

Meanwhile, back where it all began...

Impeded by raids and bans, California producers strive to keep up with demand for CBD medicinals

By Fred Gardner

In Washington, DC, Douglas Throckmorton of the FDA speaks proudly of the help his team has been providing GW Pharmaceuticals as that company strives to bring Epidiolex to market as a medicine (which it certainly is).

The states of Colorado and Kentucky in 2014 allowed CBD-rich cannabis to be cultivated as “industrial hemp” and made into oil (among other products). CBD-rich oil made from hemp harvested in 2015 is being widely distributed as a dietary supplement (which it is, too.)

But the state of California, where voters made this progress possible by legalizing marijuana for medical use in 1996 has done nothing to facilitate production and distribution of cannabidiol in any form. To the contrary, CBD producers in California have persevered despite raids and tightening political constraints.

Nevada County, for example...

Patricia Smith runs the Americans for Safe Access chapter in Nevada County in the gold country west of Sacramento. Soon after Sanjay Gupta showed how CBD-rich cannabis reduced Charlotte's Figi's seizures, Smith arranged a public screening of the CNN “Weed” Special at a theater in Nevada City, and invited two mothers of epileptic children to tell their stories afterwards.

Her goal was to drive home to local growers and law enforcement that CBD-rich cannabis was needed by children in their community, too.

Smith's next step was to organize a giveaway of plants donated by Project CBD's Martin Lee —including clones from an ACDC plant with a 20:1 CBD-to-THC ratio. Publicized only by word of mouth and a small flyer included with purchases at local nursery-supply stores, NevCo ASA's April 2014, “Plant Exchange” drew 130 medical marijuana growers and patients to an old community center in the town of North San Juan.

The plant exchange went off without a hitch. The people who came were Nevada County “mom-and-pop growers” whose median age looked to be about 50. Ten people brought starter plants to add to those being given away.

The plants to be given away had all been tagged with abbreviations. They were listed on a whiteboard and their characteristics were explained to the attentive, standing-room-only crowd by Smith's ally Brad Peceimer. Most were clones of the original ACDC plant. Clones of Medi-Haze (10% CBD, 6% THC) and Harlequin (8.5% CBD, 5.5% THC) were also distributed, as were some high-THC clones.

Smith warned the prospective growers that ACDC was “fragile,” the branches have to be braced. “Even in the clone stage you have to stake it,” she said. “But even though it's a low producer, the medicine it produces is invaluable.”

The turnout was heavier than expected, so the organizers announced a three-plant maximum. Nobody grumbled. A man whose teenage son has epilepsy asked if some ACDC clones could be set aside for him in case there was a run on them.

People formed a line on the porch outside the building and circled back in to select their plants. A donation of \$10-\$15 per plant was encouraged to fund a local initiative campaign —Measure S— to override a 2012 ordinance severely limiting cultivation. It took less than half an hour for close to 400 plants to get picked up and carried off. People lingered in the parking lot afterwards to chit-chat.

Electoral Politics

Patti Smith hoped that cultivating and distributing CBD to people in need would bolster the credibility of the medical marijuana movement and build support for Measure S.

Local drug warriors, led by Sheriff Keith Royal, contend that medical marijuana is a cover for recreational use. In 2012 the Board of Supervisors enacted a restrictive “Medical Marijuana Cultivation Ordinance.” Sheriff Royal claimed he was receiving 20-to-30 marijuana-related complaint calls a day, and that an ordinance was needed to deal with an “emergency.” There had been a much-publicized episode in which a grower allegedly threatened violence against a law-abiding citizen.

Smith hoped that half the cannabis harvested from the CBD-rich plants given away by ASA would be donated for free distribution to patients in need. “We're asking people when they trim to give us the ‘sugar leaf,’” Smith said, “so we can turn it into oil and donate it.”

Enough was donated from the 2014 harvest to provide for the two moms whose desperate situations ASA had publicized. But, according to Smith, “many patients with epilepsy and movement disorders who would benefit from CBD can't afford the astronomical prices some dispensaries are asking for it.”

Who are the “mom-and-pops?”

Growers in Nevada County are generally characterized as “mom-and-pops” or “bigger growers.” The mom-and-pops, by Smith's rough definition, range from patients growing for themselves, friends, and family members —six to 12 plants, typically— and growers with 30 to 40 plants intended for medical dispensaries.

“I don't have a problem with people getting remunerated,” she adds. “Not everybody can afford to give it away.”

Smith describes her constituents as “small organic farmers,” some of whom grow vegetables for the farmers market.

About two-thirds own their land, she estimates, one-third are renters.

The Board of Supervisors continues to look askance at Nevada County growers supplying dispensaries in the Bay Area. Smith comments: “This is why the medical marijuana program needs to be statewide rather than county by county. We are an agricultural county. I doubt very much that residents of the Bay Area grow their own



ORGANIZER BRAD PECEIMER listed the plants to be given away at a springtime plant exchange sponsored by Nevada County ASA. In September he would be busted on dubious charges.

tomatoes, produce their own milk, or raise chickens for their eggs.”

Smith thinks the campaign to restrict cultivation was organized by Royal in collusion with property owners from Alta Sierra, a neighborhood whose residents include many retirees and professionals who commute to the Sacramento area.

Through the Freedom of Information Act, NevCo ASA requested copies of the complaints that had supposedly inspired the sheriff to seek a restrictive ordinance. “We were told that they hadn't been recorded,” Smith says. “They didn't have a single complaint on file!”

Sheriff Royal had also publicized a 25-plant grow on the side of a steep hill near an elementary school. “We now think it was a set-up,” says Smith. “Photos of this grow were first introduced at the Board of Supervisors meeting to bolster the need for the ordinance. They were reprinted in our local paper, *The Union*. But Brad Peceimer discovered a discrepancy: the grow was not where they claimed it was, the topography was different!”

“Law enforcement says they only go after the biggest, most egregious growers,” says Smith. “That is so not true!”

