

Street Drug Pharmacology 2020

J. Randall Webber, MPH, CADC, QMHP

JRW Behavioral Health Services

www.randallwebber.com

www.linkedin.com

Emerging Drugs of Abuse discussion group



ADDICTION POTENTIAL

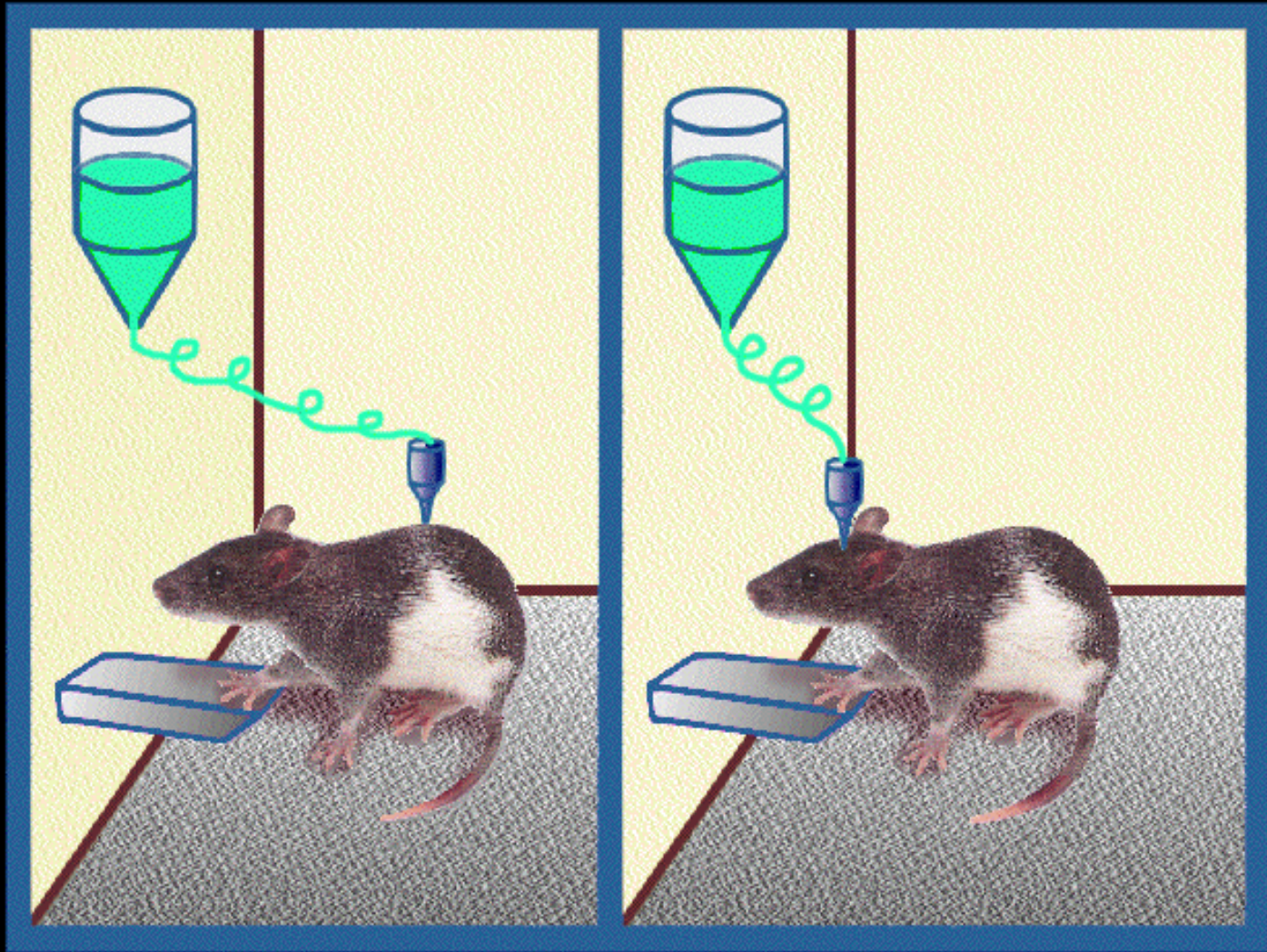
- What percentage of first-time users will enjoy the effect of the drug enough that they will seek it out again?
- If an individual uses the drug on a regular basis, how likely is it that s/he will become dependent on the substance?

ADDICTION POTENTIAL

- After being introduced to the drug, do sub-human animals (e.g., monkeys, rats, mice) seek out opportunities to self-administer the substance? Do they do so to the exclusion of eating, consuming water and engaging in reproductive behavior?

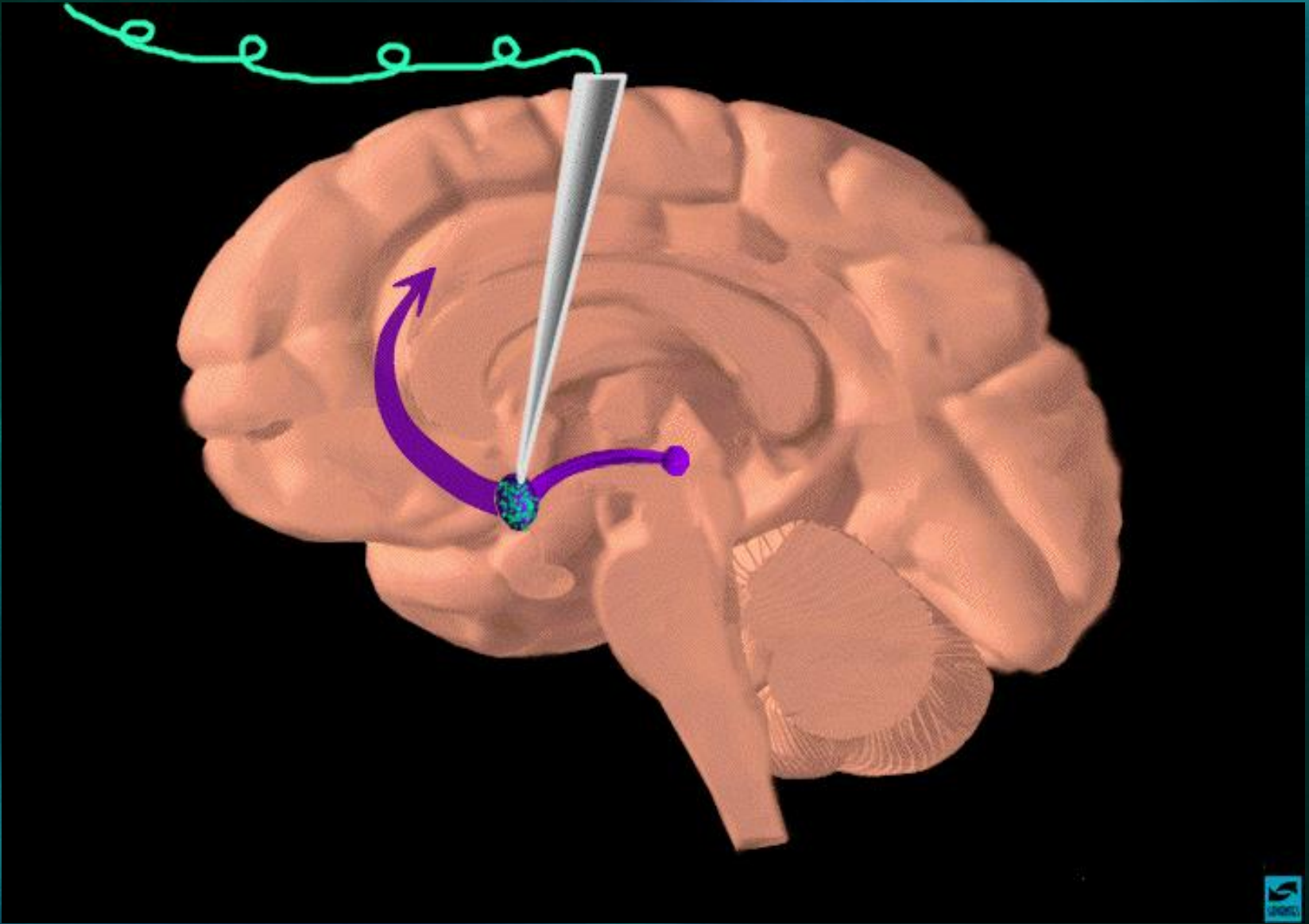
ADDICTION POTENTIAL CAN BE PREDICTED IN PART BY OBSERVING ANIMAL SELF-ADMINISTRATION

