

Hemp Based Medicine in Dentistry



Nicole Greco, RDH, BS, MA

About Nicole Greco

**BS: NYU
MA:
Columbia**

**Former
Dean of
Dental
Hygiene**

**EST. RDH
2003**

**Cannabis
& Dental
Educator**

Cannabinoids



**Phyto-
Cannabinoids**

A circular diagram with a black border. Inside, there is a faint grey illustration of a potted plant with a single leaf and a test tube with a drop of liquid. The text "Phyto-Cannabinoids" is centered in bold black font.



**Endo-
Cannabinoids**

A circular diagram with a black border. Inside, there is a faint pink illustration of a flower with a yellow gear icon in the upper right. The text "Endo-Cannabinoids" is centered in bold black font.



**Synthetic
Cannabinoids**

A circular diagram with a black border. Inside, there is a faint grey illustration of a flower and a test tube with a drop of liquid. Below the circle is a brown, cloud-like shape. The text "Synthetic Cannabinoids" is centered in bold black font.

HUMAN ENDOCANNABINOID SYSTEM CB1 AND CB2



THE MOST WELL KNOWN CANNABINOID RECEPTORS, CB1 AND CB2, ARE PROTEINS THAT ARE IMBEDDED IN THE MEMBRANE OF CELLS. THESE SURFACE PROTEINS ARE THEN ATTACHED TO ANOTHER PROTEIN THAT DETERMINES THE SIGNALING DIRECTION ACTIVATION OR INHIBITION

CB1

CB1 Receptors are primarily found in the brain and central nervous system, and to a lesser extent in the other tissues.

CB1 Receptors target :

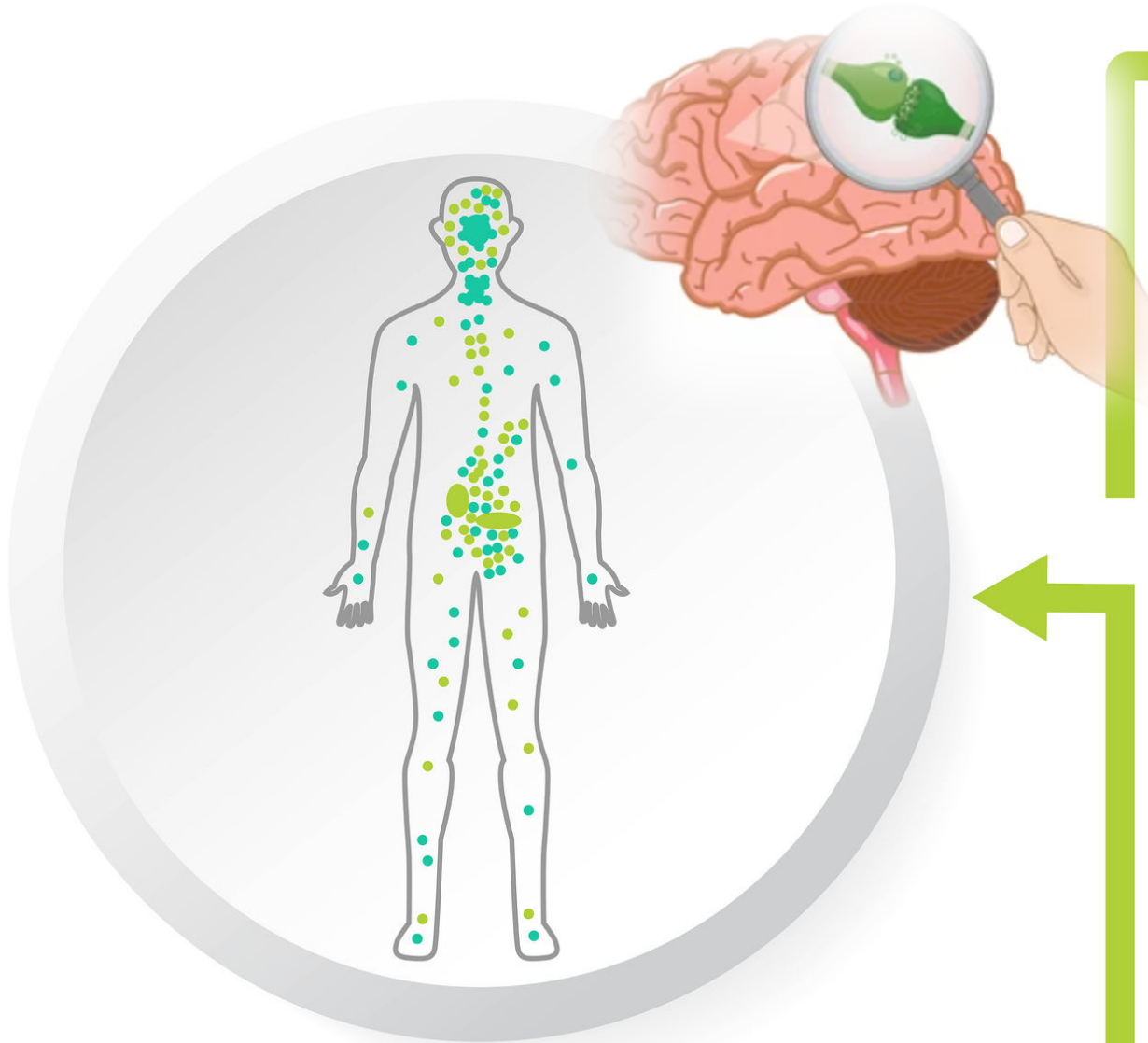
- Appetite
- Immune cells
- Motor activity
- Motor coordination
- Pain perception
- Short term memory
- Thinking

CB2

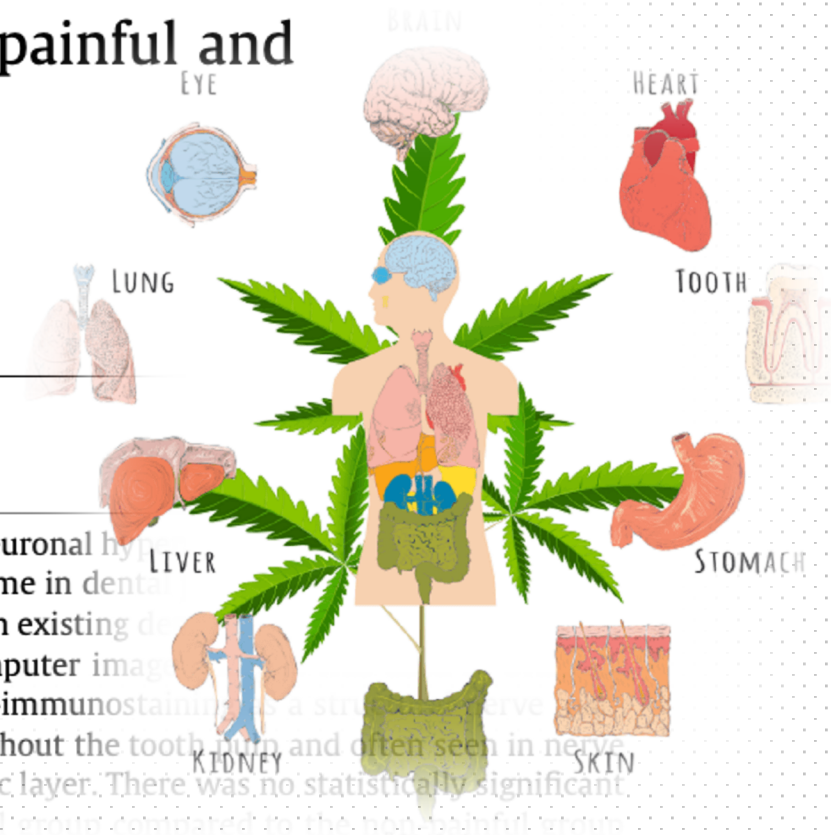
CB2 Receptors are mostly in the peripheral organs especially cells associated with the immune system.

CB2 Receptors target :

- Adipose tissue
- Bone
- Cardiovascular system
- Central nervous system
- Eyes
- Gut
- Immune system
- Kidneys
- Liver
- Pancreas
- Reproductive system
- Respiratory tract
- Skeletal muscle
- Skin
- Tumors

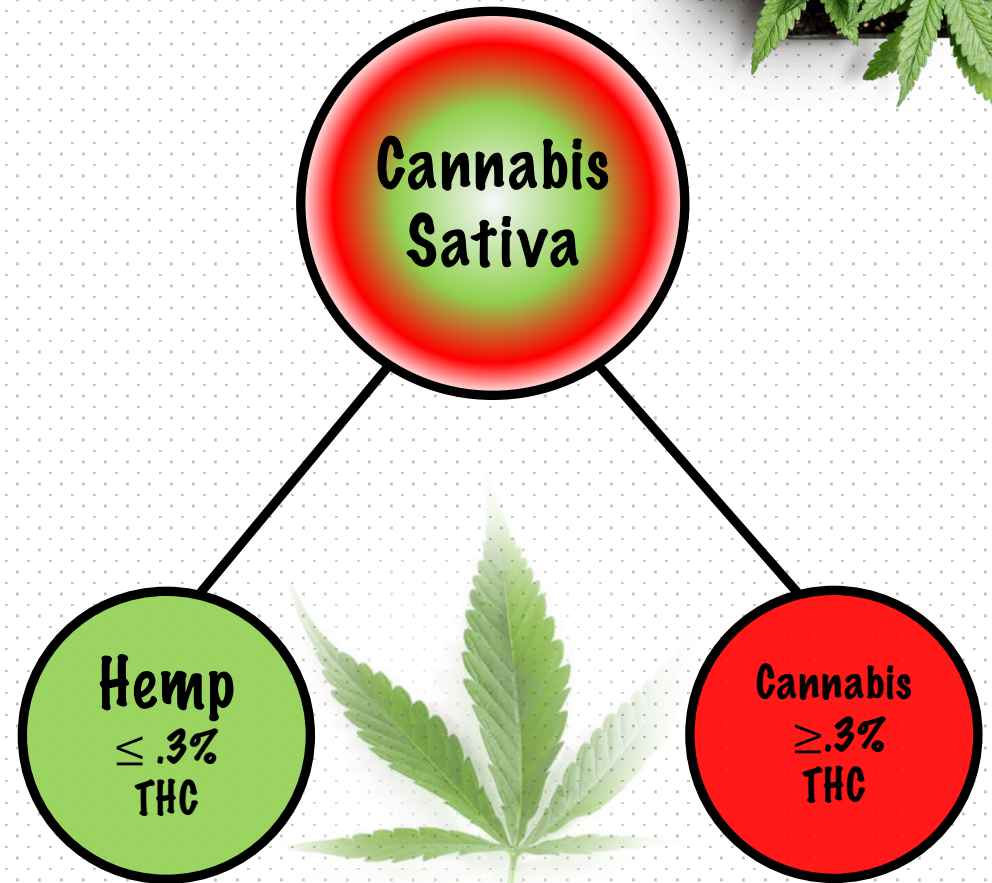
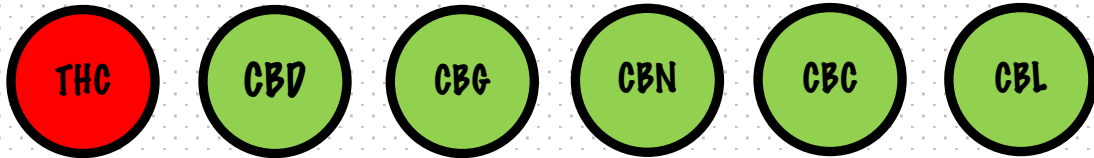


ulation of neuronal hyaluronan for the first time in dentin. In rats, those with existing dentinistry and computer image analysis, neurofilament-immunostained dentin was scattered throughout the tooth, but not in the odontoblastic layer. There



What are Cannabinoids?

Phytocannabinoids:
cannabinoids that
occur naturally in the
cannabis plant.



Legal Medical & Recreational Marijuana States



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ACCESS**



States with legal medical marijuana

States with legal medical & recreational marijuana

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REVIEW
February 2016
2019

***Cannabis sativa*: The Plant of the Thousand and One Molecules**

Christelle M. Andre*, Jean-Francois Hausman and Gea Guerriero

Environmental Research and Innovation, Luxembourg Institute of Science and Technology, Esch-sur-Alzette, Luxembourg

Terpenes



**CBD, CBG,
CBN, THC
Cannabinoids**



**Flavonoids,
Sterols,
etc.**



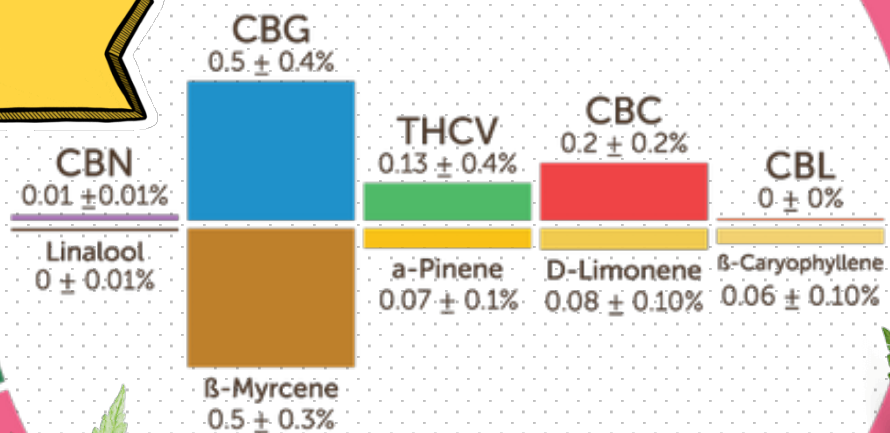
Cannabis sativa L. is an important herbaceous species originating from Central Asia, which has been used in folk medicine and as a source of textile fiber since the dawn of times. This fast-growing plant has recently seen a resurgence of interest because of its multi-purpose applications: it is indeed a treasure trove of phytochemicals and a rich source of both cellulosic and woody fibers. Equally highly interested in this

6 ± 1% THC CBD 12 ± 4%

Cannabinoids:

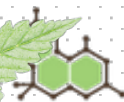
- * THC
- * CBD
- * CBN
- * CBG
- * THCV
- * CBC
- * CBL
- * AND MORE!

