

Episode 58 – Cannabis and Oral Health April 8, 2022

Cannabis legalization in Canada
Cannabis is the second most commonly used substance in Canada, after alcohol. Canada became the second country globally to legalize and regulate the sale and use of cannabis and cannabis products. [1]

Cannabis was banned from 1923 until medical cannabis became legal in 2001. The distribution, consumption, and sale of recreational cannabis was legalized on October 17, 2018 with the passing of Bill C-45, the *Cannabis Act*. Medical cannabis is regulated by the Government of Canada and is subject to different rules than recreational cannabis [2] [3].

On October 17, 2019, the production and sale of cannabis edibles, extracts, and topicals became legal under the *Cannabis Act.* [3]

Provinces and territories are responsible for developing their own regulations on sales and distribution for cannabis, and can add additional restrictions to the federal legislation (e.g., increasing age of access). Municipalities can pass bylaws to regulate the use of cannabis locally. [3] [4]

In Ontario, an individual must be ≥19 years to buy, use, possess, and grow recreational cannabis (same minimum age for the sale of tobacco and alcohol). Cannabis is legally sold in private licensed in-person stores or via the government-operated online store. Public possession limit is 30 grams (~1 ounce) of dried cannabis or equivalent. [5] [6]

One gram of dried cannabis is equivalent to:
- 5 grams of fresh cannabis
- 15 grams of edible product
- 70 grams of liquid product
- 0.25 grams of concentrates (solid or liquid)
- 1 cannabis plant seed [5]

Cannabis product regulations
Edible cannabis products can have up to:
- 10 mg of tetrahydrocannabinol (THC) per single package
- 30 mg of caffeine, if naturally occurring (e.g., in chocolate, coffee, tea)

Edible cannabis products must not:

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- Contain nicotine, or added alcohol, vitamins, or minerals
- Be appealing to youth
- Make health, dietary, or cosmetic claims (e.g., low fat; suitable for joint pain) [6] [7]

Extracts (concentrates) that are inhaled or ingested, and topicals (cannabis-infused products for skin, hair, nails) can have up to 1000 mg of THC per package. These products must not:

- Be appealing to youth
- Make health, dietary, or cosmetic claims [5]

Cannabis product regulations [7]

Regulation type	**Edible** (Eating or drinking)	**Extract** (Ingesting)	**Extract** (Inhaling)	**Topical** (Applying to skin, hair, nails)
THC limit	10 mg THC per package	10 mg THC per unit (e.g., capsule) or dispensed amount 1000 mg THC per package	1000 mg THC per package	1000 mg THC per package
Product rules	No added vitamins or minerals No nicotine or added alcohol Limits on caffeine (≤30 mg if naturally occurring)	No added vitamins or minerals No nicotine or caffeine No added sugars, sweeteners, or colours	No added vitamins or minerals No nicotine, alcohol, or caffeine No added sugars, sweeteners, or colours	No nicotine or alcohol For use only on skin, hair, and nails Not for use in eyes or on damaged skin
Other	Must not be appealing to youth Must not make health, dietary, or cosmetic claims	Must not be appealing to youth Must not make health, dietary, or cosmetic claims	Must not be appealing to youth Must not make health, dietary, or cosmetic claims	Must not be appealing to youth Must not make health or cosmetic claims

Note: this is not a complete list of regulatory rules. For the complete list refer to: https://laws-lois.justice.gc.ca/eng/regulations/sor-2018-144/index.html

Growing cannabis

Individuals can grow up to 4 cannabis plants per residence (not per person) if:

- ≥19 years
- Only for personal use
- Starting materials were purchased from the Ontario Cannabis Store or an authorized retail store
- Not prohibited by lease agreement or condominium rules [5]

Prevalence of cannabis use

Approximately 2.5% (147 million) of the global population consume cannabis. [8]
In 2020, almost 6.2 million (20%) Canadians aged ≥15 years reported using cannabis in the past 3 months, increasing from 14% prior to legalization. Rates of overall

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consumption were comparable by gender for the first time, with approximately 1 in 5 males and females each reporting cannabis use in the past 3 months. Further, 8% reported using cannabis daily or almost daily. Smoking remained the most common method of use, 64% for males and 52% for females. About 7 in 10 Canadians consumed dried flower or leaf (71%), while 41% consumed edibles. Other types of products consumed included cannabis oil cartridges or vape pens (23%); liquid concentrates (19%); and hashish or kief (16%). [9]

In 2021, about 292,000 Canadians accessed cannabis for medical purposes. Research suggests most individuals who consume cannabis for medical purposes use up to 3 gm per day of dried cannabis, although amounts under 1 gm per day are used with perceived benefits and reduced risk of side effects. Approximately, 40,000 individuals were registered with Health Canada for personal or designated cultivation of cannabis for medical purposes. [10]

