



# Don't Stop Till You Get Enough?

## Drugs and Their Modifying Effects on the Human Body

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BioS 10  
Bioscience in the 21<sup>st</sup> Century  
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# Outline

## I. Overview of Drugs

- I. Classification
- II. Facts and Figures
- III. Systems Affected

## II. Cocaine

- I. How it works
- II. Side effects

## III. Amphetamines

- I. How it works
- II. Side effects

## IV. Heroin

- I. How It works
- II. Side effects

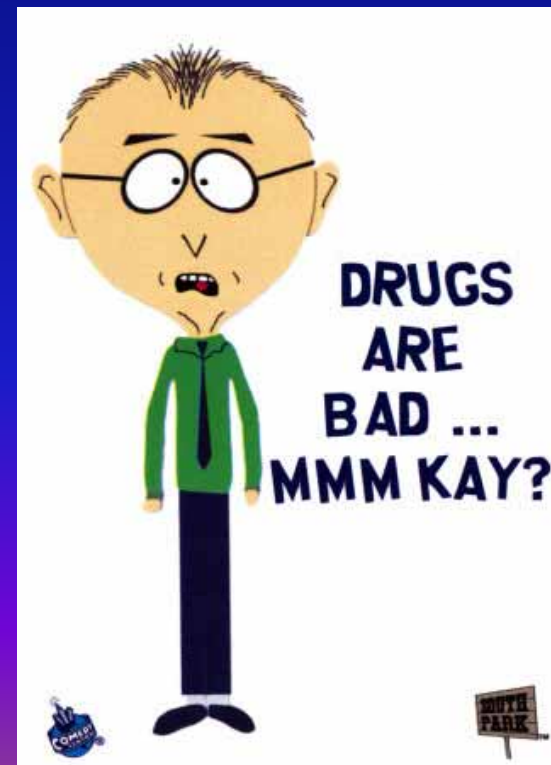
## V. Popular Drugs of the 21<sup>st</sup> Century





# What is a Drug?

- **Drug** --- A chemical substance that, when taken into the body, alters the structure or functioning of the body in some way



# Four Categories of Drug-Taking Behaviors, Derived From The Combination of Goal and Legal Status

		Licit	Illicit
Goal	Instrumental Use	<p>Taking Valium with a prescription to relieve anxiety</p> <p>Taking No Doz to stay awake on a long trip</p>	<p>Taking amphetamines without a prescription to stay awake the night before a test</p> <p>Taking morphine without a prescription to relieve pain</p>
	Recreational Use	<p>Having an alcoholic drink to relax before dinner</p> <p>Smoking a cigarette or a cigar for enjoyment</p>	<p>Smoking marijuana to get high</p> <p>Taking LSD for the hallucinogenic effects</p>

