Neuroscience of Addiction and MAT 101: Understanding the Neurobiology and Chronic Disease Nature of SUD and Medications for Addiction Treatment (MAT)

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MAT in Jails and Drug Courts is funded by DHCS with general state funds as a program in DHCS' Medication Assisted Treatment Expansion Project

WELCOME

- This webinar is intended to support counties in expanding access to Medications for Addiction Treatment (MAT) for persons with justice and/or child welfare system involvement.
- Please note this content is being recorded, and the slides will be sent after the webinar. The recording will not be professionally edited, and the session was conducted using Zoom.
- If you have questions or comments, please email MATinCountyCJ@healthmanagement.com

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LEARNING OBJECTIVES

I

An overview of the neuroscience of addiction and the chronic disease nature of substance use disorders (SUD) with an emphasis on opioid use disorder (OUD)

II

An explanation of the role of dopamine in SUD and how it relates to the recovery journey

III

A review of the medications approved for treating OUD (methadone, buprenorphine, and naltrexone) and special treatment considerations for pregnant and parenting women

IV

Considerations for effective use of MAT in jails and other justice settings including medication selection, method of action, diversion potential, side effects and common myths

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NEUROBIOLOGY OF ADDICTION AND SUBSTANCE USE DISORDERS (SUD) AS A CHRONIC DISEASE

HEALTH MANAGEMENT ASSOCIATES

TIME FOR A POLL…

POLL

Which of the following do you think is the primary contributor to substance use disorders?

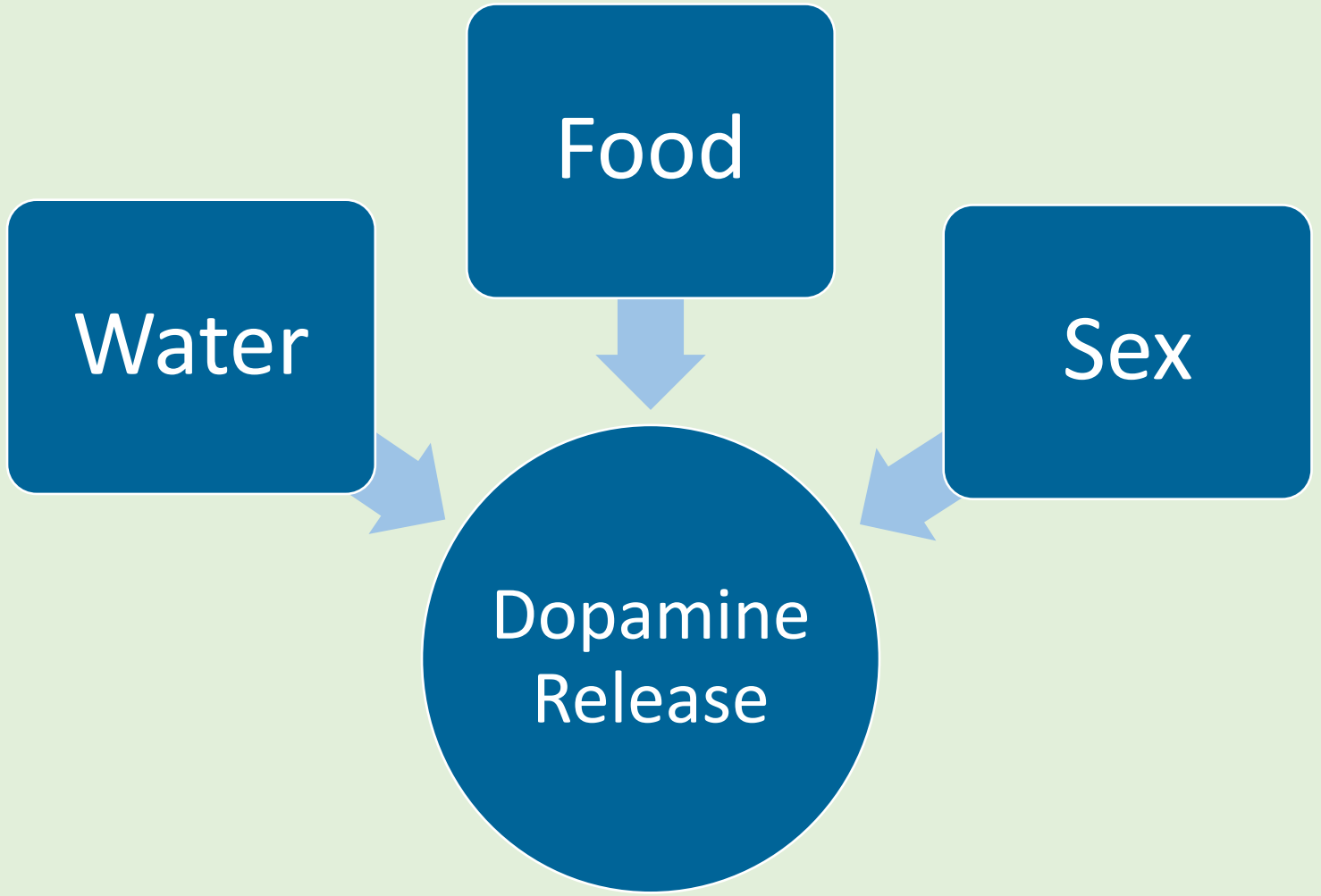
A. Personal choice and behaviors

B. Impact of trauma and other adverse life events

C. Action of neurochemicals in the brain

D. I haven't decided yet

NATURAL REWARDS RELEASE DOPAMINE



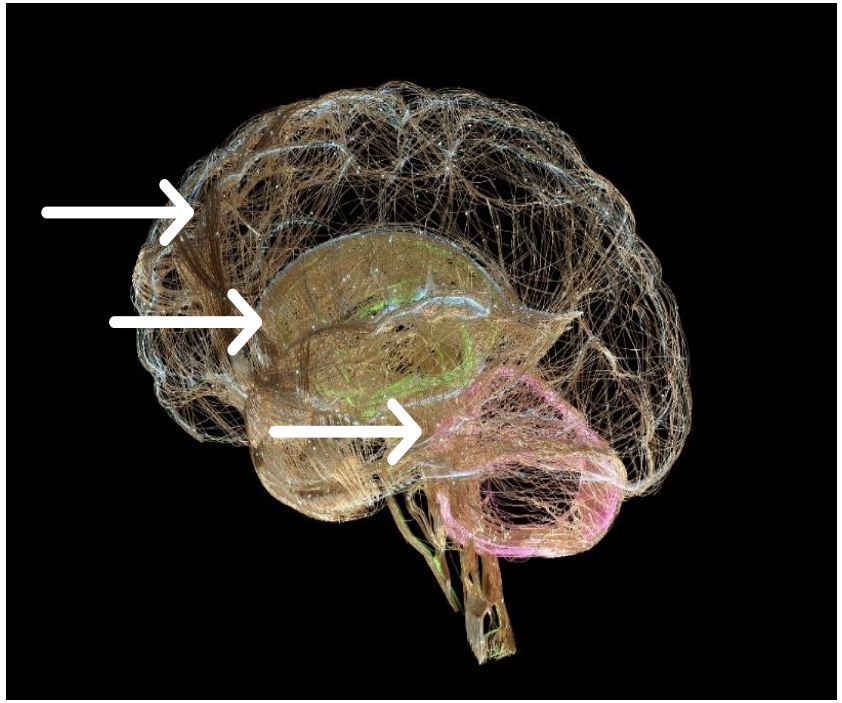
HOW SUBSTANCES OF ABUSE AFFECT THE BRAIN

- All substances of abuse result in activation of the reward pathway
- The same pathway activated by naturally rewarding substances and events

