

SOCI 270
Drugs, Society and Behavior

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Chapter 11

Caffeine



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The Coffee Song
The Muppets



Caffeine

- **The most widely used psychoactive drug**
- **Can cause dependence** and interfere with functioning
- Belongs to a class of chemicals known as **xanthines**



Caffeine

Three plants containing *xanthines* have been used by humans for thousands of years:

- 1. Coffee** — from the **Middle East**
 - 2. Tea** — first grown in **China**
 - 3. Cacao** — from the **Americas**
- All three played important **cultural and economic roles**

1. Coffee



a. History

i. Coffee originated in Ethiopia

- **Legend of** its discovery by an Ethiopian goat herder, **Kaldi**, who noticed unusually boisterous activity in his goats after they consumed the berries
- The practice then spread to Egypt and other Arabic countries by the 1400s, throughout the middle east by the 1500s and into **Europe in the 1600s.**

1. Coffee



a. History

ii. Coffeehouses spread:

a location to relax, learn the news of the day, seal bargains, and listen and learn from literary and political figures



- **England 1674:** "[The Women's Petition Against Coffee](#)" argued against the use of coffee on the grounds that it made men impotent



- [London Coffee Houses of 1765](#)

Coffeehouses: then and now

1. Coffee: History



a. History

iii. Coffee consumption in the United States

- Use increased following taxation of tea and the American Revolution
- Use also increased during and after Prohibition
- Per capita **U.S. coffee consumption**
 - **Peaked in 1946**
 - **Declined as soft drink** consumption increased
 - Current = about **25 gallons of coffee per year**

1. Coffee: History



a. History

iv. Preparation

- **Originally:** people **chewed** on coffee beans or put raw beans in hot water
- **Roasting improves the flavor**, aroma, and color of the drink made from the beans
- Coffeehouses and individuals originally roasted and ground their own beans
- **1790: Commercial roasting**
- **1900: Vacuum packing** for long-term storage of ground coffee



1. Coffee

b. Growing and Trade

i. About **half of American coffee comes from Latin America, the rest from Vietnam, Indonesia, and Thailand**

- Over \$5 billion was imported to the US in 2008

ii. Variations in coffee characteristics

- **Different varieties** of the coffee shrubs
 - *Coffea arabica* - milder flavor, takes longer to develop after planting and requires a near tropical climate to grow.
 - *Coffea robusta* - stronger and more bitter flavor and a higher caffeine content, used in less expensive blends and to make instant coffee.



1. Coffee

c. Varieties

i. Many varieties of preparation

- Black
- Espresso
- Cappuccino
- Latte
- Turkish
- Half-caf
- Iced
- Flavored
 - and many more



1. Coffee

a. Varieties

ii. Decaffeinated coffee

- **Soaking unroasted beans** in an **organic solvent** removes the caffeine (alternative Swiss water process not widely used—removes more of the coffee's flavor)
- **Caffeine removed from coffee is used in the manufacture of soft drinks**



1. Coffee



c. The **caffeine content** of coffee depends on how it is prepared:

Type	Average caffeine content
Brewed, drip (5 oz)	115 mg
Brewed, percolator (5 oz)	80
Instant (5 oz)	65
Decaffeinated, brewed (5 oz)	3
Decaffeinated, instant (5 oz)	2

2. Tea



a. History

- i. Tea is **second only to water as the most widely consumed beverage** in the world.
- ii. Tea (*Camellia sinensis*) originated in China
 - **Legend of its creation by Daruma**, the founder of Zen Buddhism, who cut off his eyelids to remain awake while meditating; a new plant grew from the spot where his eyelids touched the earth, with leaves that made a brew that would keep a person awake.

