MOOD STATE MEDICAL

Therapeutic Cannabis Vaporisation Devices:

A Guide for Medical Professionals

V1.1

ELITE II

by grenco medical

This guide provides healthcare professionals with a comprehensive overview of Therapeutic Cannabis Vaporisation Devices, their functionality, safety, and effectiveness in delivering cannabinoids for medical purposes. By the end, readers will have a more in-depth understanding of the practical application of these devices, the benefits of vaporising cannabis instead of smoking, and considerations when providing guidance to patients on the best device for their needs.

Disclaimer: This educational booklet is intended solely for qualified healthcare professionals in Australia. It provides information about therapeutic cannabis vaporisation devices for medical purposes only, including both devices registered on the Australian Register of Therapeutic Goods (ARTG) and non-registered devices. The content in this booklet is for educational purposes and does not constitute medical advice. Healthcare professionals should exercise their own clinical judgement when considering treatment options for their patients. The vaporisation devices discussed in this booklet are clearly identified as either: ARTG-registered devices (with listing numbers provided) that have been assessed by the TGA for their intended use with medicinal cannabis products; or non-ARTG-registered devices that have not been assessed by the TGA for safety, quality, or efficacy. Medicinal cannabis products themselves may not be listed on the ARTG and would be accessed through appropriate pathways for unapproved medicines. Prescribers should note that approvals under the SAS and AP schemes to supply unregistered vaping devices are only given where the ARTG-included goods are clinically unsuitable for a patient. Healthcare professionals should familiarise themselves with current TGA regulations and state/territory requirements regarding prescribing of medicinal cannabis products. For further information, please visit the TGA website (www.tga.gov.au).

CONTENTS

INTRODUCTION

The history of cannabis uses dates back 6000 years to old China in Neolithic times, however, some sources suggest even earlier use, potentially up to 10,000 years ago.[1] Li (1973) provided an archaeological and historical account of cannabis use in China, demonstrating the evolution of cannabis consumption methods over time. This historical context helps us appreciate the development of modern, more controlled methods of administration like vaporisation.

The first cannabinoid compound isolated and identified from hemp was cannabinol (CBN). CBN is formed from the oxidation of delta-9-tetrahydrocannabinol (THC) in the plant resin, typically occurring after plant harvest, during storage, or upon exposure to heat. Cannabidiol (CBD), a decarboxylation product of cannabidiolic acid, was first isolated in 1940, and its chemical structure was fully elucidated in 1963. To date, approximately 140 different cannabinoid compounds have now been identified.

In Australia, the Therapeutic Goods Administration (TGA) outlines within its medical cannabis guidance documents that cannabis should be 'vaporised but not smoked' for medicinal purposes. In addition, the smoking of cannabis products should not be supported.[2] As a result, prescribers and pharmacists are encouraged to educate patients on vaporising dried cannabis flowers over smoking for medicinal purposes.

Therapeutic Cannabis Vaporisation Devices have emerged as a popular alternative to smoking among consumers in markets where cannabis is available for use. These devices heat cannabis flower to a temperature that releases active compounds in the form of vapor, which is then inhaled.

1. Li, H. L. (1973). An archaeological and historical account of cannabis in China. Economic Botany, 28(4), 437-448.
2. https://www.tga.gov.au/resources/resource/guidance/guidance-use-medicinal-cannabis-australia-overview

Considerations for Medical Use

The therapeutic potential of cannabis and cannabinoids is vast and continually evolving. Comprehensive reviews have provided overviews of potential medical applications that could benefit from precise delivery methods like vaporisation. These reviews highlight the importance of appropriate administration methods in achieving optimal therapeutic outcomes in medical cannabis use.

Furthermore, research into the pharmacological aspects of cannabis and endocannabinoids has provided insights into why precise delivery methods are important for therapeutic applications. This understanding of cannabinoid pharmacology assists healthcare professionals when considering vaporisation as a method of cannabis administration for their patients.

When incorporating a Therapeutic Cannabis Vaporisation Device into medical cannabis treatment plans, healthcare professionals should consider factors such as dosing, patient preferences, and potential contraindications.

Starting with low doses and gradually adjusting based on patient response and tolerability is essential. Patients with respiratory conditions or allergies should be closely monitored, as vaporisation may still irritate in some cases.[3]

[3.] Earleywine, M., & Barnwell, S. S. (2007). Decreased respiratory symptoms in cannabis patients who vaporize. Harm Reduction Journal, 4(1), 1-4.

CANNABIS VAPORISATION

Difference between Cannabis Vaporisation and Smoking Cannabis

It is important to distinguish the difference between vaporisation and smoking. The fundamental distinction between vaporisation and smoking cannabis **lies in the underlying physical and chemical processes involved in releasing therapeutic compounds**. Understanding these differences is important for healthcare professionals when discussing administration methods with patients.

Smoking vs Vaporisation

THE PHYSICAL & CHEMICAL PROCESS

Smoking cannabis involves combustion, which tends to occur at temperatures typically above 230°C.

Cigarettes, as studied in combustion research, burn at temperatures between 700-900°C [4], demonstrating that plant material consumed through smoking, including cannabis, may reach temperatures well above the combustion point during consumption.

At these temperatures, the plant material burns, producing smoke that contains not only cannabinoids but also numerous harmful byproducts including carcinogenic compounds, carbon monoxide, and various irritants.

Vaporisation operates at precisely controlled temperatures, typically between 180-220°C.

This temperature range is specifically chosen to be above the vaporisation point of key cannabinoids and terpenes but below the combustion temperature of plant material.

Research has demonstrated that vaporisation can effectively deliver cannabinoids while producing significantly fewer pyrolytic compounds compared to smoking.

EFFICIENCY

The efficiency of cannabinoid delivery also differs significantly between these methods.

During smoking, a portion of cannabinoids are destroyed by high temperatures or lost in side stream smoke.

Vaporisation, however, offers higher efficiency in cannabinoid delivery.

TEMPERATURE CONTROL

Smoking provides no temperature control and can result in variable cannabinoid delivery.

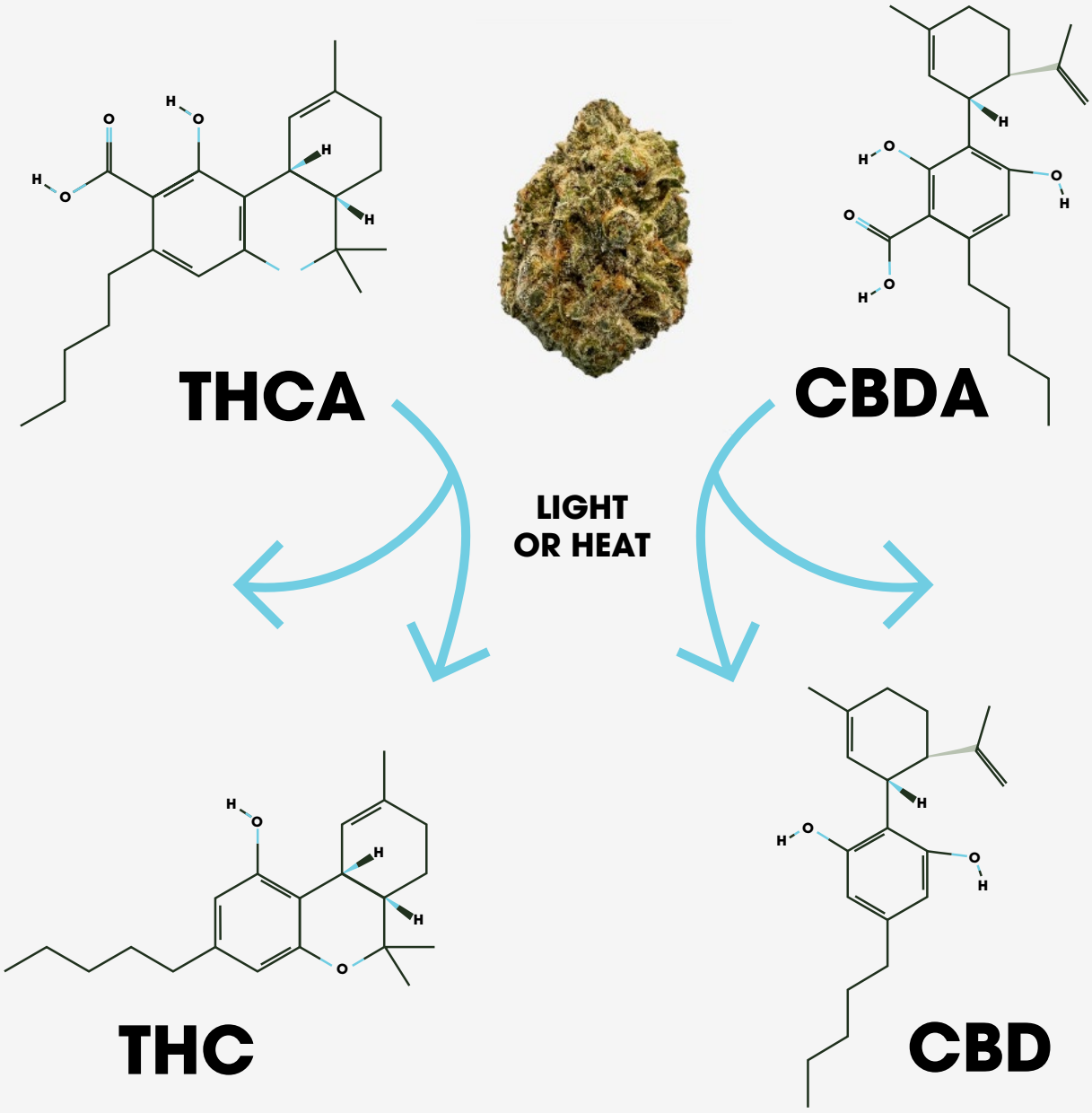
Vaporisation allows for precise temperature selection.

This control enables healthcare professionals to recommend specific temperature ranges based on the patient's therapeutic needs and the target cannabinoids and terpenes.

The Therapeutic Goods Administration outlines within its medical cannabis guidance documents that cannabis should be 'vaporised but not smoked' for medicinal purposes.