Cannabis use has increased in the older adult population[1] over the years, with more utilizing for medical purposes. [11] [12]

A systematic review and meta-analysis by Lim et al. (2021) found the lifetime prevalence of cannabis vaping among adolescents in US and Canada doubled from 2013 to 2020 (6.1% to 13.6%), past 12-month use doubled from 2017 to 2020 (7.2% to 13.2%), and the 30-day prevalence of cannabis vaping increased 7-fold from 2013 to 2020 (1.6% to 8.4%). Findings of this study suggest the prevalence of cannabis vaping has increased among adolescents in the US and Canada, with preference for cannabis products shifting from dried herb to cannabis oil. [13]

Unintentional pediatric cannabis exposures

A study by Myran et al. (2022) showed Ontario saw 9 times more emergency department visits per month for cannabis poisonings in young children under the age of 10 after Canada legalized recreational cannabis. The legalization of edible cannabis products (e.g., gummies, chocolates) appeared to be a key factor. The average age of the children was 4 years, with 39% requiring hospitalization, and 4% requiring intensive care unit (ICU) admission. [14]

Research by Cohen et al. (2021) found significantly higher rates of ICU admission and more severe presentations to SickKids emergency department for unintentional cannabis poisonings following cannabis legalization. Results showed a 4-fold increase in unintentional poisonings in children <12 years and a 3-fold increase in ICU admission for severe cannabis poisoning in the first 2 years following cannabis legalization.

The study also showed increases in severe intoxications were mainly from exposure of young children to cannabis edibles, which have become increasingly accessible and popular. Edible cannabis products are both highly concentrated and visually attractive to young children, leading to ingestion. Inconsistencies and difficulties in determining the exact formulation and potency of the edible ingested can also make it difficult for

[1] Refer to Episode 55 for additional information on cannabis use in the older adult population.

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healthcare providers to anticipate the severity and length of the effects of the cannabis exposure. [15]

Cannabis

Cannabis is a plant known for its psychoactive properties. It has 2 main subspecies, *Cannabis indica* and *Cannabis sativa*. These plants can be differentiated by their physical characteristics. *C. indica* plants are short plants with broad, dark green leaves and a higher cannabidiol (CBD) content than *C. sativa* plants. *C. Sativa* plants are usually taller with thin, pale green leaves and a higher THC content. Due to its higher THC content, *C. sativa* is the preferred choice by many users. [16]

A variety of cannabis products (e.g., herbal material, oil, concentrated extracts, edibles, tinctures, creams) are produced and used for their physical and cognitive effects. The products are consumed for medical, recreational, and religious purposes. Cannabis is usually smoked, but it is also consumed via other methods (e.g., vaping, eating).

Cannabis plants contain over 100 different chemical compounds known as cannabinoids. Cannabinoids are made and stored in the plant's trichomes, which are tiny, clear hairs that stick out from the flowers and leaves of the plant. Cannabis plants also contain other compounds, including terpenes,[2] alkaloids, amides, flavonoids, fatty acids, and non-cannabinoid phenols. Some of these compounds are responsible for the colour and distinctive smell of cannabis and may produce additional pharmacologic effects or modulate the pharmacologic effects of the cannabinoids. Cannabinoids interact with the endocannabinoid system (ECS) or other non-ECS pathways in the body with the potential to produce the desired and undesired effects. [17] [18]

Cannabinoids

Two main cannabinoids present in cannabis are:

- Delta-9-tetrahydrocannabinol (THC) is the primary psychoactive component responsible for the euphoric effect. THC is a partial agonist of CB1 and CB2 receptors.
- Cannabidiol (CBD) is the second-most common cannabinoid, with anti-inflammatory and analgesic properties but does not produce psychoactive effects. CBD has a weak affinity for CB1 and CB2 receptors and appears to exert its activity by enhancing the positive effects of the body’s endocannabinoids. [1] [19]

Synthetic cannabinoids

Synthetic cannabinoids activate or inhibit the endocannabinoid system (ECS) directly or indirectly in both the central nervous system and periphery (i.e., they have an affinity for CB1 and/or CB2). Synthetic cannabinoids were initially developed to investigate the ECS and were also developed for therapeutic use. Currently, nabilone is the only synthetic cannabinoid product on the market prescribed for medical purposes. However, other CB1 agonists are under investigation.

[2] Terpenes are chemicals made and stored in the trichomes of the cannabis plant and give cannabis its distinctive smell. [23]

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Synthetic cannabinoids are now also used for nonmedical purposes. For example, “Spice,” “K2,” “fake weed,” “synthetic marijuana,” and “legal highs” describe street market products containing synthetic cannabinoids. Synthetic cannabinoids with abuse potential, mimic the effects of THC, primarily on the CB1 receptor. Pouches of spice are usually smoked (e.g., rolled into a joint or used with a pipe) or vapourized. [17]

Endocannabinoid system

Endocannabinoid system (ECS) is a biological system that helps regulate and maintain stability in key functions of the body (e.g., temperature, mood, sleep) to maintain hemostasis. For example, if body temperature is out of the normal range, the ECS regulates it without altering other processes. ECS involves a combination of endocannabinoids, cannabinoid receptors, and enzymes.