Harlequin Strain Fingerprint™



Terpenes:

- 🍋 Linalool
- 🍋 Myrcene
- 🍋 Pinene
- 🍋 Limonene
- 🍋 B-Caryophyllene
- 🍋 AND MORE!



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The Potential Oral Effects of Cannabinoids

Anti-
Inflammatory

Anti-
Bacterial

Analgesic

Promote
Healing &
Bone Repair

Promote
Immunity





Review

Antioxidative and Anti-Inflammatory Properties of Cannabidiol

Sinemyiz Atalay, Iwona Jarocka-Karpowicz and Elzbieta Skrzydlewska *

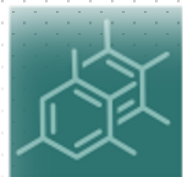
Department of Analytical Chemistry, Medical University of Białystok, 15-089 Białystok, Poland; sinemyiz.atalay@umb.edu.pl (S.A.); iwona.jarocka-karpowicz@umb.edu.pl (I.J.-K.)

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Abstract: Cannabidiol (CBD) is one of the most biologically active phytocannabinoids of *Cannabis sativa* L. CBD is non-psychoactive and exerts a number of beneficial pharmacological effects, including anti-inflammatory and antioxidant properties. The chemistry and pharmacology of CBD, as well as various molecular targets, including cannabinoid receptors and other components of the endocannabinoid system with which it interacts, have been extensively studied. In addition, preclinical and clinical studies have contributed to our understanding of the therapeutic potential of CBD for many diseases, including diseases associated with oxidative stress. Here, we review the main biological effects of CBD, and its synthetic derivatives, focusing on the cellular, antioxidant,





Article

Chemical Characterization and Evaluation of the Antibacterial Activity of Essential Oils from Fibre-Type *Cannabis sativa* L. (Hemp)

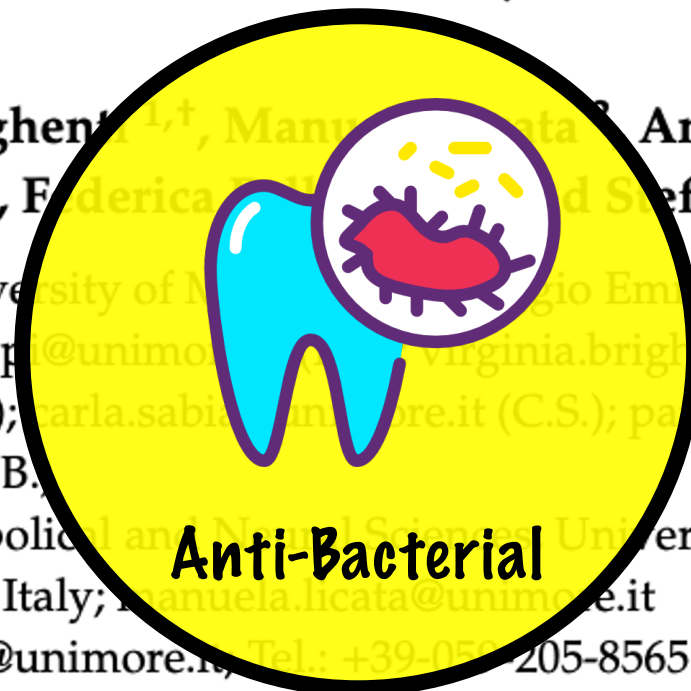
Ramona Iseppi ^{1,†} , Virginia Brighenti ^{1,†} , Manuela Licata ² , Antonella Lambertini ¹,
Carla Sabia ¹ , Patrizia Messi ¹ , Federica Pellati ¹  and Stefania Benvenuti ¹

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† Both authors contributed equally to this work.



CLINICAL REPORT

Cannabidiol (CBD) as a treatment of acute and chronic back pain: A case series and literature review

Jonathan P. Eskander, MD, MBA; Junaid Spall, BS; Awais Spall, BA;
Rinoo V. Shah, MD, MBA; Alan D. Kaye, MD, PhD

ARTICLE INFO

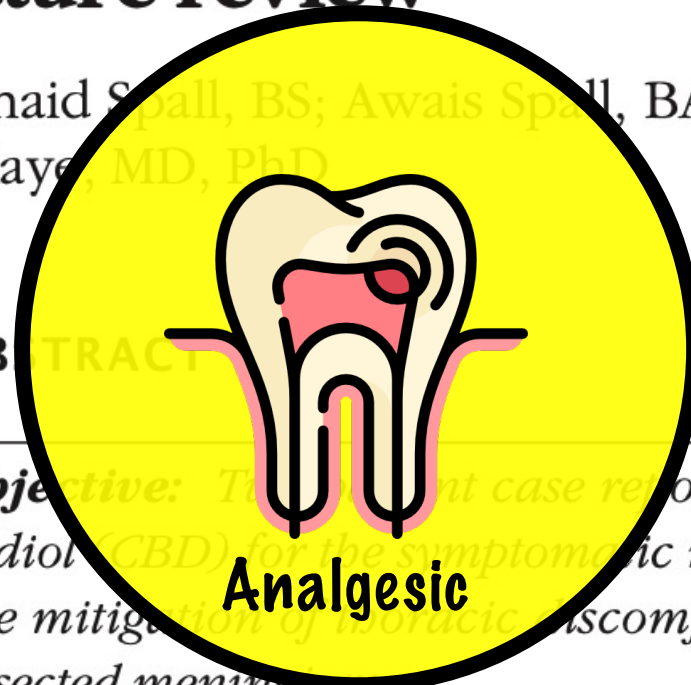
Keywords:

cannabidiol
CBD
compression fracture
low back pain
chronic pain

ABSTRACT

Objective: Two recent case reports are presented describing the use of cannabidiol (CBD) for the symptomatic relief of a lumbar compression fracture and the mitigation of thoracic discomfort and dysesthesia secondary to a surgically resected meningioma.

Discussion: CBD appears to have antinociceptive and anti-inflammatory



Endocannabinoids and Inflammatory Response in Periodontal Ligament Cells

Burcu Özdemir^{1,2*}, Bin Shi^{2,5}, Hans Peter Bantleon³, Andreas Moritz⁴, Xiaohui Rausch-Fan^{2,3}, Oleh Andrukhov^{2*}

1 Department of Periodontology, Faculty of Dentistry, Gazi University, Ankara, Turkey, **2** Division of Oral Biology, Bernhard Gottlieb School of Dentistry, Medical University, Vienna, Austria, **3** Division of Orthodontics, Bernhard Gottlieb School of Dentistry, Medical University, Vienna, Austria, **4** Division of Conservative Dentistry, Periodontology and Prophylaxis, Bernhard Gottlieb School of Dentistry, Medical University, Vienna, Austria, **5** Department of Oral Surgery, First Affiliated Hospital of Fujian Medical University, Fuzhou, China

Abstract

Endocannabinoids are associated with multiple regulatory functions in several tissues. The main endocannabinoids, anandamide (AEA) and 2-arachidonylglycerol (2-AG), have been detected in the gingival crevicular fluid of periodontitis patients, but the association between periodontal disease and human periodontal ligament cells (hPdLCs) and endocannabinoids still remain unclear. The aim of the present study was to examine the effects of AEA and 2-AG on the proliferation/viability and cytokine/chemokine production of hPdLCs in the presence/absence of *Porphyromonas gingivalis* lipopolysaccharide (*P. gingivalis* LPS). The proliferation/viability of hPdLCs was measured using 3,4,5-dimethylthiazol-2-yl-2,5-diphenyl tetrazolium bromide (MTT)-assay. Interleukin-6 (IL-6), interleukin-8 (IL-8), and monocyte chemoattractant protein-1 (MCP-1) levels were examined at gene expression and protein level by real-time PCR and ELISA, respectively. AEA and 2-AG did not reveal any significant effects on proliferation/viability of hPdLCs in the absence of *P. gingivalis* LPS. However, hPdLCs viability was significantly increased by 10–20 μ M AEA in the presence of *P. gingivalis* LPS (1 μ g/ml). In the absence of *P. gingivalis* LPS, AEA and 2-AG did not exhibit any significant effect on the expression of IL-8 and MCP-1 expression in hPdLCs, whereas IL-6 expression was slightly enhanced by 10 μ M 2-AG and not affected by AEA. In *P. gingivalis* LPS stimulated



Promote
Healing

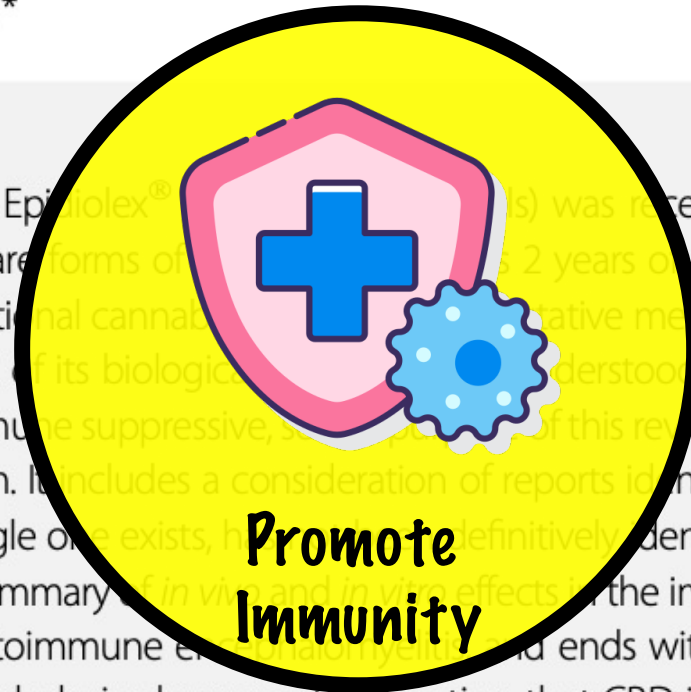
Immune Responses Regulated by Cannabidiol

James M. Nichols and Barbara L.F. Kaplan*

Abstract

Introduction: Cannabidiol (CBD) as Epidiolex® was recently approved by the U.S. Food and Drug Administration (FDA) to treat rare forms of epilepsy in children 2 years of age and older. Together with the increased societal acceptance of recreational cannabis, the exposure to CBD is increasing, even though all of its biological effects are not understood. One such example is the ability of CBD to be anti-inflammatory and immune suppressive, suggesting that it may promote immunity. The purpose of this review is to summarize effects and mechanisms of CBD in the immune system. It includes a consideration of reports identifying receptors through which CBD acts, since the "CBD receptor," if a single one exists, has not yet been definitively identified for the myriad immune system effects. The review then provides a summary of *in vivo* and *in vitro* effects in the immune system, in autoimmune models, with a focus on experimental autoimmune encephalomyelitis and ends with identification of knowledge gaps.

Conclusion: Overall, the data overwhelmingly support the notion that CBD is immune suppressive and that the mechanisms involve direct suppression of activation of various immune cell types, induction of apoptosis, and



**Why are people
using CBD?**

**How are people
taking CBD?**



Jamie Corroon^{1,2} and Joy A. Phillips³

[illegible]

Results: Almost 62% of CBD users reported using CBD to treat a medical condition. The top three medical conditions were pain, anxiety, and depression. Almost 56% of respondents reported that CBD treats their medical