The goal of NevCo ASA's 2014 ordinance was to protect the rights of small growers. “Law enforcement says they only go after the biggest, most egregious growers,” says Smith. “That is so not true! We've had calls from people with four plants, six plants, 12 plants... One of the common excuses for citing the mom-and-pops is that the ordinance bans cultivation within a certain distance of a school bus stop. One bus route has 72 stops listed. Only 12 are active stops, but they're enforcing the marijuana ban on all of them. “A mom-and-pop called and said he had 12 plants in a greenhouse and they came and took it, said it was too close to a bus stop. He asked for the address of the bus stop and looked it up. It's inactive. ‘I've lived here for 12 years and never seen a bus stop here ever,’ he said.” “The bigger growers,” according to Smith, “might be people who are selling it out of state. They stay far away from me. I only know of their existence from stories I've heard from people I've met.” Some bigger growers used to support NevCo ASA, which was formed to oppose the restrictive ordinance of 2012. Of the 2014 election, Smith says, “The bigger growers are not going to follow our ordinance or the county ordinance. They're going to do what they've always done and cross their fingers they don't get caught.”

Fear and Loathing in Nevada County

“Politics can get pretty ugly so no one should be surprised at the campaign against Measure S,” says Patricia Smith. Sheriff Royal's deputies arrested Brad Peceimer September 10 on charges of culti-

vation with intent to sell, and obstruction of justice.

Peceimer, 54, is an erstwhile aerospace engineer whose heaviest prior was a traffic citation. His father was a circuit court justice with the California Public Utilities Commission. He thinks he incurred Sheriff Royal's wrath by debunking some assertions the lawman made at a meeting in a local Methodist church.

As Peceimer tells it, the raid began around 7:30 in the morning with “seven or eight men, guns drawn yelling ‘Sheriff's Department’” outside his front door. From his doorway he asked to see a warrant and was told “‘We don't have to show you any goddamn search warrant.’”

Peceimer, says he “laughed and said, ‘Yeah, you do.’”

“As we were discussing it, I stepped forward to let my wife out the door and they grabbed me and threw me to the ground. It was like one of those videos you see on TV. I was having trouble breathing...”

“They pretty much destroyed the inside of our house.”

When he asked for an attorney, Peceimer says, an officer named Mark Hollis “slammed his little recorder onto the table and it broke to pieces.”

There were tragic and comic aspects to the raid. NevCo ASA had organized another plant giveaway for the evening of September 10, and the the law enforcers destroyed 180 CBD-rich clones that were going to be given away.

“They were three inches tall,” Peceimer says ruefully. “People drove from as far away as Alturas and Middleton to get three plants each. And they had been destroyed that morning —four years' worth of genetics. They destroyed everything in my shop, every fixture, every light. My wife has a hardwood-turning business and they knocked over all the racks of beautiful hardwoods.”

On Peceimer's confiscated cell phone were texts from 150 people who were arranging to buy grass-fed beef that a friend of his had raised. The law enforcers started calling these people —including a reporter for the Nevada City Union named Liz Keller— on the assumption that they were buying pot customers.

“The reporter told Hollis, ‘It's hamburger,’” according to Peceimer. “Hollis told her, ‘No it's not, it's marijuana.’”

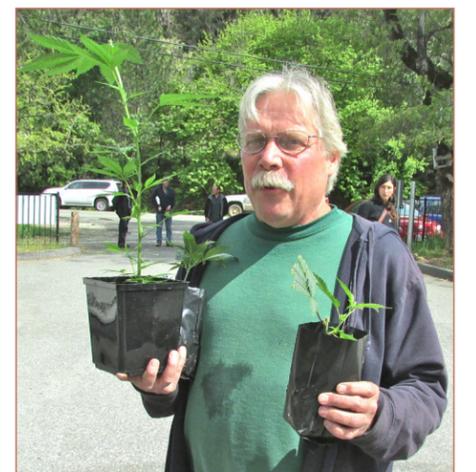
The intrepid drug warriors also, according to Peceimer, “called engineers at Lawrence Livermore Lab and asked if they were buying marijuana from me.”

When he subsequently interviewed for a job with General Dynamics in Grass Valley, “One of the first questions I was asked was ‘What's going on with this pot thing?’ I explained the whole story and the guy said, ‘We'll take that into consideration.’ But I knew he meant, ‘Your engineering career is over.’”

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THREE WOMEN WHO SCORED (ACDC plants).



FOR A SON WITH EPILEPSY: two ACDC plants.

CBD cultivator who protested 2014 raids says North Coast authorities were more discerning this year

Susan Schindler's 2014 cannabis crop consisted of experimental varieties, most of them CBD-rich. On the morning of August 5, a party of raiders descended on her property on Van Arsdale Road in Potter Valley, California —three parcels, on each of which 25 plants were growing.

Schindler is a brassy woman, 68, a breast cancer survivor who grows cannabis for and counsels other patients

The raiders' helicopters had no identifying numbers, their uniforms had no insignia or nametags, and they refused to say what agency, if any, they were with, according to Schindler. She summarized the operation thus: "Refused to show badges, warrants, paperwork of any kind. No evidence sheets. Just basically 'rip-and-run.'"

Many other growers reported similar encounters that week. Mendocino County Sheriff Tom Allman, acknowledged at a public meeting in Laytonville that his deputies and other law enforcement agents were conducting raids in the area, but said they would never fail to identify themselves.

"This was genetics that was basically irreplaceable."

Schindler says that growers deemed out of compliance by the sheriff are supposed to get summary abatement notices 10 days in advance of a raid, "but no one I know has ever received one."

Her plants were cut down with hacksaws. She says, "including some from Martin Lee of Project CBD, two 'Doug's Varin' plants [rich in THC], some from Mr. Nice. We had plants that Lost Coast Botanical asked me to grow, clone and send back. I said 'No problem.'"

Two of Schindler's 25-plant gardens were in the open, one —consisting of "plants Lawrence Ringo was experimenting with when he passed away"— was in a greenhouse set up for light deprivation.

