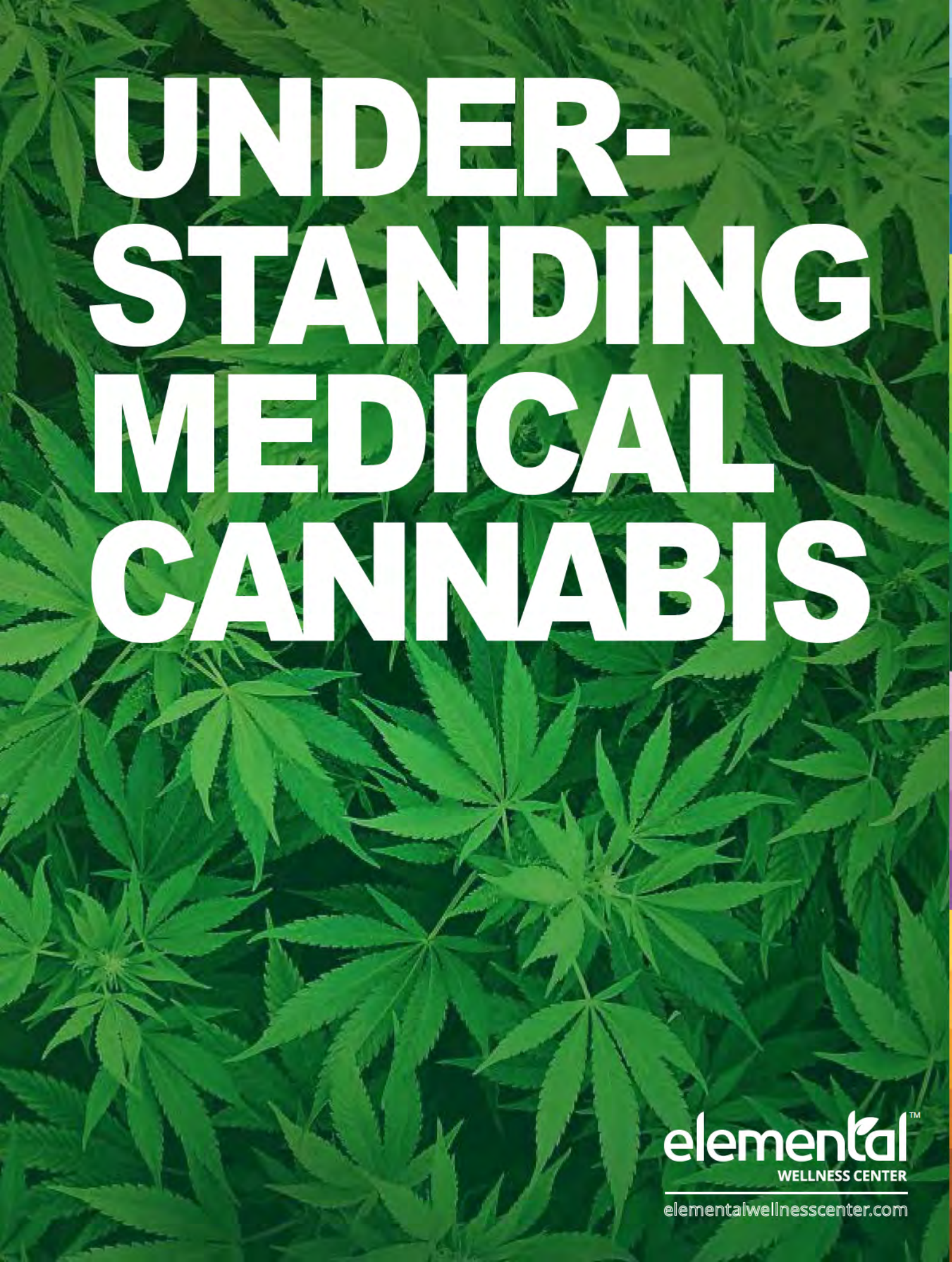
UNDER-STANDING MEDICAL CANNABIS



elemental™
WELLNESS CENTER

elementalwellnesscenter.com

To receive a high resolution version of this booklet please contact us at info@elementalwellnesscenter.com

UNDERSTANDING MEDICAL CANNABIS

elemental™
WELLNESS CENTER

elementalwellnesscenter.com
San Jose, CA | 408-433-3344

Copyright © September 2015 Elemental Wellness™

3rd edition September 2015

TABLE OF CONTENTS

Introduction 1
Medicine Information Sheet 2
Cannabinoids 3
Terpenoids: Smells and Therapeutic Effects 4
Notes on Charts 1, 2 and 3 5
Chart 1: Cannabinoids and their Relationships 6
Chart 2: Cannabinoids and their Therapeutic Effects 7
Chart 3: Cannabinoids, Therapeutic Effects and Synergistic Terpenoids 8
CBGA / CBGVA / CBG / CBGV 9
THCA / THCVA / THC / THCV 10
CBNA / Δ-8 THC / CBN 11
CBDA / CBDVA / CBD / CBDV 12
CBCA / CBCVA / CBC / CBCV 13
CBLA / CBL 14
Processing and Administering Medical Cannabis 15
Dosing Medical Cannabis 16
References ..... 17 & 18

INTRODUCTION

In continuing its efforts to provide the best holistic wellness care to its members, **Elemental Wellness** is pleased to provide this educational material to its members, staff and community physicians. The purpose of this information is to educate us on the latest scientific concepts and understanding of medical cannabis so that we may better benefit from its diverse medicinal properties. Understanding this "pharmaceutical treasure trove" will hopefully make its utilization more efficient and effective (and less daunting for those who are new to this ancient herbal medicine).

Helping us to better understand medical cannabis are the advances in laboratory analysis (now available to collectives) combined with the ongoing research taking place around the world. Much of this research is aimed at delineating the therapeutic effects of the various chemical compounds in cannabis, especially the cannabinoids and terpenoids. Two recent articles illustrating this development are those by Izzo, et al. (2009) and Russo (2011). An excellent video by Lindsey Ward on medical cannabis and its impact on human health can be found online at: http://www.youtube.com/watch?v=8Md2WNqqxTQ.