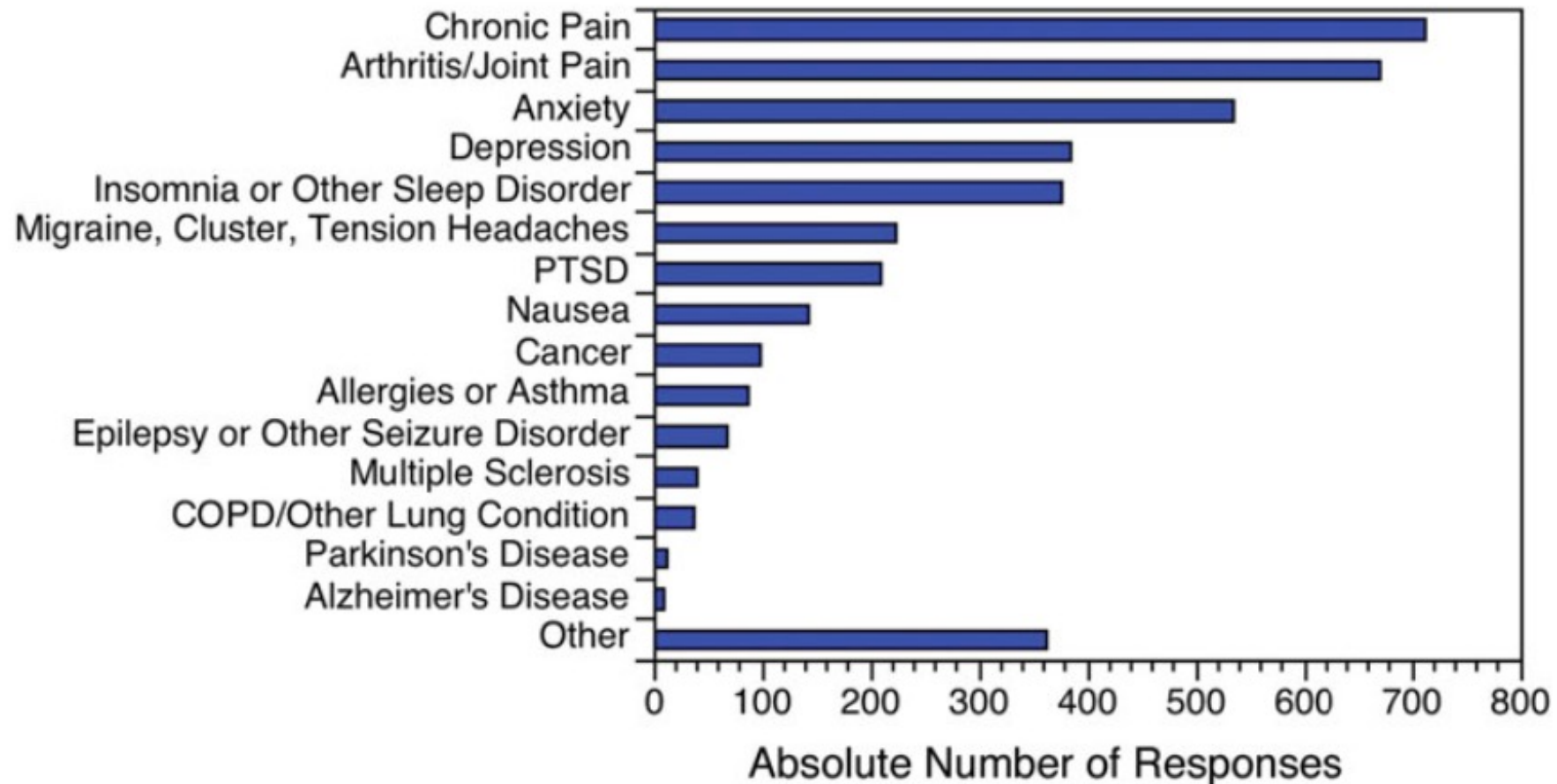


FIG. 1. Number of medical conditions for which respondents reported using CBD, by medical condition ($n = 3963$). CBD, cannabidiol; COPD, chronic obstructive pulmonary disease; PTSD, post-traumatic stress disorder.

Why are people using CBD?

Administration

- 1.Sublingual
- 2.Vaping
- 3.Capsules/Pills
- 4.Liquids
- 5.Smoking
- 6.Edibles
- 7.Topical
- 8.Other

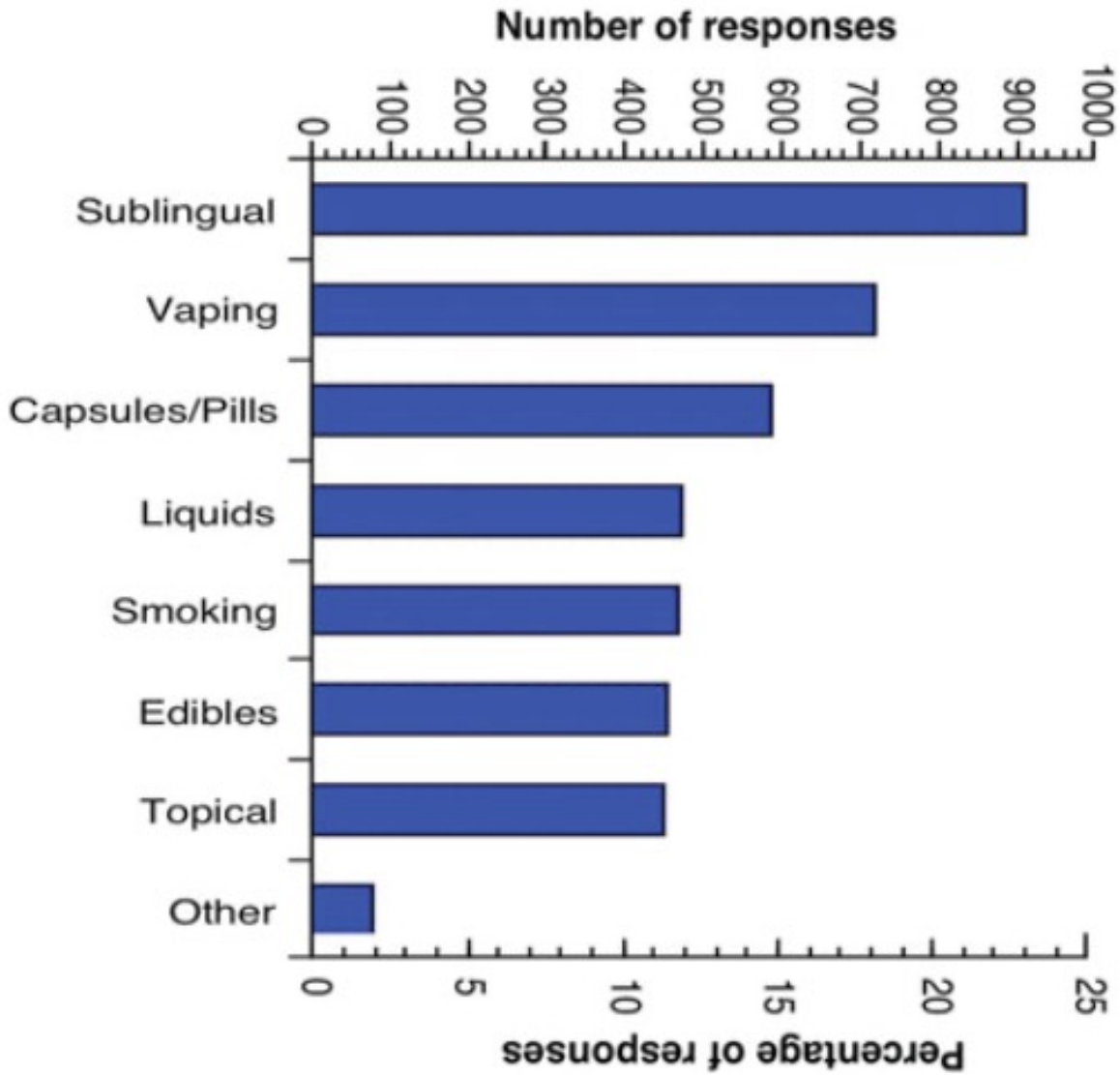


FIG. 2. Number and percentage of methods of administering CBD ($n=4135$).

Cannabinoids Administration



**CBD
Oil**



**CBD
Vape**



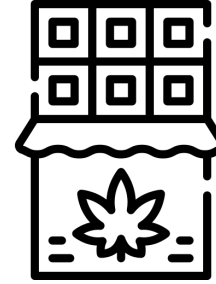
**CBD
Capsule**



**CBD
Drink**



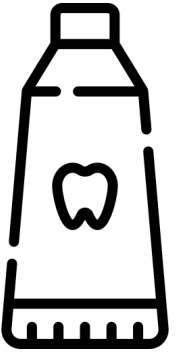
**Inhaled
CBD**



**Edible
CBD**

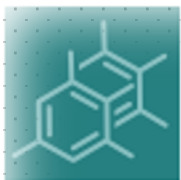


**Topical
CBD**



**Oral Care
CBD**





Review

Cannabinoid Delivery Systems for Pain and Inflammation Treatment

Nataschia Bruni ¹ , Carlo Della Pepa ², Simonetta Oliaro-Bosso ², Enrica Pessione ³, Daniela Gastaldi ⁴ and Franco Dosio ^{2,*} 

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Received: 24 August 2018; Accepted: 25 September 2018; Published: 27 September 2018

Abstract: Cannabinoids are a class of compounds that have been shown to have analgesic and anti-inflammatory properties. They are derived from the Cannabis sativa plant and have been used for centuries to treat pain and inflammation. In recent years, there has been a resurgence of interest in cannabinoids as potential treatments for a variety of conditions, including chronic pain, multiple sclerosis, and cancer. This review discusses the different delivery systems for cannabinoids, including oral, transdermal, and inhaled formulations, and evaluates their efficacy and safety for the treatment of pain and inflammation.

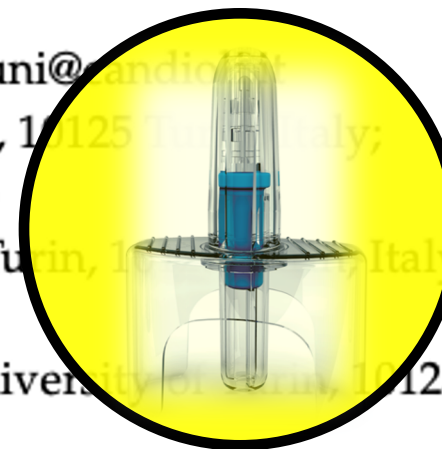
Keywords: cannabinoids; pain; inflammation; delivery systems; transdermal; oral; inhaled

1. Introduction Cannabinoids are a class of compounds that have been shown to have analgesic and anti-inflammatory properties. They are derived from the Cannabis sativa plant and have been used for centuries to treat pain and inflammation. In recent years, there has been a resurgence of interest in cannabinoids as potential treatments for a variety of conditions, including chronic pain, multiple sclerosis, and cancer. This review discusses the different delivery systems for cannabinoids, including oral, transdermal, and inhaled formulations, and evaluates their efficacy and safety for the treatment of pain and inflammation.

2. Cannabinoids: Properties and Therapeutic Potential Cannabinoids are a class of compounds that have been shown to have analgesic and anti-inflammatory properties. They are derived from the Cannabis sativa plant and have been used for centuries to treat pain and inflammation. In recent years, there has been a resurgence of interest in cannabinoids as potential treatments for a variety of conditions, including chronic pain, multiple sclerosis, and cancer. This review discusses the different delivery systems for cannabinoids, including oral, transdermal, and inhaled formulations, and evaluates their efficacy and safety for the treatment of pain and inflammation.

3. Cannabinoid Delivery Systems There are several different ways to deliver cannabinoids to the body. The most common methods are oral, transdermal, and inhaled. Each method has its own advantages and disadvantages, and the choice of delivery system will depend on the patient's condition and preferences. This review discusses the different delivery systems for cannabinoids, including oral, transdermal, and inhaled formulations, and evaluates their efficacy and safety for the treatment of pain and inflammation.

4. Oral Cannabinoid Delivery Systems Oral delivery systems are the most common way to deliver cannabinoids to the body. They include capsules, tablets, and edibles. Oral delivery systems are easy to use and can be taken anywhere, but they have a slow onset of action and can be affected by the patient's diet and metabolism. This review discusses the different oral delivery systems for cannabinoids, including capsules, tablets, and edibles, and evaluates their efficacy and safety for the treatment of pain and inflammation.




Administration Route	Name	Drug	Delivery System/ Dosage Form	Disease	Application	Development Stage	Reference
Oral	Dronabinol	THC	Solid	HIV, chemotherapy	Anorexia, nausea	Market	[56]
Oral	Nabilone	THC analogue	Solid	Chemotherapy, chronic pain	Nausea, pain	Market	[59,60]
Oral	Epidiolex	CBD	Liquid	Lennox-Gastaud and Dravet syndromes	Epilepsy	Market	[62–64]
Oral		CBD	Solid	Crohn’s disease, GVHD		Clinical trials	[66]
Oral		THC	SEDDS		Improving dissolution, stability	Preclinical	[69–71]
Oral		THC-glycosides	Prodrugs	Drug-resistant inflammatory bowel disease	Inflammation	Clinical trials	[72,73]
Oromucosal	Nabiximols	THC CBD 1:1	Spray	Multiple sclerosis	Spasticity	Market	[75,78]
Oromucosal				Cancer	Pain	Clinical trials	[77]
Oromucosal		CBD	Powder			Formulation study	[79]
Oromucosal		THC CBD 1:1	Chewing-gum	Several potential diseases	Pain, spasticity, dementia etc.	Preclinical	[80]
Intranasal		CBD	Liquid formulations		Bioavailability study	Preclinical	[82]
Pulmonary		CBD	Solid/liquid			Formulation study	[86]
Pulmonary			Powder metered-dose inhaler		Bioavailability study	Clinical trials	[87]
Transdermal		Phytocannabinoids		Induced dermatitis	Inflammation	Preclinical	[92]
Transdermal		CBD	Gel	Arthritis	Inflammation	Preclinical	[93]
Transdermal		CBD	Ethosomes	Oedema	Inflammation	Preclinical	[95]
Transdermal		CBD	Gel	Epilepsy, osteoarthritis, fragile-X syndrome		Clinical trials	[96–98]
Transdermal		CBD	Oil, spray, cream	Epidermiolysis bullosa	Pain, blistering	Clinical treatment	[100]
Transdermal		CBD	Patch			Formulation study	[112]
Transdermal		CBD + hyaluronic acid	Gel	Pain, wound management		Formulation study	[105]
Transdermal		CBD+ argan oil		Rheumatic diseases	Inflammation	Formulation study	[107]
Transdermal		CBD+boswellic acid			Inflammation	Formulation study	[108]
Topical ocular		THC analogue	Prodrugs	Glaucoma	Reduce intraocular pressure	Formulation study	[111]

THC, Δ^9 -tetrahydrocannabinol; CBD, cannabidiol; GVHD, graft-versus-host disease; SEDDS, Self-emulsifying drug delivery systems.