The plants that Schindler found most intriguing were "a cross between ACDC 10 x Harle-Tsu, x Yah 2. This was genetics that was basically irreplaceable." The Yah varieties are "early finishers," she notes.

Schindler says her lawyer, Joe Elford, was told the raid on her property was justified by "the 'open-field' doctrine." She explained:

"This law was made for hunters. If you are hunting on your land and the deer or the bear goes off your land and onto somebody else's land, as long as that animal is in an open field, you have the right to pursue that animal and not be considered a trespasser. They're using that as a loophole and saying if your plants are not close to your house, if your plants are in an open field, we can drop down without a warrant and we're not trespassing.

Schindler says she approached Sheriff Allman before the meeting in Laytonville at which he addressed reports of unidentified raiders descending from helicopters to eradicate medical grows. "I asked him if he realized that the medicine cut down in my garden was all CBD. He said to the public, 'Someone came up to me and said that they had some kind of special CB something, and quite frankly, I don't care. A marijuana plant is a marijuana plant.'

"A different approach"

Schindler thinks that protests from bona fide medical growers may have made a difference in Mendocino this year. "Although the harvest isn't over yet," she told *O'Shaughnessy's* in early November 2015, "law enforcement has had a different approach towards legitimate growers. For the most part, as far as I know, the sheriff seems to have focused on egregious grows like Island Mountain."

The reference was to raids conducted in late June by Mendocino, Humboldt, and Trinity County Sheriffs in the Emerald Triangle's remote, mountainous outback. State Fish and Wildlife agents and National Guard officers also took part. State Senator Jim Woods and Mendocino County DA David Eyster went as observers.

The raiders hit 87 parcels and eradicated 83,578 plants over the course of four days, according to the three sheriffs at their press conference. Plastic-covered greenhouses constructed from curved PVC pipe were "typically 100 feet long with about 300 pot plants," according to Allman, and built to facilitate light deprivation.

The sheriffs emphasized environmental damage wrought by growers, who, collectively, were said to use some 500,000 gallons of water for irrigation per day (six gallons per plant). The water, mostly diverted from tributaries of the Eel River, leeches nitrates from the fertilized soil before percolating back to the river, which is drying up due to a four-year drought, choking with fertilizer-enhanced algae, and clogged with debris from amateur heavy equipment operators clearing land to grow more cannabis.

An account of the Island Mountain raid in the *Anderson Valley Advertiser* noted, "Many of the plants were smaller than the typical tree-sized plants that have become popular in inland Mendocino County lately, but they were adults, not starts or juveniles." Were they CBD-rich cousins of Charlotte's Web?

"Vertical integration could destroy the small farmers," Schindler says.

Sue Schindler has "attended countless political meetings of various organizations —MCPC [Mendocino Cannabis Policy Council], CGA [California Growers Association], SFA [Small Farmers Association], and the Board of Supervisors, all working toward creating a county ordinance that will serve both small craft farmers and get support from the Supervisors and the community. There is a March 1, 2016 deadline to accomplish this, or else the State Medical Marijuana Regulations will automatically be put in place."

What do small farmers want?

The collective goal of the small growers is a niche in the regulated marketplace that will enable them to make a living in the style they became accustomed under Prop 215 and SB-420.

Small growers at the meetings Schindler attends want the county ordinance to stop defining marijuana production and distri-



'DOUG'S VARIN' PLANT, thought to be high in THC, was shielded from the weather in early November. Sue Schindler planned to harvest the buds around Thanksgiving.

bution as a public nuisance. They want the sheriff to stop summarily destroying plants. "They want due process like every other citizen has when accused of a crime," Schindler says. And there is widespread fear of a so-called "legalization" initiative that would allow single businesses to grow, distribute, and sell cannabis. "People are worried that vertical integration could destroy the small farmers," she says.

Comes now THC

The raiders who took down Susan Schindler's plants with hack saws in August 2014

left a stalk about eight inches high on one of her two THC plants. She resuscitated the plant and got some clones off it. Then, she recounts, "I sent four clones to two really competent indoor growers, and they had no luck with it.

THCV-rich cannabis would be a welcome addition to the herbal medicine chest.

But the clones Schindler planted grew into "magnificent, 10 foot-tall, Sativa-looking plants." As of mid-November their flowers were still developing. "Something about those South African plants," Schindler comments. "They never want to finish."

Her hope is "to get some flowers sufficiently mature to pollinate with another THC strain called Black Beauty, and get a cross." The plants are destined for "a friend who has Parkinson's and has gotten medical benefits from THC."

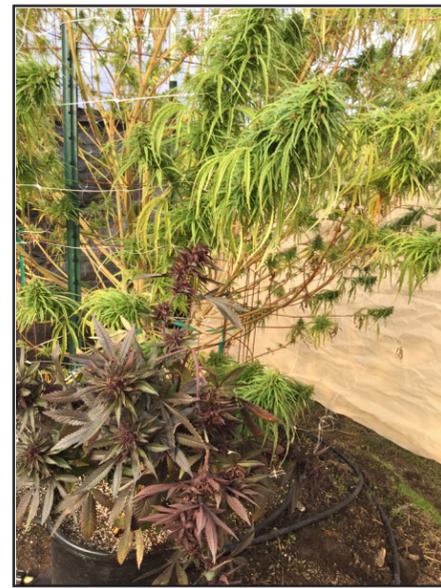
THCV-rich cannabis would be a welcome addition to the herbal medicine chest. Studies by GW Pharmaceuticals suggest that THC and CBD beneficially modulate levels of hormones involved in diabetes. The GW website states, "Both

pragmatic but crass—but pragmatic

Mendocino's Approach to Enforcing Marijuana Laws

Mendocino County Sheriff Tom Allman and District Attorney David Eyster both instituted innovative programs to expedite the transfer of funds from marijuana growers to their offices. The sheriff in 2007 began selling zip-ties at \$25/plant, guaranteed to ward off eradication by his deputies.

The district attorney's program enables



'BLACK BEAUTY' WITH MALE FLOWERS is in plastic pot beneath female Doug's Varin. Pollination is limited by putting female branches under a plastic bag with the male.



