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Hemp Is Helping Bee
Populations, Study Finds

Cannabis Extracts Don't
Effectively Relieve Cancer Pain,
Review Finds

Scientists Locate the Brain
Areas CBD Affects to
Reduce Psychosis

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Foreword Leo Bear-McGuinness

February may be the shortest month, but it's still managed to offer plenty of developments for the cannabis industry to ponder and progress with. In Colorado, we investigate the moldy misfortunes that have supposedly plagued the state's dispensaries. And over in California, we report on the latest technological tactic to curb the thriving illicit cannabis market.

Catch up on these stories and more in 17th issue of the Analytical Cannabis Digest, our free monthly resource covering the latest developments in cannabis extraction, science, and testing.

And 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 –

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Hemp Is Helping Bee Populations, Study Finds

By Leo Bear-McGuinness

It seems that the influx of hemp across America isn't just relieving CBD customers, but bee populations struggling with habitat loss, too.

Published in [Environmental Entomology](#), a recent study has found that thousands of bees are now using hemp plants as critical nutritional resources. Given the loss of bee habitats across the US, the researchers believe the cannabis crop could become vital to the insect's future survival.

C-Bee-D

In the last few years, hemp has bloomed across the US. [According to some estimates](#), the total number of acres used for cultivation has jumped up by a whopping 328 percent since 2018, when the [2018 Farm Bill](#) recognized hemp as a legal product.

And it now appears this floral revolution is not just impacting surrounding species but benefiting them, too.

In their study, researchers from Cornell University observed hundreds of bees collecting pollen – a vital subsistence resource, from male hemp plants. After sampling 355 bees from 11 hemp farms in central state New York, the group found that the cannabis crop was supporting 16 different species of bee.

The height of the hemp plants was a particularly strong factor in attracting the insects. Tall crops attracted nearly 17 times the number of visits compared to short plants, and supported more bee species.

From hive to hemp

The bond between bees and hemp has been studied before. [Back in 1983](#), researchers found seven species living off cannabis crops on the University of Mississippi campus.

But the new study is one of the first to highlight how hemp could act as a refuge crop for the insects, which have been declining in population numbers for years.

“Hemp, a newly introduced and rapidly expanding crop in US agricultural landscapes, offers an abundance of pollen resources to bees during a period of floral resource scarcity in agricultural landscapes,” the researchers wrote.

What effect could this cannabis appetite have on the country's bee populations? Well, not the intoxicating one it seems. The researchers note that THC and other cannabinoids are unlikely to affect bee developments as the insects don't possess cannabinoid receptors.

Instead, the crop's main bee-benefit lies in its pollen, which is why the researchers are now urging all those involved in hemp production to care for their newfound bee visitors, and avoid the pest control measures that could harm their populations.

"Growers, extension agents and policy makers should consider risks to bees as pest management practices are developed for this crop," they wrote in their conclusion.



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Cannabis Extracts Don't Effectively Relieve Cancer Pain, Review Finds

By Leo Bear-McGuinness

The validity of medicinal marijuana's most celebrated benefit, pain reduction, has been called into question by a new review.

[Published in the *British Medical Journal* today](#), the systematic review of six randomised controlled trials (RCTs) found that cannabinoids were no different to placebos when it came to changing patients' average pain scores.

All trials assessed in the review examined the effects of cannabinoid extracts, such as Sativex, rather than flower-based medicinal cannabis, so its conclusions may not be entirely applicable to many patients' products.

Cannabis and cancer

Chronic pain relief is one of the [most oft-cited reasons](#) patients seek out medical cannabis. And [up to 60 percent of anti-cancer therapy patients report related pain](#), the interest in cannabis-cancer pain treatment seems to be steadily growing alongside marijuana's increasing acceptance.

[In one anonymous survey](#) conducted in a US state with legalized cannabis, 21 percent of adult cancer patients had used cannabis in the last month, most frequently for pain relief.

But, according to the new review, the science supporting these prescriptions is scarce.