CrossMark

The impact of marijuana smoking on lung function

Robert J. Hancox ¹ and Malcolm R. Sears²

Affiliations: ¹Dept of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand. ²McMaster University, Dept of Medicine, Hamilton, Canada

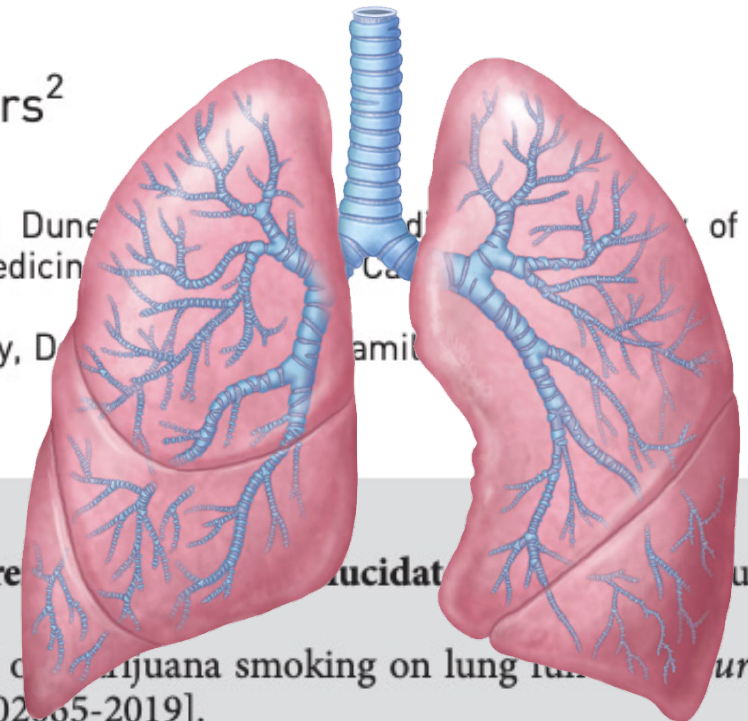
Correspondence: Malcolm R. Sears, McMaster University, Department of Medicine, Hamilton, Canada. E-mail: searsm@mcmaster.ca



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The effects of marijuana smoking on lung function remain unclear. This editorial discusses the current evidence on the effects of marijuana smoking on lung function.

Cite this article as: Hancox RJ, Sears MR. The impact of marijuana smoking on lung function. *European Respiratory Journal* 2019; 54: 1902065 [<https://doi.org/10.1183/13993003.02065-2019>].



Vaporization as a Smokeless Cannabis Delivery System: A Pilot Study

DI Abrams^{1,2,3}, HP Vizoso^{1,3}, SB Shade^{1,3}, C Jay^{4,5}, M Kelly^{1,2,3} and NL Benowitz^{3,6}

Although cannabis may have potential therapeutic value, inhalation of a combustion product is an undesirable delivery system. The aim of the study was to investigate vaporization of the Volcano[®] device as an alternative means of delivery of inhaled *Cannabis sativa*. Eighteen healthy subjects were enrolled to compare the delivery of cannabinoids by vaporization to marijuana smoked in a conventional system. One strength (1.7, 3.4, or 6.8% tetrahydrocannabinol (THC)) and delivery system was used for each of the 6 study days. Plasma concentrations of Δ -9-THC, expired carbon monoxide, and neuropsychologic effects were the main outcome measures. Peak plasma concentrations and time to peak were similar. CO levels were reduced with vaporization. Vaporization of cannabis is a safe and effective mode of delivery of THC. Further studies of clinical effectiveness of cannabis could utilize vaporization



Cannabis Sativa Smoke Inhalation Decreases Bone Filling Around Titanium Implants: A Histomorphometric Study in Rats

Getulio da R. Nogueira-Filho, DDS, MS, PhD,* Tiago G. Almeida, DDS,† Roberto T. Dosa, DDS,‡ Tiago G. Neiva, DDS,§ Roberto Tunes, DDS,|| Daiane M. de F. Almeida, DDS,¶ Lucio A. Lociti, Jr., DDS, MS, PhD, #

Classic long-term studies have already established the high predictability of osseointegration



...a within the limits of the heads of the implant were measured in the cortical (zone A) and

CBD in Dentistry

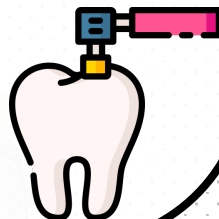
Pre-
Procedural
Anxiety



Post-
Operative
Pain



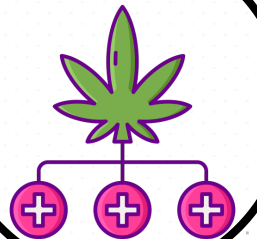
Kill
Bacteria



Improve
Healing



Reduce
Cancer &
Treat Side
Effects

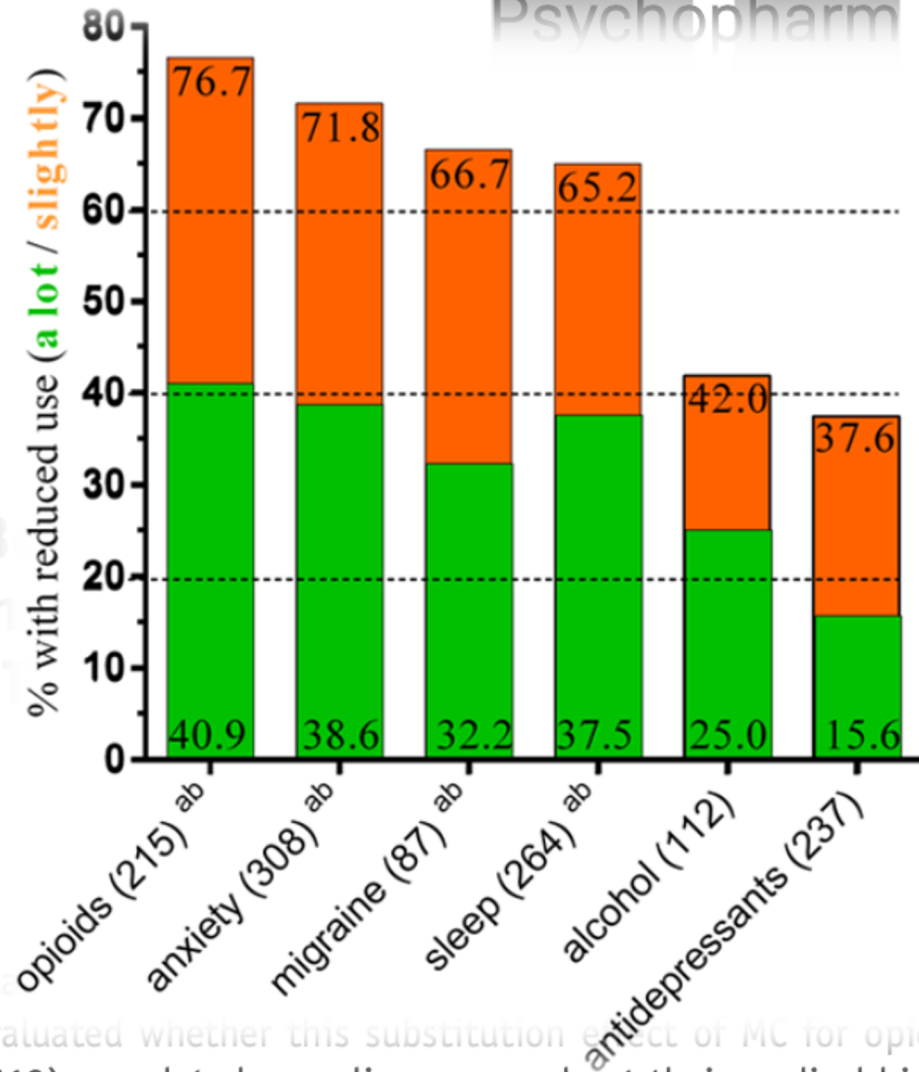


Substitution of medical cannabis for pharmaceutical agents for pain, anxiety, and sleep

Brian J Piper^{1,2,3}, Rebecca M DeKeuster^{4,12}, Monica L B
Catherine M Cobb^{4,6}, Corey A Burchman^{7,8}, Leah Perkin
Shayne T Lynn⁹, Stephanie D Nichols¹⁰ and Alexander


Abstract

A prior epidemiological study identified a reduction in opioid overdose deaths in US states where medical cannabis (MC) is legal. This study evaluated whether this substitution effect of MC for opioids also applies to other psychoactive medications. New England dispensary members ($n = 1,513$) completed an online survey about their medical history and MC experiences. Among respondents that regularly used opioids, over three-quarters (76.7%) indicated that they reduced their use since they started MC. This was significantly ($p < 0.0001$) greater than the patients that reduced their use of antidepressants (37.6%) or alcohol (42.0%). Approximately two-thirds of patients decreased their use of anti-anxiety (71.8%), migraine (66.7%), and sleep (65.2%) medications following MC which significant



Review

Cannabidiol: A Potential New Alternative for the Treatment of Anxiety, Depression, and Psychotic Disorders

María S. García-Gutiérrez ^{1,2}, Francisco Navarrete ^{1,2}, Ani Gasparyan ^{1,2} ,
Amaya Austrich-Olivares ¹, Francisco Sala ¹ and Jorge Manzanares ^{1,2,*}

¹ Neurosciences Institute, University Miguel Hernández-CSIC, Avda de Ramón y Cajal s/n, San Juan de Alicante, 03550 Alicante, Spain; maria.ggutierrez@goumh.umh.es (M.S.G.-G.); fnavarrete@umh.es (F.N.); agasparyan@umh.es (A.G.); austrich@umh.es (A.A.-O.); fsala@umh.es (F.S.)

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Anxiety



Panic



Depression



PTSD



Psychoses



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check for
updates

MINI-REVIEW

Could Cannabidiol Be a Treatment for Coronavirus Disease-19-Related Anxiety Disorders?

Saoirse E. O'Sullivan,^{1,*} Carl W. Stevenson,² and Steven R. Laviolette^{3,4}

Abstract

Coronavirus disease-19 (COVID-19)-related anxiety and post-traumatic stress symptoms (PTSS) or post-traumatic stress disorder (PTSD) are likely to be a significant long-term issue emerging from the current pandemic. We hypothesize that cannabidiol (CBD), a chemical isolated from *Cannabis sativa* with reported anxiolytic properties, could be a therapeutic option for the treatment of COVID-19-related anxiety disorders. In the global over-the-counter CBD market, anxiety, stress, depression, and sleep disorders are considered the top reasons people use CBD. In small randomized controlled clinical trials, CBD (300–800 mg) reduces anxiety in healthy volunteers, patients with social anxiety disorder, those at clinical high risk of psychosis, in patients with Parkinson's disease, and in individuals with heroin use disorder. Observational studies and case reports support these findings.

Anxiety

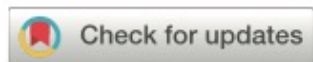
Panic

Depression

PTSD

Psychoses

Editorial



Cannabinoids in periodontal disease amid the COVID-19 pandemic

Jun-Beom Park ^{1,2}, **Kwang-Mook Jung** ², **Daniele Piomelli** ^{2,3,4,*}

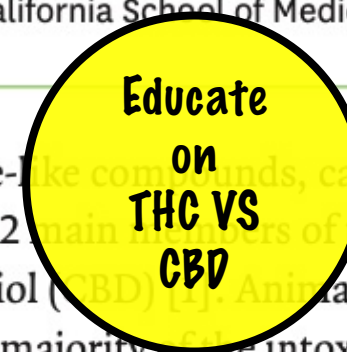
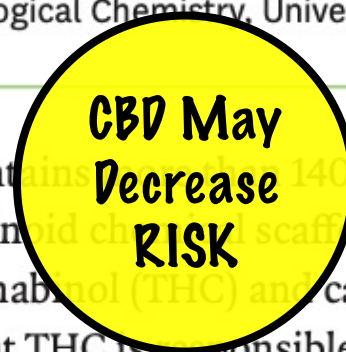
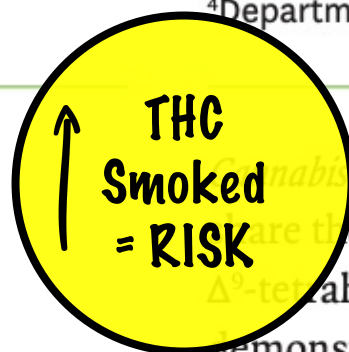
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Cannabis sativa contains more than 140 terpene-like compounds, called cannabinoids, which are the cannabinoid chemical scaffold. The 2 main members of this chemical class are Δ^9 -tetrahydrocannabinol (THC) and cannabidiol (CBD). Animal and human studies have demonstrated that THC is responsible for the majority of the intoxicating effects of cannabis;

In Search of Preventative Strategies: Novel Anti-Inflammatory High-CBD *Cannabis Sativa* Extracts Modulate ACE2 Expression in COVID-19 Gateway Tissues

Bo Wang^{1,3*}, Anna Kovalchuk^{1,2,4*}, Dongping Li^{1,3}, Yaroslav Ilnytskyi^{1,3}, Igor Kovalchuk^{1,2,3,#} and Olga Kovalchuk^{1,2,3,#}

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Keywords: COVID-19; SARS-CoV2; ACE2 receptor; medical cannabis; CBD

CBD in Dentistry

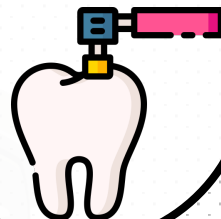
Pre-
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Anxiety



