

CBD IN DENTISTRY

Information for the Dental Professional



Introduction

By now, I am sure everyone has heard of cannabis. Most have probably heard of CBD and THC, and some have heard about Cannabinoids, The Endocannabinoid System, or maybe even Cannabinoid Receptors. But what about Phytocannabinoid vs. Endocannabinoid? Liposomal vs. Emulsion? Synergistic Effect or Entourage Effect? CB1 vs. CB2?

What does it all mean, and does it even matter?

It is likely that these terms have been presented in the course of advertising and it can be confusing to separate marketing claims designed to sell products from actual science. Understanding the difference is an important step in being able to discuss the benefits of cannabis and cannabinoids with your patients.

During the course you will learn (Course Objectives):

- *The basics of how cannabis and cannabinoids affect the body*
- *Categories of cannabinoids and their sources*
- *Similarities and differences among cannabinoids*
- *How the Mammalian Endocannabinoid System functions in the body*
- *Current product developments to support the use of Cannabinoids in dentistry*
- *Current evidence supporting the benefits of cannabinoids in healing*
- *Dental conditions that may be treated with CBD*

While the research is relatively new, it seems like the benefits are undeniable. So, let's look at some of these terms, describe what they all mean, and begin to look at how you can add CBD based products into your dental armamentarium.

Your patients will thank you!

Note: To receive your Continuing Education credit, complete and return the evaluation found on page 13.

Where does CBD come from?

Cannabis & Cannabinoids

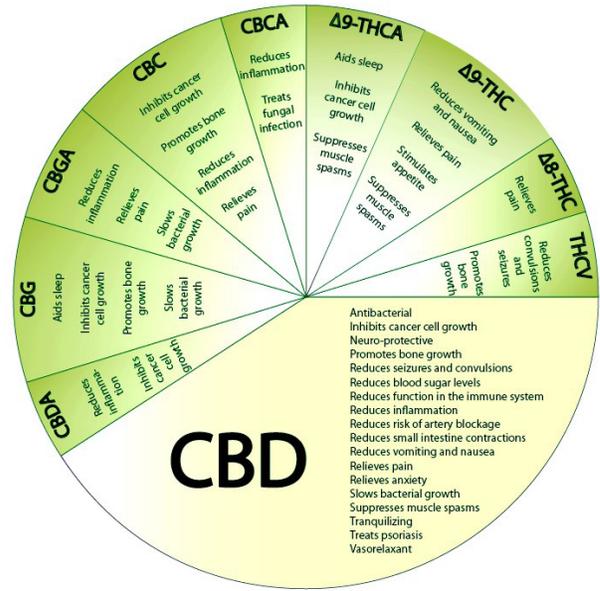
Phytocannabinoids

Any Cannabinoids that are isolated from the Cannabis plant are considered Phytocannabinoids, meaning they are naturally synthesized by plants. There are other well-known Phytocannabinoids routinely extracted and used for health benefits such as Echinacea from Echinacea flowers and Humulene from the Hops plant, but today we will be discussing the Cannabinoids that are isolated from the Cannabis plant. Plants are not the only source as there is a second distinctive category of Cannabinoids called Endocannabinoids.

Endocannabinoids

An Endocannabinoid is any Cannabinoid naturally produced by the body. The difference between a Phytocannabinoid and an Endocannabinoid is the source - not the type or structure of the molecule. One of the most common Endocannabinoids, Anandamide, is responsible for providing people with the euphoric feeling known as a "Runners High" experienced by long distance runners.

Regardless of the source, all Cannabinoids are similar on a molecular level, with comparable structures and functions, however, Endocannabinoids, like Anandamide, are generally produced on-demand in relatively small quantities and only when needed.