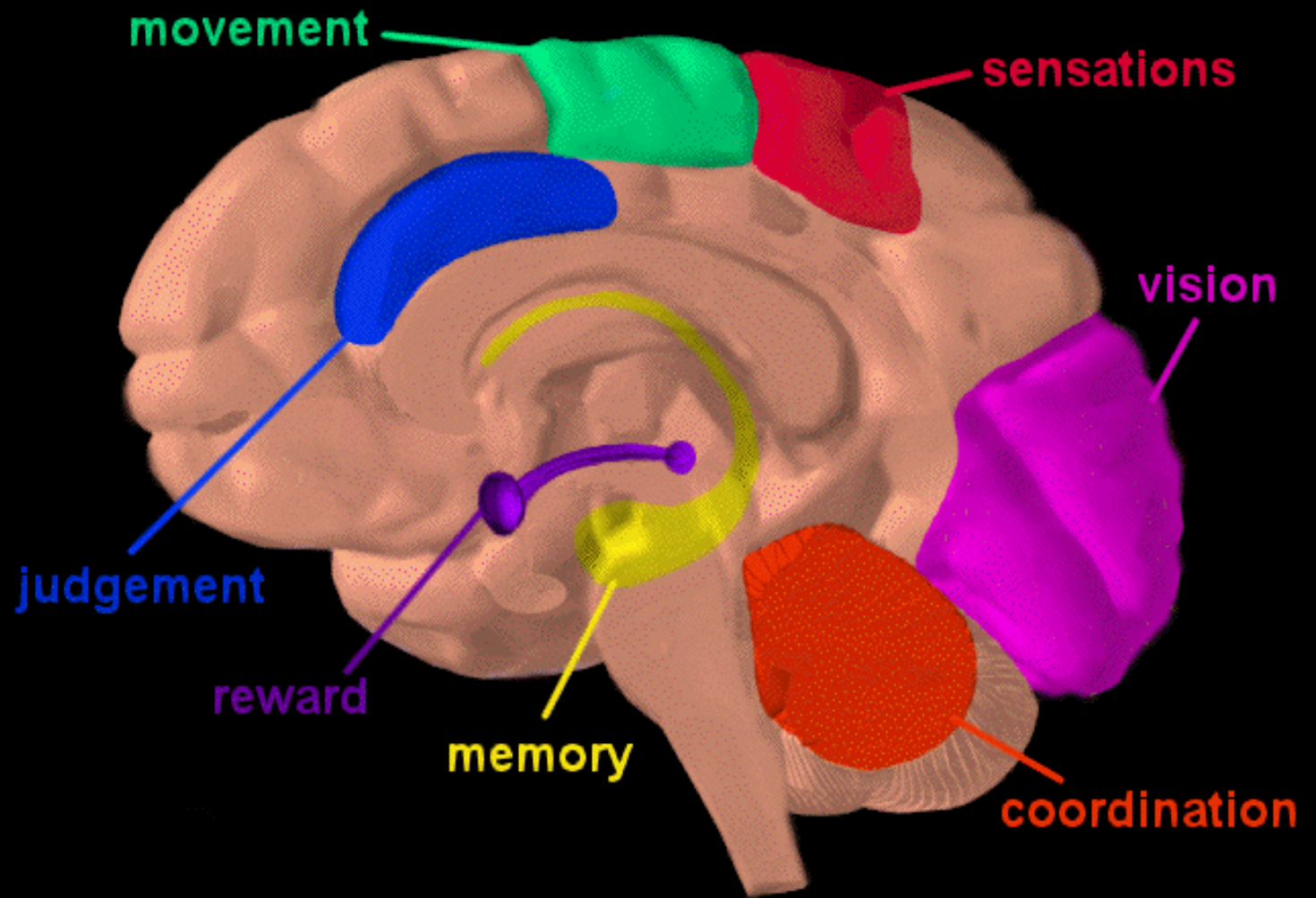




ADDICTION POTENTIAL

- **Ability to stimulate the brain's reward circuits**
- **Ability to meet a individualized neurochemical need**
- **Physical dependency potential**
- **Intensity of withdrawal symptoms**

