

# Project CBD update: the tango of supply and demand

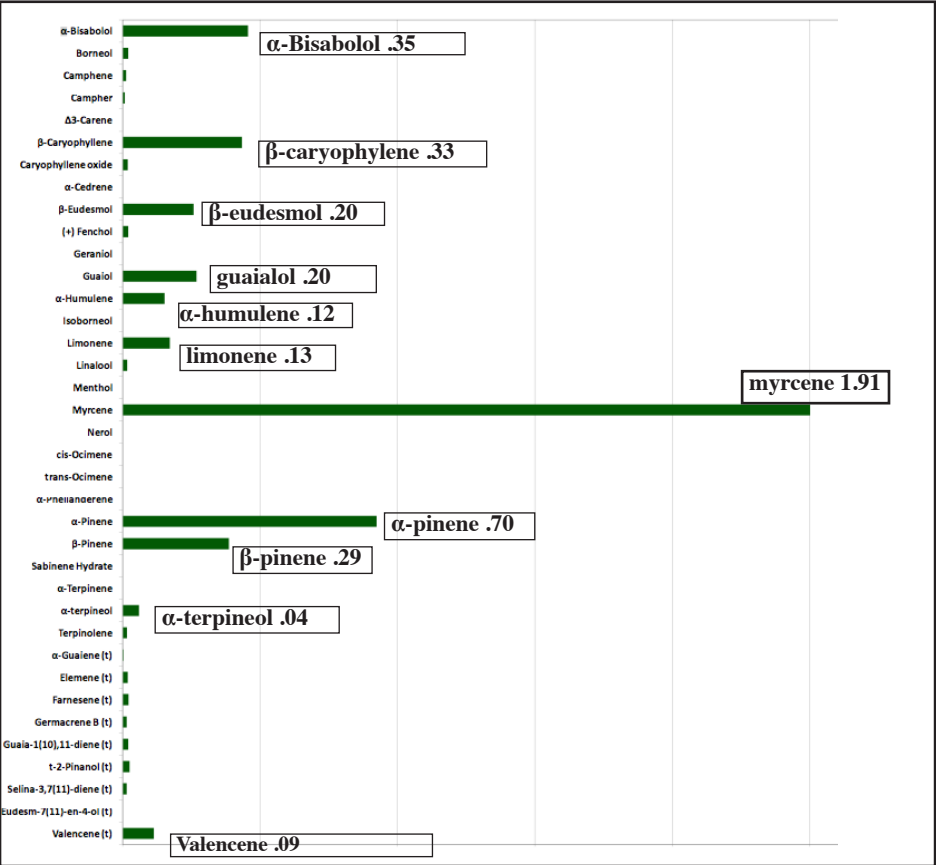
**By O’Shaughnessy’s News Service**  
Cannabidiol (CBD) is well on its way to becoming a household word. Increasing numbers of medical marijuana users know that the non-psychoactive cannabinoid dominant in hemp strains has important medical effects. CBD-rich plants have been crossed with one another and new strains of interest have been identified by labs. And, most significantly, extracts with measurable doses of THC and CBD are available.  
Several offspring of the “Cannatonic” seeds originally provided to Project CBD by European allies were found to have a CBD-to-THC ratio slightly greater than 20-to-1. Similiar CBD:THC ratios have turned up in plants identified by the grow-

*Most patients looking for CBD-rich medicine do not intend to smoke or vaporize it; they prefer tinctures or edibles for long-lasting effect.*  
ers as “AC/DC” and “Oracle.”  
Clones from these plants with 20 times more CBD than THC are being grown out in large quantities to meet the increasing demand for CBD-rich products by medical users.  
“Project CBD played a big role in carrying the message,” says director Martin A. Lee. “What we could not achieve was a balance of supply and demand.”

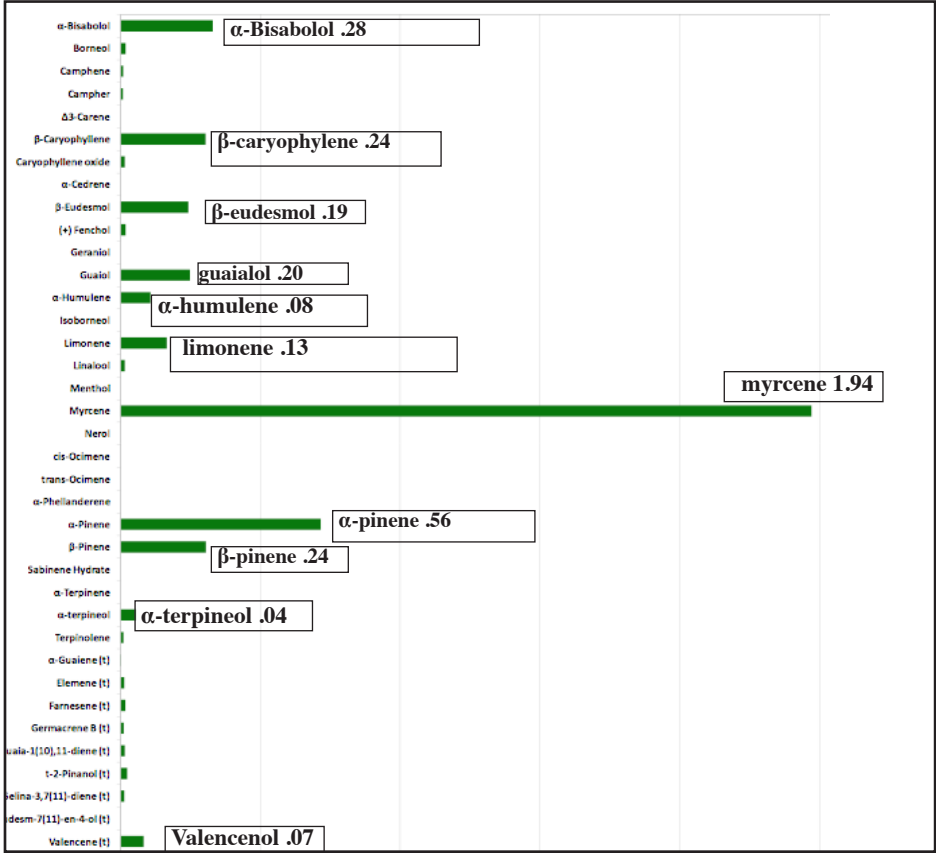
ProjectCBD.org receives a steady stream of requests from would-be users and their family members — some casual, some desperate— wondering where CBD-rich medicine can be obtained. The website, replete with introductory information about CBD, will soon be upgraded with new material, says Lee, who devoted himself to *Smoke Signals* for the past year.  
**Medical Use and “Kushville”**  
Several factors contribute to the imbalance between supply and demand. Most

dispensaries continue catering to a market Lee calls “Kushville,” and covet buds with high THC levels. Many patients looking for CBD-rich medicine do not intend to smoke or vaporize it; they prefer extracts or edibles for long-lasting effect. Since extracts and edibles can be made from trim and leaf, there is strong demand for CBD-rich verdure. Trim that growers once gave away or sold for a minimal price to tincture and edible producers is now being sold for  
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## Same strain, different names? The Werc Shop’s Analysis



TERPENOID PROFILES OF “ORACLE” (ABOVE) AND “AC/DC” (BELOW) were provided by The Werc Shop in milligrams per gram (lists at right) and bar charts. Terpenoids are aromatic compounds that give cannabis plants their smell. In both samples myrcene, a terpenoid known for its sedative properties, predominated. Both samples contained commonly encountered levels of pinene and  $\beta$ -caryophyllene, and relatively high levels of bisabolol (a constituent of chamomile), eudesmol (found in Eucalyptus), guaiolol (found in guaiacum and Cypress pine) and valencene (found in citrus fruits, especially Valencia Oranges). Guaiacum trees are native to the Caribbean, and their gum has been used for various medicinal purposes.



