



# Cannabis Therapy & Depression



How can cannabis therapeutics impact treatment of depression?  
– Aisha Rafique | Rebecca Rendall | Lucy Simpson | Hannah  
Zhang | 2022



# Cannabis Therapy & Depression

How can cannabis therapeutics impact treatment of depression? – Aisha Rafique | Rebecca Rendall | Lucy Simpson | Hannah Zhang | 2022

## Abstract

This paper examines the potential use of cannabis as a treatment for depression, with reference to the relevant literature on both successful and unsuccessful cases of cannabis use as treatment. As part of this, an evaluation of the health risks associated with cannabis use as well as the potential association between recreational cannabis use and depressive symptoms is conducted.

There was a lack of clinical trial data on the efficacy of different cannabis constituents in treating depression, and the potential side effects of cannabis use.

While Cannabis may alleviate symptoms of depression, there are also possible adverse effects, such as causing disease (cholera, tetanus, epilepsy and rheumatism), which raises the question of whether the benefits of taking Cannabis outweigh the associated risks.

These studies do not come to a definitive conclusion as external factors have a high chance of impacting depressive symptoms in the individuals rather than the use of cannabis alone.

## What is the Future Researchers' Programme?

•••

Nebula Research is an organisation built through curiosity, discovery, and the desire to add to the sum of human knowledge.

Education and research hold the key to building a better world.

The Future Researchers' Programme was established to provide College/Sixth Form students with an opportunity to work on a piece of research that fosters their curiosity and desire to learn more, add to the sum of human knowledge and provide benefit to citizens.

Working under a lead Professor – but given the autonomy to follow their own research path – students conduct high level research and become fully published authors with Nebula.

Not only does this special opportunity develop the attributes necessary to become academics, but the students also hone the skills necessary to achieve the highest of grades at University.

The top universities require a high standard of academic writing skill, yet this is something that students and professors alike do not feel receives enough attention in the academic curriculum. The Future Researchers' Programme by Nebula helps to bridge this gap.

Completion of the Programme and the recognition of such through the publication of a paper with Nebula, adds tremendous value to university applications, personal statements and CVs.



*Contents*

Introduction..... 3

    What is depression? ..... 3

    What is cannabis? ..... 3

    History of medicinal cannabis ..... 3

Advantages of cannabis treatment for depression: ..... 4

    Cannabis may be effective in improving negative moods if THC and CBD contents are adjusted. 4

    Antidepressant effect in rodents ..... 5

Limitations of cannabis treatment for depression: ..... 5

    Potential for increasing Depressive symptoms..... 5

        Short term (THC may not be effective at reducing depression symptoms, and instead could exacerbate them)..... 5

        Long-term ..... 6

    Health effects..... 6

        Studies show causal effects of cannabis to be unclear..... 7

Conclusion ..... 8

Bibliography ..... 9



## Introduction

In November 2018, a law allowing Cannabis to be prescribed by specialist doctors was passed, in the United Kingdom. Cannabis legalisation followed after the Home Secretary, Sajid Javid, listened to concerns over epileptic paediatric patients (Home Office, 2018). In America, laws allowing recreational Cannabis use in 19 states were implemented as of May 27, 2022. Following recent changes in such laws, the authors of this paper have assessed the opportunities Cannabis may create in the successful treatment of depression, including its limitations. It is imperative to consider Cannabis as a medical treatment for various conditions due to the features of psychoactive THC. In this paper, Cannabis' effects on depression are examined.

## What is depression?

Depression, a common mental illness, is known to affect approximately 280 million people worldwide (World Health Organisation, 2021). 3.8% of the global population will experience depression at some point in their life. (World Health Organisation, 2021). Major depressive disorder, commonly known as “clinical depression”, is most widely experienced and consists of symptoms such as: low mood, displeasure, or loss of interest in activities (Mayo Clinic, 2018). In the most severe cases, suicidal thoughts are provoked, which may ultimately lead to suicide. Per year, around 700,000 people die from suicide (World Health Organisation, 2021). In 15–29-year-old youths, it is the fourth leading cause of death globally (World Health Organisation, 2021). Whilst cause remains uncertain, factors involved with the cause of depression may include brain chemistry and biological differences, hormones, and inherited traits (Mayo Clinic, 2018). With suicide being so prevalent in young people and the link between depression and suicide being incredibly strong, it is vitally important to tackle depression if we as a society wish to positively impact suicide rates.