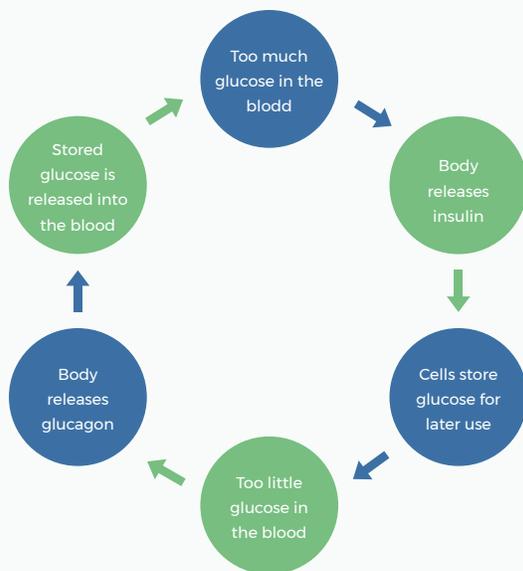
"While CBD constitutes approximately 40% of the extracted volume, over 110 different Cannabinoids have been isolated and identified."

Fun Fact: Anandamide is also called "The Bliss Molecule" because it is named after the Sanskrit word for "bliss". Anandamide can also be found in raw chocolate and is believed to be the reason people experience pleasure when eating chocolate.

How does CBD work?

Maintaining Homeostasis

The body is a complex organism that must regulate and balance many systems to maintain overall health. This balance is the ideal resting state for a cell, also known as homeostasis. The body achieves homeostasis through cooperation between interconnected physiological systems to balance temperature and pH, digest food, preserve blood sugar levels, and many other complex functions. Research is suggesting that the primary role of Cannabinoids is maintaining this homeostasis of individual body systems in order to add to the overall health and well-being of the individual (Viveros 2008).



Receptors and Homeostasis

On a cellular level, homeostasis is achieved using complex structures embedded in the cell walls called cellular receptors. These are highly specialized chemical structures, composed of proteins, that are embedded in the membrane layer of a cell. Receptors are responsible for intracellular communication ultimately helping the body to maintain homeostasis. They are tasked with actively keeping cells balanced regardless of constant internal and external changes.

For example, the sucrose receptor is responsible for maintaining proper blood sugar levels in the body by responding to increased or decreased sucrose levels in the blood. When the receptor recognizes sucrose in the blood stream, it converts the sucrose into glucose which is stored in the cell, lowering your blood sugar level to a normal level and storing energy for future. As your blood sugar lowers, the receptor will convert the stored glucose into sucrose to raise your blood sugar to a normal level creating balance in the body and maintaining homeostasis. In addition to sucrose receptors, we have recently identified a new category of cellular receptor known as “Cannabinoid Receptor”. Though Cannabinoid receptor research is relatively young, having only been discovered in the 1980’s, we know that within the body, there are two major categories CB1 and CB2 receptors.

How does CBD work?

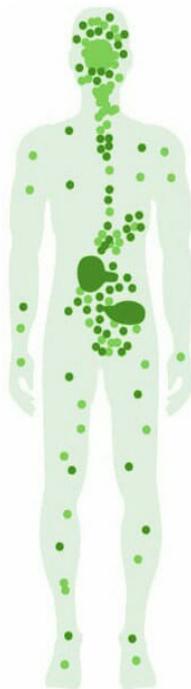
CB1 Receptors vs. CB2 Receptors

CB1 receptors are some of the most common receptors in the body. Primarily associated with the central nervous system and highly concentrated in the brain, CB1 receptors interact directly with THC and are responsible for delivering the psychoactive properties of Cannabis. If CB1 receptors in the brain are not activated by THC, then the user WILL NOT get “high”. While CB1 receptors are primarily associated with the central nervous system, they are located throughout the body and play a role in hormone production, cardiovascular health, and digestion (Foria 2018).

CB2 receptors are primarily found in the immune system and are typically more variable among species. CB2 receptors are distributed throughout cells of the spleen, reproductive tissues, areas of the brain, and are highly concentrated in the epidermis. They help to regulate the immune system and may provide antioxidant and anti-inflammatory effects by regulating the body’s response to pathogens (Javed 2016).

CB1 Receptors

CB1 receptors are concentrated in the brain and the central nervous system, a system in the body that maintains core functions such as motor activity, pain perception, stress response, and memory.