Post-
Operative
Pain



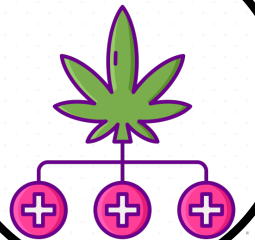
Kill
Bacteria



Improve
Healing





Reduce
Cancer &
Treat Side
Effects





Review

Cannabidiol for Pain Treatment: Focus on Pharmacology and Mechanism of Action

Jakub Mlost [†] , Marta Bryk [†]  and Katarzyna Starowicz ^{*}

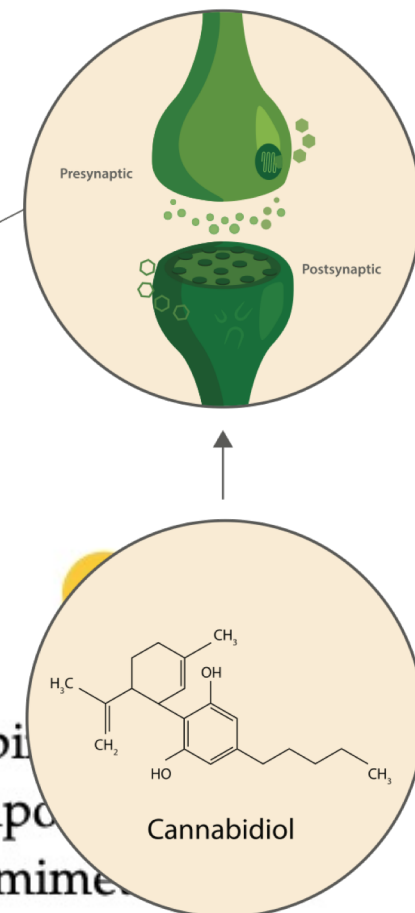
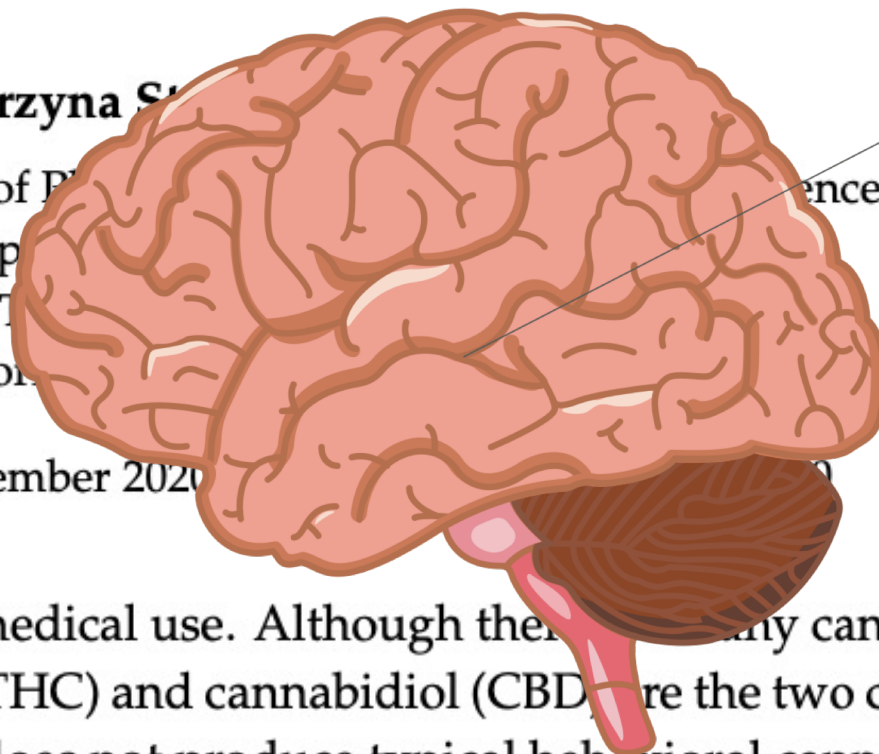
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† These authors contributed equally to this work

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Abstract: Cannabis has a long history of medical use. Although there are many cannabinoids in cannabis, Δ^9 tetrahydrocannabinol (Δ^9 -THC) and cannabidiol (CBD) are the two compounds in the highest concentrations. CBD itself does not produce typical behavioral cannabinimimetic effects, but it has been shown to be a potential modulator of the effects of Δ^9 -THC. In this review, we focus on the pharmacology and mechanism of action of CBD in pain treatment.



Cannabidiol modulates serotonergic transmission and reverses both allodynia and anxiety-like behavior in a model of neuropathic pain

Danilo De Gregorio^a, Ryan J. McLaughlin^b, María Domercq^{a,c}, María Sánchez^a, Justine Enns^a, Martha Lopez-Canul^a, Matthew Aboud^a, Scott M. Cook^a, and Gabriel Gobbi^{a,c,*}

Abstract

Clinical studies indicate that cannabidiol (CBD), the major non-psychotropic component of cannabis, may possess analgesic and anxiolytic effects. However, the mechanisms of action of CBD in models of neuropathic pain are unknown. First, using in vivo models, we demonstrated that increasing doses of CBD (0.1–1.0 mg/kg) decreased mechanical allodynia. Second, administration of the 5-HT_{1A} antagonist WAY 100629 (1 mg/kg, i.v.) or the CB₁ receptor antagonist AM 251 (1 mg/kg, i.v.) reversed the effects of CBD on 5-HT firing through desensitization of 5-HT_{1A} receptors. Third, CBD (1 mg/kg, i.v.) increased 5-HT firing activity, mechanical allodynia, and increased suppressed feeding test. Seven days of treatment with CBD reduced mechanical allodynia, decreased anxiety-like behavior, and

YOU ARE MY
SEROTONIN!

reduced anxiety-like behavior. CBD (1 mg/kg, i.v.) also interacts with the serotonin (5-HT)_{1A} receptor, as well as its impact on models of neuropathic pain. We demonstrated that acute intravenous (i.v.) administration of CBD (1 mg/kg, i.v.) into the dorsal raphe nucleus, which was prevented by the 5-HT_{1A} antagonist capsazepine (1 mg/kg, i.v.) but not by the CB₁ antagonist AM 251 (1 mg/kg, i.v.), subcutaneously [s.c., for 7 days) increased 5-HT firing activity. A chronic (7 days) injury model for 24 days showed decreased 5-HT firing activity, plus maze test, open-field test, and novelty-suppressed feeding test. Seven days of treatment with CBD reduced mechanical allodynia, decreased anxiety-like behavior, and

CBD in Dentistry

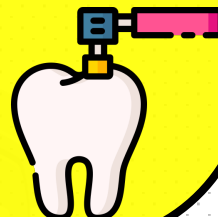
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Pain



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Effects





Cannabidiol Is a Novel Modulator of Bacterial Membrane Vesicles

Uchini S. Kosgodage¹, Paul Matewele¹, Brigitte Awamaria¹, Igor Kraev², Purva Warde³, Giulia Mastroianni⁴, Alistair V. Nunn⁵, Geoffrey W. Guy⁶, Jimmy D. Bell⁵, Jameel M. Inal³ and Sigrun Lange^{7}*

¹ Cellular and Molecular Immunology Research Centre, School of Human Sciences, London Metropolitan University, London, United Kingdom, ² School of Life, Health and Chemical Sciences, The Open University, Milton Keynes, United Kingdom, ³ Bioscience Research Group, Extracellular Vesicle Research Unit, School of Life and Medical Sciences, University of Hertfordshire, Hatfield, United Kingdom, ⁴ School of Biological and Chemical Sciences, Queen Mary University of London, London, United Kingdom, ⁵ Research Centre for Optimal Health, School of Life Sciences, University of Westminster, London, United Kingdom, ⁶ GW Pharmaceuticals Research, Cambridge, United Kingdom, ⁷ Tissue Architecture and Regeneration Research Group, School of Life Sciences, University of Westminster, London, United Kingdom

Membrane vesicles (MVs) released from bacteria participate in cell communication and host-pathogen interactions. Roles for MVs in antibiotic resistance are gaining increased attention and in this study we investigated if known anti-bacterial effects of cannabidiol



Mini Review

Open Access

Determination of the Antibiotic Properties of Cannabidiol

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Clinical Diagnostic Laboratory, Madrid, Spain

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Abstract

Marijuana has been used for centuries as therapy for very diverse health issues which displayed various pathologies, from anorexia to cancer including almost all kinds of inflammatory diseases.

However, the use of cannabis as therapy generates much controversy as there is conclusive evidence of its beneficial properties. Also it entails unwanted effects due to psychoactive power of some of its main components.

Hence, this ongoing work focuses on finding ways to administer cannabinoids, specifically, cannabidiol (CBD), without the presence of any of the psychoactive compounds. Extensive study in this field could be used amicably and we may also find ways to evaluate the effectiveness of this kind of treatment.

Comparison of Efficacy of Cannabinoids versus Commercial Oral Care Products in Reducing Bacterial Content from Dental Plaque: A Preliminary Observation

Veronica Stahl ¹, Kumar Vasudevan ²

1. Dentistry, Euro Dent Belgium, Mortsels, BEL 2. Genetics, Cannibite, Antwerp, BEL

Corresponding author: Veronica Stahl, stahlveronica@euro-dent.be

Abstract

Background

Dental plaque is a complex biofilm that gets formed on the teeth and acts as a reservoir of different microbes. It is the root cause for the occurrence of several dental problems and



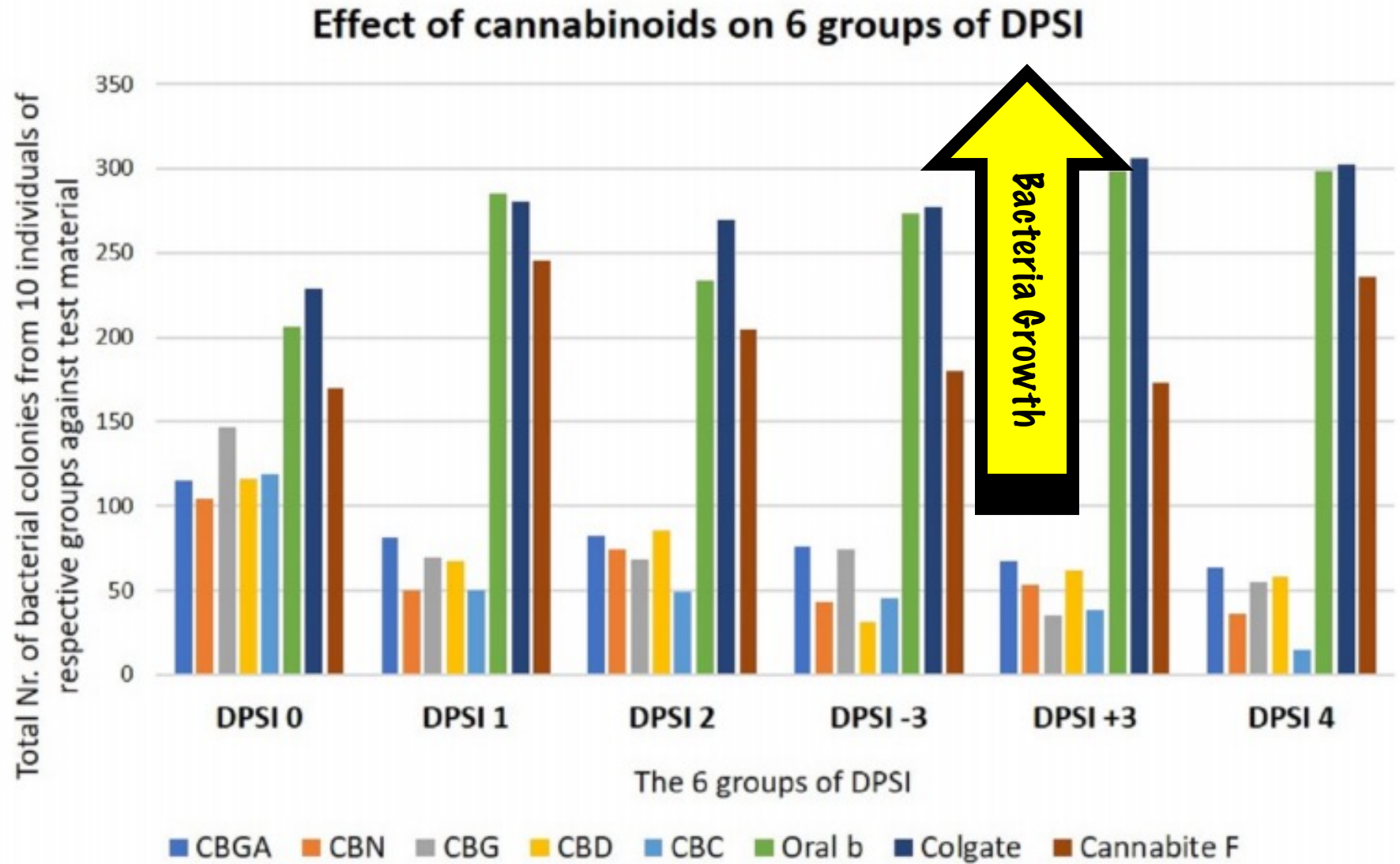
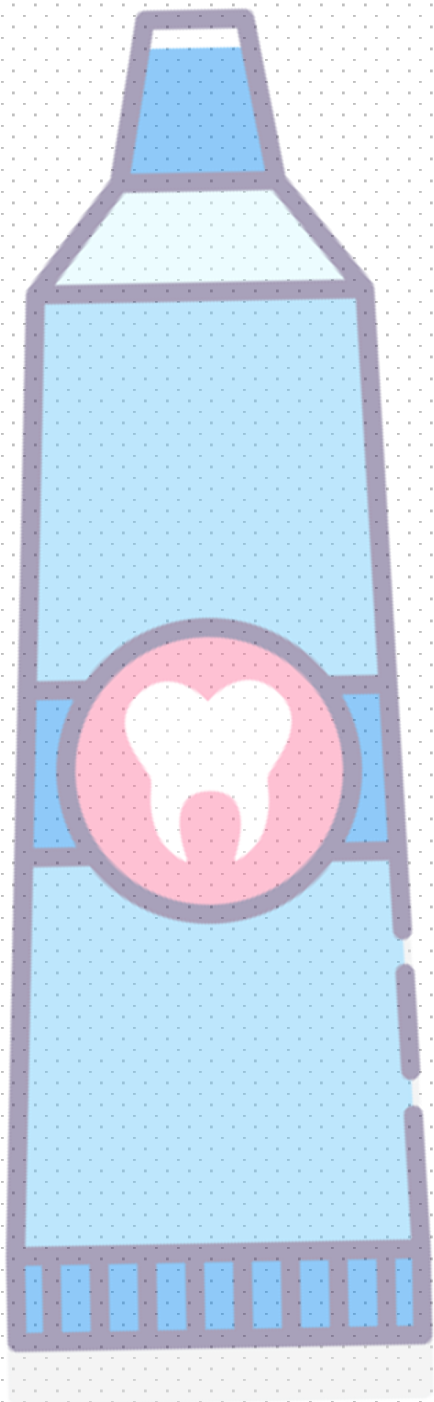


FIGURE 2: Comparison of six research groups with respect to bacterial colony count

CBD Oral Care Products

CBD
Toothpicks

CBD
Mouthwash

CBD
Toothpaste

CBD
Gum

CBD
Floss



ORIGINAL RESEARCH

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Cannabinoids infused mouthwash products are as effective as chlorhexidine on inhibition of total-culturable bacterial content in dental plaque samples



Kumar Vasudevan[†] and Veronica Stahl^{*†} 

Abstract

Background: Dental plaque is a global health problem affecting people of various age groups. Cannabinoids are gaining enormous research attention due to its beneficial properties for various applications. A preliminary observation on antimicrobial property of cannabinoids against dental plaque bacteria has been reported recently.



