

**Inside the Mind of the**



**Marijuana User**

Presentation by

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# **Today's Topics**

**The History of Marijuana**

**Epidemiology of Marijuana**

**Pharmacology**

**Major Effects**

**Marijuana and Driving**

**Drug Testing and Marijuana**

**Treatment**

# A History

- Origin in China or central Asia in Neolithic times (10,000 years ago)
- First “used” as food
- First “high” could have occurred around 6,500 B.C.
- As a medicine (Chinese emperor Shen Nung – c. 2700 B.C.)
- Social “hospitality” 200 A.D. (Galen)
- Source of ropes and sails – 3<sup>rd</sup> century Rome
- Utilized in Africa 6 centuries ago for religious, social rituals, medicinal purposes
- George Washington and the colonies

# Epidemiology

- By 2001 more than 12 million Americans (about 5% of the population) were using marijuana on a monthly basis (average of 18.7 joints) (SAMHSA, 2002)
- Over 110,000 visits to an emergency room listed marijuana as a contributing factor (DAWN)
- 39% of adult male arrestees and 26% of adult female arrestees tested positive for marijuana, as did 53% of the juvenile male and 38% of the juvenile female arrestees (DEA, DAWN, ADAM, 2003)

## Percentage of 8th-Graders Who Have Used Marijuana: Monitoring the Future Study, 2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
<b>Lifetime</b>	22.6%	22.2%	22.0%	20.3%	20.4%	19.2%	17.5%	16.3%	16.5%	15.7%
<b>Annual</b>	17.7	16.9	16.5	15.6	15.4	14.6	12.8	11.8	12.2	11.7
<b>30-day</b>	10.2	9.7	9.7	9.1	9.2	8.3	7.5	6.4	6.6	6.5
<b>Daily</b>	1.1	1.1	1.4	1.3	1.3	1.2	1.0	0.8	1.0	1.0

## Percentage of 10th-Graders Who Have Used Marijuana: Monitoring the Future Study, 2006

	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
<b>Lifetime</b>	42.3%	39.6%	40.9%	40.3%	40.1%	38.7%	36.4%	35.1%	34.1%	31.8%
<b>Annual</b>	34.8	31.1	32.1	32.2	32.7	30.3	28.2	27.5	26.6	25.2
<b>30-day</b>	20.5	18.7	19.4	19.7	19.8	17.8	17.0	15.9	15.2	14.2
<b>Daily</b>	3.7	3.6	3.8	3.8	4.5	3.9	3.6	3.2	3.1	2.8

## Percentage of 12th-Graders Who Have Used Marijuana: Monitoring the Future Study, 2006

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
<b>Lifetime</b>	49.6%	49.1%	49.7%	48.8%	49.0%	47.8%	46.1%	45.7%	44.8%	42.3%
<b>Annual</b>	38.5	37.5	37.8	36.5	37.0	36.2	34.9	34.3	33.6	31.5
<b>30-day</b>	23.7	22.8	23.1	21.6	22.4	21.5	21.2	19.9	19.8	18.3
<b>Daily</b>	5.8	5.6	6.0	6.0	5.8	6.0	6.0	5.6	5.0	5.0

# Botany

## Cannabis sativa:

- most common
- high concentration of fiber and still used for hemp
- typical plant produces 1-5 lbs of buds and smokable leaves

## Cannabis indica:

- shorter and bushier
- stronger/smellier ("skunk weed")
- usually the base plant for "sinsemilla" (without seeds)

# Pharmacology

## ADMINISTRATION AND INTOXICATION

- 420 chemicals (30 to 60 “cannabinoids”– most potent, delta-9-tetrahydrocannabinol, or THC)
- ingested orally, intoxication effects in 30 minutes
- smoking inhalation, intoxication effects within minutes
- 59% of smoked THC absorbed; 3% THC when orally ingested
- smoked THC effects 3 – 4 hours; longer if ingested orally
- 1960’s “joint” had 1-3% THC; wide range now (4-15%)
- one “joint” today equivalent to smoking 3-5 “joints” in the 1960s.