POLYESTER BLADDER USED TO STORE WATER for cannabis cultivation dwarfs a deputy during the "Island Mountain" raids in late June, 2015. Photo courtesy Humboldt County Sheriff's office.

THCV and CBD have now successfully been the subject of Phase I clinical trials. GW is preparing to advance a combined THC:CBD drug candidate into a Phase IIa multiple dose study in the treatment of dyslipidaemia and fatty liver in Type II diabetic patients."

Schindler could not continue what she calls "Ringo's experiment" in 2015 because the identifying tags had been lost in the raid. She grew out three of his plants — crosses of Harle-Tsu and Sour-Tsu— along with other CBD-rich and some high-THC varieties.

The fourth year of drought is affecting growers adversely in various ways. Schindler uses two gallons of water per plant per day, and registered with the state water board for rights to draw from a tributary of the Eel. But low water levels in 2015 resulted in blue-green algae in the nearby stream, and then *fusarium* wilt attacking the plants.

"By the time we figured out what the problem was and spent \$2,000 on an ozonator for our tank, the plants were already stunted. So the quantity was disappointing, but the quality is unbelievable."

As this issue was going to the printer in late November, Schindler was awaiting test results from Sonoma Lab Works, and

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people facing marijuana-related felony charges —who haven't been convicted of such felonies in the past—to get them reduced to misdemeanors by paying "restitution fees." In 2014 the DA's program brought in \$4.1 million, 5% of which went to the sheriff's office for eradicating the plants and making the arrests, and 5% to the DA's office for arranging the dispositions.

The editor of the *Anderson Valley Advertiser* considers the program realistic. "Under the previous DA, lots of these cases were going before juries and the DA was losing them and, in the process, the DA was losing large amounts of public money pursuing them," wrote Bruce Anderson. "DA Eyster's strategy of keeping pot cases out of court as he settles for fines is a win-win all round, although the bustee probably grumbles at the amount of cash he or she is out."

Schindler was charged with cultivation of marijuana with intent to distribute, a felony. She was inclined to plead not guilty as a bona fide herbal medicine provider, but settled for a misdemeanor.

Schindler paid \$11,000 in restitution fees and \$3,500 to her lawyer, plus fees to the court and ongoing probation fees. She will remain on probation till August 8, 2016 —two years from her bust. She has been working off her 200 hours of community service.

so was the grower who gave her the Black Beauty plant, George Bianchini.

If it turns out that THCV is associated with weight loss, the compound could generate as much demand as CBD.

Studies conducted by Roger Pertwee and colleagues at the University of Aberdeen suggest possible applications in treating diabetes and metabolic syndrome. If it turns out that THCV is associated with weight loss—a hypothesis amenable to testing—the compound could generate as much demand as CBD.

Recipients for clones from Schindler’s THCV-rich plants will include colleagues who expedited the availability of CBD-rich cannabis in California such as Lost Coast Botanicals. Care By Design has met with Schindler and Bianchini’s production manager, as well as Doug (whose THCV plant bears his name); the company hopes to grow large quantities of each variety.

Skilled plant breeders will undoubtedly try to maximize THCV content while introducing other desired qualities, such as faster flowering. (We miss you, Ringo.) And we expect that, just as with CBD, physicians and patients in the US will organize grassroots “parallel studies” to the ones that GW Pharmaceuticals has been conducting by rules laid down by the regulatory authorities.



‘LIGHT-DEPRIVATION’ process involves covering and uncovering plants to control the length of light to which they’re exposed. The onset of shorter days triggers flowering in nature. In a well designed greenhouse, it’s a two-person job, not too strenuous.

If it turns out that THCV does *not* lead to weight loss (or enhanced psychoactivity), if its real benefit turns out to be, say, reducing hormone levels associated with diabetes—then production and distribution will be carried out by the sincere medical cannabis producers like Susan Schindler and her friends, who grew and developed CBD-rich varieties before demand for them had been established.

CBD Purveyors

Harborside Health Center, purchasing manager Timothy Anderson, has been reluctant to order CBD extracts made from hemp—foreign or domestic—based on his reading of the available literature. “Drug-type cannabis diverged from hemp thousands of years ago,” Anderson says. “I know they both contain CBD, and it’s the same molecule, but I suspect there may be subtle differences that we don’t understand yet. So for patients, I think extracts made from drug-type cannabis plants might be more suitable. Just a suspicion,” Anderson adds.

Harborside offers CBD-rich sprays, capsules, tinctures, edibles, and vape pens from such California sources as Prana,

Jaden’s Juice, Treatwell, GummyCares, VedaChews, Care By Design, and Bhang. (Bhang’s gums and sprays use a European hemp-derived CBD isolate.)

Other small producers of CBD medicinals being used by California patients include Synergy Wellness, Statewide Collective, Myriam’s Hope, and Bhutan. The companies contract with growers representing collectives of medical users and, typically, affix patients’ paperwork to plants. Almost all report that one or more of their growers have been raided by law enforcement. And yet production keeps increasing to meet demand.

The year 2015 saw companies ramping up technologically at an accelerated pace—buying, building and modifying machinery to extract compounds from *Cannabis* for infusion into products such as vape pens and gel caps.

This expansion entailed hiring people trained in chemistry and engineering to operate and maintain the increasingly sophisticated equipment. Clerical and sales personnel, construction crews and warehouse workers have been hired, and local economies have profited—not to mention the state of California, which reported a \$3.1 billion surplus in November.

The media, while bemoaning water use by cannabis growers, has downplayed the economic boost provided by the industry. They run news items about tax revenues from marijuana sales, but very little about job creation.

CBD Guild, the Santa Rosa company that manufacturers Care By Design and AbsolutExtracts (THC products), went from five employees in November 2014 to 80 (including contractors) in November 2015. “And they pay taxes,” says Edward Ross.