# Illicit Drug Use Prevalence Rates For U.S. College Students In 2008

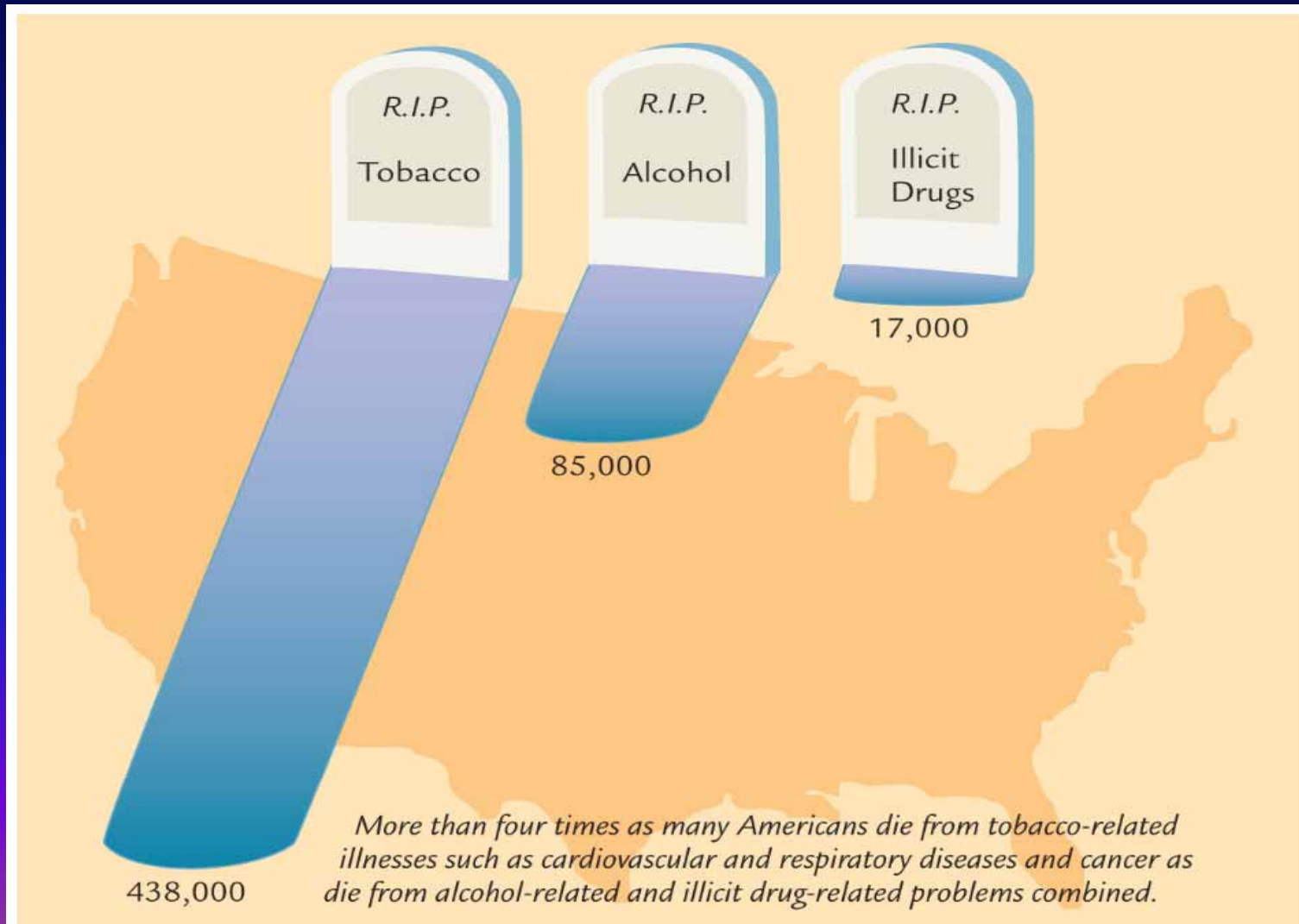
**TABLE 1.2**

Percentage of illicit drug use among college students, aged 19-22

	EVER IN LIFETIME	IN PAST TWELVE MONTHS	IN PAST THIRTY DAYS
Marijuana	47.5	31.8	16.8
Hallucinogens	9.1	4.9	1.3
Cocaine	8.5	5.4	1.7
Crack cocaine	1.3	0.6	0.1
Heroin	0.5	0.2	0.1

Source: Johnston, Lloyd D.; O'Malley, Patrick M.; Bachman, Jerald, G.; and Schulenberg, John E. (2008). Monitoring the Future: National survey results on drug use, 1975-2007. Vol. II: College students and adults ages 19-45. Bethesda, MD: National Institute on Drug Abuse, Tables 2-1, 2-2, and 2-3.