MAXIMUM AVAILABLE			MAXIMUM AVAILABLE		
$\Delta^9$ -THC	CBD	CBG	$\Delta^9$ -THC	CBD	CBG
Max. Wt. %	Max. Wt. %	Max. Wt. %	Max. Wt. %	Max. Wt. %	Max. Wt. %
0.07	2.12	0.03	0.07	2.25	0.03

CANNABINOID LEVELS IN LEAVES OF ORACLE (LEFT) AND AC/DC AS REPORTED BY THE WERC SHOP, contained more than 24:1 THC to CBD. Samples had been taken from four-week old plants.

## CBD Strains From Europe Grown out in California

*Allies in Europe provided Project CBD with seeds from nine CBD-rich strains. Four seeds from each variety were grown out by a trusted friend in a sunlit garden in northern California. He reports:*  
The seeds were started on April 20, 2012. The seeds were transplanted to pots on April 22nd with 100% germination. On June 20th, the survivors were transplanted into amended soil mix of garden soil and forest humus. Soil tests showed that they only needed supplemental nitrogen, which was provided by aged feather meal and bat guano. Once the soil warmed, approximately on July 1, the plants exploded into growth and only needed water and sunlight until finished.  
Flowering revealed that all plants were females. CBD Shark and Mango Haze seemed vulnerable to cold as they were very slow to start. Two CBD Shark and three CBD Mango Haze plants died while growing out in small pots. Day time temperatures were 55F to 65F and down to 40F at night.



ducer but seemed the weakest of these varieties. One plant had a few spider mites, and the dreaded bud moth/caterpillars were only interested in this plant of all the plants in the garden.  
CBD Yummy: Strong plant and good producer, late finisher that wanted more time on Oct 20th.  
CBD Medi-Haze: Strong beautiful sativa that finished with fluorescent purple hairs on the flowers. Very nice smoke with heavy buds.

Observations:  
CBD Shark: Not a big plant, no problems with bugs or molds. Set flower first around August 5, and finished first on October 1. Heavy producer for such a small plant.  
CBD Mango Haze: Strong sativa, no problems with bugs or molds. Late to set flower, never got real chunky and a late finisher. It wanted more time on the 21st of October.  
CBD Nordle: Strong and vigorous plant, no problems with bugs or molds. A good producer with a strong piney smell. Anecdotal evidence suggests it is good for pain relief, trimmers loved it.  
CBD Critical Mass: Only plant to show any sign of powdery mildew and on one branch only, was next to a plant that had lots of mildew, not a CBD variety. Was free of any other problems and was the heaviest producer. Anecdotal evidence is of strong, stoney smoke.  
CBD Outdoor Mix: A fairly good pro-

ducers continue catering to a market Lee calls “Kushville,” and covet buds with high THC levels. Many patients looking for CBD-rich medicine do not intend to smoke or vaporize it; they prefer extracts or edibles for long-lasting effect. Since extracts and edibles can be made from trim and leaf, there is strong demand for CBD-rich verdure. Trim that growers once gave away or sold for a minimal price to tincture and edible producers is now being sold for  
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hairs on the flowers. Very nice smoke with heavy buds.  
All plants were in a garden that received approximately eight hours of direct full sunlight per day. Elevation of the garden is approx 3,000 feet with southern exposure and the water is free of chlorine and all other chemicals. Ph of the water is 6.0.  
**Strain-specific oils**  
My next step is to work with a chemist who uses hexane to extract the oil —the same as the commercial food industry uses to extract soy for veggie-burgers. Our plan is to make mostly “generic CBD-rich oil” and a few strain-specific oils.  
In our first collaboration, approximately 600 grams of “Nordle” flowers were made into 130 grams of oil. I liked the smell, it was productive, and it was first harvested.  
Chemist Bernard Hopkins of Dabbers Delight adds: “A gram of oil extracted with hexane has significantly higher levels than a dried flower of not just cannabinoids but also the terpenes and flavonols, which are known to have medicinal effect.  
“With each new strain comes the possibility of making a new extract with potentially unique medical properties. By making strain-specific CBD concentrates, we are able to document and test the different entourage effects of compounds that act differently together than they do as individual constituents.  
“By comparing oils with similar CBD-to-THC ratios but different terpene levels, we can finally begin to identify which of these compounds are exerting which effects on the body and mind.”

Sample I.D.	Strain	THC	CBD	CBN	CBC	CBG	Total Cannabinoids
PAN0320-1	CBD Shark #1/A 10/1	5.0%	9.0%	ND	ND	0.4%	14.4%
PAN0320-2	CBD Shark #1/B 10/20	4.2%	7.5%	ND	ND	0.4%	12.1%
PAN0320-3	CBD Mango Haze #3/C 10/20	3.2%	7.6%	ND	ND	ND	10.8%
PAN0320-4	CBD Nordle #4/D 10/20	5.2%	7.5%	ND	ND	0.3%	12.9%
PAN0320-5	CBD Critical Mass #5/E 10/1	5.3%	10.7%	ND	ND	0.3%	16.3%
PAN0320-6	CBD Critical Mass #5/F 10/20	5.3%	8.2%	ND	ND	0.2%	13.7%
PAN0320-7	CBD Outdoor Mix #7/G 10/20	4.2%	7.0%	ND	ND	0.3%	11.5%
PAN0320-8	CBD Yummy #8/H 10/20	3.2%	8.0%	ND	ND	0.4%	11.5%
PAN0320-9	CBD Medi-Haze #9/I 10/20	4.5%	10.9%	ND	ND	0.6%	16.0%

NINE STRAINS FROM SPAIN GROWN FROM SEED BY A PROJECT CBD ALLY were tested by Pure Analytics lab in late October. Darkened cells indicate highest quantities of THC, CBD, and CBG detected among the samples.



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\$100/pound or more. Even leaves that used to be composted are being used to make extracts.

Andy Hospodor, the analytic chemist who runs the Electric Chocolate Factory (ECF), says his cost for a milligram of THC in 2012 was approximately two cents; his cost for a milligram of CBD was six cents. ECF contracted with three growers to produce CBD-rich plants outdoors. They grew “strains of our design derived from Harlequin, Omrita, and Cannatonic,” he says. Hospodor says he paid less than the \$1,500 per pound the growers had hoped for when negotiations began.



Andy Hospodor with ECF chocolates.

The Electric Chocolate Factory makes a candy said to contain 10 milligrams of THC and 10 of CBD —the same 1:1 ratio found in Sativex, the cannabis-extract spray that G.W. Pharmaceuticals markets in Canada and Europe. “We made a decision to blend some CBD into everything,” Hospodor says. ECF’s high-THC chocolate contains nine percent CBD.

