



The Effect of Opioids on Brain Function, Pain, and Opioid Use Disorder

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Learning Objectives

- Describe the effects of opioids on brain function
- Define the effects of opioids on pain relief over time
- Differentiate between full and partial agonists and antagonists for opioid use disorder





HOW Rx PAINKILLERS AFFECT THE BRAIN

When a painkiller such as oxycodone (OxyContin, Tylox, Percocet) enters the body, it works by stimulating certain opioid receptors that are located throughout the central nervous system, in the brain and along the spinal cord. When the chemical binds to these receptors, a variety of physiologic responses can occur, ranging from pain relief to slowed breathing and euphoria.

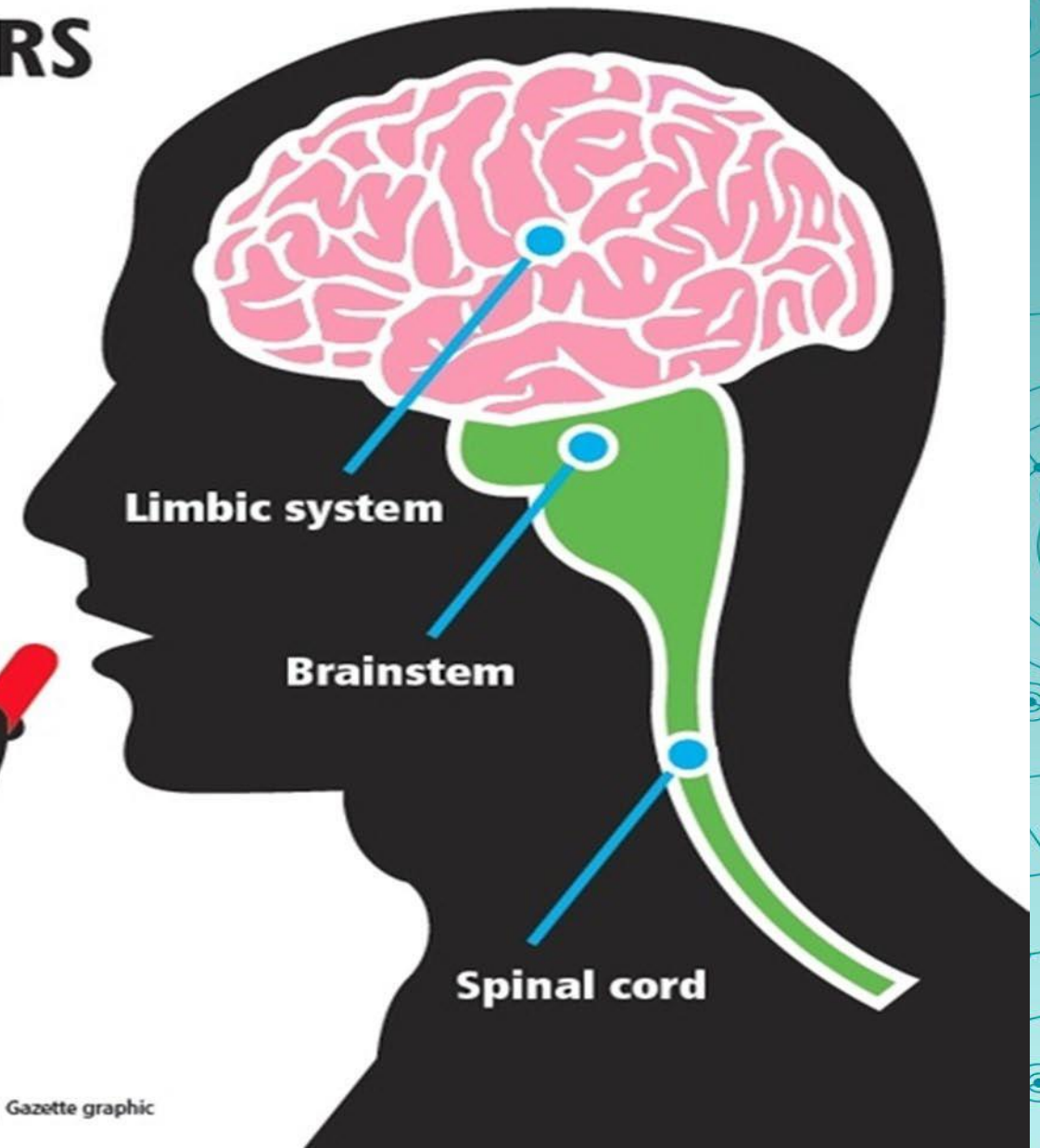
The **limbic system** controls emotions. Acting here, painkillers can produce feelings of pleasure, relaxation and contentment.

