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Exploring the Therapeutic Potentials of Cannabis Sativa in Dentistry: A Scientific Review

Marvin Gonçalves Duarte, Priscila Paulina Coutinho de Queiroz, Gracielle Radja Rodrigues de Lima, Luciano Barreto Silva*

Faculdade de Odontologia do Recife, Brazil

ABSTRACT

Objective: The aim of this study is to investigate and critically analyze the potential therapeutic applications and effects of Cannabis Sativa, particularly focusing on its cannabinoids, in the field of dentistry. **Methodology:** To conduct this research, a comprehensive literature review was undertaken. This involved querying several databases for relevant scientific articles and studies. Key databases included BVS/ BIREME, PUBMED Central, Web of Science, Science Direct, and the Periodic Portal from CAPES, The Cochrane Library, and PROSPERO. **Results:** The endocannabinoid system, along with various cannabinoids, plays a multifaceted role in immune regulation and inflammation. These components show potential in therapeutic applications, ranging from modulating immune cell function to treating inflammatory diseases.

Keywords: Cannabis, Cannabinoids, Dentistry.

INTRODUCTION

The use of Cannabis Sativa, popularly known as marijuana, has been the subject of growing scientific interest due to its medicinal and therapeutic properties. In recent years, the medical community's perception of this plant has evolved from a predominantly stigmatized perspective to a broader appreciation of its potential therapeutic benefits [1]. In this context, the present review seeks to explore and critically analyze the available scientific literature on the use of Cannabis Sativa in dentistry, highlighting its effects on pain, inflammation, anxiety and other aspects relevant to dental practice.

Contemporary dentistry faces significant challenges in effectively managing postoperative pain, controlling patient anxiety, and modulating inflammation associated with various oral conditions. Recent studies suggest that Cannabis Sativa may play a role in reducing periodontal inflammation, offering an innovative perspective in the treatment of gum disease [2]. Cannabis Sativa, rich in phytochemical compounds known as cannabinoids, emerges as a possible therapeutic alternative to address these issues innovatively. The presence of cannabinoid receptors in the central nervous system, as well as in peripheral tissues, suggests a potential direct impact of Cannabis Sativa on physiological processes crucial to dental practice.

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***Corresponding Author**

Luciano Barreto Silva

Faculdade de Odontologia do Recife, Brazil, Tel: 5581982888339, ORCID: 0000-0002-1508-4812

Email: lucianobarreto63@gmail.com

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As scientific research continues to unravel the mechanisms of action of cannabinoids, it becomes imperative to critically evaluate the clinical relevance of this plant in modern dentistry. This review aims to provide a comprehensive synthesis of recent studies exploring the effects of Cannabis Sativa on specific dental conditions, as well as its potential benefits and challenges associated with its therapeutic use [3]. Ultimately, we seek to contribute to the understanding of the potential role of Cannabis Sativa as an additional tool in the dental therapeutic arsenal, promoting an informed and evidence-driven discussion in this evolving field.

METHODOLOGY

To conduct this research, a comprehensive literature review was undertaken. This involved querying several databases for relevant scientific articles and studies. Key databases included BVS/BIREME, PUBMED Central, Web of Science, Science Direct, the Periodic Portal from CAPES, The Cochrane Library, and PROSPERO. This review aims to examine and critically assess the scientific literature pertaining to the application of Cannabis Sativa in dental practice, with a particular emphasis on its effects on pain, inflammation, anxiety, and other relevant dental concerns.

RESULTS

Table 1. Historical evolution of Cannabis Sativa

Period	Use and study	Observations
Antiquity	Medicinal use in civilizations like the Chinese and Hindus; ritual and role recreational.	References in the Vedas of India and writings of Herodotus in ancient Greece.
19th Century	Gained attention in Western medicine; commercially available cannabis-based products.	Used to treat neuralgia, insomnia, and menstrual pain.
Early 20th Century	Decline in medicinal use; increased stigmatization.	Influenced by the enactment of substance control laws.
Second half of the 20th Century	Resurgence of scientific interest; discovery of the endocannabinoid system.	Expanded research, strict prohibition policies.