4. Baker, R. R. (1974). Temperature distribution inside a burning cigarette. Nature, 247, 405-406.

What are Therapeutic Cannabis Vaporisation Devices?



Therapeutic Cannabis Vaporisation Devices are designed to heat dried cannabis flower material to a specific temperature range below the point of combustion, typically between 180-230°C.[5] At these temperatures, the inactive ingredients are converted into active forms such as Delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD). They are released as a vapor without producing the harmful byproducts associated with smoking.[6]

5. Gieringer, D., St. Laurent, J., & Goodrich, S. (2004). Cannabis vaporizer combines efficient delivery of THC with effective suppression of pyrolytic compounds. Journal of Cannabis Therapeutics, 4(1), 7-27.

6. Hazekamp, A., Ruhaak, R., Zuurman, L., van Gerven, J., & Verpoorte, R. (2006). Evaluation of a vaporizing device (Volcano®) for the pulmonary administration of tetrahydrocannabinol. Journal of Pharmaceutical Sciences, 95(6), 1308-1317.

Vaporisation is one of two inhalation methods for consuming cannabis flower, alongside smoking. In medicinal contexts, vaporisation is preferable to smoking because it reduces the number of undesired hydrocarbons being absorbed into the body. Vaporisation also allows for a more precise dose to meet the therapeutic needs of a patient, given that less of the THC dose is lost in side stream/combustion.

The concept of vaporisation as a harm reduction strategy for cannabis use was first comprehensively explored in the early 2000s, laying the groundwork for subsequent research in this area.[7] More recent studies have validated various vaporisers, confirming their efficacy in providing smoke-free inhalation of cannabis and highlighting differences between devices.[8] These studies have been valuable in establishing the scientific basis for the use of vaporisers in medical cannabis administration.

Designed to:

- **Heat dried cannabis to a specific temperature range**
- **Convert inactive ingredients to active forms of THC & CBD**
- **Released as a vapor**
- **Offers a precise dosage to patient**
- **Reduces the body's intake of unwanted hydrocarbons**

7. Gieringer, D. (2001). Cannabis vaporization: A promising strategy for smoke harm reduction. Journal of Cannabis Therapeutics.
8. Lanz, C., Mattsson, J., Soydaner, U., & Brenneisen, R. (2016). Medicinal cannabis: In vitro validation of vaporizers for the smoke-free inhalation of cannabis. PLoS One, 11(1), e0147286.

Difference between Cannabis Vaporisation and Nicotine Vaporisation

Understanding the distinctions between cannabis and nicotine vaporisation is important for healthcare professionals and patients alike. Neither technology is superior to the other; they are simply different tools designed for different purposes. Therapeutic Cannabis Vaporisation Devices are specialised medical devices for delivering plant compounds, while nicotine vaporisation devices are designed for consumption of nicotine for smoking cessation purposes.

Each has its own specific role, requirements, and regulatory framework that reflects its intended use.

Nicotine Vaporisation vs Cannabis Vaporisation

THE COMPOUND DELIVERY

Nicotine Vaporisation Devices atomise a liquid solution (e-liquid) that contains extracted nicotine combined with carrier liquids such as propylene glycol (PG) and vegetable glycerine (VG), along with permitted flavouring compounds.

Therapeutic Cannabis Vaporisation Devices heat dried cannabis flower material directly, facilitating the controlled decarboxylation and vaporisation of cannabinoids and terpenes from their natural plant form.

THE DELIVERY MECHANISMS

Nicotine vaporisation involves the atomisation of a single primary active compound (nicotine) that is already in its active form within the e-liquid, requiring no chemical transformation during vaporisation.

Cannabis vaporisation involves the temperature-controlled activation of multiple compounds, primarily THC and CBD, through decarboxylation of their acidic forms (THCA and CBDA) at temperatures between 180-220°C. This process must be precisely controlled to preserve the complex profile of cannabinoids and terpenes that contribute to therapeutic effects.

THE DEVICE DESIGN

Nicotine devices are designed around liquid atomisation systems using wicks and coils to heat e-liquids, with their engineering focused on consistent liquid vaporisation rather than compound activation.

Therapeutic Cannabis Vaporisation Devices require heating chambers designed for plant material, with precise temperature control systems to ensure optimal decarboxylation without reaching combustion temperatures. They must manage the process of extracting multiple compounds from plant material while preserving their therapeutic properties.

How do Therapeutic Cannabis Vaporisation Devices Work?

Therapeutic Cannabis Vaporisation Devices utilise various heating methods, including conduction, convection, or a combination of both, to heat the cannabis material evenly.[9] The vapor is collected in a chamber or passed through a mouthpiece for inhalation.

The efficiency of vaporisation in delivering cannabinoids has been demonstrated in several studies. A pilot study showed that vaporisation of cannabis can deliver therapeutic levels of THC while reducing exposure to harmful pyrolytic compounds associated with smoking.[10] This finding was further supported by research evaluating specific vaporiser models, which demonstrated their efficiency in delivering THC, providing a scientific basis for the use of vaporisers in medical cannabis administration.[11]

In Australia, there are several devices available via both the registered and unregistered pathway, in this guidance document, the device that is explored is the Grenco Medical Elite II. The Grenco Medical Elite II Device utilises a patented clean air intake and dual heater technology, to consistently deliver high-quality vapor through a full ceramic heating chamber with precise temperature control between 180° - 230°.

9. Loflin, M., & Earleywine, M. (2015). No smoke, no fire: What the initial literature suggests regarding vaporized cannabis and respiratory risk. Canadian Journal of Respiratory Therapy, 51(1), 7-9.

10. Abrams, D. I., Vizoso, H. P., Shade, S. B., Jay, C., Kelly, M. E., & Benowitz, N. L. (2007). Vaporization as a smokeless cannabis delivery system: A pilot study. Clinical Pharmacology & Therapeutics, 82(5), 572-578.

11. Hazekamp, A., Ruhaak, R., Zuurman, L., van Gerven, J., & Verpoorte, R. (2006). Evaluation of a vaporizing device (Volcano®) for the pulmonary administration of tetrahydrocannabinol. Journal of Pharmaceutical Sciences, 95(6), 1308-1317.

Key Benefits of Vaporisation

Therapeutic Cannabis Vaporisation Devices offer several distinct advantages over traditional methods of cannabis consumption, making them an increasingly popular choice among medical patients. These benefits include:

Reduced Exposure to Harmful Compounds

Vaporisers heat cannabis to a temperature that releases the desired compounds without the dangerous byproducts associated with combustion. In contrast, when cannabis is combusted through smoking, patients inhale a mixture of cannabinoids, terpenes, and various byproducts, including toxins and carcinogens.

These harmful compounds can irritate the lungs and increase the risk of respiratory issues. By minimising exposure to these harmful compounds, vaporisation offers a safer alternative for cannabis consumption, particularly for medical patients who may have compromised health or concerns about the long-term effects of smoking.

Enhanced Efficiency and Dosage Control

Vaporisers offer improved efficiency in extracting and delivering cannabinoids compared to smoking.

When cannabis is smoked, a significant portion of the active compounds can be lost through overheating, side stream smoke, or incomplete combustion.

Conversely, vaporisers provide a more controlled and efficient extraction of cannabinoids, allowing patients to achieve desired effects with smaller amounts of material. This efficiency can lead to cost savings over time and more precise dosage control, which is particularly important for patients who require consistent and accurate dosing to manage their symptoms effectively.

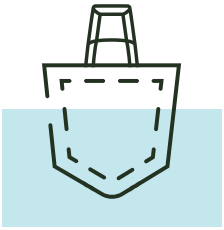
Key Benefits of Vaporisation

Rapid Onset and Customisable Effects

Vaporisation allows for rapid absorption of cannabinoids through the lungs, resulting in a faster onset of effects than oral consumption methods like pastilles (edibles) or tinctures.

This rapid onset can be particularly beneficial for patients seeking immediate symptom relief. This rapid onset allows patients to titrate their dosage more easily and achieve the desired level of symptom management.

Moreover, controlling the temperature in many Therapeutic Cannabis Vaporisation Devices enables patients to customise their experience.

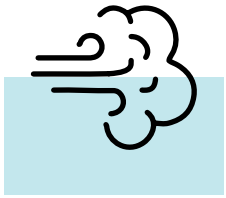


Discreet and Convenient Use

Therapeutic Cannabis Vaporisation Devices produce less odour than smoking, making them more suitable for discreet use in various settings. The vapor these devices produce dissipates quickly and does not linger in the air or on clothing and hair as smoke does. This reduced odour profile allows medical cannabis patients to use their medication more discreetly without drawing attention to their consumption or raising concerns about second-hand vapour.

Additionally, many Therapeutic Cannabis Vaporisation Devices feature compact and portable designs, making them convenient for on-the-go use and easy to integrate into daily routines.

This portability and convenience can greatly improve the quality of life for medical cannabis patients who require frequent dosing or need to medicate outside of their homes.



Improved Flavour and Aroma of Flower Material

Vaporisation preserves the natural flavours and aromas of cannabis flower by gently heating the plant material, releasing the volatile terpenes and flavonoids responsible for its distinctive sensory profile.

When cannabis is smoked, the high temperatures of combustion can destroy or alter these delicate terpenes and flavonoids, resulting in a harsher and less flavourful experience. In contrast, vaporisers operate at lower temperatures that preserve the integrity of these compounds, allowing patients to fully appreciate the natural flavours and aromas of their cannabis flower.

By maintaining the natural terpene content of the flower, vaporisation may also help to maximise the therapeutic benefits of the entourage effect.

CLINICAL APPLICATIONS AND THERAPEUTIC RELEVANCE

Cannabinoid Compound Vaporisation in Clinical Care

Cannabinoid vaporisation is an established therapeutic option for managing chronic conditions such as spasticity, neuropathic pain, and appetite loss in clinical settings; this is particularly relevant for patients where options for traditional pharmaceutical therapies may be limited or poorly tolerated.[12] Inhaled delivery enables rapid onset and symptom relief through pulmonary absorption of active cannabinoids.