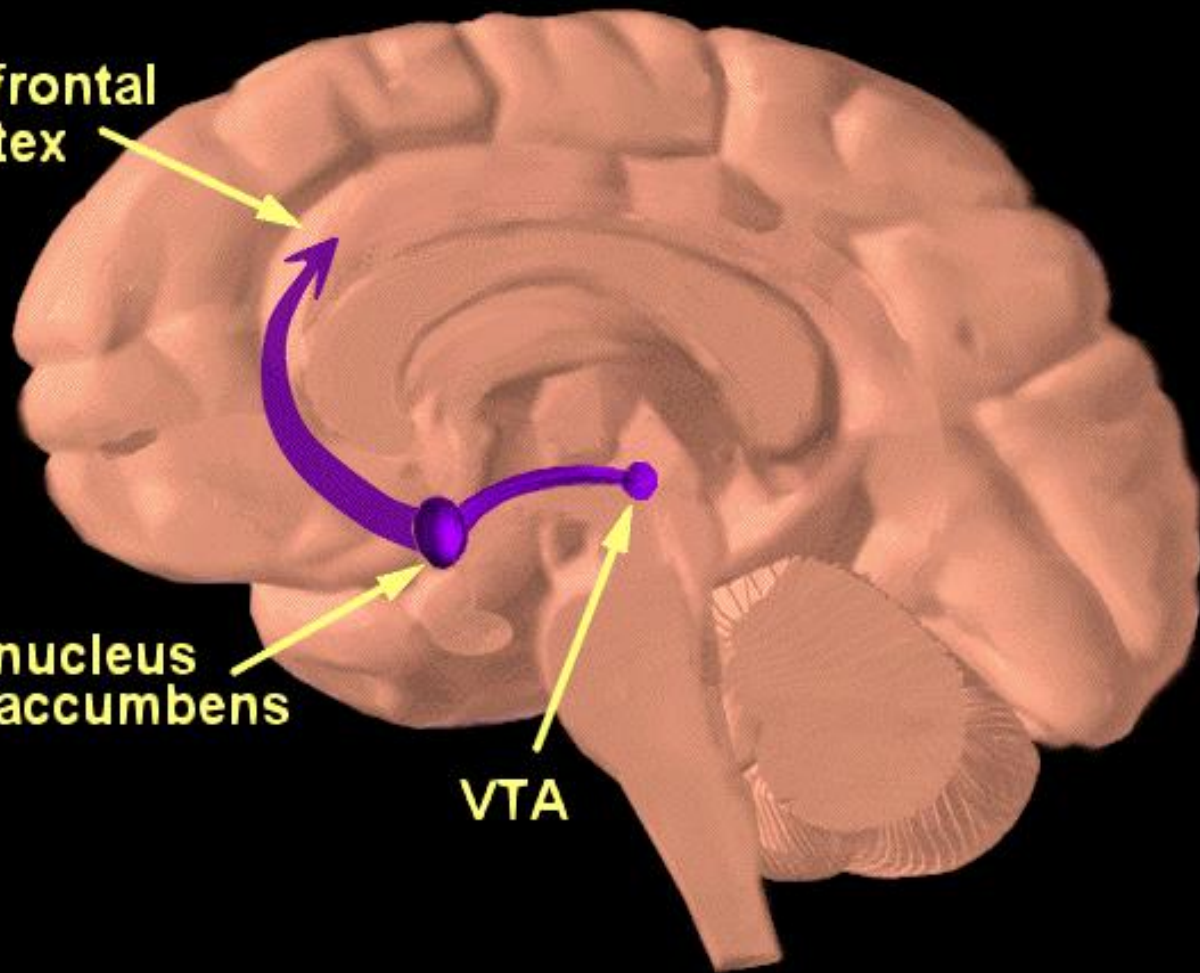


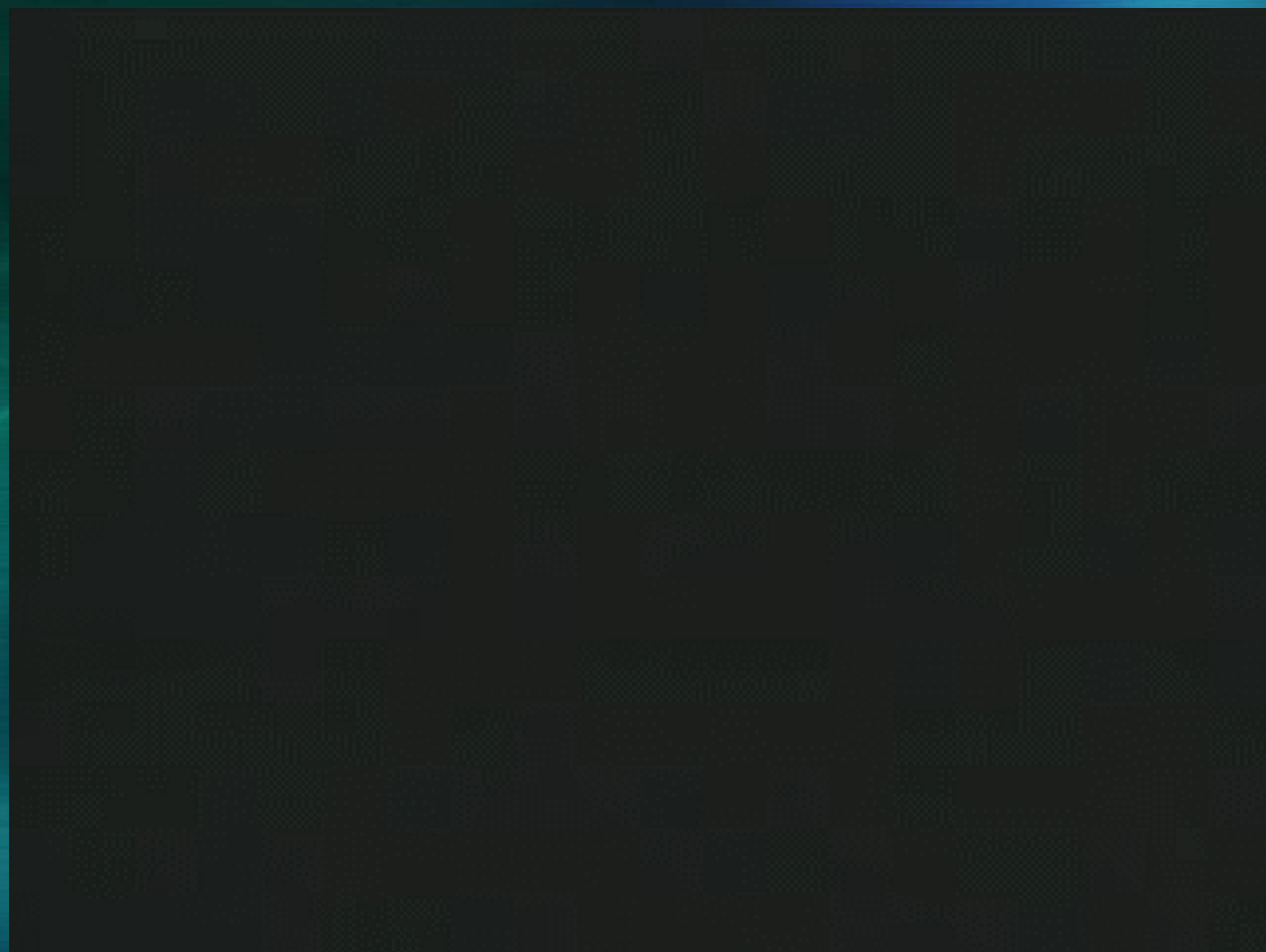


**prefrontal
cortex**

**nucleus
accumbens**

VTA





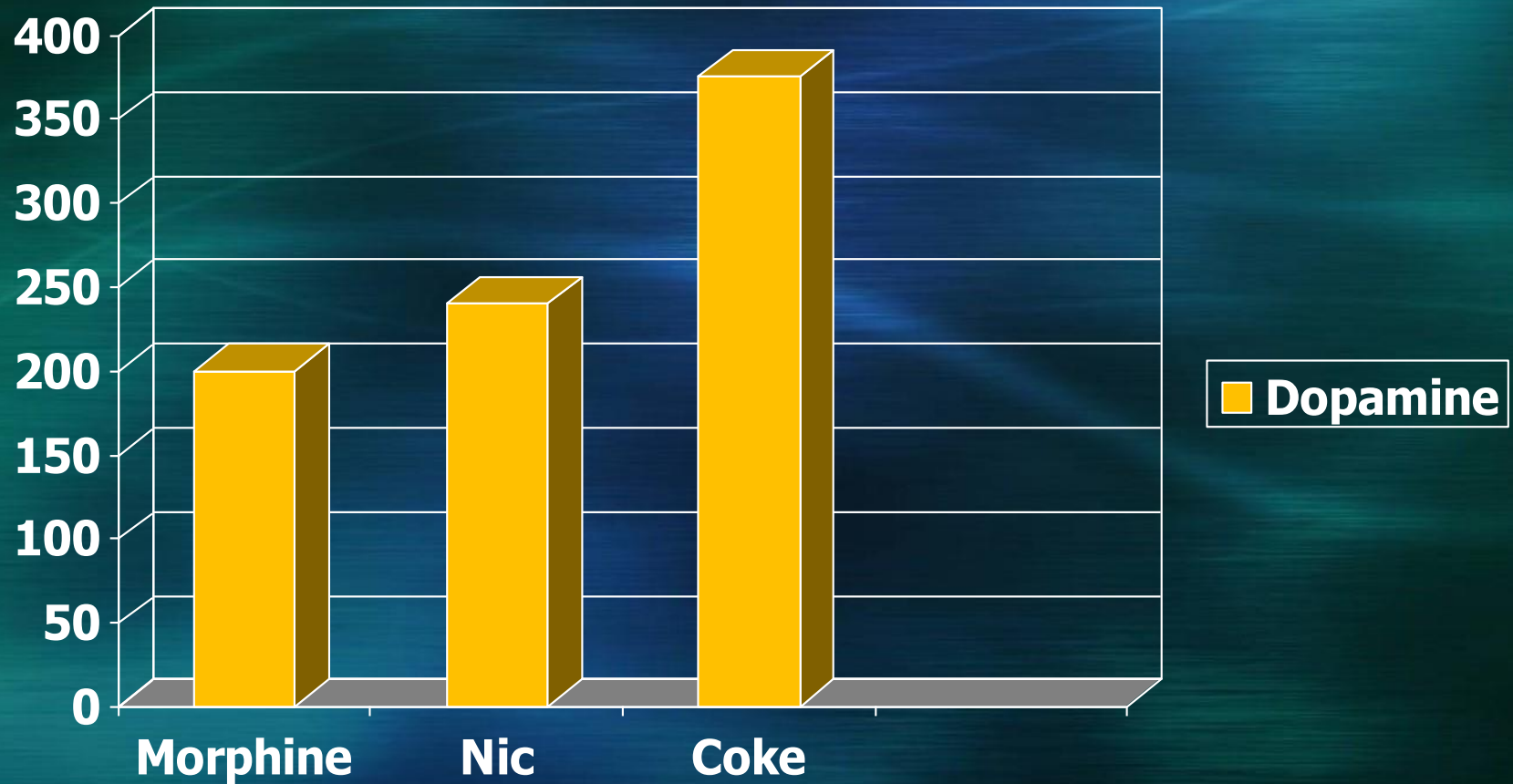
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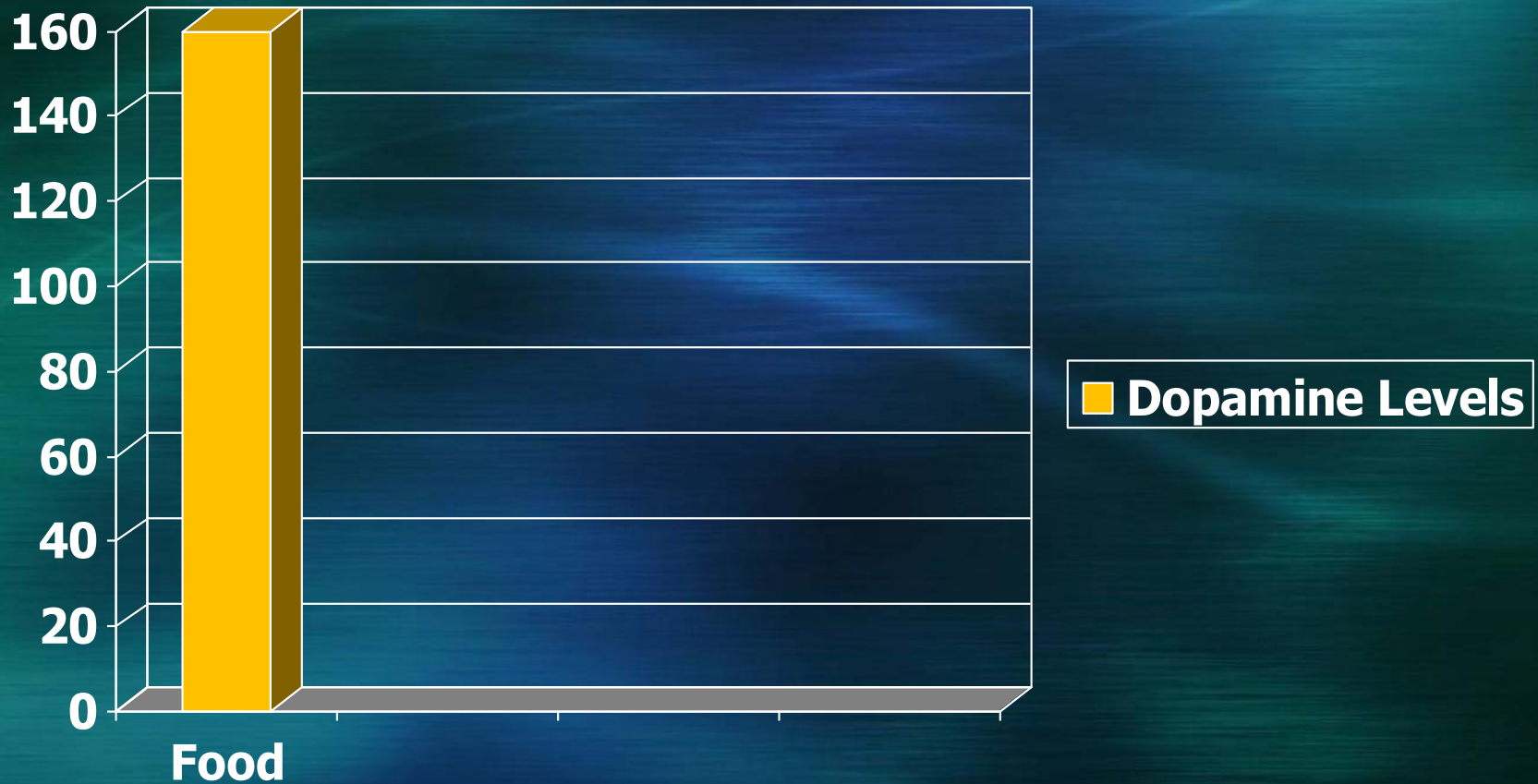
Neurotransmitters

