be explained by genetic or environmental factors, a claim which stands in contrast to previous studies in the field of cannabis and cognition, many of which believed familial factors to be a key determinant.

Frequent adolescent cannabis use impacts verbal memory

The study's 1,192 adolescent participants came from a racially and ethnically diverse set of 595 families from the metro Denver and San Diego areas. Clinical interviews established the existence and extent of drug use for each participant, and cognitive function was assessed using a battery of neurophysiological tests designed to look at response inhibition, learning and memory, attention and working memory, cognitive flexibility, and intelligence.

Data on the participants was collected in two waves; one from 2001-to-2006, when the average

age of participants was 17 years, and a second from 2008-to-2013, when the average age was 24.

"We wanted to expand our understanding of whether cannabis use is related to lower cognitive functioning," said lead author Jarrod Ellingson, PhD, assistant professor of psychiatry at the University of Colorado School of Medicine, in a statement.

"There's a large body of evidence that cannabis use is linked to cognitive functioning, but we know that cannabis use is not isolated from other important risk factors. That was the primary motivation behind this study, in which we compared siblings to account for many of these risk factors."

They found that beginning regular cannabis use at a younger age and consuming the drug more readily than one's sibling was associated with poorer performance in delayed verbal memory – the process of remembering and recalling information that a person reads or hears.

These findings are consistent with other studies that indicate the potential harms of persistent cannabis use, but do not follow the lines of other family-controlled studies in the field. The researchers suggest that this may be because other familial studies have tended to focus on adolescents with lower levels of cannabis use (a handful of times per month) rather than seen in this current study, which averaged use statistics of twice per week.

"More work needs to be done to determine how cannabis use is related to cognitive functioning and we hope that our study can help inform future study designs," Ellingson said. "These studies are particularly important because cannabis is becoming more potent and more accessible as states legalize its recreational use."

The risks of adolescent cannabis use

With the brain still developing through adolescence and into early adulthood, it is important that scientists identify any potential negative neuropsychological effects posed by drugs commonly used by this demographic, such as cannabis. To date, numerous studies have been done to try and better understand the effects of cannabis use in teenagers and young adults.

One recent paper, published in *JAMA Psychiatry*, found that young people who used high-potency cannabis products often had poorer mental health than those who only used low-THC products.

"Having tried to cut down but not being able to, your family being concerned about your use, getting into arguments of your use[...] People who report two or more of those items, we'd say they're experiencing problems."

"So things like experiencing memory problems as a result of cannabis use," Dr Lindsey Hines, a researcher at the University of Bristol and senior author of the study, clarified to *Analytical Cannabis*.

"Having tried to cut down but not being able to, your family being concerned about your use, getting into arguments of your use[...] People who report two or more of those items, we'd say they're experiencing problems."

While this present University of Colorado study did not find any genetic or familial factors to be relevant to cognitive development here, there are other studies which suggest genetics could also play a part in some of the other ways that cannabis use is believed to affect young people's health.

Cannabis use been linked to a greater risk of experiencing psychotic episodes in some users who carry a specific genetic variant. For cannabis users with this genetic variant – a single nucleotide polymorphism (SNP) in the fatty acid hydrolase (FAAH) gene – the likelihood of experiencing a psychotic episode was around ten times larger than for those without this specific genotype. ♦

THC Can Help Prevent Colon Cancer in Mice, Study Finds

By Alexander Beadle

Tetrahydrocannabinol (THC) may be able to prevent the development of colon cancers, say researchers from the University of South Carolina.

The researchers found that mice injected with both THC and carcinogens did not go on to develop any cancerous tumors in the colon, whereas a control group only given the carcinogens did.

The study, published in *iScience*, determined that THC was able to effectively suppress inflammation in the colon through activating the body's CB2 endocannabinoid receptor, which in turn prevented the onset of cancers in this region.

The finding could have significant consequences for those with inflammatory bowel diseases, such as Crohn's disease or ulcerative colitis.

THC suppresses tumor development in mice

In the study, mice were injected with either just a carcinogen designed to induce colon cancer or the carcinogen with an added 10 milligram per kilogram (mg/kg) dose of THC. By the end of the treatment period, the mice given the THC mixture had lost a significant amount of weight and experienced a significant decrease in spleen

size.