Cannabinoid vaporisation has been widely used in clinical studies due to its standardised balloon delivery system and precise temperature regulation.[13]

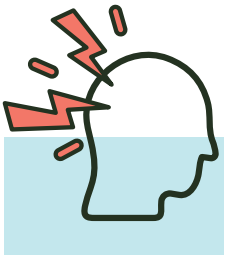
While this system demonstrates consistency in compound delivery and is recognised by regulatory bodies in Australia, Canada, and Europe, alternative vaporiser styles utilising similar temperature stability and portability offer comparable clinical outcomes. These devices, intended for patient use in healthcare or home-care settings, provide rapid inhalation without the need for balloon interfaces with the intention of greater ease of use for individuals with reduced dexterity or cognitive load.

Inhaled cannabinoids have been utilised in treatment for conditions such as multiple sclerosis, and appetite stimulation in wasting disorders, and can provide symptom relief for patients with nausea and anxiety. THC-dominant compounds are primarily used for symptomatic relief, while CBD is being investigated for anti-inflammatory, anti-anxiety, and neuroprotective properties.[14]

Vaporisers designed for clinical application can be integrated with treatment protocols that favour real-time titration and patient-guided dosing. These features allow for symptom-adapted administration without the delay of oral routes. When used under medical supervision with regulated cannabinoid products, vaporisation may enhance therapeutic adherence, patient satisfaction, and clinical outcomes.

12. Russo EB. Taming THC: potential cannabis synergy and phytocannabinoid-terpenoid entourage effects. Br J Pharmacol. 2011 Aug;163(7):1344-64. doi: 10.1111/j.1476-5381.2011.01238.x. PMID: 21749363; PMCID: PMC3165946.
13. Hazekamp A, Ruhaak R, Zuurman L, van Gerven J, Verpoorte R. Evaluation of a vaporizing device (Volcano) for the pulmonary administration of tetrahydrocannabinol. J Pharm Sci. 2006 Jun;95(6):1308-17. doi: 10.1002/jps.20574. PMID: 16637053.
14. Whiting PF, Wolff RF, Deshpande S, Di Nisio M, Duffy S, Hernandez AV, Keurentjes JC, Lang S, Misso K, Ryder S, Schmidlkofer S, Westwood M, Kleijnen J. Cannabinoids for Medical Use: A Systematic Review and Meta-analysis. JAMA. 2015 Jun 23-30;313(24):2456-73. doi: 10.1001/jama.2015.6358. Erratum in: JAMA. 2015 Aug 4;314(5):520. doi: 10.1001/jama.2015.8253. Erratum in: JAMA. 2015 Aug 25;314(8):837. doi: 10.1001/jama.2015.9010. Erratum in: JAMA. 2015 Dec 1;314(21):2308. doi: 10.1001/jama.2015.15929. Erratum in: JAMA. 2016 Apr 12;315(14):1522. doi: 10.1001/jama.2016.3470. PMID: 26103030.

Therapeutic Applications of Vaporised Cannabinoids



Chronic Pain

Inhaled cannabinoids have demonstrated efficacy in the treatment of chronic pain. In a randomised crossover trial by Wilsey, low-dose vaporised THC significantly reduced pain intensity in patients with peripheral neuropathy without causing recordable cognitive impairment.[15]

A review by Mücke concluded that inhaled cannabis offers moderate relief for chronic neuropathic pain, highlighting the acceptability and titration advantages of vaporisation.[16] A comprehensive review by the National Academies of Sciences (2017) also found substantial evidence supporting the effectiveness of cannabis in adult chronic pain management.

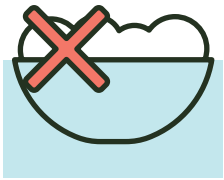
Vaporised delivery allows patients to deliver cannabinoid compounds to treat varying degrees of pain and with rapid onset, suiting conditions with fluctuating pain severity.

Spasticity in Neuromuscular Conditions

Cannabinoid-based therapy is emerging as a treatment option for patients with spasticity, particularly in association with MS and other neuromuscular conditions. THC-based compounds, as well as balanced THC/CBD compounds, can influence motor control by acting on CB1-receptors in the central and peripheral nervous systems.[17]

In a double-blind placebo study by Corey-Bloom, inhaled cannabis was shown to reduce reported spasticity and pain in patients with MS.[18] Vaporisation has been validated for consistent cannabinoid delivery, ensuring therapeutic reproducibility in clinical settings.[19] Compared to oral preparations, vaporised delivery provides rapid symptomatic relief and facilitates as-needed dosing.

15. Wilsey B, Marcotte T, Deutsch R, Gouaux B, Sakai S, Donaghe H. Low-dose vaporized cannabis significantly improves neuropathic pain. J Pain. 2013 Feb;14(2):136-48. doi: 10.1016/j.jpain.2012.10.009. Epub 2012 Dec 11. PMID: 23237736; PMCID: PMC3566631.
16. Mücke M, Phillips T, Radbruch L, Petzke F, Häuser W. Cannabis-based medicines for chronic neuropathic pain in adults. Cochrane Database Syst Rev. 2018 Mar 7;3(3):CD012182. doi: 10.1002/14651858.CD012182.pub2. PMID: 29513392; PMCID: PMC6494210.
17. Wade DT, Makela PM, House H, Bateman C, Robson P. Long-term use of a cannabis-based medicine in the treatment of spasticity and other symptoms in multiple sclerosis. Mult Scler. 2006 Oct;12(5):639-45. doi: 10.1177/1352458505070618. PMID: 17086911.
18. Corey-Bloom J, Wolfson T, Gamst A, Jin S, Marcotte TD, Bentley H, Gouaux B. Smoked cannabis for spasticity in multiple sclerosis: a randomized, placebo-controlled trial. CMAJ. 2012 Jul 10;184(10):1143-50. doi: 10.1503/cmaj.110837. Epub 2012 May 14. PMID: 22586334; PMCID: PMC3394820.
19. Hazekamp A, Ruhaak R, Zuurman L, van Gerven J, Verpoorte R. Evaluation of a vaporizing device (Volcano) for the pulmonary administration of tetrahydrocannabinol. J Pharm Sci. 2006 Jun;95(6):1308-17. doi: 10.1002/jps.20574. PMID: 16637053.



Nausea, Appetite Loss, and Cachexia

Cannabinoids have established antiemetic properties, with THC being particularly effective in managing symptoms of nausea and vomiting in patients undergoing chemotherapy. For patients on multiple medications, THC vaporisation may be preferred over oral methods for the purpose of tolerance. Abrams reported that when used in combination with standard therapies, THC vaporisation significantly reduced nausea, vomiting, and pain vs a placebo in a population of HIV patients.[20] The rapid onset of vaporised delivery enables prompt symptom relief to manage episodes of acute nausea.

THC has demonstrated utility in appetite stimulation and weight stabilisation in patients experiencing cachexia due to cancer or autoimmune conditions. Beal showed that appetite and mood improved in patients with HIV following THC treatment, while Strasser reported increased caloric intake after THC treatment in cancer patients. In these cases, vaporised THC or cannabinoid compounds may be preferable to oral formulations for patients with difficulty swallowing, nausea, or who are using several medications concurrently.[21] [22] Patient-directed titration using therapeutic vaporisers allows real-time management of appetite and energy intake.

Sleep Disturbance and Anxiety

There has been exploration into the use of cannabinoid therapy for sleep and anxiety-related conditions, particularly where symptoms are secondary to chronic illness. Low-dose THC may aid sleep initiation, while CBD demonstrates anxiety relief and sleep-stabilising effects at moderate doses.[23] Shannon reported improvements in anxiety and sleep scores in patients who were administered CBD orally.[24] While data on inhaled CBD is limited, vaporised delivery may offer faster onset and suit individuals with episodic insomnia or acute anxiety.

20. Abrams DI, Jay CA, Shade SB, Vizoso H, Reda H, Press S, Kelly ME, Rowbotham MC, Petersen KL. Cannabis in painful HIV-associated sensory neuropathy: a randomized placebo-controlled trial. Neurology. 2007 Feb 13;68(7):515-21. doi: 10.1212/01.wnl.0000253187.66183.9c. PMID: 17296917.
21. Beal JE, Olson R, Laubenstein L, Morales JO, Bellman P, Yangco B, Lefkowitz L, Plasse TF, Shepard KV. Dronabinol as a treatment for anorexia associated with weight loss in patients with AIDS. J Pain Symptom Manage. 1995 Feb;10(2):89-97. doi: 10.1016/0885-3924(94)00117-4. PMID: 7730690.
22. Cannabis-In-Cachexia-Study-Group; Strasser F, Luftner D, Possinger K, Ernst G, Ruhstaller T, Meissner W, Ko YD, Schnelle M, Reif M, Cerny T. Comparison of orally administered cannabis extract and delta-9-tetrahydrocannabinol in treating patients with cancer-related anorexia-cachexia syndrome: a multicenter, phase III, randomized, double-blind, placebo-controlled clinical trial from the Cannabis-In-Cachexia-Study-Group. J Clin Oncol. 2006 Jul 20;24(21):3394-400. doi: 10.1200/JCO.2005.05.1847. PMID: 16849753.
23. Babson KA, Sottile J, Morabito D. Cannabis, Cannabinoids, and Sleep: a Review of the Literature. Curr Psychiatry Rep. 2017 Apr;19(4):23. doi: 10.1007/s11920-017-0775-9. PMID: 28349316.
24. Shannon S, Lewis N, Lee H, Hughes S. Cannabidiol in Anxiety and Sleep: A Large Case Series. Perm J. 2019;23:18-041. doi: 10.7812/TPP/18-041. PMID: 30624194; PMCID: PMC6326553.

Safety and Efficacy of Vaporisation

Studies have shown that vaporisation can significantly reduce the intake of harmful toxins and carcinogens compared to smoking. This section briefly outlines the current scientific evidence surrounding the use of vaporisers, exploring their potential to minimise harmful exposure and efficiently administer cannabinoids.