## What is cannabis?

Cannabis is a psychoactive drug derived mainly from the female plant *Cannabis sativa* L (European Monitoring Centre for Drugs and Drug Addiction, 2013). It is grown in tropical and temperate climates although is now widely cultivated in greenhouses due to its popularity in a recreational capacity. Scientists have discovered approximately 120 cannabinoids (natural compounds from the *Cannabis Sativa*. plant) (García-Gutiérrez, et al., 2020), however, the primary cannabinoids in the cannabis plant are tetrahydrocannabinol (THC) and cannabidiol (CBD) (World Health Organisation, 2016). Tetrahydrocannabinol (THC), characterised in 1964 by Gaoni and Mechoulam (García-Gutiérrez, et al., 2020), is the main psychoactive constituent of the plant, whereas CBD, isolated in 1940 and characterized in 1963 (García-Gutiérrez, et al., 2020), is non-psychoactive (World Health Organisation, 2016). THC is normally found in higher concentrations than CBD (World Health Organisation, 2016), which perhaps explains its popularity in a recreational capacity.

## History of medicinal cannabis

Cannabis is frequently used recreationally and is usually smoked as Marijuana, a dried herbal form of the plant, as this ensures maximum absorption of THC. It can also be prepared in other forms such as hashish and hash oil. Hashish refers to cannabis resin and can be smoked mixed with tobacco but may also be eaten. Traditionally, in South Asia, bhang (cannabis prepared from the leaves and stalk



of the plant) is chewed or drunk as part of religious practice (World Health Organisation, 2016). The medicinal use of the plant in India can be traced back to around 1000BC, as it was recognised for its anti-inflammatory and soothing properties (Scherma, et al., 2018). Eventually making its way towards Western medicine in the mid 1800's, cannabis was recommended and administered by Dr William O'Shaughnessy, an Irish physician, to those suffering from convulsive diseases, including, cholera, tetanus, epilepsy, and rheumatism, due to its therapeutic properties (O'Shaughnessy, 1840). A small 2016 survey of medical cannabis users reported depression as the 3rd most frequent condition which cannabis is used for, after pain and anxiety, with 50.3% of participants reporting cannabis use for depression, many of whom are using cannabis without supervision from a medical professional (Sexton, et al., 2016)

## Advantages of cannabis treatment for depression:

### Cannabis may be effective in improving negative moods if THC and CBD contents are adjusted

There are a variety of conclusions drawn from studies investigating the effect of cannabis on depression. These may be due to the contents of the cannabis used in the experiments, and how much cannabis was administered as a dose. (Cuttler, et al., 2018). A 2017 study compared the effect of different doses of delta-9-THC on emotional responses to the Trier Social Stress Test (TSST), a psychosocial stressor, in healthy adults (Childs, et al., 2017). The results displayed a distinct difference in the response of those taking the 7.5mg THC dose than the 12.5mg dose, with those receiving a 7.5mg dose reporting a significant decrease in distress caused by the TSST, and those receiving the higher dose reporting an increase in negative emotions, before and during the TSST (Childs, et al., 2017). These results display the potential stress-reducing capabilities of THC if taken at a low dosage, conversely, the impact of a high dose could cause an overall decrease in mood. The findings of this study are supported by findings of another similar study (Single, et al., 2022).

Another study (Cuttler, et al., 2018) using self-reported data from a medical cannabis app to track symptoms was used to investigate the impact of several factors on stress, anxiety, and depression, including:

- Whether cannabis significantly reduced symptoms of depression, anxiety and stress,
- Whether gender was an aspect in these results,
- Whether dosage affects the change in symptoms,
- Whether the efficacy of cannabis reduces with time,
- Whether concentrations of THC and CBD impact symptom change and if negative moods change over time after taking cannabis

The results for the THC and CBD concentration effects show that, in the cases that benefitted most from cannabis use, the cannabis contained low levels of THC, and elevated levels of CBD. Cannabis with elevated levels of THC and low levels of CBD caused the least reduction in depression symptoms (Cuttler, et al., 2018).