However, none of the animals in the THC group went on to develop any colonic tumors. The overall severity of inflammation in the colon was also significantly lower in the animals given THC.

"The fact that we were able to show that treatment with THC prevents inflammation in the colon and at the same time inhibits the development of colon cancer supports the notion that inflammation and colon cancer are closely linked. Thus, in patients who are at a higher risk of developing colon cancer, THC or other anti-inflammatory agents may be beneficial," Dr Prakash Nagarkatti, study author and the vice-president of research at USC, said in a statement.

After further investigation, the researchers determined that THC was able to alter the body's inflammatory response through its agonism of the CB2 endocannabinoid receptor, a receptor that does not produce psychoactive effects. This particular interaction was able to prompt responses from the intestinal antigen-presenting cells (APCs) and T-regulatory cells (Tregs) which reduced inflammation in the colon.

"Our results showed that THC was acting through CB2 receptors, which is exciting and suggests that compounds that activate CB2 and cause no psychoactive effects may be beneficial to prevent IBD and colon cancer," added Dr Mitzi Nagarkatti, fellow study author and chair of USC's Department of Pathology, Microbiology and Immunology.

Crohn's, ulcerative colitis, and cancer

With the rising incidence of inflammatory bowel disease (IBD) around the world, it would follow that there would be an equivalent increase in the numbers of people who are at risk of developing IBD-linked diseases, such as colon and rectal cancers.

As things stand, research has established a genetic component to the development of IBD, but the full mechanism behind the condition is still unknown.

This present study is not the first to investigate whether a cannabinoid might have a beneficial effect on IBD-related complications. A 2019 study published by researchers at the University of Nottingham, UK, found that another major cannabinoid, CBD, was effectively able to reduce the permeability of the human gastrointestinal tract and so reduce inflammation in the gut.

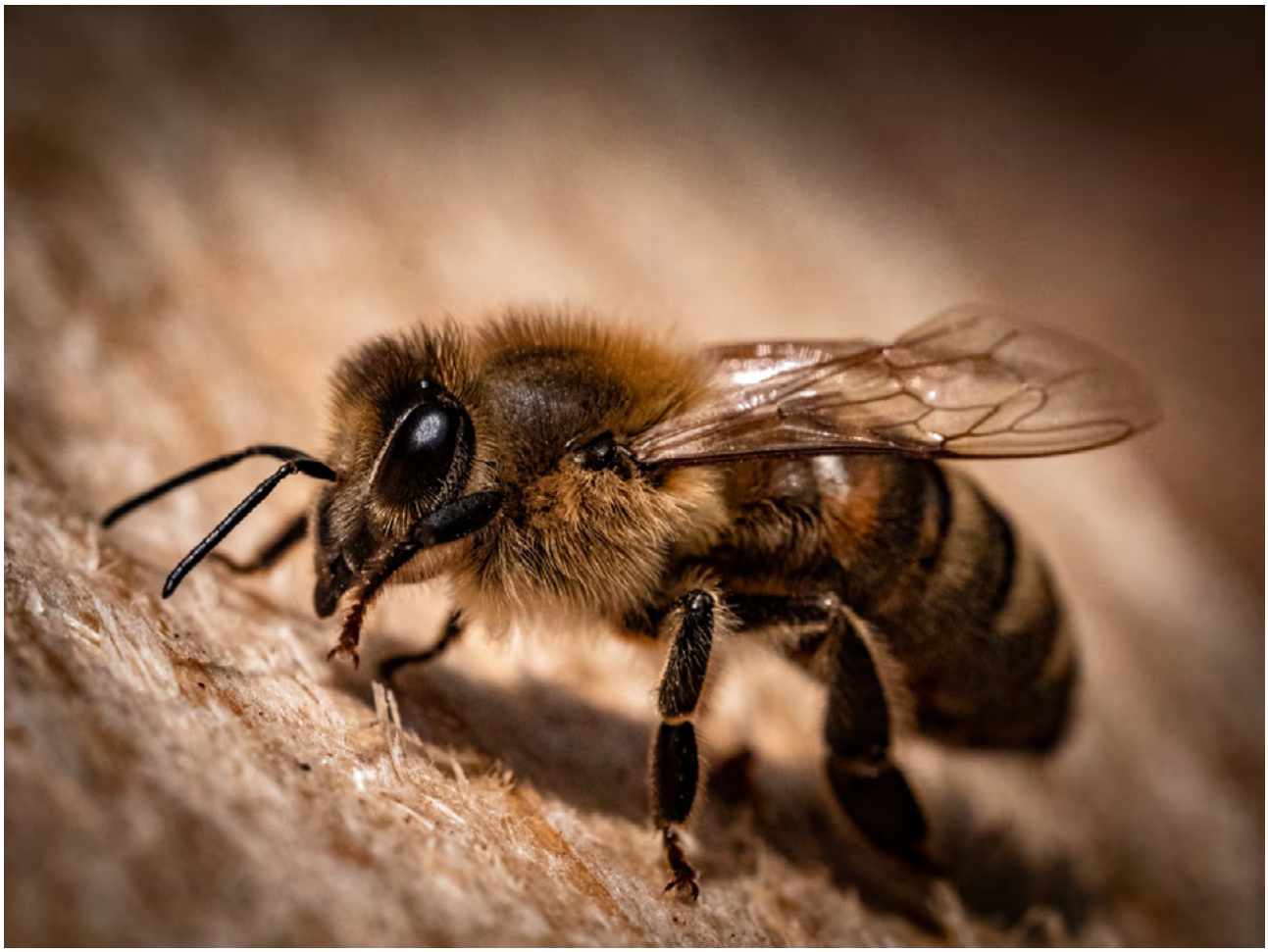
"Our results showed that THC was acting through CB2 receptors, which is exciting and suggests that compounds that activate CB2 and cause no psychoactive effects may be beneficial to prevent IBD and colon cancer."