Another key to better understanding of medical cannabis is awareness that the chemical compounds available in the plant change with how the plant is processed and administered. Potential therapeutic benefits will vary if the cannabis is processed/administered in raw (unheated), heated or aged (degraded) form.

Also knowing that the various compounds in cannabis may modulate each other in synergistic or antagonistic ways is important. For example, the cannabinoid CBD will lessen to some degree the psychotropic effects of the cannabinoid THC, while the terpenoid α-pinene will synergize the bronchodilator effects of THC. This complexity of interaction means that medical cannabis should be seen in the light of an herbal medicine, where to extract a so-called "active ingredient" will not necessarily result in the full range of therapeutic effects, or may produce unwanted side effects that usually do not occur when the whole herb is administered.

Finally, knowing that each strain of cannabis has potentially vastly different proportions of cannabinoids and terpenoids (often expressed in terms of color, smell and taste) means that one needs to be strain specific when discussing cannabis as medicine. This is a difficult step, but one that modern laboratory analysis and scientific research is now making possible. **Elemental Wellness** is working in this direction and hopes that this educational material will assist caregivers and recipients in making a choice as to which strain, in what form, and administered in which way, will be most beneficial to them.

As new research in medical cannabis becomes available, this educational material will be revised to reflect the latest insights. In this way we hope that our understanding and use of medical cannabis will continue to grow in effectiveness in order to meet the needs and maximize the wellness of our members.

MEDICINE INFORMATION SHEET

Cannabis

Pronunciation: kan-uh-bis

This medicine is USED FOR:

Although cannabis is used for a wide variety of ailments, rigorous clinical research is still relatively limited due to federal government regulations. Around the globe, however, controlled trials are taking place and more scientific information on the therapeutic effects of cannabis is being established.

Some of the more accepted medical uses of cannabis are for the following ailments:

Alzheimer's Disease: reduce agitation and nighttime tossing and turning, stimulate weight gain.

Amyotrophic Lateral Sclerosis: slow disease progression; reduce pain, appetite loss, depression, drooling.

Chronic Pain: reduce nerve-related (neuropathic) pain, allow opioid treatment at lower doses.

Diabetes Mellitus: slow disease progression, protect from eye disease, reduce neuropathic (nerve) pain, reduce symptoms of heart-muscle disease (cardiomyopathy).

Dystonia: reduce muscle tension and involuntary, painful muscle contractions.

Fibromyalgia: reduce pain and muscle stiffness, improve sleep quality.

Gastrointestinal Disorders: reduce cramping, abdominal pain, acid reflux, intestinal secretion, disease activity.

Glaucoma: reduce intraocular (eye) pressure.

Gliomas/Cancer: inhibit tumor growth, reduce nausea and vomiting from cancer chemotherapy.

HIV/AIDS: reduce neuropathic pain, anxiety, nausea, appetite and weight loss.

Incontinence: improve bladder control, reduce bladder inflammation/overactivity.

Multiple Sclerosis: reduce pain, spasticity, depression, fatigue, incontinence.

Parkinson's Disease: alleviate L-dopa induced dyskinesias (LID), reduce REM sleep behavior disorder (RBD), rigidity and psychosis symptoms.

Pruritus: reduce itching in conditions such as kidney and liver diseases.

Rheumatoid Arthritis: reduce joint pain and swelling, suppress joint destruction and disease worsening.

Insomnia: induce sleep and/or improve sleep quality.

Tourette's Syndrome: improvement of tics and obsessive-compulsive behavior.

What the active compounds might be:

Cannabichromene (CBC), Cannabidiol (CBD), Cannabidiolic acid (CBDA), Cannabidivarin (CBDV), Cannabigerol (CBG), Cannabinol (CBN), Tetrahydrocannabinol (THC), Tetrahydrocannabinolic acid (THCA), Tetrahydrocannabivarin (THCV), Terpenoids.

What the other compounds might be:

There are more than 80 cannabinoids and more than 200 terpenoids in cannabis.

How this medicine is supplied:

Cannabis comes in various forms: dried plant material ("buds", tea leaves), concentrate (hash, "wax", tincture, oil, capsules), topical salve, edible (including drinks).

Do NOT USE this medicine if:

- You are allergic to any cannabinoid or terpenoid.
- You have a history of serious mental disorder such as schizophrenia or severe depression.
- You are pregnant or planning to get pregnant. In addition to the risk of smoking, the use of cannabis when you are pregnant may be a risk factor for sudden infant death syndrome. Uterine exposure to cannabis may also cause behavioral (attention) problems in the child.
- You are nursing.
- Important: there may be other conditions where this product should not be used but which are unknown due to limited scientific information.

BEFORE USING this medicine:

ALWAYS TALK TO YOUR PHYSICIAN, PARTICULARLY IF:

- You have heart disease.
- You have asthma, chronic obstructive pulmonary disease or other disease of the airways.
- You have a history of alcohol abuse or dependence.
- You have a history of drug abuse or dependence.
- You have a history of a serious mental disorder.

HOW TO USE this medicine:

Use this medicine as directed by your doctor. Dosage and frequency of administration will vary according to route of administration (smoke, vaporization, ingestion, skin), percentage of therapeutic ingredients, and other medicines taken. Ask your doctor or collective consultant to explain what dosage, route and frequency is best for you. Remember that concentrates have higher dosages per weight of medicine than other forms. Make sure you give the medicine sufficient time to take effect. This is especially important with the edible form of cannabis where therapeutic effect may take up to 2 hours before taking effect. Eating too much medicine too fast may easily occur causing unwanted side effects. Use this medicine only for the length of time recommended by your doctor. t is not recommended to use this medicine in combination with tobacco.