- Serotonin (5-HT)
- Norepinephrine (NE)
- Dopamine (DA)
- Acetylcholine (Ach)
- Glutamate (GLU)
- Gamma amino butyric acid (GABA)
- N-methyl-D-aspartate (NMDA)

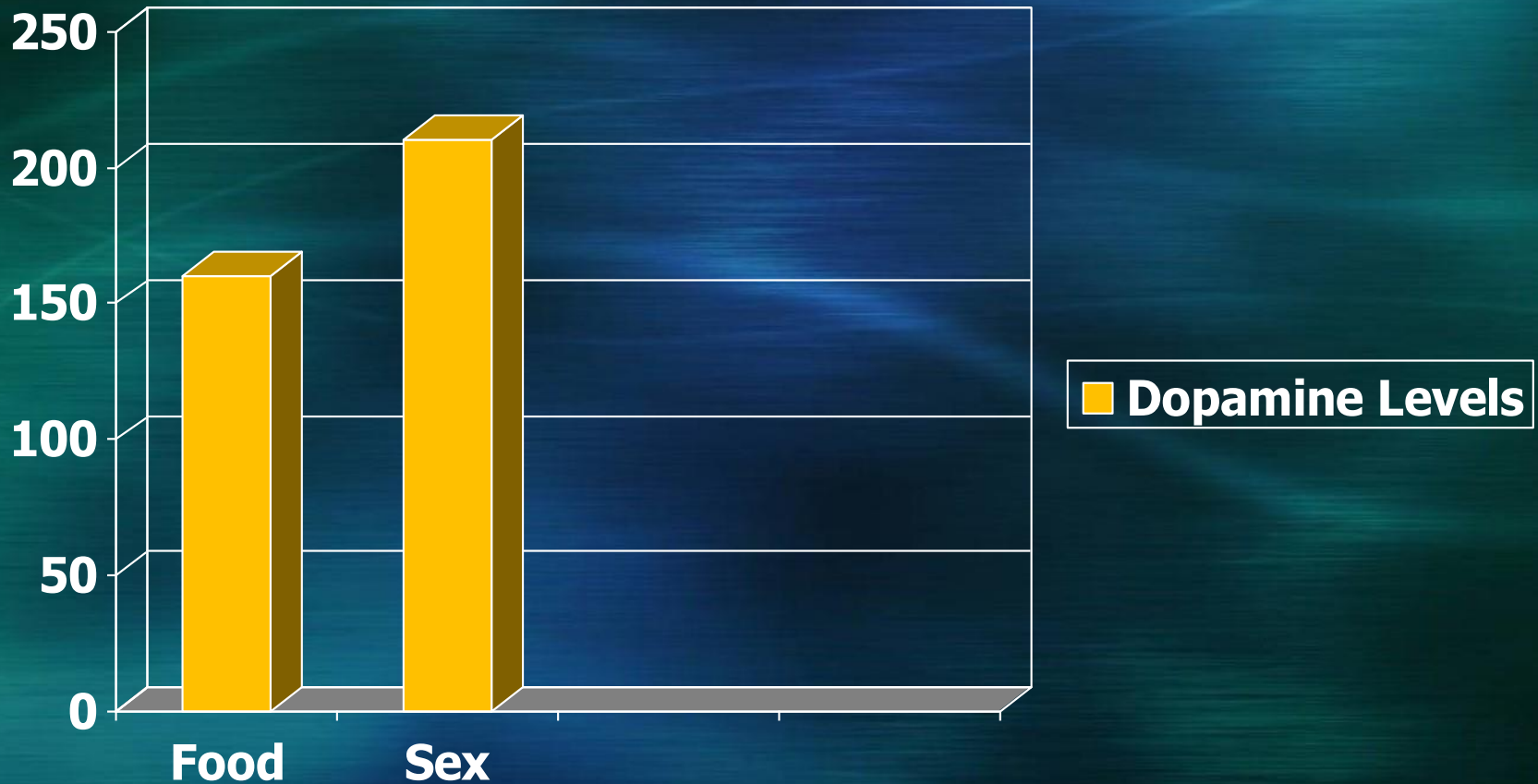
Dopamine Levels in the Shell of the Nucleus Accumbens (% of baseline)