# Pharmacology

## MARIJUANA CONCENTRATIONS

- ordinary; average of 3 percent THC
- sinsemilla; average of 7.5 percent THC, can be 24 percent
- hashish; averages 2 to 8 percent THC, can be 20 percent
- hash oil; averages 15 to 50 percent THC, but be 70 percent
- "joint" contains between 0.5 and 1.0 grams of plant matter; THC content between 5 and 150 milligrams

Source: 2006 NIDA Report

# Pharmacology

Street price:

- \$6 a gram in 1981
- \$18 a gram in 1991
- \$10 a gram now
- an ounce (one “lid”) ranges from \$100 to \$400
- pound of “commercial” grade \$400 to \$1,000 in US southwest border areas, \$700 to \$2,000 a pound in the Midwest and northeastern US
- national price for sinsemilla ranges from \$900 to \$6,000 a pound

Source: DEA, 2003

“Cocoa puff” - cocaine and marijuana

“Frios” - marijuana laced with PCP

“Fry” - joint or cigar dipped in embalming fluid

“Fuel” - marijuana laced with insecticides

“Geek – crack and marijuana

# Pharmacology

- marijuana is fat soluble
- effects may persist or reoccur for 12-24 hours
- the ability to drive a car or a plane, other motor performance tasks, alertness and the ability to concentrate may be affected for hours to days