The **brainstem** controls automatic body functions such as breathing. Acting here, painkillers can slow breathing, stop coughing and lessen the intensity of pain.

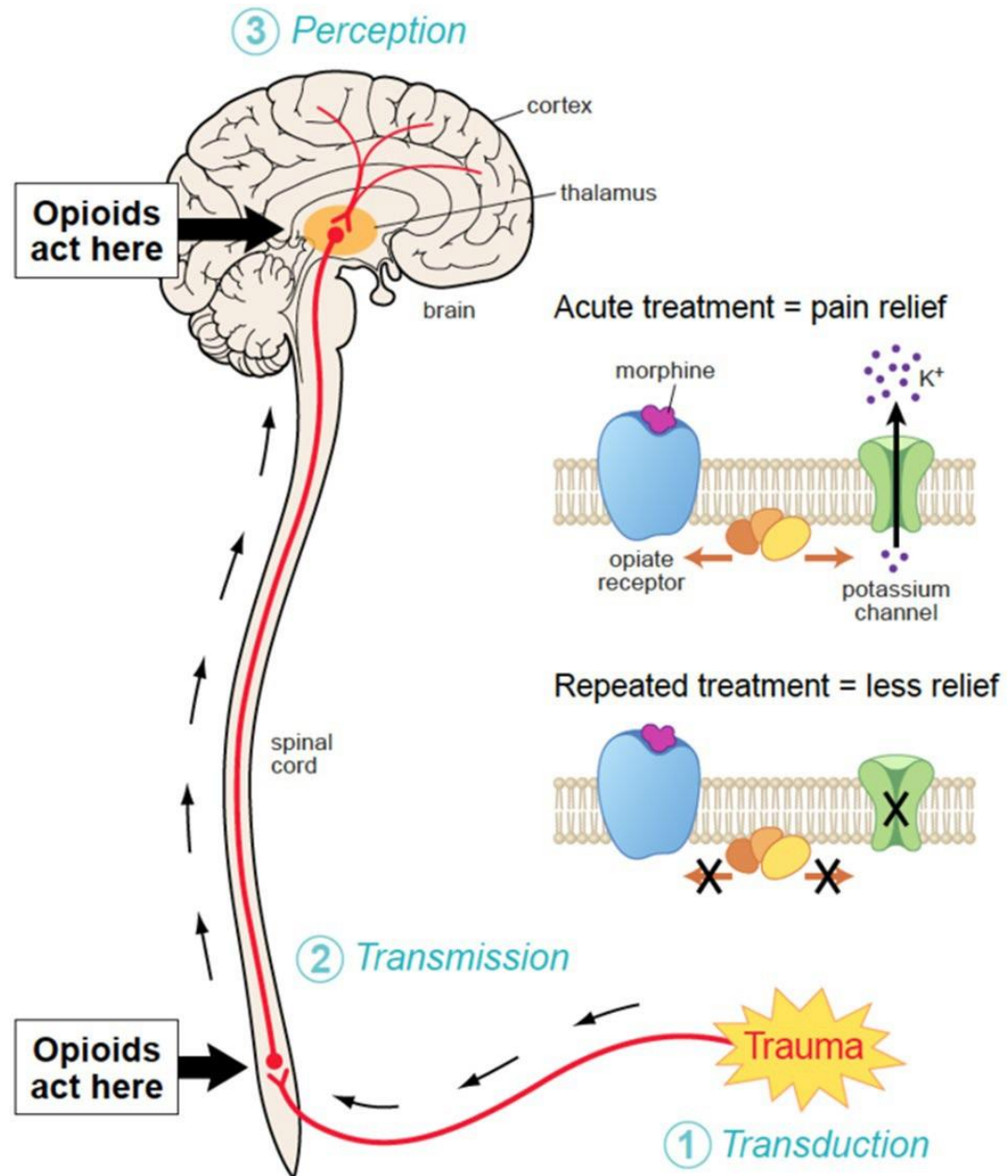
The **spinal cord** transmits sensations from the body. Acting here, painkillers bond with the spinal cord to decrease the intensity of pain.

