



Cannabigerol (CBG)

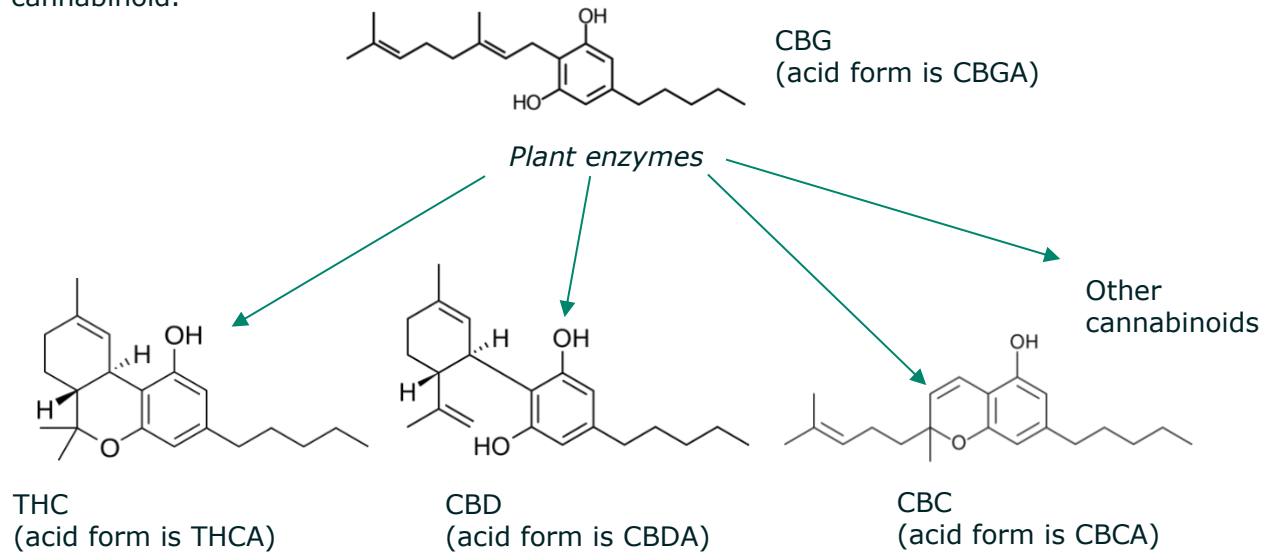
Introduction and selected scientific references

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Cannabigerol (CBG)

Introduction

CBG, sometimes called the “**mother cannabinoid**” or “**skin cannabinoid**”, is the parent molecule from which other cannabinoids are made in both marijuana and hemp. But since it’s mostly converted into other cannabinoids, such as THC and CBD, very little of it remains intact in the plant (typically <0.5% by weight). Due to its scarcity, up until now, customers and patients have struggled to access the benefits of this important non-intoxicating cannabinoid.



Plant cannabinoids are naturally produced in the acid form. Prior to consumption, they are typically converted into their better-known neutral form by heating. In this way, CBG is made from CBGA.

Potential benefits

There is a growing body of primary scientific research exploring the potential benefits of CBG, both on its own as well as in combination with other cannabinoids (e.g. CBD). Below is a summary of some of the main areas under investigation:

1. Antibacterial (e.g. MRSA, dental plaque);
2. Antioxidant;
3. Dry skin;
4. Inflammation (general);
5. Skin inflammation;
6. GI inflammation;
7. Neuroinflammation and neurodegeneration;
8. Insulin resistance;
9. Ocular tension;
10. Loss of appetite;
11. Mood disorders;
12. Neuropathic pain;
13. Cancer (in vitro studies);
14. Bladder dysfunction;
15. Stroke;
16. Epilepsy;
17. Covid-19.