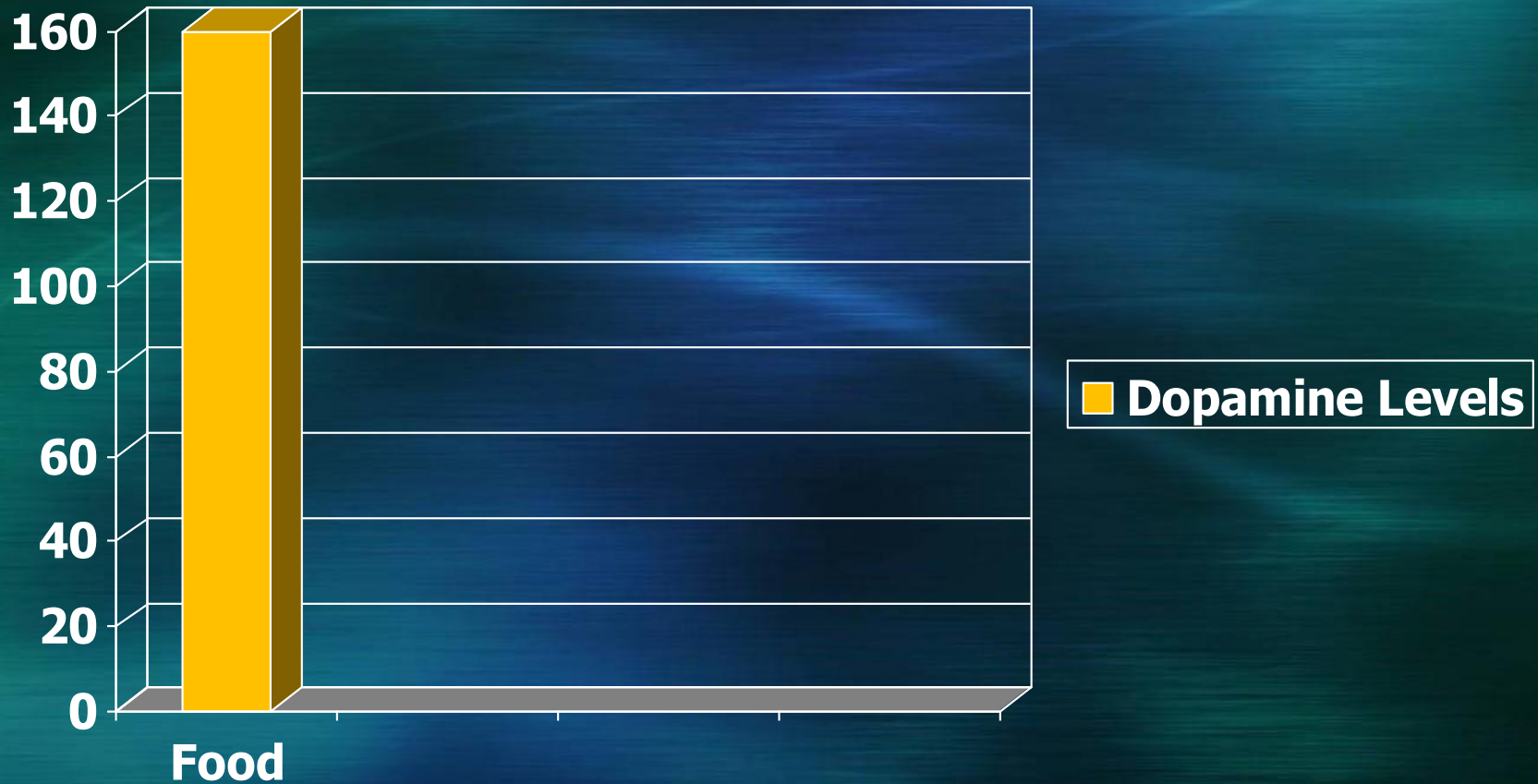
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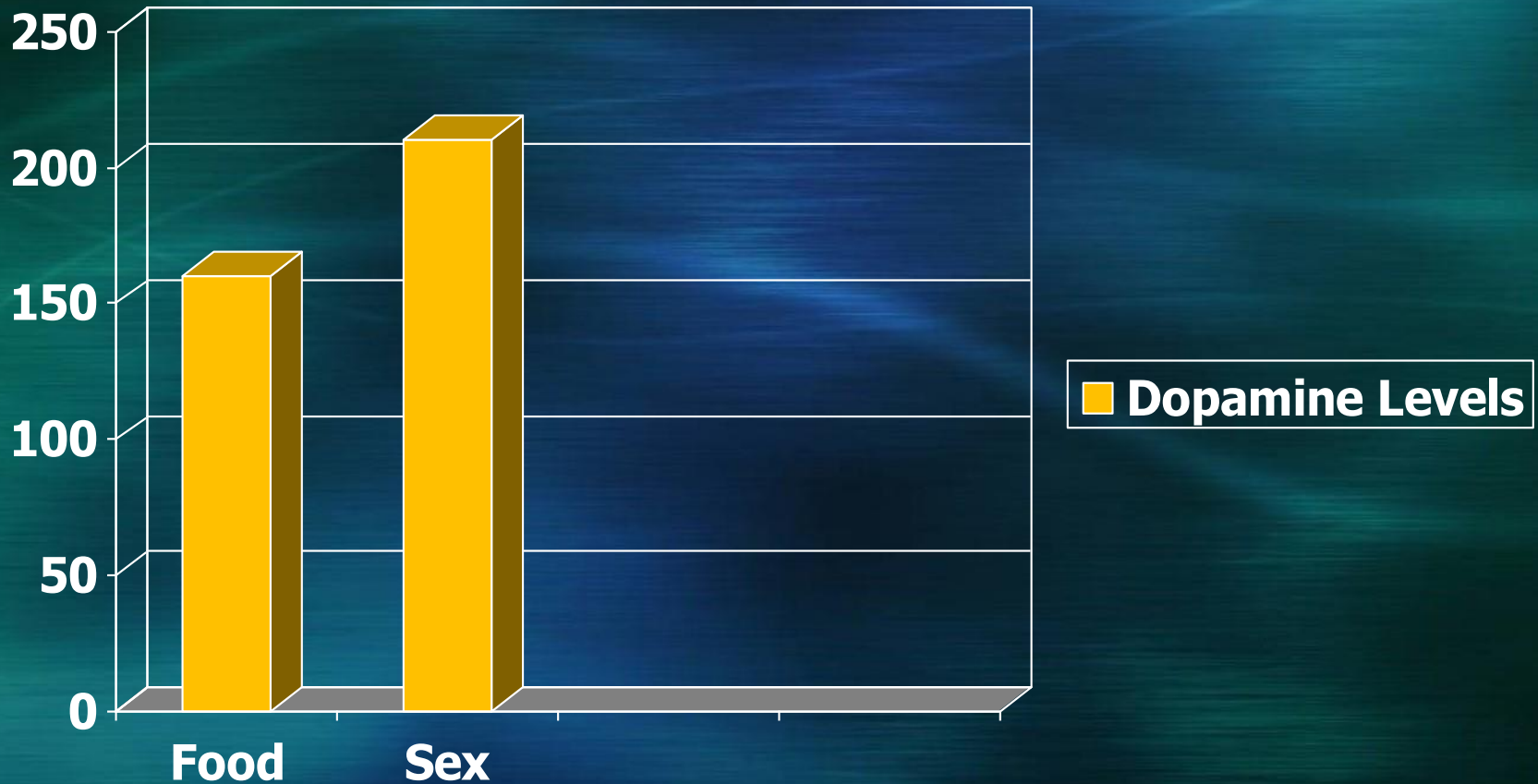
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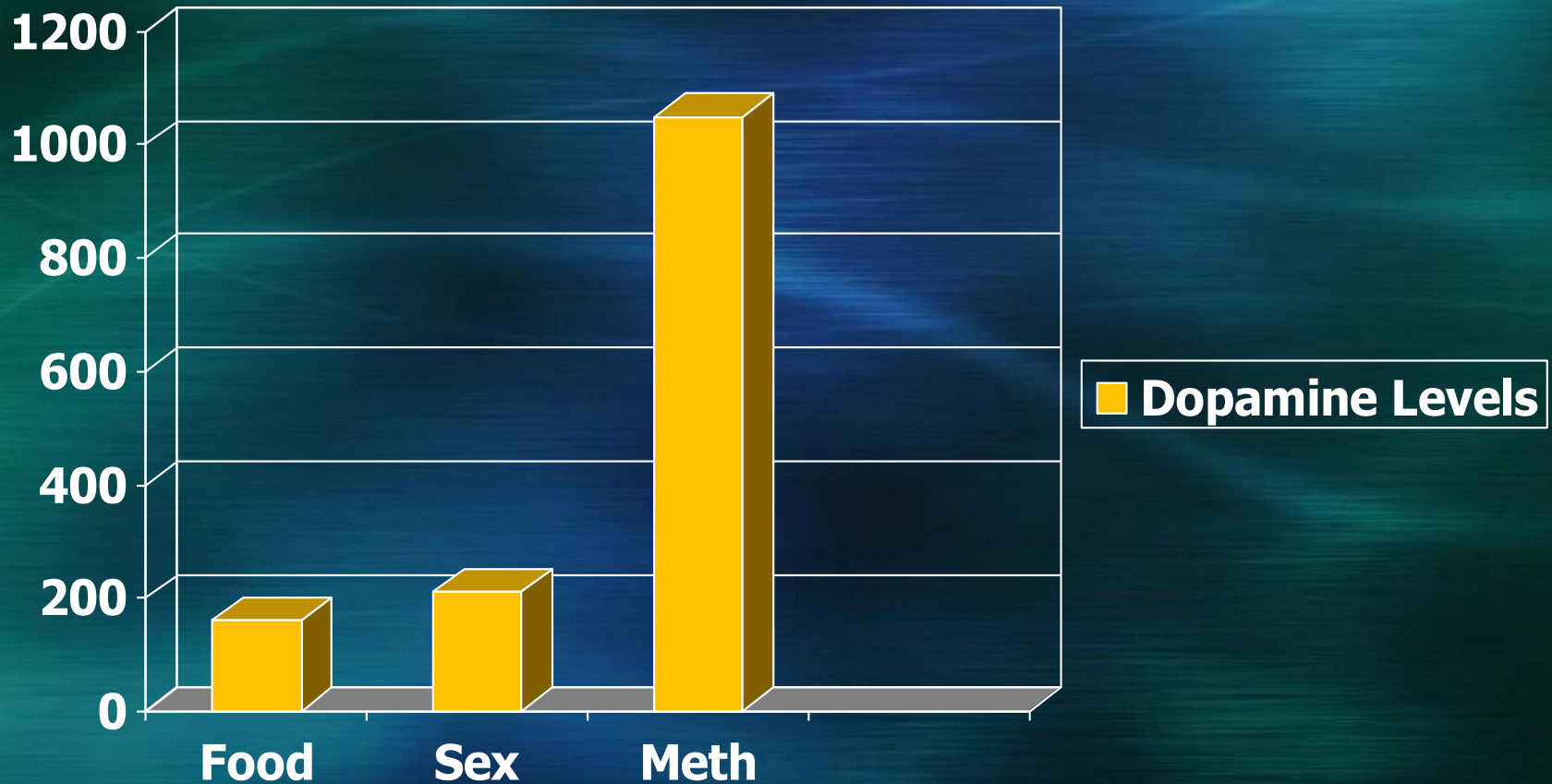
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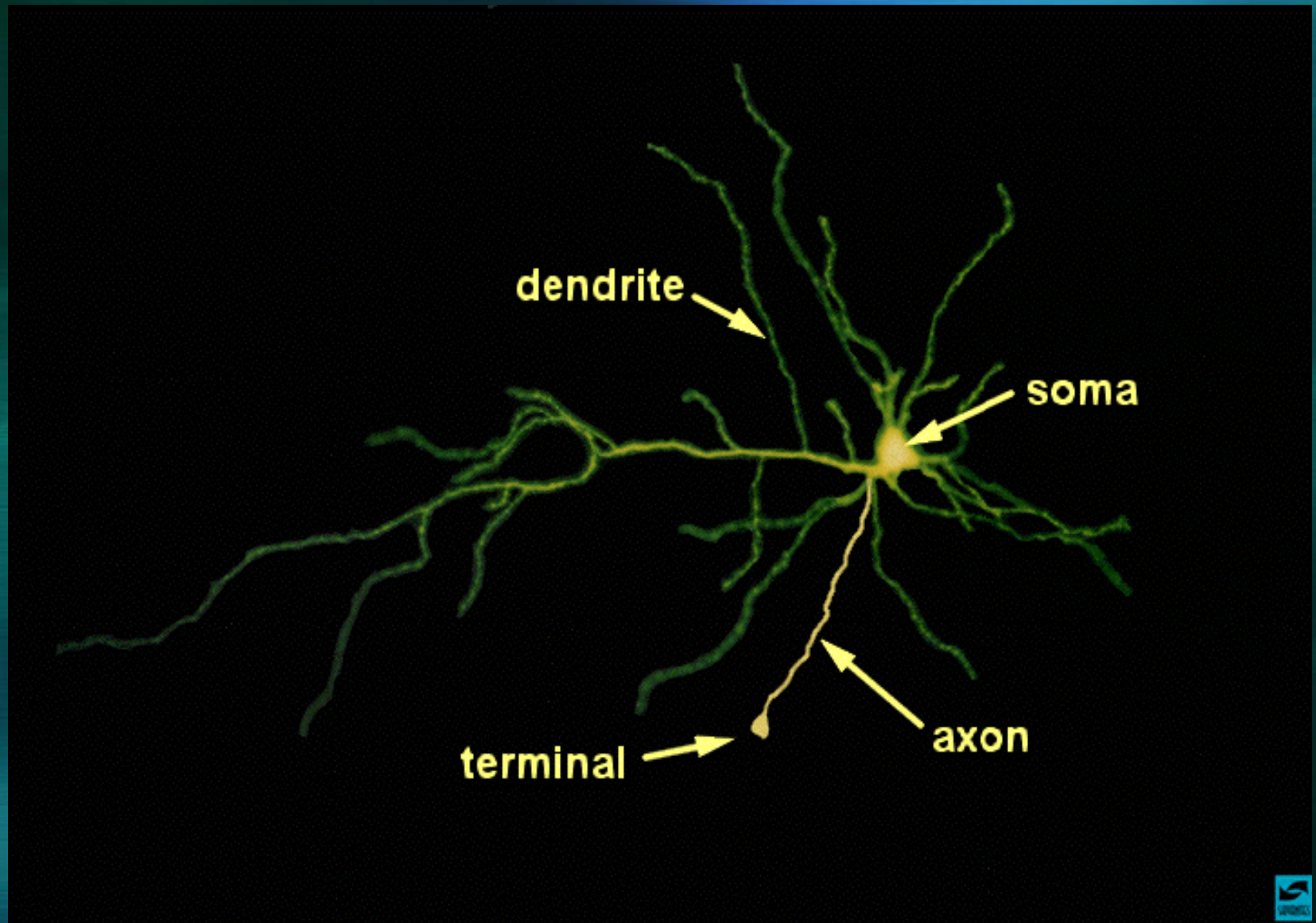