Important SAFETY INFORMATION about this medicine:

- If you have not consumed cannabis before, it would be prudent to have someone with you the first time you use it. t is important to start by using small quantities. Stop if you begin to feel confused or agitated.
- After you stop using cannabis, it remains in your system for several weeks to months. Therefore, during this time, tests that screen for cannabis may be positive.
- Cannabis may interact with several drugs. Tell your doctor which prescription drugs, nonprescription drugs and herbal products you are currently taking, particularly:
  - Any drugs that slow down the central nervous system, causing drowsiness. This may include sleeping pills, tranquilizers, some pain medications, some antihistamines or cold medications or seizure medications.
  - Antiviral drugs used in the treatment of HIV/AIDS.
- CANNABIS MAY IMPA R YOUR ABILITY TO DRIVE OR OPERATE HEAVY MACH NERY. This can last up to 24 hours after consuming.

Possible SIDE EFFECTS of this medicine:

- From Initial use:
  - When you first start consuming cannabis, you may experience mood reactions such as euphoria, relaxation, time-distortion, perception of enhanced sensory experiences, loss of inhibitions, anxiety, paranoia, agitation, amnesia, delusions or hallucinations.
  - Fast heartbeat; this may be more of a problem if you have heart disease.
  - Facial flushing or red eyes, dry mouth, headache.
  - Right after consuming cannabis you may get dizzy or feel faint when you get up from a lying or sitting position. Try getting up more slowly. If lying down, sit on the edge of the bed and let your feet dangle for 1 to 2 minutes, then stand up slowly.
- From Long-term use:
  - Wheezing or a chronic cough, if the medicine is smoked.
  - May impair short-term memory attention and concentration. These effects usually disappear after you stop using cannabis.

If OVERDOSE is suspected:

t is possible that the above mentioned side effects occur. Usually these will resolve themselves within a short period of time when medication is stopped. Often fresh air, staying hydrated and eating will help. Contact your doctor immediately if symptoms persist.

Proper STORAGE of this medicine:

Store in a tightly closed container in a cool, safe and secure place. Store away from heat, moisture and light.

GENERAL INFORMATION:

- If you have any questions about this medicine, please talk with your doctor, collective consultant or other health care provider.
- This medicine is to be used only by the patient for whom it is recommended. Do not share it with other people.
- If your symptoms do not improve or if they become worse, check with your doctor.
- Check with your collective consultant about how to dispose of unused medicine.
- This information is a summary only. t does not contain all information about this medicine.

KEEP THIS MEDICINE OUT OF REACH OF CHILDREN AND PETS.

elemental™
WELLNESS CENTER

© Elemental Wellness Issue Date: 9-17-2015

CANNABINOIDS

CBGA	Cannabigerolic Acid
CBGVA	Cannabigerivarinic Acid
CBG	Cannabigerol
CBGV	Cannabigerivarin
THCA	Tetrahydrocannabinolic Acid
THCVA	Tetrahydrocannabivarinic Acid
THC (Δ9)	Δ9-tetrahydrocannabinol
THCV	Tetrahydrocannabivarin
CBNA	Cannabinolic Acid
THC (Δ8)	Δ8-tetrahydrocannabinol
CBN	Cannabinol
CBDA	Cannabidiolic Acid
CBDVA	Cannabidivaric Acid
CBD	Cannabidiol
CBDV	Cannabidivarin
CBCA	Cannabichromic Acid
CBCVA	Cannabichromivaric Acid
CBC	Cannabichromene
CBCV	Cannabichromivarin
CBLA	Cannabicyclol Acid
CBL	Cannabicyclol

TERPENOIDS

Smells and Therapeutic Effects

α-PINENE

Pine needles

- Anti-bacterial
- Anti-fungal
- Anti-inflammatory
- Bronchodilator

β-CARYOPHYLLENE

Black Pepper

Clove

- Anti-bacterial
- Anti-cancer
- Anti-fungal
- Anti-inflammatory
- Anti-septic

BORNEOL

Camphor

- Analgesic
- Anti-insomnia
- Anti-septic
- Bronchodilator

CARYOPHYLLENE OXIDE

Eucalyptus

- Anti-fungal
- Anti-ischemic

CINEOL

Tea Tree

- Anti-bacterial
- Anti-depressant
- Anti-inflammatory
- Anti-ischemic
- Bronchodilator

CITRONELLOL

Rose

- Anti-cancer
- Anti-inflammatory
- Anti-insomnia
- Anti-spasmotic

HUMULENE

Hops

- Anorectic
- Anti-cancer
- Anti-bacterial
- Anti-inflammatory

LIMONENE

Citrus

- Anti-anxiety
- Anti-bacterial
- Anti-cancer
- Anti-depressant
- Anti-fungal

LINALOOL

Lavender

- Anti-anxiety
- Anti-bacterial
- Anti-convulsive
- Anti-depressant
- Anti-insomnia

MYRCENE

Lemongrass

Mango

- Analgesic
- Anti-cancer
- Anti-inflammatory
- Anti-insomnia
- Anti-spasmotic

NEROLIDOL

Wood

Citrus rind

- Anti-fungal
- Anti-insomnia

PHYTOL

Green Tea

- Anti-insomnia

TERPINOLENE

Lilac

Apple

- Anti-bacterial
- Anti-fungal
- Anti-insomnia
- Anti-septic

NOTES ON CHARTS 1, 2 and 3

The following charts reflect most of what is presently known on the potentially therapeutic chemical compounds in cannabis, how they are formed, and how they relate to each other. Only 21 cannabinoids and 13 terpenoids are listed. There is still much to be learned.

The charts should be read horizontally and vertically:

Horizontally: which cannabinoids can be found in which physical state of cannabis (raw, heated, aged). Raw refers to the fresh plant. Aged refers to the effects of UV-light, oxidation, and isomerization; in other words: degradation.

Vertically: how do the cannabinoids relate to each other; where do they come from?