# U.S. Deaths per Year From Tobacco, Alcohol, and Illicit Drug Use



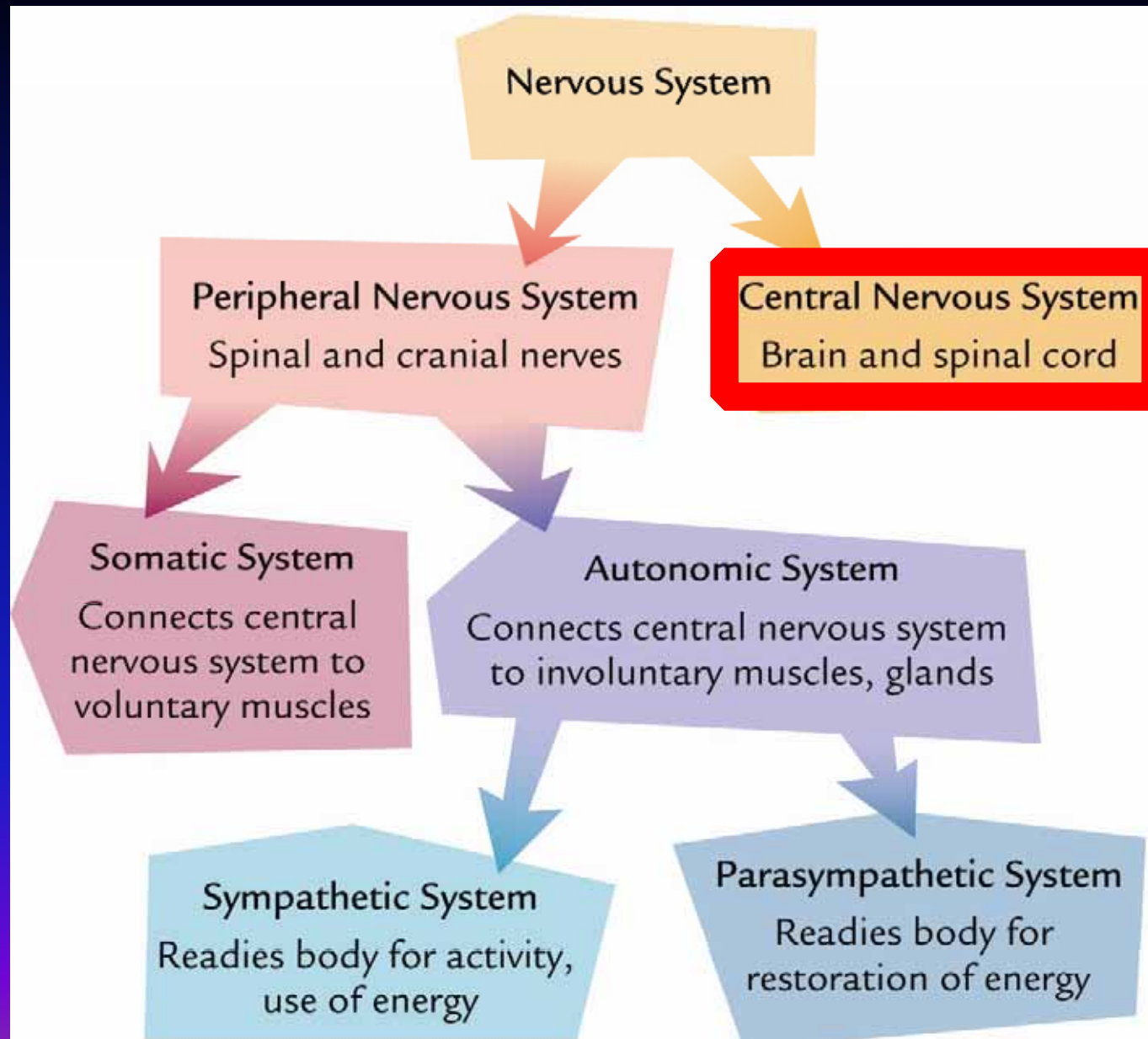
# Routes of Drug Administration



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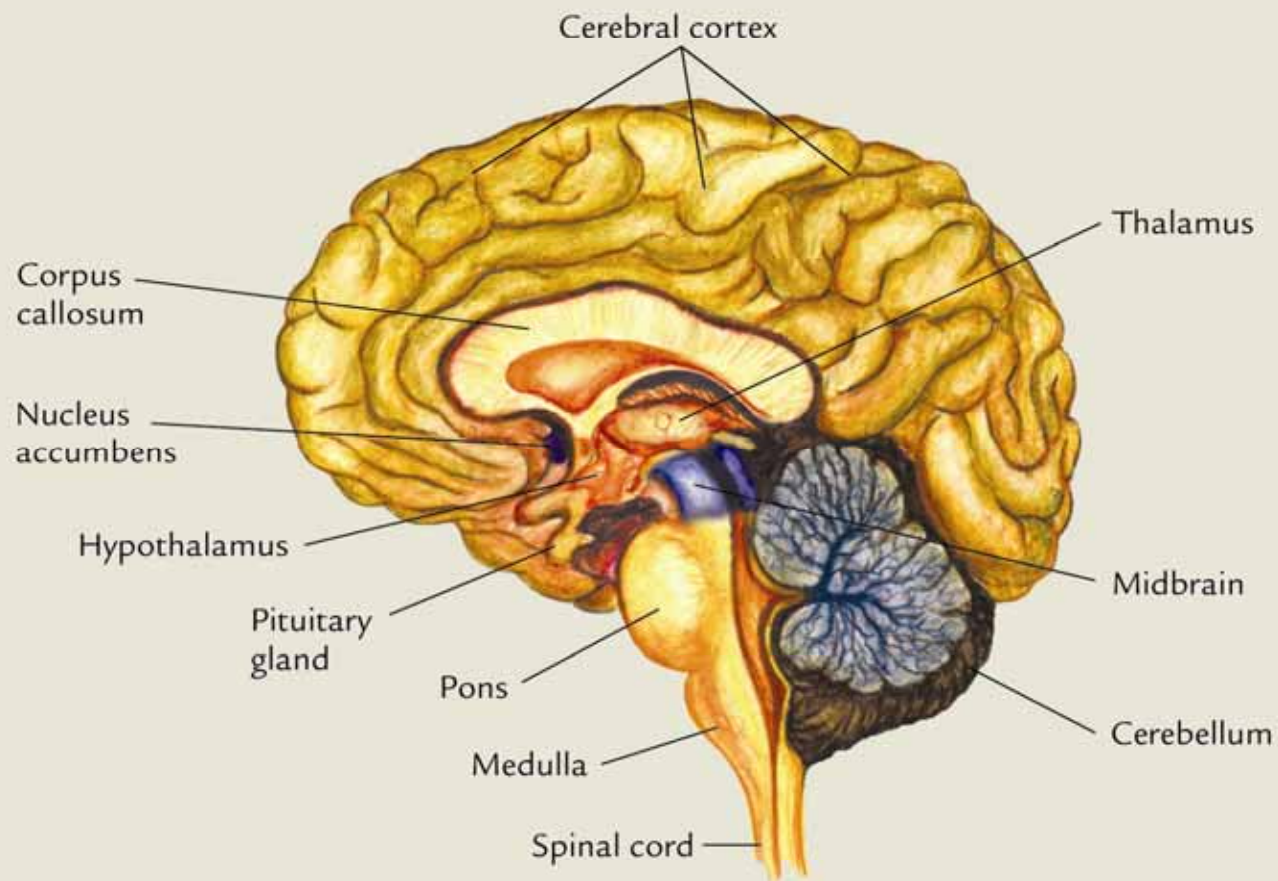