The randomized placebo-controlled, double-blind trial saw participants use aspirin to induce a state of temporary gut permeability. After examining the sugars present in the participants' urine, the researchers found that a combination dose of CBD and the endocannabinoid-like molecule palmitoylethanolamide (PEA) was able to prevent inflammation-induced hyperpermeability in the subjects' colons.

The gastrointestinal tract functions as a selectively permeable barrier, allowing water and nutrients from food to be absorbed into the body while rejecting harmful bacteria and lipopolysaccharides. Gut inflammation can disrupt this process and cause some of these harmful substances to cross the gastrointestinal barrier, which is thought to be another risk factor for developing IBD. ♦

Hemp Extract Protects Bees From Pesticide Poisoning, Study Finds

By Alexander Beadle



An extract made from hemp may help honeybees to survive the effects of pesticide poisoning, say researchers from the Maria Curie-Skłodowska University in Poland.

Inspired by past studies that have linked cannabinoids such as CBD to beneficial neurological effects in humans, the Bee-Research group, led by Professor Aneta Ptaszyńska of the University's Department of Immunobiology, wondered if this protective effect on nerve cells might also hold true for the honeybee.

The team's discovery could be a significant breakthrough for bee conservation, which would simultaneously benefit the many ecosystems that depend on bees as pollinators.

Poisoned bees live longer with hemp extract

The Maria Curie-Skłodowska University researchers studied around 5,000 bees for this research, looking at the potential protective effects of hemp extracts against the action of neonicotinoid pesticides.

These neonicotinoids are the most widely used group of pesticides in the world and mostly work by disrupting the nervous systems of insects,

however, recent research has also suggested that these pesticides can make bees more susceptible to parasites and viruses. This includes nosemosis, a disease caused by the fungus *Nosema apis*, which is one causative factor for colony collapse.

"Bees are dying because they are malnourished and weakened by the use of pesticides and then they start to suffer from various diseases," Ptaszyńska told *the First News*. "One of them is nosemosis. It attacks the digestive system, causes weakness and cachexia (muscle loss). Bees cannot digest and absorb nutrients and then they simply die."

"There are reports that hemp extract protects human nerve cells, we decided to check whether it would be the same in the case of a bee," she explained.

The research team found that bees exposed to both a neonicotinoid pesticide and hemp extract not only lived longer than the bees only exposed to the pesticide, but they also lived just as long as the bees that had no contact all with the pesticide.

Further research is planned to confirm these results, but the researchers believe that the use of such hemp extracts could present a major breakthrough in bee conservation. In the future, the research team is looking to conduct similar tests on wild bees in a range of different prairie locations, with a view to commercializing their findings. The team has already filed a patent application for its extract preparation.