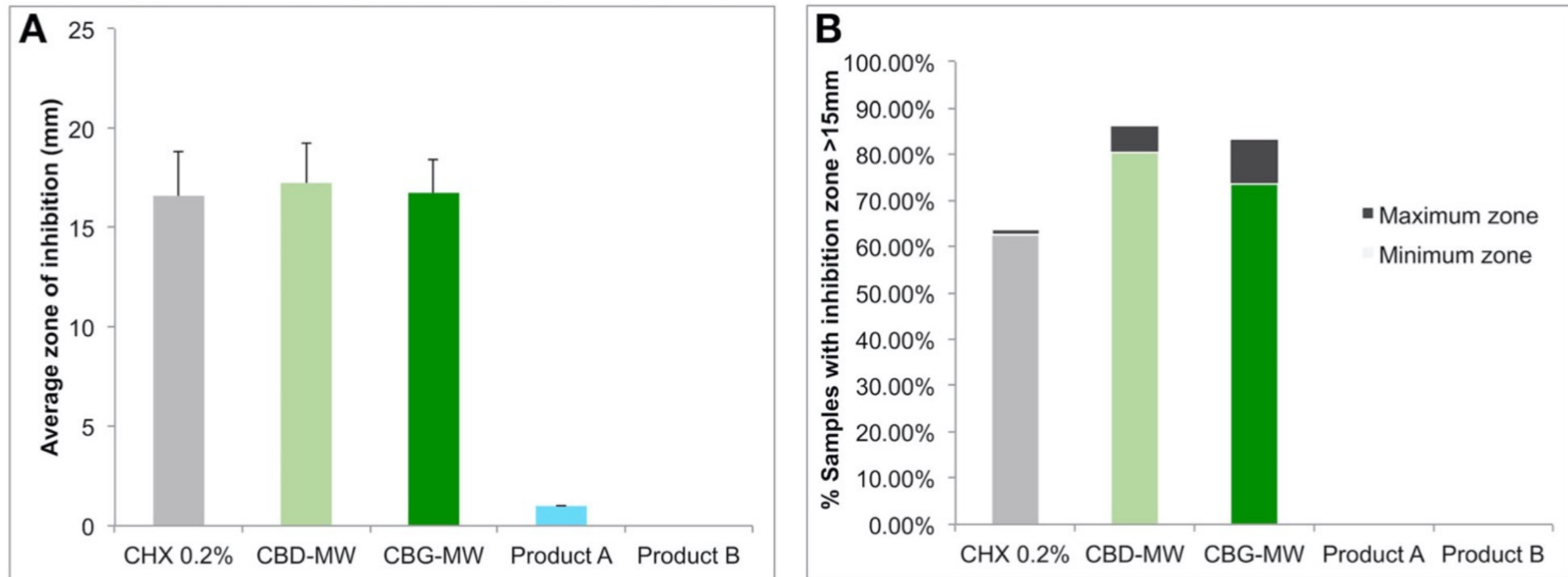


Fig. 3 Panel A, the averages of inhibition zones of all samples combining all DPSI score groups. The positive error bars represent secondary inhibition zone. Panel B, the percentage of samples with inhibition zones greater than 15 mm. The percentages including and excluding the secondary zones are highlighted separately as minimum and maximum zones

CBD-Supplemented Polishing Powder Enhances Tooth Polishing by Inhibiting Dental Plaque Bacteria

Kumar Vasudevan¹ and Veronica Stahl¹

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Kumar Vasudevan Email:

Veronica Stahl Email:

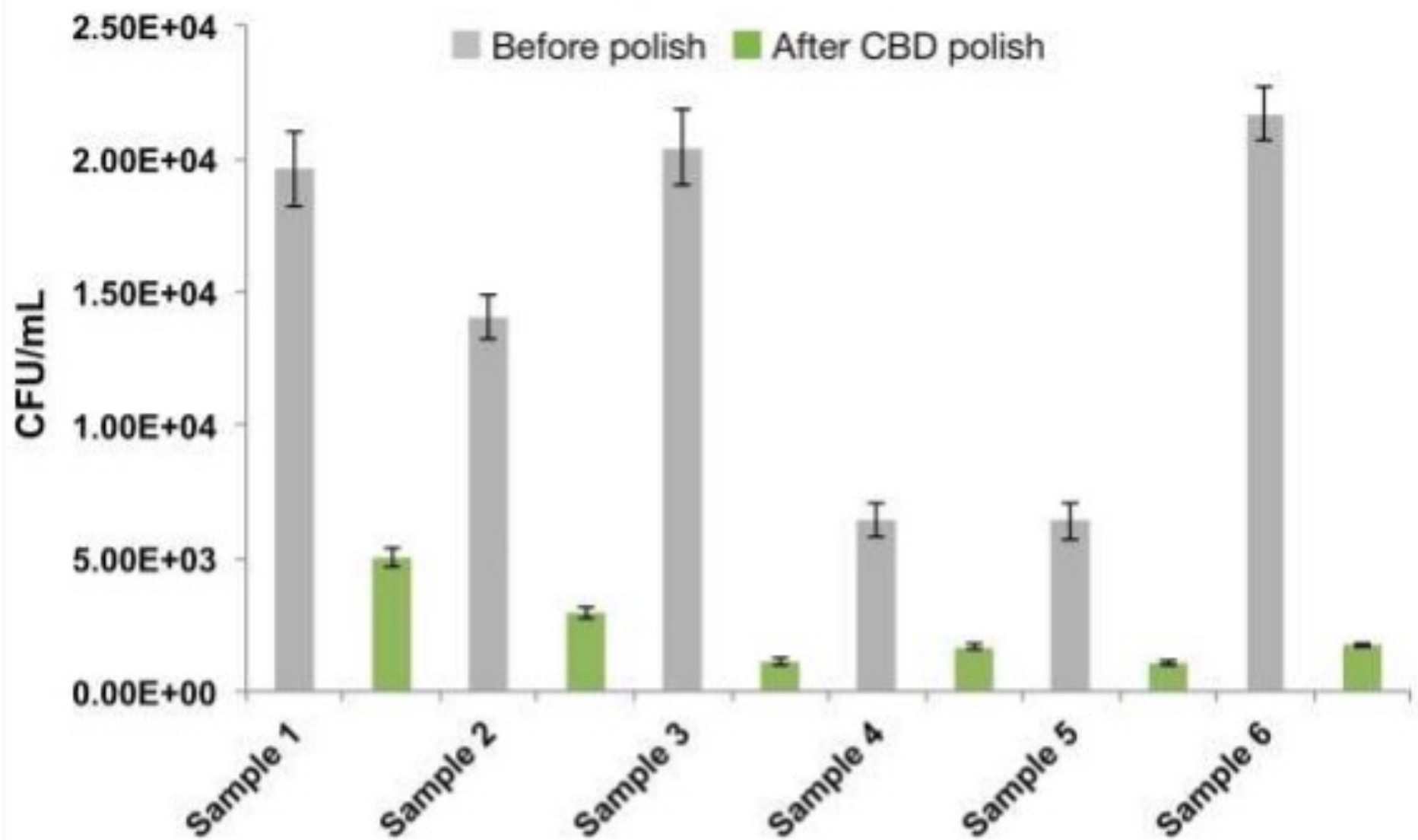
[cannibite.be](mailto:info@cannibite.be)

Abstract

Introduction

Dental health problems of different age groups are a major concern for dental professionals for stain and plaque removal and as preventive procedure for dental problems affecting people. The polishing technique used by dental professionals is a manual procedure using a toothbrush and a polishing paste. The CBD-supplemented polishing powder is a novel product used for tooth polishing. It is a fine, white, powdery substance that is applied to the tooth surface and then polished with a high-speed dental handpiece. The CBD-supplemented polishing powder is a novel product used for tooth polishing. It is a fine, white, powdery substance that is applied to the tooth surface and then polished with a high-speed dental handpiece.

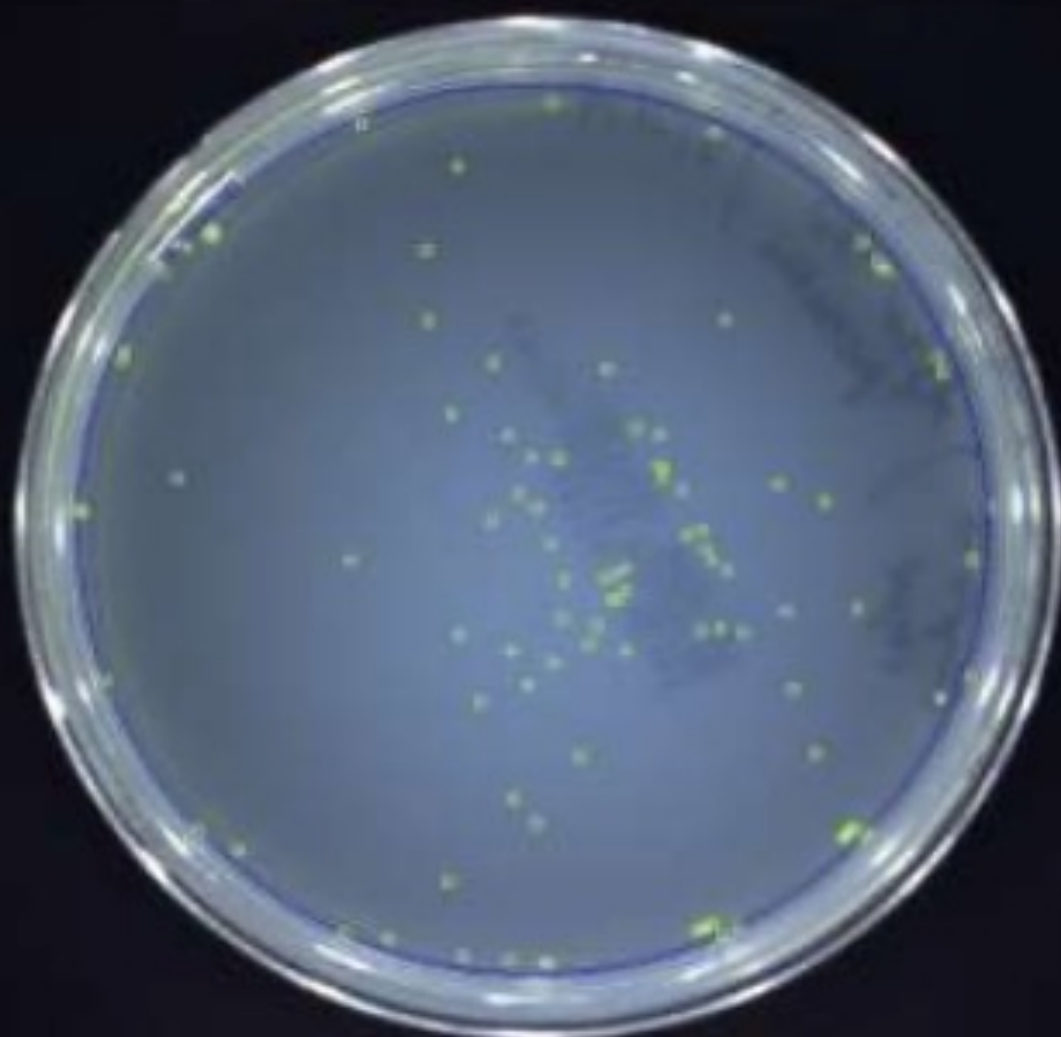
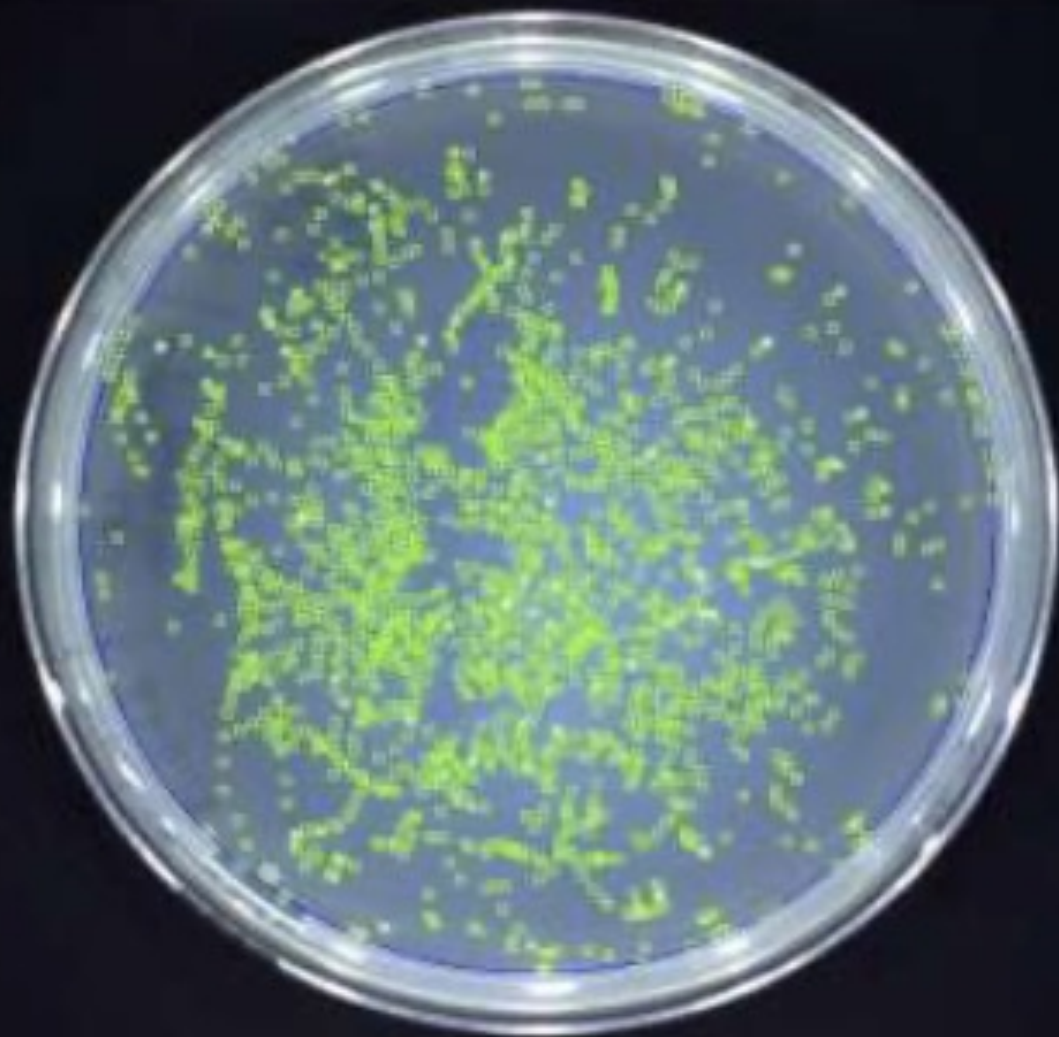