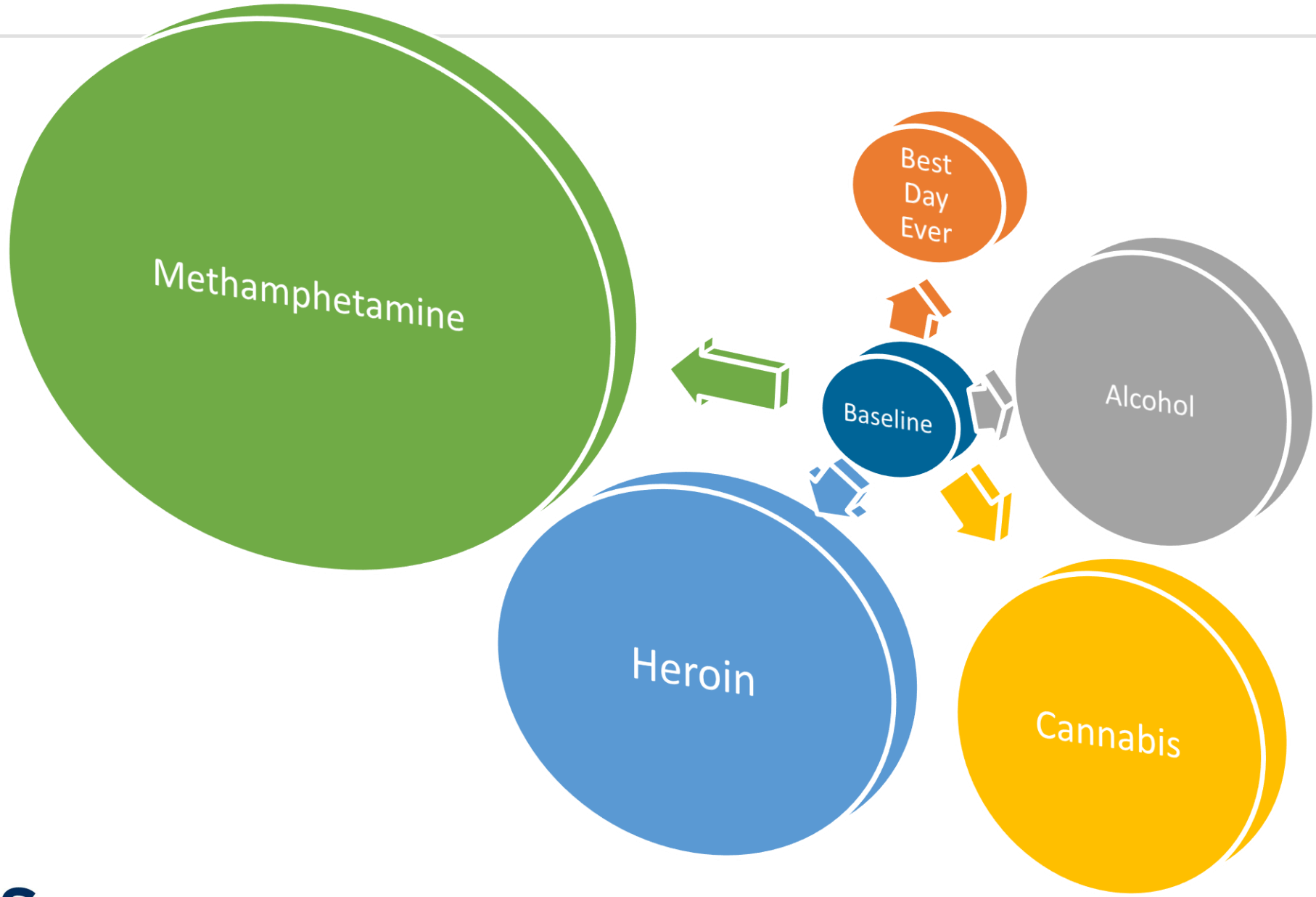
Frontal Lobe

Nucleus Accumbens

Ventral Tegmental Area

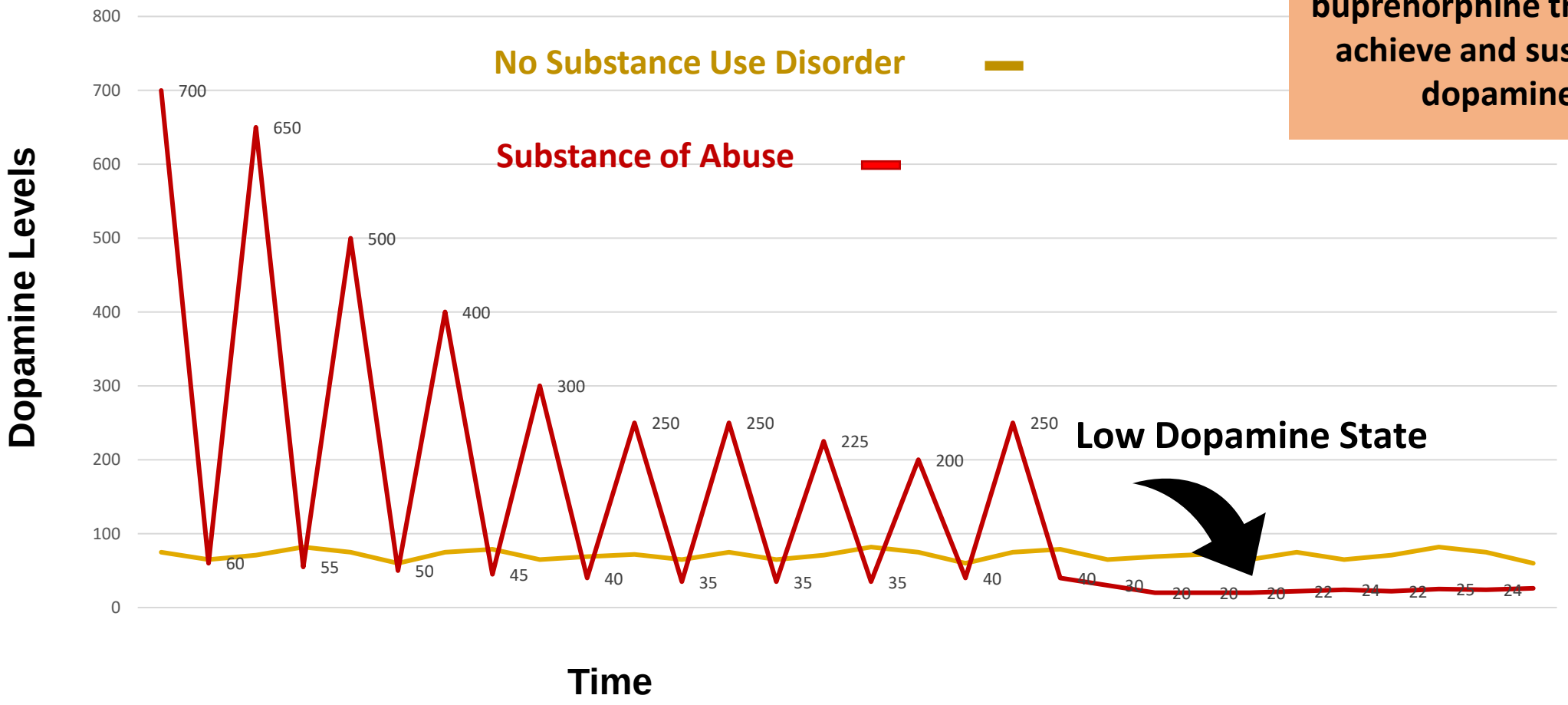


DOPAMINE RESPONSE



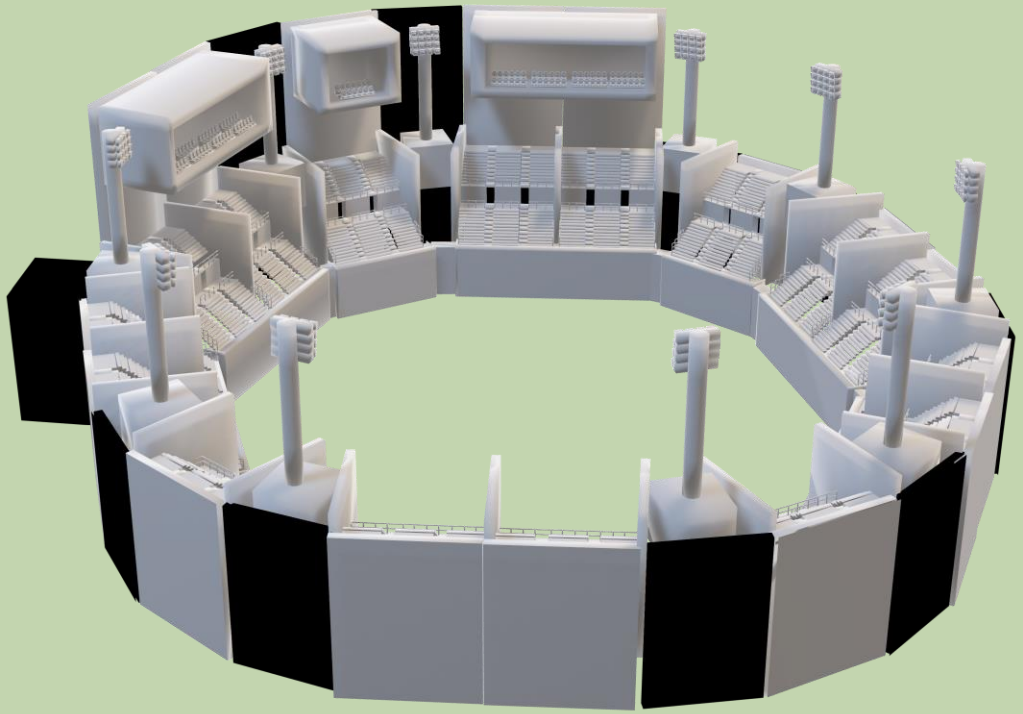
BRAIN CHANGES WITH EPISODES OF SUBSTANCE USE

Goal of methadone and buprenorphine treatment is to achieve and sustain normal dopamine level.

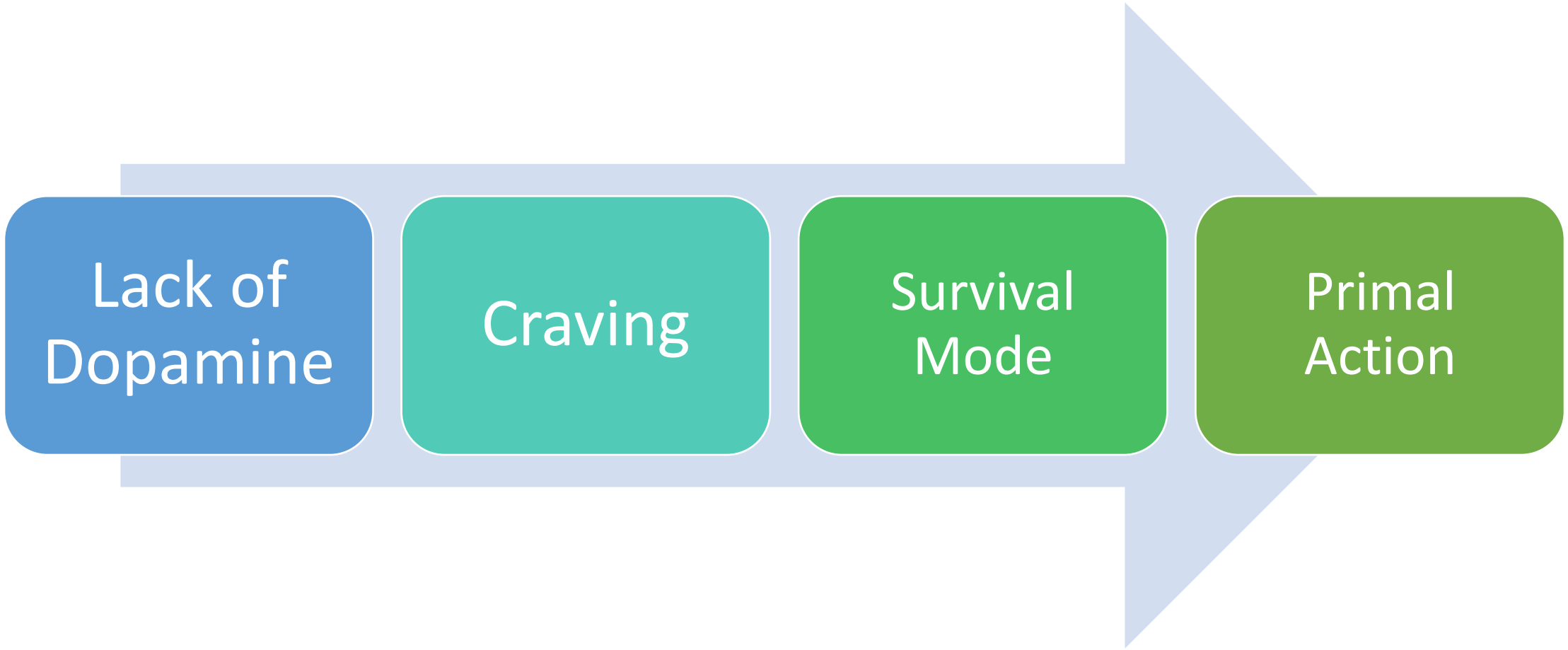


