

GREEN DENTISTRY: What You Need to Know About Cannabis + Oral Health



Barry Taylor, DMD, FAGD
June 21st, 2019



STANISLAUS
DENTAL SOCIETY



FINANCIAL DISCLOSURE
I receive nothing of value from anyone



BARRY TAYLOR DMD



OUTLINE

1. Introduction

2. The Plant: *Cannabis*

3. Pharmacology

4. Local Anesthetics + Nitrous Oxide

5. General Health Effects

6. Oral Pathology

7. Periodontal Disease

8. Xerostomia and Dental Caries

9. Dental Implants

10. Patient Management

11. The Future

TALKING WITH PATIENTS ABOUT RISING CANNABIS TRENDS

circa 2016

“During your talk, it is recommended that you caution your patient to avoid using marijuana at least seven days before a scheduled dental appointment, especially one in which anesthesia is required and the risk of infection is high.”



set station



Pick Your NPR Station

There are at least two stations nearby



shots HEALTH NEWS FROM NPR

TREATMENTS



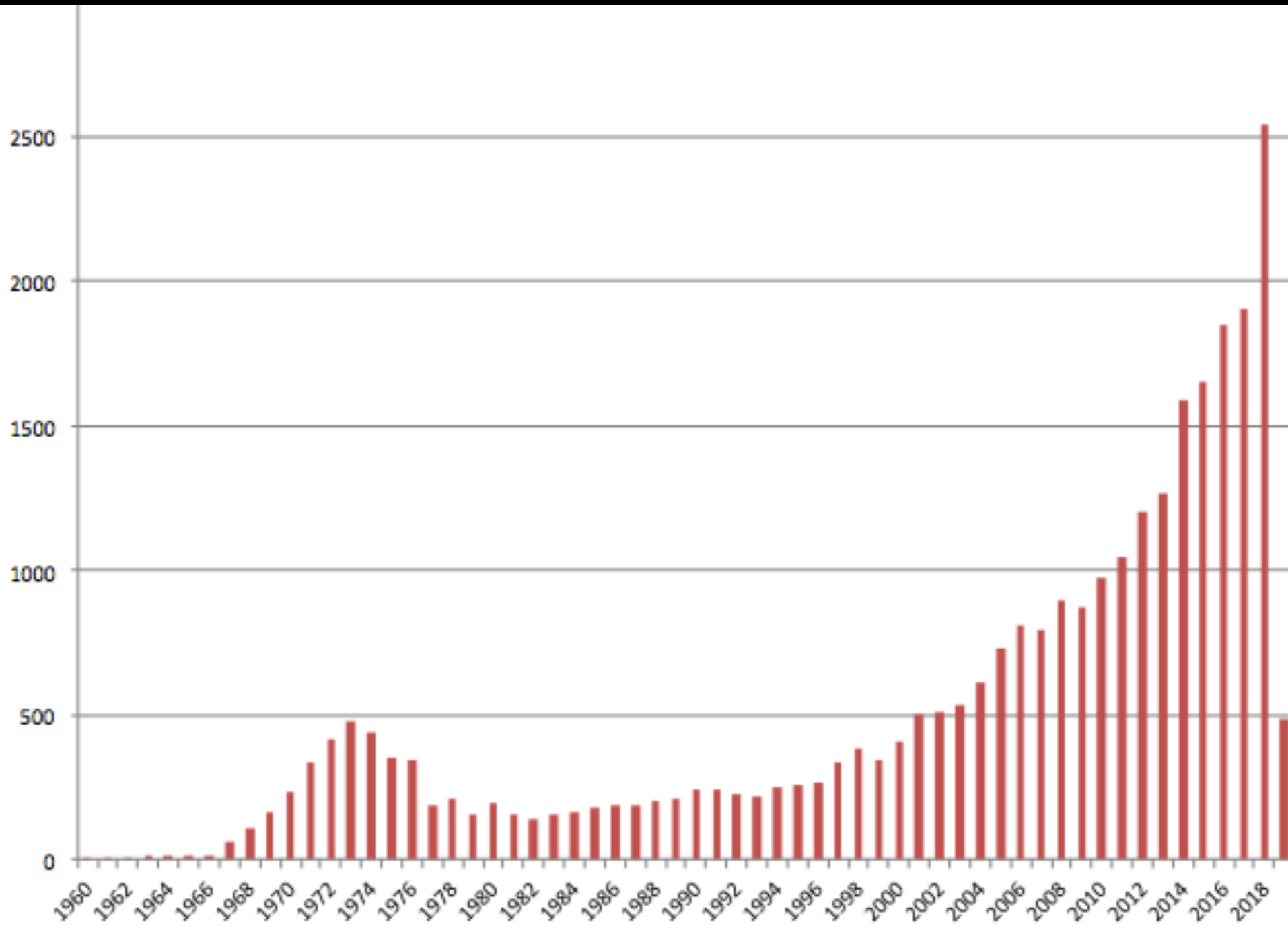
Active Ingredient In Marijuana Reduced Alzheimer's-Like Effects In Mice

November 7, 2018 · 2:03 PM ET

But even if that's true, she said, it doesn't mean the growing number of healthy [older people who smoke pot](#) should celebrate by lighting up. "We did this same experiment in healthy mice," she said, "and they had problems learning."

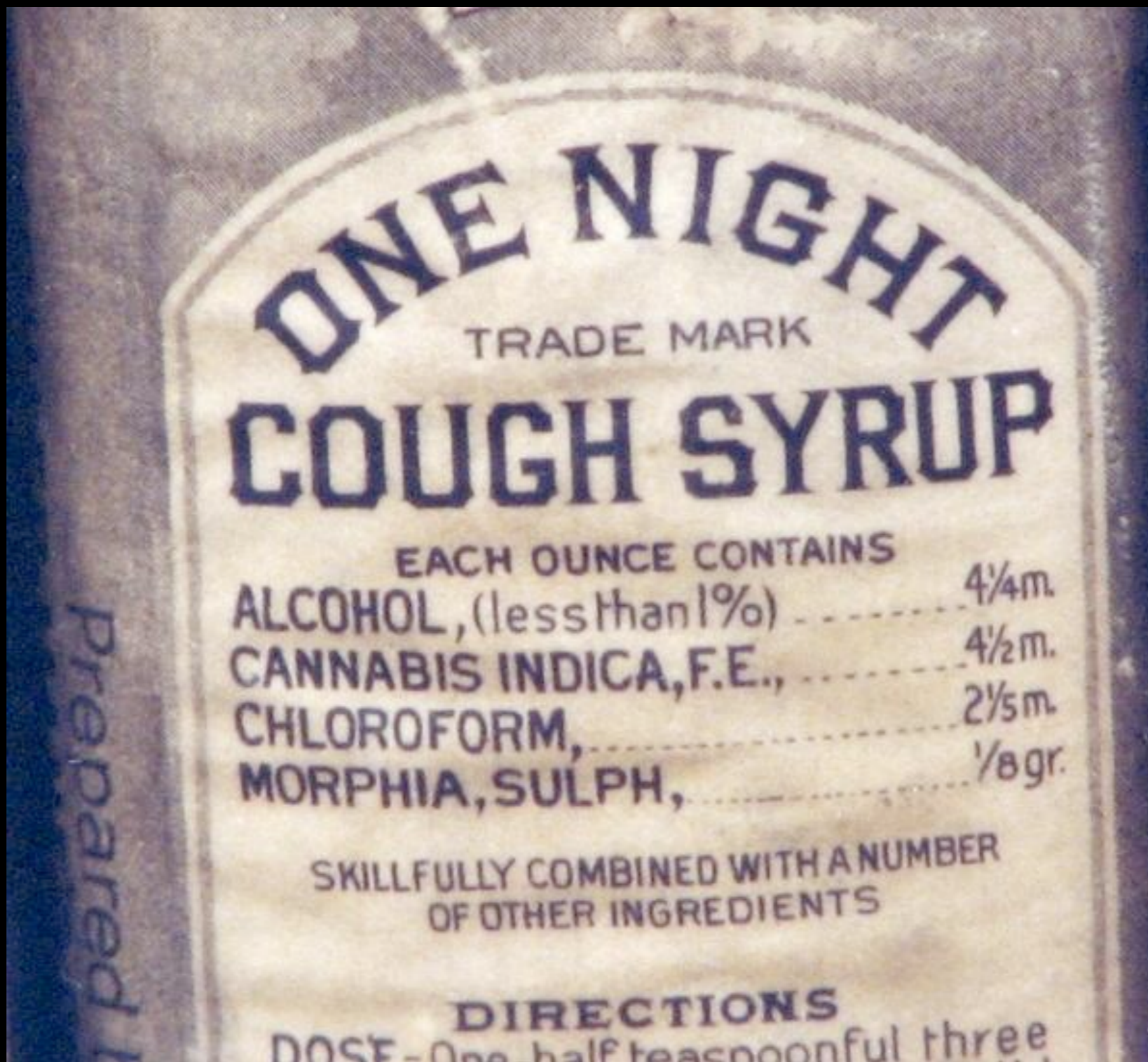
PUBMED AS OF 2019

of Publications



Year

A BRIEF CANNABIS HISTORY



A BRIEF CANNABIS HISTORY

2700 BC: Pen Ts'ao Ching – Chinese Pharmacopoeia – rheumatic pain, constipation, malaria

1000 BC: India – analgesic, anti-convulsant, anti-inflammatory, anti-biotic

1880s: Irish physician Dr. O'Shaughnessy and French Psychiatrist Dr. Moreau bring cannabis West

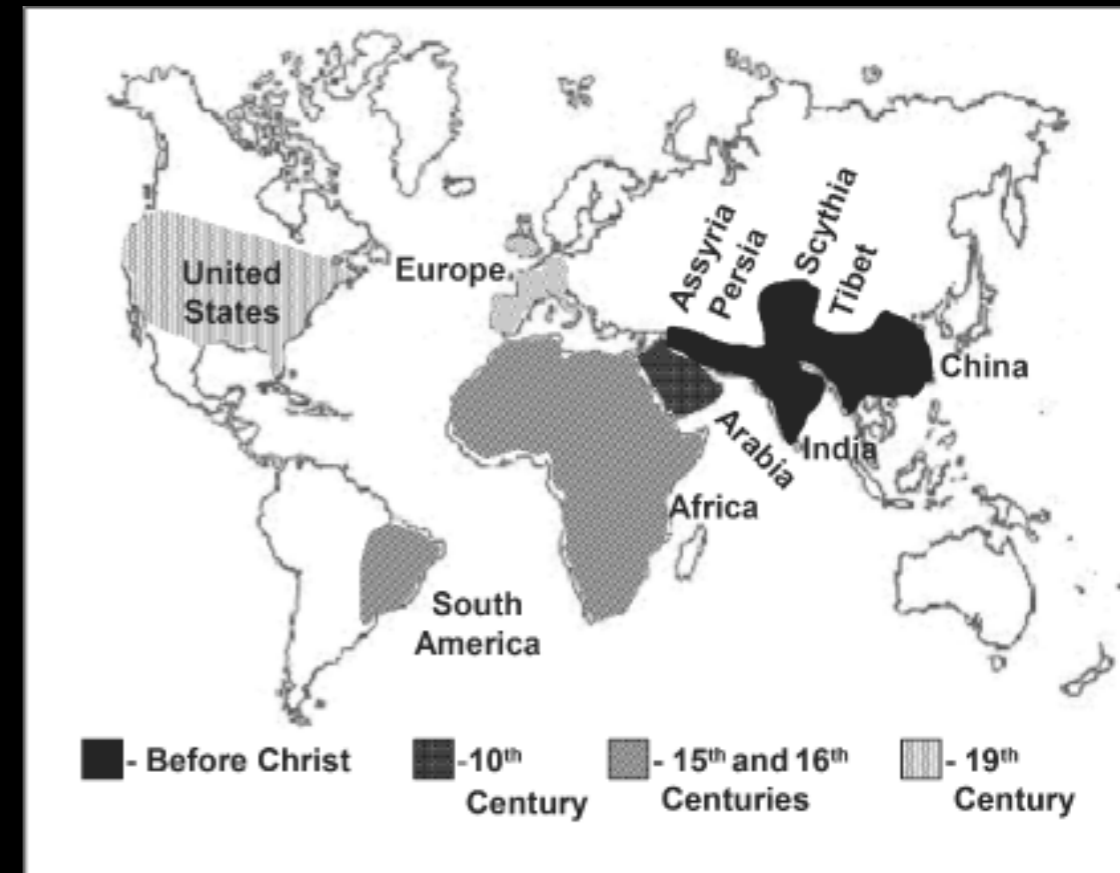


Figure 1 - Age of the beginning of cannabis use as a medicine.

A BRIEF CANNABIS HISTORY

1850: Appeared in United States Pharmacopeia until 1942

1937: 'Marihuana' Tax Act: **Opposed by the AMA**



1970: Federal Controlled Substance Act:

Schedule I controlled substance

No accepted medical use

High potential for abuse

1970-1972: Shafer Commission under President Nixon:

Cannabis should be decriminalized



115 million adults

have never tried
marijuana

78m

have tried, but don't
currently use

20m

use
mj.
yearly

35m

use
mj.
monthly

2017 – Yahoo/Marist study

2015 – Federal study – 33 million within past year

2016 – 37.8 million smoke cigarettes every day

MEDICAL MARIJUANA VERSUS RECREATIONAL MARIJUANA

Recreational marijuana users generally seek a high THC concentration

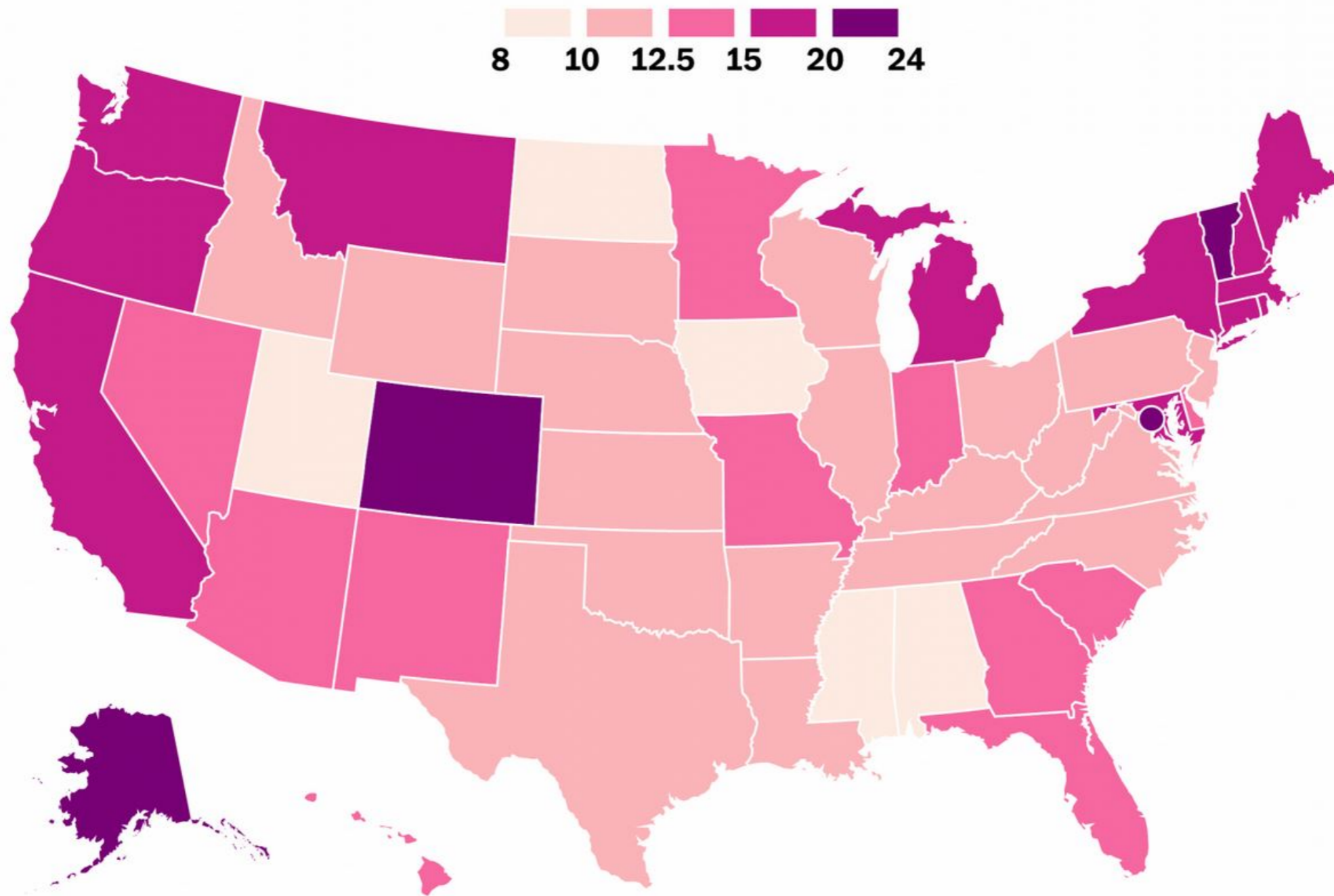
True medicinal marijuana users seek a high CBD concentration