Endocannabinoids or endogenous cannabinoids are naturally occurring, lipid-base neurotransmitters produced by the body and are present in various organs and tissues (e.g., brain, muscle). Endocannabinoids are similar to the cannabinoids present in the cannabis plant.

Two of the main endocannabinoids produced by the body are:

- Arachidonoylethanolamide (AEA, also called anandamide)
- 2-archidonoylglycerol (2-AG)

Cannabinoid receptors are located on the surface of cells throughout the body. Endocannabinoids bind to the receptors, which sends a message to the ECS to initiate a response. The primary cannabinoid receptors are:

- CB1, which is mainly present in the central nervous system.
- CB2, which is mainly located in the peripheral nervous system, immune cells, and gastrointestinal tract. [20] [21]

Endocannabinoids may attach to either type of receptor (i.e., CB1, CB2), causing different effects depending on the location of the receptor. For example, endocannabinoids may target CB1 receptors in a spinal nerve to relieve pain, or they may bind to a CB2 receptor in an immune cell, which signals the body is experiencing inflammation.

Enzymes break down the endocannabinoids after they complete the needed response; thus, preventing an overcorrection of a problem. The 2 main enzymes are:

- Fatty acid amide hydrolase, which breaks down AEA
- Monoacylglycerol acid lipase, which breaks down 2-AG

The ECS was only discovered in the 1990s, so not everything is known about this system. However, research continues to reveal more about the ECS and its role in the body’s functions. [21]

Route of administration

Cannabis is most commonly smoked, which rapidly administers the THC. The effects of THC are evident within minutes and typically diminish after 2-3 hours. However, effects

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can last up to 24 hours. THC remains in the adipose tissue for about 30 days and is slowly released back into the body.

Different forms of smoking cannabis include:
- Joints or spliffs (cannabis rolled in cigarette paper, which may be mixed with tobacco)
- Pipes, bongs, hookah pipes, bubblers
- Blunts (partially or fully hollowed out cigar wrappers filled with cannabis)

Cannabis is also inhaled through vapourizing and vaping.[3] It is uncertain if vaping is less harmful as some studies show reduced toxin exposure compared to smoking cannabis. However, other research found there may be some detrimental effects by vaping, such as the production of neurotoxic ammonia.

Cannabis is also consumed by dabbing (breathing in very hot vapours from heating cannabis concentrates). Cannabis is also ingested (e.g., capsules, foods, beverages, oil), but the psychoactive effects usually take 1-3 hours due to the longer absorption time via the gastrointestinal tract. Thus, onset time is very unpredictable and duration of the effects is usually prolonged and can last up to 24 hours. [20] [22] [23]

Cannabis can be applied topically (e.g., creams, oils). These products contain CBD and/or THC. [24]

Forms of cannabis [23]

Form	Description	THC potency
Fresh or dried herbal material	Flowers & leaves from the cannabis plant. Often referred to as marijuana.	Up to 30% (Potency has increased from an average of 3% in 1980s to about 15% today, some strains average as high as 30%)[4]
Cannabis oil	Cannabis extract dissolved in oil. Can be used to make other forms (e.g., edibles).	Up to 3%
Chemically concentrated extracts (e.g., hashish oil, shatter, budder, wax)	Highly concentrated cannabis extract dissolved in petroleum-based solvent (e.g., butane). Shatter, budder, & wax most highly concentrated.	Up to 90%
Physically concentrated extracts (e.g., hashish, kief)	Loose trichomes or pressed resin from the cannabis plant.	Up to 60%
Edibles	Foods & drinks containing extracts of cannabis.	Depends on the amount of extract added

[3] Refer to Episode 19 for additional information on vaping.
[4] Cannabis that contains very low amounts of THC in its flowers and leaves (less than 0.3%) is classified as hemp. [23]

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Form	Description	THC potency
Tinctures, sprays	Cannabis extract dissolved in a solvent, often alcohol. Can be used to make other products (e.g., edibles).	Varies
Creams, salves, liniments	Cannabis extract preparation prepared with alcohol, oil, or wax and applied to the skin.	Varies

Medical use of cannabis
Medical use of cannabis dates back over 2000 years and has been described in almost all ancient cultures. [25]

Medical cannabis are products derived from the whole cannabis plant or its extracts containing a variety of active cannabinoids and terpenes. Individuals take these products for therapeutic reasons, after obtaining authorization from their healthcare practitioner.