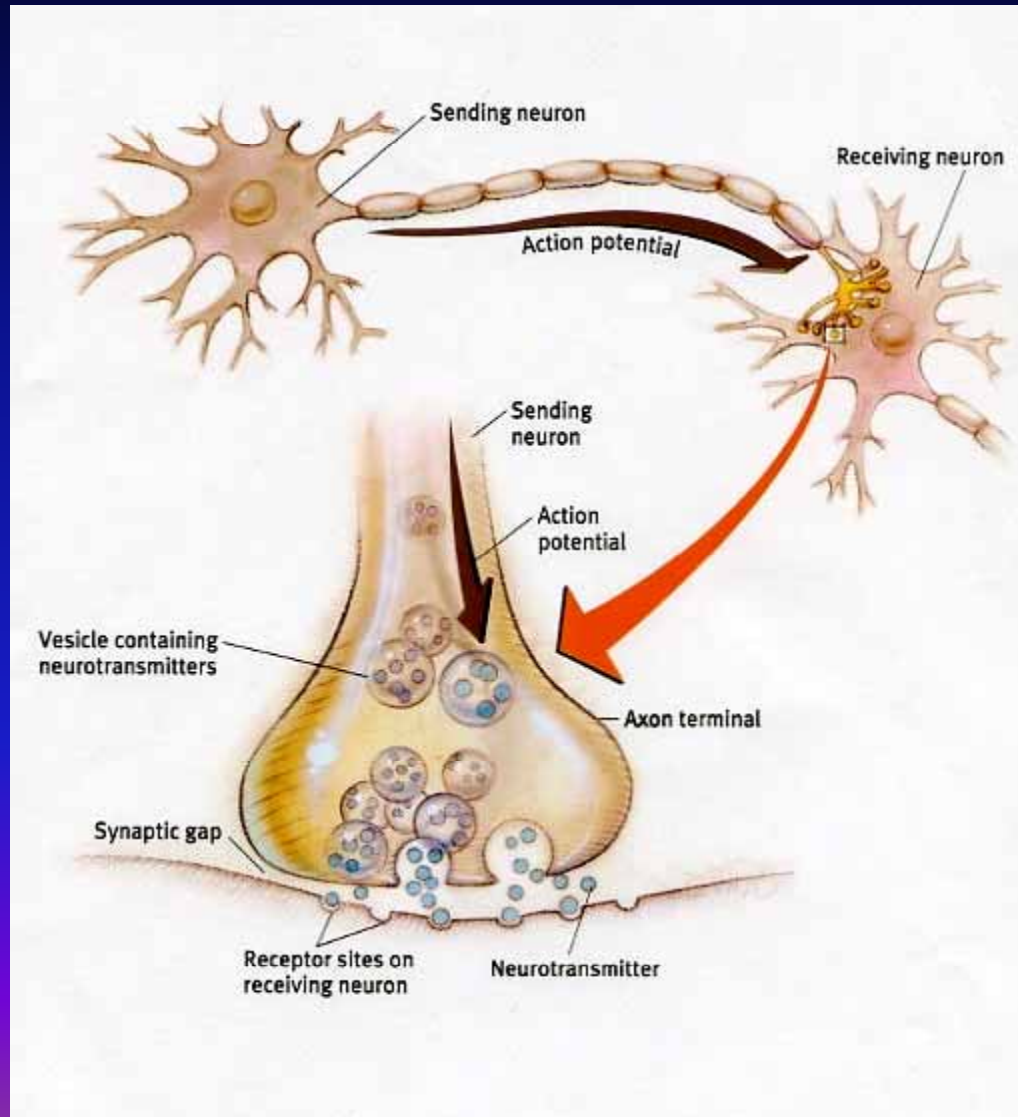




# The Brain



# Synaptic Transmission



[Play](http://www.emedillustration.com/animation/animationpage.html)

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animation/animationpage.html](http://www.emedillustration.com/animation/animationpage.html)

# Drugs and the CNS

**TABLE 3.1**

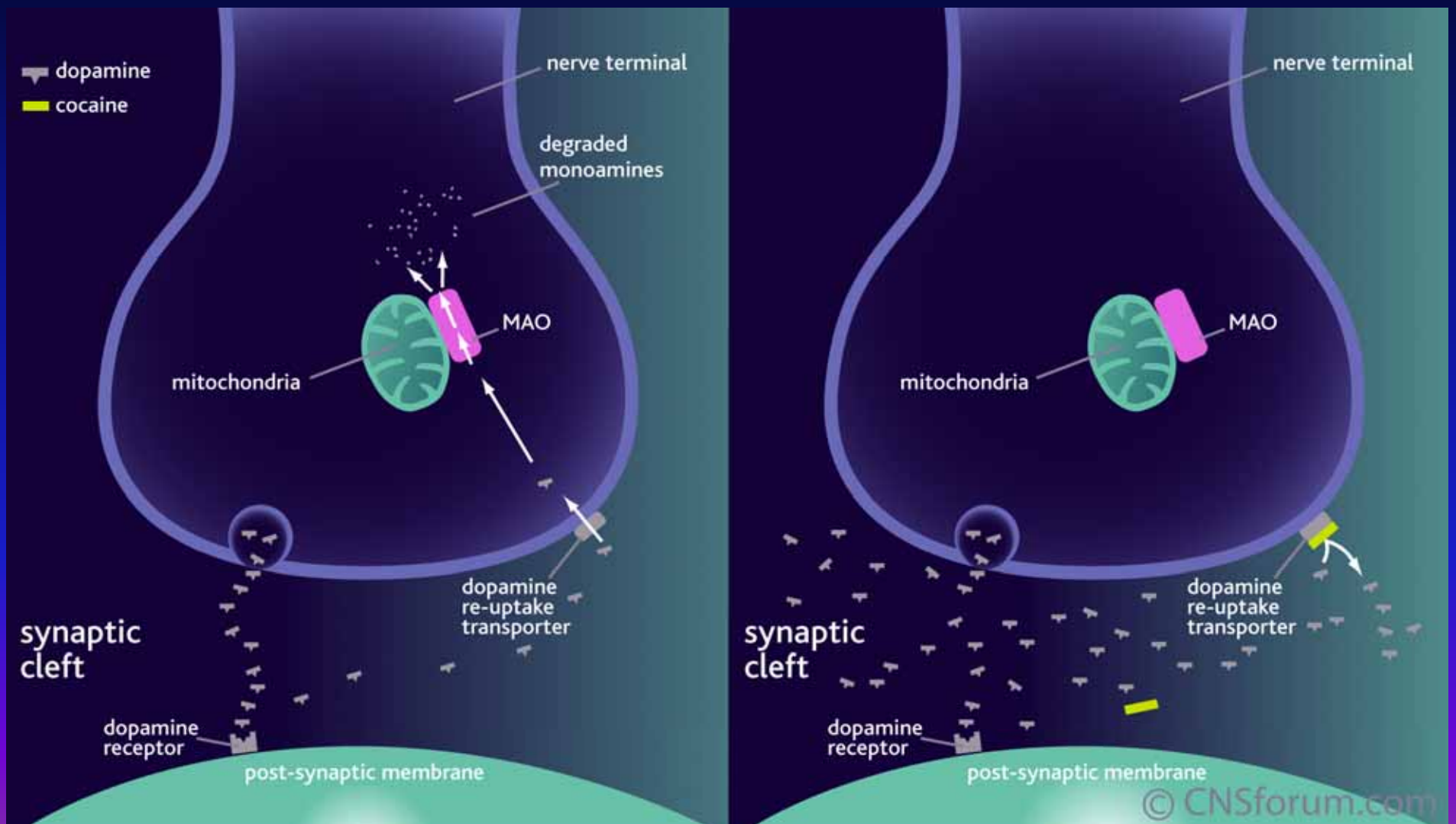
Drug Effects and Synaptic Communication in the Nervous System