SOURCES: National Institute for Drug Abuse, Discovery Health, Drug Enforcement Agency

KYLE SLAGLE | Gazette graphic



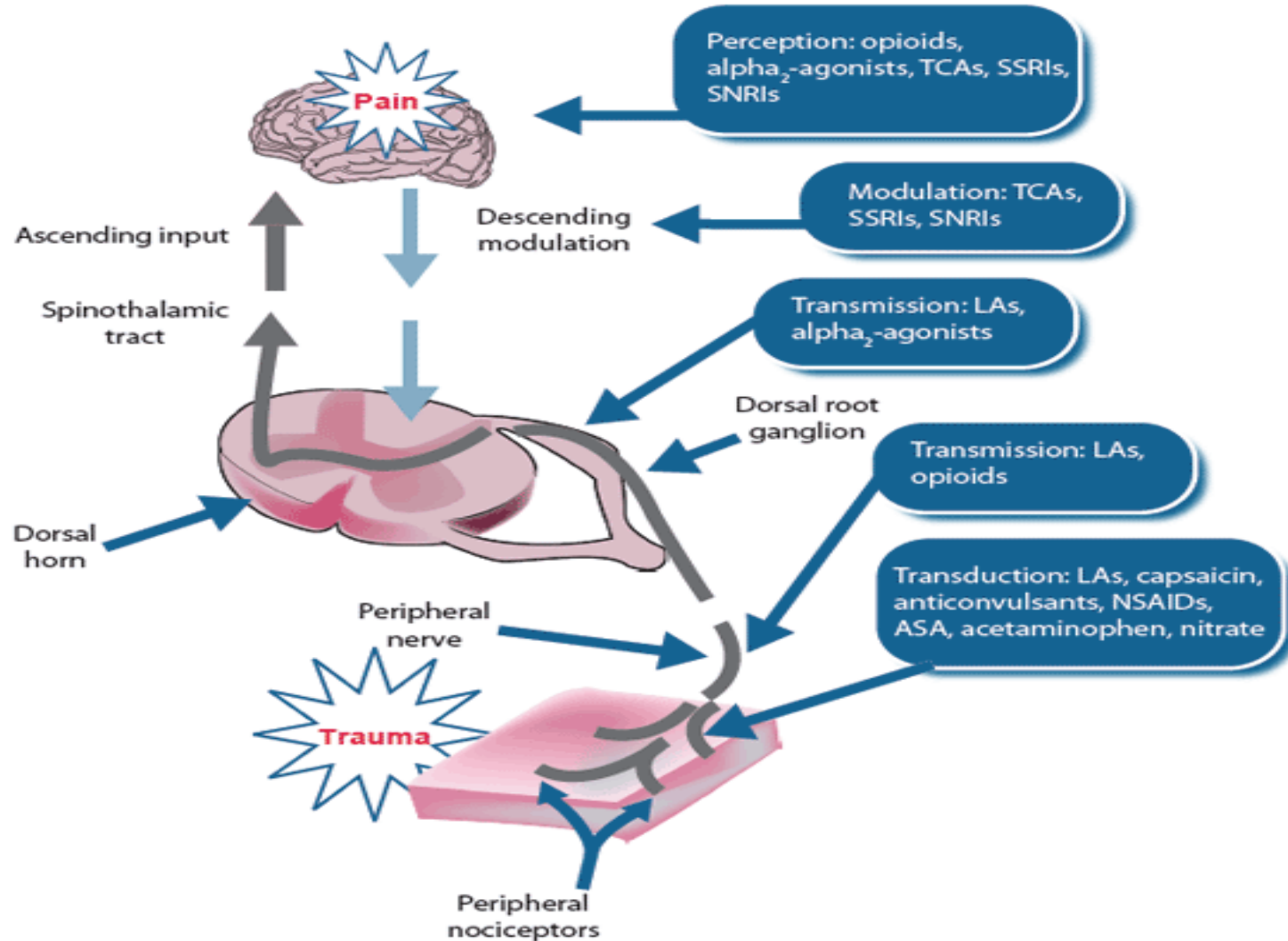
Effect of Opioids on Pain Relief Over Time