Reduced Exposure to Harmful Compounds

Studies have shown that vaporisation can significantly reduce the intake of harmful toxins and carcinogens compared to smoking. A study by Gieringer et al. (2004) found that cannabis vapor contained substantially fewer pyrolytic compounds than smoke.[25] This research supports the use of vaporisation as a harm reduction strategy.

Efficient Cannabinoid Delivery

Vaporisers have been shown to efficiently extract and deliver cannabinoids, particularly THC, from cannabis plant material. A study by Hazekamp et al. (2006) evaluated the performance of a vaporisation device and found that it effectively delivered THC, with up to 54% of the available THC being recovered in the vapor.[26] This recovery rate indicates efficient extraction while avoiding the combustion byproducts associated with smoking, suggesting that vaporisation can provide effective delivery of cannabinoids in a safer manner.

In addition to the increased efficiency, vaporisation may also enhance the bioavailability of cannabinoids. When cannabinoids are inhaled through vaporisation, they are rapidly absorbed into the bloodstream through the lungs, bypassing the first-pass metabolism that occurs with oral consumption.

The bioavailability of inhaled THC ranges from 10% to 35%.[27] In contrast to oral ingestion, inhaled THC avoids the first-pass metabolism in the liver, resulting in higher concentrations of THC in the brain compared to blood levels. Inhalation of cannabis provides a rapid and efficient delivery method with THC being detected in plasma seconds after the first inhalation of a cannabis cigarette. This rapid absorption and distribution through the pulmonary system results in THC quickly crossing the blood-brain barrier, allowing for more immediate onset of effects compared to oral administration.[28]

25. Gieringer, D., St. Laurent, J., & Goodrich, S. (2004). Cannabis vaporizer combines efficient delivery of THC with effective suppression of pyrolytic compounds. Journal of Cannabis Therapeutics, 4(1), 7-27.
26. Hazekamp, A., Ruhaak, R., Zuurman, L., van Gerven, J., & Verpoorte, R. (2006). Evaluation of a vaporizing device (Volcano®) for the pulmonary administration of tetrahydrocannabinol. Journal of Pharmaceutical Sciences, 95(6), 1308-1317.
27. Chayasirisobhon, S. (n.d.). Mechanisms of action and pharmacokinetics of cannabis.
28. Huestis, M. A. (2007). Human cannabinoid pharmacokinetics. Chemistry & Biodiversity, 4(8), 1770-1804.

PHARMACOKINETICS

Vaporised Cannabis

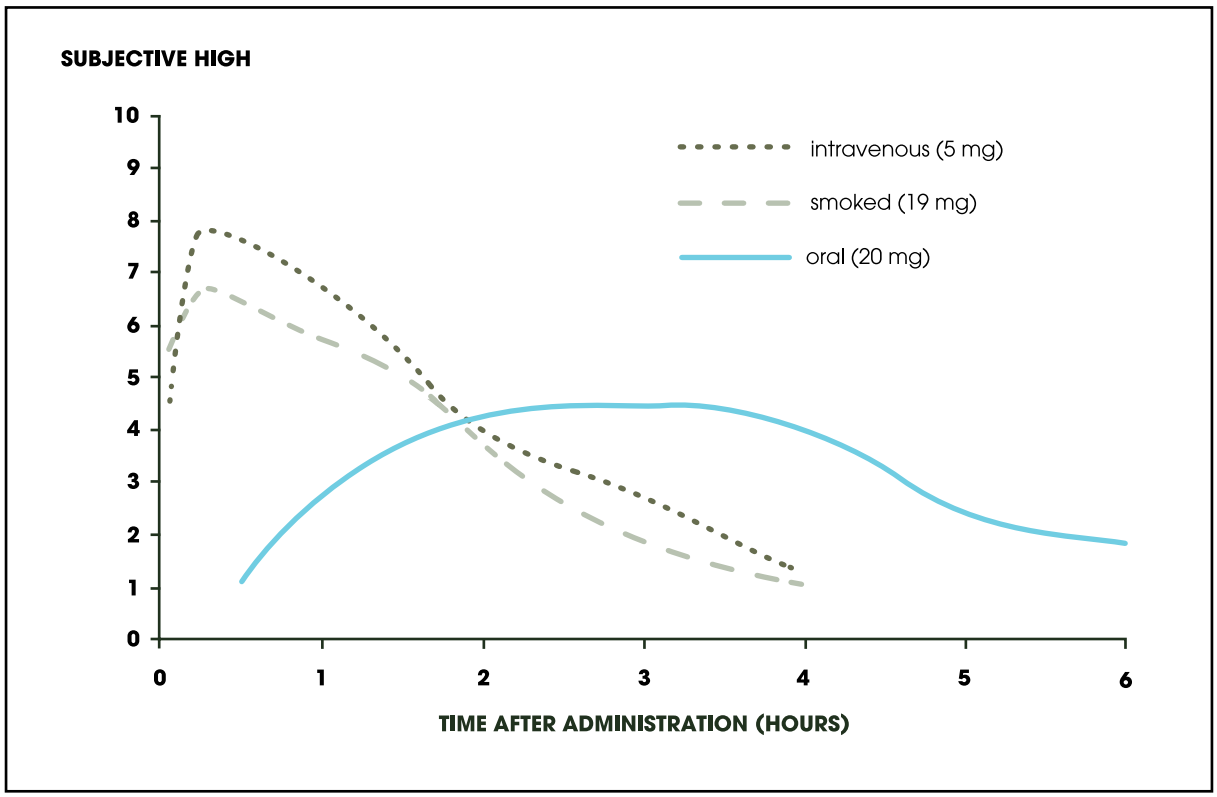
The pharmacokinetics of inhaled cannabinoids have been studied in detail. Researchers have examined the effects of intrapulmonary THC administration in humans, providing valuable data on the pharmacokinetics and pharmacodynamics of inhaled cannabinoids, which is directly relevant to vaporisation methods.[29]

Additionally, models have been developed to understand THC's effects on central nervous system parameters and heart rate, providing insights into its mechanisms of action.[30] Such models support our understanding the impact of different administration methods.

Research has shown that vaporisation can deliver blood levels of cannabinoids comparable to smoking cannabis, with vaporised cannabis demonstrating significantly higher blood concentrations at 30 minutes post-administration and beyond compared to smoked cannabis.[31] This indicates that vaporisation can serve as an effective cannabinoid delivery system.

[29.] Zuurman, L., Roy, C., Schoemaker, R. C., et al. (2008). Effect of intrapulmonary tetrahydrocannabinol administration in humans. Journal of Psychopharmacology, 22(7), 707-716.
[30.] Strougo, A., Zuurman, L., Roy, C., et al. (2008). Modelling of the concentration-effect relationship of THC on central nervous system parameters and heart rate. Journal of Psychopharmacology, 22(7), 717-726.
[31.] Abrams, D. I., Vizoso, H. P., Shade, S. B., Jay, C., Kelly, M. E., & Benowitz, N. L. (2007). Vaporization as a smokeless cannabis delivery system: A pilot study. Clinical Pharmacology & Therapeutics, 82(5), 572-578.

Cannabinoid Absorption



Time course of subjective effects following three modes of cannabis administration. Subjects rated their "high" on a 0-10 scale (estimated from figures of Hollister et al. 1981 and Ohlsson et al. 1980).

Once absorbed, the cannabinoids, primarily THC, are distributed throughout the body, binding to cannabinoid receptors in various organs and tissues. THC is highly lipophilic, meaning it readily binds to fatty tissues, which can result in a prolonged elimination phase as the compound is slowly released back into the bloodstream over time.[32]

The metabolism of THC primarily occurs in the liver through cytochrome P450 enzymes. In human hepatic microsomes, CYP2C9 is the major enzyme responsible for converting THC to 11-hydroxy-THC (11-hydroxylation), while CYP3A4 is mainly involved in other hydroxylation processes. These specific enzymatic pathways represent key mechanisms in the biotransformation of THC in humans.[33]

The clinical pharmacokinetics of cannabinoids have been extensively studied, providing valuable insights into the absorption, distribution, metabolism, and excretion of these compounds when administered through various routes, including vaporisation.

32. Huestis, M. A. (2007). Human cannabinoid pharmacokinetics. Chemistry & Biodiversity, 4(8), 1770-1804.
33. Watanabe, K., Yamaori, S., Funahashi, T., Kimura, T., & Yamamoto, I. (2007). Cytochrome P450 enzymes involved in the metabolism of tetrahydrocannabinols and cannabinol by human hepatic microsomes. Life Sciences, 80(15), 1415-1419.
34. https://www.researchgate.net/figure/Time-course-of-subjective-effects-following-three-modes-of-cannabis-administration_fig2_251789895

Onset and Duration of Effects

The pharmacokinetics of inhaled cannabis (via smoke) demonstrates rapid and efficient absorption, with cannabinoids detectable in plasma within seconds of the first inhalation. Following inhalation, peak plasma concentrations of THC are typically achieved within 3-10 minutes.[35]

This rapid onset is one of the main advantages of vaporisation over other methods of cannabis consumption, such as oral ingestion, which can take 30 to 90 minutes to take effect.[36] The fast-acting nature of vaporised cannabis can be particularly beneficial for medical patients who require quick relief from symptoms such as pain, nausea, or anxiety.

Whilst inhalation via smoking is efficient, vaporised cannabis demonstrates superior pharmacokinetic properties and delivery efficiency when compared to smoking. The research shows that vaporised cannabis administration resulted in higher mean concentrations of THC, 11-OH-THC and THCCOOH in whole blood compared to equivalent doses of smoked cannabis.[37]

The duration of effects is another important consideration when comparing vaporised cannabis to other consumption methods. Blood THC concentrations and physiological effects like **heart rate typically return to baseline within 3-4 hours after vaporisation, however cognitive effects and subjective drug experiences can persist for up to 6 hours**.[38]

The duration and intensity of effects can vary based on factors such as dose, individual metabolism, and patient tolerance. This extended duration of certain effects is an important consideration for healthcare professionals when counselling patients on the timing and frequency of dosing.

