Cannabis and Hearing Care: Hearing Loss and Tinnitus

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Editor's note: This is the conclusion of a two-part series. Part one was published in the July 2019 issue.

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Although a considerable amount of work needs to be done to fully assess the effects, efficacy, and safety of cannabis, its current status is becoming more mainstream. One primary driver is the increasing public awareness of its benefits and effects, particularly that cannabidiol (CBD) is nonpsychoactive and does not give a high. However, when administered and dosed correctly, tetrahydrocannabinol (THC) has been suggested to have medicinal benefits for some major health disorders.

Several systematic analyses, randomized trials, and observational studies providing the best evidence on cannabis efficacy and safety include evaluations of the effects of THC and/or CBD on cases of multiple sclerosis,[1] Alzheimer's disease,[2] autism,[3] PTSD,[4] inflammation,[5] Parkinson's disease,[6] cancer,[7] and epilepsy.[8] The FDA has approved the use of cannabis for chronic pain, nausea, and vomiting related to chemotherapy, and appetite stimulation of patients with cancer or HIV.[9] Furthermore, multiple studies have shown a reduction in opioid use following the introduction of cannabis.[7,10]

MEDICINAL USES OF CANNABIS

CBD has been approved by the U.S. Food and Drug Administration (FDA) for the treatment of refractory epilepsy. Over 50 million people worldwide have epilepsy, and about a third of these have seizures that are refractory to pharmacotherapy. Refractory epilepsy patients have a greater degree of morbidity, cognitive issues, profound psychological consequences, mortality, and reduced quality of life.[11] Although these patients can opt to have vagus nerve stimulation, surgical removal of the lesions, and make significant lifestyle changes to manage their condition, those with refractory epilepsy remain the biggest challenge in epilepsy management. Anti-seizure drugs have proven to be effective in many patients, but the introduction of cannabis has made a difference in those with refractory epilepsy. In fact, the FDA has approved Epidiolex, a 99 percent pure oral CBD extract for children and adults with refractory epilepsy, because the addition of CBD has been proven to reduce the median seizure frequency.[12]

In one of the larger studies on cannabis usage and effects, Stith, et al.,[13] evaluated 3,341 self-administered cannabis (THC and CBD) users who responded via Releaf, an app that required respondents to report the severity of their symptoms at baseline and through 90 minutes post-administration. Symptoms were organized in 27 categories, including back pain, sleep, and depression. The respondents reported an average improvement of 31.8 percent. The authors identified considerable variability between the different methods of application and products. THC products provided the greatest relief, and inhaling smoke from the dried flower was the most widely used method. The authors con-

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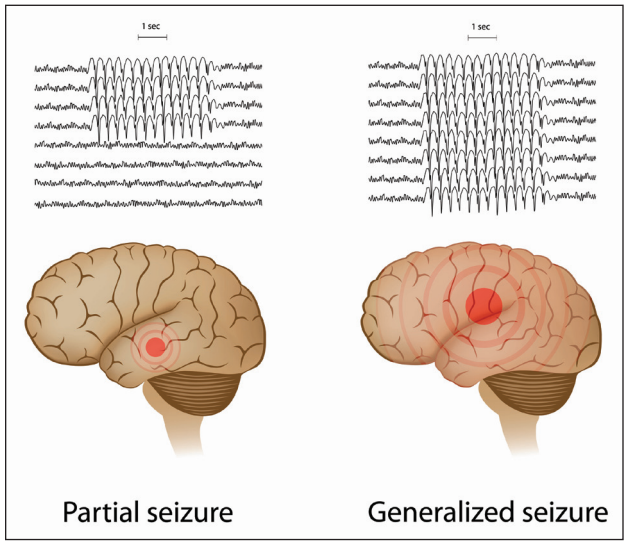

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Figure 1. EEG of partial and generalized epilepsy seizures.

cluded that cannabis provides symptom relief and has positive and negative side effects. Investigation into the effective use of these products is essential because they carry short-term risks, including functional safety issues, product toxicity and abuse, and various health concerns. Furthermore, unlike THC, CBD potency was not associated with side effects or immediate symptom changes potentially due to the inconspicuous nature of the product and lack of psychoactive awareness.