"I think there is great interest in cannabinoid medicines from the general public at the moment," Mike Bennett, a professor of palliative medicine at the University of Leeds and co-author of the review, told Analytical Cannabis. "But in cancer pain, using this particular product, we can't see a positive benefit."

To reach their conclusions, Bennett and his colleagues re-assessed six RCTs in a systematic review and five studies in a meta-analysis.

Every trial was deemed to have a low risk of bias. All had tested the effects of pharmaceutical-grade cannabis, such as the THC:CBD mouth spray Sativex, rather than flower-based products. And in all trials, patients were also given opioids concurrently with their cannabis medications (or placebos).

"I think it probably reflects the reality that patients with persistent cancer pain are often on existing analgesia, particularly opioids," Bennett clarified. "I think in practice we're most interested in seeing if cannabinoids add any extra value to opioids for pain management."

But after their calculations were done, the authors found no difference between the cannabinoids and placebos with regards to changes in average pain scores.

"We use the common outcome measure for pain, which is a simple 0-10 rating scale," Bennett explained. "So, patients were asked in the trials, what was your average pain over the previous 24 hours? It can be difficult to conceptualize an experience like pain into a simple number, but that's the industry standard in terms of trials of pain."

"But as you can see, we found no overall differences in pain intensity between the trials in the meta analysis."

Cannabis for pain

Many participants also experienced unpleasant side effects during the trials. In the worst cases, patients' dizziness and fatigue caused them to dropout from the trials. Dropouts were less prevalent in the placebo groups, but the difference wasn't deemed statistically significant.

"We found dizziness and sleepiness were the two key side effects that were more frequent for the cannabinoids," Bennett told Analytical Cannabis. "And we don't know whether that's an effect purely of the cannabinoids, or whether there's some interaction between cannabinoids and opioids that produce that. I think the truth might be in the latter."

Despite their results, the authors haven't entirely ruled out cannabis' potential as a pain-relieving medication. To make a decisive conclusion, more studies will be needed, especially those involving flower-based cannabis.

"In terms of the trial design, it may be that there are benefits but they're not being picked up by the outcome we use, which is pain intensity," Bennet said. "There may be small effects on pain, but we can't detect those. And any effects come at the expense of more side effects."

"So, I think for now, the evidence doesn't support these cannabinoid medicines for the management of cancer pain. But I can imagine that more research using different sorts of cannabinoid products and different outcome measures might need to be done to be more certain."

[Speaking to Analytical Cannabis in September last year](#), cannabis-cancer researcher Dr David Meiri also voiced his scepticism of marijuana's pain-relieving properties, but espoused a more holistic approach to treatment.

"If you look in very specific and narrow window on pain, you would say it's not good," he said. "If you look how I think you should look on cannabis policy – more holistic and doing other things that are related to pain and depression, sleep, anxiety – now you're treating all of them and the patient is much, much better. If you look just to measure a very, very narrow question, then you will fail."





THC Can Chemically Bond with Vitamin E Acetate in Vape Liquids, Study Finds

By Alexander Beadle

Tetrahydrocannabinol (THC) and vitamin E acetate (VEA) compounds can become linked with hydrogen bonds, according to a new paper published in the journal [Analytical Chemistry](#).

The study, authored by members of the US Food and Drug Administration's (FDA's) Forensic Chemistry Center, details the results of a recent investigation that discovered the presence of a hydrogen bonded THC/VEA complex in un-vaped e-liquids, vaped e-liquids, and the aerosol produced from vaporizing e-liquids.

The discovery follows at the tail-end of the US's recent vaping crisis, which both THC and VEA were heavily implicated in.

What is VEA?

Vitamin E acetate, a diluent thickener known to be [used in illicit market THC vape products](#), has been officially identified by the US Centers for Disease Control and Prevention (CDC) as the cause behind [the outbreak of vaping-related lung injuries](#) being seen in North America.