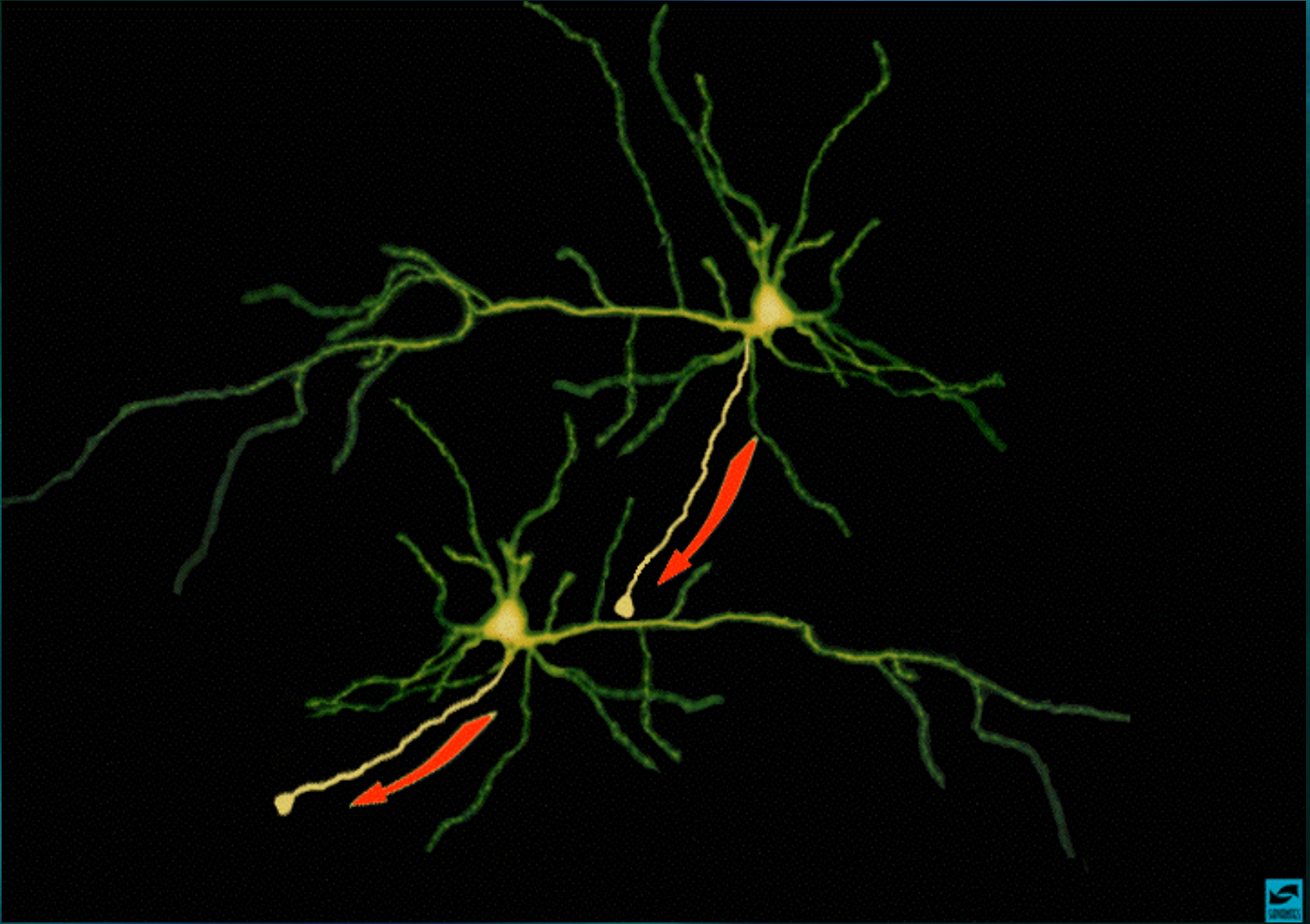
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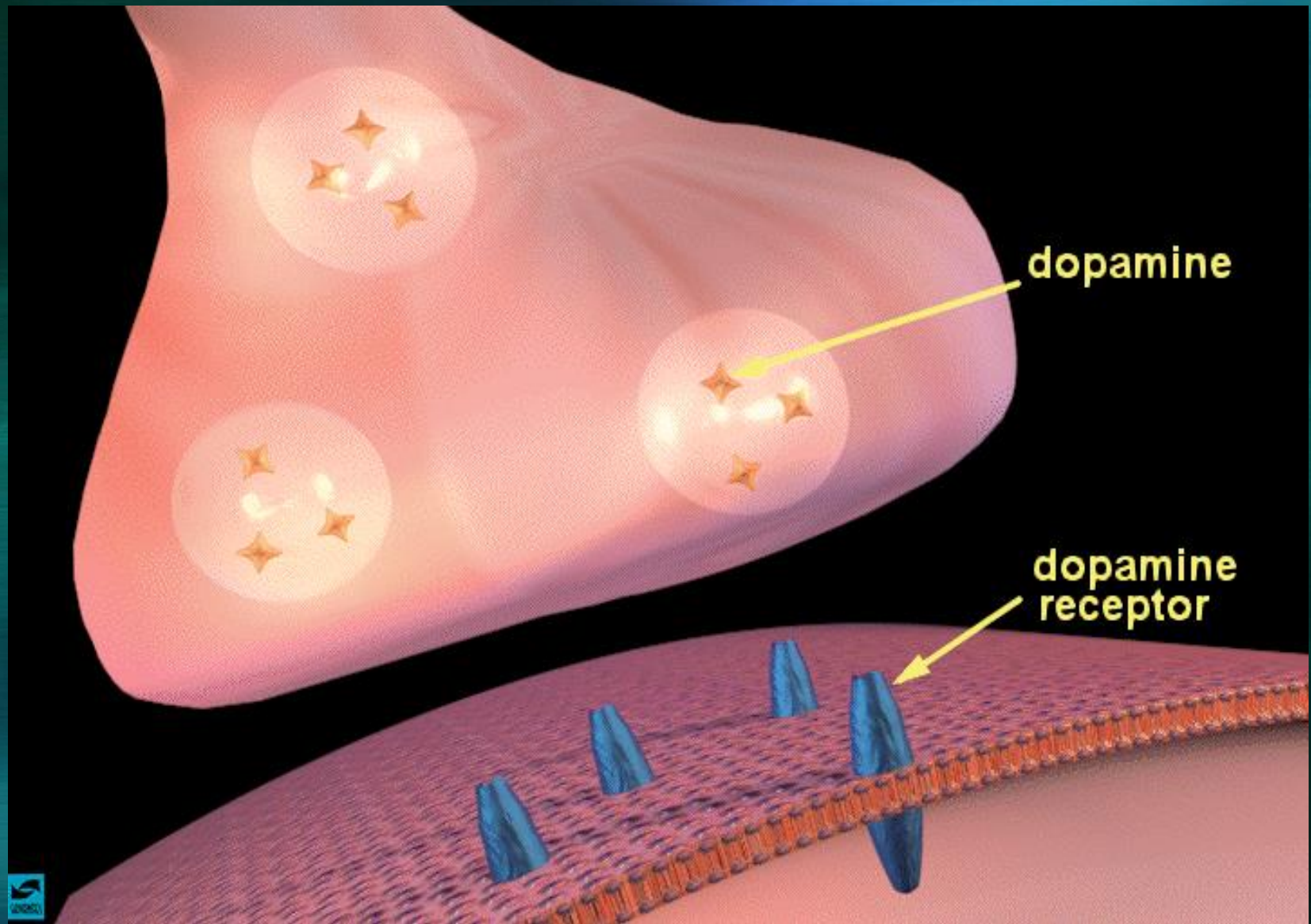