A**CBD-supplemented powder**

A

Before polish

After CBD-supplemented polish



CBD in Dentistry

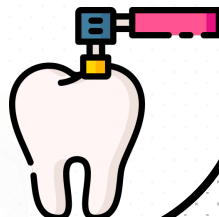
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Post-
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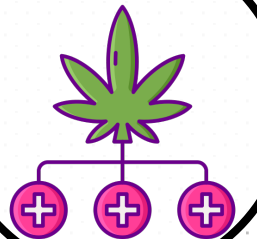
Kill
Bacteria



Improve
Healing



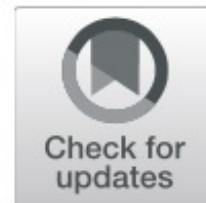
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Treat Side
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RESEARCH

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Analogous modulation of inflammatory responses by the endocannabinoid system in periodontal ligament cells and microglia

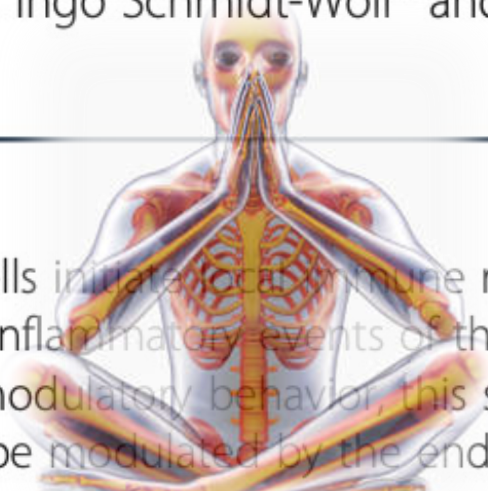


Andreas Jäger¹, Maria Setiawan², Eva Beins³, Ingo Schmidt-Wolf² and Anna Konermann^{1*} 

Abstract

Background: Periodontal ligament (PDL) cells initiate local immune responses, similar to microglia regulating primary host defense mechanisms in neuroinflammatory events of the central nervous system. As these two cell types manifest similarities in their immunomodulatory behavior, this study investigated the thesis that the immunological features of PDL cells might be modulated by the endocannabinoid system, as seen for microglia.

Methods: A human PDL cell line and an Embryonic stem cell derived microglia (ESdM) cell line were grown in



Cannabidiol, a Major Non-Psychotropic Cannabis Constituent Enhances Fracture Healing and Stimulates Lysyl Hydroxylase Activity in Osteoblasts

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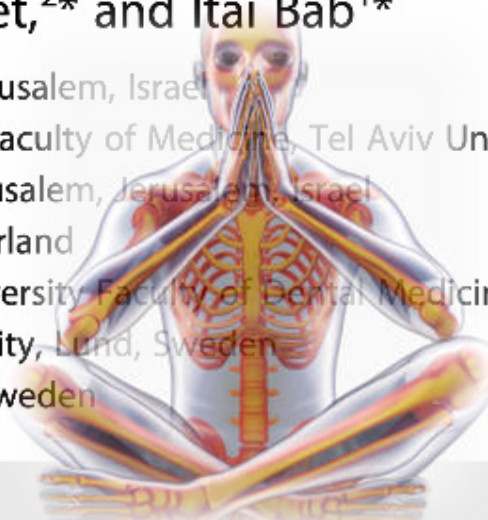
³Institute for Drug Research, Hebrew University of Jerusalem, Jerusalem, Israel

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ABSTRACT

CBD in Dentistry

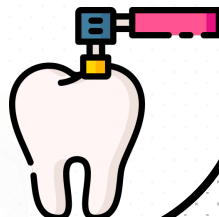
Pre-
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Post-
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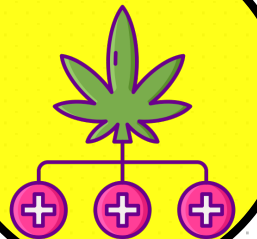
Kill
Bacteria



Improve
Healing



Reduce
Cancer &
Treat Side
Effects



Review

Cannabidiol (CBD) as a Promising Anti-Cancer Drug

Emily S. Seltzer ^{1,†} , Andrea K. Watters ^{1,†} , Danny MacKenzie Jr. ^{1,†} , Lauren M. Granat ² 
and Dong Zhang ^{1,*} 

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Simple Summary: The use of cannabinoids containing plant extracts as herbal medicine can be traced back to as early as 500 BC. In recent years, the medical and health-related applications of one of the non-psychotic cannabinoids, cannabidiol or CBD, has garnered tremendous attention. In this review, we will discuss the most recent findings that strongly support the further development of CBD as a



Review Article

Cannabidiol: an alternative therapeutic agent for oral mucositis?

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†Departamento de Farmácia, Universidade do Sul (PUCRS), Porto Alegre, Brazil

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§Departamento de Farmácia, Universidade Federal do Paraná (UFPR), Curitiba, Brazil

Anti-
Oxidant

Anti-
Inflammatory

Pain-
Relief

CBD Oil may
reduce
Mucositis

SUMMARY

What is known and objective: Chemo- and radiotherapy are therapeutic modalities often used in patients with malignant neoplasms. They kill tumour cells but act on healthy tissues as well, causing side effects. Oral mucositis is a common side effect of chemotherapy and radiotherapy. It is a painful condition that can lead to difficulty in eating and drinking, and may require hospitalization. The objective of this study was to evaluate the effect of cannabidiol (CBD) on oral mucositis.

could mediate the development of oral lesions and OM.^{4,5,7–10} However, despite our understanding of the pathogenesis of this condition, its prevention and treatment are still considered a challenge to the dentist.

The use of cannabinoids, components of *Cannabis sativa*, in the treatment of oral mucositis has been suggested in the literature.

Cannabinoids Inhibit Cellular Respiration of Human Oral Cancer Cells

Donna A. Whyte^a Suleiman Al-Hammadi^d Ghazala Balhaj^d Oliver M. Brown^b
Harvey S. Penefsky^c Abdul-Kader Souid^d

Departments of ^aPediatrics and ^bPharmacology, State University of New York, Upstate Medical University, Syracuse, N.Y., and ^cPublic Health Research Institute, New Jersey, N.J., USA; ^dDepartment of Pediatrics, United Arab Emirates University, Faculty of Medicine and Health Sciences, Al Ain, United Arab Emirates



Use CBD to Reduce Smoking!



Reducing Smoking = Reduced Cancer Risk

SCIENTIFIC REPORTS

OPEN

The effects of cannabidiol on impulsivity and memory during abstinence in cigarette dependent smokers

C. Hindocha¹, T. P. Freeman^{1,2}, M. Grabski^{1,3}, H. Crudgington¹, A. C. Davies¹, J. B. Stroud, R. K. Das¹, W. Lawn¹, C. J. A. Morgan^{1,4} & H. V. Curran¹

Acute nicotine abstinence in cigarette smokers results in deficits in performance on specific cognitive processes, including working memory and impulsivity which are important in relapse. Cannabidiol (CBD), the non-intoxicating cannabinoid found in cannabis, has shown pro-cognitive effects and





The Endocannabinoid System and Cannabidiol's Promise for the Treatment of Substance Use Disorder

Yann Chye^{1*}, Erynn Christensen¹, Nadia Solowij^{2,3} and Murat Yücel¹

¹ Brain and Mental Health Research Hub, Monash Institute of Cognitive and Clinical Neurosciences, School of Psychological Sciences, Monash University, Melbourne, VIC, Australia, ² School of Psychology and Illawarra Health and Medical Research Institute, University of Wollongong, Wollongong, NSW, Australia, ³ The Australian Centre for Cannabinoid Clinical and Research Excellence, New Lambton Heights, NSW, Australia

Substance use disorder is characterized by repeated use of a substance, leading to clinically significant distress, making it a serious public health concern. The endocannabinoid system plays an important role in common neurobiological processes



CBD in Dentistry

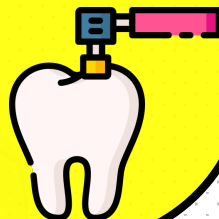
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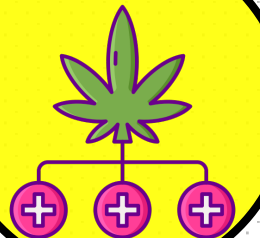
Kill
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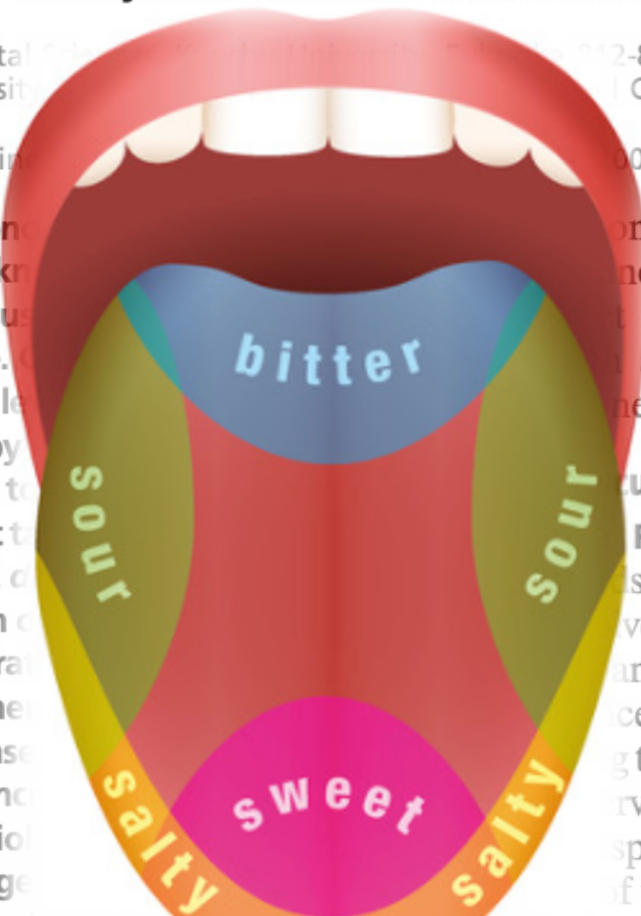
Endocannabinoids selectively enhance sweet taste

Ryusuke Yoshida^{a,1}, Tadahiro Ohkuri^{a,1}, Masafumi Jyotaki^a, Toshiaki Yasuo^a, Nao Horio^a, Keiko Yasumatsu^a, Keisuke Sanematsu^a, Noriatsu Shigemura^a, Tsuneyuki Yamamoto^b, Robert F. Margolskee^c, and Yuzo Ninomiya^{a,2}