# Pharmacology

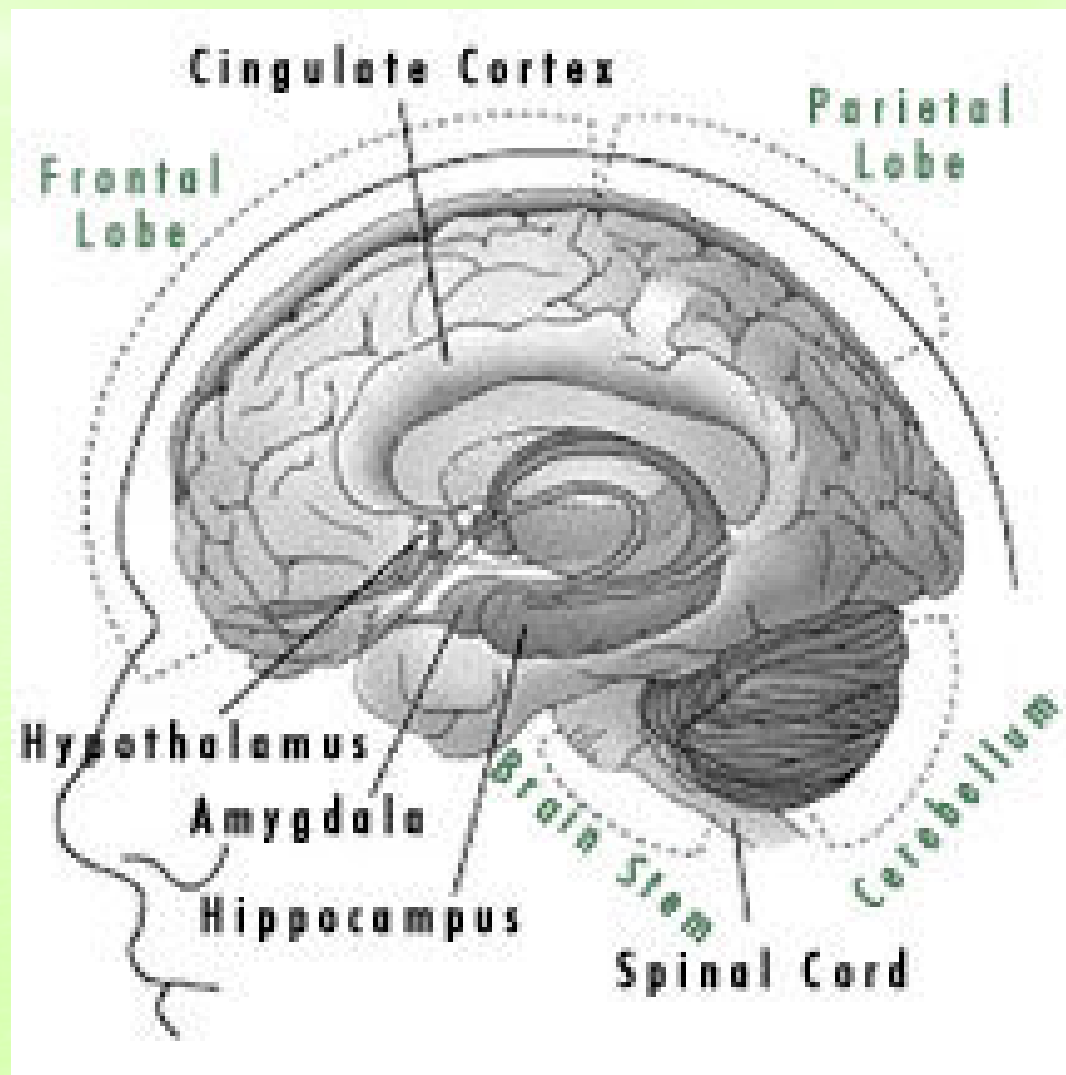
## MECHANISM OF ACTION

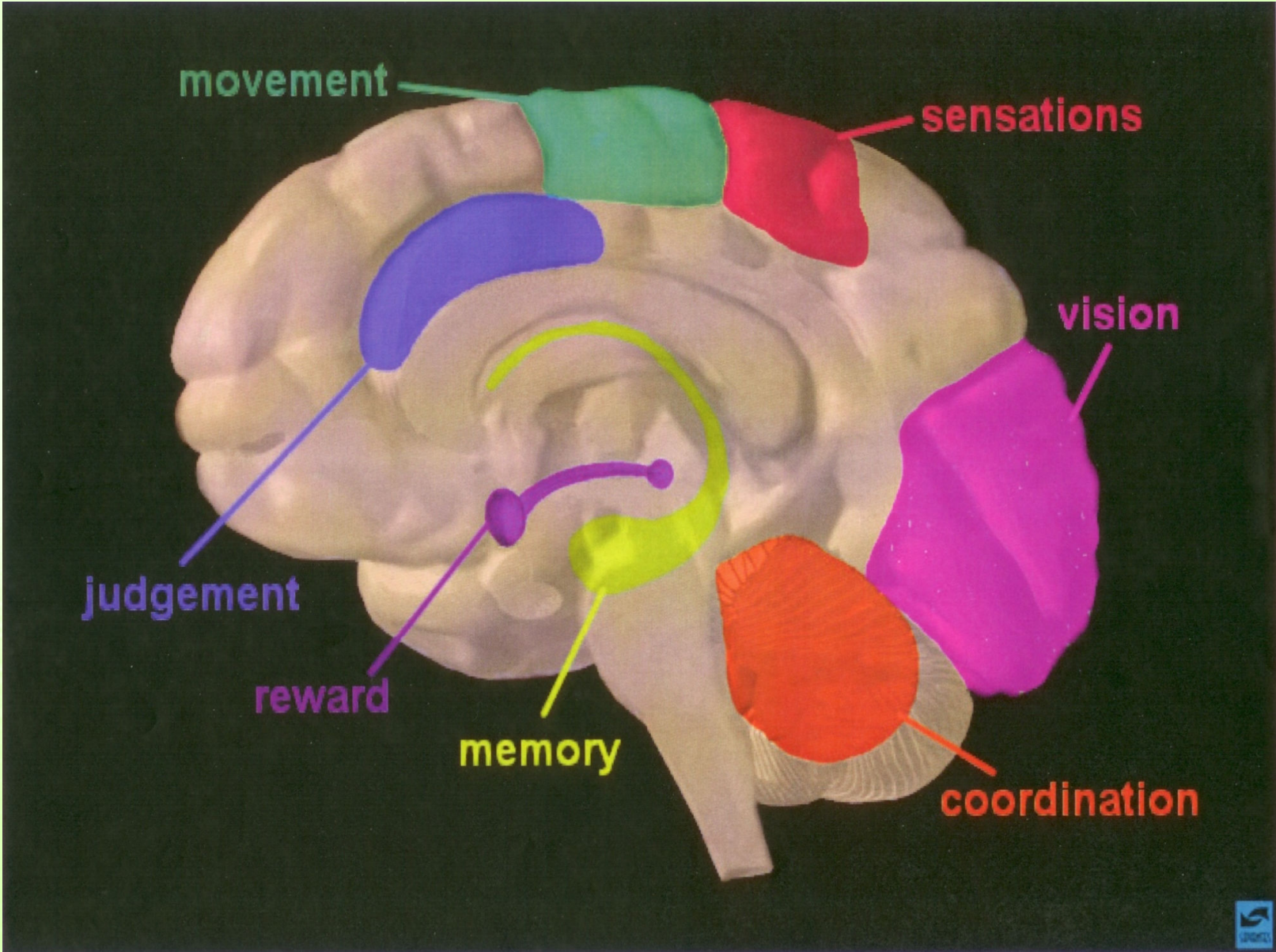
At John Hopkins Univ. (1990) receptor sites in the brain that were specifically reactive to the THC in marijuana were discovered.