DRUG	RESULT	MECHANISM
amphetamines	CNS stimulation	Mimicking of norepinephrine at its receptor sites
anxiety drugs	Reduction in anxiety	Stimulation of GABA receptors in the brain
antidepressant drugs, MAO-inhibitor type	Reduction in depressive symptoms	Inhibition of enzymes that metabolize norepinephrine and serotonin
antidepressant drugs, tricyclic type	Reduction in depressive symptoms	Slowing down of reuptake of norepinephrine and serotonin at their receptor sites
antipsychotic drugs, typical type	Reduction in schizophrenic symptoms	Dopamine blocked from entering receptor sites in the brain
caffeine	CNS stimulation	Adenosine (an inhibitory neurotransmitter) blocked from entering its receptor sites
cocaine	CNS stimulation and local anesthesia	Blocking the reuptake of norepinephrine and dopamine at their receptor sites
LSD	Visual hallucinations and disordered thinking	Stimulation of receptor sites sensitive to serotonin
morphine, heroin, and codeine	Pain relief and euphoria	Stimulation of endorphins at their receptors in the spinal cord and brain


Source: Grilly, David M. (2006). *Drugs and human behavior* (5th ed.) Boston: Allyn and Bacon.



# The Major Stimulants: Cocaine



# The Major Stimulants: Cocaine



**COCAINE**  
**TOOTHACHE DROPS**  
Instantaneous Cure!  
PRICE 15 CENTS.  
Prepared by the  
**LLOYD MANUFACTURING CO.**  
219 HUDSON AVE., ALBANY, N. Y.  
For sale by all Druggists.  
(Registered March 1885.) See other side.

In the late 1800s in the United States, cocaine was an ingredient in over-the-counter medications.

# The Major Stimulants: Cocaine

## Side Effects

- Powerful burst of energy
- General sense of well-being
- Heart rate and respiration are increased
- Appetite is diminished
- Blood vessels constrict and blood pressure is increased
- Pupils are dilated
- Continuously stuffy or runny nose
- Hallucinations (cocaine psychosis)

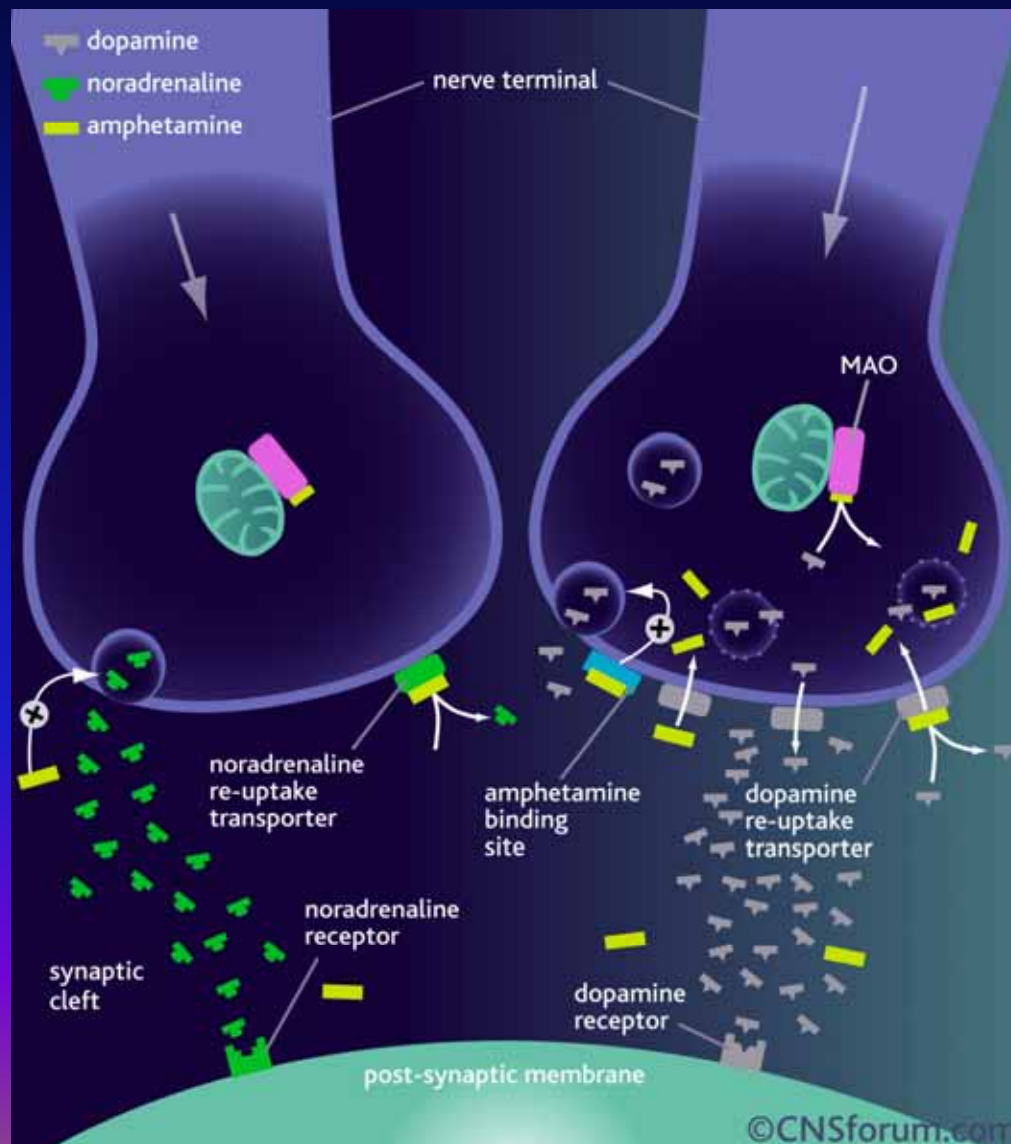




# The Major Stimulants: Cocaine



# The Major Stimulants: Amphetamines



[Play](http://www.stumbleupon.com/su/1PMK3Z/learn.genetics.utah.edu/units/addiction/drugs/mouse.cfm)