"There are reports that hemp extract protects human nerve cells, we decided to check whether it would be the same in the case of a bee."

Pesticides and the importance of a healthy bee population

Pesticides and insecticides are intended to harm insects by design, so it is no surprise that these chemicals can harm or even kill bees that find their way onto such pesticide-treated crops.

But just because these deaths are somewhat expected, doesn't mean that the extent of these deaths isn't concerning; in 2019, the rollback of pesticide regulations in Brazil was linked to the deaths of half a billion honeybees found dead in mass piles in the early spring. Similar concerns were raised at the time regarding pesticide rule changes in the United States and the United Kingdom.

The importance of bees to the global ecosystem cannot be understated. Any widespread collapse, like that which is threatened by the increasing use of harmful pesticides, would be far more devastating than just having a few fewer flowers in the world; honey bees perform roughly 80 percent of all plant pollination worldwide, and around 70 of the top 100 human food crops (accounting for approximately 90 percent of the world's nutrition) rely on bees as key pollinators.

C-Bee-D

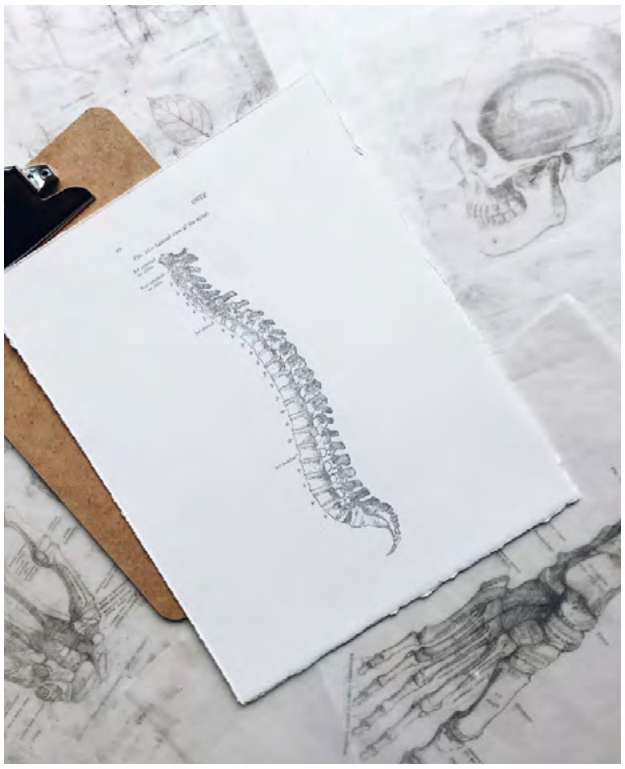
This is not the first study to draw a link between hemp and a healthy bee population. Earlier this year, researchers from Cornell University published a study in the journal *Environmental Entomology* describing how thousands of bees are now using hemp crops as a critical nutritional resource.

After extensive sampling, the researchers found that the hemp crops in central state New York were supporting sixteen different species of bee, with the taller male hemp plants being particularly attractive to the bee population.

Given the loss of regular bee habitats across the United States and the dramatic expansion of land dedicated to hemp farming following the passage of the 2018 Farm Bill, the researchers believe that the hemp crop could become a vital part of the bee population's future survival. ♦

This New Study Will Test the Effects of CBD on Spinal Pain

By Leo Bear-McGuinness



Scientists at the University of Sydney have been given AUD$1.7 million (USD$1.23 million) to help research whether CBD can treat the chronic pain that commonly occurs after a spinal cord injury (SPI).

The researchers hope that, by giving patients CBD and monitoring their brains, they can one day develop targeted treatment options for the spinal condition.

A CBD solution?

Spinal cord damage can leave injured individuals with regular pain and stiffness. Many of those living with the condition have been known to manage their symptoms with medical cannabis, but few clinical trials have actually investigated how cannabis could be treating the pain.

To better understand the effects cannabis could be having, the University of Sydney team plan to give CBD to patients with SPI-induced chronic pain in a clinical trial.

In the first part of the study, the researchers will compare the brain images of patients with SPI-induced pain to images from patients without the condition. Then, in the second part of the study, a randomized, double-blind placebo-controlled trail will be conducted to investigate CBD's ability to reduce pain.