Scientific literature

Subject	Quotation	Ref.
Antibacterial	"CBG potently inhibit[s] MRSA , repress[es] biofilm formation (Fig. 1b) and effectively eradicate[s] persister cells...CBG (Fig. 2a) exhibiting the most potent anti-biofilm activity...CBG was the most potent cannabinoid against persisters."	1
	"In conclusion, our study shows that CBG is a potential anti-biofilm agent via inhibition of the QS cascade."	2
	"We demonstrated that CBG exerts a bacteriostatic effect at a concentration of 2.5µg/ml and the growth-inhibitory effect of CBG is affected by the initial cell density. At the higher concentrations of 5–10µg/ml, CBG had a bactericidal effect as shown by 98.5–99.9% reduction of viable bacteria after 8 h."	3
	"These data demonstrate a positive drug-drug interaction with a silver-containing medicament used in combination with a cannabinoid, in particular illustrating a stronger antibiotic action of using CBG in combination with silver nitrate as opposed to using either compound on its own."	4
Antioxidant	"The presented data prove that all the examined cannabinoids [CBG] exhibit antioxidant activity...Although the intensity of these activities is not the same for the individual cannabinoids it is comparable for all of them with that of E vitamin."	5
Dental health	"In our study, cannabinoids were found to be more effective in reducing the colony count of the bacterial strains (dental plaque biofilm) as compared to the well-established synthetic oral care products such as Oral B or Colgate...In the DPSI (-3) group (chalk hardened dental plaque biofilm), the maximum number of colonies was found in the Oral B treatment and the minimum number in the CBGA treatment."	6
	"Cannabinoids (CBD/CBG) infused mouthwashes together with other natural key ingredients shows promising bactericidal activity in vitro against total-culturable aerobic bacterial content in dental plaque , with efficiency equivalent to or better than that of the gold standard (0.2% chlorhexidine)."	7
	"Our data show that CBG has anti-biofilm activities against <i>S. mutans</i> and might be a potential drug for preventive treatment of dental caries ."	8
Dry skin	"CBG and CBGV, in contrast to CBC, CBDV and THCV, behaved in an 'endocannabinoid-like' way, and increased sebaceous lipid synthesis of the sebocytes (Fig. 1a,b) raising the possibility of their administration in the management of conditions, such as dry-skin syndrome, xerosis and even skin ageing ."	9

Subject	Quotation	Ref.
Inflammation	"Cannabigerol (CBG) can have anti-inflammatory effects, i.e., suppress degranulation, by either (1) suppressing a pro-secretory pathway or (2) stimulating an anti-secretory pathway, or both...We further demonstrated strong synergistic effects of the minor cannabinoid, cannabigerol (CBG), on mast cell degranulation when it is combined with other cannabinoids and/or terpenes."	10
	"In conclusion, this study has provided evidence that CBD and CBG formulated appropriately exhibit anti-inflammatory activity. Our observations suggest that these non-psychoactive cannabinoids may have beneficial effects in treating diseases characterised by airway inflammation."	11
Skin inflammation	"Not only THCV, but also CBG, CBGV, CBC and CBDV sup-pressed LPS-induced pro-inflammatory response of the sebocytes (Figure S9a–e). These findings together with the known antiproliferative actions of the pCBs (Fig. 3) (33) raise the possibility that administration of these substances may be beneficial not only in acne, but also in other inflammation-accompanied skin diseases , for example in psoriasis ."	9
	"CBG inhibits pro-inflammatory cytokine ...release from several inflammatory inducers, such as ultraviolet A (UVA), ultraviolet B (UVB), chemical, C. acnes, and in several instances does so more potently than CBD."	12
GI inflammation	"Our results show that the non-psychotropic plant cannabinoid CBG exerts protective effects in a murine experimental model of IBD ...Also, CBG exerts antioxidant effects in the inflamed gut as well as in intestinal epithelial cells exposed to oxidative stress ...Our results suggest that CBG may represent a new therapeutic opportunity in IBD."	13
	"CBG, but not CBC, given by oral gavage, ameliorated DNBS-induced colonic inflammation. FO [fish oil] pretreatment (at the inactive dose) increased the anti-inflammatory action of CBG and rendered oral CBD effective while reducing endocannabinoid levels. Furthermore, the combination of FO, CBD, and a per se inactive dose of CBG resulted in intestinal anti-inflammatory effects."	14
Neuroinflammation/ neurodegeneration	"CBG pre-treatment, both alone and association with CBD at all doses tested, was able to reduce neuroinflammation ...The benefits shared by CBD and CBG are enhanced when they are combined ...In the present study, we confirmed the anti-inflammatory, antioxidant, and anti-apoptotic effects of CBG and CBD previously described."	15