35. Sharma, P., Murthy, P., & Bharath, M. M. S. (2012). Chemistry, metabolism, and toxicology of cannabis: Clinical implications.
36. Bridgeman, M. B., & Abazia, D. T. (2017). Medicinal cannabis: History, pharmacology, and implications for the acute care setting.
37. Spindle, T. R., Cone, E. J., Schlienz, N. J., Mitchell, J. M., Bigelow, G. E., Flegel, R., et al. (2019). Acute pharmacokinetic profile of smoked and vaporized cannabis in human blood and oral fluid. Journal of Analytical Toxicology, 43(4), 233-258.
38. Spindle, T. R., Cone, E. J., Schlienz, N. J., Mitchell, J. M., Bigelow, G. E., Flegel, R., Hayes, E., & Vandrey, R. (2018). Acute effects of smoked and vaporized cannabis in healthy adults who infrequently use cannabis.

Cannabinoids, Terpenes and Vaporisation

What are cannabinoids

Cannabinoids are a diverse group of chemical compounds found primarily in the cannabis plant. These compounds interact with the body's endocannabinoid system, a complex network of receptors and signalling molecules that regulates physiological processes such as pain, mood, appetite, and immune response.

The most well-studied cannabinoids include Delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD), though others, such as cannabigerol (CBG) and cannabinol (CBN), are gaining attention for their potential therapeutic properties.

THC (Delta-9-tetrahydrocannabinol):

The primary psychoactive cannabinoid, responsible for the euphoric "high" associated with cannabis use. THC has demonstrated therapeutic potential for conditions such as chronic pain, nausea, and muscle spasticity, but its psychoactive effects require careful dosing to balance efficacy and tolerability.

CBD (Cannabidiol):

A non-psychoactive cannabinoid widely studied for its potential anti-inflammatory, anxiolytic, and anticonvulsant properties. CBD is often used to manage conditions like anxiety, epilepsy, and inflammation without inducing psychoactive effects.

CBG (Cannabigerol):

A non-psychoactive cannabinoid considered a precursor to THC and CBD in the cannabis plant. Preliminary research suggests CBG may have antibacterial, neuroprotective, and anti-inflammatory effects, though further studies are needed.

CBN (Cannabinol):

A mildly psychoactive cannabinoid formed as THC degrades over time. CBN is being explored for its potential sedative effects and possible role in pain relief and sleep regulation.

Cannabinoids and Temperature

The key cannabinoids in cannabis are present in the plant as inactive acid forms (THCA-A and CBDA) which must be converted to active compounds through decarboxylation. This process is temperature-dependent and occurs optimally at temperatures between 180°C and 210°C. This temperature range is specifically designed to be above the vaporisation point of key cannabinoids and terpenes but below the combustion temperature of plant material (approximately 350°C).

What are Terpenes

Terpenoids are essential oil components responsible for the aroma of cannabis. Over 200 have been identified in the plant, and research suggests they may interact with cannabinoids in ways that could potentially contribute to therapeutic effects.[39]

Some common terpenes found in cannabis include:

Myrcene: Known for its musky, earthy aroma and potential relaxing and sedative effects.

Limonene: Characterised by a citrusy scent and may possess mood-elevating and stress-reducing properties.

Pinene: Offers a pine-like aroma and may have potential anti-inflammatory and bronchodilator effects.

Linalool: Provides a floral, lavender-like scent and may have potential anxiolytic and analgesic properties.

Terpenes are volatile compounds, meaning they are easily vaporised at relatively low temperatures. Each terpene has a unique boiling point, ranging from approximately 155°C to 230°C, which is lower than the combustion temperature of cannabis (around 350-450°C).[40]

By carefully controlling the temperature during vaporisation, patients can tailor their experience and potentially maximise the therapeutic benefits of terpenes.

[39]. Russo, E. B. (2011). Taming THC: Potential cannabis synergy and phytocannabinoid-terpenoid entourage effects. British Journal of Pharmacology, 163(7), 1344-1364.
[40]. Raz, N., Eyal, A. M., & Davidson, E. M. (2022). Optimal treatment with cannabis extracts formulations is gained via knowledge of their terpene content and via enrichment with specifically selected monoterpenes and monoterpenoids. Molecules, 27(20), 6920.

The ‘Entourage Effect’

The importance of terpenes in the therapeutic effects of cannabis has been highlighted in research exploring the 'entourage effect', which suggests that the interaction between cannabinoids and terpenes may enhance therapeutic effects.[41]

Vaporisation allows for precise temperature control, potentially optimising the release of both compounds.

The Grenco Medical Elite II device offers precise temperature control, accurate to 1°C, allowing patients to select the optimal temperature for their desired terpene profile and therapeutic effects.

Scan to view our Terpene Heat Point Guide

41. Russo, E. B. (2017). Cannabis pharmacology: The usual suspects and a few promising leads. Advances in Pharmacology, 80, 67-134.

Temperature Control and Optimal Ranges

Temperature control is an important aspect of cannabis vaporisation. The temperature and time of vaporisation can affect the efficiency of cannabinoid volatilisation and the production of breakdown products in the vapor. Precision temperature control allows patients to fine-tune their experience and optimise cannabinoid extraction while minimising the formation of unwanted compounds.

160°C — 180°C

Vaporising cannabis at this lower temperature range allows for the optimal release of terpenes.

This temperature range also facilitates the decarboxylation of cannabinoids, converting them into their active forms, such as THC and CBD.

180°C — 200°C

Vaporising at this temperature range still allows terpenes to release, providing a flavourful experience, although not as pronounced as in the lower temperature range.

The effects of cannabinoids become more noticeable in this range as a higher proportion of them are activated.

200°C — 230°C

Vaporising at these higher temperatures maximises the activation and release of cannabinoids, resulting in the strongest potential physical effects.

The flavour profile from terpenes may be diminished at these temperatures, as many terpenes have lower boiling points and can be degraded at higher temperatures.

Cannabinoid Volatilisation Profile

The efficiency of cannabinoid extraction during vaporisation is significantly influenced by temperature settings. Research by Pomahacova et al. (2009)[42] demonstrated that vaporisation at different temperatures impacted the yield of cannabinoids when consumed, particularly THC and CBD.

Hazekamp et al. (2006) found that at 210-230°C, THC and CBD were released more rapidly and in higher concentrations per inhalation compared to lower temperatures. This study noted that efficiency peaks around 226°C, while still avoiding significant toxic byproducts.[43]

More recent research by Eyal et al. (2023)[44] has provided quantitative data on the rate of cannabinoid volatilisation at different temperatures.

Understanding the relationship between temperature settings and cannabinoid volatilisation provides healthcare professionals with important insights when recommending therapeutic cannabis vaporisation devices.

180°C
Only 10% of THC evaporates within 20 seconds, increasing to 20% after 40 seconds

210°C
(the maximum temperature of some ARTG-listed devices), volatilisation is slower and less complete

230°C
there is 34% volatilisation of THC within 20 seconds and 50% within 40 seconds

42. Pomahacova B, Van der Kooy F, Verpoorte R. Cannabis smoke condensate III: the cannabinoid content of vaporised Cannabis sativa. Inhal Toxicol. 2009 Nov;21(13):1108-12. doi: 10.3109/08958370902748559. PMID: 19852551.
43. Lanz C, Mattsson J, Soydaner U, Brenneisen R. Medicinal Cannabis: In Vitro Validation of Vaporizers for the Smoke-Free Inhalation of Cannabis. PLoS One. 2016 Jan 19;11(1):e0147286. doi: 10.1371/journal.pone.0147286. PMID: 26784441; PMCID: PMC4718604.
44. Eyal AM, Berneman Zeitouni D, Tal D, Schlesinger D, Davidson EM, Raz N. Vapor Pressure, Vaping, and Corrections to Misconceptions Related to Medical Cannabis' Active Pharmaceutical Ingredients' Physical Properties and Compositions. Cannabis Cannabinoid Res. 2023 Jun;8(3):414-425. doi: 10.1089/can.2021.0173. Epub 2022 Apr 18. PMID: 35442765; PMCID: PMC10249740.

<160°

Terpenes:
- **Pinene 155°C**
- **Myrcene 168°C**
- **Limonene 176°C**

Mainly terpenes are vaporized at <170°. This range is ideal for a mild, flavorful experience without significant psychoactive/ psychotropic effects.

Provides more of a fragrant, flavorful vapor that can have calming or uplifting effects depending on the terpenes present.

160 - 180°C

Terpenes:
- **THC 157°C** (Tetrahydrocannabinol)
- **CBD 180°C** (Cannabidiol)

This range vaporizes terpenes and some cannabinoids, offering a balanced experience with moderate psychoactive/ psychotropic effects.

A mix of flavor and moderate psychoactivity, useful for daytime use and for those seeking mild relief from symptoms like anxiety and pain.

180 - 200°C

Terpenes:
- **THC** (Fully vaporized)
- **CBD** (Fully vaporized)
- **CBN 185°C** (Cannabinol)

Higher temperatures in this range ensure efficient vaporization of both cannabinoids and terpenes, providing stronger psychoactive/psychotropic and therapeutic effects.

Stronger psychoactive effects with significant therapeutic benefits. Suitable for managing pain, insomnia, and other conditions requiring higher cannabinoid doses.

200 - 230°C

Terpenes:
- **THC** (Fully vaporized)
- **CBD** (Fully vaporized)
- **CBG 198°C** (Cannabigerol)

The highest range is suitable for vaporization without combustion. Maximizes cannabinoid extraction but may degrade some terpenes.

Intense effects, both psychoactive/psychotropic and therapeutic. Useful for severe symptoms but may be harsh on the throat and lungs.

THC (Tetrahydrocannabinol) Optimal Temp: 157°C	Has both euphoric and analgesic effects and induces a strong state of relaxation.
CBD (Cannabidiol) Optimal Temp: 160-180°C	Known for its therapeutic effects. It can act as a moderate the side effects of THC, such as anxiety.
CBN (Cannabinol) Optimal Temp: 185°C	CBN is believed to have sedative properties and may contribute to relaxation effects.
CBG (Cannabigerol) Optimal Temp: 160-220°C	Has potential therapeutic effects.