"Vitamin E acetate is strongly linked to the EVALI [e-cigarette or vape produce use-associated lung injury] outbreak," stated the CDC's [official fact sheet](#) on the outbreak. "Vitamin E acetate has been found in product samples tested by

FDA and state laboratories and in-patient lung fluid samples tested by CDC from geographically diverse states."

"However, evidence is not sufficient to rule out the contribution of other chemicals of concern, including chemicals in either THC or non-THC products, in some of the reported EVALI cases."

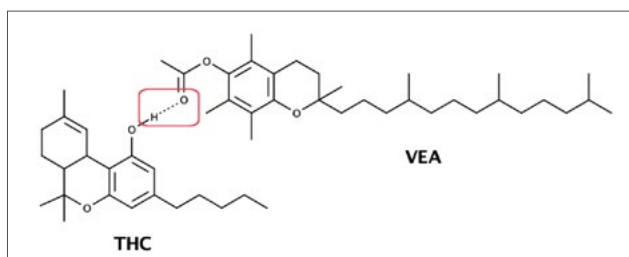
As of January 21, 2020, the CDC reports that there have been a total of 2,711 hospitalized EVALI cases, including 60 deaths. Emergency department visits related to EVALI appear to have [peaked in September 2019](#), with numbers slowly declining since then. However, vaping-related hospitalizations have yet to fall back to baseline levels.

Latest figures show that 82 percent of patients admitted to hospital with EVALI reported using THC-containing products. While this high incidence may simply be down to the majority of EVALI patients [acquiring their THC products from informal or illicit sources](#) which are more likely to contain VEA, a lack of evidence ruling out other contributing factors has motivated further study of VEA and THC-containing vape products.

Discovering the THC/VEA complex

Using Fourier-transform infrared spectrometry (FTIR), nuclear magnetic resonance (NMR) spectrometry, and direct analysis in real time ionization coupled to a high-resolution mass spectrometer (DART-HRMS), the FDA scientists in the *Analytical Chemistry* study analyzed various different vape samples from hospitals, state laboratories, and related FDA investigations.

The suspect vape samples were compared against a 50:50 un-vaped THC/VEA control mixture prepared in the laboratory, a pure THC control, and a VEA control, in each of these spectroscopy apparatus.



The proposed structure of the hydrogen bonded THC/VEA complex found in suspect e-liquids. The hydrogen bond has been highlighted here in red.

The FDA scientists observed significant differences between the FTIR absorption spectra of the suspect e-liquids and in-house THC/VEA mixture compared to the individual THC and VEA controls. Differences in the e-liquid absorption spectra fell inside the wavenumber ranges corresponding to changes in C=O bonding, C-O bonding, and OH bonding.

From this FTIR absorption spectra data, taken in combination with information gleaned from scientific literature, the FDA scientists hypothesized

that a hydrogen bonded THC/VEA complex is being formed inside VEA-containing e-liquids.

Further examination using carbon-13 NMR revealed a downfield shift in the carbonyl peak region, consistent with the presence of hydrogen bonding. The proposed structure and existence of the hydrogen bond was also supported by the results generated using DART-HRMS.

What does the discovery mean?

In the paper, the FDA scientists reveal that the results of this study have already led to additional research into the adverse health effects associated with vaping VEA.

“While analysis of the effects of vaporizing VEA is beneficial, understanding the interactions between VEA and other constituents commonly found in the vape cartridges in various phases could provide additional information needed to better understand the cause of EVALI,” the authors wrote.

“While this work doesn’t directly link the hydrogen bonded complex to EVALI, it demonstrates that the complex is present in the aerosol produced under the vaping conditions used here and would likely be delivered to the lungs in this form.”

Given that this would put the THC/VEA complex at the primary site of lung injury, the researchers advise that further work should be considered, looking at how this complex may impact the formation of toxic pyrolysis byproducts and consequently harm the lungs.