## Antidepressant effect in rodents

Although limited clinical trials have been carried out on patients with depression, trials have been carried out on mice and rats to assess the antidepressant-like properties of different constituents of cannabis. (Resstel, et al., 2009) (El-Alfy, et al., 2010) (Zanelati, et al., 2010) (Jiang, et al., 2005)

The forced swim test was used to determine the antidepressant-like effect through the monitoring of the immobility time of rodents when placed in water (El-Alfy, et al., 2010) (Zanelati, et al., 2010). The results of these studies found antidepressant-like effects but in a limited range of doses. In one study where CBD was used, an antidepressant-like effect was only determined at a dose of 30mg.kg<sup>-1</sup>. However, this antidepressant-like effect was comparable to that of imipramine (Zanelati, et al., 2010), an antidepressant prescribed for more severe cases of depression that do not respond to other treatments. (NHS, 2021) Another study found that at 2.5mg/kg  $\Delta^9$  THC had antidepressant-like effects and CBD only had a significant antidepressant effect at 200mg/kg (El-Alfy, et al., 2010). (Jiang, et al., 2005) also found that varied antidepressant-like effects occurred in rats after chronic and acute treatment with synthetic CBD, this reflects the need for further clinical trials into the appropriate dosages. The other studies only investigated acute treatment in the rodents which needs to be further explored as depression is a chronic disorder that requires long term drug treatment (Campos, et al., 2012) which is not reflected in the acute doses used in these experiments. Overall, these results highlight the antidepressant-like effect of constituents of cannabis,  $\Delta^9$  THC and CBD, but also indicate the need for further testing into effective dosages and the comparative efficacy in patients.

## Limitations of cannabis treatment for depression:

### Potential for increasing Depressive symptoms

Below is a summary of the potential short- and long-term consequences of cannabis use for individuals suffering with depression as well as the potential for the development of depression in association with cannabis use.

#### *Short term (THC may not be effective at reducing depression symptoms, and instead could exacerbate them)*

A small study tested the effect of seven days of oral THC on the mood of hospitalized patients with depression (Kotin, et al., 1973). 50% of patients had no alterations in their mood, and the only noticeable effect of the medication was extensive drowsiness. The other half of patients had a premature end to the trial and were unable to complete the seven days due to unexpected reactions of depersonalization and severe anxiety after one dose (Kotin, et al., 1973). Not only are these results unpromising for the potential use of cannabinoids as a mood disorder treatment, but they also display negative impacts that THC may have on someone with depression. With the high numbers of (Sexton, et al., 2016) people using cannabis to medicate for mental illnesses, these adverse reactions experienced by certain patients in the trial highlight the vast range of effects THC can have depending on the user and dosage, some of which could exacerbate one's emotional state, and those with depression or anxiety disorders may be especially vulnerable to these reactions.



### Long-term

Although Cannabis use could help temporarily alleviate the symptoms of depression when medically prescribed, it has also been found to increase the risk of depression long-term when used recreationally. In an article published by the British Medical Journal (BMJ) “frequent cannabis use in teenage girls predicts later higher risks of depression and anxiety.” (Patton, et al., 2002). This suggests that although cannabis could be an effective treatment for depression when closely monitored, if the patient becomes a recreational user, the long-term effects of daily cannabis use are more harmful and may exacerbate symptoms and lead to more severe depression. However, the association in this study could be indirect as social behaviours such as educational failure, unemployment and crime are associated with cannabis use and may be the cause of the depression, rather than the cannabis use itself. Further research is needed in this regard.

It is unclear if the correlation between depression and cannabis use is due to cannabis causing depression, or cannabis being used to self-medicate for depression, however, a large 2001 study ‘sought to estimate the degree to which cannabis abuse is a risk factor for depressive symptoms rather than an effort to self-medicate depression’ (Bovasso, 2001). A sample of 1920 people who were involved in an earlier Epidemiologic Catchment Area study (1980) were reinterviewed, 849 of whom reported having no depressive symptoms in the previous study and 1837 of whom reported having no past or present cannabis abuse issues (Bovasso, 2001).

The 849 subjects without prior depressive symptoms were reassessed. Those with cannabis abuse issues at baseline were four times more likely to show depressive symptoms – particularly suicidal thoughts - than those with no history of cannabis use. (Bovasso, 2001). These results support the conclusion that cannabis abuse may lead to depression in the long-term, however, factors, such as socioeconomic background or mental health background, may affect those abusing cannabis.