<http://www.stumbleupon.com/su/1PMK3Z/learn.genetics.utah.edu/units/addiction/drugs/mouse.cfm>

# The Major Stimulants: Amphetamines

- Euphoria
- Insomnia
- Increased heart rate
- Increased blood pressure
- Dilated pupils
- Parkinson's-like symptoms
- Tremors
- Convulsion
- Paranoia
- Hallucinations
- Strokes
- Cardiovascular collapse, death

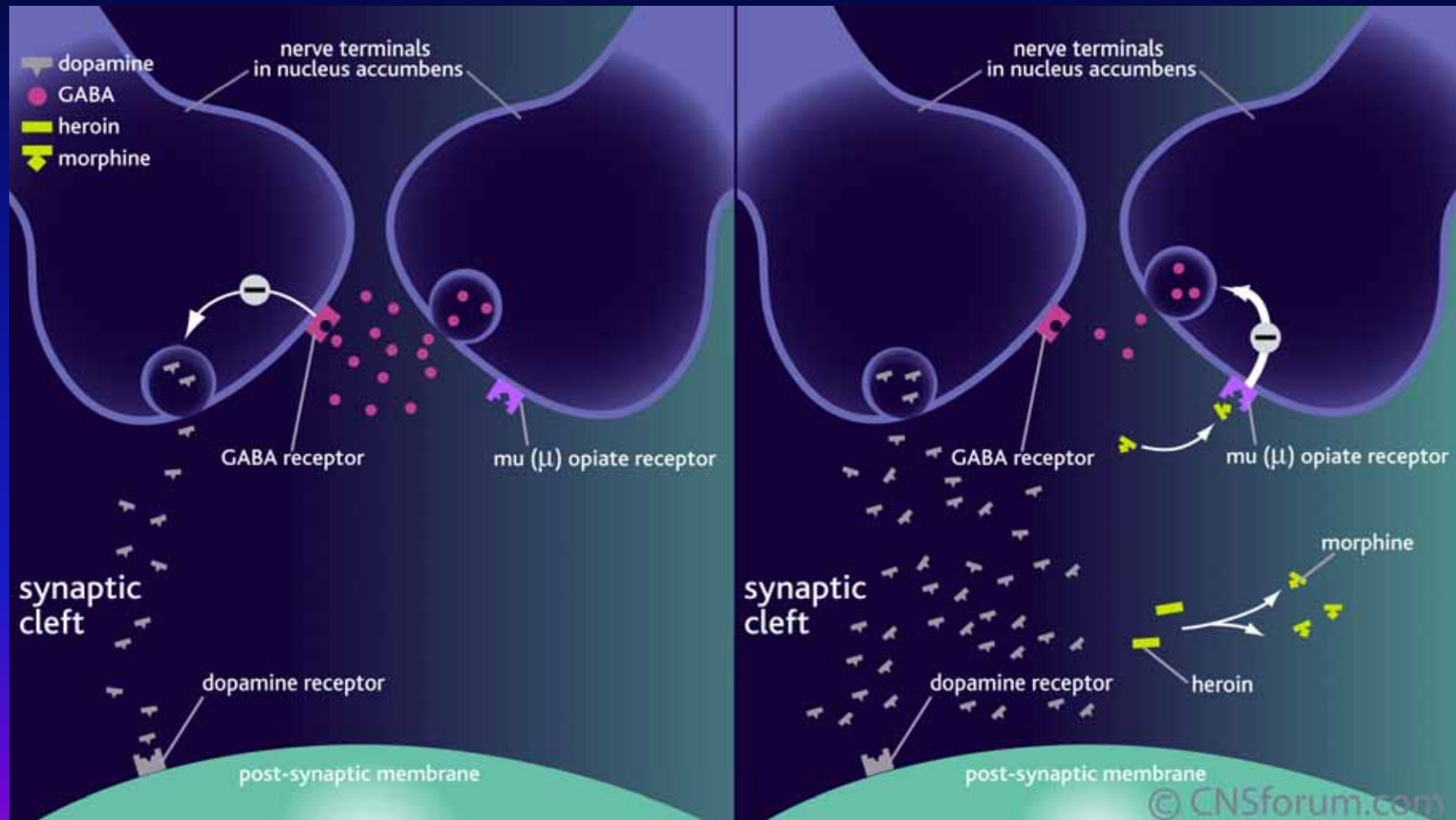




# The Major Stimulants: Amphetamines



# The Narcotics: Heroin



# The Narcotics: Heroin

## Side Effects

- Intense euphoria