INTENSITY OF CRAVINGS

A direct, or indirect, force pulling someone towards a substance or behavior



BEHAVIOR




CHATTERFALL

CHATTERFALL

Think about someone you know who has struggled with addiction.

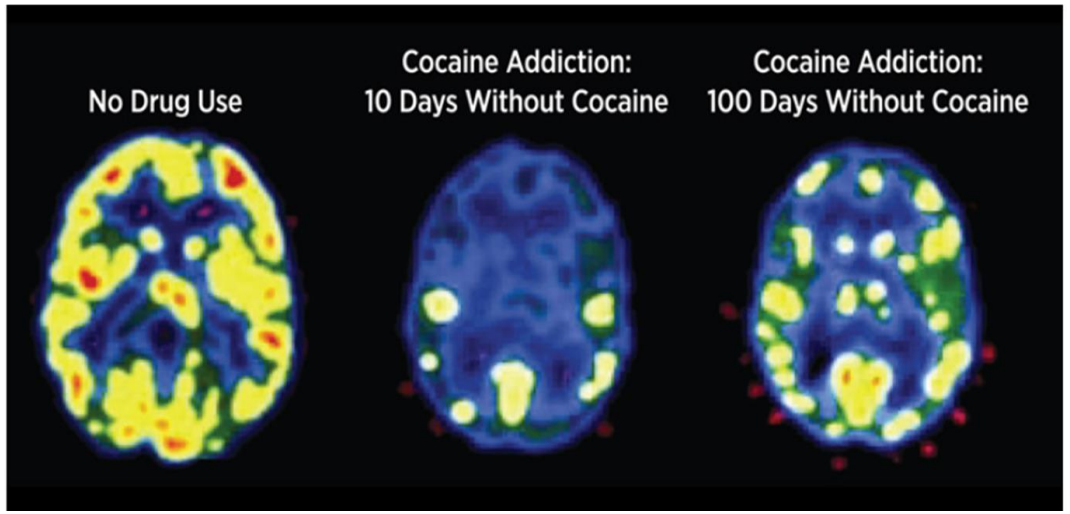
Reflecting on what you have heard so far today, has your thinking about their behavior related to addiction changed?