CB2 Receptors

CB2 receptors are widely distributed throughout the peripheral organs in the body, serving as core components in the immune system, muscular system, and cardiovascular system.

How does CBD work?

Cannabinoid Synergy or “Entourage Effect”

Cannabinoids have an ability to bind to – or activate – both CB1 and CB2 receptors. This is true of both Endocannabinoids and Phytocannabinoids – with one major exception. CBD is unable to activate CB1 or CB2 receptors itself. Instead, CBD will change the shape of the receptor and will make it much more efficient at binding with naturally occurring Endocannabinoids already in the system – for instance, Anandamide (Laprairie 2015).

Like an enzyme, we find that the body’s naturally occurring reactions occur much more efficiently in the presence of CBD. By acting as an allosteric modulator for the CB2 receptors CBD increases the affinity of a multitude of other Cannabinoids (Namdar 2019).

The naturally occurring Endocannabinoids in your body function more efficiently in the presence of CBD than they would by themselves in a form of synergy. This phenomenon is referred to as “The Entourage Effect” (Namdar 2019). The body works smarter, not harder.

Our body has abundant targets for Cannabinoids known as Cannabinoid receptors, responsible for regulating and balancing multiple bodily systems. We are able to enhance the body’s natural ability to maintain homeostasis on a cellular level by supplementing with Phytocannabinoids, like CBD.

How does CBD work?

Bioavailability

When a patient ingests Cannabis, medicine, or any other substance, not all the constituents of the item are processed by the body for benefit. For the substance to be used beneficially by the body, it must enter the blood stream and reach its intended target. Regardless of the substance, whether it is a vitamin, mineral, or pharmaceutical salt, only a portion of the substance introduced to the body will reach its intended target before the body naturally filters the material away. The proportion of a drug or substance that enters the bloodstream can be referred to as “Bioavailability”.

This is an important concept when dealing with Phytocannabinoids, like CBD, for two major reasons:

- 1) Phytocannabinoids like CBD are fat soluble while the human body is primarily made of water.
- 2) The stomach lining of the human body will begin to break down the Phytocannabinoid and CBD molecules before they enter the blood stream, also known as “first pass metabolism”.



How can we increase the bioavailability of products designed for ingestion, and ultimately ensure the beneficial compounds are reaching their intended targets?

How does CBD work?

Overcoming fat solubility with “Emulsions”

The human body is water based, and the Cannabinoids we have been exposed to are fat soluble. We have long known the problem with trying to dissolve oil into a water mixture. In order to overcome these problems of solubility, pharmaceutical companies have been performing treatments that help fat soluble molecules mix in water. The same treatments are now performed on oil extractions of Phytocannabinoids to increase bioavailability. **How?**

We are all familiar with Mayonnaise, but not everyone knows this is a stable mix of two substances that normally are unable to mix: oil and vinegar. The process of mixing two normally immiscible (or “unmixable”) substances into a stable concoction is also known as “An Emulsion”.

By creating a stable mixture of water and oil, we are making the Phytocannabinoids water soluble. What happens when we ingest a water-soluble substance? It immediately can mix into the bloodstream, increasing the bio availability drastically.



Overcoming first pass metabolism through Advanced Chemistry - The Liposomal Microemulsion

In a highly advanced process long performed in the pharmaceutical industry, the Phytocannabinoid oil is treated to become a Liposomal Microemulsion. Not only is the oil water soluble, but the individual oil droplets have been broken down to much smaller individual sizes. This small size (approximately 25 microns) is small enough to pass through the membranes of the body that are normally impermeable, including the stomach lining. By reducing the size of the individual droplets of oil to such a small size that they pass through the stomach lining, we are effectively able to bypass the first pass metabolism of the human body.



Standard Oil

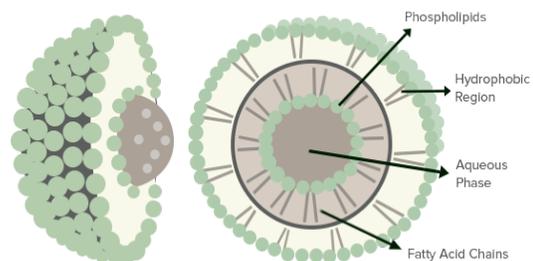


100-1000 Nanometer Liposomal Microemulsion



25 Nanometer (Avg) Nano-Sized Microemulsion for Maximum Bioavailability

STRUCTURE OF LIPOSOME



What conditions can CBD treat?