No prescriptions are written, a medical marijuana user has access to purchase marijuana products

NATIONAL DRUG USE 2016

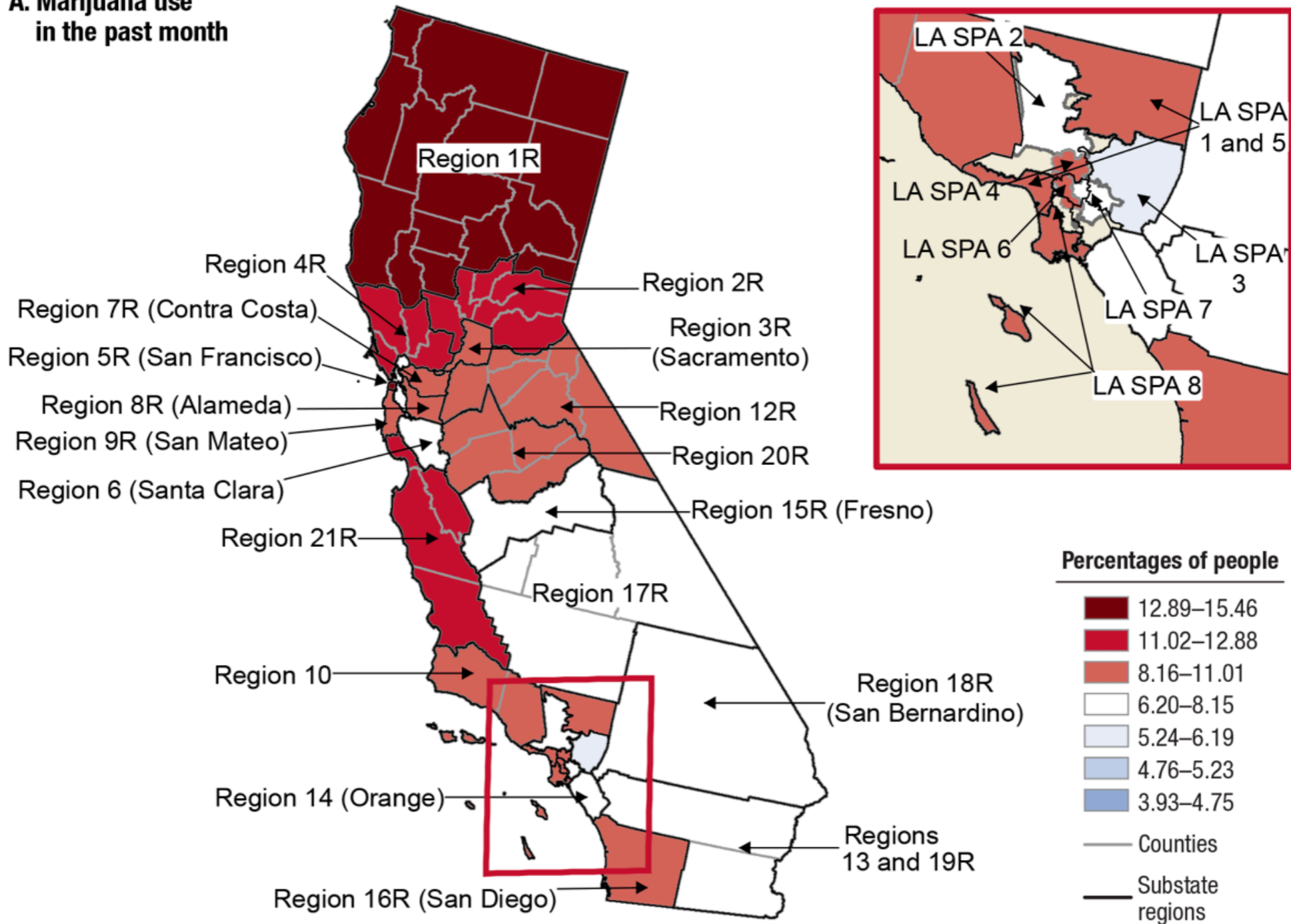
Marijuana nation

% of residents age 12 or older using marijuana in the past year



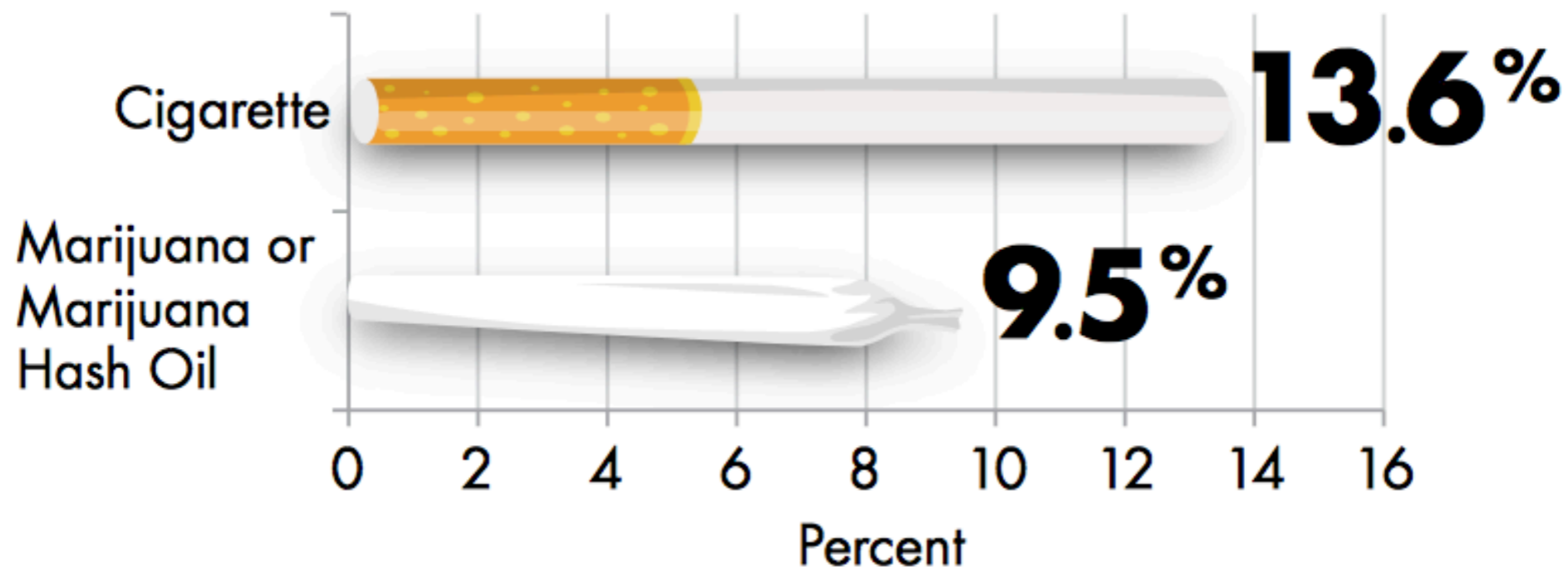
California 2016

A. Marijuana use in the past month

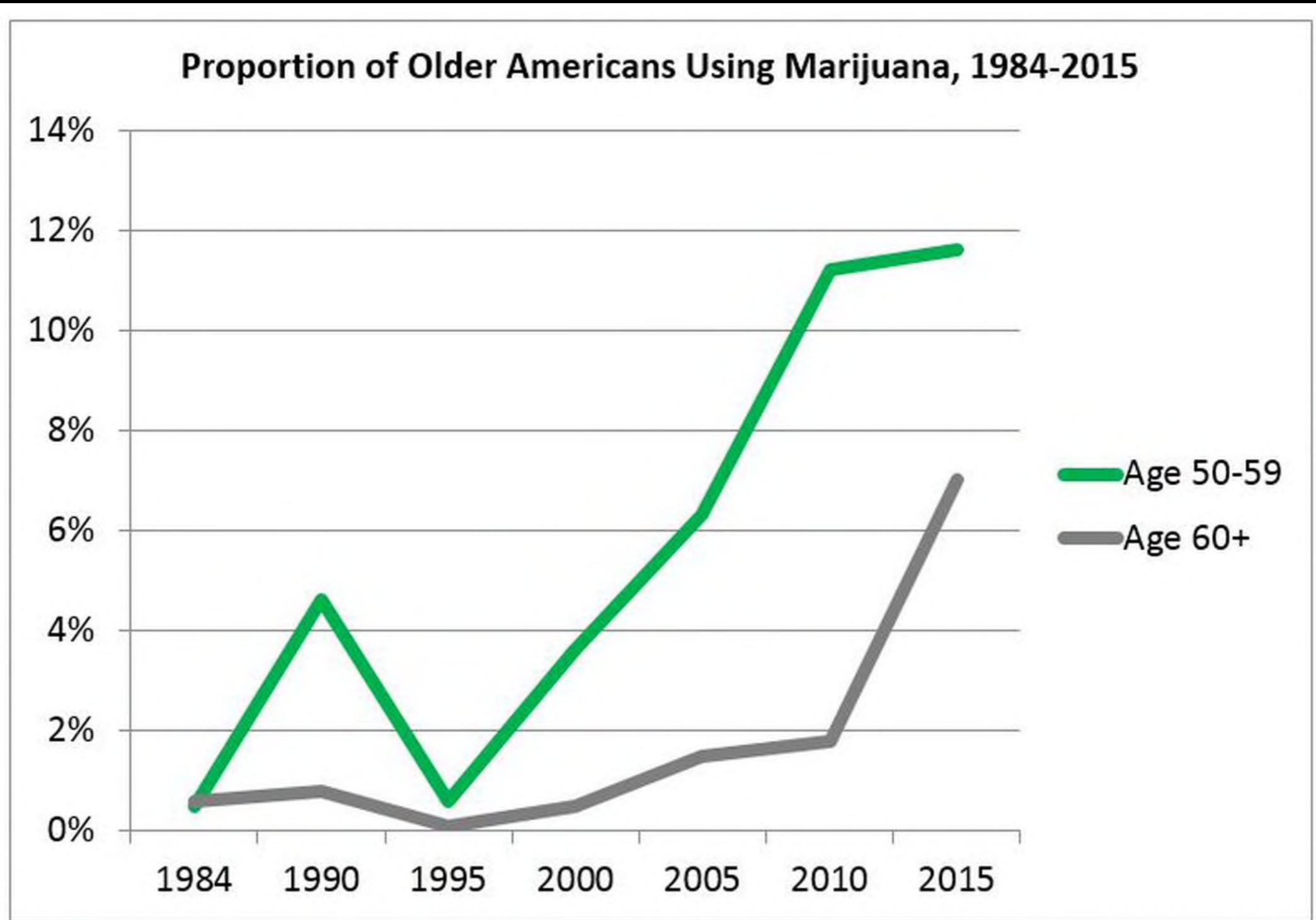


CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

Smoking Prevalence of California Adults at Least One Day in the Past 30 Days



OLDER AMERICANS USING MARIJUANA



Source: March 2018 issue of [Addiction](#).

IS MARIJUANA A GATEWAY DRUG?

Yes

"A large proportion of individuals who use cannabis go on to use other illegal drugs. The increased risk of progression from cannabis use to other illicit drugs use among individuals with mental disorders"

International Journal of Drug Policy

No

"However, the majority of people who use marijuana do not go on to use other, "harder" substances"

National Institute of Drug Abuse

MARIJUANA + OPIOIDS



AFTER LEGALIZATION OF MARIJUANA

NEGATIVE or NULL EFFECT on:

SUICIDE RATES

Anderson et al. 2014

CRIME RATES

Morris et al. 2014

OPIOID TREATMENT ADMISSIONS

PACULA et al. 2014

OPIOIDS + CANNABIS



Opioid Rx's drop 10% and
25% fewer opioid-related
deaths in states with legal
marijuana



Less dependency
No mortality

BRADFORD + BRADFORD 2016

BACHAUBER et al. 2016

OLFSON et al. 2018

OPIOIDS + CANNABIS



After medical marijuana legalization:

23% decrease in opioid dependency

13% decrease in opioid overdoses

SHI et al. Drug and Alcohol Dependence 2017

But...

“Cannabis use appears to INCREASE rather than decrease the risk of developing opioid use disorder”

OLFSON et al.

American Journal of Psychiatry 2018

ADDICTION VS. ABUSE VS. DEPENDENCE

Abuse:

Excessive use
+ misuse

Dependence:

A biologic
process

Addiction:

Loss
of control +
compulsive use

DSM-V: CANNABIS USE DISORDER

1. Used in larger amounts or over longer period of time
2. Unsuccessful efforts to cut down
3. A great deal of time is spent obtaining cannabis
4. Craving
5. Failure to fulfill major role obligations
6. Continued use despite recurrent social issues
7. Activities are given up or reduced
8. Used when physically hazardous
9. Continued use despite persistent physical or psychologic problem
10. Tolerance
11. Withdrawal

DSM-V: CANNABIS USE DISORDER

Assigning a Diagnosis:

Mild: 2-3 symptoms

Moderate: 4-5 symptoms

Severe: 6+ of the 11 listed symptoms

Past-year prevalence of cannabis use and cannabis use disorder, Adults 18+ yo

	2001-2002	2012-2013
Any use	4.1%	9.5%
Meets criteria for CUD	1.5%	2.9%
Of those with past-year use, prevalence of CUD	35.6%	30.6%

Hasin DS, Saha TD, Kerridge BT, et al. Prevalence of marijuana use disorders in the United States between 2001-2002 and 2012-2013. *JAMA Psychiatry*. 2015;72(12):1235-1242. doi:10.1001/jamapsychiatry.2015.1858

Thanks to Dr. Travis Lovejoy



**Centers for Disease
Control and Prevention**
National Center for
Health Statistics

MARIJUANA ADDICTION

About 1 in 10 marijuana users will become
"addicted"

For people who begin using before the age of 18,
that number rises to 1 in 6

DRUG HARM SCORES

Nutt et al. Lancet 2010

OVERALL HARM

Harm to User

Harm to Others

Physical

Psychological

Social

Social

i.e. crime

Injury

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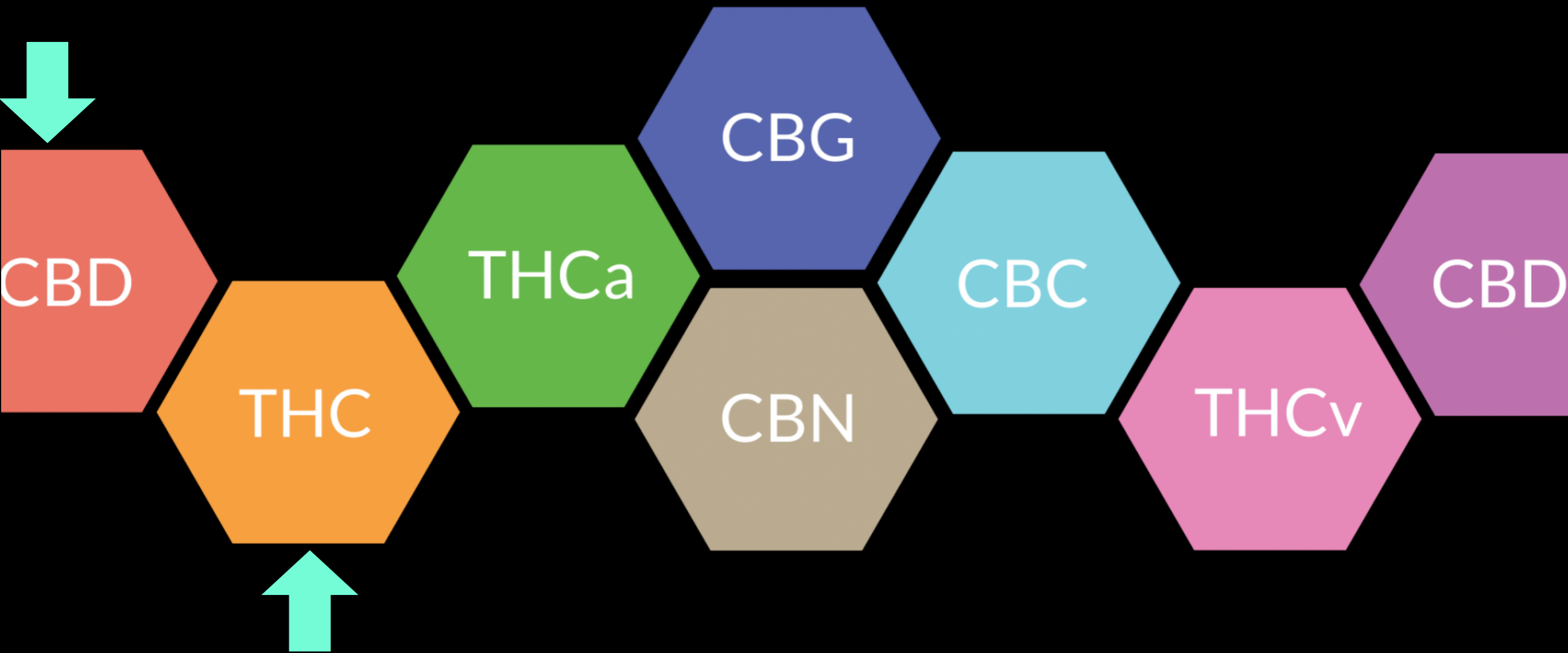
10. Patient Management