Hospodor’s commitment to making accurately dosed medicines is much appreciated by physicians planning efficacy studies. He and cannabis oil maker John Erickson described their operations at a recent meeting of the Society of Cannabis Clinicians in San Francisco.

“We’re building a network that’s looking a lot like a Tupperware model,” Hosodor said, “where you have a locally established force of people who go out and find the

people who need the medicine and get it to them,” he said. “Not a pyramid scheme,” he added, detecting O’Shaughnessy’s suspicion.

ECF is trying to bring the price down to consumers by limiting its distributors’ markup to 30 percent. Says Hospodor: “An ECF distributor can, for a \$50 donation, obtain a sheet of 30 medicated chocolates —a one month’s supply for many patients— and provide it for \$65.”

ECF chocolates are sugar-free. “Sugar feeds cancer,” Hospodor said. “I learned this first hand when my mother went through a PET scan. The way they determine the spread of metastatic cancer is: inject you with a sugar dye and as the dye is metabolized it goes to the cancer sites in the body and fluoresces.

“We encourage all the people who work with our oils to make products that are sugar-free, dairy-free, and gluten-free, and to use nuts and berries. We want to have medicine that can be used by everyone, including diabetics.”

ECF uses hexane as a solvent, extracting terpenes and flavonols from plants along with their cannabinoids. Hexane, Hospodor notes, is also used by the food industry to extract soy proteins. The solvent can be recovered and reused repeatedly. But hexane, is neurotoxic gasoline byproduct, and *any* residue is problematic. A lot is riding on the skill and integrity of the analytic chemists testing cannabis for the emerging industry.

ECF sends batches of oil to Halent Labs for testing and reblends them to produce desired ratios of THC to CBD.

“We donate medicine to Laguna Honda’s hospice ward and cancer ward,” Hospodor told the SCC. “We figured we’d donate a case a month of medicine. When it grew to about two cases a week I had a talk with a supervisor and said ‘You’ve got to tell the patients that this is a prescribed-dosage medicine, you don’t just use it till you feel high.’

“She said, ‘You know, the nursing staff here knows how to administer medicine. What you have is eight times as many patients as when you started.’”

## Avidekel!

In a video that aired June 27, Reuters’ Tara Cleary reported on the availability to patients in Israel of a CBD-rich strain of cannabis. It wasn’t quite the “breakthrough” being ballyhooed, but it was a breakthrough in the eyes of the world, and Zach Klein deserves a world of credit. The transcript follows.

**Reporter:** These cannabis plants in northern Israel are taking the “silly” out of smoking pot. Tikun Olam, the company responsible for them, has found a way to produce cannabis without the side effect of getting stoned. What? Marijuana without a “high” —but that’s pointless, no? Well, not quite —with this plant, cannabis’s many medical benefits are heightened. Tikun Olam’s Zach Klein explains.

**Zach Klein (Speaking English):** Not all of the people can enjoy the high. For some of them, it’s not what they want. So they use the new plant that has all the qualities, all the medicinal qualities of Cannabis but without the high, without the psycho-active effect.” The plant has very low levels of THC —the ingredient in cannabis that makes people high— and it has enhanced levels of another element, CBD or Cannabidiol. CBD has anti-inflammatory benefits and about six months ago Tikun Olam made a major breakthrough with “Avidekel,” a cannabis plant that contains almost 16 percent CBD and only traces of THC.

**Narrator:** Professor Ruth Gallily from the Hebrew University has been studying CBD for more than 12 years.



**Professor Gallily (English):** The cannabis plant, enriched with CBD, can be used for treating diseases such as rheumatoid arthritis, colitis, liver inflammation, heart disease, and diabetes. Very inexpensive, no side effects, just optimum drug.

**Narrator:** Nine thousand people currently use cannabis in Israel to treat illnesses like cancer, Parkinson’s and multiple sclerosis. And many welcome their newfound mental clarity.

**Female Patient (Hebrew):** “For me it’s a huge advantage because it’s very easy for me now to smoke during the day, and to function this way with a lot less pain and still be focused, work and drive. It is really a great gift.”

**Narrator:** A gift that Klein sees as the first step in a long campaign to cultivate the plant’s popularity.

**Zach Klein:** “I think that cannabis will become main medicine and main treatment, not as it is today. Our main goal is to bring it to the center of medicine so it will be available for those who need it.” And those patients can get physical relief without their senses going up in smoke.

### Statewide Collective

In early 2012 a group called Statewide Collective was launched in Los Angeles to provide patients with CBD-rich extracts. Statewide grew out CBD-rich clones provided via Project CBD and is now making them available to members.

A Marin County grower who joined Statewide told us, “I grew 20 plants for them, which they picked up when they were drying. I hardly had to trim it. For every two liters produced from your plants, you get a liter for your family. Which is quite a bit of medicine. Or you can be reimbursed by patient-members.”

Statewide’s CBD-rich extracts are diluted with sterile water, organic glycerin, and alcohol for preservation and spray-ability. They are made available in five- and 30-cubic-centimeter spray bottles of darkened glass. They can be taken sublingually (sprayed under the tongue) or orally (with the extract dissolved in water and swallowed).

The original cannabinoid concentration in Statewide extracts was 7.2 milligrams per milliliter, but a decision was made to double that, based on the increasing number of members growing CBD-rich plants. “Making a stronger tincture represents a break for patient-members at the expense of grower-members,” says our source. “Pa-

*The same ratios of CBD:THC will prevail in the oil as in the plant from which it was extracted, but the amounts per gram will be about six times greater in the oil.*

tients get twice as much medicine for the same price. We get half as much for our pounds. But the sense that you’re doing something righteous means a lot, and so does not having to knock on dispensaries’ doors.”

Statewide uses supercritical carbon dioxide to make its extractions. At a certain temperature and pressure, carbon dioxide retains the density of a liquid while expanding to fill its container like a gas. The oil containing extracted cannabinoids and terpenes, after some cleaning, dewaxing and decarboxylating, is sent to the Werc Shop to determine its cannabinoid and terpene content. The same ratios of CBD:THC will prevail in the oil as in the plant from which it was extracted, but the amounts per gram will be about six times greater in the oil.

### Discussing Dosing

The psychoactivity of an extract is not simply a function of its THC content or

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## Medical Marijuana, Inc. Pitching CBD Products

By Martin A. Lee

Denver-based Dixie X Elixirs and Edibles recently launched a new line of ingestible CBD products to complement its medicated foodstuffs, tinctures and creams infused with THC.

Dixie X, founded in 2009 to serve the Colorado market, now operates under the umbrella of Medical Marijuana, Inc. (MJNA), a publicly traded start-up founded by Bruce Perlowin and based in San Diego. In the 1970s Perlowin was busted for shipping marijuana into the United States and spent seven years in prison. He is no longer officially associated with Medical Marijuana, Inc., but remains a key player in Hemp, Inc., another start-up company traded on the OTC stock exchange.

In an October 2, 2012, press release, Medical Marijuana, Inc. estimated the “CBD and wellness industry” to be “a \$5 billion market.” Dixie Elixirs, MJNA’s de facto subsidiary, is the first business to mass market CBD as a “wellness product.”