Anxiety

Anxiety and dental phobia affect 1 in 4 patients (Armfield 2013). When experiencing dental anxiety, patients may experience an elevated heart rate, heightened levels of awareness and sensitivity, and may be more likely to avoid or delay dental care in order to minimize the overwhelming feeling of anxiety and fear. In a fearful state, the body releases adrenaline, cortisol, and norepinephrine. Recent studies report that Cannabinoids help to regulate the “fight or flight” feelings by stabilizing stress hormones and thereby easing anxiety (Blessing 2015). Our body’s natural Endocannabinoid system receptors respond to the Cannabinoids in hemp and process CBD at a cellular level. In instances of appointment related anxiety, it can be difficult, if not impossible to manage dental procedures without potentially harmful sedatives. This situation leads to added fear and cost and may lead to additional oral health complications when treatment is delayed. Researchers have found that compared to a placebo, CBD products absorbed by the bloodstream “significantly decreased” medical procedure-induced anxiety in patients. “Confirming several preclinical and clinical studies, recent results indicate that acute doses of CBD can decrease anxiety,” (Linares 2018).

General Pain & Inflammation

Pain is the body’s natural protection from internal damage. When a patient experiences pain, it is often a side effect of swelling and inflammation localized in a specific part of the body. The American Dental Association (ADA) reports suggest that Cannabis is capable of anti-inflammatory properties (ADA 2019). When CBD enters the body, it reacts with the body’s natural Endocannabinoid system to essentially block the brain from receiving pain signals and reducing the perception of discomfort. CBD can alleviate pain and prevent inflammation of gum tissue that can be experienced during dental procedures or dental cleaning appointments (Genaro 2017). As the research continues, this list will grow. Incorporating CBD into a daily practice

could prove to increase the comfort level of patients who suffer from symptoms associated with chronic inflammatory conditions like periodontal disease, gingivitis, or peri-implantitis.

Temporomandibular Joint Disorder (TMD)

Approximately 12% of adults in the United States suffer from some variation of TMD or discomfort associated with the Temporomandibular Joint (TMJ). TMD is typically associated with symptoms of temporomandibular joint (TMJ) pain, limited range of motion, malocclusion, sleep apnea, bruxism, joint stiffness, muscle pain, and chronic headaches or migraines (10, 12, 15). It’s one of the most common musculoskeletal concerns that patients discuss with their dentists. Pain is nearly always the chief complaint (Macfarlane 2002). Depending on the severity of their discomfort, patients may be unable to maintain a normal diet. Traditional symptom management typically involves the use of bite splints, physical therapy, massage, NSAIDs, muscle relaxers, cosmetic injection, a combination of two or more therapies, and in rare circumstances, surgery. Cannabidiol provides an alternative option. When blended for topical absorption, concentrated CBD products applied to the TMJ may provide relief of symptoms by reducing inflammation and relaxing muscular tissues.

Questions?

Email questions or comments to
Vikki Edmond, CE Coordinator:
admissions@chcicareer.com

Please allow 24-48 hours for email response.
For immediate assistance, please call 610-363-9170 during normal business hours.