"While there are some studies showing that CBD can reduce pain in other chronic conditions, no one fully understands how it works to reduce pain. Our study can help tease this out," Luke Henderson, a professor at the University of Sydney's School of Medical Sciences and lead author of the study, said in a statement.

The study is the latest aspect of the university's Lambert Initiative for Cannabinoid Therapeutics, a wider research project that has been investigating "the medicinal potential of the cannabis plant" since 2015. Thanks to an initial pledge of AUD$33.7 million – the largest ever given to research at the University of Sydney – the initiative has helped finance several studies that investigated whether cannabis can treat conditions such as Tourette syndrome, insomnia, epilepsy, anxiety, and cancer.

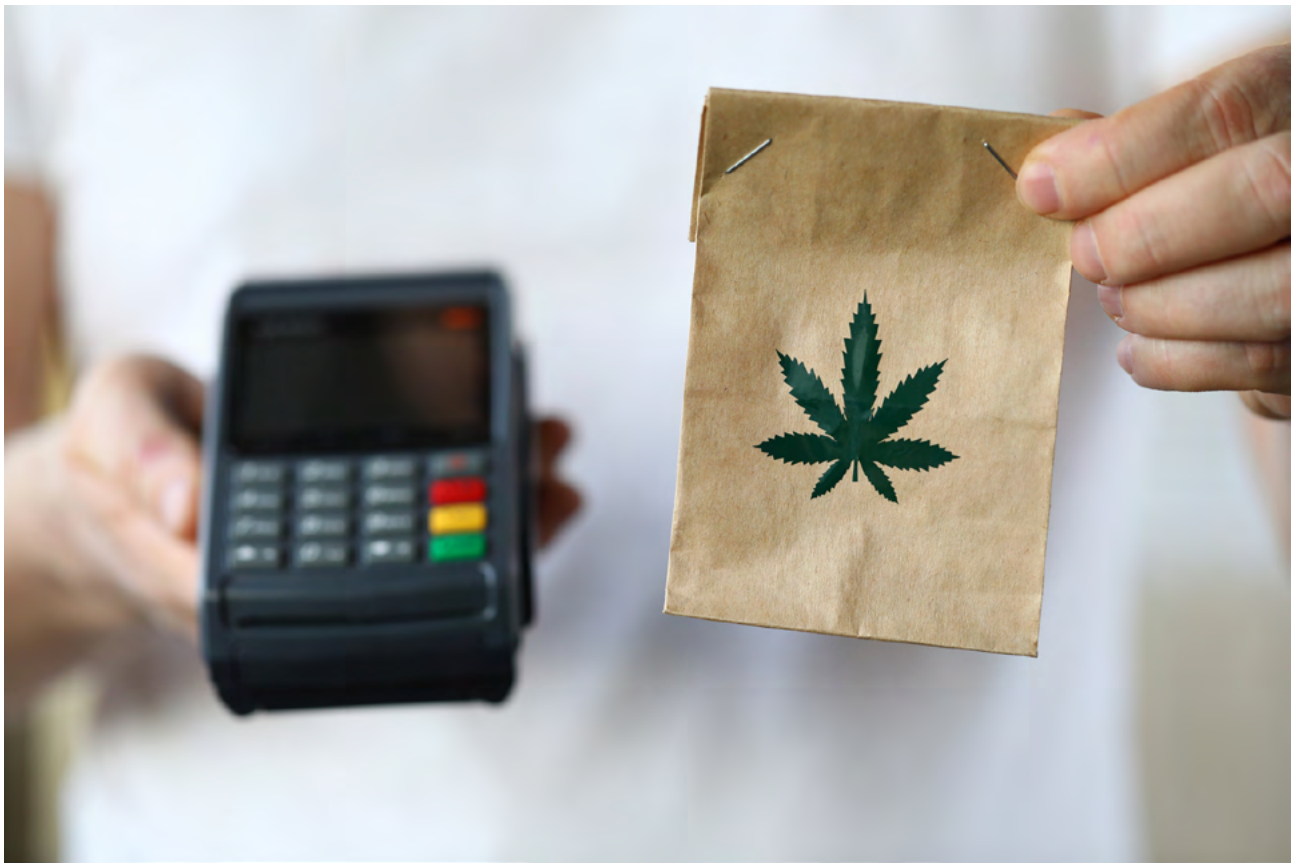
Around AUD$350,000 of this fund helped finance the spinal cord injury study, while the New South Wales Ministry of Health donated a further AUD$1.45 million.