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CANNABIS SATIVA



CANNABINOIDS



The cannabis plant has 100+ "cannabinoids"

THC = Psychoactive

CBD = Non-Psychoactive

TRICHOMES PRODUCE

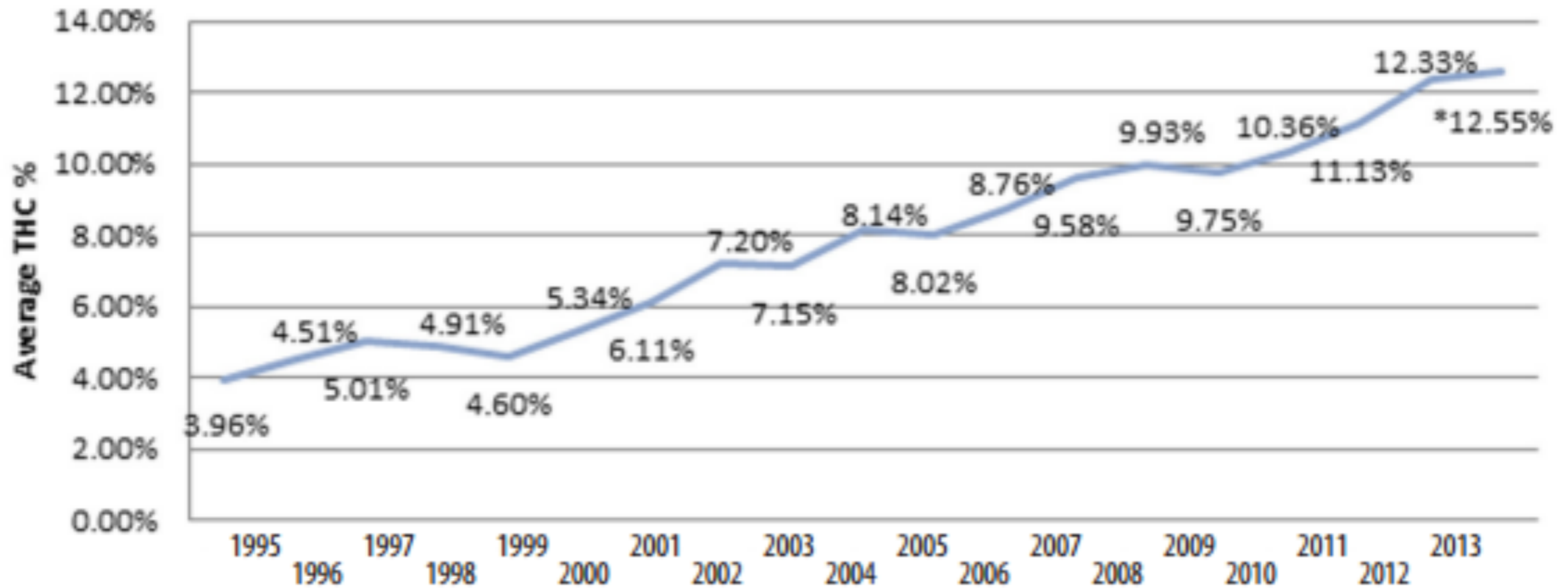
Cannabinoids: THC + CBD + many more

Terpenoids similar to pine + eucalyptus



INCREASING THC POTENCY

**Average THC Percent of DEA Submitted Samples
1995 - 2013**



Source: Potency Monitoring Program

CASCINI et al. Curr Drug Abuse Rev. 2012

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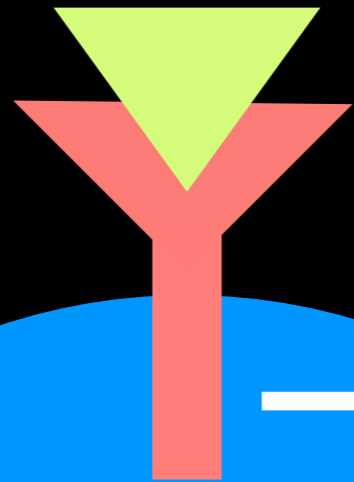
THE ENDOCANNABINOID SYSTEM



CELLULAR BIOLOGY REVIEW

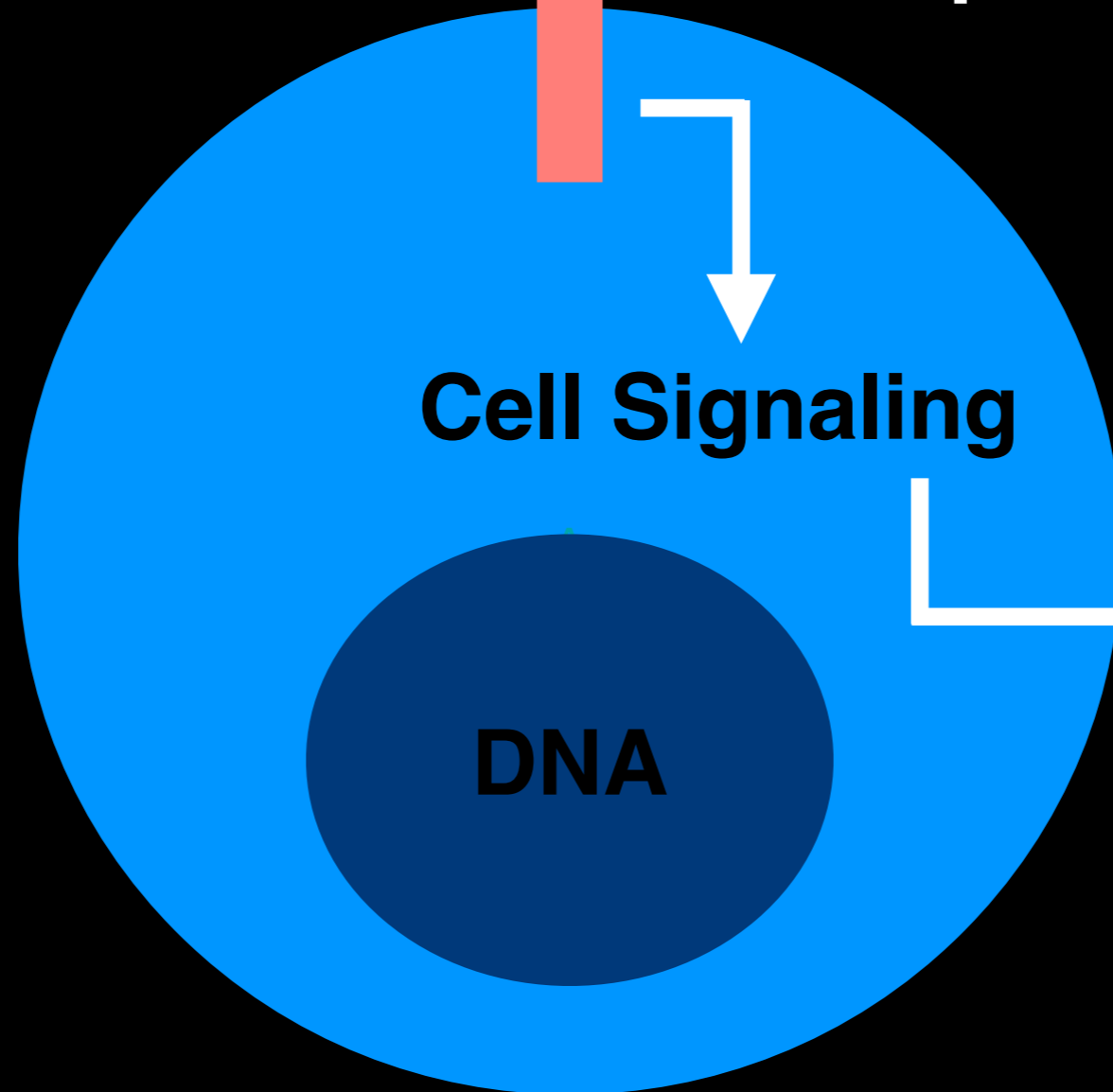
i.e. THC or CBD

Ligand



Receptor

**i.e. CB1
or CB2**



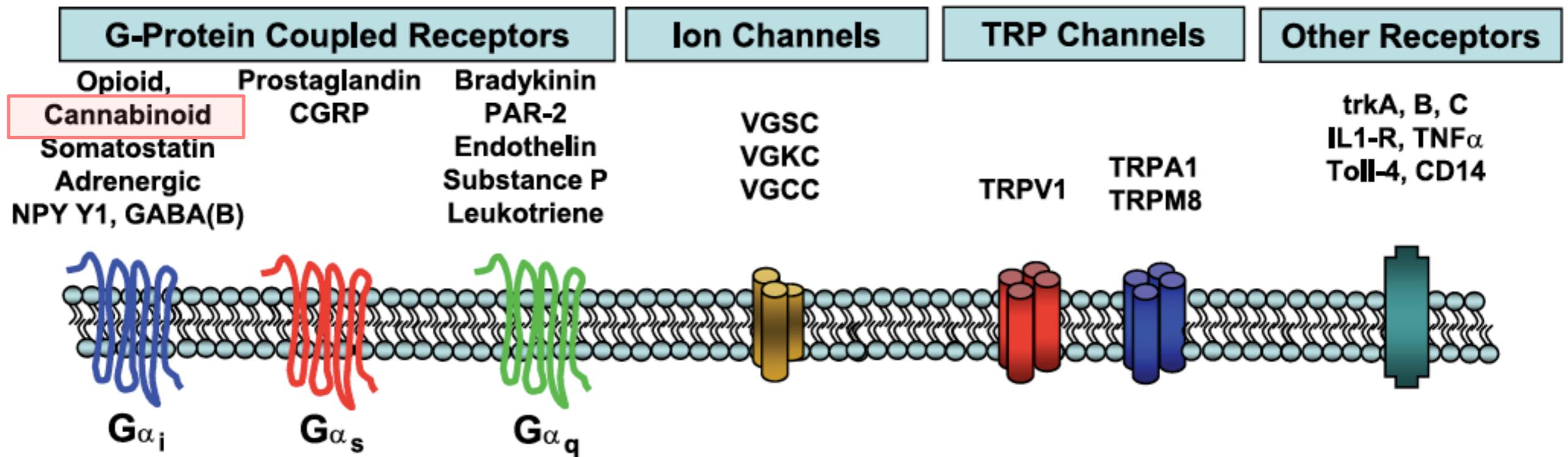
Cell Signaling

**i.e. dopamine
release**

DNA

A Human Cell

CANNABINOID RECEPTORS



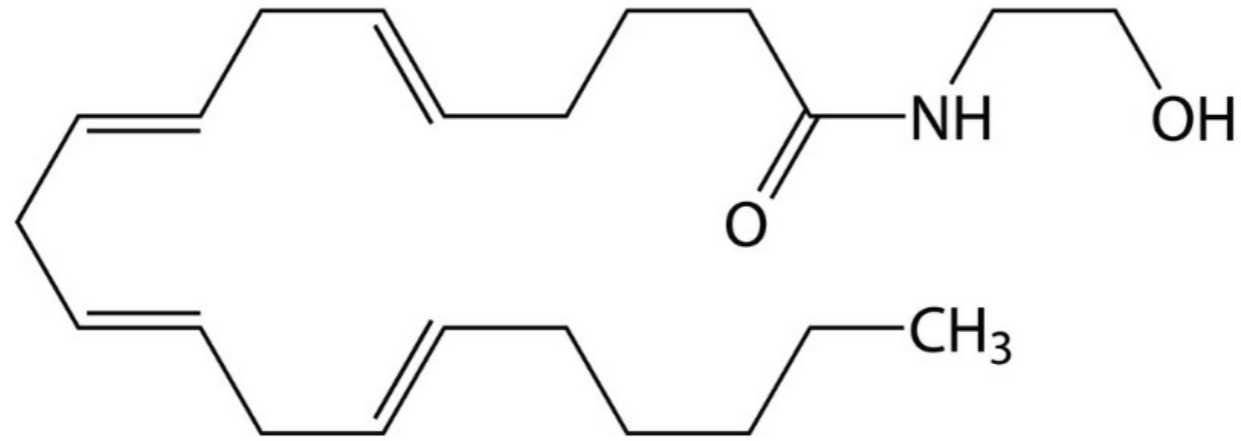
CB-1 and CB-2 are G-protein Coupled Transmembrane Receptors:

1. Detect molecules outside the cell
2. Activate internal signal transduction pathways
3. Illicit various cellular responses

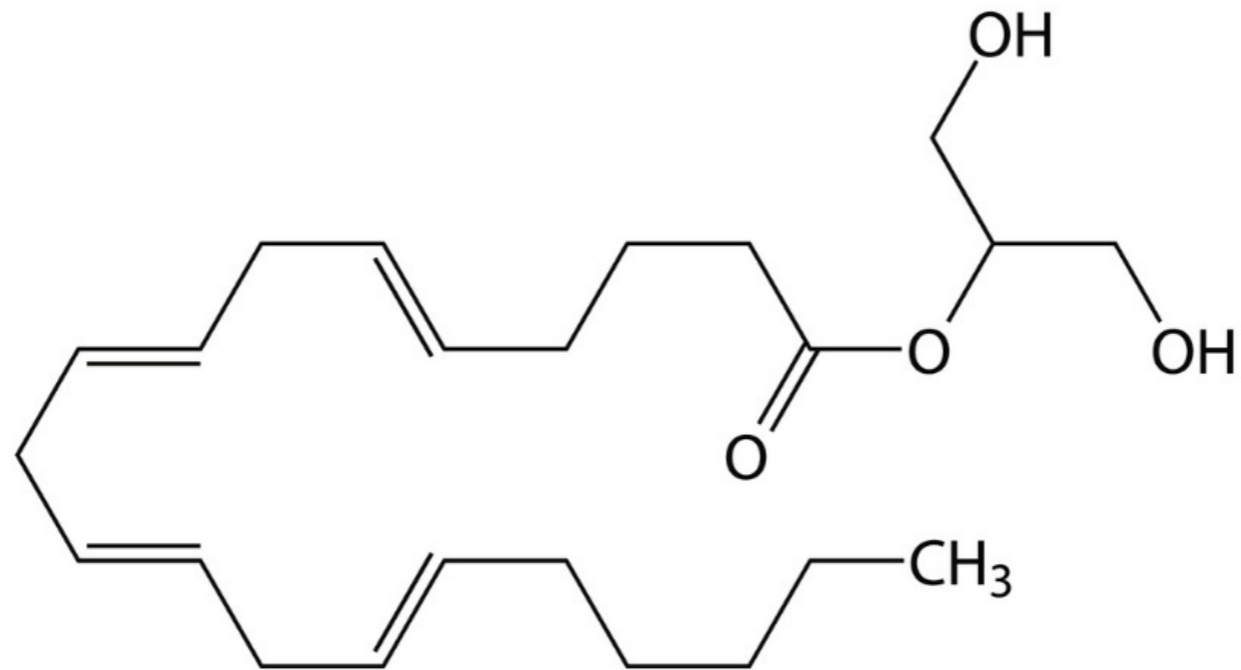
THE ENDOCANNABINOID SYSTEM —RECEPTORS—

- Cannabinoid Receptor 1 (CB1) found predominately in the:
 - Central Nervous System
 - Immune System
 - Cardiovascular System
 - Respiratory System
- Cannabinoid Receptor 2 (CB2) found predominately in the:
 - Immune System
 - Musculoskeletal System

Endocannabinoid System



Anandamide



2-Arachidonoyl glycerol

NEUROLOGIC EFFECTS OF CBD

CBD has low affinity for
CB1 & CB2

CBD enhances the
endocannabinoid system

CBD injections induce
anxiolytic effects in mice

Potential effects of CBD:

Anxiolytic

Antidepressant

Neuroprotective

Anti-nausea

RECEPTOR for CBD

PHARMACOLOGIC OUTCOME

CB1

Attenuation of impaired learning, memory,
and psychosis effects induced by THC

CB2

Anti-Inflammatory

GPR55

Anticancer

5HT1- α

Pain Relief (via modulation of mu and sigma
opioid receptors)
Anti-Anxiety

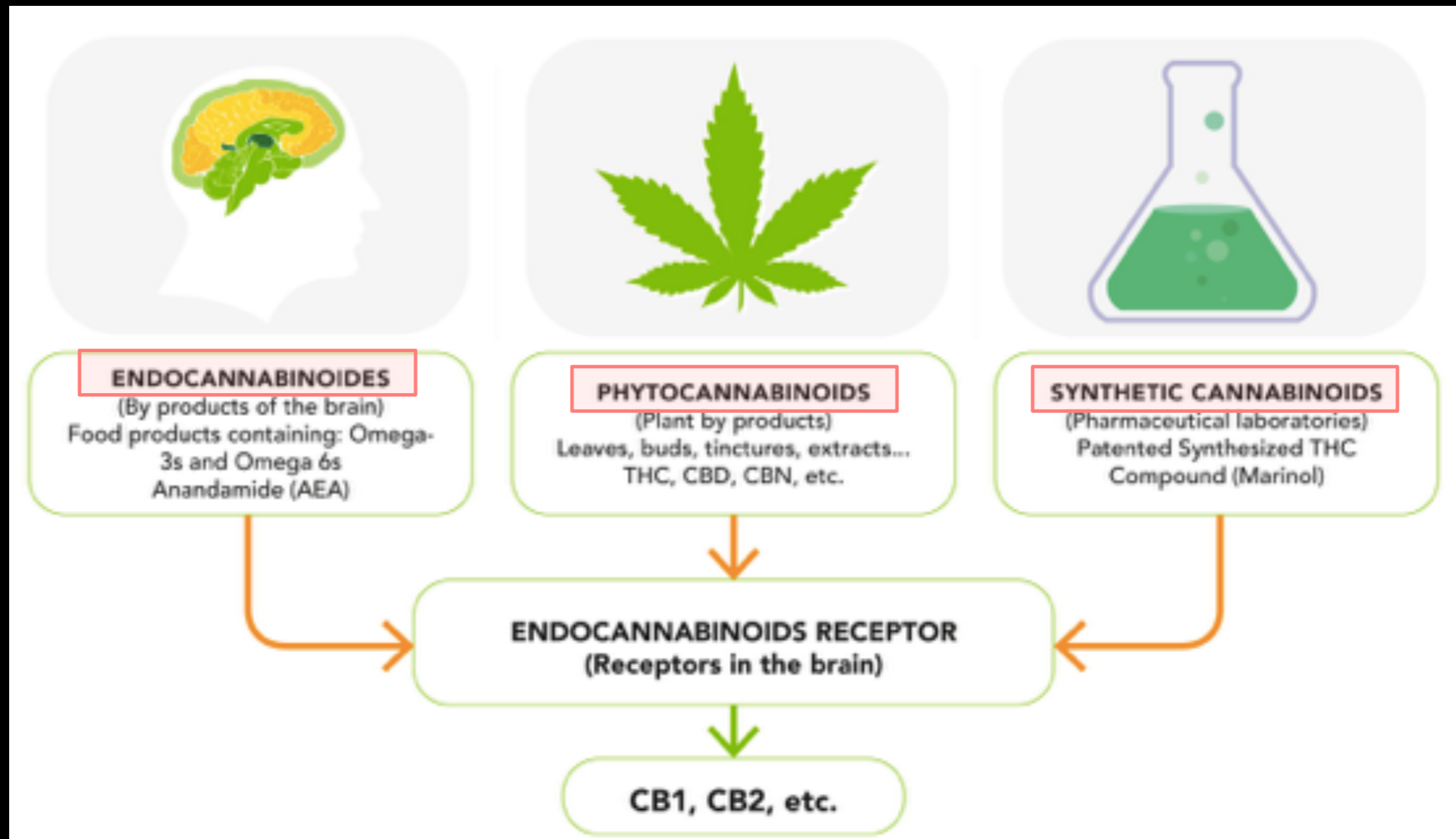
TPVR-1

Anti-Inflammatory
Pain Relief

Adenosine

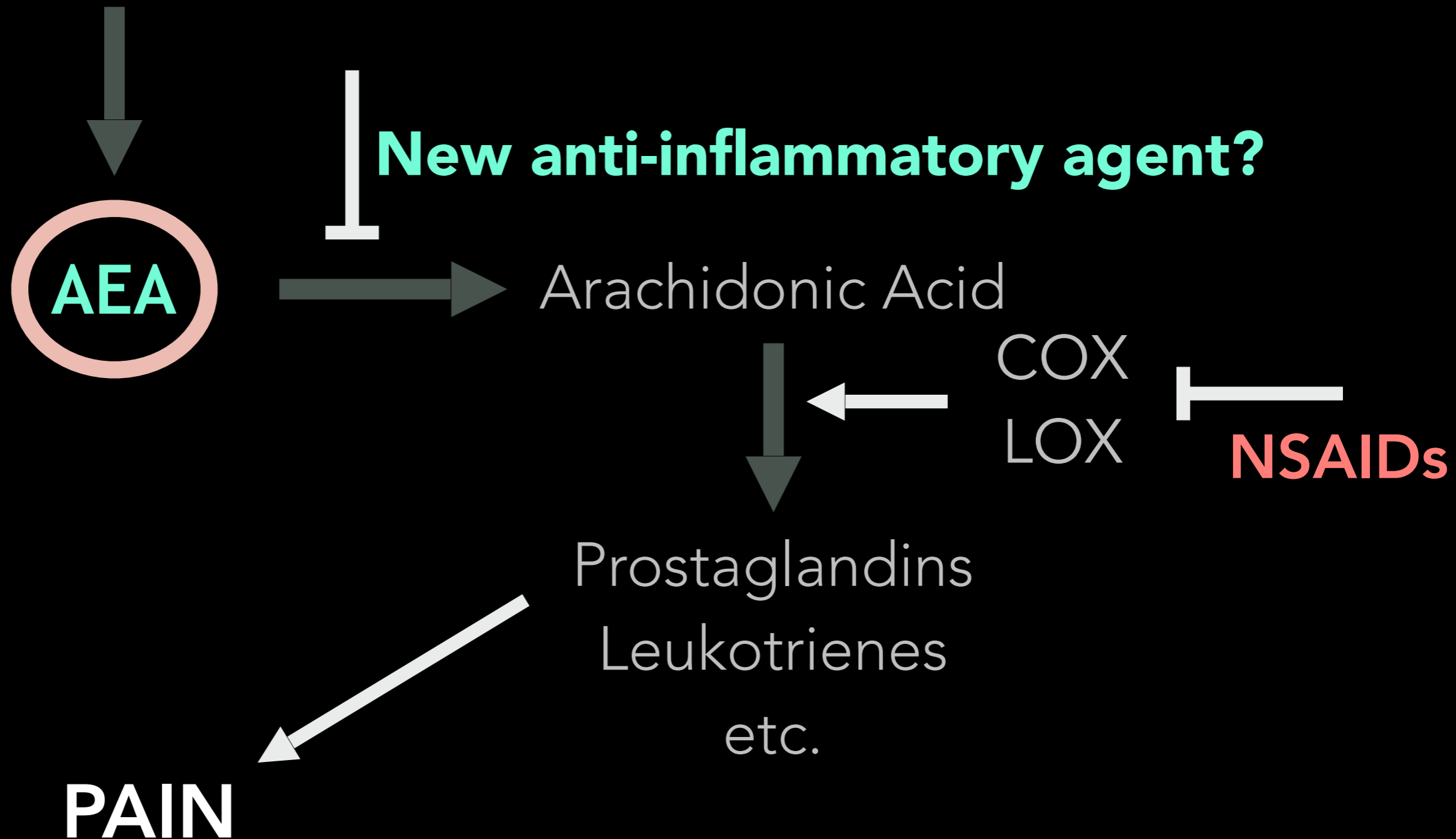
Anti-Inflammatory

CANNABINOID LIGANDS



ENDOGENOUS CANNABINOID: ANANDAMIDE (AEA)

phospholipid precursors i.e. cell membranes



SYNTHETIC CANNABINOIDS

Nabilone (Cesmet®)

1985 – treatment of nausea and vomiting (N+V) associated with chemotherapy



Dronabinol (Marinol®)

1985 – treatment of chemotherapy N+V

1992 – treatment of anorexia associated with AIDS



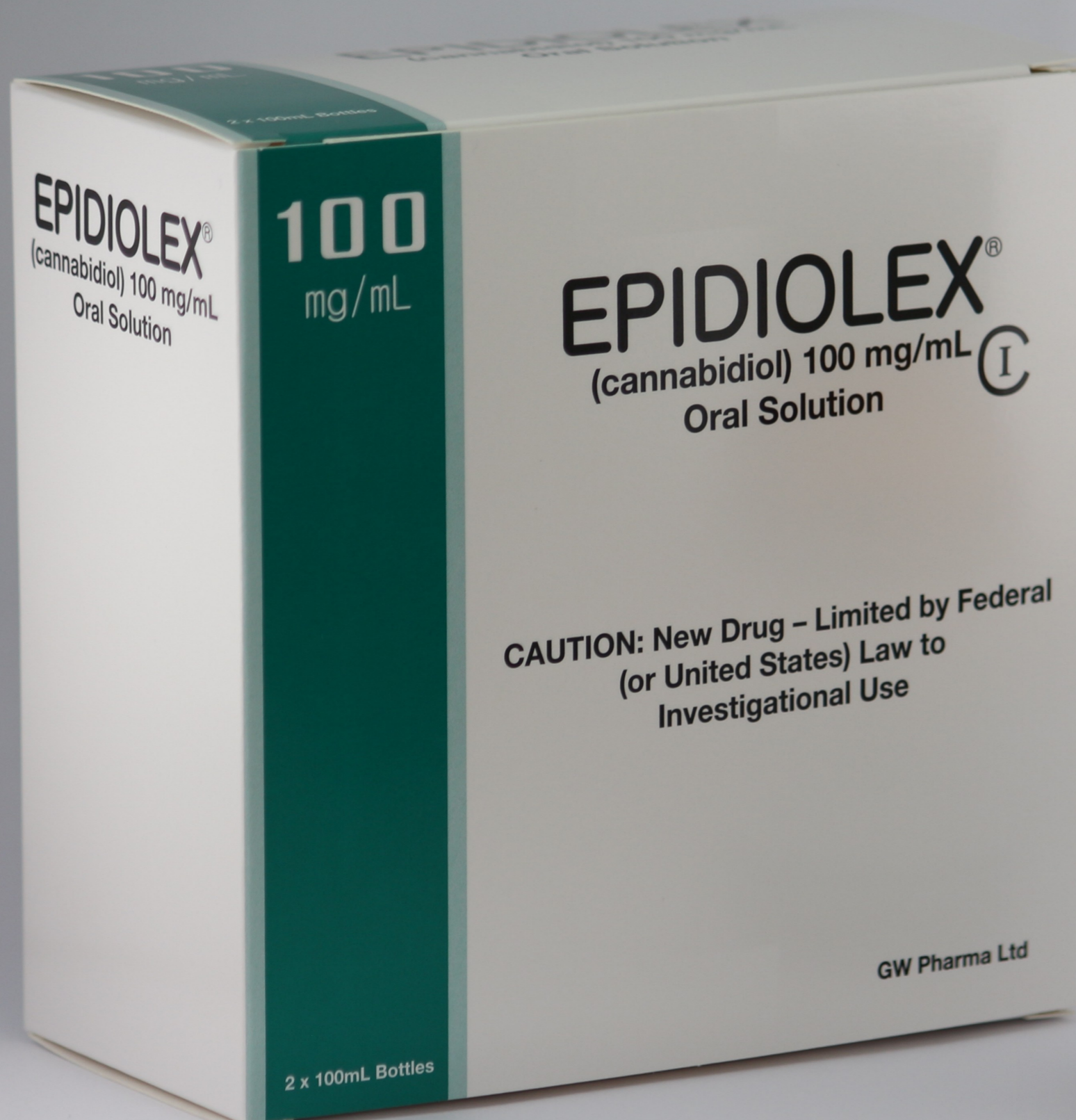
Acomplia (Rimonabant®)

2006 – anti-obesity drug that blocked CB1 receptor

Double the risk of developing psychiatric disorders

— withdrawn

2018 APPROVAL



ROUTES OF ADMINISTRATION

Inhalation

Water pipe aka "bong"

Marijuana cigarette aka "joint"

Pipe smoking

Vaporization

Oral "Edibles"

Sublingual spray

Topical

Lotions, chapstick

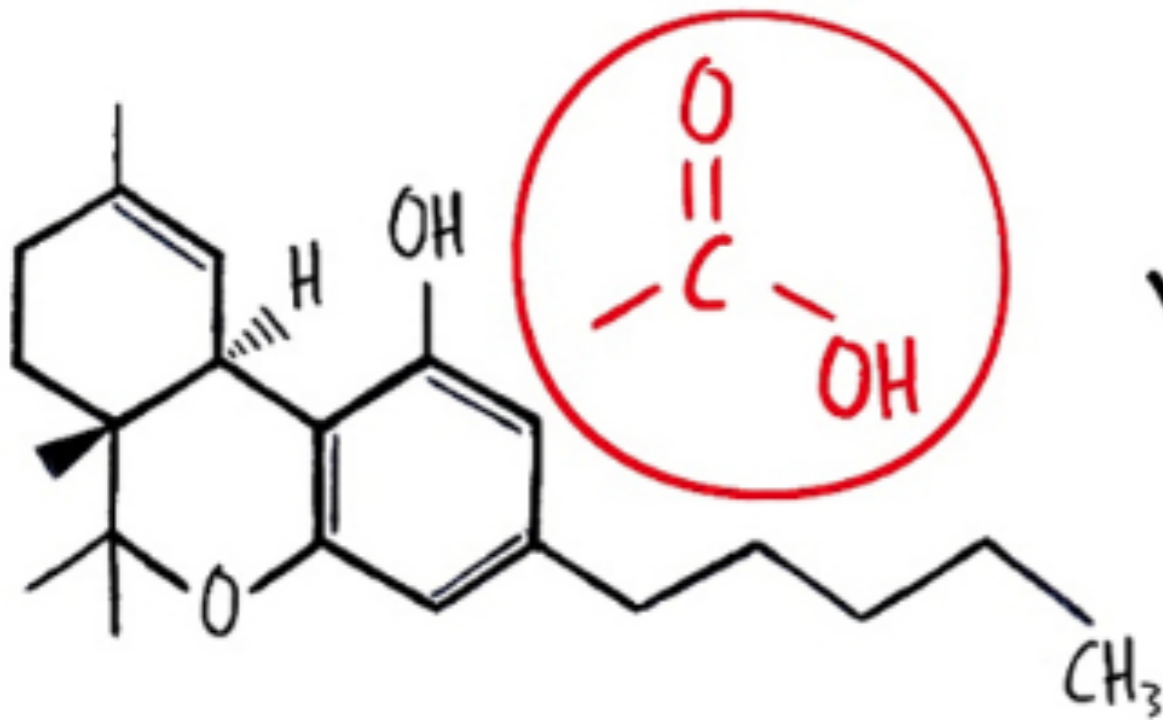


KANNACORP

DECARBOXYLATION

THCA

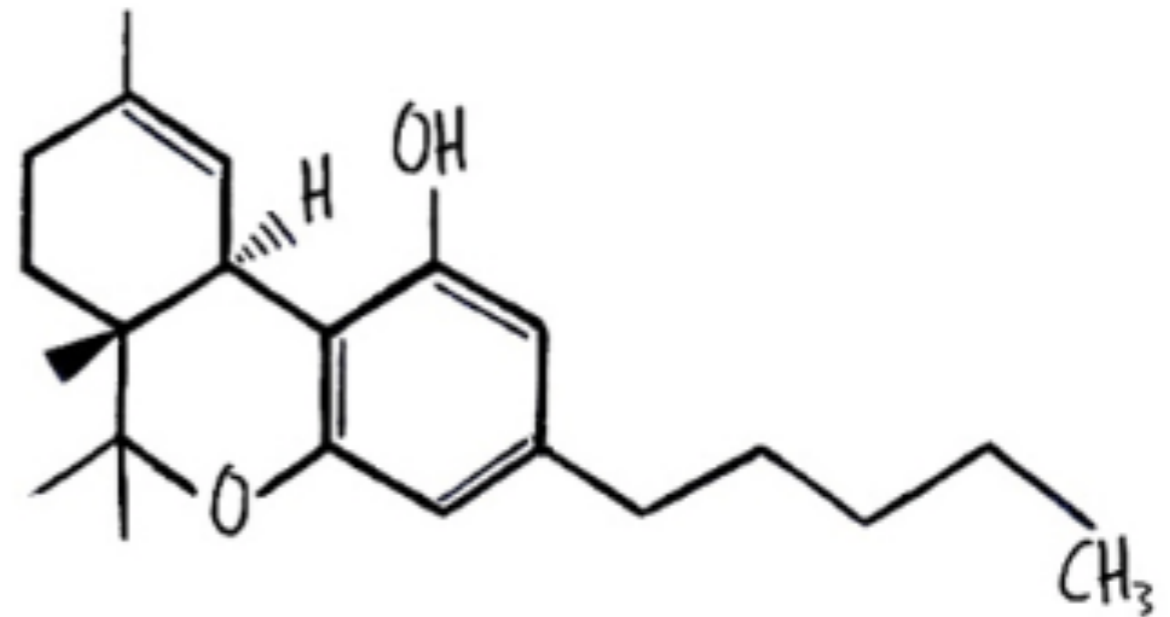
Can't bind to CB receptors



VS

THC

Bioavailable and ready to bind with CB receptors



PULMONARY HAZARDS

WU et al. NEJM 1988

Increased puff volume, therefore greater inhaled volume

Increased airway retention

Increased tar inhalation, with 30% more tar retention in respiratory tract

Decreased cigarette use and frequency of smoking

Marijuana:tobacco cigarette ratio is roughly 1:5

VAPORIZABLE CANNABIS CONCENTRATES

Butane Hash Oils (BHOs) used for "dabbing"