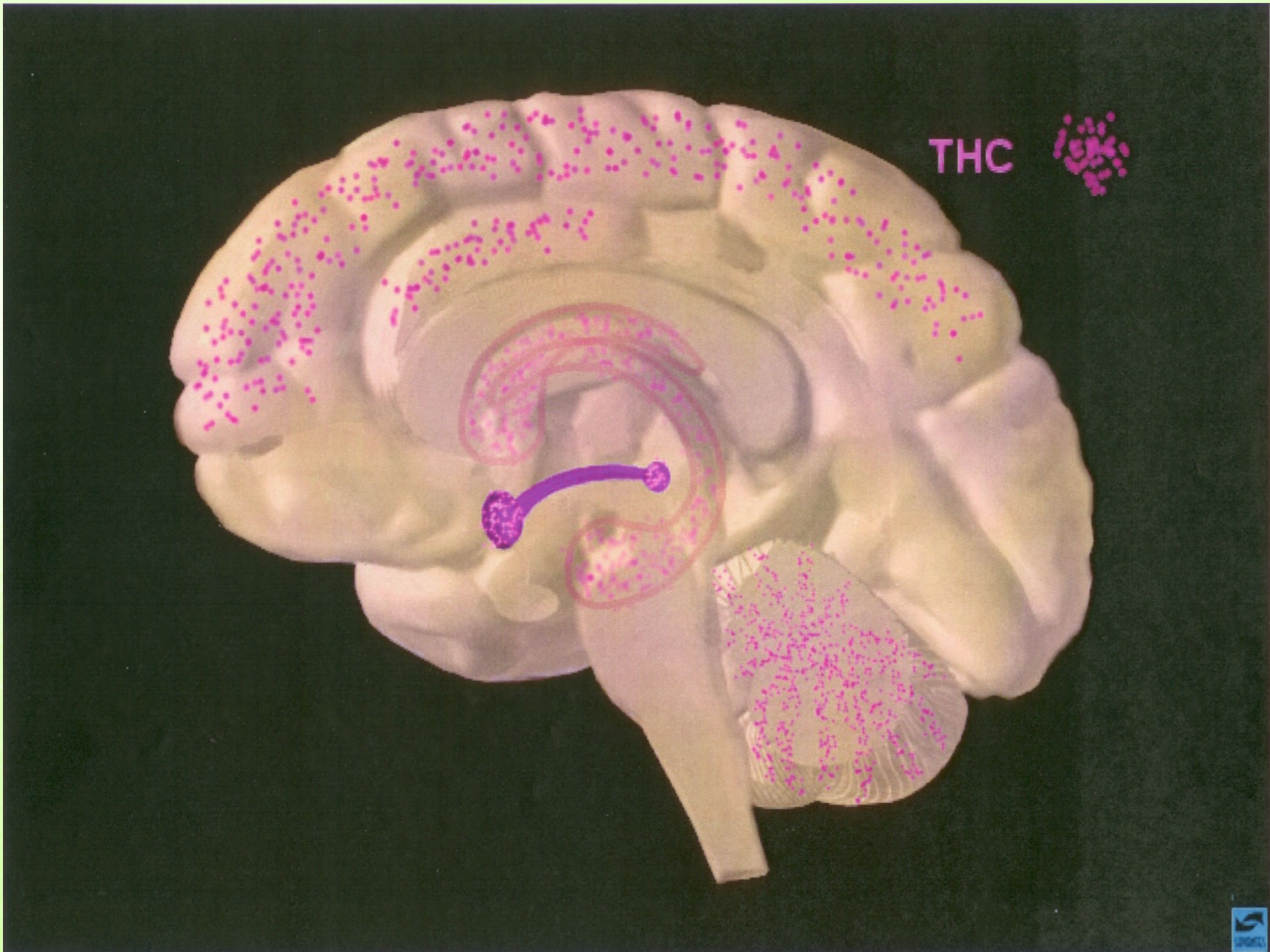
1992 – NIDA announced the discovery of ANANDAMIDE (Sanskrit word for “bliss”), the natural neurotransmitter that first into the receptor sites.