These play a part in determining whether cannabis is the sole causal route of depression.

Cannabis abuse is associated with an increased risk of depressive symptoms long-term, however, cannabis abuse may not be *the* root cause of the depressive symptoms. (Kuhns, et al., 2022)

### Health effects

In 1980, Australia legalised the importation of cannabis for medical uses and enabled the prescription of cannabis to patients but only in the case of extreme situations. However, it was only in 2008 when the first medicinal prescription of cannabis was approved in the country (Mahonen, 2018). Subsequently, several other countries such as Uruguay and Canada (Sohn, 2019), have legalised cannabis for both recreational and medicinal uses. There are undoubtedly many benefits to medicinal cannabis use but, if not closely monitored, unsafe and excessive use can lead to long term health risks such as disease and addiction (Sohn, 2019).

Despite the series of benefits. Health concerns soon arise, and cannabis is seen to have several short and long-term negative effects. According to a report by the National Academia of Sciences, Engineering and Medicine, in the United States, a population of 22.2 million people aged 12 and older



have been recognised as cannabis users, of which 4.3 million have a problem known as Cannabis Use Disorder (CUD) (National Academies of Sciences, Engineering, and Medicine, 2017). CUD was first introduced in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM 5), it is a diagnosis given due to problematic cannabis usage, and individuals can be impacted by cannabis usage without necessarily becoming addicted (Hartney, 2022). CUD can be classed by capturing the behaviour disorders of the patient and following a set of 12 criteria. For instance, one criterion states, “Cannabis is often taken in larger amounts or over a longer period than was intended” (Patel & Marwaha, 2022). CUD may be classified into mild (two to three symptoms), moderate (four to five symptoms) and severe (six or more) (Patel & Marwaha, 2022) (Hartney, 2022).

Taking Colorado as a case, hospitals have seen an increase in the number of cases of cyclic vomiting syndrome due to the usage of cannabis, which is a condition that is characterized by vomiting and extreme abdominal pain, and yet the occurrences of this condition have doubled its number since the legalisation of medicinal cannabis at the location of two Denver hospitals (Sohn, 2019). Additionally, between the year of 2009 and 2014, there has also been 29 cases of cannabis-related burns in the University of Colorado burns centre, in comparison with zero before the changes to the cannabis liberation policy (Sohn, 2019). There were nearly 10,000 visits between 2012 and 2016 with the latest data available to the University of Colorado Health Emergency Department, including a various of reasons such as psychiatric, cardiovascular symptoms, etc. (Sohn, 2019).

Similar to alcohol, there seems to be also a strong correlation between cannabis use and vehicle crashes along with high morbidity as any who are involved in accidents test positive for cannabis (Poling, et al., 2010). However, unlike alcohol, cannabis seems to have a bigger impact on different individuals due to the differences of absorptions of THC, and other factors such as the smoking tolerance of the individual (Poling, et al., 2010). Cannabis has dose-dependent effects, which are most noticeable while executing acts with highly automated functions as opposed to complicated tasks requiring control (Poling, et al., 2010).

### Studies show causal effects of cannabis to be unclear

There is no definitive conclusion on whether cannabis causes depression as it is difficult to assess the impact of cannabis in isolation. Other “real world” occurrences exist alongside the cannabis use and the extent to which these have a causal impact to the levels of depression cannot be accurately quantified. Factors such as pre-existing poor mental health, prompting the patient to take Cannabis to cope with the mental illness, resulting in further depression compared to a patient that did not have poor mental health initially.

In a study carried out by (Green & Ritter, 2000), Marijuana use is shown to have positive and negative effects on depression. Using Marijuana to reduce feelings of mental illness in adulthood is more prevalent if the user has a history of cannabis use in their adolescence (Green & Ritter, 2000). Moreover, it was found that when Marijuana is used to cope with feelings of depression, it may lead to an increase in depression, whereas when Marijuana is not taken to cope; it may alleviate depression.



In another study of adolescent males, cannabis' chemical interference with the enzyme Aromatase led to a deficiency in serotonin synthesis – creating further depressive symptoms in the subjects. (Bovasso, 2001) This shows how cannabis use may increase depression, yet variables including social background and mental health background were not controlled, therefore a direct correlation, between Cannabis and depression, cannot be inferred.