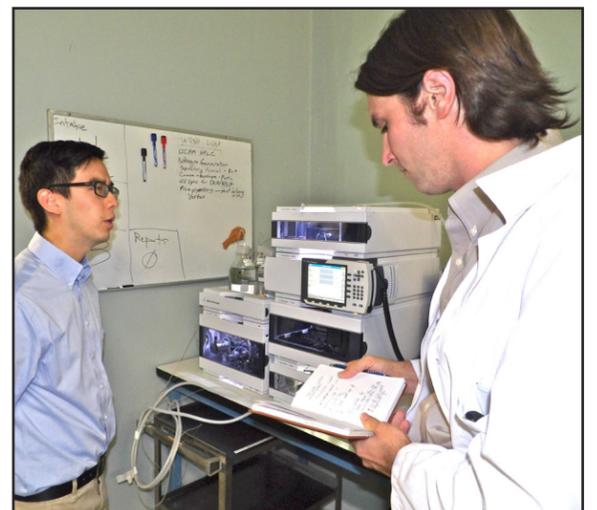
Ross is CBD Guild’s liaison with growers, all of whom are in Northern California. He used to live in Costa Rica, speaks Spanish fluently, and has built a crew of skilled workers who are dispatched

to support growers as needed. “Kind of like a landscaping service,” he says. “They do everything from installing light-deprivation greenhouses to harvesting finished plants—as much or as little as the grower requests.”

Ross also oversees the nursery where clones—cuttings—are started in rock-wool rooting kits. These are transferred to one gallon pots and grown out for a few weeks before being moved to a large greenhouse—also Ross’s responsibility.

The greenhouse produces three crops a year, thanks to “light-dep,” which enables growers to induce flowering. (In the wild, most varieties of *Cannabis* start to flower when daylight gets down to about 12 hours. Flowering is triggered in light-dep greenhouses by covering the plants with black plastic that two people can draw with relative ease over wire rigging).

Light-dep greenhouses are so widely used in Northern California that an annual event is held in Redway in early September—about when Cannabis begins to flower naturally—to honor practitioners with a “Golden Tarp Award.” The trophy is a small statue of a worker pulling a tarp. Among growers, “light-dep” has been further abbreviated to “dep” (as opposed to “full-term”).



DAVID CHEN OF SONOMA LAB WORKS AND JAHAN MARCU with Agilent 1290 Ultra-High Pressure Chromatograph. Photo was taken during Marcu’s second audit of the facility for Patient-Focused Certification.



ANNELIESE CLARKE (RIGHT) AND JESSICA LILGE (with box of Care By Design sprays). Clarke was with a group of Florida mothers invited to California by Harborside’s Steve DeAngelo to see if CBD options unavailable in the Sunshine State would help their seriously ill children.

CBD beneficial in treating less-than-catastrophic conditions

Doctors and dispensaries report that it’s not only cancer, MS, and epilepsy patients who are requesting CBD-rich medicine. People are increasingly using CBD sprays and gel caps to reduce everyday aches, pains and stress while making it through the workday without loss of functionality.

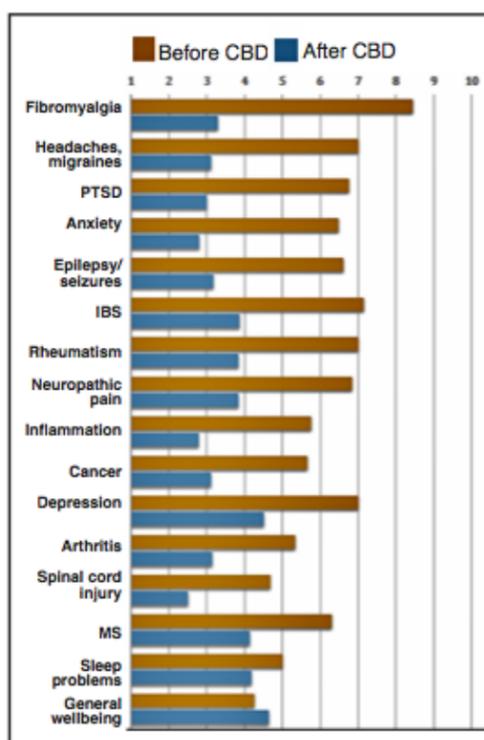
Between March and August of 2015, Care By Design, a producer of cannabis

extracts with five different CBD-to-THC ratios, surveyed visitors to its website for at least 30 days concerning:

- The conditions for which they were taking CBD-rich cannabis.
- The ratio of CBD-to-THC being used.
- The impact of CBD-rich cannabis on pain or discomfort, energy, mood, and overall wellbeing.

Out of 2,495 visitors to the site (www.cbd.org) who had been using CBD for at least 30 days, 703 responded—a high rate of participation (28%), reflecting the desire among medical marijuana users to share and learn from their experience.

IMPROVED SENSE OF WELLBEING was attributed to use of CBD-rich medicine by patients responding to Care By Design survey. List at left is of conditions patients were seeking to treat. Horizontal bars measure sense of wellbeing from 1 (“I feel great”) to 10 (“I feel the worst imaginable.”) Tan top bar in each pair shows patient’s self-assessment before using CBD, blue bottom bar shows “after CBD.” Patients whose purpose in using CBD was to improve general sense of wellbeing were disappointed more often than not, and people using to treat sleep problems were helped only marginally.



Care By Design excluded 55 incomplete responses and 27 from people who had not been taking CBD-rich cannabis for at least a month, leaving 621 completed surveys to be evaluated. What follows is a summary of the results.

• WHAT CONDITIONS ARE PEOPLE USING FOR?

Medical marijuana patients reported using CBD-rich cannabis therapies for a wide variety of conditions:

21.4% using for mood or psychiatric disorders: anxiety (6.5%), depression (4.0%), PTSD (3.6%), ADD/ADHD (1.6%), bipolar disorder (1.6%), stress (1.6%), schizophrenia (1.2%), autism (0.8%), and addiction (0.4%).

19.4% using for inflammatory conditions: arthritis (9.7%), general inflammation (6.5%), rheumatism (2.4%), and Crohn’s disease (0.8%).