Receptors for anandamide found in several regions of the brain, but not that much in the brainstem (as compared to receptors for opioids and cocaine) and is why it is so difficult to physically overdose with marijuana. (Huestis et al., 2001)

Like other psychoactive drugs, THC activates neurons because its chemical structure mimics the natural neurotransmitters – can directly and indirectly target the brain’s reward system by flooding the circuit with dopamine.







# Marijuana's Effect on the Brain

## Brain regions in which cannabinoid receptors are abundant

<b>Brain Region</b>	<b>Functions Associated with Region</b>
Cerebellum	Body movement coordination
Hippocampus	Learning and memory
Cerebral cortex, especially cingulate, frontal, and parietal regions	Higher cognitive functions
Nucleus accumbens	Reward
Basal ganglia	Movement control

# Marijuana's Effects on the Brain

## Brain regions in which cannabinoid receptors are moderately concentrated

<b>Brain Region</b>	<b>Functions Associated with Region</b>
Hypothalamus	Body “housekeeping” (temperature regulation, salt/water balance)
Amygdala	Emotional response, fear
Spinal cord	Peripheral sensation, pain
Brain stem	Sleep and arousal, temperature, motor control
Central gray	Analgesia
Nucleus of the solitary tract	Visceral sensation, nausea/vomiting

Source: NIH, Publication Number 05-3859, 2005

# Major Effects

## SHORT-TERM EFFECTS

### Physical:

- relaxation to sedation
- bloodshot eyes
- coughing/lung irritation
- some pain control
- increase in appetite,
- loss in muscular coordination
- decreased blood pressure
- decrease in pressure behind the eyes
- increased heart rate
- increased blood flow through the mucous membranes of the eye
- decreased nausea
- impaired tracking ability
- marijuana can act as a stimulant or depressant,
- temporary disruption of the secretion of testosterone

# Major Effects

## SHORT TERM EFFECTS

### Mental

#### Mild to moderate dose:

- confused and separated from the environment
- feeling of deja vu
- drowsiness
- feelings of detachment and being aloof
- difficulty in concentrating
- disrupts short-term memory

#### Strong dose:

- stimulation, giddiness, distortions of color/time/sound

#### Very strong dose:

- feelings of movement, visual hallucinations and hallucinations

#### Mental effects dependent on set, setting, and experience

- can exaggerate mood, personality, empathy or suggestibility

# Major Effects

## POTENTIAL ADVERSE PSYCHIATRIC REACTIONS

- hallucinations
- precipitate individuals who are predisposed
- paranoid ideation
- suspiciousness
- frank delusions.