Current literature and public awareness are turning toward CBD as a primary product for health care. According to the Expert Committee on Drug Dependence of the World Health,[14] CBD is non-psychoactive, non-addictive, and "well-tolerated with a good safety profile." Furthermore, no evidence shows that recreational use of pure CBD results in public health-related problems. The issues surrounding the sale of CBD appears to be related to the quality of the product and labeling. Fortunately, several factories are producing pharmaceutical-grade CBD isolate, and several product manufacturers follow FDA-approved Good Manufacturing Practices (GMP).

CANNABIS FOR HEARING LOSS AND TINNITUS

Only a few studies have looked into the use of cannabinoids for hearing loss, tinnitus, or balance disorders, suggesting the need for further research. Some of the latest articles in the U.S. National Library of Medicine include the study by Tabrizi, et al., who reported the potential of endocannabinoids to inhibit the action of a receptor (TRPV1) that responds to noxious stimuli, causing pain and injury to the cell.[15] The TRPV1 receptor activation is considered responsible for the pathology development of cystitis, asthma, epilepsy, diabetes, and hearing loss. The use of antagonists, including CBD, to target this receptor may have a clinically therapeutic potential.

Fiskerstrand and colleagues identified a gene mutation that produces an error in endocannabinoid metabolism, which resulted in a multifocal debilitating neurodegenerative disease.[16] PHARC affects the peripheral and central nervous systems, causing impaired vision and hearing loss. The gene mutation disrupts the metabolism of endocannabinoids, reducing the cells that remove damaged cells and infection, while dysregulating neurogenesis.

In tinnitus research, Smith and Zheng[17] investigated if cannabinoid receptor activation could create a pro- or antiepileptic action in the cochlear nucleus and if cannabis could make tinnitus better or worse. The results of this research were inconclusive.

The use of antineoplastic drugs, particularly cisplatin, has been shown to result in hearing loss. Ghosh, et al.,[18] evaluated the use of endocannabinoids delivered via transtympanic administration to rats that were subsequently injected with cisplatin. The results "support the role of the endocannabinoid/CB2R system in maintaining normal hearing in the rat cochlea." The authors concluded that the use of transtympanic injections of agonists to the CB2 receptor provided effective protection against cisplatin-induced hearing loss.

Acoustic trauma is an area that is widely researched. The formation of free radicals and reduced blood flow are key players in the cochlea. It has also been shown that tinnitus has a central representation and that antiepileptic drugs are sometime used as a treatment. Zheng, Reid, and Smith[19] investigated whether THC and CBD delivered to rats could provide relief from tinnitus. Their findings suggest that cannabinoids may increase the occurrence of tinnitus in noise-exposed rats, especially when there is prior hearing damage.

In hearing care, further investigation into the benefits of cannabis is needed, particularly in the treatment of debilitating tinnitus and hyperacusis with comorbid sleep deprivation and psychopathology.[20]

ISSUES IN COMMERCIAL CONSUMPTION

Cannabis products have been widely and experimentally used for a variety of medical conditions with generally favorable results. However, the use of *C. Sativa* products with THC has adverse side effects, including disorientation, somnolence, concentration, and memory problems. CBD may have similar health benefits without the psychoactive properties, and is generally considered safer.

THC and CBD have different effects based on the cannabinoid strain and concentration as well as the dose and delivery system.[21] Since these affect the cannabinoid receptors differently, users may not know what or why they are taking a specific product. For example, when the drugs are inhaled or used as a tincture under the tongue, the absorption factors are much higher than when the drugs are ingested or applied to the skin as an analgesic. When ingested, the effects may last longer than that via other forms of application. However, getting the correct dose for the intended target can be rigorous when the user is not aware of the potential effects. They may not know how cannabinoids