Table 2. Chemical Characteristics of Cannabis Sativa

Component	Prescription	Potential Effects
Cannabinoids (THC, CBD)	Interact with cannabinoid receptors in the nervous system.	THC: psychoactive effects. CBD: therapeutic benefits without psychoactivity.
Terpenes	Responsible for the characteristic aroma.	-
Flavonoids	Have antioxidant properties.	-
"Entourage Effect"	Complex interaction between chemical components.	Importance in the diversity of effects on the human body.

Table 3. Regulation of Inflammation in Dentistry

Treatment	Purpose	Importance
Scaling and root planing, antimicrobial therapies	Reduction of inflammation in periodontal diseases.	Critical for the prevention and treatment of gingivitis and periodontitis.
Post-surgical management	Reduction of inflammation and promotion of healing.	Essential after tooth extractions and dental implant placements.
Anti-inflammatory medications	Dental pain management.	Common in pain management practices.
Decay prevention	Application of dental sealants and fluoride treatments.	Reduces the risk of inflammation and related dental issues.

Table 4. Management of Neurological Diseases

Condition	CBD Efficacy	Notes
Autism and other neurological disorders	Therapeutic potential in various disorders.	Interacts with multiple targets within the CNS.
Epilepsy	Antiepileptic.	-
Chronic pain	Analgesic.	-
Neurodegenerative diseases (e.g., Alzheimer's)	Neuroprotective.	-
Mental health disorders (anxiety, depression)	Antidepressant, anxiolytic.	-

DISCUSSION

Historically, Cannabis Sativa has been used in various cultures, notably in Chinese and Hindu medicinal practices, signifying its long-standing therapeutic importance. Its integration into Western medicine during the 19th century for illnesses like neuralgia, insomnia, and menstrual pain marked a broader acceptance of its medicinal properties [4]. However, the 20th century witnessed a significant shift with increasing stigmatization and prohibition, followed by a resurgence in scientific interest, particularly after the discovery of the endocannabinoid system. This transition underscores the evolving perception of cannabis, influenced by cultural, legal, and scientific factors.

The plant's chemical complexity is highlighted by the focus on cannabinoids (such as THC and CBD), terpenes, and flavonoids. THC is known for its psychoactive effects, whereas CBD is recognized for its non-psychoactive, therapeutic potentials. The 'entourage effect', which refers to the synergistic interaction of these compounds, suggests diverse therapeutic applications in dentistry, indicating that different compositions of cannabis might yield varying effects.

Inflammation plays a central role in periodontal diseases and postoperative healing. Traditional treatments have relied on mechanical procedures and anti-inflammatory medications. Cannabis Sativa's potential as an anti-inflammatory agent presents an innovative alternative, potentially beneficial in managing periodontal diseases, post-surgical healing, and inflammation due to orthodontic tooth movement.

Endocannabinoids, along with their metabolic enzymes and receptors, play a crucial role in the immune system, being found in cells such as monocytes, macrophages and lymphocytes. These molecules act in an autocrine and paracrine manner, modulating immune responses to maintain homeostasis. Notably, CB1 receptors are expressed predominantly on B cells, NK cells and T cells, highlighting the broad involvement of the endocannabinoid system in immune function [5].

In particular, the CB2 receptor is vital in immune cell dynamics. For example, human B cells show an increase in CB2 expression after activation, but a decrease during their differentiation process [6]. In macrophages, CB2 expression levels vary depending on the activation state of the cell and the presence of inflammation. This dynamic expression of CB2 receptors significantly influences immune cell functions, especially in inflammatory conditions, suggesting a crucial role of the endocannabinoid system in immune regulation.