Why This ‘Hemp Task Force’ Is Out to Standardize Sampling Methods

By Leo Bear-McGuinness

There is always plenty of exciting ‘news’ when a nascent industry gets going. And the US hemp industry has been no different. There have been new businesses. New careers. New markets, and hundreds of new opportunities. But in these heady days of celebration, a crucial aspect of any new sector can easily be forgotten about: the new rules.

And, one year on from its formal legalization, it turns out US hemp production is still badly in need of some rules.

Hemp rules

“Everybody has worked together to get the policy in the United States such that it’s on a semi-firm foundation. But it’s not 100 percent there yet,” says Mark Privitera, CEO of PreProcess, a San Francisco-based process development and engineering firm. “The policy has still got issues.”

[Thanks to the 2018 Farm Bill](#), everyone involved in hemp can now agree on its legal status as an agricultural crop. But what part of the plant should be sampled for testing? How much should be taken? What equipment settings should be used to test it? These are the more practical issues that have got activists scrambling for a consensus.

“Everybody seems to have a different way of prepping the sample,” Privitera tells Analytical Cannabis. “Do I take a chocolate bar that has a

claim of 10 milligrams per square, or do I grind the whole bar? Do I take one square? What we found is, Kentucky would specify one way, New York would specify another.”

As both a hemp farmer and CEO of a process development firm, Privitera sits in a unique position between cannabis agriculture and the engineering industries. It’s one of the reasons why the Hemp Industries Association (HIA) commissioned him to head up a new task force, one with the aim of cataloguing every standard and measuring technique US companies and agencies use to measure hemp samples.

“We went to the HIA, and we said, ‘Let’s take a look at what everybody’s doing,’” Privitera says. “So what we decided to do is put together this task force and gather from everywhere.”

With the blessing of the HIA, Privitera assembled a top team of analytical scientists, university researchers, and hemp experts at the end of 2019. And now that the new year is here, they’re ready to get cataloguing.

“We had the first kick-off in December. Now the working group has been feeding in and saying, ‘Hey, here’s a method a company’s using in Texas. Here’s a method that X lab is using in Colorado,’” says Privitera. “We’re gathering that information and a group of ten of us look at it and go, ‘Okay, this looks very similar [this] method. We have five

people using that method. But those five people have five different sample prep [methods]. So there's a difference."

The trouble with inconsistency

While it might just sound like an excessive amount of interviewing and paperwork, the task force's project could be incredibly beneficial for an industry struggling to organize itself. Only a few years ago, many in cannabis lab sector were still trying to agree on which THC/CBD referencing standards to use.

"In the past, there would be larger variance in reported results, depending on whose calibration standards we used to generate our calibration curves," Christopher Hudalla, chief scientific officer at ProVerde Labs, [told Analytical Cannabis](#) in 2017. "But now that we have identified the most reliable sources and do our own internal quality control on incoming batches of samples, we do not have the problems we had in the past."

These are the kinds of technical problems Privitera knows all too well – and he's not all that confident they're an issue of the past.

"What we're seeing a lot of is, 'Okay, I measured my stuff and it's at ten percent cannabinoid, whether it's CBD or THC,'" he says. "And, of course, a processor might do their own test and say, 'Oh, no, I get eight percent.'"

"Both parties are confident in the number that they're basing on," he adds. "Right now, it's like, 'Well, I say eight, you say, ten. Let's make it nine.' It's not the way you want an industry to be."

Even as recently as August last year, reports of mass discrepancies in sample tests were still blemishing the US cannabis industry. Upon discovering that components in chocolate were interfering with cannabis potency tests, [researchers in California claimed that](#) thousands of cannabis-chocolate products across the country could be inaccurately labelled.

But by November this year, Privitera and his colleagues are hoping that their studious project will be ready to provide some much-needed guidance to cannabis samplers and analysts.

"So by November, [we'll] have our report out," he says. "To get there, the first quarter of this year, up until April, is our gather mode... then, [we'll] have that [data] crafted in the third quarter into a presentation that says, 'Okay, here's some things we need to think about.' And we're hoping then, at that point, people will get together to say, 'Okay, this is what the industry really should do.'"