In the spring of 2012, Dixie X entered into a licensing agreement with Red Dice Holdings, another subsidiary of Medical Marijuana Inc. Dixie owner and managing director Tripp Keber is president and CEO of Red Dice Holdings and a board member of Medical Marijuana, Inc. “I make companies to sell companies. Make me an offer, and I’ll ride off into the sunlight with saddlebags of gold,” Keber told *The Daily Beast*.

*The legal status of CBD is somewhat muddled.*

The arrangement between Dixie and Red Dice is structured so that Medical Marijuana, Inc. is able to utilize only the CBD aspect of the licensing agreement, while MJNA eschews responsibility for Dixie’s THC products.

In September 2012 Michael Llamas, Medical Marijuana, Inc.’s president and CEO, was indicted by the federal government and charged with running a \$17 million multistate mortgage fraud scam. Shortly thereafter a MJNA press release announced that Llamas was “taking a leave

of absence effective immediately . . . [and] stepping down from his position in order to focus his attention on personal business matters.”

Medical Marijuana, Inc. claims that it “does not grow, sell or distribute any substances that violate the United States Law or the controlled substances act.”

### Is CBD legal?

The legal status of CBD is somewhat muddled. Cannabidiol is conspicuously absent from the DEA’s recently updated list of proscribed drugs. But “marijuana,” including CBD-rich varieties, continues to be listed as a controlled substance.

CBD as a natural compound exists only in marijuana and in industrial hemp, which are both illegal to grow in the United States. Although industrial hemp contains more CBD than THC, the overall cannabinoid content of hemp plants is much lower than what’s found in CBD-rich marijuana strains. The kind of CBD-rich plants being grown for the medical market in the U.S. produce much more cannabidiol than fiber hemp plants.

Medical Marijuana, Inc. says it circumvents the federal prohibition by extracting CBD from industrial hemp —not from marijuana— that is grown outside the United States in five different countries. MLNA won’t disclose which countries.

The initial extraction is performed by another Medical Marijuana, Inc. subsidiary, Phytosphere, which provides raw hemp paste to Dixie X and its sister firms. Like other industrial hemp products legally imported into the United States, this hemp paste apparently contains a minuscule amount of THC; hence it’s legal to bring it into the United States, according to Dixie officials.

Once they receive the crude hemp extract, Dixie personnel refine, purify and filter the paste, turning it into the CBD oil that eventually goes into three Dixie X products: Dixie X Dew Drops (a tincture), Dixie Scrips (granulated powder in a capsule), and a topical “pain relief salve.”

Project CBD received samples of the Dixie Scrip capsules and the Dixie X tinc-

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THC:CBD ratio —terpenes have a big impact. Terpenes are volatile, aromatic compounds that interact synergistically with THC, CBD, and dozens of minor cannabinoids in a way that activates and enhances their effects. Certain terpenes bind directly to cannabinoid receptors, while others dilate capillaries in the lungs, which enable CBD and THC to enter the bloodstream more easily.

Statewide staff make a subjective determination by sampling each batch of extract and assigning it a number indicating its psychoactivity level. These numbers range from one (no psychoactivity) to 10 (very stony) and are prominently displayed on every bottle.

Allan Frankel, MD, who has treated many Statewide members, observes, “There are some symptoms, such as pain with Multiple Sclerosis that appear to be treated very well with CBD. But nocturnal spasms —also a symptom of MS—seem to require THC, as well. These are all still relative unknowns And as always, we expect to see individual-to-individual differences.”

Frankel’s patients are encouraged to start with a single spray (2 mg of whole-plant CBD under Statewide’s new formulation). He says: “A relaxed feeling is generally the first change to be noted. This typically takes under five minute to onset and will be followed by increased focus and clarity. Maximal benefit of sublingual use will be present in around 30 minutes and can be expected to last up to eight hours.”

According to Frankel, “Many patients report that two milligrams of whole-plant CBD sprayed sublingually twice daily relieves the majority of anxiety, pain, inflammation, insomnia, frequent awakening, etc. For most, no dose increases will be required. Patients often report they use



**CBD-RICH EXTRACT- from Statewide Collective in spray bottle that includes a number (in red circle) indicating psychoactivity level. One spray provides a two-milligram dose of cannabinoids. Terpenes also influence perceived effect.**

less of the extract over time, particularly if the goal is to control pain.”

Frankel encourages patients to determine their most effective dosing pattern. “Starting slow and going slow is especially important for patients using high-THC tinctures. My advice is to wait 90 minutes after taking an initial dose before deciding whether or not you need an additional dose. Recently I saw a patient who was about to add a high-THC tincture dissolved in water to the CBD sprays to control pain and spasticity of MS. I advised her to start with as little as four to six milligrams —two or three sprays. ‘Wait... Wait... Wait. You will slowly find your dose and then you can take it without so much caution.’

“I also reminded her, as I do all patients using high-THC cannabis tinctures, that they are way stronger on an empty stomach.”

**The 24-to-1 Strain(s)**

Statewide blends various strains to obtain the desired CBD:THC ratios. As of September 2012 they were producing tinctures with CBD-to-THC ratios of 1:1, 2:1, and 3:1. With the harvest came plants identified as “AC/DC” that tested at 24-to-1 CBD:THC. Statewide used them in a strain-specific (24:1) extract.

*Seeking out the highest CBD:THC ratio formulations may be overly simplistic.*

“Patients using this 24:1 CBD:THC report no psychoactivity and a greatly enhanced ability to focus,” says Frankel, a man of great enthusiasms. “It is being used successfully to treat inflammatory and neuritic pain. Because it is non-psychoactive, its potential applications include any and all conditions that CBD might be effective

*Figuring out which cannabinoid and terpene combinations are most effective in treating which symptoms of which illnesses will be a huge, long-term project.*

in treating.”

Many patients are seeking out the highest CBD:THC ratio formulations, but this approach may be overly simplistic, Frankel reminds them: “In one lab study [by Jahan Marcu in Mary Abood’s lab at Temple University], a cannabinoid ratio of 1:4 CBD:THC was most effective at killing a certain line of cancer cells.”

Figuring out which cannabinoid and terpene combinations are most effective in treating which symptoms of which illnesses is a huge, long-term project. Fortunately, unlike the pharmaceutical companies that have to bribe people into taking part in their studies, the medical marijuana industry has a patient base eager to provide feedback. We are at the very beginning of a long data collection process. Theoretically, it’s all do-able.

The 24:1 strains have great appeal for producers of extracts and edibles. Statewide Collective’s grower-members are being provided with clones. Mature females are being dusted with pollen from a CBD-rich “Harle-Tsu” plant (a Harlequin-Sour Tsunami cross) bred by Lawrence Ringo of Sohum Seeds. In its vegetative state this plant had a CBD:THC ratio of 16:1.