2. Tea



a. History

- iii. **AD 350:** Chinese manuscript describes many **medicinal** uses
- AD 780:** **Nonmedical cultivation** and use of tea; **Lu Yu, Chinese tea master of the 8th c.**



2. Tea



a. History

iv. 1610: Dutch delivered tea to Europe

- **English East India Company**
 - Concentrated on importing spices, so the first tea was taken to England by the Dutch.
 - As demand grew, the company expanded its imports from China.
 - Became the world's first multinational corporation.
- Most tea sold in coffeehouses
- In Britain, major marketing campaigns promoted the switch from coffee to tea
 - After the American Revolution, **to be a tea drinker was to be loyal to the Crown (a traitor!)**

2. Tea



a. History

v. 1770s: Tea and the American Revolution

- American colonists were big tea drinkers
- Anger over a tax on tea that they had not helped formulate
 - "Taxation without representation"
- Legal tea sales dropped due to a boycott
- Illegal smuggling of tea increased

2. Tea



v. cont. *Tea and the American Revolution*

- A special arrangement was made for the English East India Company, giving them a monopoly and angering American merchants

The result was "The Boston Tea Party" of 1773



2. Tea



b. Consumption and Production

i. Annual per capita tea consumption

- 4.5 pounds in the United Kingdom
- .5 (1/2) pound in the United States

ii. Tea starts its life on a four- to five-foot bush **high in the mountains of China**, Sri Lanka, India or Indonesia.

2. Tea



b. Consumption and Production

iii. **Bushes** are regularly pruned to aid in harvesting new growth

- Tea leaves are picked by hand, about every 6 to 10 days
- Preparation: tea leaves are
 - Dried
 - Rolled to crush the cells in the leaves
 - Placed in a cool, damp place for fermentation (oxidation)



2. Tea

c. Varieties

- **Black tea** is fully oxidized leaves
- **Green tea** is slightly oxidized leaves
- **White tea** is nonoxidized leaves



2. Tea: Varieties



c. Varieties

- **Iced tea** (orig. 1904, Louisiana Purchase Exposition, St. Louis) accounts for 75 percent of all tea consumed in U.S.
- **Flavored teas** are mixtures of tea and mint, spices, or other flavors (ex. Earl Grey, Jasmine)
- **Herbal teas** contain a mix of plant leaves and flowers but no actual tea



2. Tea



d. Active Ingredients

i. **Xanthines** block inhibitory receptors for *adenosine*, thereby having a stimulant effect

ii. Caffeine

- Pound for pound, tea has more caffeine than coffee **BUT**
 - 1 pound of tea leaves = 200 cups of tea
 - 1 pound of coffee = 50 to 60 cups of coffee
- Tea has about 40 to 60 mg of caffeine per cup depending on the type and strength of the brew

iii. Theophylline

- Tea contains a very small amount of theophylline
 - In high doses, theophylline is used as an asthma medication

3. Chocolate



a. History

i. Chocolate originated in Mesoamerica

- **Legend:** Cacao tree was a gift to humans from paradise from the Aztec god **Quetzalcoatl**
- Linnaeus named the cacao tree *Theobroma*, meaning "food of the gods"
- **Aztecs cultivated cacao** widely, and the cacao bean was an important part of their economy and culture



3. Chocolate



a. History

ii. "**Xocolatl**"—from the **Mayan** words **xoc** ("warm") and **latl** ("beverage")

It was a thick, bitter liquid flavored with vanilla

iii. **Cortés** introduced chocolate into **Europe**

- Chocolate drinking spread slowly
- Chocolate was often sold alongside coffee and tea in established coffeehouses



3. Chocolate



b. Processing

i. Prior to 1828, the **traditional Aztec process** was still used

- Cacao pods were dried in the sun, then roasted to remove the husk
- Kernels were ground to obtain a thick liquid (baking chocolate)



3. Chocolate



b. Processing

ii. **1828**: Dutch patent issued for a process that removes about two-thirds of the fat (**cocoa butter**) and produces a powder

- A mixture of cocoa butter, sugar, and chocolate powder can be formed into slabs or bars

iii. **1876**: **Milk chocolate** introduced by the **Swiss**



3. Chocolate



c. Xanthines

- **Theobromine** (lit. "Food of the Gods")
 - Chocolate contains the unique xanthine *theobromine*
 - It acts in a parallel fashion to caffeine, but it is much less potent in its CNS effects
- **Caffeine**
 - An average cup of cocoa contains about 4 mg of caffeine