If yes, please type a brief sentence about how your thinking may have changed.

IT TAKES TIME FOR YOUR BRAIN TO RECOVER

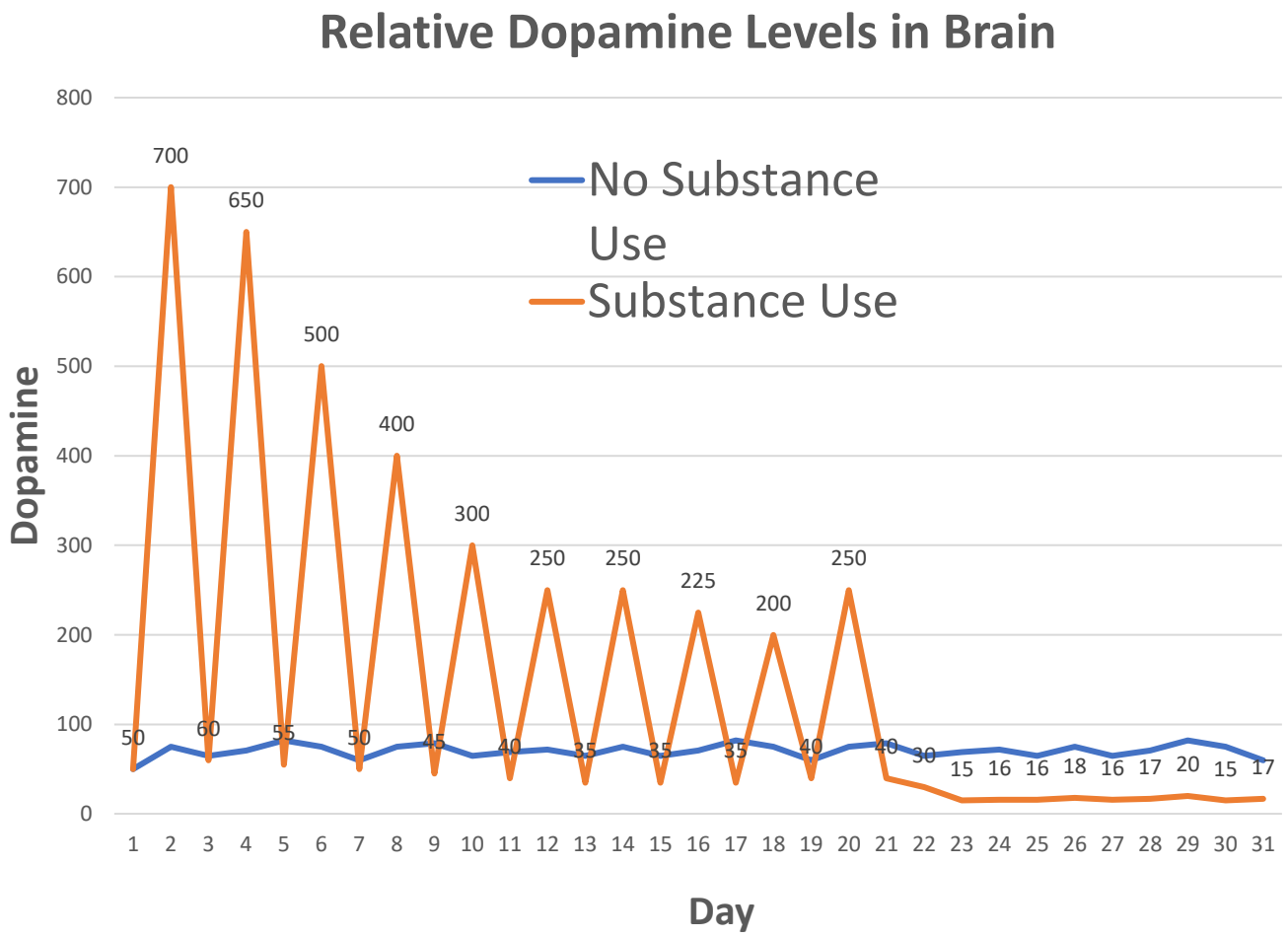
- Prolonged drug use changes the brain in long lasting ways
  - Structure and function of the brain
- Return to the brain function you had before substances of abuse, takes over 1 year
- If you stop medication before a year, you may lose the desired benefits

How the Brain Changes and Recovers From Drug Use



Source: https://nida.nih.gov/publications/teaching-addiction-science/bringing-power-science-to-bear-drug-abuse-addiction