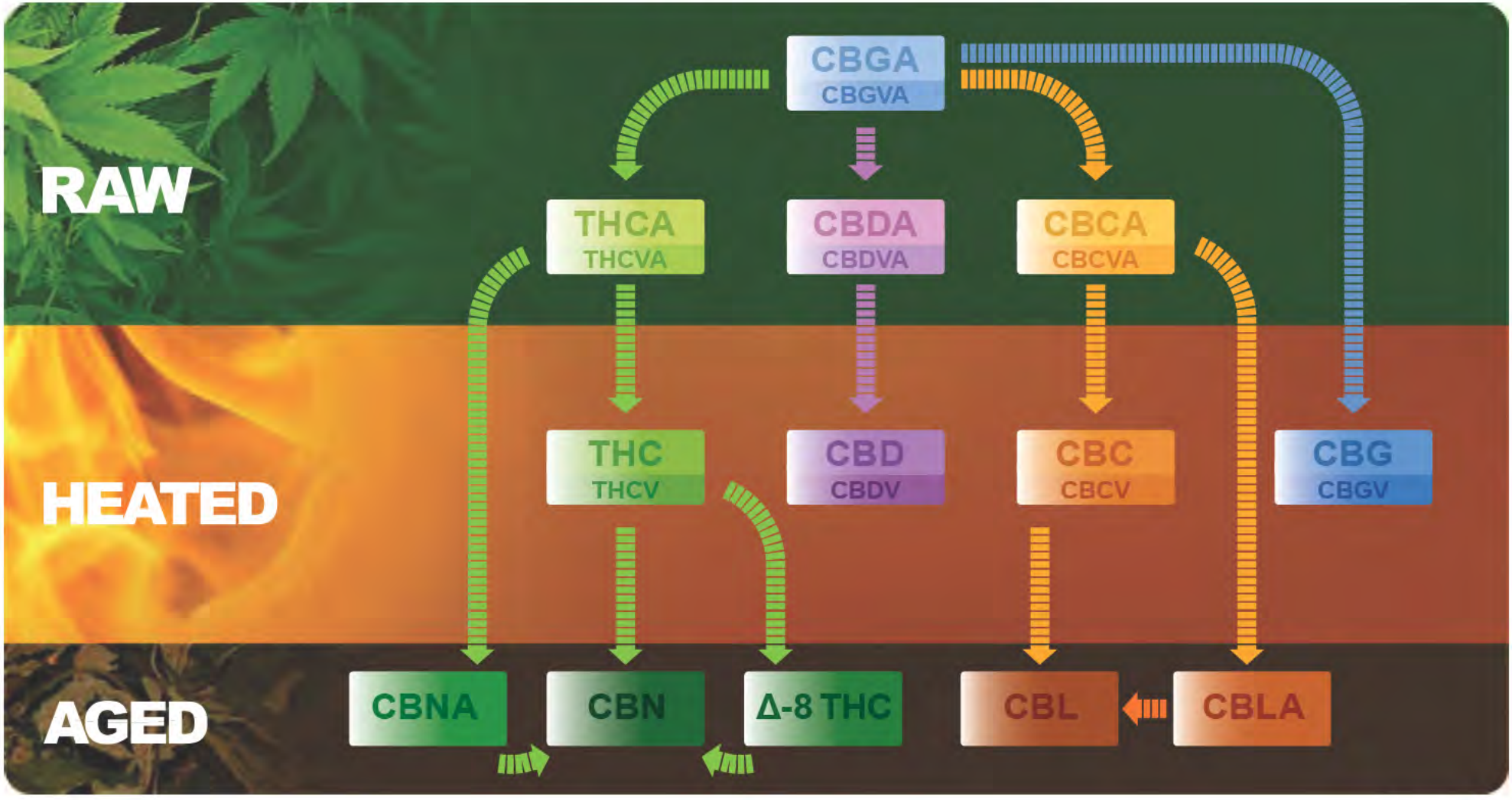
In general, the amount of divarinic cannabinoid (those with “V” in the acronym) is always less than the olivetolic cannabinoid. In the charts, this is reflected in the smaller font size of the acronym.

The charts do not imply that all cannabinoids listed are always detectable in the various strains currently available. Breeding has mainly focused on increasing the amount of THC. Recently CBD is getting a lot of attention, and strains high in CBD are now being bred. Hopefully other strains with significant amounts of other cannabinoids will be available soon.

Since terpenoids are more volatile than cannabinoids, their presence is more closely related to freshness and temperature. The fresher and cooler the cannabis (upper part of the chart), the more the terpenoids peculiar to the strain are preserved. Therefore, as one goes down the chart, terpenoids listed in the different physical states of cannabis may or may not be available in amounts of therapeutic significance.