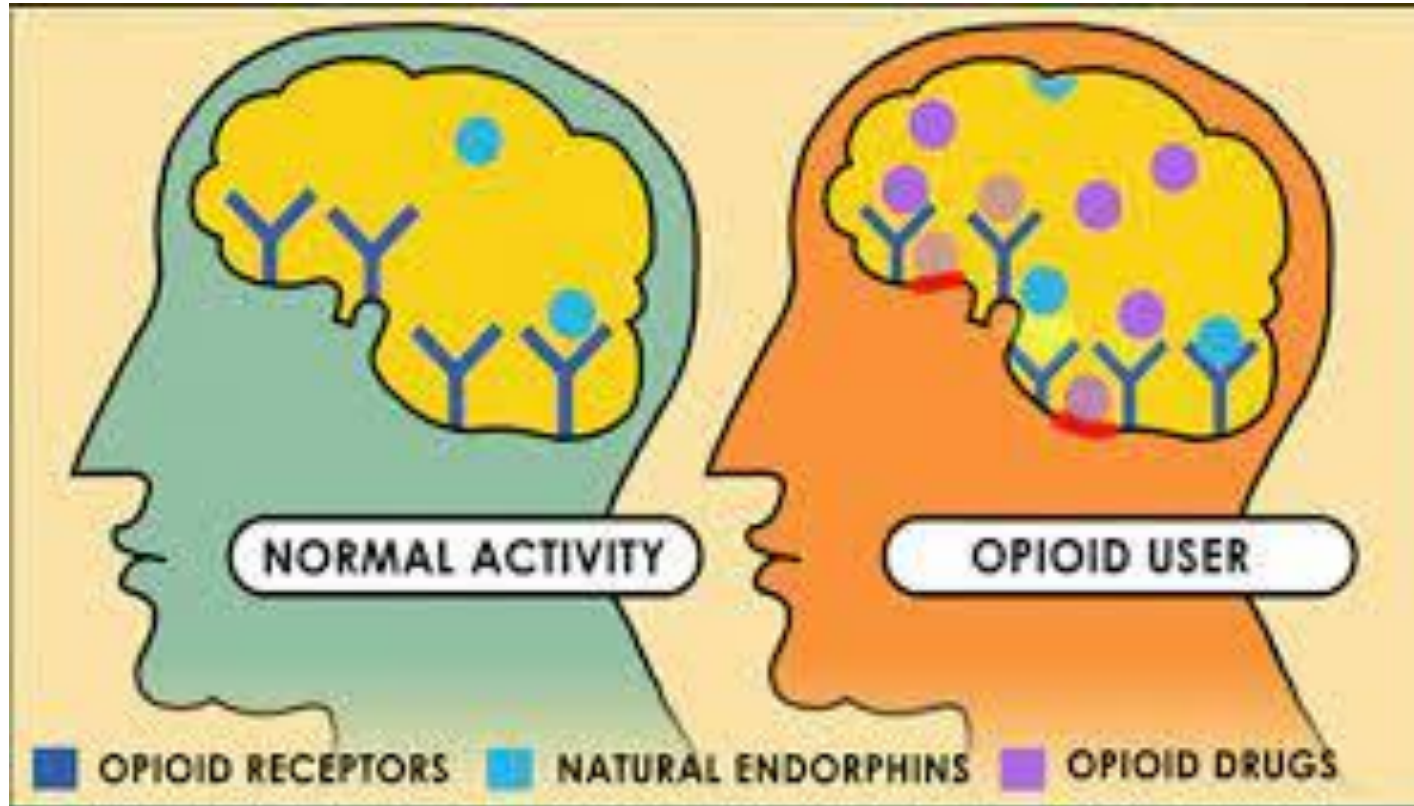


Multiple Learning and Memory Systems

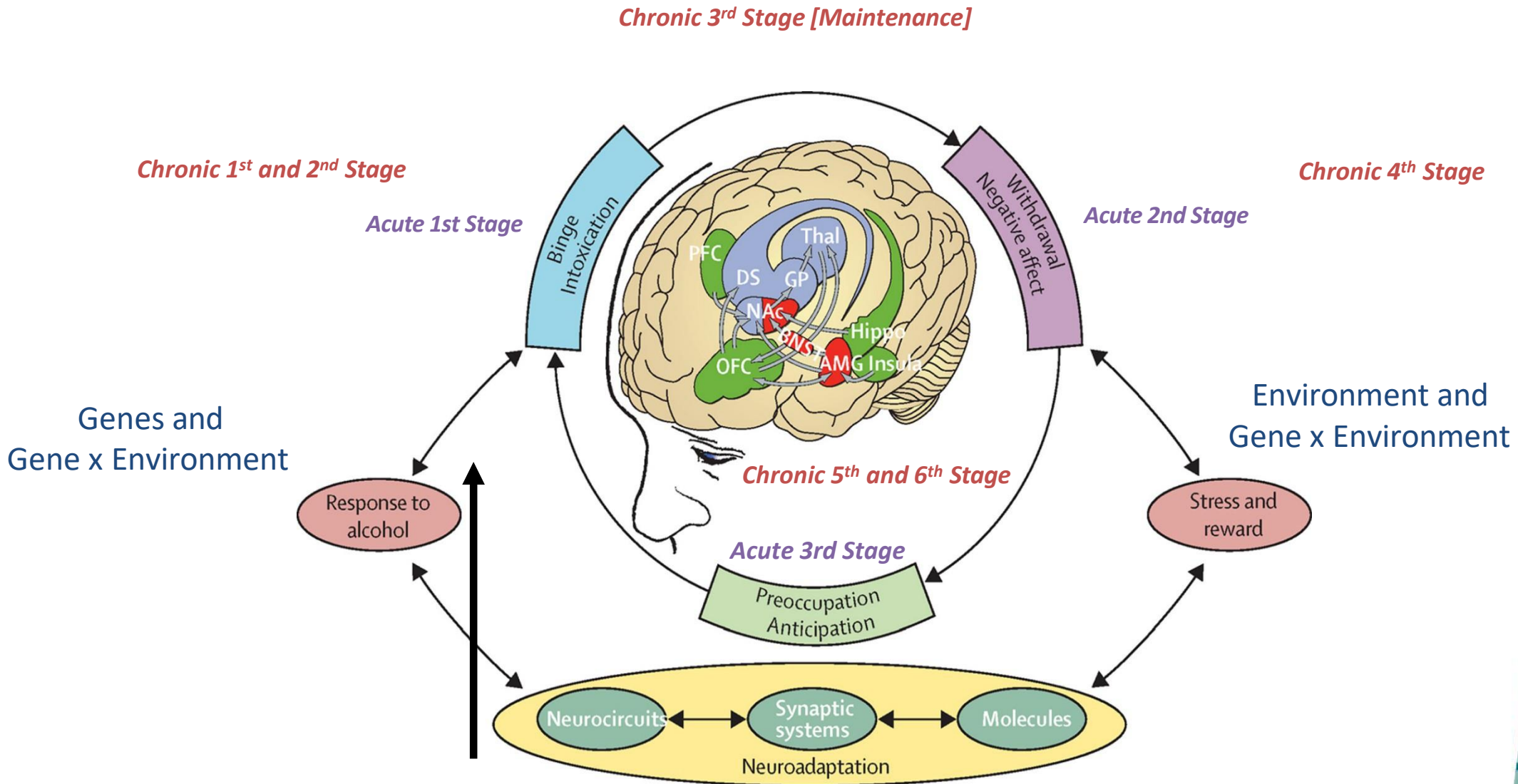
Medscape

www.medscape.com

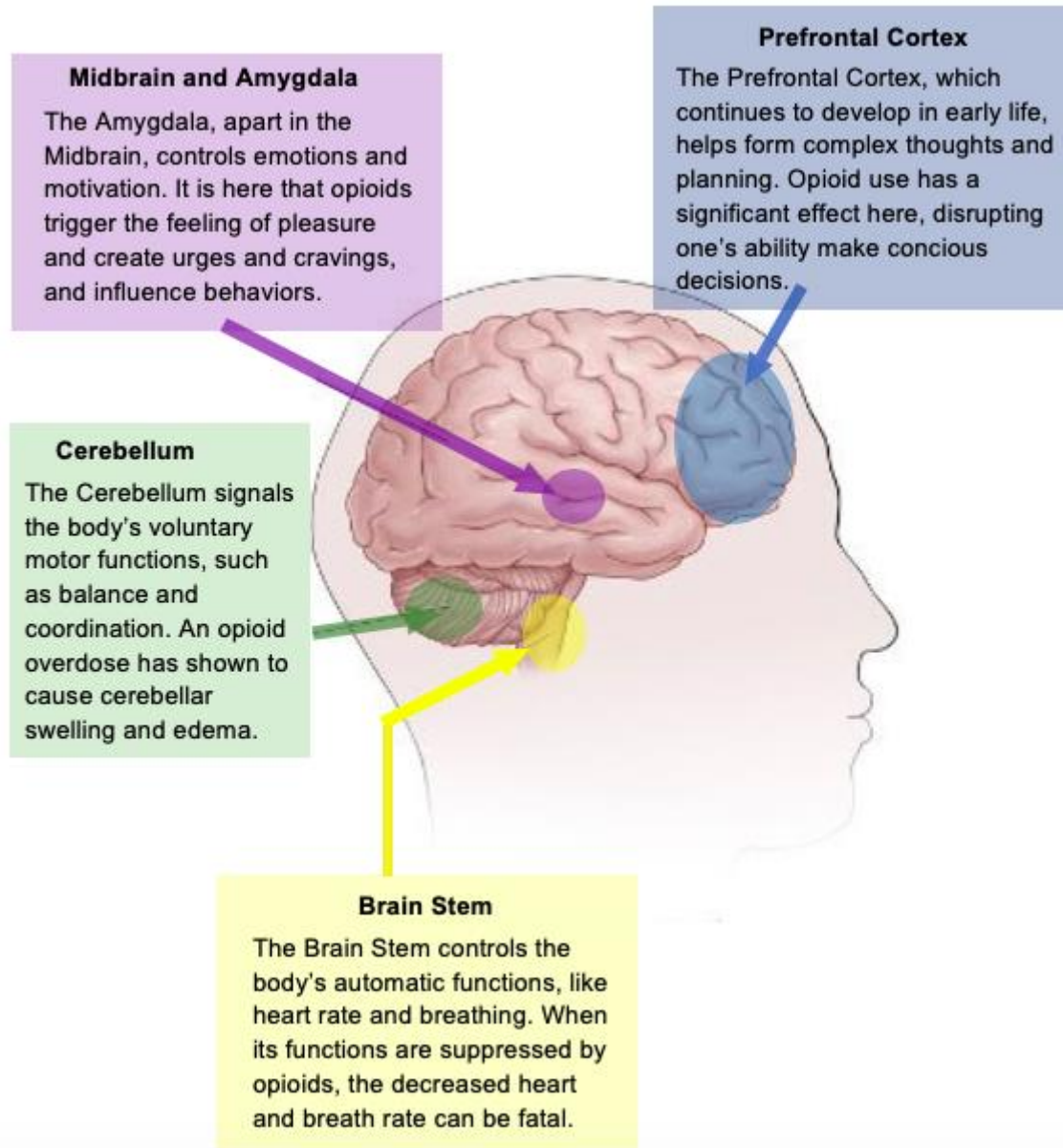




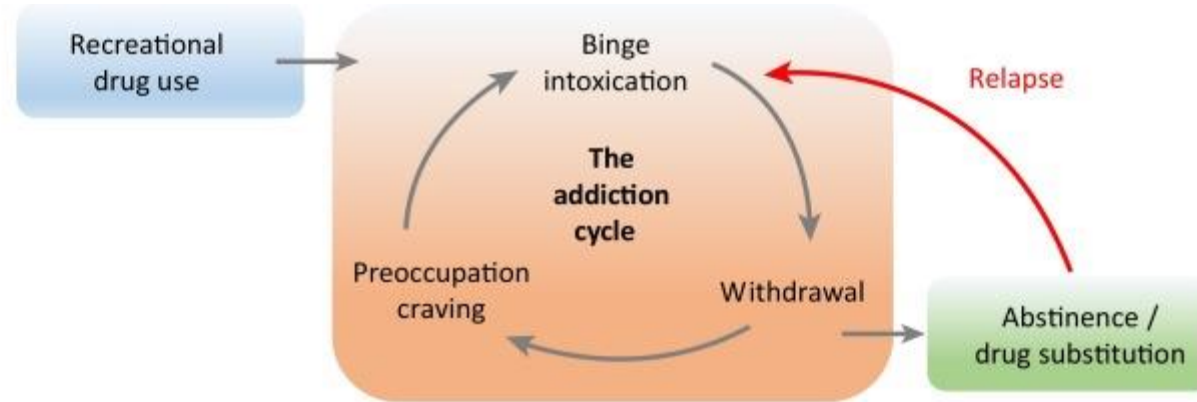
Stages of Addiction



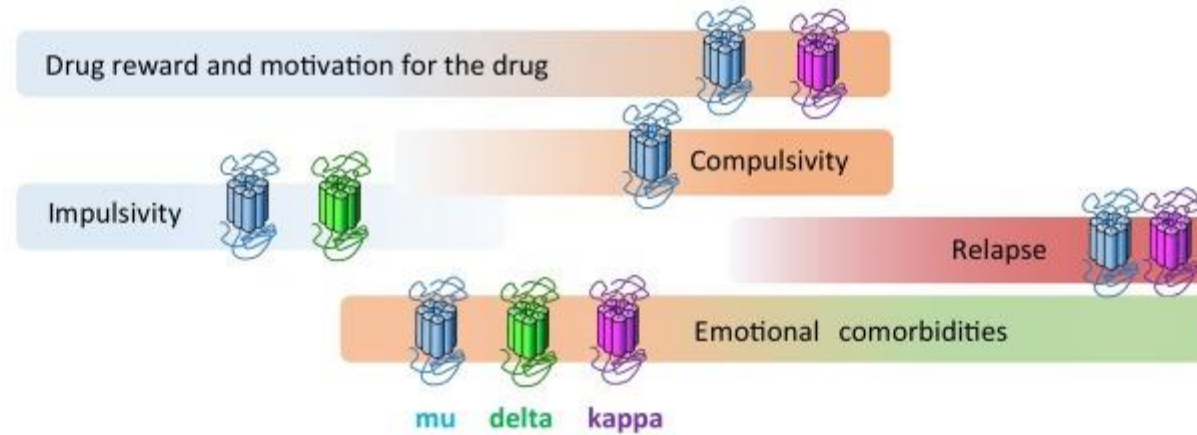
This neurocircuitry is just as relevant for other drugs that are misused (i.e., opiates/opioids).



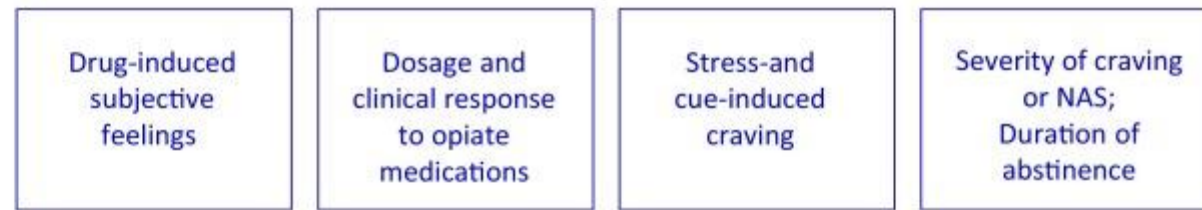
(A) **Natural course of illness**



(B) **Opioid adaptations of neural processes**



(C) **Target phenotypes for biomarkers**



HOW DO OPIOID TREATMENT MEDICATIONS WORK IN THE BRAIN?

Opioids alter your brain chemistry by attaching to opioid receptors. When opioids attach to your receptors, it reduces your perception of pain. As time goes on, it takes more and more opioids to achieve the same effect. Taking opioid treatment medication blocks these receptors to varying degrees (see below) and helps you to stabilize, giving you time to work through the psychosocial aspects of your substance disorder and focus on recovery.



METHADONE



- Full agonist
- Generate effect

BUPRENORPHINE



- Partial agonist
- Generate limited effect

NALTREXONE



- Antagonist
- Blocks effect



Summary

- The limbic system, brainstem, and spinal cord are sites of action for the opioid drugs
- Pain relief from specific opioid doses decreases over time in chronic pain leading to the need for increasing doses
- Other types of medications can be useful in pain relief (TCAs, NSAIDs, SNRIs)
- Genes and the environment play a significant role in neuroadaptation – how our brains are altered physically in the process of substance use disorder
- The neurobiology of substance use disorder provides an evidence base for the use of medications in treatment