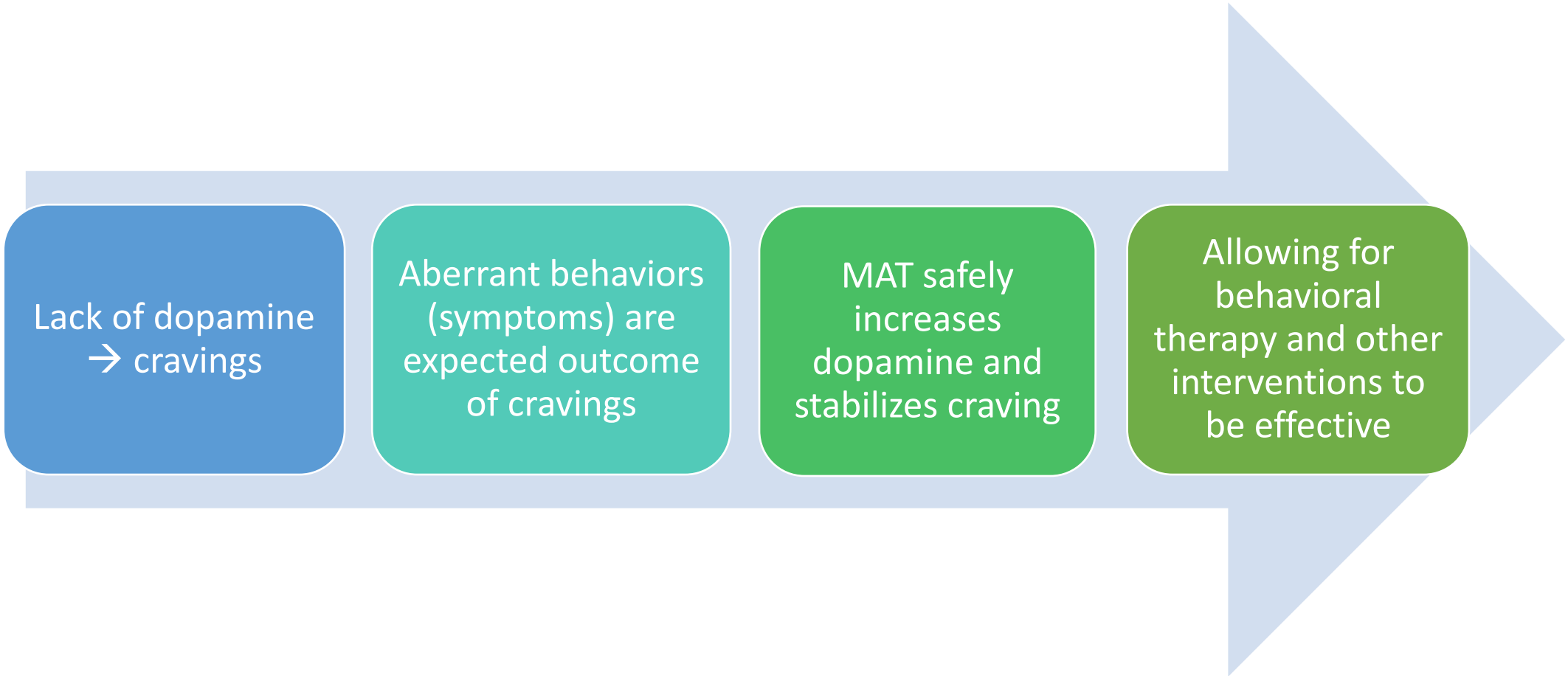
DOPAMINE DEPLETION AFFECTS RECOVERY



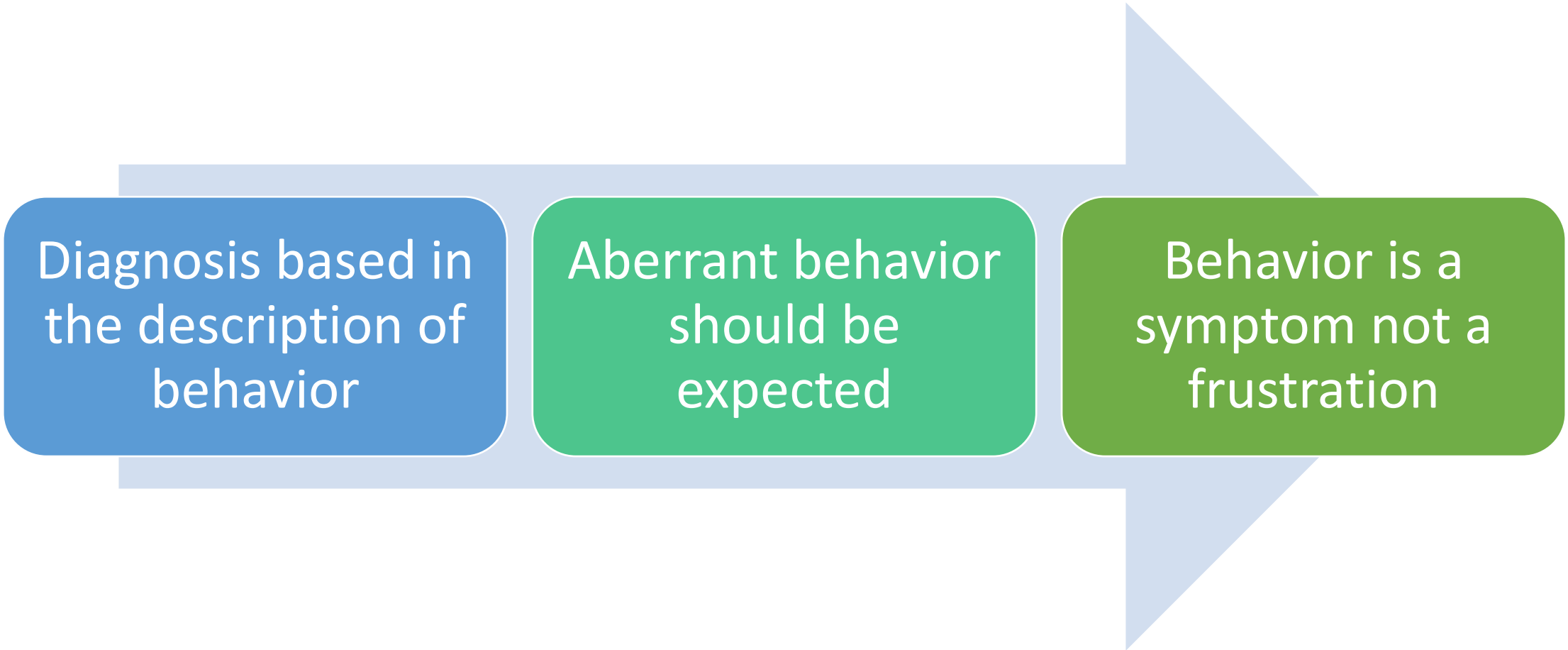
Addressing Dopamine Depletion

- MAT for OUD
- Contingency Management
- Transitioning from external rewards to internal rewards

ADDICTION 101: TREATMENT



UNDERSTANDING ADDICTION TO INFORM TREATMENT



DSM-5: DIAGNOSIS OF OUD

TABLE 1 **Summarized DSM-5 diagnostic categories and criteria for opioid use disorder**

Category	Criteria
Impaired control	• Opioids used in larger amounts or for longer than intended • Unsuccessful efforts or desire to cut back or control opioid use • Excessive amount of time spent obtaining, using, or recovering from opioids • Craving to use opioids
Social impairment	• Failure to fulfill major role obligations at work, school, or home as a result of recurrent opioid use • Persistent or recurrent social or interpersonal problems that are exacerbated by opioids or continued use of opioids despite these problems • Reduced or given up important social, occupational, or recreational activities because of opioid use
Risky use	• Opioid use in physically hazardous situations • Continued opioid use despite knowledge of persistent physical or psychological problem that is likely caused by opioid use
Pharmacological properties	• Tolerance as demonstrated by increased amounts of opioids needed to achieve desired effect; diminished effect with continued use of the same amount • Withdrawal as demonstrated by symptoms of opioid withdrawal syndrome; opioids taken to relieve or avoid withdrawal

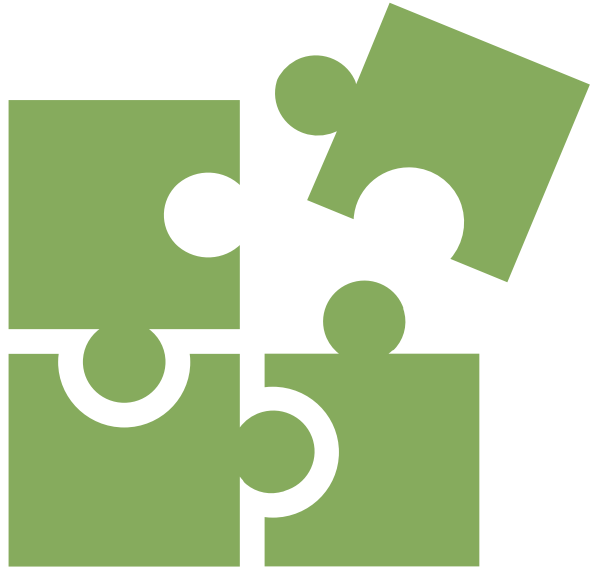
Chronic Diseases: Addiction and Diabetes

Cause? Genes, Environment and Behavior

Prevention? Environmental and Behavior Change

Treatment? Long Term Biochemical Replacement and Lifestyle Changes

What is Different?



UNDERSTANDING ADDICTION TO INFORM TREATMENT

Diabetes and Addiction: You make a mistake…what could you lose?