"Shatter"

"Oil"

"Wax"

"Sugar"

(Andres Rodriguez)



UNKNOWN POSSIBLE BENEFITS

BUDNEY et al. 2015 Addiction

Eliminates smoke

Limits second-hand exposure

Reduces smoke-related respiratory illnesses and mortality



Acute Effects of Vaporized Cannabis

SPINDLE et al. 2018 JAMA Netw OPEN



Higher peak concentrations when vaporized

Possible that some drug is destroyed when "burned"

UNKNOWN POTENTIAL HARMS

BUDNEY et al. 2015 Addiction

Health impact of long-term aerosol inhalation

Increased frequency of use

Decreased motivation to reduce use or quit

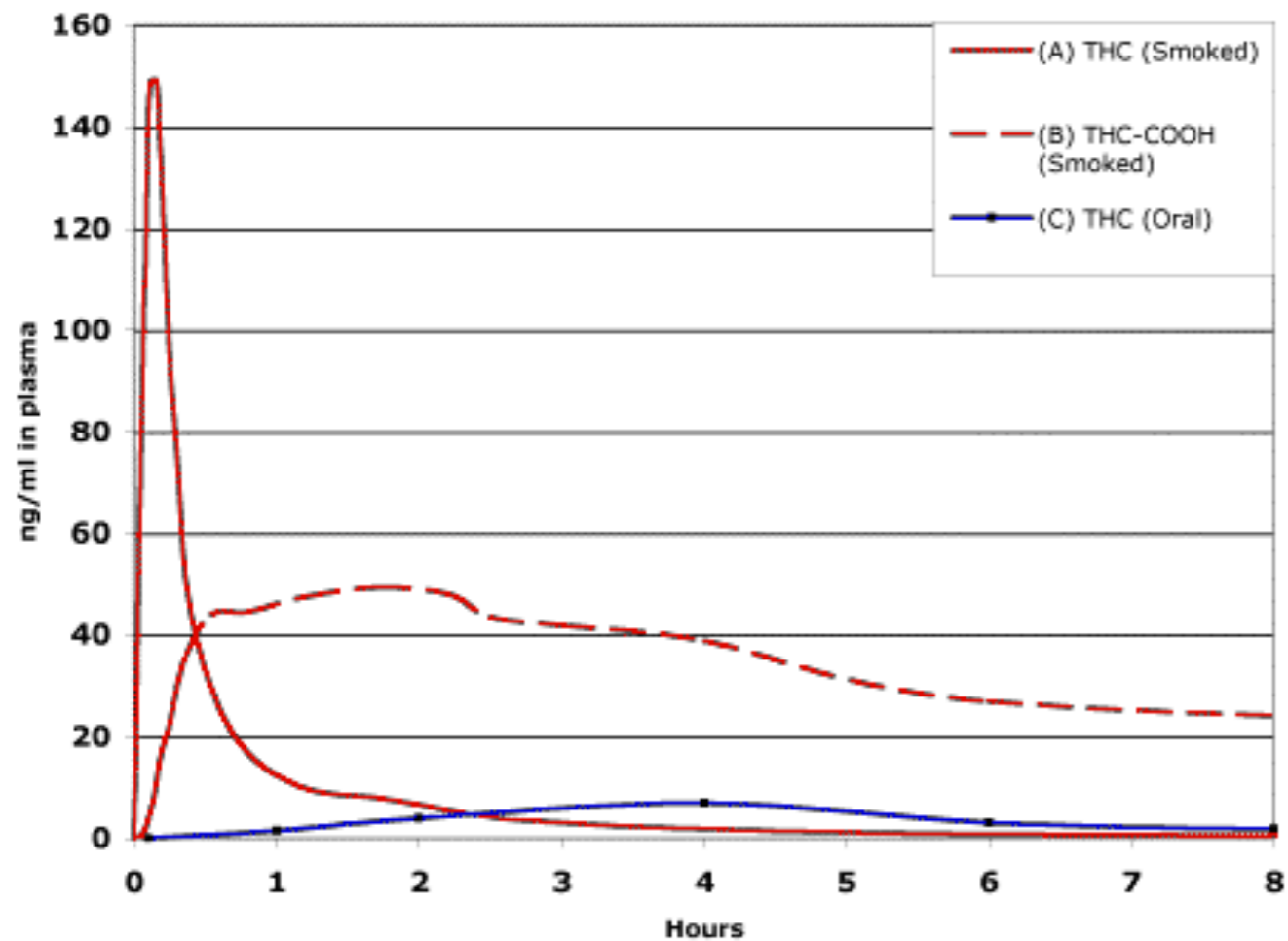
Promotion of a pathway to use for youth

(Shutterstock)



ONSET AND DURATION

Blood Levels of THC & Metabolite



INHALED:

Onset: 0-30 minutes
Duration: 2 hours +/-
Peak: 20-30 minutes

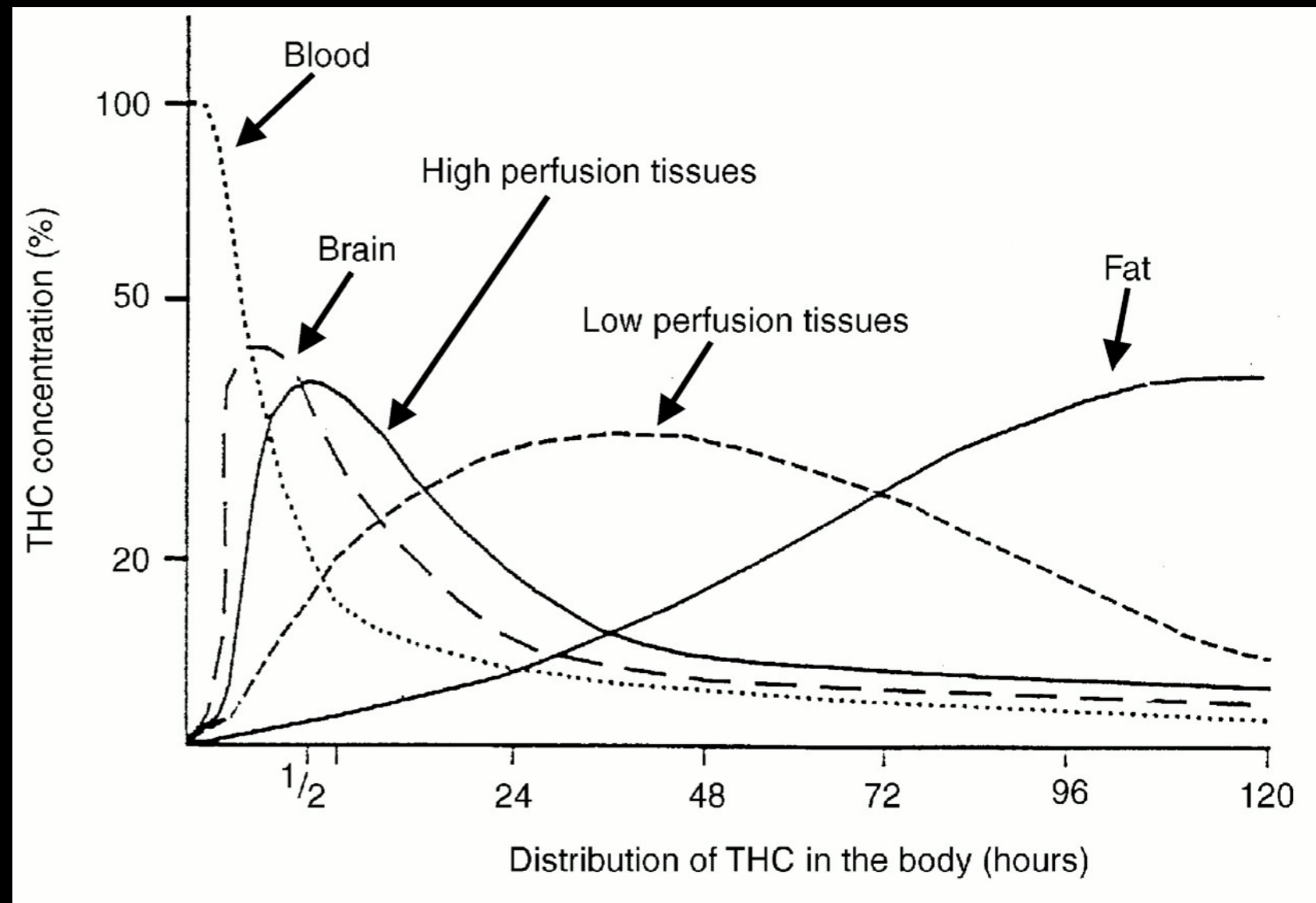
ORAL:

Onset: 30-120 minutes
Duration: 6-8 hours
Peak: 2-3 hours

HUESTIS et al. J Anal Toxicol 1992

DISTRIBUTION

Cannabinoids are highly **lipophilic**
Tissue elimination in
7 days



Kreuz and Axelrod. 1973. Science.

ROUTES OF ADMIN. COMPARISON

Russell et al. Int Journal of Drug Policy 2018

“Basically no experimental (e.g. randomized controlled trials) studies exist comparing the effects of different routes of administration on health outcomes, and what data exists largely focuses on associations”

METABOLISM

THC is metabolized in the **liver** by cytochrome p450 enzymes:

CYP2C9 and CYP3A4

Biotransformation of THC to active metabolite:

11-hydroxy-THC

DRUG INTERACTIONS

Inhibitors of CYP2C9:

Amiodarone — Anti-arrhythmic

Cimetidine (Tagamet[®]) — Histamine receptor antagonist

Metronidazole (Flagyl[®]) — Antibiotic

Fluoxetine (Prozac[®]) — Antidepressant

Fluvoxamine — Antidepressant

Fluconazole — Anti-fungal

DRUG INTERACTIONS

Inhibitors of CYP3A4:

Ketoconazole — Anti-fungal

Itraconazole — Anti-fungal

Clarithromycin — Antibiotic

Erythromycin cyclosporine — Antibiotic

Verapamil — Calcium channel blocker

DRUG INTERACTIONS

Synergism with:

Opioids

Benzodiazepines

Sleep medications

Muscle relaxants

Alcohol

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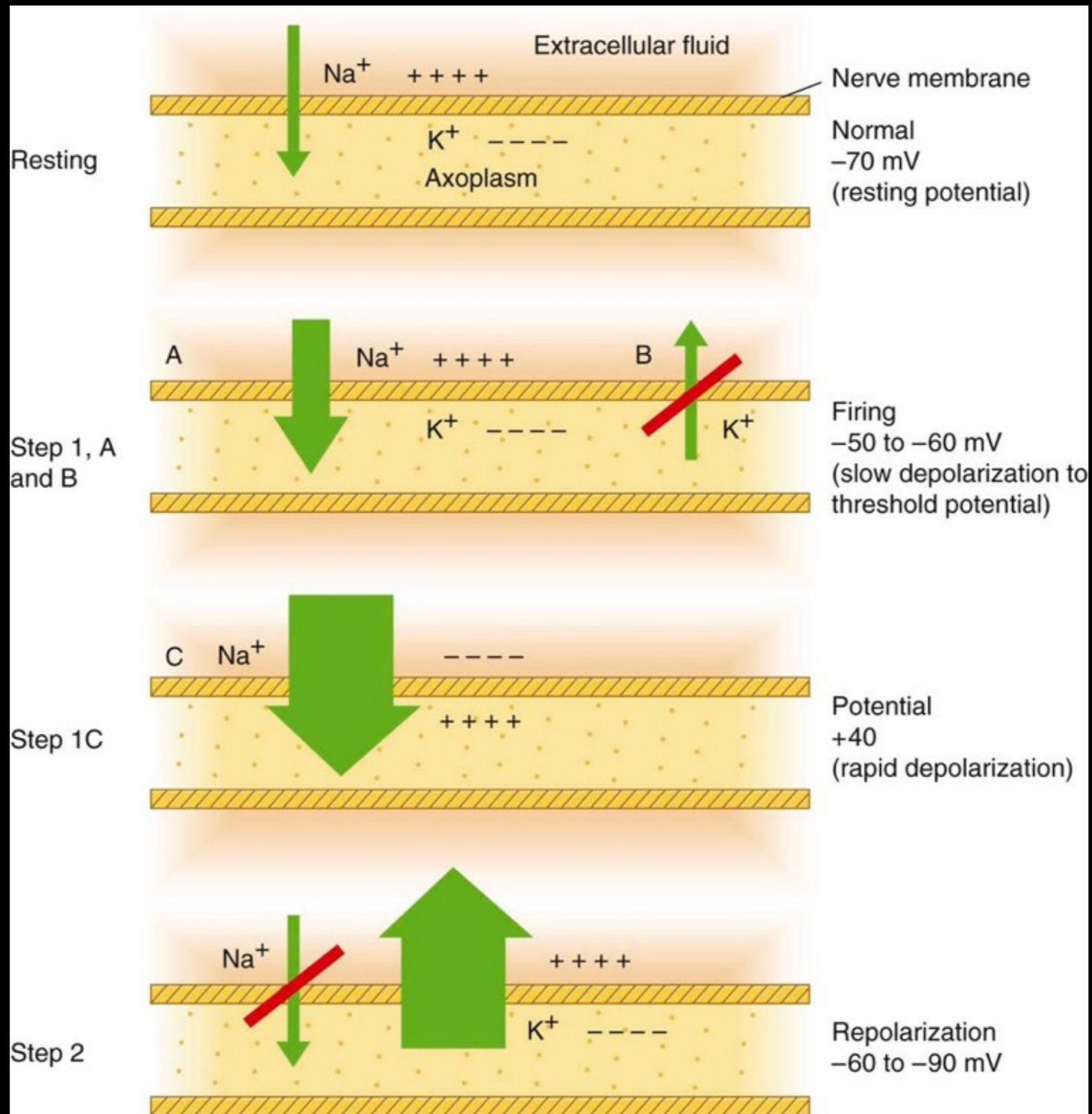
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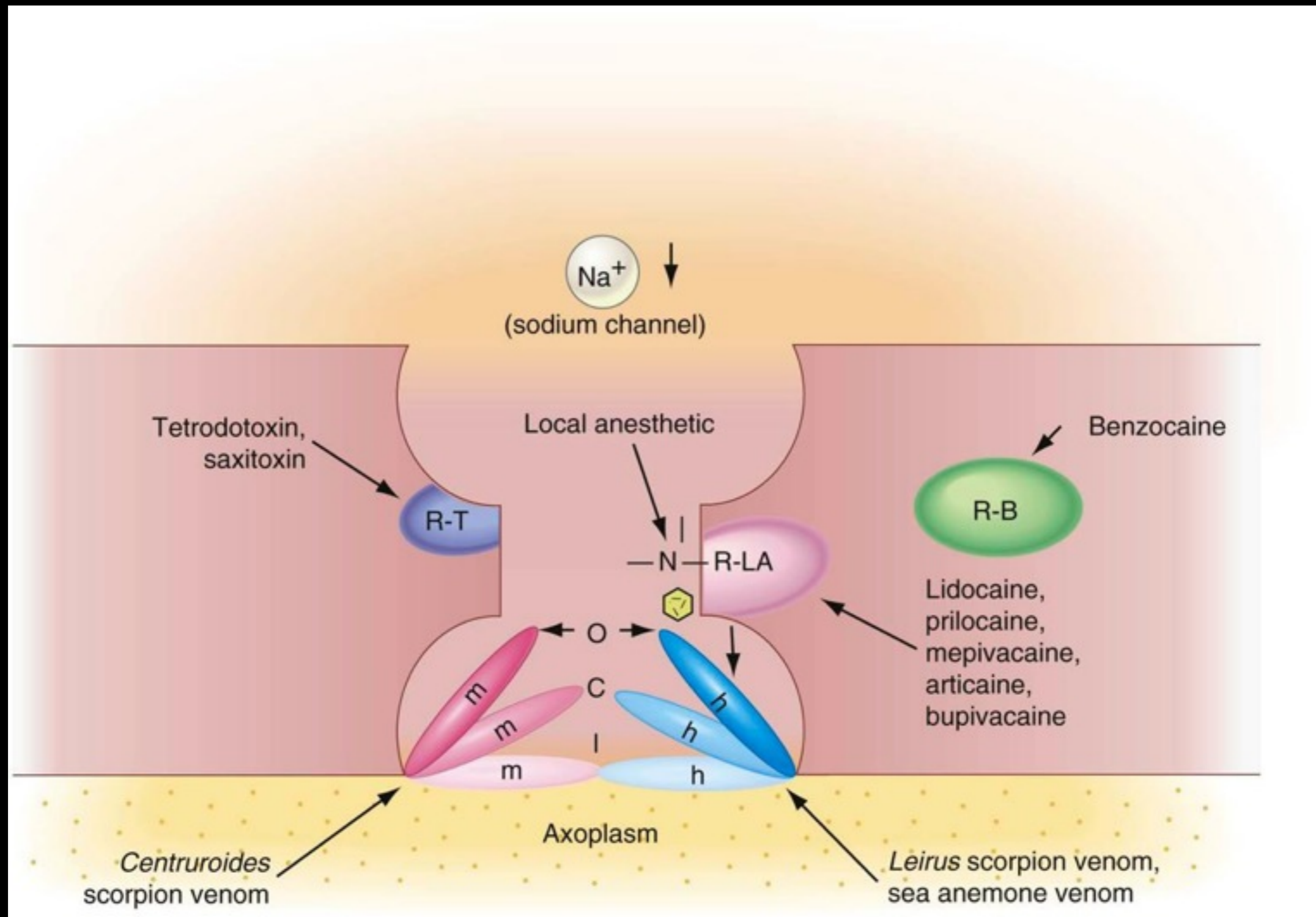
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LOCAL ANESTHETIC REVIEW