When testing on adult alcoholics, it was found that depression “did not necessarily lead these individuals to initiate cannabis use” (Cornelius, et al., 2000). Here, cannabis use may have been a result of alcohol abuse – an external variable – which may be the leading contributor to the depressive symptoms, rather than cannabis itself.

## Conclusion

Due to the lack of research into the use of medicinal cannabis for depression and the potential side effects, it is suggested that further clinical studies be conducted on the long and short-term effects of medical cannabis use. There are many dimensions to the treatment of depression using cannabis which are yet to be explored in studies.

Although studies have indicated the antidepressant-like effect of the constituents  $\Delta^9$  THC and CBD in rodents, few clinical trials could be found that assess the antidepressant-like effect of these constituents in patients, and the potential side effects of these treatments. There are also very few papers that indicate research into the best way to administer these treatments or the most appropriate dosage for different demographics of patients.

Considering external circumstances, such as the socioeconomic background and initial mental health status of the patient, it becomes harder to attribute cannabis use to depression and vice versa. This is particularly true given the fact that it is not possible to completely exclude external factors and study the effect of cannabis isolation. Drawing a conclusion with valid evidence therefore becomes increasingly difficult.

It has been concluded by the authors of this paper that taking extenuating factors into account, such as socio-economic background and mental health background, should be a pre-requisite in the prescription of Cannabis for treatment of depression. The authors also suggest that further clinical trials investigating social and mental health backgrounds should be conducted. It cannot be concluded, from the available literature, that cannabis alone has a positive or negative effect in treating depression.

## Bibliography

- Bovasso, G. B., 2001. Cannabis Abuse as a Risk Factor for Depressive Symptoms. *The American Journal of Psychiatry*, 158(12).
- Campos, A. C. et al., 2012. Multiple mechanisms involved in the large-spectrum therapeutic potential of cannabidiol in psychiatric disorders. *Philosophical Transactions: Biological Sciences*, 367(1607), pp. 3364-3378.
- Childs, E., Lutz, J. A. & de Wit, H., 2017. Dose-related effects of delta-9-THC on emotional responses to acute psychosocial stress. *Drug and Alcohol Dependence*, pp. 136-144.
- Cornelius, J. R. et al., 2000. Fluoxetine versus placebo in depressed alcoholics: A 1-YEAR follow up study. *Addictive Behaviours*, 25(2), pp. 307-310.
- Cuttler, C., Spradlin, A. & McLaughlin, R. J., 2018. A naturalistic examination of the perceived effects of cannabis on negative affect. *Journal of Affective Disorders*, pp. 198-205.
- El-Alfy, A. T. et al., 2010. Antidepressant-like effect of  $\Delta^9$ -tetrahydrocannabinol and other cannabinoids isolated from *Cannabis sativa* L.. *Pharmacology Biochemistry and Behavior*, 95(4), pp. 434-442.
- Ellickson, P., Bui, K., Bell, R. & McGuigan, K. A., 1998. Does early drug use increase the risk of dropping out of high school?. *Journal of Drug Issues*, 28(2), pp. 357-380.
- European Monitoring Centre for Drugs and Drug Addiction, 2013. *Cannabis drug profile*. [Online] Available at: [https://www.emcdda.europa.eu/publications/drug-profiles/cannabis\\_en](https://www.emcdda.europa.eu/publications/drug-profiles/cannabis_en) [Accessed 10 June 2022].
- García-Gutiérrez, M. S. et al., 2020. Cannabidiol: A Potential New Alternative for the Treatment of Anxiety, Depression, and Psychotic Disorders. *Biomolecules*, 10(11), p. 1575.
- Green, B. E. & Ritter, C., 2000. Marijuana Use and Depression. *Journal of Health and Social Behavior*, 42(1), pp. 40-49.
- Hartney, E., 2022. *What Is Cannabis Use Disorder?*. [Online] Available at: <https://www.verywellmind.com/cannabis-use-disorder-22295> [Accessed 2 July 2022].
- Home Office, 2018. *Government announces that medicinal cannabis is legal*. [Online] Available at: <https://www.gov.uk/government/news/government-announces-that-medicinal-cannabis-is-legal>
- Jiang, W. et al., 2005. Cannabinoids promote embryonic and adult hippocampus neurogenesis and produce anxiolytic- and antidepressant-like effects. *The Journal of Clinical Investigation*, 115(11).
- Kotin, J., Post, R. M. & Goodwin, F. K., 1973.  $\Delta^9$ -Tetrahydrocannabinol in Depressed Patients. *Arch Gen Psychiatry*, 28(3), pp. 345-348.
- Kuhns, L., Kroon, E., Colyer-Patel, K. & Cousijn, J., 2022. Associations between cannabis use, cannabis use disorder, and mood disorders: longitudinal, genetic, and neurocognitive evidence. *Psychopharmacology*, Issue 239, p. 1231-1249.
- Mahonen, S., 2018. *A nation in pain: Can medicinal cannabis help?*. [Online] Available at: [https://www.jstor.org/stable/pdf/26529665.pdf?refreqid=excelsior%3A8a4ae08d320bc8b058a1805a186e44a7&ab\\_segments=0%2F5YC-6490%2Ftest\\_segment\\_5&origin=](https://www.jstor.org/stable/pdf/26529665.pdf?refreqid=excelsior%3A8a4ae08d320bc8b058a1805a186e44a7&ab_segments=0%2F5YC-6490%2Ftest_segment_5&origin=) [Accessed 1 July 2022].
- Mangieri, R. A., 2008. Animal research highlights a therapeutic potential of cannabinoids for the treatment of depression. *Cannabinoids*, 3(2).
- Mayo Clinic, 2018. *Depression (major depressive disorder)*. [Online] Available at: <https://www.mayoclinic.org/diseases-conditions/depression/symptoms-causes/syc->