	Diabetes	Addiction
Treatment	No	**Yes**
Custody of Children	No	**Yes**
Freedom (Probation, Incarceration)	No	**Yes**
Housing	No	**Yes**
Family	No	**Yes**
Work Identity	No	**Yes**

MEDICATIONS FOR ADDICTION TREATMENT

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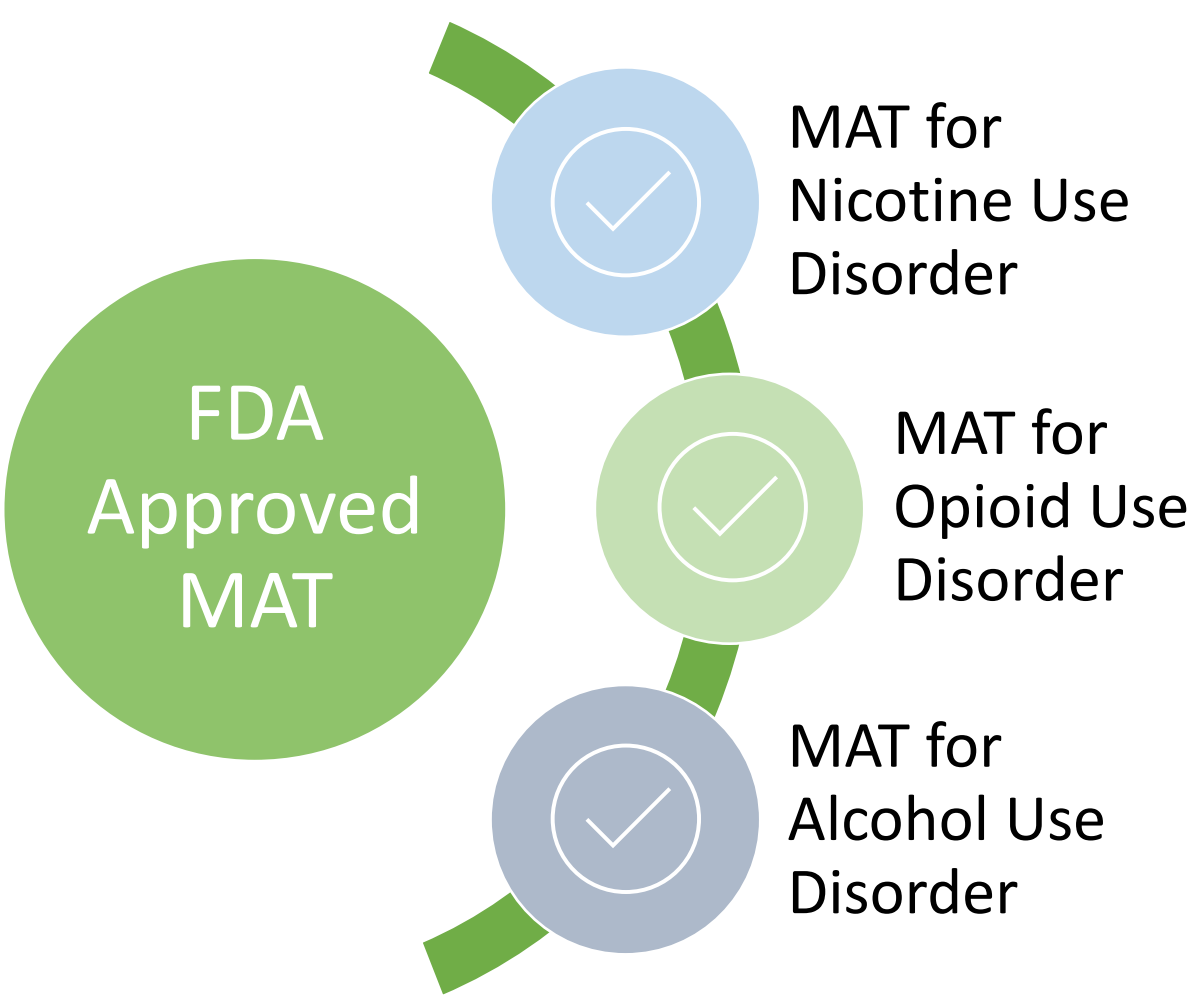
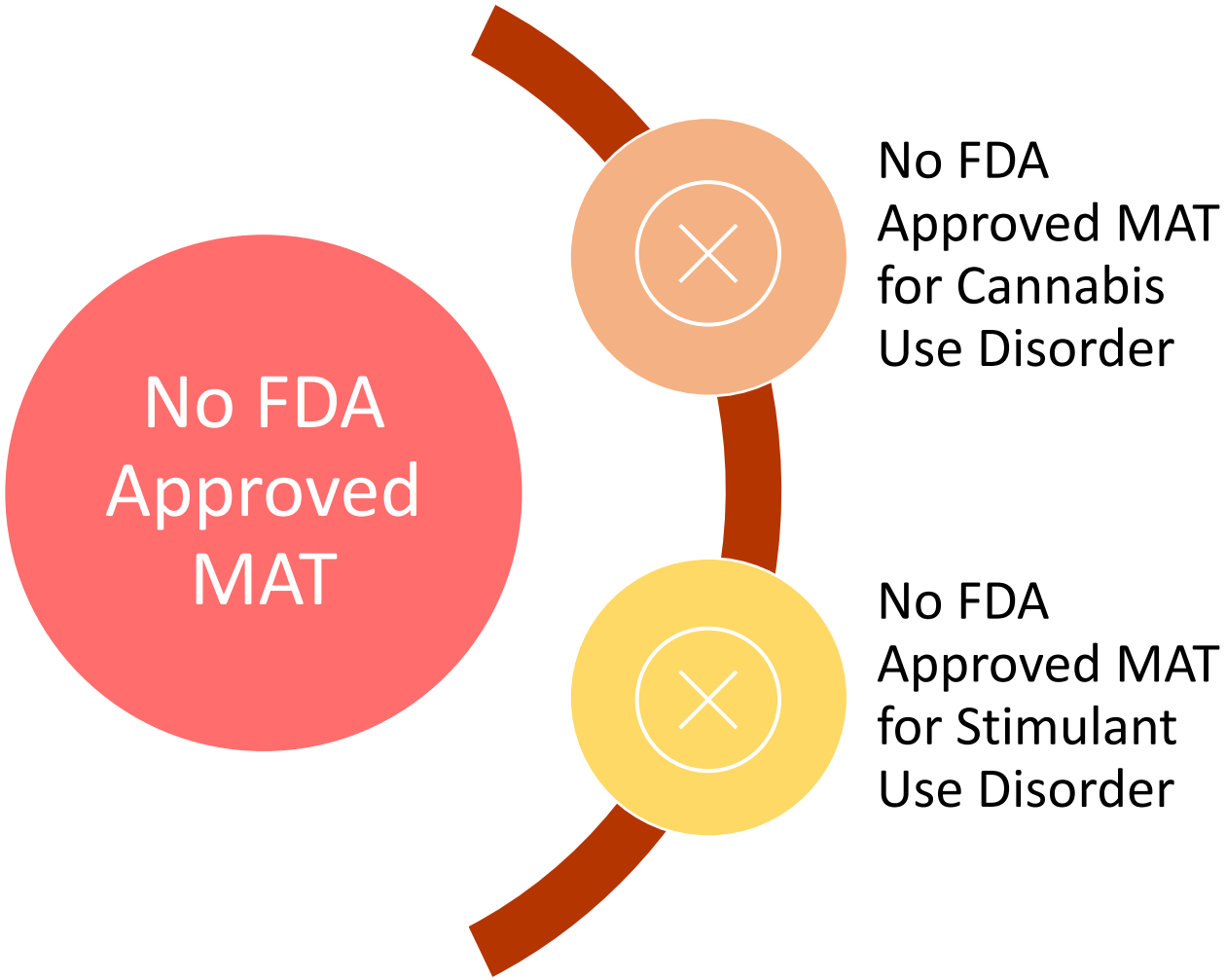
FDA APPROVED MEDICATIONS FOR SUD





WHY IS MAT FOR OUD IMPORTANT?