13.7% for conditions marked by pain: neuropathic pain (7.3%), headaches and migraines (3.6%), fibromyalgia (2.8%).

12.4% using for diseases of and injuries to the central nervous system: multiple sclerosis (MS) (3.2%), epilepsy and seizures (2.4%), spinal cord injury (2.4%), Parkinson’s disease (1.6%), Traumatic Brain Injury (TBI) (1.6%) and other neurodegenerative disorders (1.2%).

12.1% reported using cannabis to treat cancer-related symptoms—more than were using for any other single condition.

Conditions affecting fewer than 2% of respondents were not reported.

IMPACT ON SENSE OF WELLBEING

A large majority (88.2%) of patients using CBD-rich cannabis to treat specific conditions reported an improved overall sense of wellbeing. (See chart at left.) The greatest improvement in wellbeing was reported by patients with fibromyalgia, headaches and migraines, PTSD and anxiety.

Interestingly, however, a small majority of patients who had been using CBD-rich medicine in hopes of improving their overall sense of well-being, were disappointed. How to explain this paradox?

Clearly, if a patient has a specific problem that CBD ameliorates, using CBD-rich medicine will enhance their sense of wellbeing. But if they’re healthy and using CBD on the assumption that a neuroprotective, anti-inflammatory effect can only be beneficial, they might not start feeling better, and might even experience some dysphoria as CBD modulates the effects of THC.

IMPACT ON PAIN AND DISCOMFORT

A majority of all patients (72.6%) reported a decrease in pain or discomfort.

All patients (100%) with headaches and migraines, fibromyalgia, irritable bowel syndrome (IBS), and spinal cord injury reported a decrease in pain or discomfort.

A biochemist walks into a greenhouse...

By Fred Gardner

Dale Deutsch welcomed and befriended us when the wife and I first started attending meetings of the International Cannabinoid Research Society in 1998. (Not everyone in the ICRS thought a journalist associated with the medical marijuana movement ought to be allowed in.) Also, Deutsch turned out to be a very clear explainer, which is what one needs when the subject is Fatty Acid Amide Hydrosase.

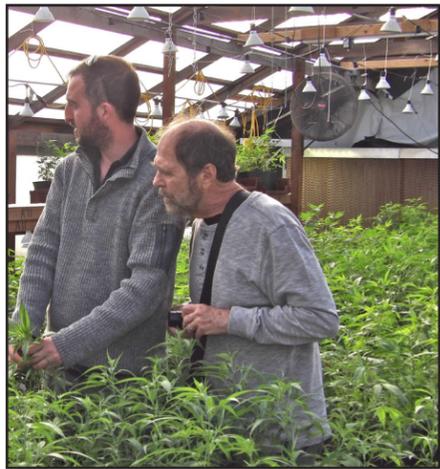
It was Deutsch and colleagues in his lab at Stony Brook University on Long Island who identified FAAH as the enzyme that breaks down anandamide. This finding led to development of "FAAH-inhibitor" compounds that augment anandamide levels without involving a Schedule I substance.

Deutsch's lab continues to study how anandamide gets from the membrane to the endoplasmic reticulum, where it is broken down by FAAH. His team has identified three enzymes that do the transporting, and elucidated how THC and CBD augment the effect of anandamide at the CB1 receptor. (See illustration at bottom of page.)

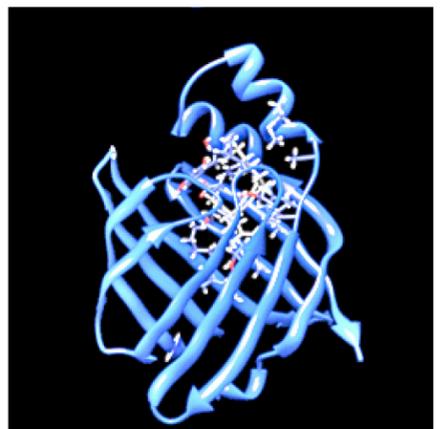
At the 2015 ICRC meeting, Deutsch was given the lifetime achievement award. In San Francisco on a sabbatical this fall, he expressed interest in seeing how the medical marijuana industry functioned —how products are actually made. Care By Design invited him for a tour of their facilities in Sonoma County, and I went along. Here's some of what we saw and heard.



PAPERWORK ON PLANTS identifies medical users for whom they are being grown. Netting will support heavy ACDC flowers.



DALE DEUTSCH IN THE NURSERY where Care By Design clones and propagates plants in one-gallon pots before transferring them to larger greenhouses. Deutsch usually looks at cannabinoids through computer screens.



CBD MOLECULE within an FABP transporter (blue). CBD binding to FABP prevents anandamide transport for enzymatic breakdown, augmenting the effect of anandamide at the receptor.



ACDC PLANTS BEGINNING TO FLOWER inside a "light-dep" greenhouse. Care By Design provides support services for about 20 growers and medical products for California dispensaries, who in turn provide documentation that the products are destined for bona fide medical users.



SUPERCritical FLUID EXTRACTION UNIT has a 4-foot tall flanged extraction vessel (right) that can hold 20 liters. Smaller separator vessels are on left.

Pure carbon dioxide transitions to the supercritical fluid phase at 1,072 pounds per square inch and 87.75°F. It is pumped through tubes at bottom into the extraction vessel.

Supercritical CO₂ is an aqueous gas. It has almost the density of liquid but the molecules within are moving so rapidly that it diffuses more like a gas, allowing it to pass through solid cell walls. As it rises through the finely ground cannabis, it pulls out cannabinoids and terpenes.

Pipe at top directs exit stream to the left, towards the separator vessel. Black knob in center of pipe is a needle valve. When pressure in the extraction vessel reaches 2,000 pounds per square inch, the needle valve expands and restricts the flow. On the left side of the needle valve, pressure is at 360 PSI and the cannabinoid-laden CO₂ goes from supercritical state to a gas.