LOCAL ANESTHETIC REVIEW



Handbook of Local Anesthesia

Author: Stanley F. Malamed

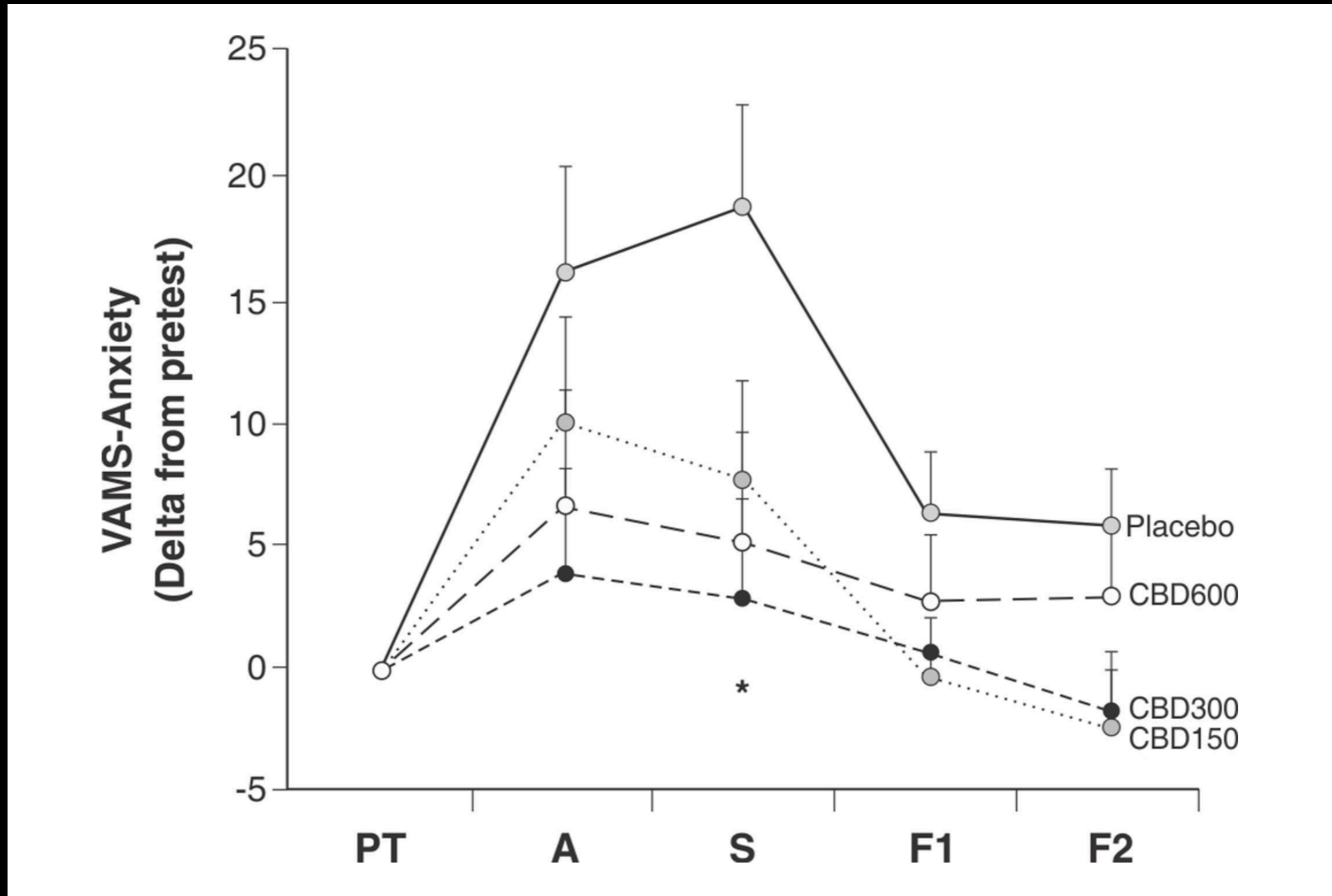
LOCAL ANESTHETICS + CANNABINOIDS



A. Evidence does show that cannabinoid agonists inhibit sodium and potassium channel conductance — therefore, cannabinoids should promote anesthesia

B. If cannabinoids are antagonizing local anesthesia it is likely from peripheral or central receptor desensitization

Speaking to a group of Dentists (hypothetical!)



NITROUS OXIDE

YAJNIK et al. Drug and Alcohol Dependence 1994

Marijuana users appeared to have intensified subjective effects induced by nitrous oxide

Otherwise, no differences between marijuana users and non-users

MODERATE CONSCIOUS SEDATION

PATEL et al. Southern Medical Association 2015

Marijuana users did NOT require higher doses of sedation compared to non-users to complete a colonoscopy

Opioid users did require a significantly greater amount of fentanyl and midazolam compared to controls

T-Mobile®

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CNS: ACUTE EFFECTS

Mood: Euphoria - Relaxation - Anxiety

Psychosis: Confusion - Disorientation - Dizziness

Perception:

Intensified sensations

Time distorted

Impaired perceptual ability

Cognition:

Impaired + short-term memory loss



CNS: CHRONIC EFFECTS

Psychosis + Schizophrenia

(linked with early onset use)

Depression+ Anxiety

Dependence:

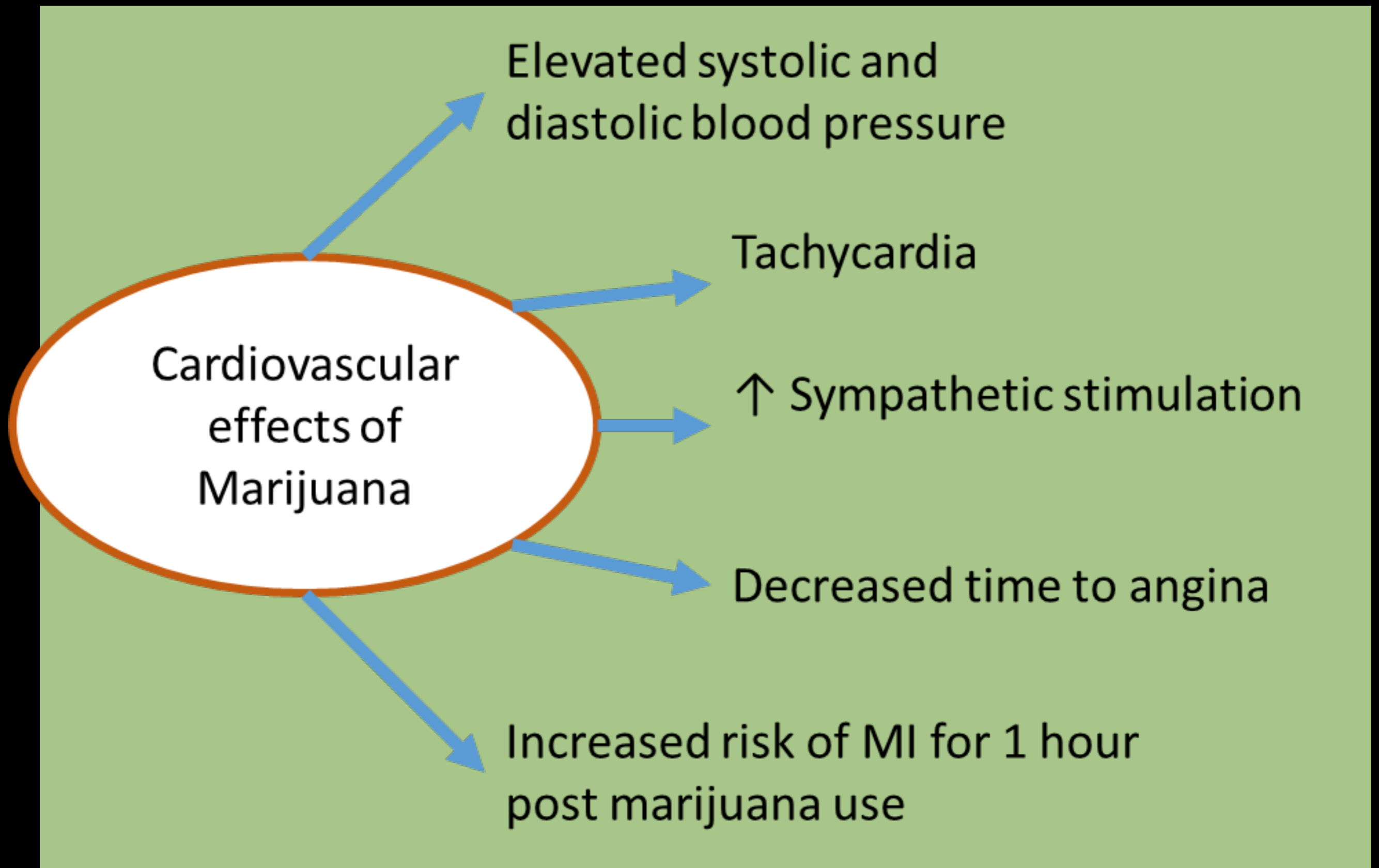
Restlessness

Irritability

Insomnia



CARDIOVASCULAR SYSTEM



RESPIRATORY SYSTEM

Bronchodilation

Stimulates ventilation

Minimal to zero
respiratory depression

Chronic bronchitis

Respiratory
immunosuppression



IMMUNE SYSTEM

Immunosuppression

Pro-inflammatory — THC

Anti-inflammatory — CBD + THC

Oral CBD has a beneficial action on two symptoms of established inflammation:

1. Edema
2. Hyperalgesia



DIGESTIVE SYSTEM

Increased appetite

Perceived improved quality of life, but no inflammation reduction for IBS, Chron's Disease and Ulcerative Colitis patients



REPRODUCTIVE SYSTEM

FEMALES: Decreased folic acid uptake

MALES: Decreased sperm count + decreased libido



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CANNABIS-ASSOCIATED ORAL LESIONS

'Cannabis stomatitis'

Leukoedema

Hyperkeratosis

Oral candidiasis

CANNABIS-ASSOCIATED ORAL LESIONS

+ ASSOCIATION

Zhang, 1999 – H+N and oral squamous cell carcinoma

Gillison, 2008 – HPV and H+N

Feng, 2009 – Nasopharyngeal

Marks, 2014 – oropharyngeal

NO ASSOCIATION

Hashibe, 2002 – H&N

Rosenblatt, 2004 – Oral Cavity

Hashibe, 2006 – H+N and esophageal

Aldington, 2008

Berthiller, 2009

Liang, 2009 – H+N and SCC

Marks, 2014 – oral and tongue

HPV + MARIJUANA + ORAL CANCER

Gillison et al. J Natl Cancer Inst 2008

Gillison et al. JAMA 2012

Increasing use of MJ increases risk of HPV H&N Cancer

HPV prevalence increases with MJ use

ETIOLOGY OF ORAL CANCER

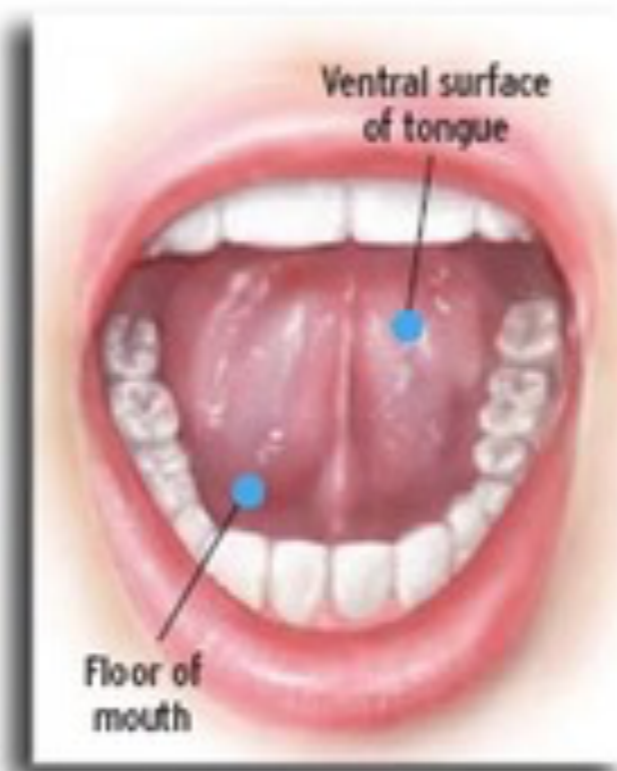
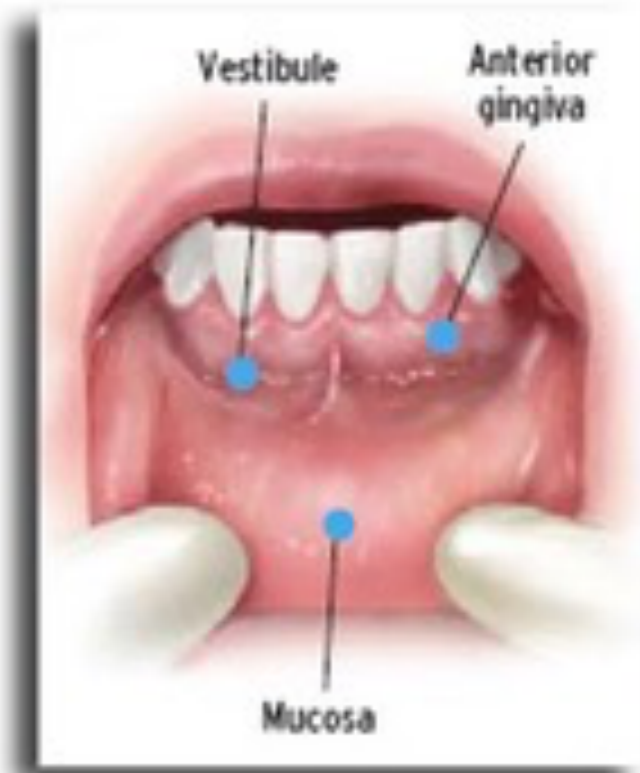
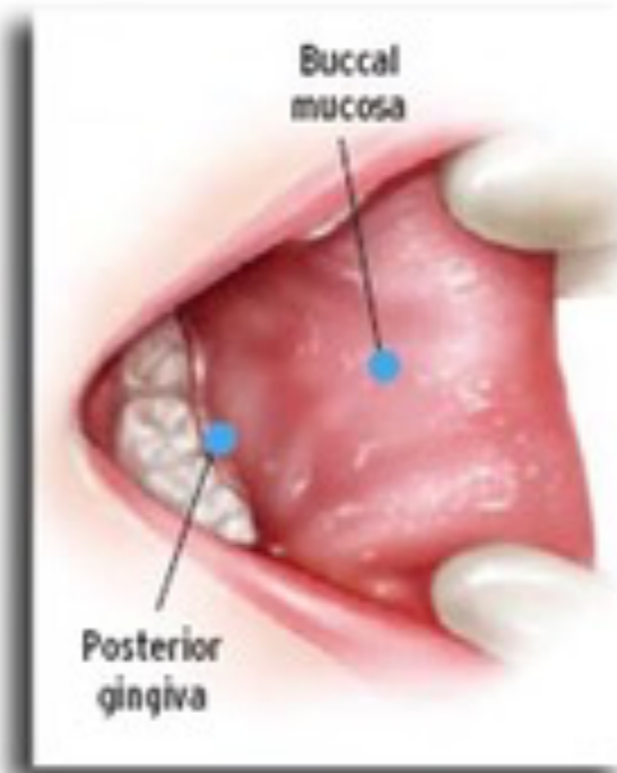
Cannabis Carcinogens:

Aromatic hydrocarbons

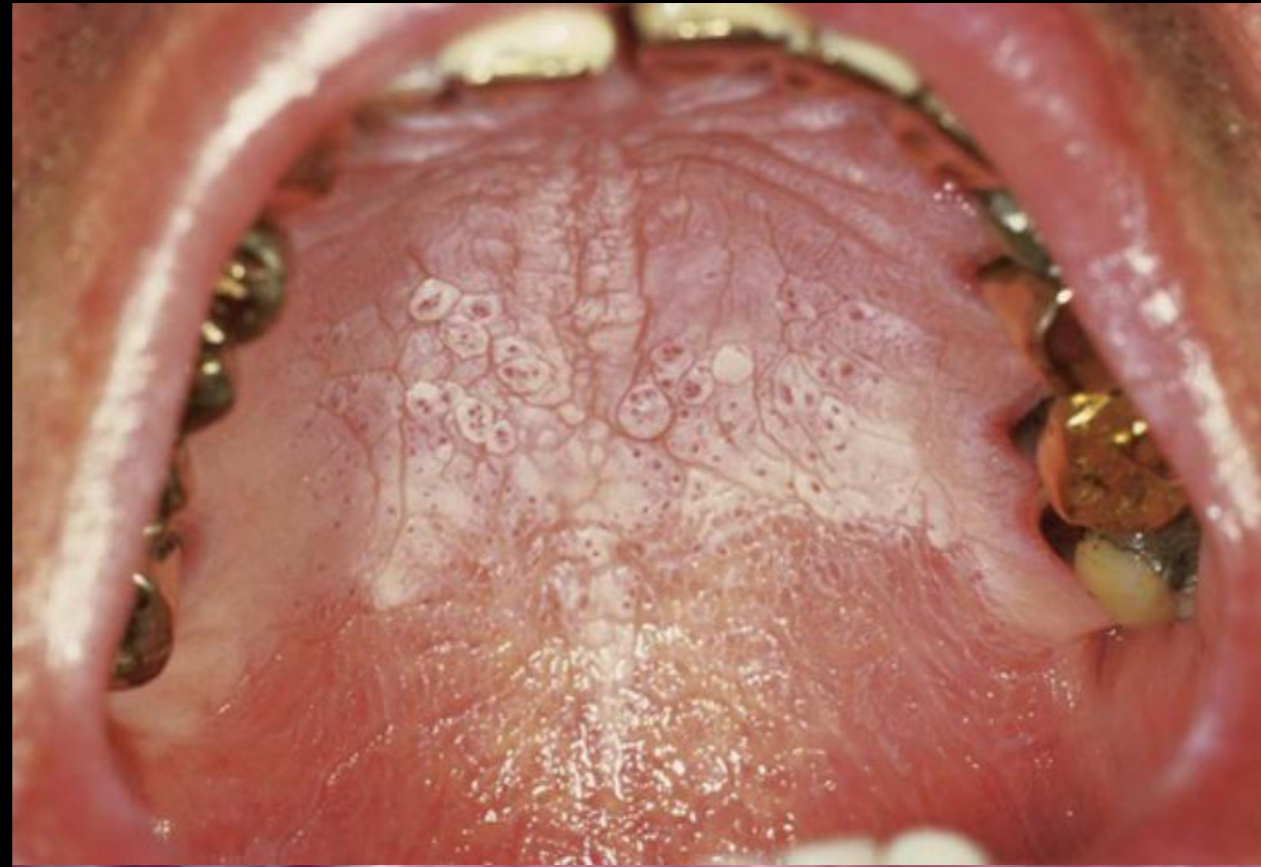
Benzopyrenes

Nitrosamines

ORAL CANCER SCREENING



CANNABIS STOMATITIS



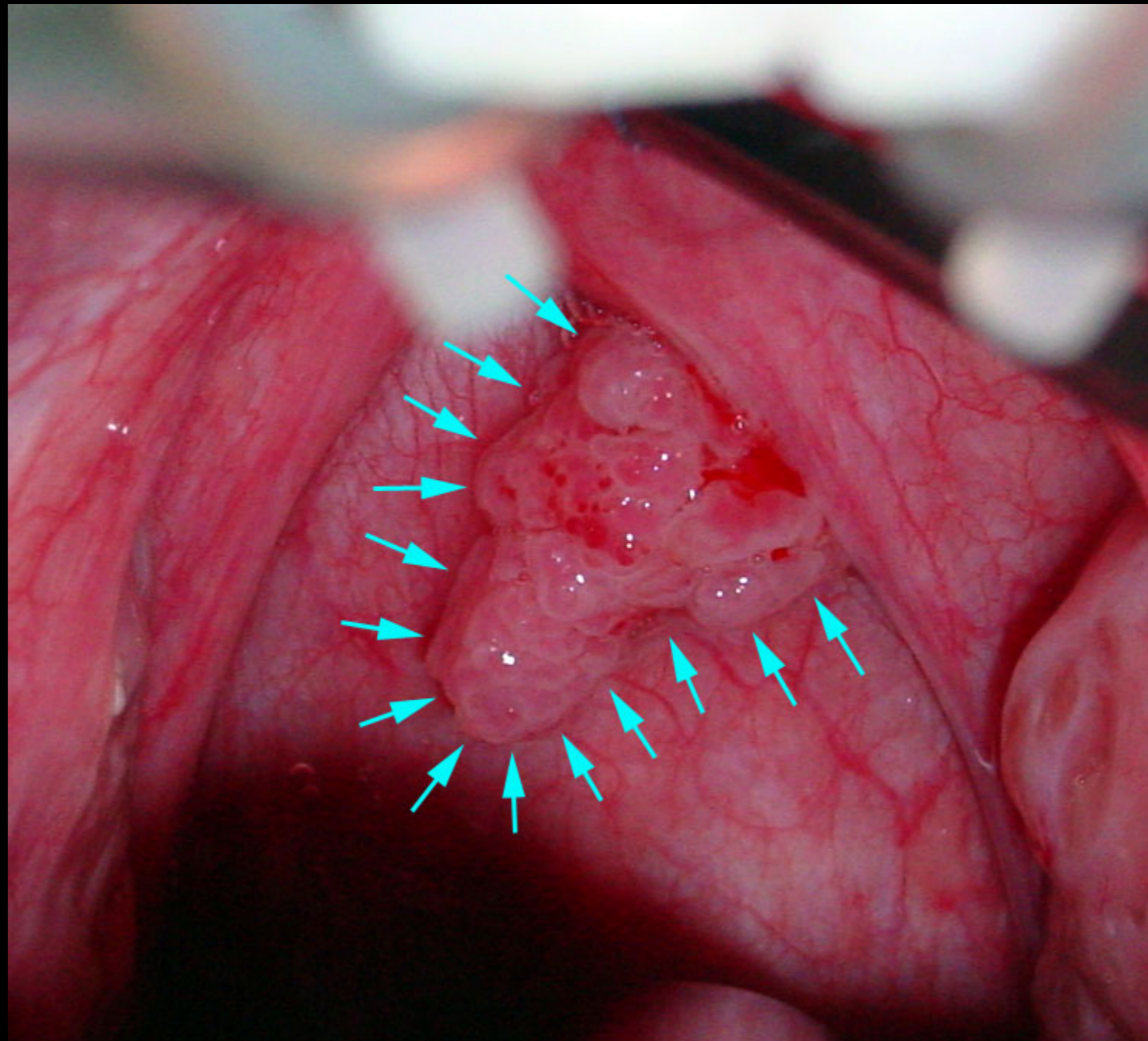
ORAL CANDIDIASIS



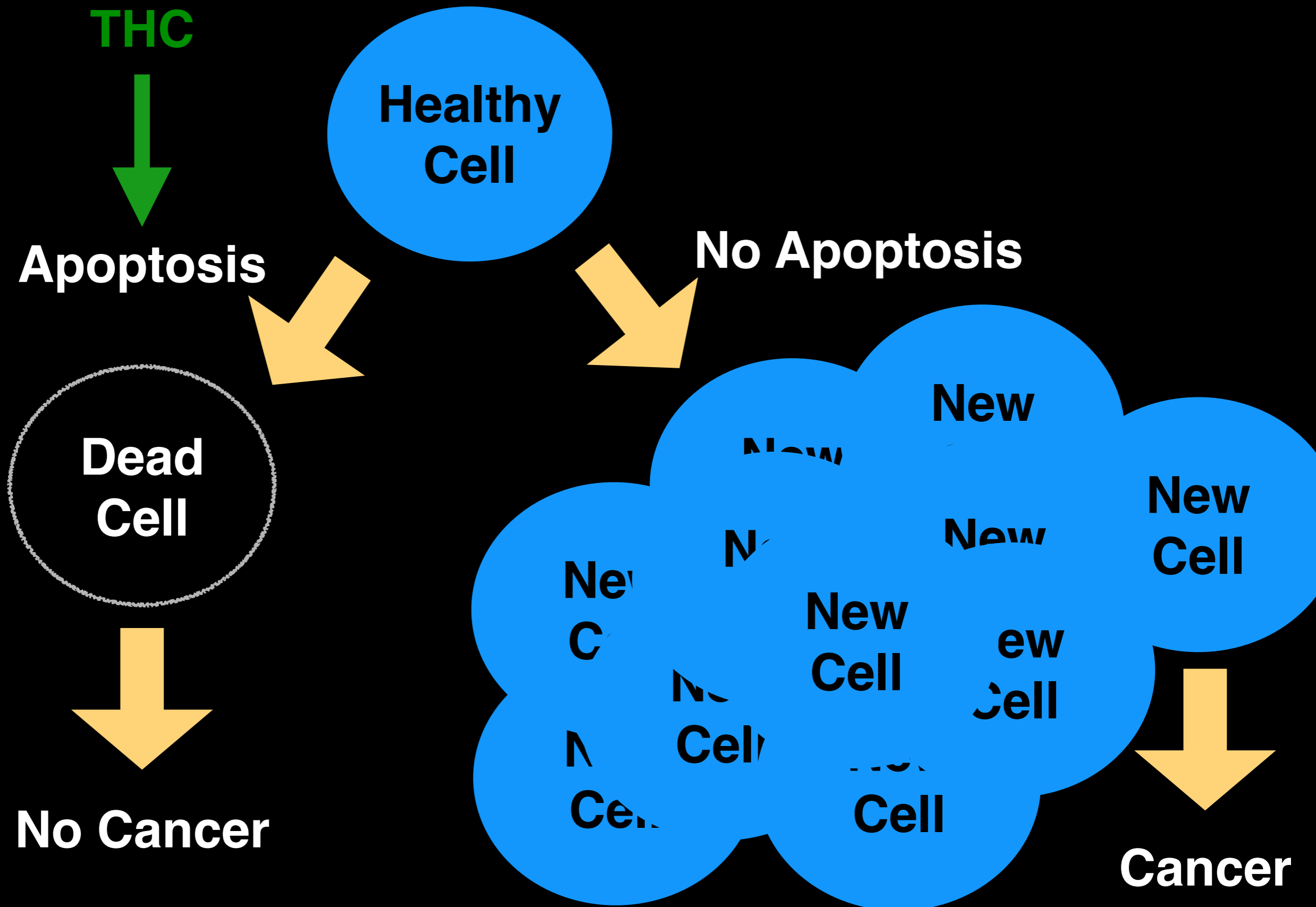
PHARYNGEAL CANCER



HUMAN PAPILLOMA VIRUS

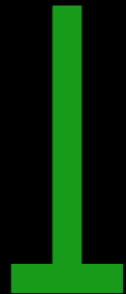


CANCER ANTI-CANCER POTENTIAL

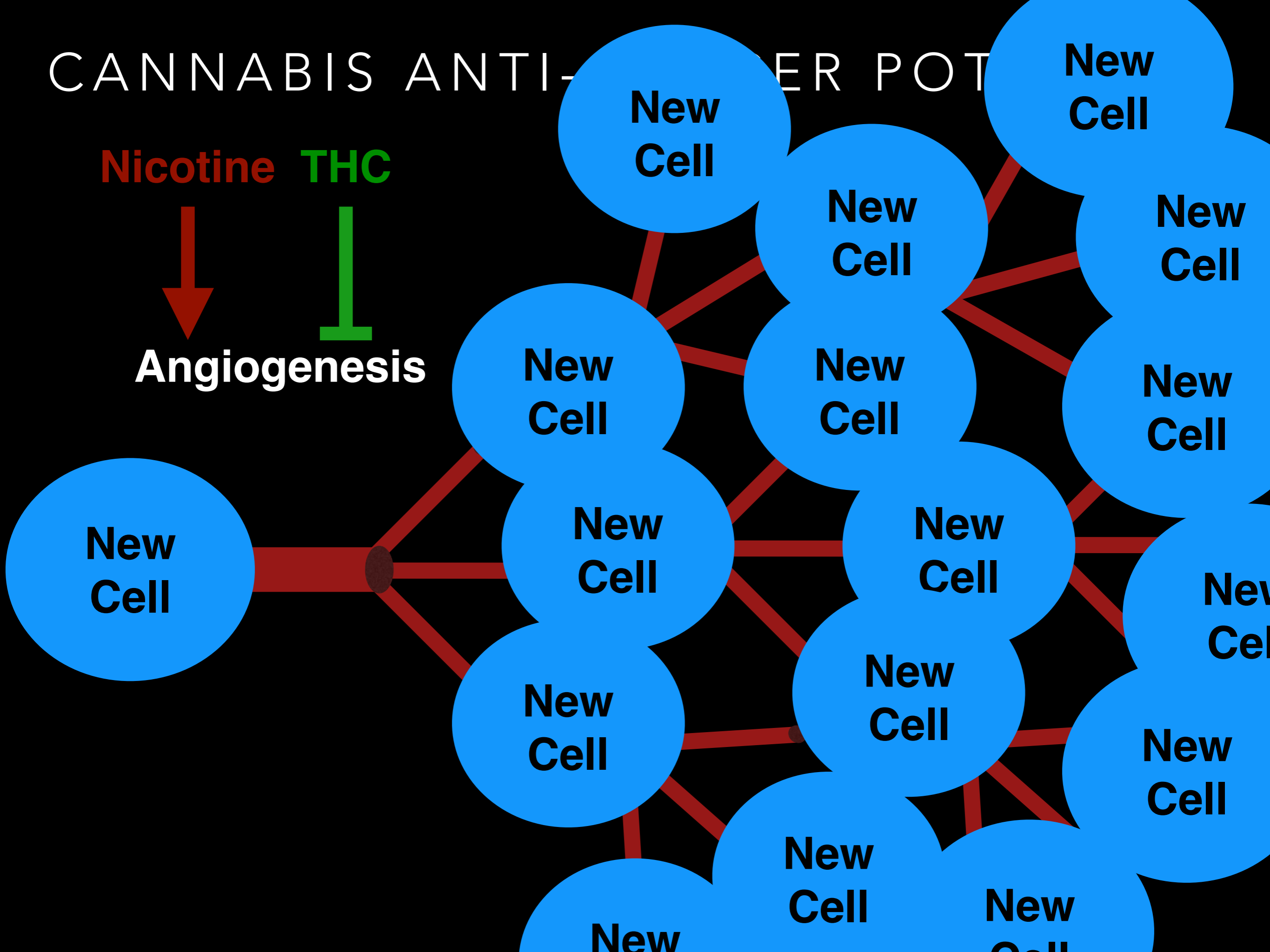


CANNABIS ANTI-ANGIOGENESIS POTENTIAL

Nicotine **THC**



Angiogenesis





“Scientists reported that THC and other cannabinoids such as CBD slow growth and/or cause death in certain types of cancer cells growing in lab dishes. Some animal studies also suggest certain cannabinoids may slow growth and reduce spread of some forms of cancer.”