**Halent Labs Update**

In a talk to the Society of Cannabis Clinicians, Rev. Dr. Kymron DeCesare of Halent Labs noted that many plants being grown from supposedly stabilized seeds or labeled clones were not, in fact, what the grower thought. For example, Halent —using HPLC technology that measures cannabinoids in the acid form— has tested “Cannatonic” flowers with CBDA-to-THCA ratios of 21-to-0.7 and 22-to-1. In addition to this CBD-dominant phenotype, Halent also tested “Cannatonic” with ratios of .4 to 22, and .1-to-14 —in other words, a

**CBD-rich samples tested by Halent**

- Cannatonic (21% CBDA, 0.7% THCA)
- Sour Tsunami (19% CBDA, 9% THCA)
- True BlueberryxOG Kush (18% CBDA, 5% THCA)
- L.A. Confidential (18% CBDA, 5% THCA)
- Harlequin (16% CBDA, 6.5% THCA)
- Train Wreck (16% CBDA, 4% THCA)
- Terpene Queen (14% CBDA, 4% THCA)
- Harlequin (14% CBDA, 6% THCA)
- CRC Harlequin (13% CBDA, 5.5% THCA)
- Blueberry (13% CBDA, 5% THCA)
- Wizard (13% CBDA, 4.6% THCA)
- Omrita (13% CBDA, 8.5% THCA)
- Omrita Rx-7 (12.5% CBDA, 7% THCA)
- CRC Harlequin (12.5% CBDA, 5.5% THCA)
- Harlequin (12.5% CBDA, 4.2% THCA)
- Blueberry OG (12% CBDA, 4.8% THCA)

high-THC phenotype.

Halent tracks samples that contain relatively high amounts of the so-called “minor” cannabinoids, whose medical potential has hardly been explored. When such plants are identified, the clients are notified that they have something out of the ordinary that they might want to use in a breeding program.

Three strains were found to be relatively high in Cannabigerolic (CBG) acid:

- Vanilla Kush 5% CBGA (21% THCA)
- Super Skunk 2.8% CBGA (19% THCA)
- SSDH 2.6% CBGA (16% THCA)

The following contained relatively high levels of THC-Varin:

- Pineapple Purps 2.3-4.6% THCVa (THCA 6-10%)
- Bakhye XXXX 1.5-3.2% THCVa (THCA 8-8.5%)
- TimeWreck 2-TWxVT 1.8% THCVa (19% THCA)
- Durban Poison (New) 1.5% THCVa (22% THCA)
- H 13 1.3% THCVa (18%THCA)
- Sour Diesel 1.2% THCVa (20% THCA)
- Chernobyl 1.2% THCVa (15% THCA)
- Dutch Treat 1.1% THCVa (17% THCA)
- Durban Poison 1% THCVa (16% THCA)

These were highest in cannabichromene (all containing between 0.5 and 1.0% CBCA and 15-21% THCA. Repeats included).

MJ23	Casey Jones
Mr. Nice	Mr. Nice
Train Wreck	Mystery
Green Ribbon	Green Crack
Casey Jones 9344	Mr. Nice

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MMJ, Inc. from previous page

ture and submitted these for analysis to the Werc Shop in Los Angeles and Halent Laboratories in Davis, California. We did not test the salve.

Both analytical labs confirmed that the Dixie Scrip capsules (priced at \$11 per unit) contain approximately 20 to 25 milligrams of CBD and one milligram of THC. The amount of THC in the capsules measured less than the federal government’s .3 percent limit for THC permitted in industrial hemp. “In order to be able to ship these products across state lines we need to keep the THC to a trace amount so we can service people all over the United States,” explained Dixie X marketing specialist Christie Lunsford.

The 20-something-to-one ratio of CBD-to-THC is similar to a CBD-dominant cannabis phenotype that’s available in California and other medical marijuana states. This CBD-dominant phenotype has been circulating under various strain names — Oracle, AC/DC, and Cannatonic, among others.

According to Dixie’s website, “Dixie X Hemp Oil Scrips” capsules contain several ingredients in addition to CBD: turmeric powder, “conjugated linoleic acid,” and white willow bark (herbal aspirin).

Test results from The Werc Shop indicated that the Dixie Scrip capsules were nearly devoid of terpenes, which were lost during processing. Creating CBD and THC from raw plant matter involves a process known as decarboxylation. When heated, raw CBD-Acid decarboxylates into neutral

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CBD and raw THC-Acid becomes neutral THC. But it takes twice as long (if not longer) to decarboxylate CBD than THC. And the decarboxylation process removes the volatile terpenes, which evaporate at much lower temperatures than are required to decarboxylate CBD and THC. Some cannabis extract-makers make a point of putting terpenes back into their decarboxylated products.

When tested by The Werc Shop and Halent, the Dixie X Dew Drops, a syrupy, cinnamon-flavored, glycerin-based tincture, was found to contain a negligible amount of THC (below .3% by weight in accordance with federal law) and a small amount of CBD.

The Werc Shop reported 1.51 milligrams per gram of CBD in a bottle containing 1 fluid ounce of tincture, which amounts to about 45 milligrams of CBD. Halent got slightly higher numbers: 2.1 mgs per gram of CBD, or about 62 milligrams of CBD in an ounce of the Dixie Dew Drops tincture. Halent also reported approximately 8 mgs of other cannabinoids (THC, CBG and CBC) in the tincture.

Both labs found CBD concentrations at significantly lower levels than the “approx-

imately 100 mgs CBD and other cannabinoids” promised on the label of the one-ounce Dixie X Dew Drops ampule, which retails for \$40 a bottle.

Halent also analyzed the contents of a two-ounce bottle of the Dixie X Dew Drops tincture, advertised as containing 500 mgs of CBD and other cannabinoids. Halent found 280 mgs of CBD plus 37 mgs of other cannabinoids in the two-ounce ampule, which sells for \$160.

Lacking significant THC and terpene content, Dixie’s diluted CBD tincture is weak medicine, but it may have some value. “For some people, taking one to two milligrams of CBD a day can have a positive effect,” explains Allan Frankel, MD, a Los Angeles-area physician who specializes in CBD treatment regimens. “A small dose like this might help with anxiety or seizures, but most patients need larger doses of CBD along with substantial amounts of THC.”

Whereas Medical Marijuana Inc.’s press releases initially included sweeping claims about CBD’s therapeutic efficacy, the company has recently shifted its rhetorical gears as part of a rebranding makeover. Henceforth, Dixie’s CBD products will be marketed strictly as “hemp oil” dietary supplements and cosmetics rather than as curatives in order to comply with FDA rules. “We had a little bit of a misstep in our initial launch because of our backgrounds in medicinal cannabis,” Lunsford acknowledged. “We didn’t understand what claims were appropriate.”

Toning down the medicinal claims for Dixie’s CBD products seems appropriate given that their therapeutic value is limited by the paucity of biologically active terpenes and THC, which may result in disillusioned consumers who were hoping for more pronounced results. Others may benefit to some degree from these so-called food supplements. And for many people, the Dixie X CBD products might be the only way they can access cannabidiol, especially if Medical Marijuana, Inc. is able to market its products nationwide.

Whether Dixie’s CBD products are ultimately successful in the marketplace may come down to a matter of cost-effectiveness: Do they contain enough CBD on a dose-per-dollar basis to justify Dixie’s asking price when more concentrated CBD extracts, infused with a synergistic bouquet cannabinoids and terpenoids, are becoming available in states where medical marijuana is legal?

As we go to press, we find this message from Dixie Botanicals on its website: “We have revised our labels for our small containers, and these small labels do not have enough room for the Supplemental Facts box.” Thus there is no indication of how much CBD is in these small containers, but consumers can allegedly learn “the precise amount of CBDs per serving” by visiting Dixie’s website.