20356007

[Accessed 28 June 2022].

National Academies of Sciences, Engineering, and Medicine, 2017. *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*. Washington, DC: The National Academies Press.

NHS, 2021. *Overview - Antidepressants*. [Online]

Available at: <https://www.nhs.uk/mental-health/talking-therapies-medicine-treatments/medicines-and-psychiatry/antidepressants/overview/>

[Accessed 2 July 2022].

O'Shaughnessy, W., 1840. New Remedy for Tetanus and Other Convulsive Disorders. *The Boston Medical and Surgical Journal*, 23(10), pp. 153-155.

Patel, J. & Marwaha, R., 2022. [Online]

Available at: <https://www.ncbi.nlm.nih.gov/books/NBK538131/>

[Accessed 2 July 2022].

Patton, G. C. et al., 2002. Cannabis use and mental health in young people: cohort study. *British Medical Journal*, Volume 325, pp. 1195-1198.

Poling, J., Sewell, R. A. & Sofuoglu, M., 2010. *The Effect of Cannabis Compared with Alcohol on Driving*. [Online]

Available at: <https://doi.org/10.1080/10550490902786934>

[Accessed 2 July 2022].

Resstel, L. B. et al., 2009. 5-HT<sub>1A</sub> receptors are involved in the cannabidiol-induced attenuation of behavioural and cardiovascular responses to acute restraint stress in rats. *British Journal of Pharmacology*, pp. 181-188.

Scherma, M. et al., 2018. New Perspectives on the Use of Cannabis in the Treatment of Psychiatric Disorders. *MDPI*, 5(4).

Sexton, M., Cuttler, C., Finnell, J. S. & Mischley, L. K., 2016. A Cross-Sectional Survey of Medical Cannabis Users: Patterns of Use and Perceived Efficacy. *Cannabis and Cannabinoid research*, 1(1), pp. 131-138.

Single, A. et al., 2022. Cannabis use and social anxiety in young adulthood: A meta-analysis. *Addictive Behaviours*, Volume 129.

Sohn, E., 2019. *Weighing the dangers of cannabis*. [Online]

Available at: <https://www.nature.com/articles/d41586-019-02530-7>

[Accessed 2 July 2022].

Van Ours, J. C. & Williams, J., 2011. Cannabis Use and Mental Health Problems. *Journal of Applied Econometrics*, 26(7), pp. 1137-1156.

World Health Organisation, 2016. *The health and social effects of nonmedical cannabis use*, Geneva: World Health Organisation.

World Health Organisation, 2021. *Depression*. [Online]

Available at: <https://www.who.int/news-room/fact-sheets/detail/depression>

Zanelati, T. et al., 2010. Antidepressant-like effects of cannabidiol in mice: possible involvement of 5-HT<sub>1A</sub> receptors. *British Journal of Pharmacology*, 159(1), pp. 122-128.