The expanding CO₂ turns very cold and causes a flurry of oil-laden, dry-ice snowflakes. These are gently thawed by a heat exchanger so liquid solutes drain to the bottom of the primary separator and gas exits from the top. Unloaded gases are cooled in a secondary separator to further reduce solubility in CO₂ and condense any remaining volatile solutes.

The gas circulates back to the pneumatic liquid pump at bottom left. Liquid CO₂ is pressurized from 800 to 2,000 PSI at 40°F. A lower heat exchanger then warms it to the proper temperature before it enters the extraction vessel.

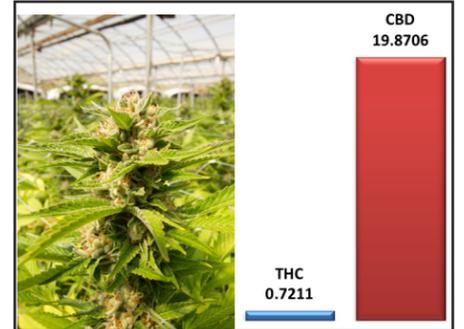
The cycle continues for 12 hours.

"It may be in the nature of CO₂ extraction that some terpenes will be lost to heat and pressure," says production chief Steve Timberlake. "Some terpenes are so light that they stay in the CO₂ gas instead of separating out with the cannabinoids."

Machinists have figured out a method and built a device enabling Care By Design to extract terpenes from the CO₂ for reintroduction back into the oil.

The cannabis oil is tested twice before being mixed with coconut oil for use in sublingual sprays and gel caps. When the oil is pulled from the CO₂ machine, it includes the antioxidant-rich plant waxes, which are free-radical scavengers that enhance the therapeutic value of sublingual sprays and gel caps.

For vape pen cartridges, the oil extract is further refined through a process known as "winterization," which uses pure grade ethanol to remove the wax from the oil. Then a roto-vape is employed to separate the oil and ethanol. The latter is captured and recycled. The final product is pure, strain-specific, essential oil of cannabis.



ACDC FLOWERS with graphic representing percentage of THC (blue, 0.722) and CBD (19.87) similar buds were found to contain. ACDC is the CBD-rich workhorse in Northern California — a finicky plant to grow, but a copious source of cannabidiol when cultivated properly. ACDC is a variant of the Cannatonic strain from Spain, provided by Sensi Seeds to Project CBD in 2010. The most common terpenes in ACDC essential oil are Myrcene, Nerolidol, alpha-Pinene, and beta-Caryophyllene.



EXTRACTION VESSEL is packed full of dried cannabis that has been very finely grated through a stainless steel screen. The vessel, manufactured by machinists employed by Critical Solutions, is six inches in diameter and four feet deep. It holds 20 liters — typically, six pounds of ground cannabis, which will yield about three liters of essential oil.



PERISTALTIC PUMP releases uniform amounts of cannabinoid-rich mixture through tube to fill sublingual spray bottles. Beaker at left contains essential oil with one of five CBD-to-THC ratios, mixed with coconut oil. Magnetic stir plate keeps the blend well-mixed throughout the process.



PLANT MATERIAL IN PETRI DISHES is growing mold and bacteria for identification by Sonoma Lab Works. Growers bring suspect foliage to the lab for this service.

"Fanatic freethinking, coupled with the impression that youth is intentionally being deceived by the State through lies."

—Albert Einstein on his outlook at age 12.

THCV from page 1

Unlike THCv, which has a partial blocking effect, Rimonabant is a full antagonist at the CB1 receptor. It proved to have serious adverse effects, including “suicidal ideation” in people. (Studies indicating that it caused tumors and seizures in rodents were suppressed by Sanofi and reported only in the publication you’re reading.)

The U.S. Food and Drug Administration rejected Rimonabant, and in 2008 it was pulled from the European market.

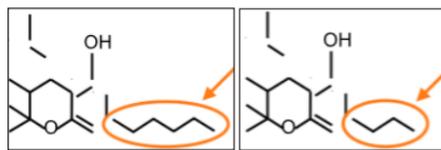
Also in 2008 a team backed by GW Pharmaceuticals reported on “The Metabolic Effects of THCv and CBD.” Michael Cawthorne and colleagues at the Clore Laboratory, University of Buckingham, conducted a five-week trial treating genetically obese mice with purified THCv, purified CBD, and a 1:1 mix of the two. The mix was most promising. The THCv exerted a thermogenic effect (increased energy expenditure) while the CBD raised plasma HDL-cholesterol concentration and reduced liver triglyceride levels.

“This is the first demonstration of potential beneficial effects of CBD in hypercholesterolaemia and non-alcoholic fatty liver disease,” the authors concluded. “In combination with THCv, it potentially addresses a number of components of the metabolic syndrome.”

The takeaway message for US doctors, patients and cultivators: a combination of THCv and CBD might be most effective in treating metabolic syndrome.

In 2010 GW filed patent application (EP 2151262A1), stating: “This invention relates to THCv and THCv containing extract derived from plant material. A botanical drug substance preferably comprises at least 70% THCv.”

“A botanical drug substance (BDS) as claimed in claim 1, wherein the secondary extraction comprises ‘winterisation’... wherein a substantial proportion of waxes, wax esters and glycerides, unsaturated



WHAT A DIFFERENCE A TAIL MAKES: Δ 9-tetrahydrocannabinol (THC, at left) has a five-carbon molecular tail called a pentyl group. Δ 9-tetrahydrocannabinol varin has a three-carbon tail known as a propyl group.