UNDERSTANDING MEDICAL CANNABIS

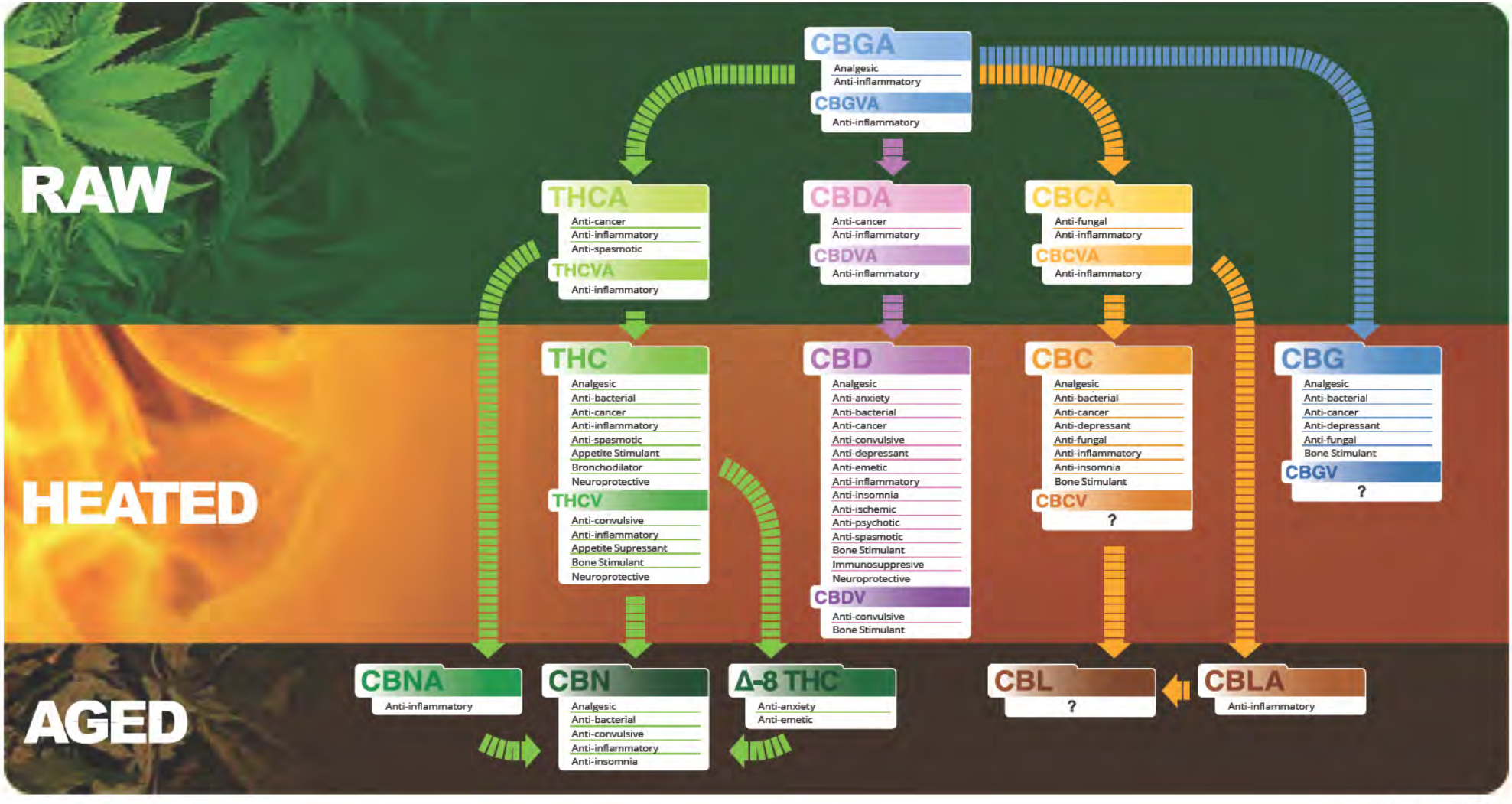
Cannabinoids and Their Relationships



elemental
WELLNESS CENTER

UNDERSTANDING MEDICAL CANNABIS

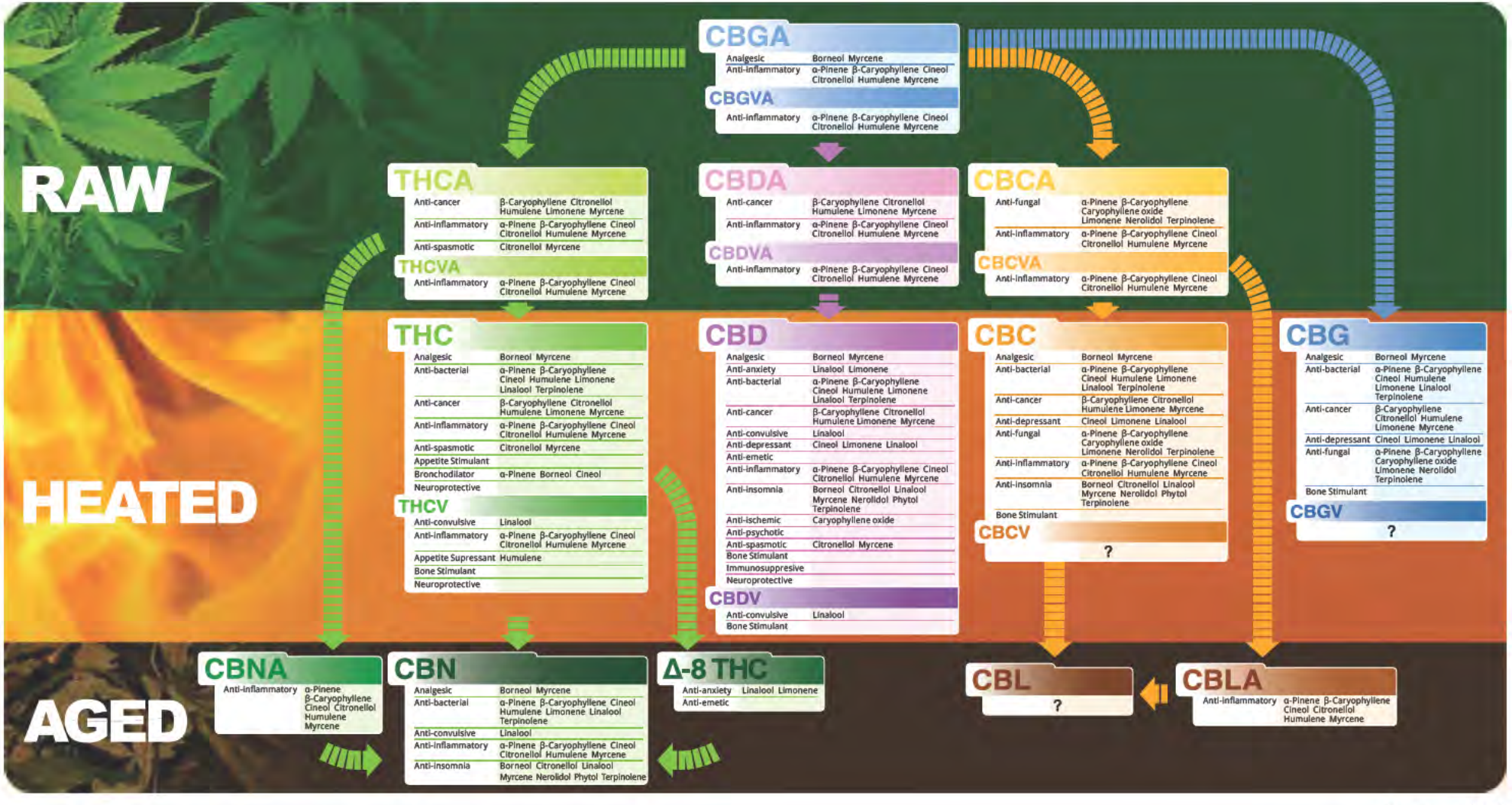
Cannabinoids and Their Therapeutic Effects