After receiving a medical document for medical cannabis use, individuals obtain medical cannabis by:
- Registering with a licensed producer;
- Registering with Health Canada to grow a limited amount for their own medical purposes; or
- Designating someone to produce it for them. [19]

Medical cannabis may be used to alleviate symptoms for various conditions (e.g., neuropathic pain, other chronic pain conditions, anxiety, depression, migraine headaches, sleep problems). It can be smoked, vapourized, taken orally, sublingually, topically, or rectally. Individuals using medical cannabis generally use cannabinoids to alleviate symptoms while minimizing intoxication. [19] [26]

Research by Yang et al. (2020) found older adults (78%) used cannabis primarily for medical purposes to treat a variety of common health conditions, including pain, sleep disturbances, anxiety, and depression. Most common administration forms were lotions (35%), tinctures (35%), and smoking (30%). Most indicated family members (94%) knew about their cannabis use and 41% had informed their healthcare provider. The study also found 61% of older adults had initiated use after age 60. [19] [27]

Pharmacologic cannabinoids
Medically prescribed cannabinoids include:

Nabilone (Cesamet®)
- Antiemetic agent for adults ≥18 years
- Indicated for the management of severe nausea and vomiting associated with cancer chemotherapy
- Oral administration. Capsules contain a synthetic cannabinoid (THC)
- Generic versions also available [28] [29]

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Nabiximols (Sativex®)
- Cannabinoid analgesic
- Oromucosal spray containing THC and CBD
- Indicated for use:
    - As adjunctive treatment for symptomatic relief of spasticity in adults ≥18 years with multiple sclerosis who have not responded adequately to other therapies and who show good improvement during an initial trial of therapy. [30]

Dronabinol (Marinol®)
- No longer available for sale in Canada (post-market discontinuation was in February 2012; not for safety reasons). Still sold in the US
- Oral capsule containing THC
- Used as an antiemetic and appetite stimulant
- Indicated for use in adults ≥18 years for treatment of:
    - AIDS-related anorexia associated with weight loss
    - Severe nausea and vomiting associated with cancer chemotherapy [29] [31]

Considerations for oral healthcare appointments

Individuals taking nabilone, nabiximols, or dronabinol may experience orthostatic hypotension so special caution is necessary with positional changes, especially when standing up after lying in a dental chair for extended periods. Dry mouth has also been reported as a side effect.[5]

Epidiolex®
- Approved by US FDA to treat seizures associated with Lennox-Gastaut syndrome, Dravet syndrome, or tuberous sclerosis complex in individuals aged ≥1 year
- Oral oil-based solution containing >98% CBD
- Not approved for use in Canada [29] [32]

Potential therapeutic uses of cannabis

There is some evidence of potential therapeutic uses for cannabis or its component chemicals (e.g., cannabinoids) in:
- Palliative care to alleviate a wide range of symptoms often encountered in palliative care settings (e.g., anorexia, cachexia, severe intractable pain, depression, anxiety).
- Wasting syndrome (cachexia, e.g., from tissue injury by infection or tumour) to increase appetite and caloric intake.
- Anorexia nervosa to increase body mass index.
- Multiple sclerosis, amyotrophic lateral sclerosis, and spinal cord injury to improve symptoms encountered with these conditions, such as spasticity, spasms, pain, sleep, and bladder dysfunction.
- Osteoarthritis, rheumatoid arthritis, and fibromyalgia to relieve symptoms associated with these conditions (e.g., chronic pain, inflammation, anxiety, depression, sleep disturbance). [29]

[5] Refer to drug monographs for a full list of possible side effects, contraindications, and precautions.

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Contraindications
Cannabis should not be used by individuals:

- Under 25 years[6] (unless prescribed for medical purposes)
- Allergic to cannabis, any cannabinoid, or to smoke
- With serious liver, kidney, cardiovascular, or lung disease
- With a personal or family history of serious mental disorders (e.g., schizophrenia, psychosis, bipolar disorder)
- Who are pregnant, planning to get pregnant, or are breast-feeding
- Wishing to start a family since long-term use may decrease sperm count, concentration, and mobility, and increase abnormal sperm morphology
- With a history of alcohol or drug abuse or substance dependence

Due to limited scientific information, there may be other conditions where cannabis should not be used. [33]

Allergic reactions
Similar to other plants and pollens, individuals can have allergic reactions triggered by cannabis. Symptoms can be mild to severe (anaphylaxis). CBD oil can also cause reactions. An individual can develop an allergy or allergic sensitization[7] to cannabis after exposure to the plant by inhaling pollen in the air, or by smoking, touching or eating cannabis.