Compliance Considerations

What are ARTG and Unregistered Therapeutic Cannabis Vaporisation Devices?

Therapeutic Cannabis Vaporisation Devices available for medical use in Australia fall into two distinct categories: those registered on the Australian Register of Therapeutic Goods (ARTG) and those that remain unregistered. Understanding the differences between these categories is essential for healthcare professionals when recommending devices to patients, as it impacts safety, regulatory oversight, and compliance with Australian therapeutic goods standards.

ARTG-Registered Devices

Therapeutic cannabis vaporisation devices that are registered on the Australian Register of Therapeutic Goods (ARTG) have undergone a rigorous medical device assessment process by the TGA. These devices have been evaluated for their safety, quality, and efficacy, ensuring they meet the essential principles required for medical devices in Australia.

The Grenco Medical Elite II Device is a Class IIb medical device successfully registered on the ARTG (ARTG Number: XXXXX). This registration signifies that the device has undergone a rigorous assessment process and has been deemed suitable for medical use in Australia.

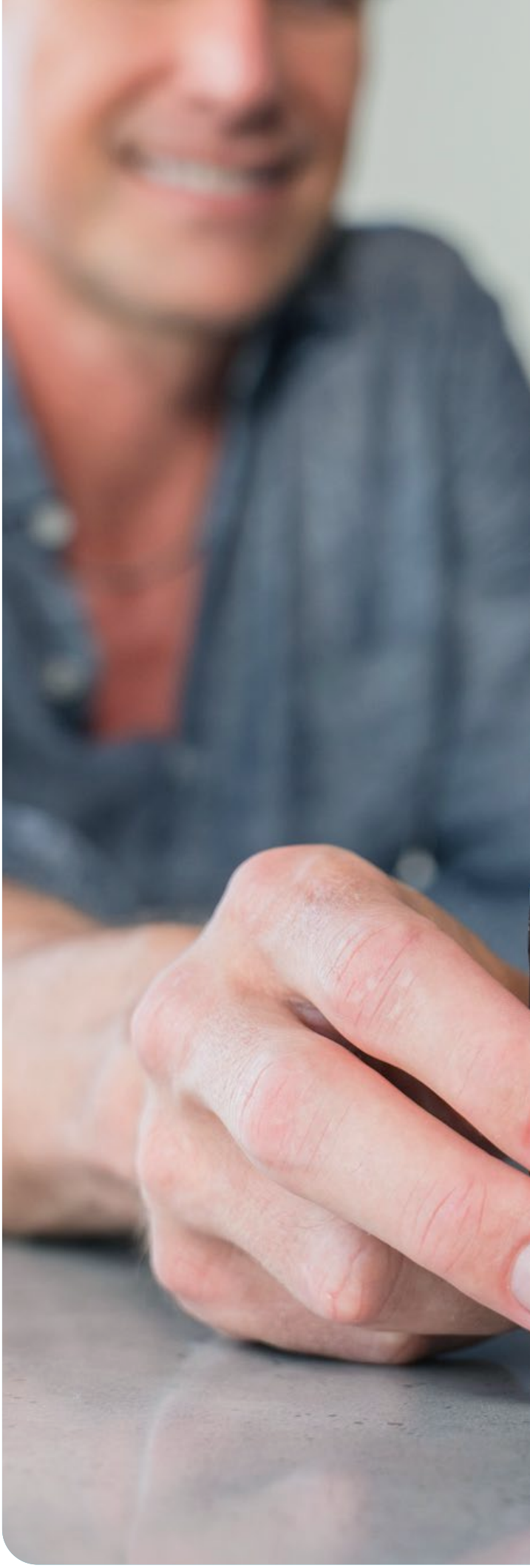
The Grenco Medical Elite II was also approved by Health Canada (Medical Device License 113029) in 2025 and has also been registered with MedSafe in NZ (WAND registration 250506-WAND-7513K4) in 2025.

By prescribing an ARTG-approved device like the Grenco Medical ELITE II device, healthcare professionals can have confidence in the following:

- Safety: The device has been evaluated for its safety and potential risks, ensuring that it meets the TGA's essential principles.
- Quality: The manufacturer has implemented a Quality Management System (QMS) that complies with international standards, ensuring the consistent quality of the device.
- Efficacy: The device has been assessed for its performance and ability to administer medicinal cannabis through vaporisation effectively.
- Compliance: The device complies with all applicable TGA regulations and standards, including labelling, instructions for use, and post-market surveillance requirements.
- Ongoing Monitoring: As an ARTG-registered device, the Grenco Medical Elite II device is subject to ongoing monitoring and reporting of adverse events, ensuring continued safety and effectiveness.

By choosing an ARTG-approved device, healthcare professionals can provide their patients with a reliable and regulated option for administering medicinal cannabis through vaporisation. This adherence to regulatory standards ensures patient safety and promotes the responsible use of medical devices within the healthcare system.

When discussing Therapeutic Cannabis Vaporisation Devices with patients, it is helpful to emphasise the importance of using a device thoroughly assessed and registered on the ARTG. This can help build trust and confidence in the treatment plan while ensuring patients receive the highest quality care.



Unregistered Devices

Unregistered therapeutic cannabis vaporisation devices are those that have not been included in the ARTG. While these devices may be used in some circumstances, they have not undergone the same level of regulatory scrutiny as ARTG-registered devices.

According to TGA regulations, unregistered medicinal cannabis vaping devices can only be:

- Imported with an appropriate licence and permit from the Office of Drug Control
- Supplied to patients via the Special Access Scheme (SAS) or Authorised Prescriber (AP) scheme
- Used in situations where ARTG-registered products are not clinically appropriate for the patient

It's important to note that the importation of unregistered devices requires the importer to provide a notice to the TGA stating that the device complies with the essential principles for medical devices under the Therapeutic Goods Act 1989. This places additional responsibility on importers to ensure the safety and quality of these devices.

Healthcare professionals should be aware that there are already medicinal cannabis vaporisation devices included on the ARTG. Approvals under the SAS and AP schemes to supply unregistered vaping devices are only given in the rare occurrence where the ARTG-included goods are clinically unsuitable for a patient.

GRENCO MEDICAL ELITE II DEVICE

ARTG REGISTERED DEVICES

Introducting the **Grenco Medical ELITE II Device**

The Grenco Medical ELITE II Device (ARTG NO#) vaporises cannabinoids by heating cannabis flowers through the heating chamber, and the active ingredients of cannabinoids enter the body through the alveoli.

ELITE II

by grenco medical

FIRST OF IT'S KIND DUAL SYSTEM

- Dual Heater Technology
- Patented Clean Air Intake
- Precise Temperature Control
- Ceramic Vapor Path
- Easy-Open Magnetic Lid
- Haptic Feedback
- Fast-Charging Battery
- Full-Colour TFT Display
- USB-C Fast-Charging
- Compact, Discreet Design

Take a look at the **Grenco Medical ELITE II** in *action*!

Key Features

Dual Heater Technology

At the heart of the Grenco Medical Elite II device's performance is its dual heater technology. This system consistently delivers vapor through a full ceramic heating chamber, ensuring efficient and effective medication delivery.

Patented Clean Air Intake

The patented clean air intake providers a purer, smoke-free vaporisation experience by reducing exposure to harmful byproducts. This feature contributes to the device's suitability for medical use.

Precise Temperature Control

Temperature control supports effective vaporisation. The Grenco Medical Elite II device offers precise temperature control accurate to 1°C, designed to cater to patient specific wants and needs, allowing for customisation of the vaporisation experience.

Ceramic Vapor Path

The Grenco Medical Elite II device utilises a ceramic vapor path. This allows for cooler draws and impacts the flavour profile of the vapor.

Easy-Open Magnetic Lid

The easy-open magnetic lid facilitates simple loading of herbal material and doesn't involve any clips or complicated locks, making it perfect for those with joint and mobility issues. This feature, combined with the device's compact and discreet design, makes it particularly suitable for on-the-go use.

Fast-Charging Battery

Power management is optimised through a fast-charging battery system. The 2100mAh rechargeable lithium-ion battery offers approximately 60 minutes of continuous use, ensuring extended medication sessions when needed.

Haptic Feedback

The device incorporates haptic feedback, providing sensory notifications that improve patient experience and device interaction. This feature helps patients navigate the device's functions more intuitively.

Full-Colour TFT Display

The device features a full-colour large, easy-to-read display, which provides clear visual feedback and enhances the patient interface's ease of use. This display shows the precise temperature control, allowing patients to easily monitor and adjust their settings.

USB-C Fast-Charging

The USB-C fast-charging capability ensures the device can be fully charged in just 90 minutes. This quick turnaround time minimises interruptions in treatment regimens.

Compact and Discreet Design

The device boasts a sleek, ergonomic form factor suitable for on-the-go use. Its compact and discreet design includes a built-in carb for easy airflow control and a zirconia mouthpiece with an integrated spiral air-path for cooling vapor.

THC DELIVERY KINETICS OF THE GRENCO MEDICAL ELITE II

This section presents the findings from a recent study evaluating the THC delivery kinetics of the Grenco Medical Elite II Therapeutic Cannabis Vaporiser, providing healthcare professionals with evidence-based insights into its performance for efficient cannabinoid extraction and delivery.

Introduction to the Study

Healthcare professionals may find it helpful to understand the scientific evaluation of device performance when recommending therapeutic cannabis vaporisation options. A dedicated study was conducted to evaluate the THC delivery kinetics of the Grenco Medical Elite II Therapeutic Cannabis Vaporiser.

This investigation aimed to assess the device's efficiency in vaporising THC from cannabis flower at a clinically relevant temperature of 210°C, using a custom vaping machine designed to simulate realistic inhalation conditions. The experimental design was adapted from published methodologies, such as Carrara et al. (2020)[45], to provide robust data on decarboxylation, extraction efficiency, and aerosol yield.

The study focused on measuring the reduction of THC in the cannabis flower residue and the amount of THC delivered in the vapor over multiple inhalations. This information is valuable for healthcare professionals to understand the device's performance in delivering therapeutic cannabinoids, enabling better-informed prescribing and patient education on dosing and onset of effects.