# Major Effects

## LONG TERM EFFECTS

- respiratory problems - irritant to lungs
- 4 joints equivalent to pack of cigarettes (Tashkin, 1998).
- can depress the immune system
- increased coughing with acute and chronic bronchitis

# Major Effects

## LONG TERM EFFECTS

- learning and emotional maturation:

  - disrupts concentration

  - slow learning (state dependency)

  - interferes with short-term memory

  - "Amotivational syndrome"

  - "the mirror that magnifies" – can exaggerate natural tendencies in the user - primitive brain takes over – "don't have to do things/don't bother doing it" (Inaba, 2005)

- acute mental problems:

  - long-term and lasting problems rare

  - BUT, can trigger pre-existing problems

  - "post hallucinogenic drug perceptual disorder"

# Major Effects

## MAJOR ISSUES OF CONCERN

- decrease in color discrimination
  - decrease in ocular motor tracking
  - visual distortion
  - decreased recognition
  - decreased analysis of peripheral visual field light stimuli
- 
- marijuana and alcohol, polyabuse

# Major Effects

## CLINICAL SYNDROME

### Tolerance:

- develops quickly and continues long term
- tolerance develops to anandamide.
- Cannabinoid receptor antagonist - SR141716A (Rinaldi-Carmona, 1994).

# Major Effects

## CLINICAL SYNDROME

### Dependence/Withdrawal

- 9.2% (Warner, 1995)
- 20% (Hall, 1994 )
- anger, irritability, aggression
- aches, pains, chills
- depression
- inability to concentrate
- sleep disturbance
- slight tremors
- decrease in appetite
- sweating
- craving

3 to 7 days, to several weeks after abstinence (Haney, 1999)

# Major Effects

## CLINICAL SYNDROME

### Overdose

- no documented cases of death
- BUT, polyabuse ?

# Marijuana and Driving

- 65% of heavy drinkers also smoke marijuana
- marijuana appears in urine and blood 3 - 5 times more frequently in fatal driving accidents than in the general population. (SAMSHA, 1999)
- marijuana, drive slower; alcohol, drive faster;
- low dose marijuana + low dose alcohol (.04 BAC) = .09 BAC
- moderate marijuana + low dose alcohol = > .12 BAC
- high marijuana + low dose alcohol = inability to stand
- impairment lasted 3 hours

Source: James O'Hanlon, Ph.D.

Institute of Human Psychopharmacology/The Netherlands (2000).

# Marijuana and Driving

- impairment dose related
- 60% failed field sobriety test 2 1/2 hours after moderate smoking
- impairment documented 3-8 hours later (Hollister, 1986)
- low amounts, diminished ability to perceive and respond to changes on the road
- did not make appropriate speed adjustments
- induces drowsiness and impairs judgment (Mathias, 1996)
- with alcohol, performance worse

(SAMHSA/NHTSA)

# Marijuana and Driving

2 joints smoked (10 minutes apart with 1.8-3.6% THC)

Failed field sobriety tests 20 minutes later:

- one leg stand/30 seconds
- touch finger to nose
- walk straight line

Subjects swayed, raised arms to keep balance

In 12 states (Arizona, Georgia, Indiana, Illinois, Iowa, Michigan, Minnesota, Nevada, Pennsylvania, Rhode Island, Utah, and Wisconsin), it is illegal to operate a motor vehicle with any detectable level of a prohibited drug, or its metabolites, in the driver's blood.