Besides anaphylaxis, another risk linked to cannabis allergy is cross-reactivity[8] with other allergens. Cross-reactivity occurs when proteins (e.g., pollen) in the cannabis plant resemble proteins in another plant. An allergic reaction may then occur when an individual comes into contact with similar proteins. Cannabis cross-reacting foods that have been reported to cause allergy include tomatoes, peaches, almonds, apples, bananas, chestnuts, eggplant, and grapefruit. This cross-reactivity can potentially cause serious allergic reactions. [34] [35]

Drug interactions
Cannabis can interact with several drugs causing adverse side effects. For example, it may cause a drug to be less effective, or increase the effect of the THC product leading to psychiatric events (e.g., paranoia) or excessive sedation. Examples of drugs cannabis may interact with include:

- Drugs which slow down the central nervous system, causing drowsiness (e.g., opioids, benzodiazepines [e.g., Xanax, Ativan], antipsychotics, antidepressants, sedatives, tranquilizers, antihistamines, cold medications, anticonvulsants, alcohol). Cannabis may potentiate the sedative effects of these drugs leading to increased sleepiness, sedation, lethargy, slowed breathing, fatigue, falls, and accidents.
- Antiretroviral drugs used in the treatment of HIV/AIDS.
- Stomach acid inhibitors (e.g., Prilosec) may increase risk of diarrhea.
- Antibiotics (e.g., clindamycin) and antifungals (e.g., amphotericin B).

[6] Note: this is older than the legal age to buy and use cannabis in Ontario.
[7] Refer to Episode 45 for additional information on hypersensitivity disorders.
[8] Refer to Episode 45 for additional information on cross-reactivity.

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- Cardiovascular medications (e.g., digitoxin, verapamil).
- Levothyroxine.
- Warfarin (very high INR levels and bleeding have been reported with combined use).
- Saint John's Wort, kava, melatonin (e.g., may increase sedative affects). [17] [33] [36] [37] [38]

Overdose
Symptoms of overdose may include:
- Sleepiness, confusion, disorientation
- Clumsiness, loss of coordination
- Dizziness, fainting
- Chest pain
- Fast, slow, or pounding heartbeat
- Panic attacks
- Loss of contact with reality
- Seizures

If overdose is suspected, immediate medical attention should be sought, especially when the individual is experiencing serious conditions (e.g., chest pain, panic attacks, loss of contact with reality, or seizures).

Cannabis should be used with caution in individuals receiving concurrent therapy with other psychoactive drugs because of the potential for greatly enhanced effects on the brain and other parts of the nervous system. An overdose can also occur if an individual is smoking or vapourizing cannabis while consuming orally administered cannabinoids (e.g., prescription cannabinoid medications, oils, teas, baked goods, etc.). [33]

Adverse reactions[9]
A systematic review and meta-analysis by Whiting et al. (2015) evaluating cannabis and cannabinoid clinical trial results found the pooled risk of adverse drug events (ADEs) was 3-fold higher with cannabis and cannabinoid therapies compared to placebo. All products studied included THC alone or combined with CBD. [39]

The main focus for ADE prevention should be on THC and synthetic cannabinoids that are agonists at CB1. CBD, unless used at very high doses to prevent seizures, is unlikely to cause serious ADEs when used alone. In clinical trials for seizure disorders, CBD was associated with some ADEs, such as sedation, lethargy, somnolence, decreased appetite, and sleep disturbances. Research has shown CBD may lower incidence of ADEs caused by THC in recreational or medical cannabis products. However, these effects vary between studies. [17]

[9] Healthcare professionals and consumers are encouraged to report any adverse reactions associated with cannabis, regardless of its use, to Health Canada. Under the *Cannabis Regulations*, licence holders who sell or distribute a cannabis product must report all serious adverse reactions to Health Canada. https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/recalls-adverse-reactions-reporting/report-side-effects-cannabis-products.html

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The most common ADEs of THC include psychiatric and nervous disorders, cognitive disturbances, and cardiac disorders. Cardiovascular effects can occur in healthy individuals and in those with pre-existing heart disease. The euphoric and dissociative effects of THC are the most commonly reported ADEs and are also the most common reasons for stopping treatment. In clinical trials, dizziness, euphoria, disorientation, drowsiness, and confusion were 3 to 5 times higher with THC-containing products compared to placebo.