Outgrowing the competition

Of course, with the cannabis industry's reputation at stake, the HIA's hemp task force isn't the only organization to try to standardize testing practices. Over in the UK, the Centre for Medicinal Cannabis [is currently reviewing the analytical testing methods employed in the UK CBD industry](#). While back in the US, the American Society for Testing and Materials (ASTM) [set out to establish its own hemp sampling protocols](#) in April of last year.

So what makes the HIA's task force so special?

"A lot of these other organisations exist and what they're starting to do is go, 'Oh, cannabis is a new sector. We have to apply our existing stuff over to cannabis,'" says Privitera. "What we're doing [that's] uniquely different is looking at the whole picture and... trying to identify who has what and looking at those methods and what the differences might be in them."

"So, if AOAC [the Association of Analytical Communities] comes up with a method for doing pesticides in cannabis, but then ACS [the American Chemical Society] comes up with [another] method and they're sort of similar but different, we're trying to identify that," he continues.

But before any comparisons can be made, the task force first needs the data, which is why Privitera is keen to stress the project's collective nature.

"The one thing I want to make sure everybody is aware of is this is open and collaborative," he says. "We're looking to reach out to everybody in all corners of the industry... This is not a competition. So if you've got info you want to share, please reach out, because we really want folks to get their information out there."



Rot and Recall: What's Going On in Denver's Dispensaries

By Alexander Beadle

Local dispensaries in Denver made headlines at the close of 2019, but not for the best reasons. Reports claimed that [80 percent of yeast and mold tests](#) carried out by city officials on cannabis products had failed.

But was this really an accurate representation of what happened in Colorado's cannabis sector? And if not, what is actually going on in Denver dispensaries?

The City of Denver's random inspections

On August 19, the City of Denver [issued a notice](#) to all licensed cannabis dispensaries in the city, making them aware that investigators from the Denver Department of Public Health & Environment (DDPHE) would soon begin a random testing drive in order to "evaluate contaminants in products on store shelves."

"Each sample will be tested for pesticides and total yeast and mold by a state- and ISO-certified marijuana testing facility," the announcement stated.

Then, in late October, a report appeared in the regional Denver publication [Westword](#). The article stated that, while the official write-up of the test results was still months away from official release, Westword had learned that 20 of the 25 dispensary inspection reports had at least one

quarantine order, which was reported as an 80 percent failure rate.

"Each of those disciplinary actions was tied to plant matter testing above the maximum allowed for total yeast and mold," the Westword article read.

Total yeast and mold tests are used in cannabis testing to detect the presence of harmful molds and fungi, which, if left untreated, can begin to [produce chemical mycotoxins](#) that are harmful to human health. Particularly dangerous are the aflatoxins, a type of mycotoxin produced by aspergillus fungi species, which are strongly carcinogenic. Acute aflatoxin exposure can be fatal in large doses, as the aflatoxin attacks the liver and causes the organ to fail.

As a result of these potential health risks, it has become commonplace for states with legal cannabis to make total yeast and mold, or other similar tests for microbial contaminants, a mandatory part of the state cannabis testing regimen.

"We want to catch any product that's got contaminants in it via pesticides, molds, or mycotoxins – whatever it is, we want to catch that," Richard Pruckler, a supervisor for the DDPHE, told Analytical Cannabis. "And that's really the point of these interventions and recalls."

“When we identify potential contaminants, we’re trying to look to a science-based thought process,” he explained. “Pesticides, whether you consume them via eating or inhalation, we know there are potential public health risks. It’s the same thing for total yeast and mold.”

So, did 80 percent of samples really fail?

Since the publishing of the original Westword article, the [“80 percent failure rate”](#) has been [bandied about](#) frequently in discussions over Denver’s cannabis system.

Over time, this morphed into a report that [“80 percent of products tested”](#) failed the city’s total yeast and old tests, when actually 80 percent of dispensaries recorded at least one failure out of the many products tested at each location.