35. Carrara L, Giroud C, Concha-Lozano N. Development of a Vaping Machine for the Sampling of THC and CBD Aerosols Generated by Two Portable Dry Herb Cannabis Vaporisers. Med Cannabis Cannabinoids. 2020 Jan 14;3(1):84-93. doi: 10.1159/000505027. PMID: 34676343; PMCID: PMC8489338.

Study Objectives

To guide the evaluation, the study established clear objectives focused on validating the device's functionality and characterising its delivery profile. These included:

- Validate that the Grenco Medical Elite II vaporises cannabis flower at 210°C as intended, confirmed by a reduction of at least 95% in THC content within the flower.
- Establish that the THC content in the vapor meets a minimum threshold of 2.5 mg and exceeds double that threshold (5 mg).
- Characterise the timepoints at which these thresholds are achieved.
- Profile the delivery kinetics of THC over a series of inhalations.

These thresholds were selected based on established dosing guidelines from sources such as the TGA, ANZCCP, MacCallum & Russo (2018)[46], Bhaskar et al. (2021)[47], and Ware et al. (2010)[48], which recommend starting doses of 1.25–5 mg THC for medicinal use, emphasising a "start low, go slow" approach.

46. MacCallum CA, Russo EB. Practical considerations in medical cannabis administration and dosing. Eur J Intern Med. 2018 Mar;49:12-19. doi: 10.1016/j.ejim.2018.01.004. Epub 2018 Jan 4. PMID: 29307505.
47. Bhaskar A, Bell A, Boivin M, Briques W, Brown M, Clarke H, Cyr C, Eisenberg E, de Oliveira Silva RF, Frohlich E, Georgius P, Hogg M, Horsted TI, MacCallum CA, Müller-Vahl KR, O'Connell C, Sealey R, Seibolt M, Sihota A, Smith BK, Sulak D, Vigano A, Moulin DE. Consensus recommendations on dosing and administration of medical cannabis to treat chronic pain: results of a modified Delphi process. J Cannabis Res. 2021 Jul 2;3(1):22. doi: 10.1186/s42238-021-00073-1. PMID: 34215346; PMCID: PMC8252988.
48. Ware MA, Wang T, Shapiro S, Robinson A, Ducruet T, Huynh T, Gamsa A, Bennett GJ, Collet JP. Smoked cannabis for chronic neuropathic pain: a randomized controlled trial. CMAJ. 2010 Oct 5;182(14):E694-701. doi: 10.1503/cmaj.091414. Epub 2010 Aug 30. PMID: 20805210; PMCID: PMC2950205.

Materials and Methods

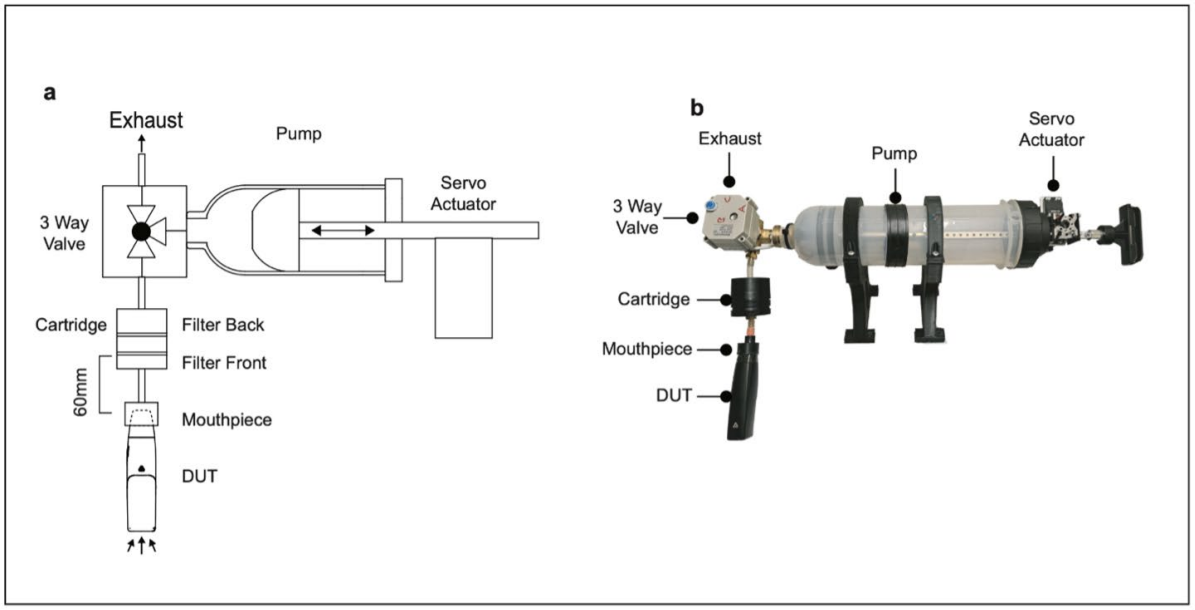


FIgure 1: Diagram (a) and image (b) of the vaping machine and the experimental setup.

The study utilised standardised materials and a controlled methodology to ensure reliable results, these included:

- Cannabis Material - Ground Cannabis sativa L. flower (Redecan GRIND "Purple Churro", labelled THC ~7.87 mg/g, CBD <0.50 mg/g; lab analysis: 8.1 mg/g THC, 17.1% THCA, Total THC 231 mg/g). Each test used 0.20 g ± 0.01 g, conditioned at 50% relative humidity for 24 hours to ensure consistent moisture content (~10–12%).
- Filters - Whatman GF/B 47 mm glass microfiber filters mounted in SKC conductive three-piece styrene cassettes.
- Experimental Setup - A custom vaping machine was developed to generate 500 mL inhalations lasting 5 seconds at a frequency of 2 inhalations/min (~6 L/min flow rate), aligning with tidal breathing volumes for therapeutic cannabis vaporisers. The machine included a servo-driven syringe actuator, 3-way motorised valve, and short silicone tubing to minimise losses. A 3D-printed fixture positioned the device, with vapor drawn through filters ~40 mm from the mouthpiece.
- Inhalation Regime - The device was preheated to 210°C for 90 seconds. Inhalations were initiated with a 5-second draw, followed by expel and reset phases, with a 25-second inter-inhalation interval (30-second cycle). Testing endpoints were at 1, 5, 10, 15, and 20 inhalations (0.5, 2.5, 5, 7.5, and 10 minutes).
- Analysis - Residual flower and filters were analysed by an SCC-accredited laboratory (High North Inc.) using HPLC-PDA. Flowers were extracted with ethanol, sonicated, diluted, and quantified against a calibration curve. Filters were sonicated in ethanol, centrifuged, filtered, and analysed similarly.

Results from THC in Cannabis Flower Residue

Examining the residual THC in the heated cannabis flower offers a direct measure of the device's extraction efficiency. As shown in the table below, THC content decreased progressively, achieving over 95% reduction (to 1.64%) by 15 inhalations or 7.5 minutes, demonstrating the Grenco Medical Elite II's capability for thorough cannabinoid release without combustion.

THC Content (%) in Cannabis Flower

Inhalations	Flower Weight (g)	THC %
Baseline	0.184	23.08
1	0.138	24.03
5	0.120	14.16
10	0.105	8.53
15	0.096	1.64
20	0.090	1.14

Results from THC in Vapor

Assessing THC levels in the vapor provides practical insights into the amounts patients may inhale during use. The cumulative THC captured increased steadily, exceeding 2.5 mg by 5 inhalations (2.5 minutes) and 5 mg by 10 inhalations (5 minutes), as detailed in the following table. This aligns with clinical needs for rapid symptom relief.

THC Vapour Content (Whatman Filter)

Inhalations	Filter Weight (g)	THC (mg)
Baseline	0.2427	0
1	0.248	0.770
5	0.260	4.262
10	0.268	6.057
15	0.271	6.929
20	0.279	8.437