4. Caffeine and Culture



a. The cultural effects of caffeine have been far-reaching

- Propped-up legends** (Lu Yu)
- Prompted revolutions** (American Revolution, eg.)
- Practices of slavery** (**Burkina Faso**)
- iv. These abuses have created a strong movement toward **Fair Trade**



5. Other Sources of Caffeine

a. Soft Drinks: Coca-Cola

- Developed as a **nerve tonic** in the late 1800s; ingredients included:
 - Caramel
 - Fruit flavoring
 - Phosphoric acid
 - Caffeine
 - A secret mixture called *Merchandise No. 5*
- Named for two flavoring agents: coca leaves and cola (kola) nuts
- Up until 1906, the beverage did contain a small amount of cocaine



5. Other Sources of Caffeine

b. Other soft drinks

- All types of soft drinks are popular
- U.S. per capita soft drink consumption is about 50 gallons per year



c. Energy drinks

d. Over-the-counter medications (“no-doz”, “vivarin”)



5. Caffeine Content



Item	Caffeine Content (mg)	Serving
Brewed coffee	40-180	5 oz
Instant coffee	30-120	5 oz
Decaffeinated coffee	1-5	5 oz
Tea	20-110	5 oz
Cocoa	5-20	5 oz
Diet Coke	47	12 oz
Pepsi One	54	12 oz
Mountain Dew	54	12 oz
Jolt	72	12 oz
Red Bull	80	8.3 oz
Milk chocolate bar	1-15	1 oz
Dark chocolate bar	5-35	1 oz
Vivarin stimulant dose	200	1

6. Caffeine Pharmacology

a. Three key xanthines

- Caffeine
- Theophylline
- Theobromine

b. Time course

- Rapid absorption if taken orally
- Peak levels reached in 30 minutes
- Half-life is about 3 hours

c. Dependence

- Reinforcing properties
- Withdrawal symptoms include headache and fatigue



6. Caffeine Pharmacology



d. Mechanism of action

- Xanthines block inhibitory receptors for *adenosine*, thereby having a stimulant effect

e. Physiological effects

- Stimulates the CNS and skeletal muscles
- Causes sleep disturbances
- Elevates mood
- Constricts blood vessels in the brain
 - May explain the ability of caffeine to reduce migraine headaches

7. Benefits and Drawbacks

a. Potential Benefits

i. Stimulation

- Caffeine partially offsets the effects of fatigue on both mental and physical tasks, but it may not improve performance in well-rested individuals
- High caffeine consumption among college students is associated with lower academic performance

ii. Headache treatment

- Helps relieve both migraine and non-migraine headaches

iii. Hyperactivity treatment

- High doses may decrease hyperactivity

iv. Sobering up? No.

- Caffeine does **not** lower blood alcohol concentration and will not help a person sober up

7. Benefits and Drawbacks



b. Causes for Concerns

i. There is no clear evidence that moderate caffeine consumption is dangerous

ii. Cancer: Caffeine is not a risk factor in human cancer

iii. Reproductive effects:

- High consumption of caffeine reduces a woman's chances of becoming pregnant and slows the growth of the fetus
- Research is mixed on whether caffeine increases the risk of miscarriage

iv. Heart disease: High intake of caffeine may increase the risk of heart attack, particularly in people with other risk factors

7. Benefits and Drawbacks



v. Caffeinism (excessive use of caffeine)

- **Toxicity is relatively low**
 - It would require about **100 cups of coffee** to receive a **fatal dose** from oral caffeine
- Unpleasant symptoms do occur:
 - Nervousness
 - Irritability
 - Tremors
 - Muscle twitching
 - Insomnia
 - Flushed appearance
 - Elevated temperature
 - Palpitations
 - Heart arrhythmias
 - Gastrointestinal disturbances