Project CBD from previous page

“Pineapple Purps”

The grower of the strain that Halent ID’ed as unusually rich in THCV is known as “The Medicine Man” and his special strain is called “Pineapple Purps.” He grew it from a bag full of miscellaneous seeds and cannot narrow down its lineage. He first had it tested because consumers reporting back commented that it reduced anxiety and onset quickly.

Land says that Halent “has been working with the grower to do directed hybridization. To date none of the hybrids have been any where near as high in THCV as the original... The strain produces about half as much THCVA as THCA. The amount of THCV in different samples varies from 2.3% to 4.6% in recent testing. A sample from last year topped 5.6%. We suspect it has origins, at least in part, from southern Africa, where one finds many samples containing 1-2% THCVA, such as the classic land race, ‘Durban Poison.’”

THCV — a mild, natural antagonist at the CB1 receptor—is being evaluated by G.W. Pharmaceuticals as a possible treatment for obesity and metabolic syndrome. It reportedly counters the munchies.

We asked Land how Halent had obtained a standard by which to detect THCV. He replied, “We use a photodiode array UV detector and a mass spectrometer. Togeth-

er with some clever chemistry and data from the literature, we are able to estimate content of several cannabinoids without the use of a certified standard. As such, the uncertainty of the measurements is higher than for those compounds for which certified standards are available, but still relatively small.”

Another way to get CBD?

Halent’s deCesare says “Scientists affiliated with Halent have developed a chromatographic method that separates THC from CBD while leaving about half of the associated entourage intact with the CBD-containing component,” deCesare claims. The method allows for a CBD:THC ratio of between 30:1 and 1,000:1 — even starting from Harlequin, which typically produces a 5:2 ratio.

“The process involves decarboxylating finely pulverized cannabis flowers from a CBD rich strain, like Harlequin. The material is extracted in 95% ethanol and then boiled down to concentrate the mixture about 20:1 for separation. A column containing sorbent resin is conditioned with dilute ethanol and the concentrated essential oils are added, followed by separation with more concentrated ethanol, and fractions are collected. The first few fractions contain little of anything, with CBD (along with part of the minor cannabinoids) be-

ing collected in the middle fractions and THC coming out near the end. Fractions with desirable ratios are then recombined, boiled down again to remove most of the ethanol and water, quantitated and then finally rediluted to an appropriate dosage and volume. Since this was being done for young children, a target range for CBD of 50mg to 100mg per milliliter of ethanol (and very low total delivery of alcohol).

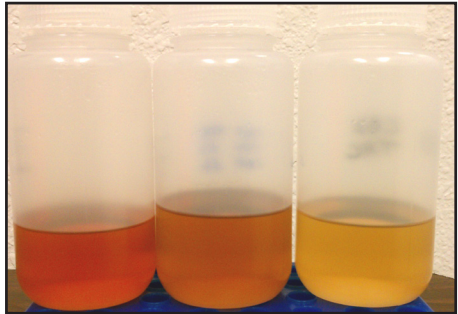
“When properly constructed, the column yields a 10-to-20 fold improvement in the ratio of CBD to THC, with each pass. For Cannatonic C-6, only one pass is necessary to achieve at least a 150:1 ratio. With Harlequin, two passes were required to achieve a >100:1 ratio.

“The added advantage in fractional collecting,” deCesare points out, “is the ability to selectively remix to the ratios desired, the inclusion of other meaningful cannabinoids like CBG, CBC and CBN, and the stability of the terpenoids concentrated in ethanol, for longterm storage.”

The separation method has not been employed on large batches —runs have involved less than five grams, done pro bono for desperate parents.

“Scaled-up technology is being developed by a couple of manufacturers to produce larger amounts and serve more customers,” deCesare said as this issue went to press in February 2013.

PROTOTYPE COLUMN for separating cannabinoids was developed at Halent Labs. Sorbent is loaded into the top portion of a disposable vacuum filtration device. Essential oils are concentrated into ethanol/water and added to the top. Vacuum applied to the bottom flask draws the solution through the column with CBD eluting significantly ahead of THC, allowing their separation.



THREE FRACTIONS from the CBD separation process vary in color. First to elude is the CBD rich fraction (in bottle at left) because it is less tightly bound to the resin. Second fraction is a mix of CBD and THC. Fraction at right contains most of the THC, which is retained longer by the sorbent resin

# CBD Shows Promise vs. Brain Cancer

Ability to stop spread of cancer could extend beyond breast cancer to brain cancer despite significant differences between the two malignancies.

Researchers at California Pacific Medical Center Research Institute (CPMCRI) have found that a compound in cannabis previously shown to decrease metastatic breast cancer now shows promise in stopping aggressive brain cancer as well. The findings are particularly important given the safety of the cannabis compound and the fact that patients with advanced brain cancer have few options for treatment.

“These findings offer some hope in an area where there’s been very little, and give even greater potential to our earlier research,” said Pierre-Yves Desprez, Ph.D., senior scientist with CPMCRI and corresponding author of the new study. “We thought that the mechanisms for the progression of brain cancer would be quite different from that of breast and other cancers, and the fact that we were able to duplicate the same success for brain cancer that we did for breast, quite frankly, amazed us.”

There are about 20,000 people diagnosed with brain cancer each year in the US alone, and very few therapies exist to help those with the most aggressive form of the disease. Brain tumors, known as gliomas, are the fourth most frequent cause of cancer-related death in younger patients aged 35–45; the median survival span from the time of diagnosis is 14 months. And the incidence of the most malignant type of tumor, glioblastoma, appears to be on the rise.

The journey to this discovery is almost two decades in the making. CPMCRI scientists, led by molecular biologist Dr. Desprez, had previously discovered that Id-1, a gene first identified in 1991 and known to be a key player in embryonic development, was a culprit in the metastasis of certain types of breast cancer —particularly those that do not have hormone receptors (“triple negatives”) and thus do not respond to non-chemotherapy treatments such as Tamoxifen or Herceptin.

Subsequently, as a collaborative effort with CPMCRI pharmacologist Sean McAllister, PhD, the researchers found that cannabidiol (CBD), a non-toxic and non-psychotropic compound found in cannabis, inhibited (“down-regulated”) Id-1 in human breast cancer cells —meaning that CBD stopped Id-1 from causing cancer invasion and metastasis. Initial research conducted in cell cultures was followed with animal studies.

“Originally, our research was focused on cannabis compounds similar to THC, the primary psychoactive compound in the plant. We were excited to realize that CBD, this lesser known compound in cannabis, could halt breast cancer metastasis through the inhibition of Id-1,” said Dr. McAllister, senior author of the new study.

Similar Effect for Brain Cancer Cells

The new CPMCRI study, published online December 13 in the journal *Cancer Research*, shows that the Id-1 gene has the same key role in regulating aggressive brain cancer cells as it does in controlling metastatic breast cancer cells: when the gene is “turned off,” the spread of the brain cancer cells is slowed down. And more importantly, CBD was effective in turning off the gene in both culture and animal models using human glioblastoma cells. As with breast cancer, the more aggressive the disease, the greater success CBD had in controlling it.