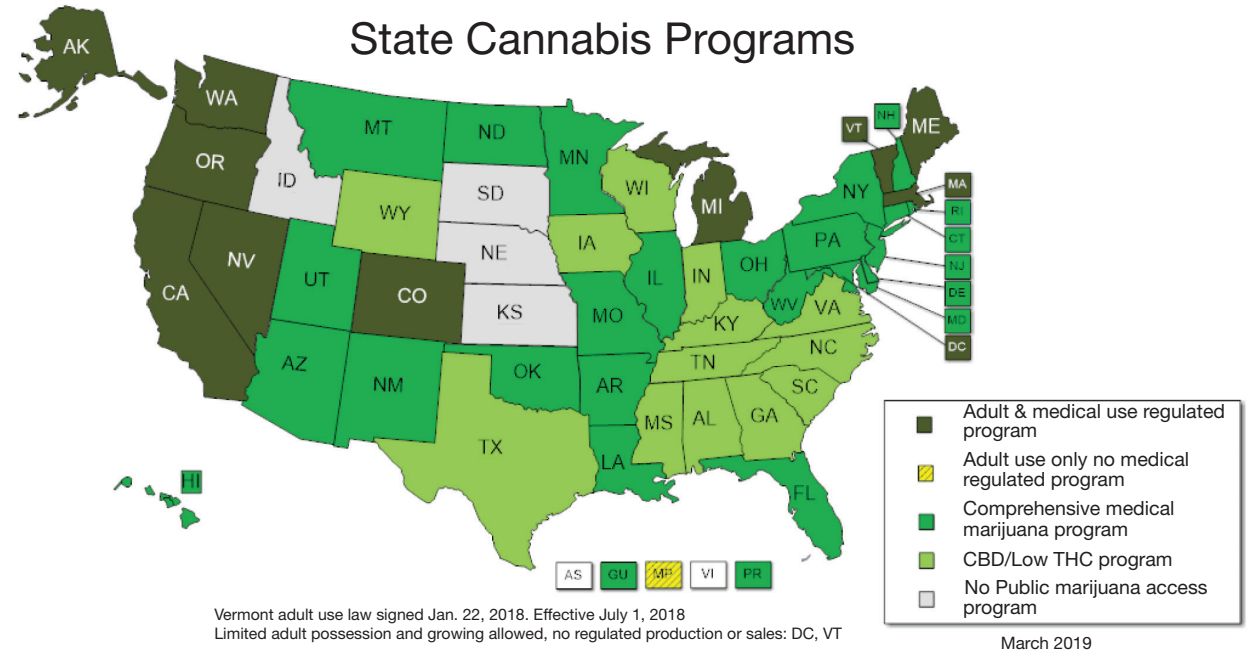

Figure 2. U.S. state cannabis programs (from http://www.ncsl.org).

will interact with some medications, especially the elderly. When in doubt, patients should consult their physician. The general rule is to start with lower concentrations, noting that THC products give the sense of being high and THC-free CBD products do not.[22]

Today, the biggest issues that FDA and state regulators face are misrepresentations concerning the treatment of medical conditions, non-adult use, safety, and efficacy of commercial cannabis products. There are concerns that labeling and concentrations of the products need to be regulated. In 2016, Bonn-Miller, et al.,[21] blind-tested 84 products from 31 online companies for labeling accuracy. The samples were tested for CBD, THC, and other phytocannabinoids. The results showed considerable variance, with only 30.95 percent of the CBD products accurately labeled. The rest were either under-labeled (42.85%) or over-labeled (26.19%). Of the product types, vaporization products were most frequently mislabeled. THC was also misrepresented in 21.43 percent of the products. This would suggest that patients who try CBD products labeled as THC-free could experience an unwanted psychogenic response. Fortunately, new state and existing federal laws have placed considerable control over labeling and third-party testing.

The discovery of the endocannabinoid system and medicinal properties of cannabis has changed the way the public and the medical community view marijuana and hemp. Researchers are only starting to understand the medicinal effects of cannabinoids, but they are already seeing treatment efficacy when appropriately applied. Further investigation into its safety and efficacy will be crucial to properly regulate these products as they become more mainstream.

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Cannabis: Part II

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