Subject	Quotation	Ref.
Neuroinflammation/ neurodegeneration	"On the bases of these results, thanks to its neuroprotective effects , we encourage the use of CBG against neurodegeneration and in those pathological conditions where neuroinflammation and oxidative stress play a main role...We have already demonstrated the CBG antioxidant properties in macrophages stimulated with hydrogen peroxide (H2O2). Also anti-inflammatory and neuroprotective effects were reported for CBG..."	16
	"CBG was extremely active as neuroprotectant in mice intoxicated with 3-nitropropionate (3NP) (HD mouse model), improving motor deficits and preserving striatal neurons against 3NP toxicity."	17
	"Studies indicate that CBG may have therapeutic potential in treating neurological disorders (e.g. Huntington's disease, Parkinson's disease, and multiple sclerosis), inflammatory bowel disease, as well as having antibacterial activity."	18
	"CBD and CBG showed neuroprotective effects against H ₂ O ₂ or rotenone...Our results contribute to the understanding of the neuroprotective effect of CBD and CBG, showing differences with their acid forms, and also highlight the role of 5-HT1A receptors in the mechanisms of action of CBG."	19
	"Using NSC-34 cells to model spinal cord injury in vitro, our work evaluated the properties of CBG treatments in motor neuron regeneration...Our results indicate CBG as a phytocompound worth further investigation in the field of neuronal regeneration ."	20
Insulin resistance	"Our study highlights phytocannabinoids as a potential novel pharmacological tool to regain control of functional adipose tissue in unregulated energy homeostasis often occurring in metabolic disorders including type 2 diabetes mellitus (T2DM), aging and lipodystrophy...We provide evidence that CBD, CBDA, CBGA and THCV (5 μM) increase the number of viable BM-MSCs; whereas only CBG (5 μM) and CBD (5 μM) alone or in combination promote BM-MSCs maturation into adipocytes via distinct molecular mechanisms...CBD and CBG might be an effective treatment for insulin sensitization ."	21
Ocular tension	"These results suggest that cannabigerol and related cannabinoids may have therapeutic potential for the treatment of glaucoma ."	22
	"These results indicate that chronic administration of these cannabinoids lowers ocular tension considerably. Like marihuana and delta-9-tetrahydrocannabinol, cannabinol produced both ocular toxicity and neurotoxicity. As cannabigerol lacked these toxicities, it appears that the ocular hypotensive effect of this cannabinoid is somewhat dissociable from both the adverse central and ocular effects accompanying marihuana intake."	23

Subject	Quotation	Ref.
Loss of appetite	"The data presented here demonstrate that CBG has protective effects against multiple components of chemotherapy-induced cachexia pathophysiology, including anorexia, weight loss, muscle atrophy, and metabolic dysregulation."	24
	"We demonstrate for the first time that CBG elicits hyperphagia , by reducing latency to feed and increasing meal frequency, without producing negative neuromotor side effects."	25
Mood disorders	"The data presented suggest that CBG may induce antidepressant effects. Moderate doses of CBG produced behaviours that were consistent to imipramine in the tail suspension test and as such the use of this naturally occurring cannabinoid may have beneficial effects over that of HCA antidepressants such as imipramine which are known to cause many side effects in users."	26
	"This is the first patient survey of CBG-predominant cannabis use to date, and the first to document self-reported efficacy of CBG-predominant products, particularly for anxiety , chronic pain, depression , and insomnia."	27
Neuropathic pain	"CBG, CBD and THC demonstrated potent dose-related inhibition of capsaicin responses in DRG [dorsal root ganglion] neurons when applied individually in vitro, and enhanced when applied in combination, being most effective at 90 µM. Thus, efficacy and tolerability of THC could be improved in combination with CBG and CBD at optimal concentrations, which deserve further studies <i>in vivo</i> ."	28
	"This finding demonstrates that the cannabinoids CBDV, THCV and CBG are superior to CBD in their ability to treat the neuropathic pain brought about by the animal model used in this experiment."	29
	"A previous study reported that CBG (10 µM) blocks voltage-gated sodium (Nav) currents in CNS neurons; however, the underlying mechanism is not well-understood...We found that CBG is a ~10-fold state-dependent Nav inhibitor ($K_I - K_R$: ~2-20 µM) with an average Hill-slope of ~2...Inhibition of Nav1.7 in DRG neurons may underlie CBG-induced neuronal hypoexcitability ."	30