“What’s so thrilling about this discovery is that it offers a new window of hope,” said Liliana Soroceanu, MD, PhD, an expert in brain cancer research at CPMCRI and lead author of the new study. “CBD has proven effective in reducing the aggressiveness of a subset of tumor cells, namely the ‘cancer stem cells,’ which are resistant to radiation and chemotherapy. We believe CBD shows great promise in rendering these cells more responsive to standard therapies.”

The researchers feel confident that this new research, conducted with human tumor biopsy samples and animal subjects, validates their earlier breast cancer studies. Efforts are now underway to begin clinical trials with cancer patients to confirm efficacy and determine the best means of drug delivery.

The new study in *Cancer Research*, entitled “*Id-1 is a Key Transcriptional Regulator of Glioblastoma Aggressiveness and a Novel Therapeutic Target*,” can be found online at the website of the American Association for Cancer Research. Other co-authors are Chandani Limbad, Eric Singer, Juanita Allison, Isabel Adrados, Rumi Kawamura, Arash Pakdel, Daniel Nguyen, Robert Arauz as well as Drs. Ryuichi Murase, Yayoi Fukuyo, Sabeena Khan, Garret L. Yount and Dan H. Moore.

— Dean Fryer, SutterHealth.org

Steep Hill’s Gold Standard

When Steep Hill lab’s general manager-Wilson Linker started listing the advantages of the “Quantacann gold” system, we thought he was using *gold* to mean “high-end.” But he was speaking literally about a key component of the technology that Steep Hill provides to dispensaries, growers, and others seeking to assess the contents of cannabis samples without bringing them into the lab.

The original Quantacann system involved direct measurement of flowers and did not report on the contents of edibles and extracts. The upgraded technology, which measures Cannabis in solution, can provide readings on extracts as well.

Cannabis in solution (isopropyl alcohol) is exposed to infra-red light at the client’s site. Each compound in the solution reflects IR light in a unique pattern. Reflectivity data from the Quantacann is conveyed via the internet for spectral analysis by servers back at the lab and the contents reported “in real time.” The reflectivity of the inert gold disk provides a baseline enabling the spectral analysis.

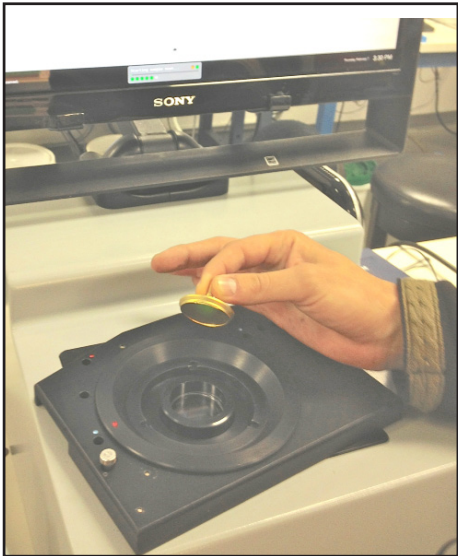
Nine clients are leasing Quantacanns from Steep Hill. Linker expects all to go for the gold. “It adds a couple of steps to the preparation of samples,” says Linker, “but it’s more accurate.”

Steep Hill president David Lampach got

the idea for the Quantacann from an equipment salesman who described their use by breweries in connection with grain purchases.

Steep Hill has begun testing for terpenes, and has leased a headspace sampler that will enable more detailed reporting.

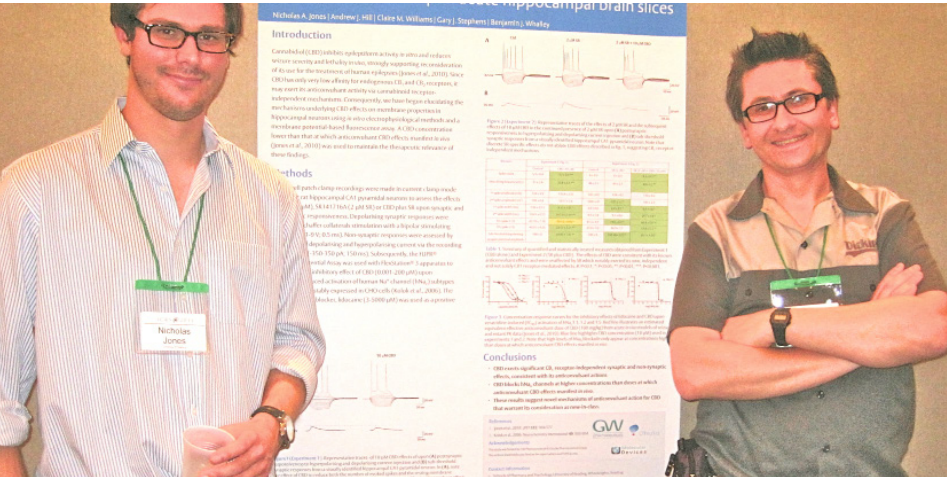
Linker is concerned about the growing popularity of BHO (butane hash oil). “Terpenes are incredibly important,” says Steep Hill co-founder Addison DeMoura. “One reason butane is used as a solvent, despite its dangers, is that it’s cold and pulls out the terpenes.”



WILSON LINKER, GENERAL MANAGER OF STEEP HILL LABS, with equipment that enables fast assessment of an herbal product’s contents by a client at a remote site.



Project CBD from previous page



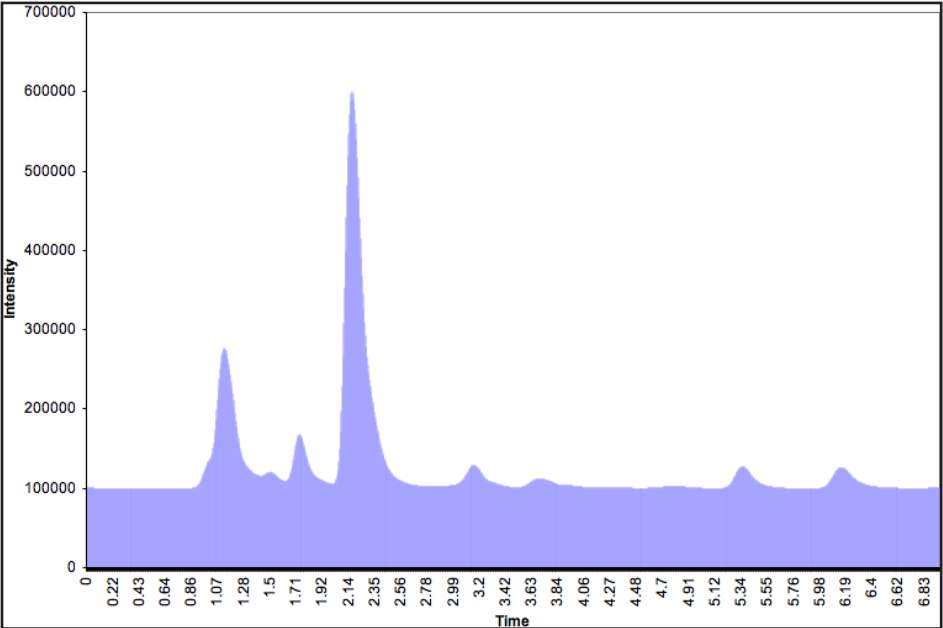
Nicholas Jones and Benjamin Whalley at the 2011 ICRS meeting, where they presented findings about the mechanism of action by which CBD exerts anticonvulsive effects at the cellular level. Recently they published findings about CBDV (see below).