References

1. Appendino, G., Gibbons, S., Giana, A., Pagani, A., Grassi, G., Stavri, M., ... Rahman, M. M. (2008, August). Antibacterial Cannabinoids from *Cannabis sativa*: a structure-activity study. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/18681481>.
2. Armfield, J. M., & Heaton, L. J. (2013, December 3). Management of fear and anxiety in the dental clinic: a review. Retrieved from <https://onlinelibrary.wiley.com/doi/full/10.1111/adj.12118>.
3. Blessing, E. M., Steenkamp, M. M., Manzanares, J., & Marmar, C. R. (2015, October). Cannabidiol as a Potential Treatment for Anxiety Disorders. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4604171/>.
4. Bruni, N., Della Pepa, C., Oliaro-Bosso, S., Pessione, E., Gastaldi, D., & Dosio, F. (2018, September 27). Cannabinoid Delivery Systems for Pain and Inflammation Treatment. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6222489/>.
5. Cannabis: Oral Health Effects from the Center for Scientific Information, ADA Science Institute. (2019, July 19). Retrieved from <https://www.ada.org/en/member-center/oral-health-topics/cannabis>.
6. Commissioner, O. of the. (n.d.). FDA Regulation of Cannabis and Cannabis-Derived Products: Q&A. Retrieved from <https://www.fda.gov/news-events/public-health-focus/fda-regulation-cannabis-and-cannabis-derived-products-questions-and-answers>.
7. Da ChengHao, X.-J. G., & GenXiao, P. (2015, July 3). Phytochemical and biological research of Cannabis pharmaceutical resources. Retrieved from <https://www.sciencedirect.com/science/article/pii/B9780081000854000116>.
8. Foria. "CBD: Benefits for Your Endocannabinoid System." Foria Wellness, 4 Aug. 2018, <https://www.foriawellness.com/blogs/learn/your-endocannabinoid-system-cbd>.
9. F.Thomas, B., & Mahmoud. (2015, December 4). Biosynthesis and Pharmacology of Phytocannabinoids and Related Chemical Constituents. Retrieved from <https://www.sciencedirect.com/science/article/pii/B9780128046463000023>.
10. Genaro, K., Fabris, D., Arantes, A. L. F., Zuardi, A. W., Crippa, J. A. S., & Prado, W. A. (2017, June 21). Cannabidiol Is a Potential Therapeutic for the Affective-Motivational Dimension of Incision Pain in Rats. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5478794/>.
11. Goulet, J. P., Lavigne, G. J., & Lund, J. P. (1995, November). Jaw pain prevalence among French-speaking Canadians in Québec and related symptoms of temporomandibular disorders. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/8530734>.
12. Hammell, D. C., Zhang, L. P., Ma, F., Abshire, S. M., McIlwrath, S. L., Stinchcomb, A. L., & Westlund, K. N. (2016, July). Transdermal Cannabidiol reduces inflammation and pain-related behaviours in a rat model of arthritis. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/26517407>.
13. Hartsel, Joshua. "Cannabis Sativa and Hemp." ScienceDirect, Academic Press, 19 Feb. 2016, <https://www.sciencedirect.com/science/article/pii/B978012802147700053X>.
14. Javed, Hayate, et al. "Cannabinoid Type 2 (CB2) Receptors Activation Protects against Oxidative Stress and Neuroinflammation Associated Dopaminergic Neurodegeneration in Rotenone Model of Parkinson's Disease." *Frontiers in Neuroscience*, Frontiers Media S.A., 2 Aug. 2016, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4969295/>.
15. Johansson, A., Unell, L., Carlsson, G. E., Söderfeldt, B., & Halling, A. (2003). Gender difference in symptoms related to temporomandibular disorders in a population of 50-year-old subjects. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/12756928>.
16. Kozono, S., Matsuyama, T., Biwasa, K. K., Kawahara, K.-ichi, Nakajima, Y., Yoshimoto, T., ... Maruyama, I. (2010, April 16). Involvement of the Endocannabinoid system in periodontal healing. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/20233580>.
17. Laprairie, R B, et al. "Cannabidiol Is a Negative Allosteric Modulator of the Cannabinoid CB1 Receptor." *British Journal of Pharmacology*, John Wiley and Sons Inc., Oct. 2015, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4621983/>.
18. Linares, I. M., Zuardi, A. W., Pereira, L. C., Queiroz, R. H., Mechoulam, R., Guimarães, F. S., & Crippa, J. A. (2018, October 11). Cannabidiol presents an inverted U-shaped dose-response curve in a simulated public speaking test. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/30328956>.
19. Macfarlane, T. V., Blinkhorn, A. S., Davies, R. M., Kincey, J., & Worthington, H. V. (2002, March 25). Oro-facial pain in the community: prevalence and associated impact. Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1034/j.1600-0528.2002.300108.x?sid=nlm:pubmed>.