elemental
WELLNESS CENTER

UNDERSTANDING MEDICAL CANNABIS

Cannabinoids, Therapeutic Effects and Synergistic Terpenoids



elemental
WELLNESS CENTER

CBGA

Analgesic	Borneol, Myrcene
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

CBGVA

Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

CBG

Analgesic	Borneol, Myrcene
Anti-bacterial	α-Pinene, β-Caryophyllene, Cineol, Humulene, Limonene, Linalool,Terpinolene
Anti-cancer	β-Caryophyllene, Citronellol, Humulene, Limonene, Myrcene
Anti-depressant	Cineol, Limonene, Linalool
Anti-fungal	α-Pinene, β-Caryophyllene, Caryophyllene oxide, Limonene, Nerolidol, Terpinolene
Bone Stimulant	

CBGV

?

THCA

Anti-cancer	β-Caryophyllene, Citronellol, Humulene, Limonene, Myrcene
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene
Anti-spasmotic	Citronellol, Myrcene

THCVA

Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

THC

Analgesic	Borneol, Myrcene
Anti-bacterial	α-Pinene, β-Caryophyllene, Cineol, Humulene, Limonene, Linalool, Terpinolene
Anti-cancer	β-Caryophyllene, Citronellol, Humulene, Limonene, Myrcene
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene
Anti-spasmotic	Citronellol, Myrcene
Appetite Stimulant	
Bronchodilator	α-Pinene, Borneol, Cineol
Neuroprotective	

THCV

Anti-convulsive	Linalool
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene
Appetite Supressant	Humulene
Bone Stimulant	
Neuroprotective	

CBNA

Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

Δ-8 THC

Anti-anxiety	Linalool, Limonene
Anti-emetic	

CBN

Analgesic	Borneol, Myrcene
Anti-bacterial	α-Pinene, β-Caryophyllene, Cineol, Humulene, Limonene, Linalool, Terpinolene
Anti-convulsive	Linalool
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene
Anti-insomnia	Borneol, Citronellol, Linalool, Myrcene, Nerolidol, Phytol, Terpinolene

CBDA

Anti-cancer	β-Caryophyllene, Citronellol, Humulene, Limonene, Myrcene
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

CBDVA

Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

CBD

Analgesic	Borneol, Myrcene
Anti-anxiety	Linalool, Limonene
Anti-bacterial	α-Pinene, β-Caryophyllene, Cineol, Humulene, Limonene, Linalool, Terpinolene
Anti-cancer	β-Caryophyllene, Citronellol, Humulene, Limonene, Myrcene
Anti-convulsive	Linalool
Anti-depressant	Cineol, Limonene, Linalool
Anti-emetic	
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene
Anti-insomnia	Borneol, Citronellol, Linalool, Myrcene, Nerolidol, Phytol, Terpinolene
Anti-ischemic	Caryophyllene oxide
Anti-psychotic	
Anti-spasmotic	Citronellol, Myrcene
Bone Stimulant	
Immunosuppresive	
Neuroprotective	

CBDV

Anti-convulsive	Linalool
Bone Stimulant	

CBCA

Anti-fungal	α-Pinene, β-Caryophyllene, Caryophyllene oxide, Limonene, Nerolidol, Terpinolene
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

CBCVA

Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

CBC

Analgesic	Borneol, Myrcene
Anti-bacterial	α-Pinene, β-Caryophyllene, Cineol, Humulene, Limonene, Linalool, Terpinolene
Anti-cancer	β-Caryophyllene, Citronellol, Humulene, Limonene, Myrcene
Anti-depressant	Cineol, Limonene, Linalool
Anti-fungal	α-Pinene, β-Caryophyllene, Caryophyllene oxide, Limonene, Nerolidol, Terpinolene
Anti-inflammatory	α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene
Anti-insomnia	Borneol, Citronellol, Linalool, Myrcene, Nerolidol, Phytol, Terpinolene
Bone Stimulant	

CBCV

?

CBLA

Anti-inflammatory α-Pinene, β-Caryophyllene, Cineol, Citronellol, Humulene, Myrcene

CBL

?

PROCESSING AND ADMINISTERING MEDICAL CANNABIS

Medical cannabis is processed for administration in various ways: fresh, dried, cold extractions/concentrates and heated extractions/concentrates.

Although rarely done due to the large quantities usually needed, cannabis can be ingested raw, freshly cut from the plant, in order to primarily benefit from the acid cannabinoids and their anti-inflammatory effects. Terpenoids remain intact. Psychoactivity is minimized.

Dried cannabis is most often consumed by inhaling the burned or vaporized buds. Cannabinoid acids are converted to their neutral forms and the amount of terpenoids available will vary according to the method of administration chosen and the instruments used (pipe, joint, vaporizer).

Cold extractions/concentrates result in various products:

1. **Kief**: powder of the trichomes that have fallen off the plant. May be ingested raw but is usually smoked or ingested in cooked edibles.
2. **Slurry**: extraction using olive oil or alcohol. Usually ingested raw.
3. **Hash**: extraction using cold water and ice. May be ingested raw, smoked or used in cooking. Variety names reflect differences in the proportion of plant material to trichomes and how the variety reacts to heat:
   a. Bubble = initially bubbles when exposed to heat.
   b. Full bubble = continues to bubble throughout the heating process.
   c. Melt = melts or turns into gooey oil when exposed to heat.
   d. Full melt = almost pure trichomes, fully melts when exposed to heat leaving little or no residue.
4. **Wax**: extraction using a solvent, most commonly butane, CO_2 or O_2. Removal ("purging") of the solvent may be through cold or heat evaporation (which changes the compounds available). Waxes are usually burned or vaporized, but may be used in cooking and in topical salves. Variety names usually refer to consistency. Examples:
   a. *Honeycomb/Crumble* = dry, crumbly texture, often has small holes like a honeycomb.
   b. *Budder* = more viscous, consistency like butter.
   c. *Shatter/Glass* = consistency similar to a hard candy.
   d. *Sap* = sticky texture similar to honey.
   e. *Taffy* = firmer than sap but not brittle like shatter.