"We hope this research will be able to make real impacts for patients and their families, paving a path towards an effective treatment for a greater number of patients," Dr Elizabeth Cairns, a research fellow from the Lambert Initiative,said in a statement.

The first trials are expected to take place at Neuroscience Research Australia institute, Sydney, and the University of Sydney during the first half of 2021. Those looking to participate can find more information at the University of Sydney website. ♦

Noncompliance in the Cannabis Industry: The Dangers of Operating Blindly

By Kelley Detweiler and Jack Teitelman



Whether you are a multi-state operator or running a cannabis testing laboratory, your day-to-day focus is ensuring that operations run safely, efficiently, and effectively. You are expected to wear many hats and adhere to a plethora of regulations at the state and federal levels that, often times, seem like moving targets. This can be a challenge for *any* operator. While compliance efforts typically do not rank "top of the list" for priorities, they do serve as the foundation for your operation, and ultimately keep you in business *and* on the right side of the law.

Still, compliance is an area where many cannabis companies fail to implement a cohesive and comprehensive program. If you are (or have previously been) in the running for a state license, chances are you had a voluminously detailed set of standard operating procedures (SOPs), developed as part of the application submission packet. Whether you are lucky enough to have been awarded a license, or you have an application in the works, SOPs create the foundation for your operational network.

Unfortunately, as we've seen time and again, shortly after cannabis companies are awarded a license, they hit the ground running too fast and abandon their SOPs (and plans). While growth and expansion take front and center, gaping holes develop exposing an operation to vulnerabilities in its compliance infrastructure. This snowball effect can permanently inhibit an operation's long-term growth and stability.

Avoid it or embrace it

Avoiding compliance in the cannabis industry is similar to training for a marathon, then showing up to the race without shoes. You put the time and effort into preparing for the marathon, then put yourself in a position to fail when it's time for the race to begin. *You wouldn't do that, right*?

One of the most common reasons cannabis companies fail to implement a compliance program is cost. We often hear that "it's too expensive," and "I can't afford it right now." Going back to the marathon example, if the shoes were too expensive, you should not have entered the competition. Compliance, like the time and energy you put into your operations, is most effective when applied proactively, so embrace it!

Complying with the innumerable laws and regulations throughout the cannabis industry is number one. Everything from cultivation to sales must follow an ever-changing set of federal, state, and local laws/regulations. While compliance solutions are not cheap, investing in a cannabis compliance program will reward you with dividends far exceeding the potential costs of non-compliance.

Complacency is costly

Whether you are just starting, or you are years into operations, now is the time to start implementing a compliance strategy. It may seem like an overwhelming task, but the truth is that complacency is costly. Federal, state, and local regulatory processes are anything but transparent. Information concerning the number of cannabis companies currently under investigation or being targeted will never be made public knowledge.

If you are on the DEA's or state's radar, there will be no warning, regulatory agents will simply show up unexpectedly to assess your facility or retail location. This isn't a scare tactic; it is a fact of doing business with controlled substances.

Examples of fines

A Massachusetts cannabis company was fined $120,000 for charges that it sold tainted vape cartridges as a result of an employee's failure to read the full set of results from required laboratory testing.

The Nevada Cannabis Compliance Board recently issued a $1.25 million fine, revocation of six business permits, and required the sale of eight additional licenses to vertically integrated operator CWNevada for a range of violations including "running afoul of the state's MJ inventory track-and-trace program."

Complying with the innumerable laws and regulations throughout the cannabis industry is number one. Everything from cultivation to sales must follow an ever-changing set of federal, state, and local laws/ regulations.

The good news is you and your business do not have to become victims of non-compliance. You can take action now to ensure you are not only ready for an unexpected visit, but are also in a position to provide these governing entities with a positive report.

Compliance vulnerabilities

Though every business is unique, here are the most common areas where we see vulnerable cannabis companies.

Poor inventory management

Never be caught in a situation where you lack sufficient evidence and/or an explanation

for missing stock or inventory discrepancies. Discrepancies are typically due to human error, lack of quality assurance, and careless packaging.