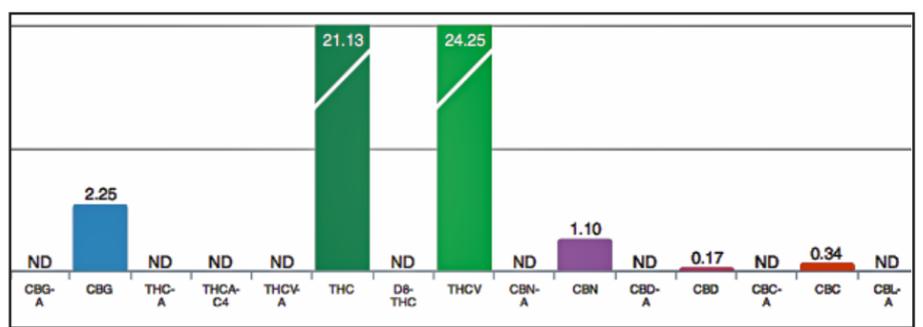
fatty acid residues, terpenes, carotenes, and flavenoids and other ballast have been removed... by the following steps:

- “i) Harvesting and decarboxylating cannabis plant material;
- “ii) Extraction with liquid carbon dioxide (CO₂), and removal of CO₂ to recover a crude extract;
- “iii) Dissolution of the crude extract in ethanol followed by chilling of the solution to precipitate unwanted waxes; and
- “iv) Removal of unwanted waxy material by cold filtration.”

GW’s high-THCV plant extract may protect the insulin-producing cells of the pancreatic islets.

GW’s plant extract that is more than 70% THCv has been dubbed GWP42004. In 2012 the company published results of an “exploratory study” involving 62 Type-2 diabetes patients, concluding:

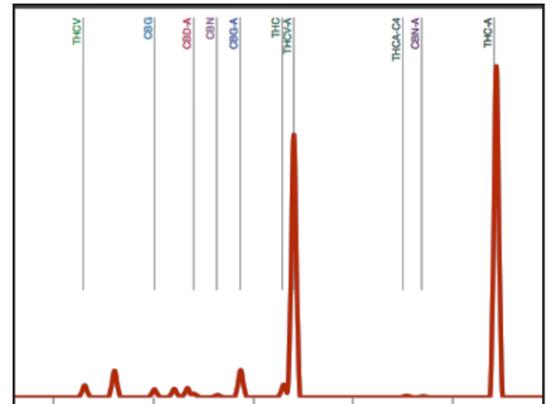
“GWP42004 produced a variety of desirable anti-diabetic effects including reduced fasting plasma glucose levels, an increase in fasting insulin, improved pancreatic beta-cell function, increased serum adiponectin, reduced systolic blood pressure, and reduced serum IL-6 levels. Several of these findings are consistent with pre-clinical data suggesting that GWP42004 protects the insulin-producing cells of the pancreatic islets, a highly desirable feature of a new anti-diabetic medicine, increases insu-



THCV (TALL BAR AT RIGHT, 24.25%) AND THC (21.13%) are the dominant cannabinoids in kief sample after decarboxylation. Heating causes cannabinoids to lose a carboxyl group (an oxygen atom bound to a hydrogen atom) and the compound goes from acid (electronegative) to neutral. Lab director Kymron DeCesare notified the grower that he had a unique plant, and dubbed the strain “Doug’s Varin.”

CHROMATOGRAM AT RIGHT SHOWS THCVA (large spike near center) comprising 15.07% of the cannabinoid content of kief sample, THCv (bump at left) = 0.67%. THCA (large spike at right) = 19%, THC = 0.73. Analysis was done at Steep Hill Halent lab in June, 2014.

DeCesare did not know why decarbed THCv exceeded THC (above) when before heating, THCA exceeded THCVA (at right).



Greenhouse from previous page

TWO VIEWS OF GEL ENCAPSULATION MACHINE



DIE ROLLER AND INJECTOR ASSEMBLY (top photo) forms gel caps infused with a blend of cannabis oil and coconut oil fed in through tubes at top. Bronze-colored gel spreaders on each side of the injector assembly (visible in photo at right) are heated and spread a thin band of pharmaceutical grade gelatin that is conveyed via a series of support-rollers into the injection and sealing mechanism. Sheets of gel pass through the capsule die (rollers with circular indentations) and the blend of coconut and cannabis oil is injected through the triangular green “wedge” at the exact split second that two sheets of gel are cut and fused to form the two halves of the gel capsule.

Once the two sides of the capsules have been cut by the die, the fully formed capsules are displaced by brushes into a conveyer that sends them into a rotating drum called a trommel where they are cured and dried. Capsules are then spread on large, perforated trays where the humidity and temperature are carefully controlled for 2-3 days while the gel capsule hardens or “cures.”

The gel is made (off-camera) from pharmaceutical-grade lime-bone gelatin, glycerin, and water. It takes several hours to prepare in a heated mixing chamber that operates under vacuum. Water and glycerin are combined and heated before adding the lime-bone gelatin, and the mixture is closely monitored while vacuum is applied to the system to remove any tiny bubbles that can form in the liquid gel. When the process has been completed, the thick gel is transferred to heated spreader chambers.



GEL CAPSULES (0.5 milliliters each) are made from cannabis-infused oil of varying ratios and strengths. Care By Design makes capsules with a 1:1 ratio (10 milligrams each of CBD and THC) and an 18:1 ratio (20 mg CBD and 1.1 mg THC). AbsoluteExtracts makes THC capsules in 10 mg, 25 mg and 50 mg strengths.

lin sensitivity, and reduces fasting plasma glucose levels.”

In 2014 GW undertook a 12-week randomized, double blind, placebo controlled study of a THCv-dominant plant extract —GWP42004— to treat Type 2 diabetes. Some 200 patients taking the diabetes drug metformin added GWP42004 at three dose levels —or placebo— to their regimen to see if it improved their glucose levels. The study was ongoing as we went to press. (GW also expects it to establish the safety of THCv to the satisfaction of British regulatory authorities.)

Follow the leader

Just as GW Pharmaceuticals’ studies established the safety and efficacy of CBD

in the decade before the compound was rediscovered in California cannabis, their research into THCv can now provide guidance to doctors, cultivators and patients who have a couple of homegrown plants to work with.

Although nowhere near the potency of the THCv plants referenced in GW’s patent application —70% and higher— two strains rich enough in THCv to start a breeding program are being grown in Northern California, and breeders can producing three generations of crosses a year.

On the following pages are interviews with the growers of “Black Beauty” and “Doug’s Varin.”