“Based upon what [the DDPHE] have shared publicly, they sampled a total of 150 samples of three different product types,” Heather Krug, state marijuana laboratory sciences program manager at the Colorado Laboratory Services Division, told Analytical Cannabis.

“They did pre-rolls, shake and trim, and flower. They took two samples of each of those matrix types from 25 different dispensaries in the metro area, and then they had those tested for pesticide residues and total yeast and mold.”

“So that 80 percent number is not accurate of the actual overall study,” Krug explained. “The average failure rate for all three of those matrix types was about 30 percent.”

While the DDPHE has yet to release its final report, it has made public the fact that no products at any dispensary failed the pesticide testing, so it can be assumed that the failures seen in the 20 anonymous dispensaries were down to unacceptable levels of microbial contaminants.

Speaking more generally about cannabis testing in Colorado, Krug said that the state has seen an improvement in compliance when it comes to cannabis testing, but believes that microbial testing is possibly the area with the highest failure rate.

“In many ways, that makes a lot of sense because mold is this ubiquitous thing in the environment and is prone to grow in these types of environments where cannabis is grown,” she said.

“We are having a lot of ongoing discussions surrounding microbial testing and the limits associated with testing just to ensure that we are still being protected with public health, but also realistic with what is likely to occur within the cannabis plant.”

Cannabis testing in Denver

To better understand the way cannabis testing works in Denver, Analytical Cannabis also spoke with Richard Pruckler, a supervisor, and Tammy Jeronimus, a public health investigator with the DDPHE.

“Testing regulations are actually set by MED, which is the state Marijuana Enforcement Division. They are the ones that required testing. Our department, the Denver Department of Public Health Environment, doesn’t usually get involved unless it’s on a complaint basis,” explained Jeronimus.

“[The MED] have a requirement to test for pesticides and total yeast and mold count and potency, but not every harvest batch at every grow is required to test,” Jeronimus continued. “Some grows are what they call process validated, which means that for six weeks they’ve sent in samples from every harvest batch. And if every single one of those harvest batches passes for total yeast and molds and pesticides, then for the next year they only have to send in one harvest batch per month.”

When asked whether this system might have contributed to recent [cannabis products recall actions](#) taken by the city, Pruckler explained that, “the idea behind this process validation is for a cultivation facility to see that they have a good trend of passing test results. And then if so the business, in theory, then shouldn’t need to test as frequently throughout the year because they have good practices in place.”

“There is another gap as well,” he continued, “these harvest batches are tested pretty much directly after being harvested. So, there might be some time in between [harvesting and retail sale] for the product to get contaminated with molds, or if it had lower passing levels that maybe those molds could grow before it gets to the retail level.”

So while the testing system is designed to reward good practices, its schedule still leaves some vulnerable periods, such as post-harvest

processing, open to contamination. Indeed, only last month, [a DDPHE investigation found unsafe levels of yeast and mold in products](#) sold from three more Denver dispensaries.

But despite these incidences, Pruckler says that, as an early adopter of cannabis testing policies, Denver is still leading the field in yeast and mold detection.

“Denver really likes to lead by example here, and I think that the state health departments do look to Denver a lot for guidance on this,” he told Analytical

Cannabis. “We do have the ability, based on the way the city’s rules are written, to conduct these kinds of investigations, where the state and federal level would not be able to do this. So we really feel like we’re providing some valuable information to get the conversation started.”

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The Link Between Cannabis and Anxiety Has Been Found, According to Study

By Alexander Beadle

The nebulous connection between cannabis and anxiety is clearer than ever before, according to a new study.

Researchers have found that 2-arachidonoylglycerol (2-AG), a molecule produced by the brain which can activate the body's cannabinoid receptors, is able to protect the brain against stress by reducing connections between two brain regions which heighten anxiety.

The new findings, published in the neuroscience research journal *Neuron*, may help scientists to better understand why many people turn to cannabis when they feel anxious or stressed, and why many find it an effective treatment.