References

20. Morales, Paula, et al. "Molecular Targets of the Phytocannabinoids: A Complex Picture." Progress in the Chemistry of Organic Natural Products, U.S. National Library of Medicine, 2017, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5345356/>.
21. Nakajima, Y., Furuichi, Y., Biswas, K. K., Teruto Hashiguchi, K.-ichi K., Yamaji, K., Uchimura, T., ... Maruyama, I. (2006, January 3). Endocannabinoid, Anandamide in gingival tissue regulates the periodontal inflammation through NF- κ B pathway inhibition. Retrieved from <https://febs.onlinelibrary.wiley.com/doi/full/10.1016/j.febslet.2005.12.079>.
22. Namdar, Dvora, et al. "Terpenoids and Phytocannabinoids Co-Produced in Cannabis Sativa Strains Show Specific Interaction for Cell Cytotoxic Activity." Molecules (Basel, Switzerland), MDPI, 21 Aug. 2019, <https://www.ncbi.nlm.nih.gov/pubmed/31438532>.
23. Napimoga, M. H., Benatti, B. B., Lima, F. O., Alves, P. M., Campos, A. C., Pena-Dos-Santos, D. R., ... Guimarães, F. S. (2009, February). Cannabidiol decreases bone resorption by inhibiting RANK/RANKL expression and pro-inflammatory cytokines during experimental periodontitis in rats. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/19070683>.
24. Ren, Meng, et al. "The Origins of Cannabis Smoking: Chemical Residue Evidence from the First Millennium BCE in the Pamirs." Science Advances, American Association for the Advancement of Science, 1 June 2019, <https://advances.sciencemag.org/content/5/6/eaaw1391>.
25. Russo, E. B. (2008, February). Cannabinoids in the management of difficult to treat pain. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2503660/>.
26. Viveros, M P, et al. "Critical Role of the Endocannabinoid System in the Regulation of Food Intake and Energy Metabolism, with Phylogenetic, Developmental, and Pathophysiological Implications." Endocrine, Metabolic & Immune Disorders Drug Targets, U.S. National Library of Medicine, Sept. 2008, <https://www.ncbi.nlm.nih.gov/pubmed/18782018>.
27. Xiong, W., Cui, T., Cheng, K., Yang, F., Chen, S.-R., Willenbring, D., ... Zhang, L. (2012, June 4). Cannabinoids suppress inflammatory and neuropathic pain by targeting $\alpha 3$ glycine receptors. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3371734/>.

Submission Instructions (online or by mail)

1. Online: Visit <http://www.cb-dentistry.com> for online submission.

2. Mail completed questionnaire to:
Please allow 1-2 weeks processing for
mail submissions.

Attention: CE Department
Contemporary Health Career Institute
101 John Robert Thomas Drive Exton, PA 19341

Name: _____

E-mail: _____

Mailing Address: _____

1. _____ are structures responsible for intracellular communication.

- A) Endocannabinoids
- B) Phytocannabinoids
- C) Receptors
- D) Emulsions

2. Ingesting large amounts of CBD will intoxicate the user. TRUE FALSE

3. CBD directly activates CB1 receptors. TRUE FALSE

4. _____ refers to cannabinoids functioning more efficiently in the presence of other cannabinoids.

- A) Liposomal Microemulsion
- B) Homeostasis
- C) Entourage Effect
- D) Both A & B

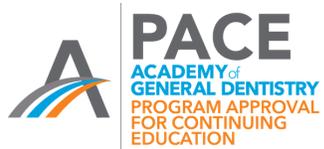
5. Cannabinoids are _____ soluble, while blood is composed primarily of _____.

- A) water, water
- B) fat, water
- C) water, lipids
- D) fat, lipids

6. Recent studies have found that CBD may be effective in managing symptoms related to the following conditions:

- A) Anxiety
- B) Pain
- C) Inflammation
- D) All of the Above

7. Cellular receptors are located in the nucleus of a cell. TRUE FALSE



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