Delivery Kinetics Profile

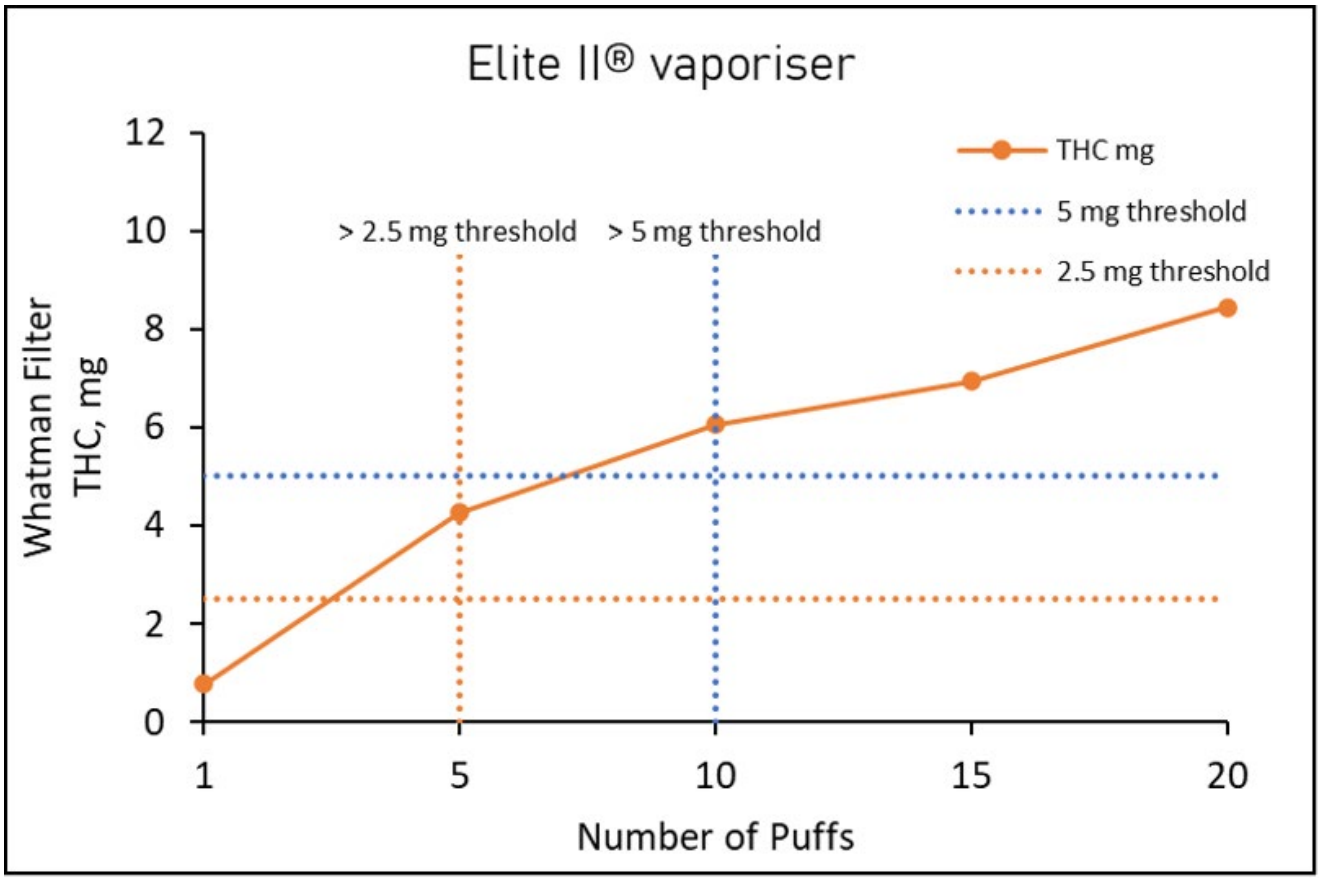


Figure 2: Amount of THC in the Elite II vapour (mg)

To further illustrate the device's consistency, the study profiled the cumulative percentage of THC delivered over time. As depicted in the figure below, the Grenco Medical Elite II exhibited a uniform release pattern across 20 inhalations, supporting predictable dosing for patients.

This steady profile can assist healthcare professionals in advising on session duration for optimal effects.

Discussion of Findings

The objective of the study was to evaluate the THC delivery kinetics of the Grenco Elite II using a similar experimental design to Carrara et al. 2020. Interpreting these results in a clinical context highlights the Grenco Medical Elite II's ability for medical cannabis administration.

The device achieved efficient THC vaporisation, with rapid threshold attainment consistent with TGA guidance on onset (effects within 90 seconds, peaking at 15–30 minutes). Experimental factors, such as filter distance from the mouthpiece and the device's safety-focused cooling spiral, suggest actual inhaled THC may be higher than measured, providing a conservative estimate of efficacy.

Overall, these insights can inform treatment plans, particularly for conditions benefiting from fast-acting, titratable delivery.

GRENCO MEDICAL ELITE II PERFORMANCE DATA

Healthcare professionals can be confident in recommending the Grenco Medical Elite II as the device has undergone an exceptionally high level of independent and in-house verification and validation testing, far exceeding what is typically seen in non-ARTG therapeutic cannabis vaporisers.

This rigorous testing programme was conducted to satisfy the strict requirements of IEC 60601-1 (medical electrical equipment), ISO 10993 (biocompatibility), ISO 18562 (breathing gas pathways), IEC 62304 (medical device software), and IEC 62366 (usability engineering).

Temperature Accuracy and Consistency

Five production devices were tested across the clinically relevant range (180 °C, 200 °C, and 220 °C) with 10 repeats at each setting after full cool-down.

- Result: Accuracy of ±1 °C at all three temperatures.

This level of precision ensures that the temperature displayed on the Elite II's high-resolution TFT screen is the actual temperature experienced by the cannabis flower, allowing reliable, reproducible dosing of specific cannabinoids and terpenes.

Component Lifetime and Durability

Rigorous lifetime testing verified the Grenco Medical Elite II's key heating components can endure extended clinical use.

- Ceramic Furnace: Five units cycled at 230°C (300 seconds on/300 seconds off). Criterion: ≥2,190 cycles (~3 years heavy daily use). Result: All exceeded 2,500 cycles.
- Heating Wire: Five units tested at 90% power (3.7V), heating every 5 seconds for 45 cumulative hours. Criterion: ≥32,400 cycles. Result: All exceeded 50,000 cycles.

These results confirm long-term reliability for consistent therapeutic performance.

Vapor and Mouthpiece Temperature Safety

To eliminate any risk of thermal injury to the lips, mouth, or respiratory tract, the Elite II incorporates multiple redundant safety controls, including an internal temperature sensor that automatically shuts the device down at 53 °C internal temperature. Independent verification testing (minimum 12 full sessions per device):

- Mouthpiece contact temperature (where lips touch): 40.1 – 41.3 °C
- Maximum inhaled vapor temperature recorded: 49.2 °C
- Device safely shuts down at 3:30 – 4:10 minutes of continuous draw if needed, then automatically restarts only when internal temperature drops below 40 °C.

These temperatures are well below the 65°C safety threshold and provide a significant safety margin for patients.

International Safety Standards Compliance

The Grenco Medical Elite II has passed full third-party certification to the following recognised standards – these include:

- IEC/EN 60601-1 – General requirements for basic safety and essential performance
- IEC/EN 60601-1-11 – Requirements for medical electrical equipment in the home healthcare environment
- IEC/EN 60601-1-2 – Electromagnetic compatibility
- IEC/EN 60601-1-6 & IEC 62366 – Usability engineering
- IEC 62304 – Medical device software life-cycle processes
- UN 38.3 Li-ion battery safety
- ISO 10993-5, -10, -18, -23 – Cytotoxicity, sensitisation, chemical characterisation, irritation
- ISO 18562-1, -2, -3 – Full biocompatibility of breathing gas pathways (including particulate matter and volatile organic compounds)

All tests passed with no failures.

The Grenco Medical Elite II is one of the most comprehensively tested portable therapeutic cannabis vaporisers available in Australia. The combination of ±1 °C temperature accuracy, proven component longevity exceeding 3–5 years of typical use, vapor temperatures consistently below 50 °C, and full compliance with international medical device safety standards provides healthcare professionals with an exceptionally high degree of confidence in both safety and day-to-day clinical performance.

This comprehensive testing profile directly supports the device's two-year expected lifetime and the straightforward cleaning protocol described in the following section.

INTEGRATING THERAPEUTIC CANNABIS VAPORISATION DEVICES INTO MEDICAL PRACTICE

The process of integrating the use of a Therapeutic Cannabis Vaporisation Devices within your patient treatment protocol requires engagement with the patient. As such, the following process has been developed to support healthcare professions discuss the use of cannabis vaporisation with their patients.

Discussing Vaporisation with Patients

One

Introduce vaporisation as a safer alternative to smoking cannabis

a. Explain how vaporisation heats cannabis without combustion, reducing exposure to harmful byproducts.

b. Highlight the potential benefits, such as improved respiratory health and more precise dosing.

Two

Address common patient concerns and misconceptions

a. Clarify that vaporisation is not the same as e-cigarettes or "vaping" nicotine products.

b. Explain that medical-grade vaporisers are designed specifically for cannabis use.

c. Discuss the initial cost of vaporisers as an investment in long-term health and potentially reduced cannabis consumption.

Three

Use clear, accessible language to explain the process

a. Provide a simple overview of how Therapeutic Cannabis Vaporisation Devices work.

b. Use visual aids or diagrams if available to enhance understanding.

Incorporating Therapeutic Cannabis Vaporisation Devices into Treatment Plans

One

Assess patient suitability for vaporisation

a. Consider factors such as respiratory health, dexterity, and cognitive ability to operate the device.

b. Evaluate the patient's treatment goals and symptom management needs.

Two

Develop personalised dosing strategies

a. Start with low doses and gradually titrate up based on patient response.

b. Recommend specific temperature settings based on desired cannabinoid and terpene profiles.

c. Advise on frequency of use, considering the faster onset and shorter duration of effects compared to other methods.

Three

Guide patients in selecting appropriate devices

a. Discuss features such as temperature control, portability, and ease of use.

b. Consider recommending specific models that meet relevant standards.

Four

Integrate vaporisation with other treatment modalities

a. Explain how vaporised cannabis can complement or potentially replace other medications.

b. Discuss potential interactions with other treatments and how to monitor for effects.

By following these guidelines, healthcare professionals can effectively integrate Therapeutic Cannabis Vaporisation Devices into their medical practice, ensuring safe and effective use of medical cannabis while prioritising patient education and individualised care.

Ongoing Patient Education and Monitoring

One

Provide comprehensive education on proper use and maintenance

a. Demonstrate correct loading, operation, and cleaning of the Therapeutic Cannabis Vaporisation Devices.

b. Offer written instructions or reputable online resources for reference.

Two

Monitor for adverse effects and treatment outcomes

a. Teach patients to recognise signs of overconsumption or adverse reactions.

Three

Encourage open communication

a. Create a non-judgmental environment where patients feel comfortable discussing their experiences.

Four

Adjust treatment as needed

a. Be prepared to modify dosing, frequency, or strain selection based on patient response.

b. Consider alternative delivery methods if vaporisation proves unsuitable for a particular patient.

Five

Stay informed about new developments

a. Keep up to date with the latest research on vaporisation and medical cannabis.

CONCLUSION

Inhalation has emerged as a clinically advantageous delivery method due to its rapid systemic absorption, bypassing of first-pass metabolism, and suitability for self-titration in patients with fluctuating symptom severity.

The therapeutic benefits of inhaled cannabinoids include a rapid onset of symptom relief within minutes, which is valuable in managing breakthrough pain and acute episodes of nausea or spasticity. Inhaled delivery also has a higher bioavailability compared to oral ingestion, allowing for more consistent therapeutic effects using smaller doses.

Therapeutic Cannabis Vaporisation Device use offers a promising alternative to smoking for the administration of medical cannabis. By heating cannabis to precise temperatures, these devices can efficiently deliver cannabinoids while reducing exposure to harmful compounds.

Healthcare professionals can use this information to guide patients in making informed decisions about the use of vaporisation and to develop personalised treatment plans that optimise the benefits of medical cannabis while minimising potential risks.