THC and other CB1 agonists have been associated with exacerbations of mania, depression, and schizophrenia. ADEs from synthetic cannabinoids are much more pronounced and can lead to medical emergencies. [17]

Cannabis and cannabis products may be contaminated by different microorganisms and substances (e.g., heavy metals, pesticides or other toxins, preservatives, additives, prescription medications [e.g., opioids]). Some ingredients may be purposely added to cause a greater psychoactive effect, whereas others are naturally present or introduced during growing, processing, or chemical synthesis. Microbial contamination is a particular threat to individuals who are immunocompromised. [17]

Extracts used for vaping for medical and recreational purposes may also contain toxic materials, including vitamin E, medium-chain triglycerides, or other lipids, which have been linked to lung injuries. [17]

General effects of cannabis use
Cannabis use affects multiple body systems, some more acutely, such as the respiratory, cardiovascular, and central nervous system. Its effects vary considerably between individuals, preparation type, and administration route. [20]

Respiratory effects
Cannabis contains similar carcinogens to tobacco (e.g., phenols, nitrosamines, vinyl chloride, polycyclic aromatic hydrocarbons). Cannabis smoke contains 50% more carcinogenic hydrocarbons than tobacco smoke. The amount of tar inhaled and retained in the lower respiratory tract is higher in cannabis smokers in comparison to tobacco smokers. Cannabis is usually smoked for a longer period of time, inhaled more deeply, and held for longer in the lungs compared to tobacco, increasing tar exposure.

Research shows smoking cannabis causes chronic bronchitis and damages the cell linings of the large airways, possibly explaining why smoking cannabis leads to chronic cough, phlegm production, wheeze, lung infections, and acute bronchitis.

Secondhand cannabis smoke contains many of the same toxins and carcinogens found in directly-inhaled cannabis smoke, in similar amounts, if not more. [20] [22] [40]

Cardiovascular effects
THC has shown to consistently increase heart rate, during the initial period of cannabis use. Research suggests the risk of heart attack is 5 times higher in the hour after smoking cannabis, especially in individuals with established heart disease. In contrast,

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bradycardia may be induced in some regular cannabis users. Blood pressure is typically increased in the supine position, and postural hypotension (e.g., fainting) has been reported. The process of smoking and vaping may increase oxygen demand and decrease supply to the heart and lead to angina. It can also decrease anginal threshold in individuals with chronic stable angina. Epidemiologic studies link cannabis consumption to myocardial infarction, stroke, and heart failure.

If a client has used cannabis prior to dental treatment, the impact of cannabis on the cardiovascular system is important to consider, especially if epinephrine is to be administered. Further, take into consideration the client's ability to give true informed consent based on their level of intoxication. [17] [20] [41]

Psychological effects
Cannabis acts as a mild sedative and mood enhancer. After use, psychomotor and cognitive functions are impaired (e.g., concentration, memory), and users report feeling relaxed, mellow, euphoric, or sleepy. Negative psychological effects have also been reported (e.g., anxiety, paranoia, delusions, hallucinations). [22] [42]

Mental health effects
Cannabis use may increase risk of developing mental illnesses (e.g., schizophrenia or psychosis), especially in those who:
- Begin using cannabis at a young age
- Use cannabis daily or almost every day
- Have a personal or family history of schizophrenia and/or psychosis

Frequent cannabis use has been associated with a heightened risk of suicide, anxiety disorders, and depression.

Evidence suggests combining tobacco with cannabis may increase:
- Strength of some psychoactive effects, and
- Risk of adverse mental health outcomes including addiction

Emerging evidence suggests CBD may help dampen some of the psychoactive effects of THC (e.g., psychotic symptoms, mood disturbances). This may occur when the amount of CBD in the cannabis is the same or higher than the amount of THC. [23] [43]

Signs of intoxication
Signs of potential intoxication may include:
- Euphoria
- Hyperactivity
- Tachycardia
- Paranoia
- Delusions
- Hallucinations
- Blood shot eyes
- Odour of cannabis

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- Orthostatic hypotension
- Impaired concentration and attention
- Decreased reaction time
- Xerostomia [44] [45]

Long-term Use

Long-term effects of cannabis may include:

- Psychological dependence (addiction), which is characterized by impaired control over drug use, compulsive use, continued use despite harm, and craving.
- A decrease in one or more of the effects of cannabis (tolerance).
- Withdrawal-type symptoms when use is abruptly stopped or discontinued (e.g., anger, aggression, irritability, anxiety, nightmares, strange dreams, insomnia, sleep disturbances, craving, headache, restlessness, decreased appetite or weight loss, depression, chills, stomach pain, shakiness, sweating). Symptoms typically subside over 30 days.
- Impaired memory, concentration, intelligence (IQ), and ability to think and make decisions. Effects appear to be worse if cannabis use was initiated early in adolescence, and with chronic long-term use.
- Cannabinoid hyperemesis syndrome (CHS), which leads to repeated and severe bouts of vomiting. Other symptoms may include stomach pain, anxiety, constipation, diarrhea, increased thirst, sweating, and xerostomia. CHS is a rare condition and only occurs in daily long-term cannabis users. It is prevented and treated by not using cannabis. Symptoms may be lessened by taking hot showers or baths; drinking water to stay hydrated; seeking support through friends, family or a counsellor; and not using cannabis. Medical treatment (e.g., IV fluid replacement, medications to decrease vomiting) may be necessary depending on severity. [17] [22] [33] [46] [47]