Heated extractions/concentrates convert the cannabinoid acids into their neutral forms and usually removes most of the terpenoids. Various products:

1. **Tea**: extraction into hot water and then drunk.
2. **Tincture**: heated cannabis that is extracted in alcohol. Usually administered directly under the tongue.
3. **Edible**: extraction into a fat (butter, oil) and then used in cooking food.
4. **Oil**: slow heating of cannabis in olive or coconut oil. Usually used in food or topically on skin.
5. **Salve/Cream/Lotion**: low heating of cannabis oil with beeswax. Used topically on skin.
6. **Suppository**: low heating of cannabis oil with cocoa butter. Inserted into rectum.

DOSING MEDICAL CANNABIS

Understanding how to dose medical cannabis is difficult. We are not talking about a single active ingredient, but rather a complex of chemical compounds that modulate each other. Up to now, most attention in dose determination has focused on the psychoactive effect of THC. It is now obvious that the other (non-psychoactive) cannabinoids may be of greater therapeutic importance, depending on the ailment to be treated. Unfortunately, scientific research in dosing of these cannabinoids is still in its infancy.

Since the psychoactive effects of THC remain the main determinant of normal or "altered" daily functioning for most people, it is wise to continue to refer to the THC content of a strain when discussing dose of medicine. Some patients will want and need a high percentage of THC effect, while others will want and need a low percentage of THC effect. Determining the therapeutic dose of medical cannabis remains a very personal determination. The patient has the final say as to how much is enough. In addition, one person may react differently than another person to the same strain. Also keep in mind that THC in amounts in excess of 25 mg may sporadically cause THC toxicity.

In this regard, route of administration will also be an important consideration in determining dose. For example, due to liver metabolism, cooked edibles may be 3-5 times more psychoactive than inhaled cannabis.

In trying to understand dosage, there are a few helpful **rules-of-thumb**:

1. Normal adult dosage of THC for:
   beginners: 2.5-5 mg
   more experienced patients: 10-20 mg
   heavy users: 25 mg or more.
2. To convert percentage to milligrams:
   move decimal one place over to the right. For example,
   21.23% THC = 212.3 mg of THC per gram of cannabis.
   The same conversion can be done for other cannabinoids and terpenoids (e.g., 0.39% β-caryophyllene = 3.9 mg per gram of cannabis).
3. Under ideal conditions, only about 63% of the cannabinoids will get absorbed when smoked. Multiplying the milligrams of THC by 0.63 will result in a more accurate calculation of dose.

REFERENCES

Cannabidiol can improve complex sleep-related behaviours associated with rapid eye movement sleep behaviour disorder in Parkinson's disease patients: a case series
Chagas, MHN, et al
Journal of Clinical Pharmacy and Therapeuties, 2014, 39, 564-566.

Marijuana smoking does not accelerate progression of liver disease in HIV-Hepatitis C coinfection: a longitudinal cohort analysis
Brunet, L, et al
Clinical Infectious Diseases, 2013 July 4.

Cannabidiol reduces cigarette consumption in tobacco smokers: preliminary findings
Morgan, CJ, et al
University College London, Clinical Psychopharmacology Unit, 2013.

Elevated brain cannabinoid CB1 receptor availability in post-traumatic stress disorder: a positron emission tomography study
Neumaster, A, et al
Molecular Psychiatry, 2013 May 14.

Cannabis induces a clinical response in patients with Crohn's Disease: a prospective placebo-controlled study
Naftali, T, et al
Clinical Gastroenterol Hepatology, 2013 May 3.

Talking terpenes
Lee, Martin A
High Times, May 2013.

THC can prevent brain damage-study
Science 2.0, 2013 May 30.

Low-dose vaporized cannabis significantly improves neuropatic pain
Wilsey, B, et al
Journal of pain, 2013, 14(2): 136-148.

High on health: cannabinoids in the food supply
Badiner, Alan
www.wakingtimes.com, 2013 April 25.

Aroma therapy
Gardner, Fred
Medical Marijuana, 2012, Spring: 29-34.

Emerging clinical applications for cannabis and cannabinoids: a review of the recent scientific literature, 5th Edition
Armento, Paul
NORML Foundation, 14 March 2012.

Cannabidivarin is anticonvulsant in mouse and rat
Hill, AJ, et al
British Journal of Pharmacology, 2012, 167(8): 1629-1642.

Naturally occurring anxiolytic substances from aromatic plants of genus citrus
Pimenta,Flávia Cristina Fernandes, et al
Journal of Medicinal Plants Research, 2012, 6(3): 342-347.

Symptom-relieving and neuroprotective effects of the phytocannabinoid Δ9 THCV in animal models of Parkinson's disease
Garcia, C, et al
British Journal of Pharmacology, 2011 Aug; 163(7):1495-1506.

The endocannabinoid system and cancer: therapeutic implication
Guindon, Josée, et al
British Journal of Pharmacology, 2011, 163: 1447-1467.

Taming THC: potential cannabis synergy and phytocannabinoid-terpenoid entourage effects
Russo, Ethan B.
British Journal of Pharmacology, 2011, 163: 1344-1364.

Importance of terpenes
Spaulding, Nathan
?

Cannabidiol attenuates the appetitive effects of Δ9-Tetrahydrocannabinol in humans smoking their chosen cannabis
Morgan, Celia JA, et al
Neuropsychopharmacology, 2010, 35(9):1879-1885.

Opposite effects of delta-9-tetrahydrocannabinol and cannabidiol on human brain function and psychopathology
Bhattacharyya, Sagnik
Neuropsychopharmacology, 2010, 35: 764-774.