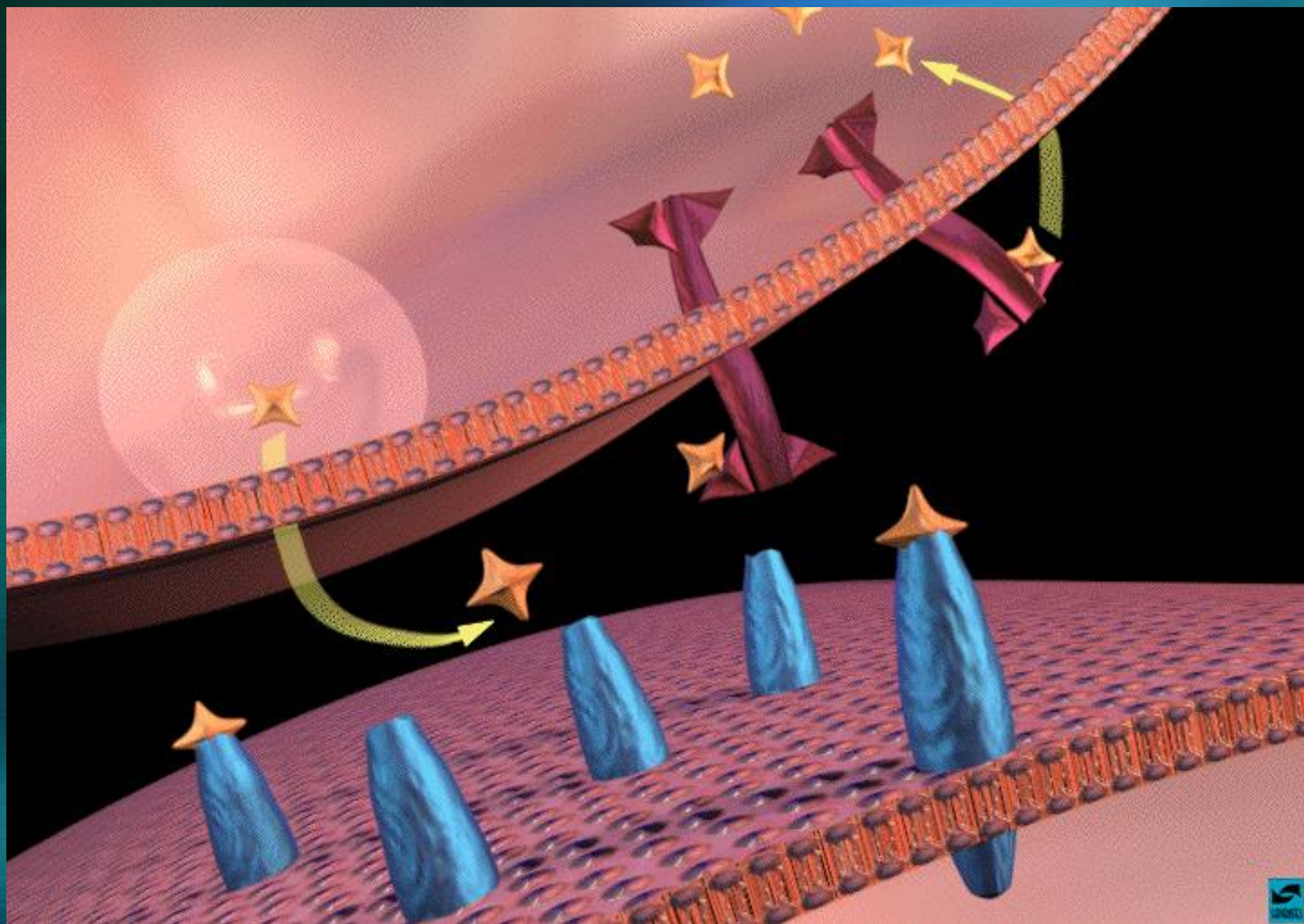
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NEUROTRANSMITTERS

- Naturally-occurring brain chemicals
- Many psychoactive drugs resemble neurotransmitters:

NEUROTRANSMITTERS

DRUG

NEUROTRANSMITTER

LSD

Serotonin

Methamphetamine

Norepinephrine

heroin

Endorphins

NEUROTRANSMITTERS

DRUG

NEUROTRANSMITTER

THC

Anandamide

PCP

Receptor site identified but not associated
neurotransmitter

TOXICITY

- Ability to produce physical damage to the human body
- Long-range = months, years
- Short-range = days, weeks
- Physical vs behavioral

TOXICITY

- Physical
- Behavioral
- Acute Vs Long-Term

PSYCHIATRIC IMPAIRMENT

- Ability of drug to produce negative changes in thinking, learning, perception, mood or behavior
- Acute vs chronic

PSYCHIATRIC IMPAIRMENT

- **Short-term**
- **Long-term**
- **Affective Disorders**
- **Thought Disorders**

“Krokodil”:

A Media Rumor Runs Wild

A lesson in how to divert attention from real problems



Krokodil patient in Russia

Krokodil: A Timeline

- 2010: News reports from Russia
- November 2012: “Krokodil” implicated in overdose death in Oklahoma. Autopsy showed only morphine
- Oklahoma Bureau of Narcotics: Accounts of “Krokodil” in the media “should be taken with a grain of salt.”
- September 23, 2013: 2 patients in Arizona diagnosed with krokodil-related medical conditions. No laboratory evidence of desomorphine found
- Early October, 2013: 2 cases reported in Utah. Still no laboratory evidence of desomorphine exists anywhere in US

- October 14, 2013: Krokodil reported in Joliet, Illinois. The media frenzy begins





Intravenous Drug User in Great Britain (Picture used in a report on Krokodil broadcast by ABC affiliate WLS-TV in Chicago)



Krokodil: A Timeline

- Reports greeted with skepticism by LinkedIn.com “Emerging Drugs of Abuse” discussion group
- Media continues to report stories despite lack of analytical findings
- US DEA makes finding krokodil top priority for 200 agents in five states. Only heroin found.

October 27, 2013: A Voice of Rationality



Suspected krokodil a false alarm

Negative tests lead to further skepticism

October 27, 2013|By Andy Grimm, Chicago Tribune reporter

(Anthony Scutell, Chicago Tribune)

The hunt for krokodil continues as tests conducted in recent days on a suspected sample of the so-called flesh-eating drug came back negative, federal officials said.

An announcement two weeks ago by a Joliet doctor who said he treated three patients who showed the telltale rotting flesh associated with the toxic, home-brewed opiate — made from mixing codeine tablets with solvents like gasoline or acids — has sparked media coverage. A week later, a Crystal Lake hospital reported treating a krokodil user, and reports have cropped up across the country.

But whether the U.S. faces a horrifying new drug or merely an urban legend is hard to say, and confirmation of cases may not come for months or years, if ever.

Jack Riley, special agent in charge of the Drug Enforcement Administration's Chicago office, said doctors and victims in the Chicago area have been interviewed by law enforcement.

In a sweep modeled after the agency's successful search for the source of deadly fentanyl-tainted heroin some six years ago, 200 DEA agents across five states have made finding krokodil a top priority, Riley said.

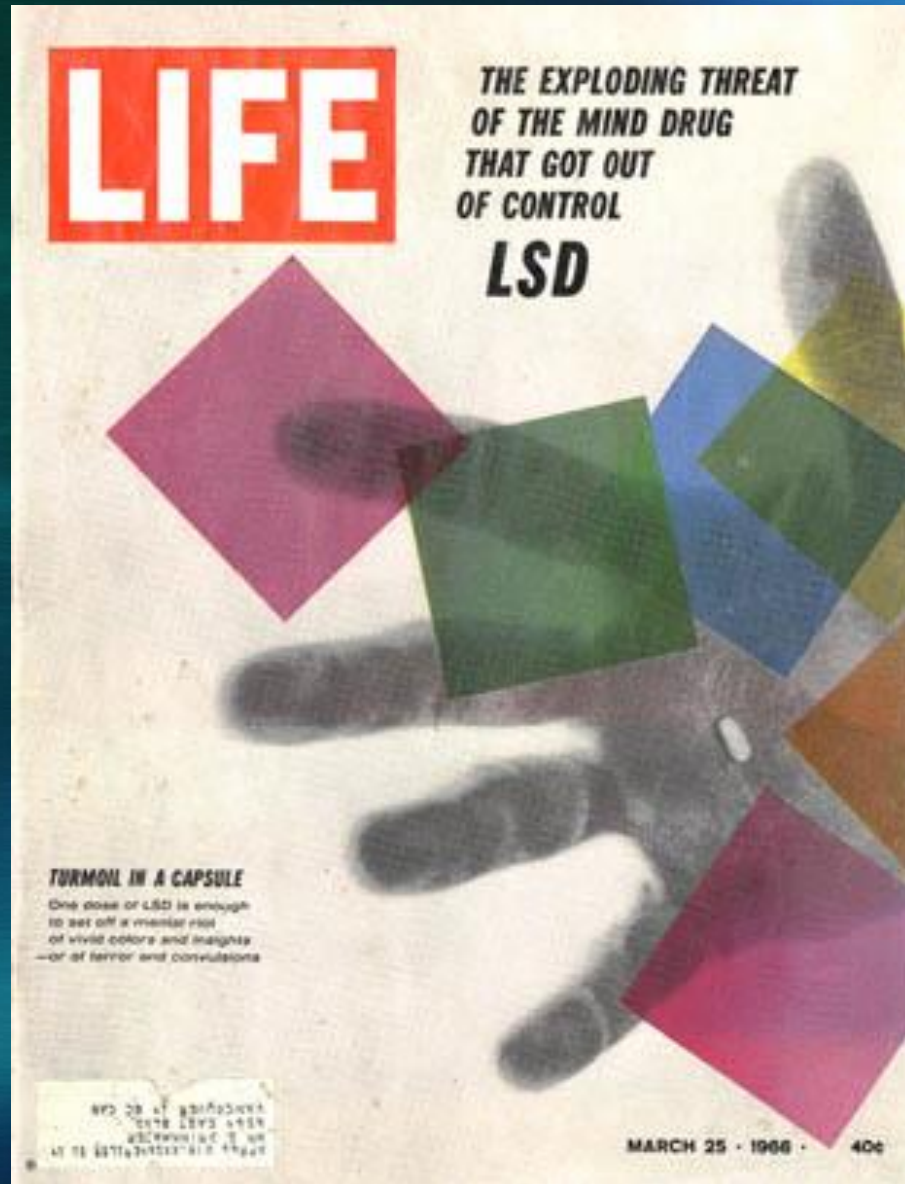
"We have run quite a few buys in the city and suburbs," Riley said "What the lab tells us is it's just heroin."