Additionally, two key endocannabinoids, 2-arachidonoylglycerol (2-AG) and anandamide (AEA), are notable for their immunomodulatory roles, primarily through their interaction with CB2 receptors. These molecules are involved in crucial immune regulatory processes, including the inhibition of pro-inflammatory cytokines and the modulation of intracellular signaling pathways, highlighting the importance of these endocannabinoids in maintaining immune homeostasis and their potential therapeutic applications.

An interesting aspect of the endocannabinoid system is its interaction with Toll-like receptors (TLRs). This interaction involves cannabinoids modulating the inflammatory responses induced by TLRs, suggesting a complex interaction between the endocannabinoid system and innate immunity.

As can be seen in the work of [7], n the intricate dance of the body's response to inflammation, particularly in the central nervous system (CNS), cannabinoids like cannabidiol (CBD) play a nuanced and critical role. Just as the body's innate defenses marshal acute inflammatory reactions through the action of macrophages and the secretion of pro-inflammatory cytokines, cannabinoids work in a parallel yet distinct pathway to modulate these responses. CBD, in particular, exerts its influence by engaging with a constellation of receptors TRPV1, CB2, and GPR55, each playing a pivotal role in the modulation of inflammation.

This interaction with receptors is just the beginning. The

downstream effects of these engagements are profound: there's a marked downregulation of key enzymesinducible nitric oxide synthase (iNOS) and cyclooxygenase 2 (COX2) which are crucial in the production of inflammatory mediators like prostaglandins, reactive oxygen species, and cytokines such as tumor necrosis factor alpha (TNF-α). CBD's influence extends further to the molecular signaling cascades, where it inhibits the MAPK (mitogen-activated protein kinases) pathways and downregulates NF-kB (nuclear factor kappa-light-chain-enhancer of activated B cells), a pivotal player in the inflammatory process.

Beyond these pathways, CBD also activates PPARγ (peroxisome proliferator-activated receptor gamma), which plays a role in reducing lipid peroxidation, a process often upregulated in inflammatory states [8]. This action of CBD echoes the body's natural inflammatory response, where mast cells release vasoactive amines and arachidonic acid metabolites, leading to the clustering and migration of neutrophils towards the inflamed tissue [9].

Just as the body's response to inflammation involves a delicate balance of pro-inflammatory and anti-inflammatory forces, with mechanisms like the secretion of C-reactive protein and C3 complement protein synthesized by the liver in response to TNF-α, IL-1β, IL-6, IL-12, and chemokines signaling, CBD's interaction with the body's endocannabinoid system offers a nuanced counterbalance. It establishes a form of negative feedback, not unlike the intricate interplay between the neuroendocrine axis and the immune system, highlighting the complexity and elegance of the body's response to injury and infection [10].

By potentially reducing inflammation and promoting healing, CBD might offer a more comfortable and efficient recovery for patients undergoing dental surgeries or treatments that typically result in postoperative inflammation and pain [11]. Additionally, its anxiolytic effects could be a boon for patients experiencing dental anxiety, a common barrier to seeking necessary dental care. The use of CBD in dental practices might not only improve patient outcomes in terms of healing and comfort but also potentially reduce the reliance on traditional pain medications, which often come with side effects and risks of dependency [12]. As research continues to evolve, the integration of CBD into dental treatments could signify a significant shift towards more holistic and patient-centered care in dentistry, addressing both physiological and psychological aspects of oral health and treatment experiences [13].

The review suggests Cannabis Sativa could be effective in managing dental pain and anxiety, common challenges in dental practice [14]. Its potential use in treating gum diseases and controlling postoperative inflammation and pain could revolutionize certain aspects of dental care. However, this field faces challenges, including varying global legal status and the necessity for rigorous clinical trials to establish its efficacy, safety, and usage guidelines in dentistry.

CONCLUSION

The endocannabinoid system, along with various cannabinoids, plays a multifaceted role in immune regulation and inflammation. These components show potential in therapeutic applications, ranging from modulating immune cell function to treating inflammatory diseases. As research in this area continues to evolve, the understanding and use of cannabinoids in medical science will likely expand, offering new avenues for the treatment and management of various conditions.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interests.

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