Health effects on youth

Youth are particularly vulnerable to the effects of cannabis on brain development and function since the brain is not fully developed until about age 25. THC in cannabis affects the same biological system in the brain that directs brain development. Cannabis use has been associated with increased risk of harms when it is frequent, chronic, and begins early in adolescence. Some of the harms may not be fully reversible. Thus, it is important for parents, teachers, healthcare providers,[10] and other trusted adults to be prepared to talk with youth about cannabis use. [43]

Health effects during pregnancy and breastfeeding

Cannabis use prenatally or postnatally can negatively affect the fetus or newborn child, respectively. Chemicals in cannabis can cross the placenta during pregnancy, and be passed through breast milk, which can lead to detrimental health effects for the child. For example, cannabis use during pregnancy can lead to low birth weight. It has also been associated with developmental effects in children and adolescents, such as:

- Impaired memory function

[10] Refer to *Talking to Youth About Cannabis Vaping: A Guide for Healthcare Professionals* https://substanceuse.ca/talking-youth-about-cannabis-vaping-guide-healthcare-professionals

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- Inability to pay attention
- Decreased reasoning and problem-solving skills
- Hyperactive behaviour
- Increased risk for future substance use [22]

Oral health effects

Cannabis use, especially cannabis smoking, has been associated with poor oral health. Cannabis is usually smoked longer and has a higher combustion temperature compared to tobacco, which can impact oral health. However, identifying the oral effects of cannabis alone is complicated by the concurrent use of cannabis with tobacco, alcohol, and other drugs; poor oral selfcare; and infrequent oral healthcare visits associated with cannabis use. [20] [44]

Cannabis use is also associated with:

- Xerostomia, which can contribute to several oral health conditions (e.g., caries, periodontal disease).
- Increased cariogenic food consumption as THC is an appetite stimulant.
- Increased caries compared to nonusers, especially in cleansable smooth surfaces.
- Higher DMFT (decayed, missing, and filled teeth) scores.
- Periodontal disease (e.g., due to xerostomic effect, poor home care, heat from cannabis combustion). Periodontal disease appears to follow a dose-dependent relation.
- Alveolar bone loss.
- Erythematous gingivitis.
- Gingival hyperplasia (enlargement).
- Leukoedema, which is the bilateral, diffuse, translucent greyish thickening, particularly of the buccal mucosa. However, it is not clear whether associated irritants, such as orally inhaled smoke, rather than cannabis itself, may be contributing causes.
- Leukoplakia, erythroplakia, keratosis, stomatitis.
- Candidiasis possibly caused by the immunosuppressive effect of THC via CB2 receptors located on immune cells may potentially allow opportunistic infections, such as candida to proliferate. The combination of inadequate denture hygiene, poor nutritional intake, and cannabis use can increase growth of candida. Certain types of candida can use constituents of cannabis such as hydrocarbons to produce energy, which can be used for reproduction.
- Nicotinic-like tooth staining.
- Uvulitis. [20] [48]

Cannabis and oral cancer

It is known the combined use of alcohol and tobacco significantly increases the risk of developing oral cancer. Similar to tobacco, cannabis contains carcinogens and long-term smoking of cannabis is associated with similar pathologies as tobacco use. Cannabis may be considered a potential risk factor for oral cancer. However, its role is unclear since several studies have shown an association, while other studies have not.

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Also, individuals who smoke cannabis may also smoke tobacco making it hard to determine the risk of oral cancer from cannabis smoking alone. [20] [48]

Cannabis and HPV

Research has shown daily cannabis use is associated with HPV[11] oral infection and with development of HPV-positive head and neck squamous cell carcinoma (HNSCC). Increased cannabis use, together with high rates of early exposure to oral sex and lagging HPV vaccination rates, may potentially contribute to the increase in HPV-positive HNSCC. [49]

Research by Liu et al. (2020) explained how the presence of THC in the bloodstream activated the p38 mitogen-activated protein kinase (MAPK) pathway, which controls apoptosis (programmed cell death). When activated, p38 MAPK prevented apoptosis from occurring, allowing cancer cells to grow uncontrollably. The study demonstrated THC promotes the progression of HPV-positive HNSCC via p38 MAPK activation using *in vitro* and animal models, and patient cohorts. These findings are consistent with epidemiologic data that daily cannabis use may have a role in the development of HPV-positive HNSCC. [49]

Oral health considerations

Cannabis use impacts oral health. Several strategies can be incorporated to reduce risk, such as:

- Educating clients on the risks and effects of cannabis use.
- Offering smoking or vaping cessation.
- Providing education on xerostomia relief (e.g., drinking water throughout the day, limiting alcohol beverages, using sugarless gums, mints, lozenges to stimulate saliva flow).[12]
- Improving homecare to decrease periodontal disease and caries risk.
- Increasing recare appointments based on risk level.
- Applying in-office topical fluoride (e.g., fluoride varnish) to help combat caries risk.
- Performing regular oral cancer screening to assess for tissue changes and referring as required (i.e., refer if lesion does not heal within 2 weeks).
- Educating clients on how to perform monthly oral cancer self-examinations and reduce risk factors (e.g., smoking cessation, limit alcohol use, etc.).
- Recommending low sugar foods and beverages, especially snacking foods.