Subject	Quotation	Ref.
Cancer	"CBG inhibited the growth of xenograft tumours as well as chemically induced colon carcinogenesis . CBG hampers colon cancer progression in vivo and selectively inhibits the growth of CRC cells...CBG should be considered translationally in CRC prevention and cure."	31
	"Geraniol (1), olivetol (2), cannabinoids (3 and 4) and 5-fluorouracil (5) were tested for their growth inhibitory effects against human oral epitheloid carcinoma cell lines (KB) and NIH 3T3 fibroblasts using two different 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay and sulforhodamine B protein (SRB) assay. Cannabigerol (3) exhibited the highest growth-inhibitory activity against the cancer cell lines."	32
	"Cannabigerol(3) was synthesized and evaluated for its inhibitory activity against mouse skin melanoma cells. Cannabigerol displayed significant antitumor activity [inhibitory concentration (IC50)=31.3l μ/mL] in vitro assay."	33
	"This study evaluated the synergistic anti-cancer potential of cannabinoid combinations across...human breast cancer cell lines...The most promising cannabinoid combination (C6) consisted of tetrahydrocannabinol, cannabigerol (CBG), cannabinol (CBN), and cannabidiol (CBD), and displayed favorable dose reduction indices and limited cytotoxicity against the non-cancerous breast cell line, MCF-10A."	34
	"Among primary brain tumors, glioblastoma is the most aggressive...[N]ontoxic cannibigerol (CBG), being recently shown to exhibit anti-tumour properties in some carcinomas, is assayed here for the first time in glioblastoma with the aim to replace THC...CBG can destroy therapy-resistant glioblastoma cells, which are the root of cancer development and extremely resistant to various other treatments of this lethal cancer. CBG should present a new yet unexplored adjuvant treatment strategy for glioblastoma."	35
	"DNA topoisomerases are proved cancer therapeutic targets with clinically successful anticancer drugs for decades. However, the role of RNA topoisomerase (TOP3β) remained mysterious especially in cancer, and no targeted agent has been reported yet...We demonstrated that CBG directly engaged with TOP3β, and promoted TOP3β depletion in wildtype but not mutant cancer cells...We also demonstrated that CBG induced formation of stress granule, RNA-loop and asymmetric DNA damages in cancer cells, and all these phenotypes were significantly attenuated in TOP3B knockout cells...Our findings not only highlighted TOP3β as a promising therapeutic target of cancer, but also identified CBG as a lead chemical inhibitor of TOP3β for cancer therapy ."	36

Subject	Quotation	Ref.
Bladder dysfunction	"There are anecdotal reports that some Cannabis preparations may be useful for bladder dysfunctions ... The rank order of efficacy was CBG=THCV>CBD>CBDV. In depth studies on CBG showed that the effect of this phytocannabinoid on acetylcholine-induced contractions was not affected by CB1 or CB2 receptor antagonists. Additionally, CBG also reduced acetylcholine-induced contractions in the human bladder."	37
Stroke	"We show that CBG and CBDV were protective against [oxygen glucose deprivation] mediated injury in three different cells that constitute the [blood brain barrier], modulating different hallmarks of ischemic stroke pathophysiology. These data enhance our understanding of the protective effects of CBG and CBDV and warrant further investigation into these compounds in ischemic stroke."	38
Epilepsy	"These results suggest CBGA, CBDVA and CBGVA may contribute to the effects of cannabis-based products in childhood epilepsy ."	39
COVID	"In follow-up virus neutralization assays, cannabigerolic acid and cannabidiolic acid prevented infection of human epithelial cells by a pseudovirus expressing the SARS-CoV-2 spike protein and prevented entry of live SARS-CoV-2 into cells."	40
	"This study intended to examine the anti-inflammatory activity of cannabis on immune response markers associated with coronavirus disease 2019 (COVID-19) inflammation ...To conclude, treatment with cannabis compounds CBD, CBG, and THCv may have clinical value in reducing cytokine secretion and ACE2 expression in lung epithelia cells."	41

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