- Subsequent tranquil drowsiness
- Elevated body temperature

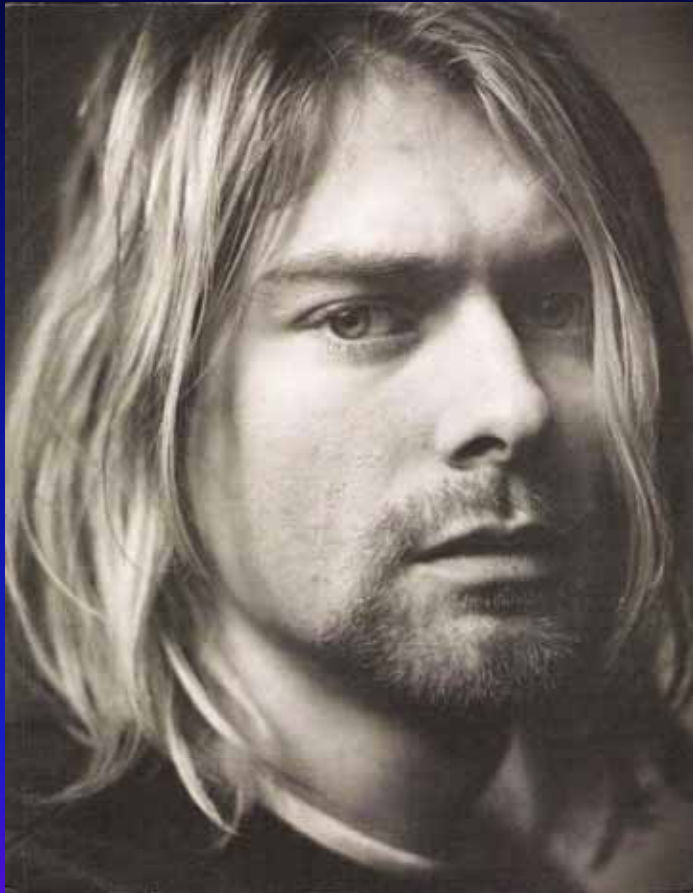
## Withdrawal

- Increased blood pressure
- Tearing, runny nose
- Diarrhea
- Spontaneous ejaculations
- Restlessness
- Involuntary kicking movements
- Pain and irritability
- Depression and anxiety





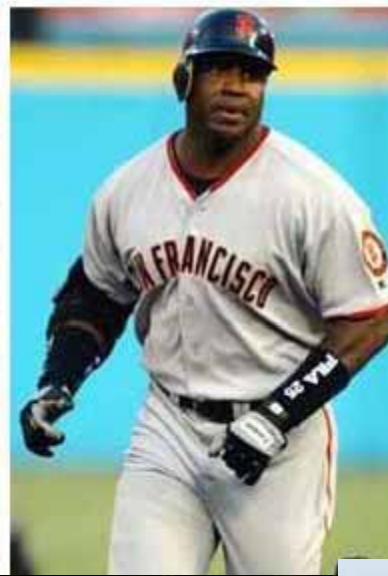
# The Narcotics: Heroin



# 21<sup>st</sup> Century Drugs



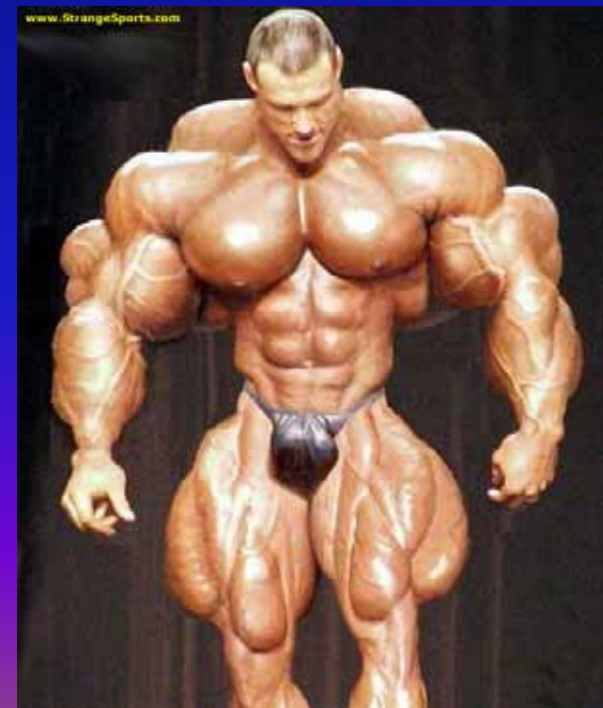
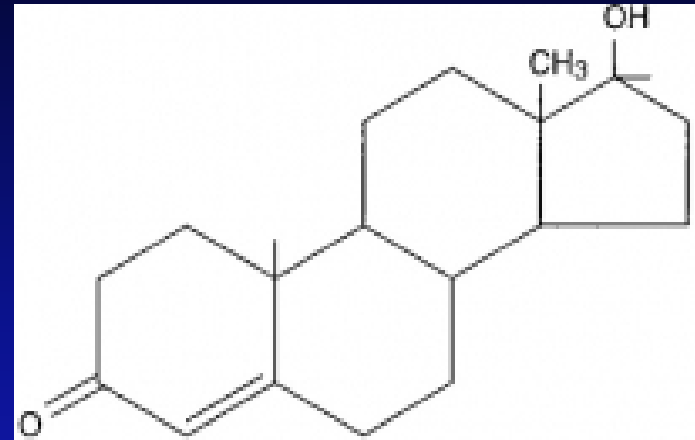
# Performance-Enhancing Drugs