Improper data reporting

Every state that has legalized cannabis implements their own set of compliance requirements. These requirements outline the format and frequency for reporting of product testing results, inventory, and sales. Compliance reporting is a regular part of conducting business. Therefore, you should be able to provide on-demand reports that reflect accurate inventory counts in the format required by the governing authorities.

Licensing issues

Let's face it, licensing requirements for cannabis operations can be confusing. Each legal state has its own set of ever-changing requirements and regulations concerning licensing and documentation for cannabis cultivation, retail, and testing operations. Knowing what's required in your state is paramount for your continued success.

Illegal sales

Whether it's selling to an underage person, making a sale outside of authorized operating hours, or exceeding the daily sales limit for an individual, every form of an illegal sale can cause compliance trouble for an operation.

Insufficient technology

Efforts put into tracking inventory and transactions are worthless if that data is stolen, corrupted, or cannot be recorded. Loss of data due to unreliable technology is a significant compliance risk. Unreliable technology can take many forms. There have been high profile data breaches in the news recently and the cannabis industry has not been spared.

Technology is also a very valuable part of your security measures. Proper surveillance and storage equipment as well as money handling procedures, can make or break your business.

Insufficient record-keeping

Every state has its own set of requirements for how long cannabis records must be maintained. For example, California has a seven-year requirement, whereas Washington has a three-year requirement. To be safe, stay on top of your state record-keeping requirements, and conduct periodic self-audits to identify any weakness in record-keeping or any other compliance issues. Self-audits allow a cannabis business to address issues as early as possible.

Failure to follow packaging, labeling, and product safety laws

Packaging, labeling, and product safety issues are quickly becoming one of the largest compliance pitfalls throughout the cannabis industry. As noted previously, states set their own regulations, and some will impose more stringent requirements than others. Does the state you're operating in (or distributing to) require all packaging to be child-resistant? Are there regulations that mandate government warnings and/or symbols that also specify prominent placement? For example, in Colorado, all edibles must be marked with a "THC" or "cannabis warning" on each piece.

Unreliable legal partners

A common theme among compliance pitfalls is their ability to be avoided. It is vital for cannabis companies to engage the right legal and technology partners to keep them on track. For instance, prioritize finding a legal firm that specializes in the cannabis industry specific to your operational area. You want a legal team that will keep you current on licensing issues, regulatory changes and forecasting for potential compliance problems.

Have a plan

In the event of a violation, attorneys, PR nightmares, investigations, remediation, and more, can all quickly add up to in excess of $100k. But nothing compares to the costs associated with forfeiting your license. You can easily avoid these risks and their associated costs by partnering with reputable legal and compliance firms who specialize in cannabis business and operations.

The TITAN Group has helped multiple cannabis operators ranging from testing labs to multi-state operations from Massachusetts to California. Led by former DEA special agent Jack Teitelman, the TITAN Group leverages years of enforcement experience to approach cannabis compliance with the same vigor and insight as the DEA or regulatory authority you may be facing. Remember, it may be daunting, but an investment in compliance will pay dividends beyond your bottom line. ♦

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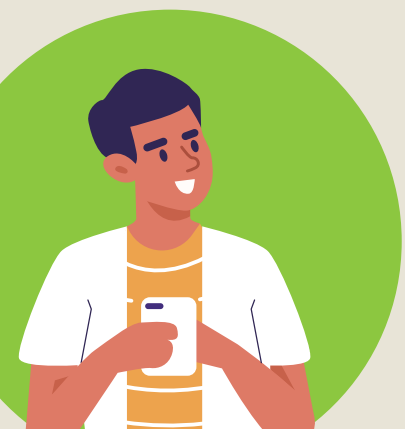

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SALES

Kelly Giles | Sales Director
k.giles@technologynetworks.com
Tel: +44 (0) 1787 314951
Cell: +44 (0) 7900 492770

EDITORIAL

Jack Rudd | Editorial Director
jack@analyticalcannabis.com
Tel: +44 (0) 1787 315116

Tiffany Quinn | Custom Content Manager
customcontent@technologynetworks.com
Tel: +44 (0) 11787 314 066

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Analytical Cannabis is published by:
Technology Networks Ltd

Woodview | Bull Lane | Sudbury | CO10 0FD | UK
Tel: +44 (0) 1787 319234

www.technologynetworks.com
info@technologynetworks.com