Some experts in law enforcement and public health say it's unlikely the drug will be widely used beyond the remote areas of Russia and eastern Europe where it became popular a decade ago.

Krokodil is a myth. So what?

- “Krokodil” symptoms probably caused by bacterial infection such as necrotizing fasciitis (“flesh-eating disease”)
 - Transmitted by dirty hypodermic needles
 - Drug users could have been told free sterile syringes available legally at needle exchanges
- Waste of time and resources
- Loss of credibility
- What is something real shows up. Like....

March 25, 1966



Important “basics”

- What is the drug's addiction potential?
- Does the drug produce tolerance?
- What are typical physical dependence withdrawal symptoms?
- What is the drug's potential for producing immediate and long-term physical toxicity?
- Does the drug produce psychiatric impairment? Short-term? Chronic?

Inhalants

- High risk: Volatile solvents
 - Toluene
 - Xylene
 - Trichlorethylene
 - Gasoline
- Lower risk
 - Nitrous oxide (“laughing gas”)
 - Amyl/butyl nitrite

Inhalants

- High risk: Volatile solvents
 - Onset immediate/duration short (minutes)
 - Addiction potential low
 - Tolerance develops
 - Short- and long-term toxicity potential moderate to high
 - Behavioral toxicity potential moderate to high
 - Acute and chronic psychiatric/cognitive impairment potential moderate to high

Inhalants: Higher Risk

- Physical toxicity
 - Overdose (death, hypoxia)
 - Neurotoxicity
 - Inflammation of the lungs
 - Liver and kidney damage
 - Cancer (Benzene and vinyl chloride)
 - “Fetal solvent syndrome”

Inhalants

- Lower risk:
 - Onset immediate/duration short (minutes)
 - Addiction potential low
 - Tolerance develops
 - Short- and long-term toxicity potential low to moderate
 - Behavioral toxicity potential low to moderate
 - Acute and chronic psychiatric impairment potential low

Stimulants

- Cocaine
- Amphetamine (Adderall)
- Lisdexamfetamine (Vyvanse)
- Methamphetamine
- Methylphenidate (Ritalin/Concerta)

Stimulants: Basics

- High addiction potential
- Tolerance develops
- Withdrawal symptoms minimal
- Moderate to high potential for immediate physical toxicity
- Moderate potential for long-term toxicity
- Moderate to high potential for acute psychiatric impairment
- Low to moderate potential for chronic psychiatric impairment

CNS Stimulants (Cocaine)

- Local anesthesia
- coca (*Erythoxylum Coca*)
- cocaine hydrochloride (hcl) ("coke", "toot", "nose/nose candy", "blow", "freeze", "snow", "girl", "white lady", "la mujer blanca")
- alkaloidal cocaine ("free base", "crack", "rock/ready rock", "basuco")



ERYTHROXYLOM COCA FLOWER



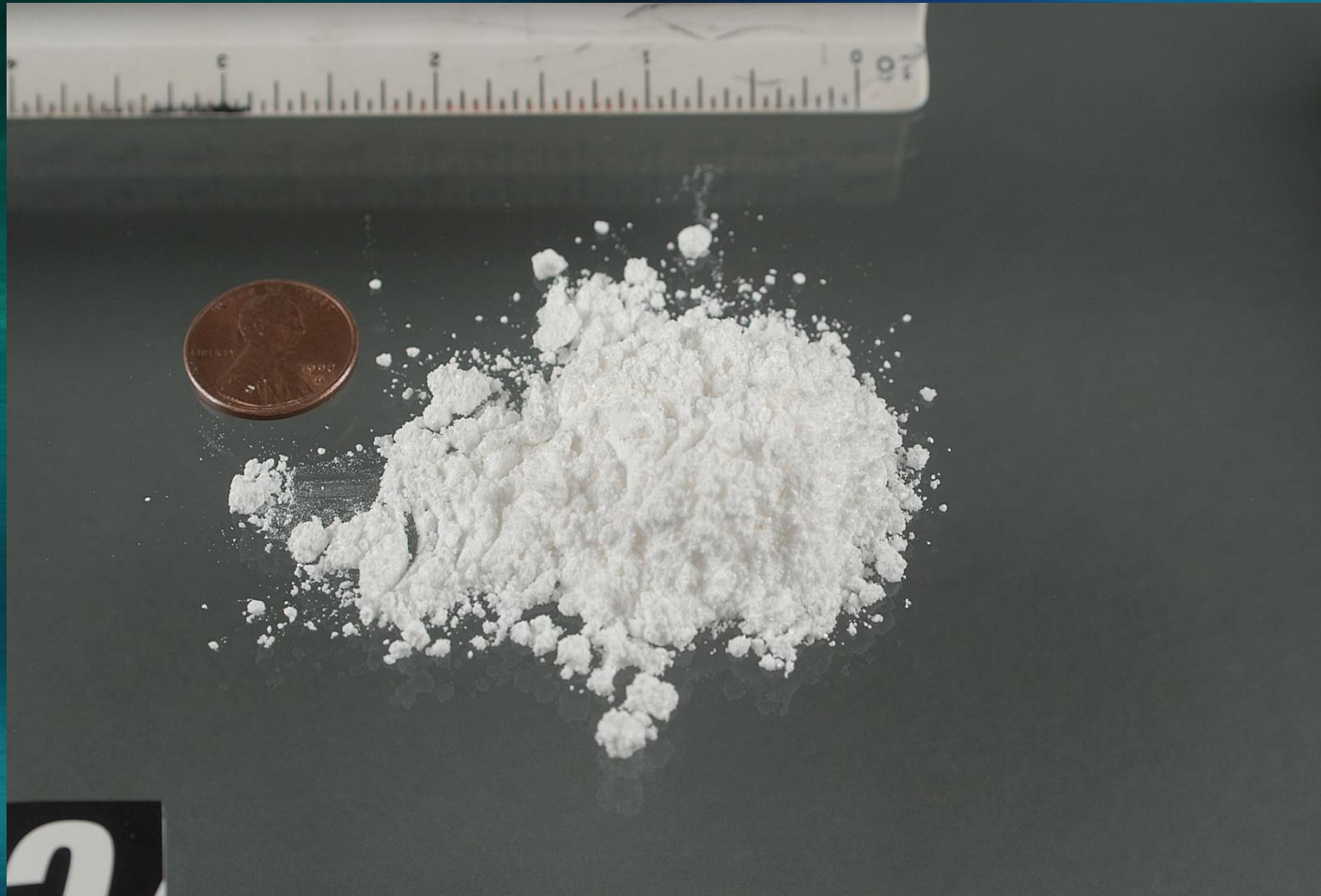
COCA FARMER



MAKING COCAINE



Cocaine Hcl





COCAINE PARAPHERNALIA



VIALS OF CRACK



MORE CRACK



Cocaine Vs. Amphetamine

- Cocaine:
 - Short-acting drug, with a duration of 5-60 minutes.
 - Cocaine can be snorted, injected or smoked, but it is relatively ineffective when swallowed.
 - Tolerance to cocaine can develop and then disappear in a matter of hours.
 - When snorted tends to do much more severe damage to the nasal area.
 - Produces *local anesthesia*

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Adderall/Other ADD Medications

- Between 2003 and 2019, number of adolescents with an ADHD prescription rose 400%
- By senior year, nearly two-thirds of college students are offered Adderall or other “study drugs”, and nearly one-third have accepted

5 million college seniors $\times \frac{1}{3} = 1,650,000$

$1,650,000 \times 10\% = 165,000$

Stimulants

- Amphetamine (Adderall)
- Lisdexamfetamine (Vyvanse)
- Methamphetamine
- Methylphenidate (Ritalin/Concerta)
- Cocaine