^aSection of Oral Neuroscience, Graduate School of Dental Science, Nagasaki International University, 8-1-1 Shinkawa, Nagasaki 852-8582, Japan; ^bDepartment of Pharmacology, Faculty of Medicine, University of Pennsylvania, 3531 Locust Walk, Philadelphia, PA 19104-3308; ^cHoward Hughes Medical Institute, National Institutes of Health, 3541 Center Expressway, Philadelphia, PA 19104-3308

Edited by Linda M. Bartoshuk, University of Florida, Gainesville, FL 32611-0009 (received for review October 19, 2009)

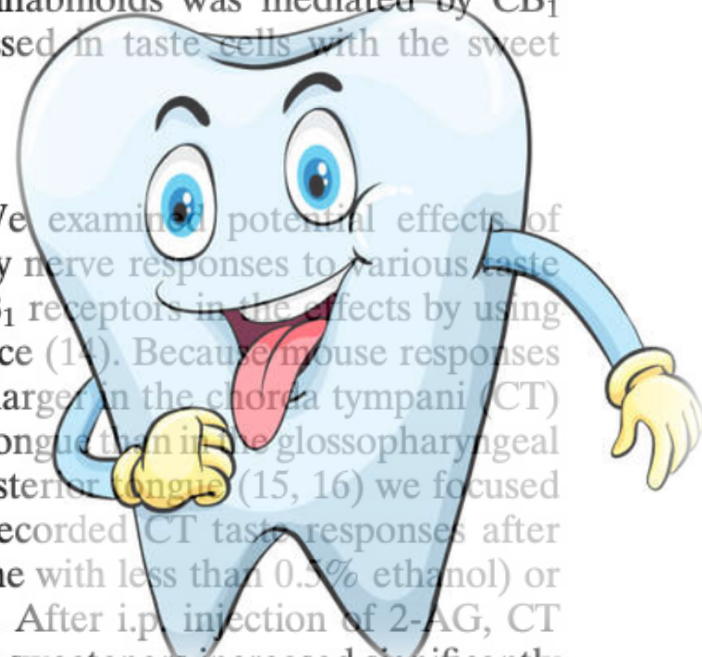
Endocannabinoids such as anandamide [N-arachidonic acid (AEA)] and 2-arachidonoyl glycerol (2-AG) are known as mediators that act via CB₁ receptors in hypothalamus and brain to induce appetite and stimulate food intake. Endocannabinoid levels inversely correlate with plasma leptin, an anorexic mediator that reduces food intake by acting on hypothalamic receptors. Recently, taste has been found to be a target of leptin. Leptin selectively suppresses sweet taste responses in wild-type mice but not in leptin receptor-deficient mice. We show that endocannabinoids oppose the action of leptin as enhancers of sweet taste. We found that administration of 2-AG increases gustatory nerve responses to sweeteners in a leptin-dependent manner without affecting responses to bitter, sour, and umami compounds. The cannabinoids increase responses to sweet-bitter mixtures and electrophysiological responses of taste receptor cells to sweet compounds. Mice lacking CB₁ receptors show no enhancement by endocannabinoids of sweet taste responses at cellular, nerve, or behavioral levels. In addition, the



Responses are selectively enhanced by administration of endocannabinoids AEA and 2-AG, and that the sweet taste effect of endocannabinoids was mediated by CB₁ receptors that are coexpressed in taste cells with the sweet taste receptor T1r3.



Discussion

Responses. We examined potential effects of endocannabinoids on gustatory nerve responses to various taste compounds. Administration of CB₁ receptors in the effects by using CB₁ agonists and CB₁^{-/-} mice (14). Because mouse responses to sweet taste are much larger in the chorda tympani (CT) than in the anterior tongue (15, 16) we focused on responses originating from the posterior tongue. We recorded CT taste responses after administration of vehicle (saline with less than 0.5% ethanol) or endocannabinoids AEA and 2-AG. After i.p. injection of 2-AG, CT nerve responses of WT mice to sweeteners increased significantly



Review

The Cannabis Terpenes

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Pinene



Limonene



**Terpin-
elone**



Myrcene



BCP



Terpenes in Dentistry

**Anti-
Bacterial**



**Anti-
Inflammatory**



Analgesic

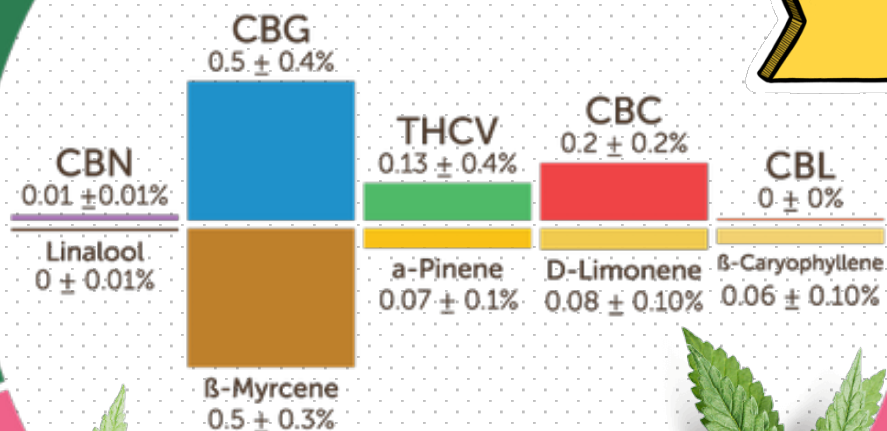


6 ± 1% THC CBD 12 ± 4%

Cannabinoids:

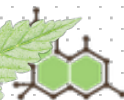
- * THC
- * CBD
- * CBN
- * CBG
- * THCV
- * CBC
- * CBL
- * AND MORE!

Harlequin Strain Fingerprint™



Terpenes:

- 🍋 Linalool
- 🍋 Myrcene
- 🍋 Pinene
- 🍋 Limonene
- 🍋 B-Caryophyllene
- 🍋 AND MORE!






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Review

Protective Effects of (*E*)- β -Caryophyllene (BCP) in Chronic Inflammation

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RESEARCH ARTICLE

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Use of β -caryophyllene to combat bacterial dental plaque formation in dogs

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Abstract

Background: Periodontal disease is a highly prevalent condition in individuals over the age of 3 years. To combat dental plaque in these animals, the etiology of the disease has been reported. Thus, surveys are conducted through the use of antimicrobial therapy and prevention of periodontal disease. The objective of the work was to evaluate the use of β -caryophyllene in many dogs, reaching up to 85 % for combating the formation of bacterial plaque. β -caryophyllene, which has several side effects, is a potential substitute for antimicrobial therapy.





Article

β -Caryophyllene Reduces the Inflammatory Phenotype of Periodontal Cells by Targeting CB2 Receptors

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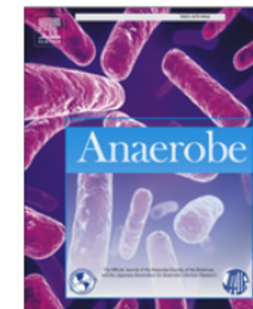


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Note

Antimicrobial effect of linalool and α -terpineol against periodontopathic and cariogenic bacteria

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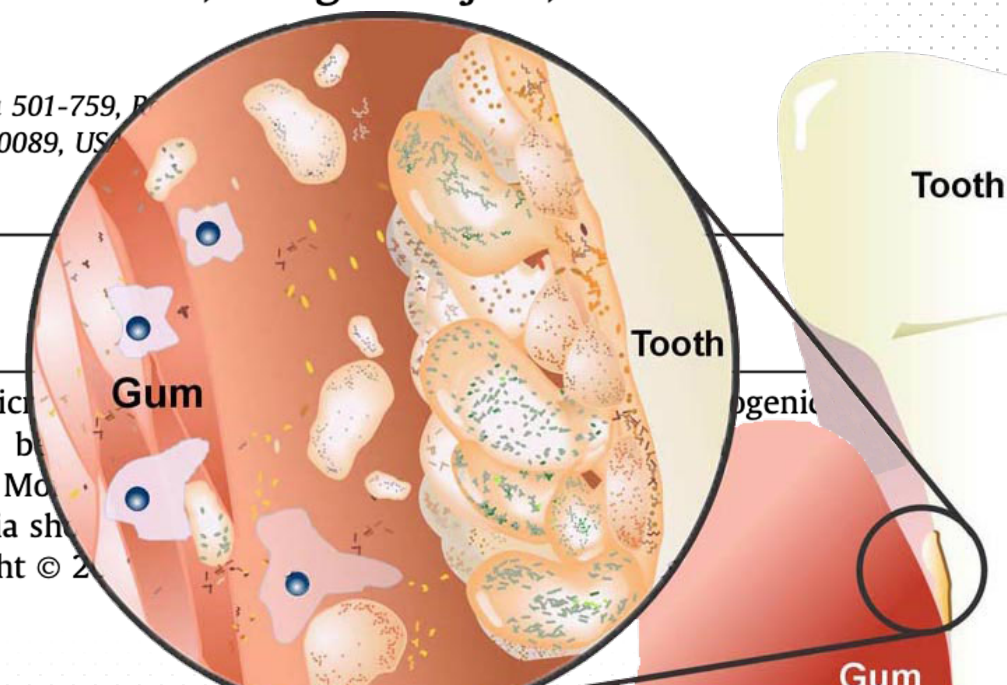
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ABSTRACT

Linalool and α -terpineol exhibited strong antimicrobial activity against periodontopathic and cariogenic bacteria. However, their concentration should be adjusted to be effective as components of toothpaste or gargling solution. Molecular docking studies showed that linalool and α -terpineol could bind to the cell wall of bacteria against periodontopathic and cariogenic bacteria.

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References

- Atalay, S., Jarocka-Karpowicz, I., & Skrzydlewska, E. (2019). Antioxidative and Anti-Inflammatory Properties of Cannabidiol. *Antioxidants (Basel, Switzerland)*, 9(1), 21. <https://doi.org/10.3390/antiox9010021>
- Blaskovich, M., Kavanagh, A. M., Elliott, A. G., Zhang, B., Ramu, S., Amado, M., Lowe, G. J., Hinton, A. O., Pham, D., Zuegg, J., Beare, N., Quach, D., Sharp, M. D., Pogliano, J., Rogers, A. P., Lyras, D., Tan, L., West, N. P., Crawford, D. W., Peterson, M. L., ... Thurn, M. (2021). The antimicrobial potential of cannabidiol. *Communications biology*, 4(1), 7. <https://doi.org/10.1038/s42003-020-01530-y>
- Burt B. A. (2006). The use of sorbitol- and xylitol-sweetened chewing gum in caries control. *Journal of the American Dental Association (1939)*, 137(2), 190–196. <https://doi.org/10.14219/jada.archive.2006.0144>
- Helal, I. M., El-Bessoumy, A., Al-Bataineh, E., Joseph, M., Rajagopalan, P., Chandramoorthy, H. C., & Ben Hadj Ahmed, S. (2019). Antimicrobial Efficiency of Essential Oils from Traditional Medicinal Plants of Asir Region, Saudi Arabia, over Drug Resistant Isolates. *BioMed research international*, 2019, 8928306. <https://doi.org/10.1155/2019/8928306>
- Jäger, A., Setiawan, M., Beins, E., Schmidt-Wolf, I., & Konermann, A. (2020). Analogous modulation of inflammatory responses by the endocannabinoid system in periodontal ligament cells and microglia. *Head & face medicine*, 16(1), 26. <https://doi.org/10.1186/s13005-020-00244-0>
- Meyer, F., & Enax, J. (2019). Hydroxyapatite in Oral Biofilm Management. *European journal of dentistry*, 13(2), 287–290. <https://doi.org/10.1055/s-0039-1695657>
- Nayak, P. A., Nayak, U. A., & Khandelwal, V. (2014). The effect of xylitol on dental caries and oral flora. *Clinical, cosmetic and investigational dentistry*, 6, 89–94. <https://doi.org/10.2147/CCIDE.S55761>
- Nichols, J. M., & Kaplan, B. (2020). Immune Responses Regulated by Cannabidiol. *Cannabis and cannabinoid research*, 5(1), 12–31. <https://doi.org/10.1089/can.2018.0073>
- Özdemir, B., Shi, B., Bantleon, H. P., Moritz, A., Rausch-Fan, X., & Andrukhov, O. (2014). Endocannabinoids and inflammatory response in periodontal ligament cells. *PloS one*, 9(9), e107407. <https://doi.org/10.1371/journal.pone.0107407>
- Park, M., M. Hyu Huh., & M. Kyung Lee. Effects of Cannabinoid and Trpv1 in Formalin-induced Orofacial Pain. *Journal of Dental and Medical Sciences*, 15(9), 26-29.
- Stahl, V., & Vasudevan, K. (2020). Comparison of Efficacy of Cannabinoids versus Commercial Oral Care Products in Reducing Bacterial Content from Dental Plaque: A Preliminary Observation. *Cureus*, 12(1), e6809. <https://doi.org/10.7759/cureus.6809>
- Vasudevan, K., & Stahl, V. (2020). Cannabinoids infused mouthwash products are as effective as chlorhexidine on inhibition of total-culturable bacterial content in dental plaque samples. *Journal of cannabis research*, 2(1), 20. <https://doi.org/10.1186/s42238-020-00027-z>
- Vasudevan, K., & Stahl, V. (2020). CBD-supplemented Polishing Powder Enhances Tooth Polishing by Inhibiting Dental Plaque Bacteria. *Journal of International Society of Preventive & Community Dentistry*, 10(6), 766–770. https://doi.org/10.4103/jispcd.JISPCD_351_20
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