2-AG, cannabis, and acute stress

The endocannabinoid system is hugely important in maintaining the normal function of the body and plays an important role in the development of the central nervous system.

The active compounds in cannabis, such as tetrahydrocannabinol (THC) and cannabidiol (CBD), are exogenous cannabinoids, a type of compound that can modulate the body's endocannabinoid

system by interacting with one or more of its receptors. In the case of THC, it's a [partial agonist at the CB1 receptor](#), and its action with this receptor gives the user the feeling of a cannabis high.

As an endocannabinoid, 2-AG is produced naturally inside the body. And like THC, it's also a [CB1 receptor agonist](#), and can exert powerful effects on the body through its interaction with the endocannabinoid system.

In this latest research, scientists from Vanderbilt University Medical Center observed that when mice were subject to acute stress, a connection appeared between two brain regions, the amygdala and the frontal cortex. This connection in brain circuitry was determined to be tied to the mice exhibiting anxiety-related behaviors. Ordinarily, the researchers say, 2-AG would be responsible for maintaining the disconnect between these two regions.

"The circuit between the amygdala and the frontal cortex has been shown to be stronger in individuals with certain types of anxiety disorders," said Dr Sachin Patel, and one of the authors on the new paper, in [a statement](#). "As people or animals are exposed to stress and get more anxious, these two brain areas glue together, and their activity grows stronger together."

"We might predict there's a collapse in the endocannabinoid system, which includes 2-AG, in the patients that go on to develop [an anxiety] disorder. But not everyone develops a psychiatric disorder after trauma exposure, so maybe the people who don't develop a disorder are able to maintain that system in some way," Patel continued. "Those are the things we're interested in testing next."

The cannabinoid system might be the key to controlling stress levels

Also observed during the course of the study, the scientists found that genetic manipulations that compromised the mice's endogenous cannabinoid signaling pathways were able to strengthen the signaling between the amygdala and the frontal cortex. This caused the mice in question to exhibit anxious behaviors, even without the initial application of acute stress.

From this, the researchers concluded that the cannabinoid signalling system is able to effectively suppress the information flow between these two brain regions, making the system a crucial part of setting anxiety levels in animals.

"We don't know how or why this cannabinoid signaling system disappears or disintegrates in response to stress, but it results in the strengthening of the connection between these two regions and heightened anxiety behaviors in mice," added Patel.

"Understanding what's causing that compromise, what causes the signaling system to return after a few days, and many other questions about the molecular mechanisms by which this is happening are things we're interested in following up on."

The study's authors are now interested in how the endocannabinoid system might react to more chronic forms of stress. From there, the researchers wish to determine whether there are other environmental exposures that might compromise or enhance the system to regulate behavior.

With improved insight into the molecular mechanisms behind feelings of stress and the endocannabinoid system, the researchers believe that it may be possible to develop more effective pharmacological treatments for stress and anxiety in the future, which could provide current medical cannabis users with an alternative treatment route.



Scientists Locate the Brain Areas CBD Affects to Reduce Psychosis

By Leo Bear-McGuinness

[Several recent studies](#) have suggested that CBD has an antipsychotic effect in people with existing forms of psychosis. But just how the cannabis compound is achieving this effect has remained unclear. Now, researchers from King's College London say they may know the answer.

[Published in the journal *Psychological Medicine*](#), their new study is the first to demonstrate that a single dose of CBD may partially boost activity in two parts of the brain, the prefrontal and mediotemporal cortices, in people with established psychosis.

Regain in the membrane

To source their results, the research group gave 13 people, who had all been diagnosed with psychosis, one 600mg CBD capsule each.

After a few hours, every participant underwent a word association memory test while their brain was scanned with an functional magnetic resonance imaging (fMRI) machine. To act as a control group, 19 other participants were also scanned under identical conditions, but without any drug administration.