# Drug Testing

Thin Layer Chromatography (TLC):

- wide variety of drugs at the same time
- sensitive to minute amounts of drugs
- BUT, does not accurately differentiate drugs with similar properties

Gas Chromatography/Mass Spectrometry Combined (GC/MS) and Gas Liquid Chromatography (GLC):

- most sensitive, accurate and reliable method
- BUT, expensive, lengthy and tedious, requires skilled interpreters
- GLC is similar to TLC; less accurate than GC/MS

# Drug Testing

Enzyme-Multiplied Immunoassay Techniques (EMIT), Radio Immunoassay (RIA), Enzyme Immunoassay (EIA):

- extremely sensitive
- easy to operate
- rapidly performed
- use antibodies to seek out specific drugs
  
- BUT, do not distinguish concentrations
- separate test must be done for each suspected drug
- “look alike – false positives”
- “too sensitive”

# Drug Testing

## Hair Analysis:

- detect drugs over long period of time
- differentiates occasional and chronic/addictive involvement

## - Saliva, Sweat and Breath:

- less accurate
- prone to be affected by environmental exposure
- Saliva tests "on the spot" tools, BUT need confirmation

# Drug Testing

## DETECTION PERIOD (PharmChem, 1999)

- single use 1-3 days
- casual use to 4 joints per week 5-7 days
- daily use 10-15 days
- chronic, heavy use 1-2 months

## CONCERNS:

- elimination rate varies significantly
- correlation with level of impairment
- drug interactions/polyabuse.

# Drug Testing

- can be set for different levels
- 50 nanograms per milliliter (ng/mL) in urine samples
- “light” smoker can test negative 24-48 hours later
- “long-term” smoker needs 3 weeks to not register
- would need another 3 weeks to show nothing
- can take 10 weeks for the person to be "clean."

# Treatment

## Criteria for Substance Abuse (DSM-IV-TR)

A maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by one (or more) of the following, occurring within a 12-month period:

- (1) recurrent substance use resulting in a failure to fulfill major role obligations at work, school, or home
- (2) recurrent substance use in situations in which it is physically hazardous
- (3) recurrent substance-related legal problems
- (4) continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance

# Treatment

## DSM-IV-TR Cannabis Intoxication:

- A. Recent use of cannabis
- B. Clinically significant maladaptive behavioral or psychological changes (e.g., impaired motor coordination, euphoria, anxiety, sensation of slowed time, impaired judgment, social withdrawal) that developed during, or shortly after, cannabis use
- C. Two (or more) of the following signs, developing within 2 hours of cannabis use:
  - (1) conjunctival injection
  - (2) increased appetite
  - (3) dry mouth
  - (4) tachycardia
- D. The symptoms are not due to a general medical condition and are not better accounted for by another mental disorder.

# Treatment

50% of the teens entering Tx in 1996 were for marijuana (87, 687)

Tx should be individualized

- assessment
- detox/polyabuse?
- “why” in Tx
- “what” from Tx
- special issues
- self-efficacy
- “readiness”
- relapse prevention

National Center on Addiction and Substance Abuse at Columbia Univ  
(1999)

# Treatment

## ADDICTION:

- pathological attachment (“craving”)
- loss of control
- continuation despite consequences

## CAGE:

- Cut down
- Anger
- Guilt
- Eye opener

# Treatment

## RISK FACTORS (Bachman 1998)

Protective – decreased use:

parental presence

focus on school and grades

connected to family

personal religious belief

few nights out

high self-esteem

connected to school

disapproval of “drugs/druggers”

# Treatment

## RISK FACORS

Liabilities – increased use

easy access to drugs

cigarette smoking

peers who “drug”

working 20+ hours/week (9<sup>th</sup> – 12<sup>th</sup> grade)

appearing older

low grades

sexually deviant behavior

perceived risk of untimely death

# Medical Marijuana

Has been studied in many countries

- reduces intraocular pressure
- control of nausea and vomiting
- anticonvulsant
- appetite stimulant
- withdrawal from depressants and opioids
- analgesic

(Source: IOM, MJ and Medicine, 1999)

# What Else?

- "Gateway Drug"?
- "Attitudes" and "Profiles"
- Correlation with:
  - Violence
  - Sex
  - Flashbacks

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