Potential applications of medicinal cannabis products in oral health

The distribution of CB receptors in the oral cavity, including salivary glands, suggests the ECS may be a target for the treatment of oral and dental diseases. CBD has known anti-inflammatory, analgesic, antimicrobial, and anxiolytic properties suggesting it may have therapeutic potential against conditions, such as burning mouth syndrome, dental anxiety, caries, periodontal disease, and oral mucositis. Other metabolites of cannabis plants such as terpenes and flavonoids also have anti-inflammatory, analgesic, anxiolytic, and antimicrobial properties and may also have dental and oral applications.

[11] Refer to Episode 7 & 53 for additional information on HPV, oral cancer, and HPV vaccination.
[12] Refer to Episode 55 for more xerostomia management strategies.

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There are currently a variety of cannabinoid-based oral products on the market (e.g., CBD-infused toothpastes and mouthwashes, CBD oral sprays, etc.). However, the scientific literature on the safety, efficacy, toxicity, and quality of these products is limited.

Currently, studies are being conducted on cannabinoid-based pharmaceuticals in general and are increasingly positive and evidence-based. However, more research is required in the field of oral health to discover cannabinoid-based products for the treatment of oral and dental diseases. Research is important to confirm the safety, tolerability, toxicity, efficacy, optimal dosages, and optimal delivery systems for these products for future potential use by oral health clinicians and the public. [50] [51]

Take home messages

- Current trends suggest dental practices are likely to treat a growing number of clients who use cannabis either medicinally and/or recreationally.
- Oral health professionals need to be knowledgeable on cannabis use, the various forms available, its effects on oral and systemic health, and potential drug interactions, including prescription and non-prescription drugs and herbal products.
- Medical history forms should be updated with cannabis use questions, such as amount, frequency, type, administration route, last exposure, purpose (i.e., medical and/or recreational) and if for medical purposes, reason for medical use.
- When verbally updating medical histories ask about cannabis use, similar to inquiring about tobacco and alcohol use, to encourage disclosure and open conversation.
- Remind clients to keep cannabis and cannabis products out of reach and stored in a safe place to prevent accidental ingestion by children and pets.
- It is important to recognize signs of intoxication to determine and ensure safe treatment and informed consent can be provided.

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Why my dental hygienist is asking about vaping, CDHO fact sheet, 2020
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Is cannabis safe to use? Facts for youth aged 13–17 years
Government of Canada. Also available as a PDF
https://www.canada.ca/en/health-canada/services/publications/drugs-health-products/is-cannabis-safe-use-facts-youth.html

Is cannabis safe to use? Facts for young adults aged 18–25 years
Government of Canada. Also available as a PDF
https://www.canada.ca/en/health-canada/services/publications/drugs-health-products/is-cannabis-safe-use-facts-young-adults.html

Talking Pot with Youth: A Cannabis Communication Guide for Youth Allies
Canadian Centre on Substance Use and Addiction
The purpose of the guide is to help those who work with young people to have safe, unbiased, informed, and non-judgemental conversations with youth. Download as PDF.
https://www.ccsa.ca/talking-pot-youth-cannabis-communication-guide-youth-allies

Youth Cannabis Diversion Program
Youth Cannabis Diversion Program is an online E-learning experience to educate youth (age 12-18 years) about the risks associated with cannabis use at their stage of development. It promotes confidence and self-awareness for youth to assess the impacts of cannabis use to make positive choices.
https://youthcannabisdiversionprogram.ca/

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Youth Cannabis Knowledge Hub
YMCA's Youth Cannabis Knowledge Hub provides youth, young adults, parents, and professionals evidence-based information and resources in English and French, including self-guided educational modules about recreational cannabis use.
https://youthcannabisawareness.ymcagta.org/resource-hub

Is cannabis safe during preconception, pregnancy and breastfeeding?
Government of Canada. Also available as a PDF.
https://www.canada.ca/en/health-canada/services/publications/drugs-health-products/is-cannabis-safe-during-preconception-pregnancy-breastfeeding.html

How to report an adverse reaction to cannabis
Healthcare professionals and consumers are encouraged to report any adverse reactions associated with cannabis, regardless of its use, to Health Canada.
https://www.canada.ca/en/health-canada/services/drugs-health-products/medeffect-canada/health-product-infowatch/february-2022.html

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