### Conclusions

- CBD exerts significant CB<sub>1</sub> receptor-independent synaptic and non-synaptic effects, consistent with its anticonvulsant actions
- CBD blocks hNa<sub>v</sub> channels at higher concentrations than doses at which anticonvulsant CBD effects manifest *in vivo*.
- These results suggest novel mechanisms of anticonvulsant action for CBD that warrant its consideration as new-in-class.

#### References

1. Jones et al., 2010, *JPT* 332:569-577



MASS SPECTROGRAM OF “HARLE-TSU” SAMPLE that won “CBD-Richest” honors at this year’s Emerald Cup in Humboldt County was provided by SC Labs. Horizontal scale shows time in minutes as a solution containing cannabis components extracted by methane passes through a beam of ultraviolet light. The vertical “Intensity” scale shows the amount of UV light being absorbed by various compounds (and not hitting the detector) as they pass through in sequence. The spike above 2.2 is indicative of CBD Acid. Spike above 1.2 is from caffeine, which the lab uses for calibration purposes.



CBD-RICH HARLE-TSU PLANTS GROWING IN THE SOHUM SEED PATCH, SEPTEMBER 2012.

### Note from a blue-ribbon grower

My name is Christopher Larson. I am a producing member of TeaHouse Collective, a group dedicated to growing only organic, sustainable, sun-grown cannabis, and within that group I have undertaken to provide and promote the use of CBD. To that end I grew 15 different strains from clones and seeds last season, including the seed-grown Harle Tsu A that I obtained from Lawrence Ringo SoHum Seeds, tested and identified as exceptional and entered in the Emerald Cup.

*It frustrates me that so many in the cannabis culture express huge interest in CBD but fail to back it up with any tangible support.*

The Emerald Cup was an interesting experience. I was not present when the award for CBD was announced as I was manning the TeaHouse table in the 215 tent, so there are no acceptance photos. When I learned that my entry had won I tried to find a certificate or something. I was told that Tim Blake had been embarrassed at the cheesiness of the glass prize (a hapless murky brown dildo of a pipe with ‘CBD’ on the end) and would replace it in the future, but meanwhile no certificate for CBD, although all other categories had them.

I began to wonder if I’d really won when there was no mention on the Emerald Cup-website. I did eventually find the test results from SC Labs, but no indication that it was a winner. It frustrates me that so many in the cannabis culture express huge interest in CBD but fail to back it up with any tangible support. They play up its importance but don’t use or grow it!

That hasn’t stopped me from doing my best to make it available. I have 1:1, 2:1, 3:1 4:1, 5:1, 10:1, and 20:1 CBD/THC ratios available as flowers, and have used five extraction methods. These are available to any practitioners or patients. I make 10:10 and 44:8 Cannachocolates and have just done a trial run of disposable vape pens loaded with CO<sub>2</sub>-extracted Cannatonic oil (37% CBD, 35% THC). More ratios to come. I was instinctively opposed to disposable anything, but it turns out that for palliative care and serious illness, loading vaporising apparatus is far too difficult for many patients. **Christopher Larson**

## CBD-V As a Treatment for Epilepsy?

Researchers led by Ben Whalley at the University of Reading reported in the September *British Journal of Pharmacology* that cannabidivarin —CBDV—suppressed seizures in animal models of epilepsy. Whalley *et al* were testing PURE CBD OR a CBDV-rich extract developed by G.W. Pharmaceuticals. CBDV also proved effective in combination with currently used anti-seizure drugs.

Whalley told the university’s news service: “There is a pressing need for better treatments for epilepsy. It’s a chronic condition with no cure and currently in around one third of cases, the currently available treatments do not work, cause serious side-effects and increase fatalities. Currently prescribed drugs to prevent fits can cause significant side-effects to individuals’ motion and cognitive abilities that can adversely affect the quality of life for people who have to take them every day.

“Our work has highlighted the potential for a solution based on cannabinoid science... Cannabidivarin is the most effective and best tolerated anticonvulsant plant cannabinoid investigated to date.”

Whalley and colleagues are now trying to figure out the mechanism of action by which cannabidivarin works to reduce seizures. GW hopes “to advance CBDV into human clinical trials” in 2013 , according to R&D director Dr. Stephen Wright.

### Labs Declare War on Dirt

The Association of California Cannabis Laboratories (ACCL) recently conducted its first round of validation testing. According to CEO Robert Martin of CW Analytics, nine member labs received identical liquid samples containing known quantities of THC, CBD, and CBN. When the labs’ measurements were compared, says Martin, “the values clustered together, except for one lab that had machine issues that week. We’re working with them to help resolve their problem.”

The labs taking part were The Werc Shop, Halent, Delta 9 Technologies, Excelsior, Halent, Green Style, Sequoia, Steep Hill and CW Analytical. “We’re working together in the interests of accuracy,” says Martin. “We all want to know that the numbers we’re coming up with are correct.”

Safety is another ACCL goal. Labs occasionally encounter Cannabis samples containing microorganisms that are associated with filth and can cause disease. The level can become concerning, Martin says, if bubble hash isn’t properly processed, handled and stored. “If you concentrate a product of the earth, you can concentrate dirt,” he observes. “We don’t see this problem in oils that are made with alcohol or waxes made with butane —they’re microbiologically cleaner.”

The ACCL works with California hash makers “to help them clean up the way they handle their shake and the way they process and store their product. We work with vendors, go back through the process, and determine where it was contaminated. Ninety-nine percent of the time we find the smoking gun and they mobilize and do whatever it takes to fix the problem.

“In 30 years working in the food industry,” Martin adds, “I never saw that. When notified of a problem, people would usually respond with denial or blame. In this industry, everybody wants to find out why it’s dirty and how to clean it up.”

Martin is frankly proud of the trade association, which he helped launch in 2009 with David Lampach of Steep Hill (who is the ACCL president) and Jeffrey Raber of the Werc Shop (now the CFO). “When it first started the labs wouldn’t talk to each other,” Martin reflects. “Now we have a forum where we can air our grievances. It’s really wonderful, a mature way of dealing with things. We hope we can provide an example for the rest of the industry: collaboration is the way to win.”

### CBD in Colorado

New therapeutic opportunities are possible in the Rocky Mountains now that marijuana has been legalized for adult use. The Colorado “Free for All” program has announced plans to give away CBD-rich plants to anyone 21 years old in Colorado “who wants to try using CBD to prevent disease and increase their long term quality of life.” Participants will be given plants with the expectation that they will clone them and gift them on to others. “People no longer have to wait to get sick before they can use CBD legally,” Cannatech volunteer Bill Althouse explained.

Scheduled for launch in Denver in mid-February, the CBD-rich “Free for All” will be accompanied by educational events about the potential benefits of CBD. Those who receive a free plant will be encouraged to participate in a long-term study of the use of CBD as a preventative medicine. For more information, contact info@cannatech.coop. And for updates and announcements about the CBD-rich Free For All, follow Project CBD on Facebook.