Review on clinical studies with cannabis and cannabinoids 2005-2009
Hazekamp, Arno
Cannabinoids, 2010, 5 (special issue): 1-21.

Cannabinoid receptor CB1 mediates baseline and activity-induced survival of new neurons in adult hippocampal neurogenesis
Wolf, Susanne et al
Cell Communication and Signaling, 2010 8:12.

Cannabidiol, a nonpsychotropic component of cannabis, inhibits cue-induced heroin seeking and normalizes discrete mesolimbic neuronal disturbances
Ren, Yanhua, et al
The Journal of Neuroscience, 2009, 29(47): 14764-14769.

Non-psychotropic plant cannabinoids: new therapeutic opportunities from an ancient herb
Izzo, Angelo A, et al
Trends in Pharmacological Sciences, 2009, 30(10).

Preventive and therapeutic anti-inflammatory properties of the sesquiterpene α-humulene in experimental airways allergic inflammation
Rogerio, Alexandre P, et al
British Journal Pharmacology, 2009, 158: 1074-1087.

Cannabis Review
Hazekamp, Arno
Department of Plant Metabolomics Leiden University, 2008-2009.

The diverse CB1 and CB2 receptor pharmacology of three plant cannabinoids: Δ9-tetrahydrocannabinol, cannabidiol and Δ9-tetrahydrocannabivarin
Pertwee, RG
British Journal of Pharmacology, 2008.

Gut modulatory, blood pressure lowering, diuretic and sedative activities of cardamom
Gilani, Anwarul Hassan, et al
Journal of Ethnopharmacology, 2008, 115(3):463-472.

Cannabidiol: from an inactive cannabinoid to a drug with wide spectrum of action
Zuardi, Antonio Waldo
Revista Brasileira de Psiquiatria, 2008 September.

Cannabidiol, extracted from Cannabis Sativa selectively inhibits hypermotility in mice
Capasso, R et al
British Journal of Pharmacology May 12, 2008, 154, 1001-1008.

Cannabinoids in the management of difficult to treat pain
Russo, Ethan B
Therapeutics and Clinical Risk Management, 2008, 4(1): 245-259.

Influence on cannabis use on severity of hepatitis C disease
Ishida, Julie H, et al
Clin Gastroenterol Hepatol, 2008, 6(1): 69-75.

Screening of antibacterial activities of twenty-one oxygenated monoterpenes
Kotan, Recep, et al
Zeitschrift für Naturforschung, 2007, 62c: 507-513.

Sedative effect of monoterpene alcohols in mice: a preliminary screening
de Sousa, Damião Pergentino, et al
Zeitschrift fur Naturforschung, 2007, 62c: 563-566.

D-Limonene: safety and clinical applications
Sun, Jidong
Alternative Medicine Review, 2007, 12(3): 259-264.

A multicenter dose-escalation study of the analgesic and averse effects of an oral cannabis (cannador) for postoperative pain management
Holdcroft, Antita, et al
Anesthesiology, 2006, 104 (5): 1040-1046.

Evaluation of a vaporizing device (Volcano) for the pulmonary administration of tetrahydrocannabinol
Hazekamp, Arno, et al
Journal of Pharmaceutical Sciences, 2006, 95(6): 1308-1317.

Interaction between terpenes and penicillin on bacterial strains resistant to beta-lactam antibiotics
Gallucci, N., et al
Molecular Medicinal Chemistry, 2006, 10: 30-32.

Delta-9 tetrahydrocannabinol protects cardiac cells from hypoxia via CB2 receptor activation and nitric oxide production-Abstract
Shmist, Y.A. et al
Molecular Cell Biochemistry, 2006 February.

Immunomodulatory and therapeutic properties of the Nigella sativa L. seed
Salem, Mohammed Labib
International Immunopharmacology, 2005, 5: 1749-1770.

Antilleishmanial activity of the terpene nerolidol
Amuda, Denise C, et al
Antimicrobial Agents and Chemotherapy, 2005, 49(5): 1679-1687.

Chronic conditions treated with cannabis. Encountered between 1990-2004. "Dr. Tod's List"
Mikuriya, Tod H
2004.

Transdermal delivery of zidovudine: effect of terpenes and their mechanism of action
Narishetty, Sunil Thomas Kumar, et al
Journal of Controlled Release, 2004, 95: 367-379.

The inheritance of chemical phenotype in cannabis sativa L.
Meijer, Etienne PM de
Genetics, 2003, 163: 335-346.

A cDna clone for β-caryophyllene synthase from Artemisia annua
Cai, Yu, et al
Phytochemistry, 2002,: 523-529.

Pharmacological actions and therapeutic uses of cannabis and cannabinoids
Kumar, RN, et al
Anaesthesia, 2001, 56: 1059-106.

Cannabis and cannabis extracts: greater than the sum of their parts?
McPartland, John et al
Hayworth Press, 2001.

Cannabinoids in clinical practice
Williamson, Elizabeth et al
Drugs, 2000 December.

The nonpsychoactive cannabis constituent cannabidiol is an oral anti-arthritic therapeutic in murine collagen-induced arthritis
Malfait, AM, et al
Proceedings of the National Academy of Sciences, 2000, 97(17): 9561-9566.

Prevention and therapy of cancer by dietary monoterpenes
Crowell, Pamela L
Journal of Nutrition, 1999, 129(3): 775S-778S.

Essential oil of cannabis sativa L. Strains
Mediavilla,Vito, et al
Journal of the International Hemp Association, 1997, 4(2): 80-82.

Geraniol, an inhibitor of mevalonate biosynthesis, suppresses the growth of hepatomas and melanomas transplanted to rats and mice
Yu, Suzanne G, et al
The Journal of Nutrition, 1995, 125 (11): 2763-2767.

Chemical ecology of cannabis
Pate, David W
Journal of the International Hemp Association, 1994, 2: 29, 32-37.

Subacute cannabinoid treatment: anticonvulsant activity and withdrawal excitability in mice
Karler, Ralph
British Journal of Pharmacology, 1980, 68: 479-484.