The researchers found that when the participants with psychosis were given the dose of CBD, the activation in their prefrontal and mediotemporal

brain areas became more like the activation seen in the control group.

These brain regions are often associated with decision making and conscious memory, and [their over- and under-activation](#) have been reported in individuals with schizophrenia, as well as in those at risk.

"Our study provides important insight into which areas of the brain CBD targets," Sagnik Bhattacharyya, a psychology professor and senior author of the study, said in a statement.

"It is the first time research has scanned the brains of people with a diagnosis of psychosis who have taken CBD and, although the sample is small, the results are compelling in that they demonstrate that CBD influences those very areas of the brain that have been shown to have unusual activity in people with psychosis."

CBD and psychosis

The study also showed that CBD could improve the connections between the brain's striatum, which helps to coordinate cognition, and the hippocampus, which has a major role in learning memory. After the one dose of CBD, this functional connectivity in people with psychosis became more like that seen in the control group.

But while the study's results may be unique, the authors note that it has its limitations, and further, larger trials will still be needed to properly understand just how CBD is affecting the prefrontal and mediotemporal brain areas.

"The finding that psychotic symptoms may show a trend towards improvement in this group even after one dose of CBD is encouraging, but requires a larger scale clinical trial to investigate if the effects would continue with longer term treatment," Bhattacharyya continued.

[Speaking to Analytical Cannabis in October last year](#), Dr Amir Englund, a postdoctoral cannabis researcher at King's College London, also called for more placebo-controlled clinical trials into

cannabis' effect on psychotic disorders, following a [major review](#) that found little evidence to support medicinal cannabis use to relieve depression, anxiety, or attention-deficit hyperactivity disorders.

"There might be all sorts of benefits from cannabis," Englund said. "But the problem we see in research is all the hype that's being built around cannabis... with that comes a potential for a very strong placebo effect."

"And that's one of the key sticking points when it comes to a field like medicinal cannabis research: a lot of studies don't have a placebo comparison, or [are] based on people who go to dispensaries and use for their own medical conditions and their own self-reports of cannabis."



Legal Cannabis Stores in California Now Require QR Codes

By Leo Bear-McGuinness

In an effort to undermine the state's thriving illicit market, cannabis businesses in California are now required to post a unique Quick Response (QR) code in their storefront windows and transport vehicles.

Code green

Piloted by the state's Bureau of Cannabis Control (BCC) this January, the QR code initiative allows consumers to scan dispensary storefronts to verify if they're licensed or not.

Now the measure has become state law. [The BCC submitted the state's Office of Administrative Law](#) on Monday, February 3, and, following five days of public comments, it was approved on Saturday, February 8. California is now the first state to require cannabis companies to display QR codes.

The scheme was designed to support California's legal cannabis market, which has been struggling against an indomitable illicit trade. In 2019, [it's estimated that \\$8.7 billion of the total \\$12 billion](#) made in cannabis sales went to the illegal market.

This fierce competition has been partly blamed for [the numerous job losses and financial woes](#) that have plagued the Californian cannabis sector since it opened in January 2018.

"The legal industry is still suffering at the hands of a booming illegal market," Dr Swetha Kaul, vice

president of the board of directors at the California Cannabis Industry Association, [recently told Analytical Cannabis](#).

In response to the illegal threat, the BCC and the Department of Consumer Affairs' Cannabis Enforcement Unit have carried out several enforced raids on unlicensed retailers. [During one recent raid](#), over \$660,000 of cannabis products and vape cartridges were seized.

"Illegal dispensaries harm and burden surrounding business owners and taxpayers," said City of Costa Mesa Mayor Katrina Foley, [in a statement following a raid last March](#).

"Allowing them to illegally operate in the city creates an unfair advantage over our lawfully permitted green zone businesses. We are so grateful for the efforts of the Bureau [of Cannabis Control] to address illegal dispensaries in Costa Mesa."

This article was updated on February 8, 2020, to reflect the decision of the Californian Office of Administrative Law and the legal requirement of 'cannabis QR codes.'

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