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Management of cannabis-induced periodontitis via resective surgical therapy

A clinical report

Fatemeh Momen-Heravi, DDS, MPH;
Philip Kang, DDS

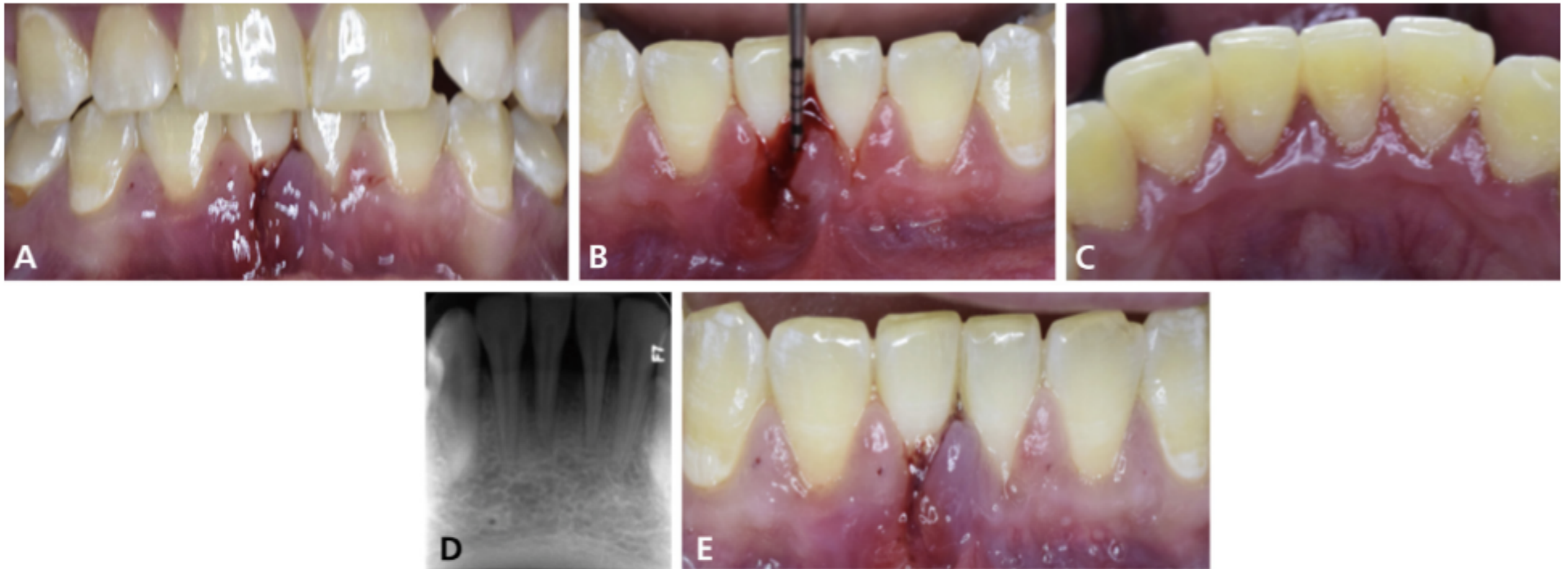


Figure 1. Clinical and radiographic presentations during initial visit and nonsurgical therapy. **A.** Initial visit, frontal view. **B.** Initial visit, facial view of mandibular anterior teeth showing papillary gingival enlargement and edematous tissue with increased probing depth (7 millimeters) at the mesiofacial aspect of teeth nos. 24 and 25. **C.** Initial visit, lingual view of anterior teeth showing nodular appearance. **D.** Radiographic bone loss seen at the mandibular anterior teeth (nos. 23-26) with more prominent bone loss at interproximal site of teeth nos. 24 and 25. **E.** Frontal view at re-evaluation visit 4 weeks after scaling and root planing.



CHILE

CANNABIS USE AND DESTRUCTIVE
PERIODONTAL DISEASES AMONG
ADOLESCENTS

LOPEZ + BAELUM J Clin Perio 2009

Cannabis use is NOT positively
associated with periodontal diseases in
an adolescent population

NEW ZEALAND



DUNEDIN MULTIDISCIPLINARY HEALTH AND DEVELOPMENT STUDY

A cohort from New Zealand

Periodontal examinations at ages 26, 32 and 38

Smoking habits determined at ages 15-38

DUNEDIN MULTIDISCIPLINARY HEALTH AND DEVELOPMENT STUDY

THOMSON et al. J Clin Perio 2013

Tobacco smokers and cannabis smokers are
both more likely to be in
"Moderately increasing" or
"Markedly increasing" trajectory groups
for developing periodontitis

DUNEDIN MULTIDISCIPLINARY HEALTH AND DEVELOPMENT STUDY

MEIER et al. JAMA Psychiatry 2016

“Cannabis use for up to 20 years is associated with periodontal disease but is not associated with other physical health problems in early midlife.”

Study says long-term pot use causes poor gum health - but not much else

Long-term recreational cannabis users in new study had increased risk for tooth loosening and loss but not other health problems across a dozen measures



📷 'What we're seeing is that cannabis may be harmful in some respects, but possibly not in every way,' said the study's co-author. Photograph: Nelson Almeida/AFP/Getty Images



UNITED STATES OF AMERICA

NHANES 2011-2012

SHARIFF et al. J Periodontal 2015

**Frequent recreational cannabis use is
associated with:**

Deeper probing depths

More clinical attachment loss

Higher odds of severe periodontitis



PUERTO RICO

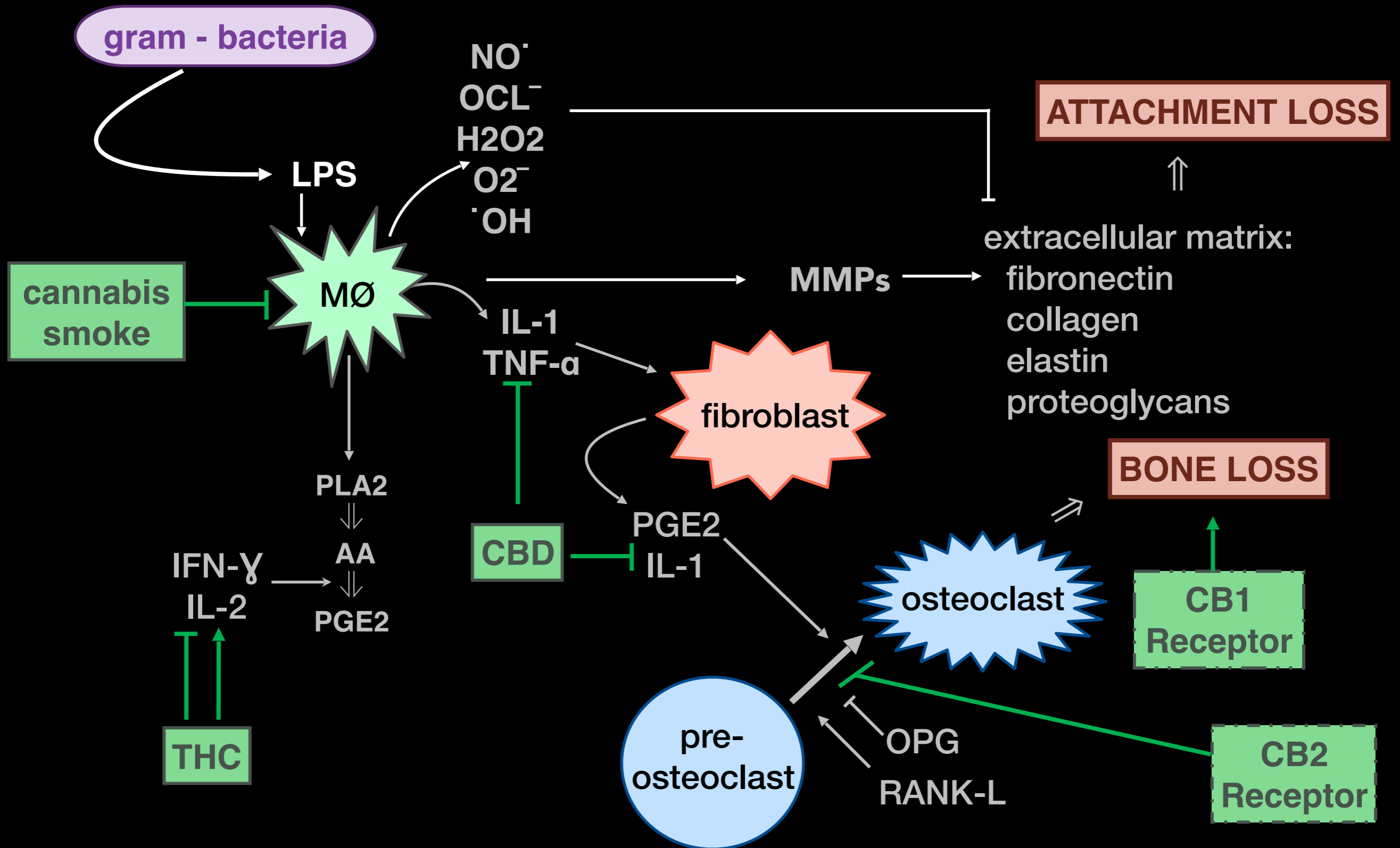
SAN JUAN OVERWEIGHT ADULTS
LONGITUDINAL STUDY

ORTIZ et al. J Periodontal 2017

Frequent marijuana users nearly 3x more
likely to have severe periodontitis

Frequent marijuana use was not
associated with oral HPV infection in a
Hispanic population

PERIODONTAL DISEASE PATHOGENESIS



OUTLINE

1. Introduction

2. The Plant: *Cannabis*

3. Pharmacology

4. Local Anesthetics + Nitrous Oxide

5. General Health Effects

6. Oral Pathology

7. Periodontal Disease

8. Xerostomia and Dental Caries

9. Dental Implants

10. Patient Management

11. The Future

XEROSTOMIA

Clinical Appearance:

Oral mucosa appears dry, pale, or atrophic

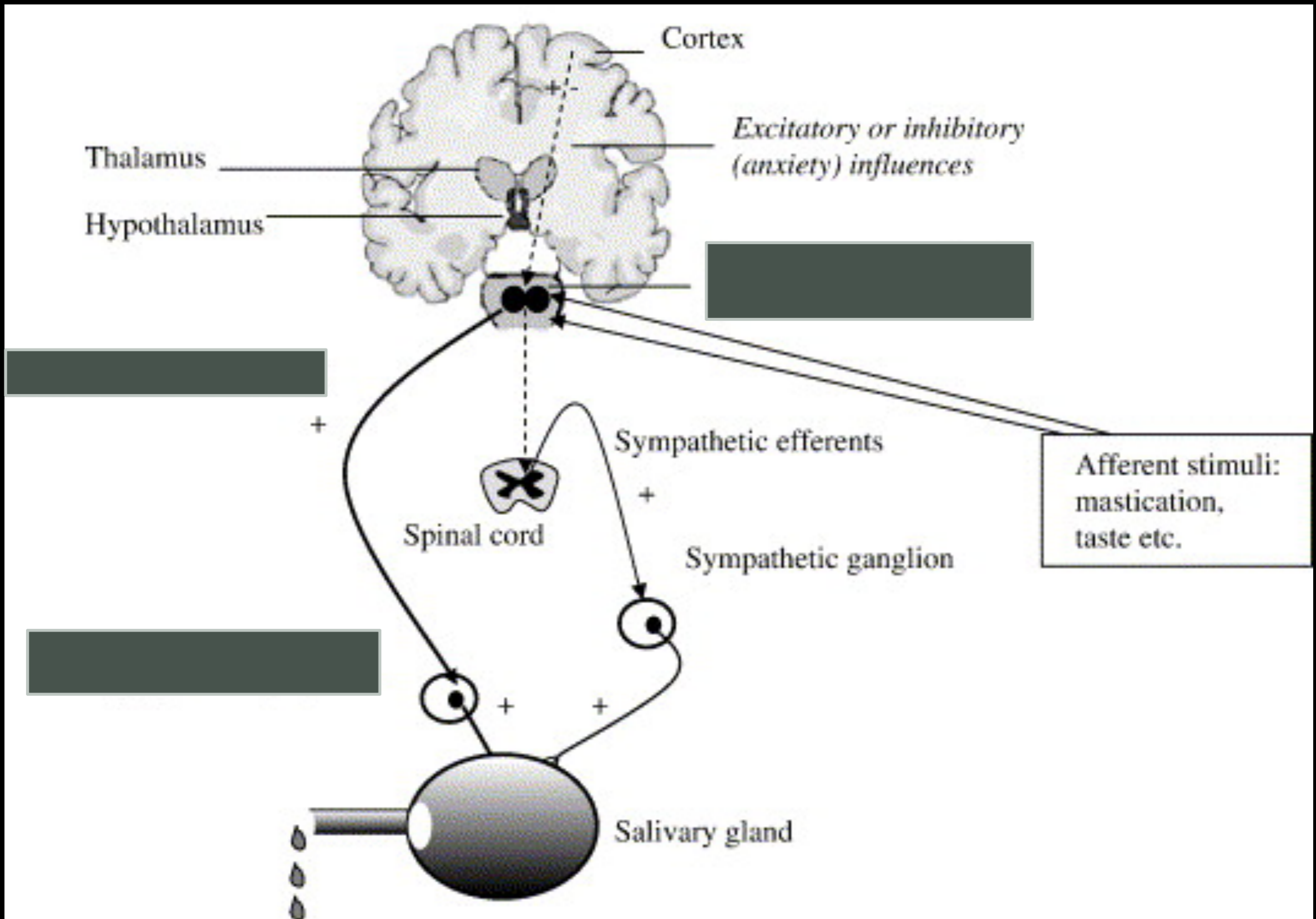
Tongue may be devoid of papillae, fissured and inflamed

New and recurrent dental caries

Difficulty with chewing, swallowing, and tasting

Fungal infections are common

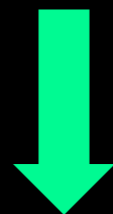
SALIVARY GLAND INNERVATION



CANNABIS + SALIVARY GLANDS

Agonist binding to CB-1 and CB-2 receptors causes:

1. Relaxation of myoepithelial cells
2. Inhibition of signaling within secretory cells
3. Modulation of neurotransmitter release from presynaptic terminals — affecting sympathetic/parasympathetics



Decreased salivation

CANNABIS + XEROSTOMIA

DARLING et al. Int Dental Journal 1992

Xerostomia Experience Among:

Cannabis users — 69 %

Non-cannabis users — 17 %

APPETITE STIMULATION
FACT OR FABLE?

FACT

Cannabis inhibits leptin
— keeping you hungry

Cannabis stimulates dopamine release
— making food more desirable

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A panoramic view of a Swiss mountain valley. In the background, a massive, jagged mountain range with light-colored rock faces and some snow patches rises against a clear blue sky. The middle ground is dominated by dense, dark green coniferous forests covering the slopes. In the foreground, rolling green hills are dotted with several traditional Swiss-style buildings, including a prominent white church with a dark steeple. The overall scene is bright and clear, suggesting a sunny day.

SWITZERLAND

CARIES RISK IN CANNABIS + TOBACCO USERS

SCHULZ-KATTERBACH et al. 2009

21% of cannabis users regularly visited the dentist

Most cannabis users brushed less frequently

63% of cannabis users consumed "sweet" foods and
drinks post-cannabis use

Xerostomia reported 1-6 hours after use

6X the amount of decayed surfaces



NEVADA

TOBACCO + MARIJUANA + DENTAL HEALTH

DITMYER et al. J of Adolescent Health 2013

Tobacco:

75% increase in untreated caries

Marijuana + Tobacco:

65% increase in untreated caries

CANNABIS + DENTAL IMPLANTS

Cannabis sativa smoke inhalation decreases bone filling around titanium implants: a histomorphometric study in rats



CANNABIS + DENTAL IMPLANTS

NOGUEIRA-FILHO GDA et al.

J Periotondol 2010

“Considering the limitations of the present study, the deleterious impact of cannabis sativa smoke on bone healing **may** represent a new concern for implant success/failure.”

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RECOMMENDED QUESTIONS FOR MEDICAL HISTORY

Do you use marijuana?

Yes — No

If yes:

How do you ingest it?

Smoke — Eat — Vape — Topical

Do you use a high THC or high CBD concentration?

Yes — No — Don't Know

How frequently do you use marijuana?

Once a month or less — Weekly — Daily

INFORMED CONSENT

*Can I please
just sign the
form now?*

American College of Dentists:

“A blanket non-treatment policy is not supported by available science or ethical analysis”

Peltier JACD 2010



RECOMMENDED RESOURCES

UW — ALCOHOL AND DRUG ABUSE INSTITUTE:

[HTTP://LEARNABOUTMARIJUANA.WA.ORG/](http://learnaboutmarijuana.wa.org/factsheets.htm)

[FACTSHEETS.HTM](http://learnaboutmarijuana.wa.org/factsheets.htm)

PUBLIC HEALTH HOTLINE:

[WWW.WARECOVERYHELPLINE.ORG/](http://www.warecoveryhelpline.org/)

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TAKE HOME MESSAGES

1. Know your patient and her/his medical history
2. Be comfortable talking to your patients about their marijuana use

THANK YOU! TAYLORBA@OHSU.EDU