Treat Withdrawal	Address Dopamine Depletion	Treat OUD	Achieve Results
• Symptoms include Muscle pain, dilated pupils, nausea, diarrhea, abdominal cramping, piloerection ○ Lasts 3-7 days ○ Using methadone or buprenorphine is recommended over abrupt cessation due to risk of relapse, overdose (OD) & death	• Reward/motivation pathway ○ Depletion persists for months-years after people stop using ○ Treated with methadone or buprenorphine	• Abstinence based treatment results in 85% relapse within 1 year vs. 60% with MOUD	• Increases retention in treatment • Decreases ○ opioid use ○ cravings ○ overdose ○ complications IVDU and other risky behaviors ○ criminal behavior

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Sources:
Mattick, RP & Hall W (1996) Lancet 347: 8994, 97-100.
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Rich, JD, et al. (2015) Lancet

AGONIST VERSUS ANTAGONIST

- An **agonist** is a drug that activates certain receptors in the brain. Full agonist opioids activate the opioid receptors in the brain fully resulting in the full opioid effect. **Partial agonist** opioids activate the opioid receptors in the brain, but to a much lesser degree than a full agonist.
- An **antagonist** is a drug that blocks opioids by attaching to the opioid receptors without activating them. Antagonists cause no opioid effect and block full agonist opioids.

Source: U.S. Department of Health and Human Services. Indian Health Services. Pharmacological Treatment https://www.ihs.gov/opioids/recovery/pharmatreatment/

FDA APPROVED MAT FOR OUD

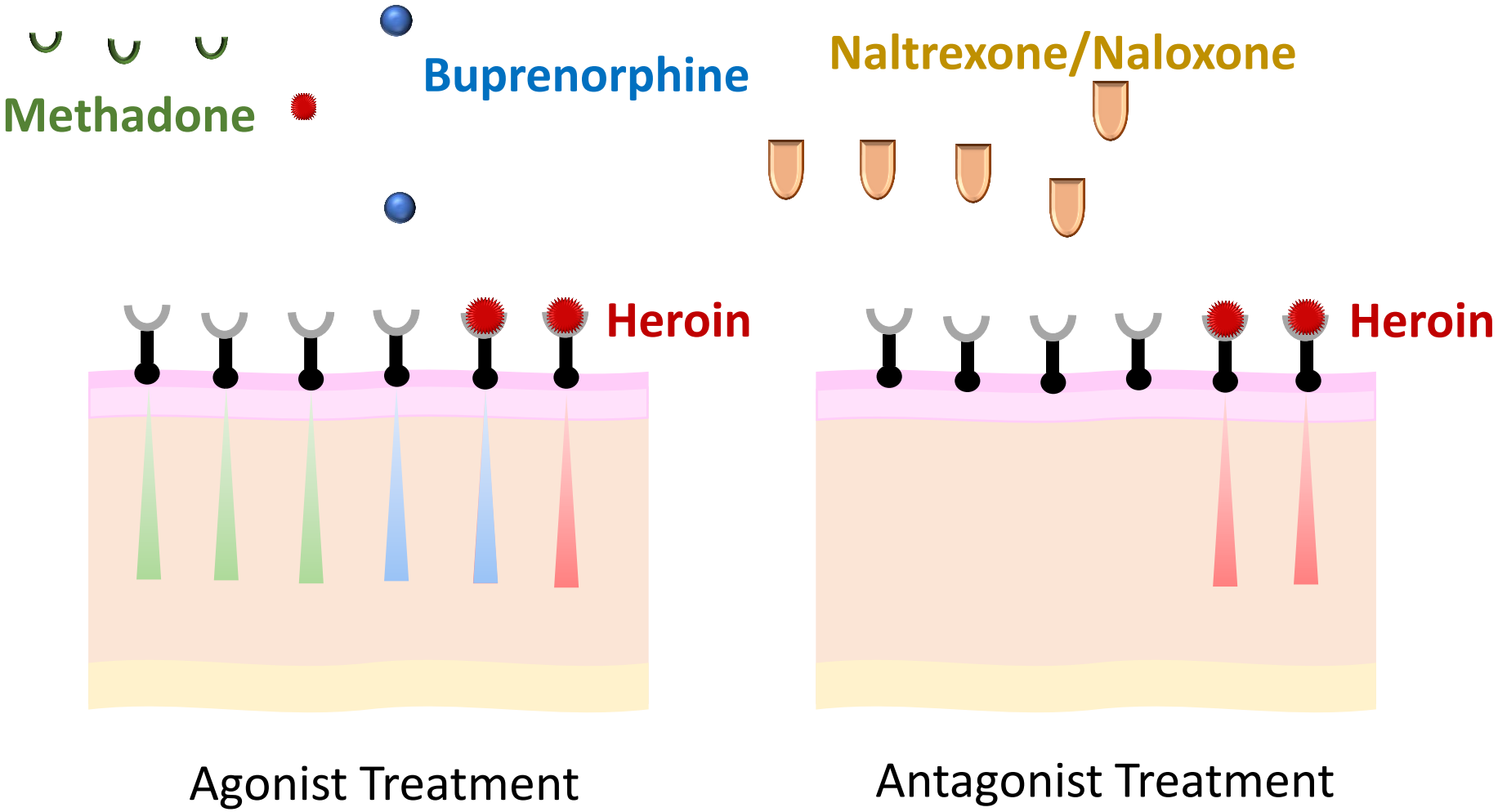
Agonist Treatment:

- Methadone- approved for cough in 1940s, for OUD 1972
- Buprenorphine-approved in 1981 for pain; oral approved for OUD 2002, patch, implants & injection later

Antagonist Treatment:

- Naltrexone- oral approved 1984; injectable 2006 AUD, 2010 OUD
- Naloxone- approved 1961, autoinjector 2014, nasal spray 2015

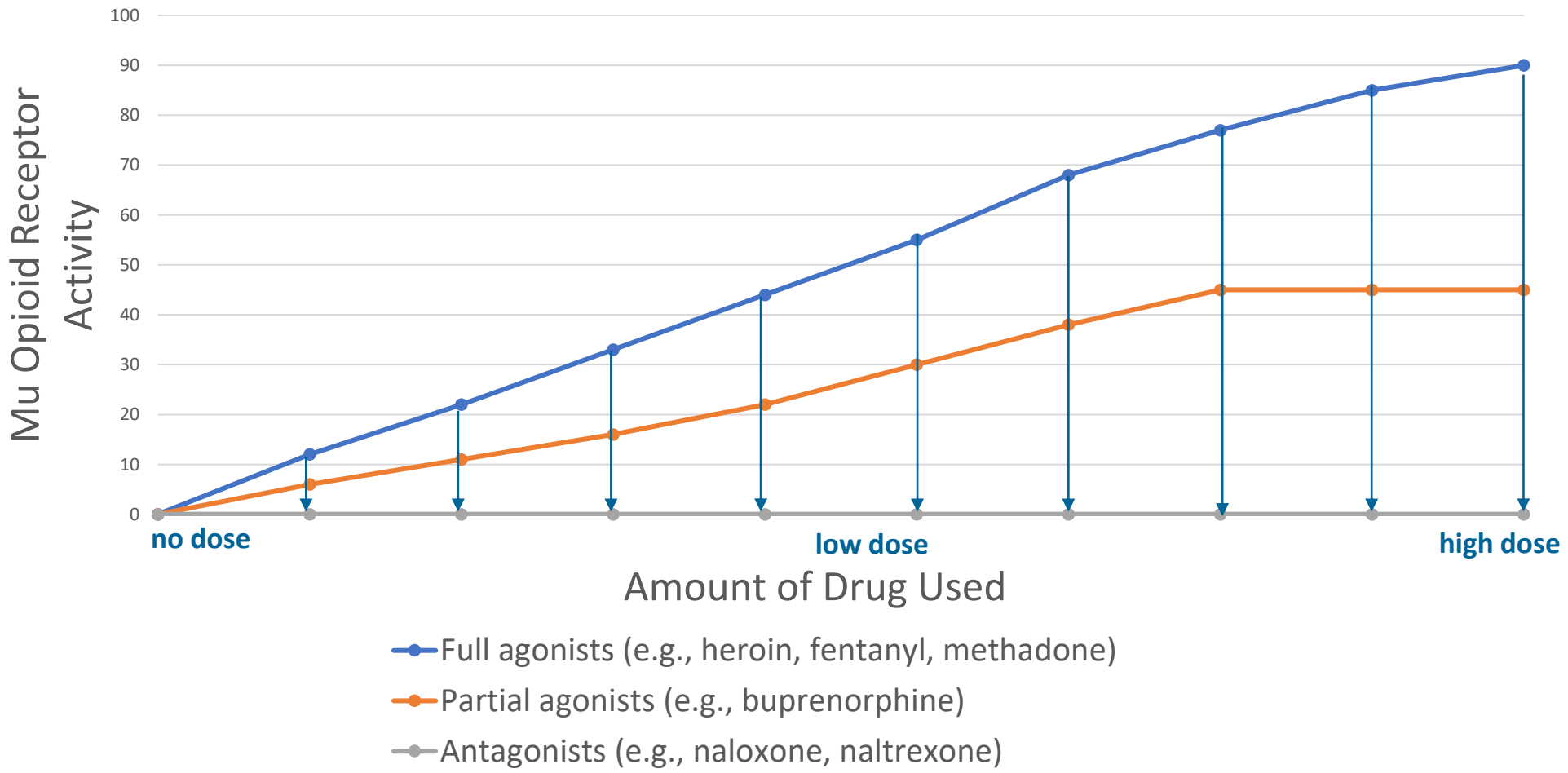
HOW DO THESE MEDICATIONS WORK?