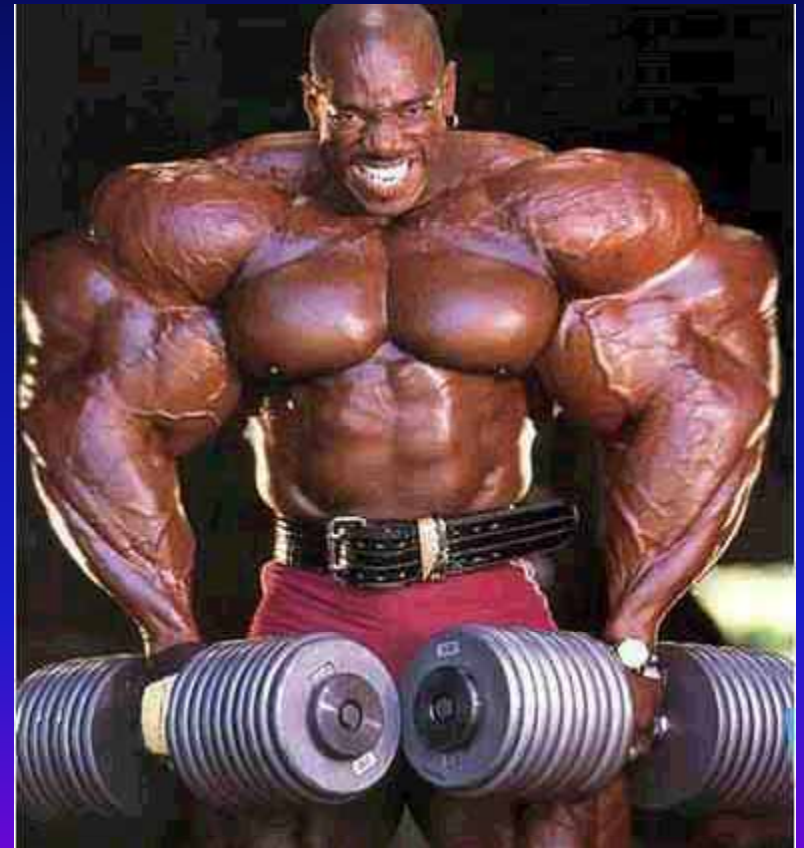
# Performance-Enhancing Drugs

- **Androgenic** - acting to promote masculinizing changes in the body
- **Anabolic** - acting to promote growth and muscular development
- **Anabolic-androgenic steroids (anabolic steroids)** - a group of drugs patterned after the testosterone molecule, producing anabolic and androgenic effects



# Performance-Enhancing Drugs

- Shrunk testicles
- Diminished sperm count
- Enlarged breasts
- Frequent, sustained, painful penile erections (priapism)
- Acne on shoulders and back
- Increased facial hair, accelerated balding



# Performance-Enhancing Drugs

- Lower voice
- Increased facial hair
- Enlarged clitoris
- Increased aggressiveness
- Increased appetite and decreased body fat
- Diminished menstruation
- Decreased breast size
- Increased body hair
- Increased loss of scalp hair





# Performance-Enhancing Drugs

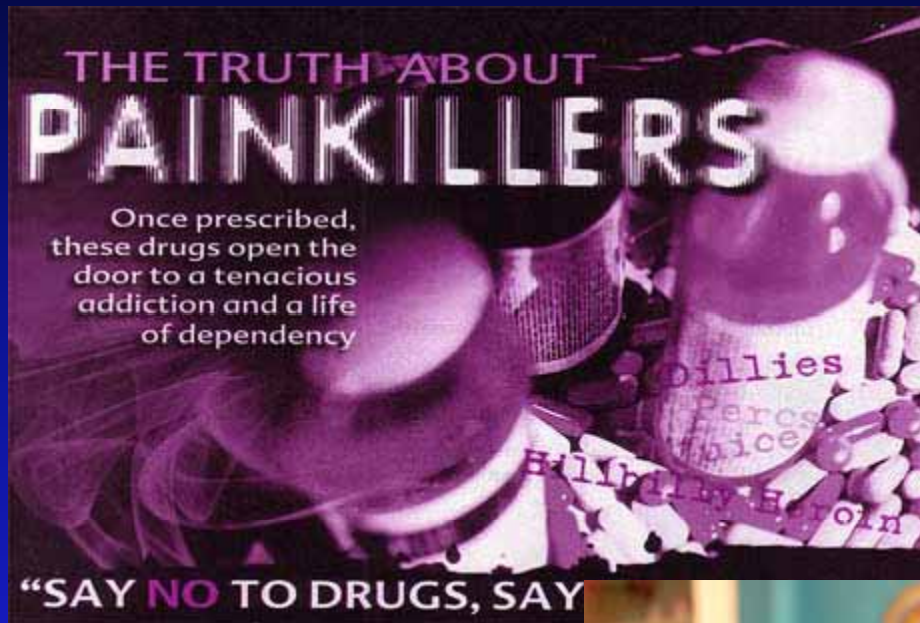
## Suspension Penalties for Steroid Use

The 2005 agreement on regulations against steroid use in major league baseball (MLB) included a ban on “all substances regarded now, or in the future, by the federal government as steroids” as well as human growth hormone and steroid precursor hormones such as androstendione. Suspension penalties for positive-test infractions under these new regulations are shown in comparison to previous MLB regulations and those of other U.S. and international athletic organizations.

	POSITIVE TEST				
	<i>First</i>	<i>Second</i>	<i>Third</i>	<i>Fourth</i>	<i>Fifth</i>
Major League Baseball					
<i>Pre-2005</i>	counseling	15 days	25 days	50 days	1 year
<i>Late 2005</i>	50 games	100 games	lifetime suspension, with right of rein- statement after two years		
Minor League Baseball	15 days	30 days	60 days	1 year	lifetime
National Football League	4 games	6 games	1 year	1 year	1 year
National Basketball Association	5 games	10 games	25 games	25 games	25 games
National Hockey League	— no testing for steroids —				
World Anti-Doping Association (Olympic sports)	2 years	lifetime			

Source: Curry, Jack (2006, November 16). Baseball lacks stiffer penalties for steroid use. *New York Times*, pp. A1, D2. NFL will ban amphetamines as enhancers (2006, June 28). *Newsday*, p. A53.

# Misuse of Prescription Drugs



# Misuse of Prescription Drugs



Prescription Drugs



# Misuse of Prescription Drugs



**Diprivan**