Agonist turns on the receptor
Antagonist blocks receptor from turning on

FULL, PARTIAL, OR NO EFFECT

- Buprenorphine, Naloxone, and Naltrexone can all cause precipitated withdrawal.



METHADONE: WHAT AND FOR WHOM?

- Mu opioid agonist without a “ceiling effect”
- Reaching a therapeutic dose (60-120mg) takes time
  - <60 mg/d is not therapeutic
  - Increased frequency and daily dose required during pregnancy
- Several significant drug-drug interactions
- Illegal to write prescription for methadone to treat OUD unless:
  - Narcotic Treatment Program (NTP)
  - Hospital
  - Covering a gap of ≤3 days

Patients with a more severe OUD

Patients who would benefit from the services available in an OTP environment

Patients who were not reached treatment goals with other MOUD

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METHADONE: GENERAL FEDERAL REGULATIONS

Highly monitored in a Narcotics or Opioid Treatment Program setting (NTP/OTP)

Once patient is stable and after 6 weeks, can be given take-home doses *

Delivered initially via observed dosing

Many requirements for treating patients

** OUD >1 y requirement for methadone removed by Omnibus Bill 12.29.22, 18 months for HHS to implement; Proposed Rule https://public-inspection.federalregister.gov/2022-27193.pdf*

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BUPRENORPHINE: WHAT AND FOR WHOM?

- Partial Mu opioid agonist with ceiling effect
  - Available alone or in combination w/naloxone
  - Different formulations (SL and buccal pill/film, injectable)
  - Combination formulation averts diversion
- Greater binding affinity than most full agonists
  - Start buprenorphine when client in moderate withdrawal (to avoid causing precipitated withdrawal)
- Many ways to do initiation (protocols needed)
  - Typical dose is 16-24 mg/d
  - Dosing adjustments required during pregnancy
- Fewer drug-drug interactions than methadone

Opioid use disorder or withdrawal

Patient wants agonist treatment

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BUPRENORPHINE: GENERAL REGULATIONS

DEA X-Waiver updates

https://www.deadiversion.usdoj.gov/pubs/docs/index.html

X waiver no longer required

Use standard DEA number for buprenorphine prescriptions

No cap on number of people treated with buprenorphine

CONSIDERATIONS FOR THOSE IN THE CRIMINAL JUSTICE SYSTEM

- Forcible withdrawal or transition for persons on agonist treatment is not advised
  - Fifty percent (50%) of those forcibly withdrawn DO NOT return to treatment
  - Jails that forcibly withdraw people from agonist treatment are being sued and losing (ADA violation)
  - Patients can be transitioned from methadone to buprenorphine, but this is complex and requires planning and expertise
- Pregnant women receiving MAT *should* be maintained on agonist treatment to avoid risk to pregnancy and the fetus

NALTREXONE: WHAT AND FOR WHOM?

- Mu opioid antagonist with high, competitive binding affinity
- Does NOT treat withdrawal or underlying dopamine depletion
- Client must be opioid free 7 days before starting
- More readily accepted in criminal justice and “abstinence-only” communities
- Evidence of decreased mortality is limited *

Patients with a high degree of motivation (dopamine)

Patients who did not reach treatment goals with methadone or buprenorphine

Can be for occasional use/ high risk situation or as “back-up” after discontinuation of methadone or buprenorphine

Source: Larochelle, et al. Medication for opioid use disorder after nonfatal opioid overdose and association with mortality. A cohort study. Annals of Internal Medicine. 169:3 (2018) 137-45.

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NALTREXONE: GENERAL REGULATIONS

No Federal regulations inhibit the use

Not all BH clinics have RN to give injections

Multiple formulations:

- Pills at 25mg and 50 mg (50-100 mg for AUD)
- Long acting injectable 380mg (28-30 days)

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NALOXONE OVERVIEW

- Mu opioid antagonist used for opioid overdose (OD) reversal
- Shorter half-life & more rapid onset of action than naltrexone
- High affinity, competitive binding & displaces full agonists
- Intranasal or intramuscular by bystander
- May require more than one dose
- Opioids have longer half-life than naloxone
- CA Assembly Bill 2760- Naloxone prescribing
  - >90mg Morphine Milliequivalents
  - Opioids + benzodiazepines
  - Increased risk of OD: History of OD or SUD

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Evidence-Based Tapering of Agonist Treatment

Evidence is clear that long-term or indefinite treatment with medications for OUDs is often required for effective and sustained outcomes	In practice, successful tapers from methadone or buprenorphine typically occur in only about 15 percent of cases	According to the U.S. Surgeon General, successful tapers typically occur, if at all, when individuals have been treated with MAT for at least 3 years

1. National Academies of Science, Engineering, and Medicine. (2019). Medications for opioid use disorders saves lives. Washington, DC: The National Academies Press.
2. Nosyk, B., Sun, H., Evans, E., Marsh, D. C., Anglin, M. D., Hser, Y. I., & Anis, A. H. (2012). Defining dosing pattern characteristics of successful tapers following methadone maintenance treatment: results from a population-based retrospective cohort study. Addiction (Abingdon, England), 107(9), 1621–1629.
3. Substance Abuse and Mental Health Administration. (2018). Medications for opioid use disorder: Treatment improvement protocol (TIP 63) for healthcare and addiction professionals, policy makers, patients and families. (Rep. No. HHS Publication No. SMA 18-5063). Bethesda, MD: Author.
4. Substance Abuse and Mental Health Administration. (2018). Facing addiction in America: The Surgeon General's spotlight on opioids; Washington, DC: US Department of Health and Human Services.

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TIME FOR A POLL…

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POLL

Do you know anyone who has received MAT for OUD?

A. Yes
B. No

If you answered yes in the previous poll, from your perspective, is/was this treatment helpful for them?

A. Yes
B. No
C. N/A (I do not know anyone who has received MAT for OUD)

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QUESTIONS?

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POLLING QUESTIONS

1. Overall, today's webinar was:
   A. Very useful
   B. Somewhat useful
   C. Not very useful
   D. Not useful at all

2. The material presented today was:
   A. At the right level
   B. Too basic
   C. Too detailed

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THANK YOU!

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