

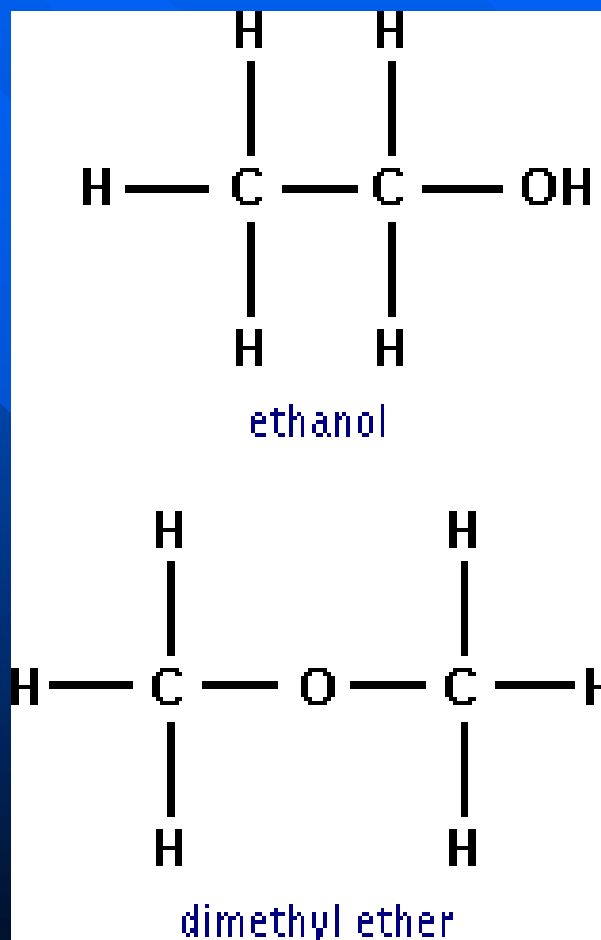


WELCOME TO THE SCIENCE OF ALCOHOL AND ALCOHOLISM

Element- A substance which cannot be decomposed into simpler substances by chemical reactions. Some important biological elements:

- Oxygen (O)
- Carbon (C)
- Phosphorus (P)
- Calcium (Ca)
- Potassium (K)
- Iron (Fe)
- Hydrogen (H)
- Nitrogen (N)
- Sulfur (S)
- Sodium (Na)
- Magnesium (Mg)

CHEMICAL ISOMERS
BOTH CHEMICALS ARE $\text{H}_6\text{C}_2\text{O}$,
BUT THEY ARE NOT THE SAME
CHEMICAL!



Types of Alcohol

- Isopropyl ("rubbing alcohol")
- Methyl ("wood alcohol") (CH_3OH)
- Ethyl (beverage alcohol/ethylene/ethanol) $\text{H}_5\text{C}_2\text{OH}$

ALCOHOL EQUIVALENTS

12 Oz. Beer @ 6% alcohol =

4 oz wine @ 12% alcohol =

**1.25 oz spirits @ 80 proof (40%) alcohol
=**

1 oz spirits @ 100 proof (50%) alcohol

Absorption of alcohol

- **small amounts of alcohol absorbed by the mouth**
- **most alcohol enters bloodstream from stomach, small intestine and colon**
- **rate of absorption dependent on gastric emptying time**

Absorption of alcohol

- **absorption delayed by presence of food in the small intestine**

Metabolism of alcohol

- occurs primarily in the liver
- Proportionate to body weight
- A small amount of alcohol is detoxified by the microsomal enzyme oxidation system

Metabolism of alcohol

- On average, occurs at rate of 1 ounce of pure alcohol per three hours
(1.78 oz of 80 proof alcohol/hour)

Metabolism of alcohol

Alcohol

alcohol dehydrogenase (ADH)

Acetaldehyde-

acetaldehyde dehydrogenase (ALD-H)

Acetic acid (acetate)

CO₂ & H₂O

Metabolism of alcohol

- In heavy alcohol drinkers, liver enzymes will show an increase, especially:
 - SGOT (serum oxaloacetic transaminase)
 - SGPT (serum glutamic pyruvic transaminase)

Variations in alcohol metabolism

- 50% of persons of Japanese ancestry have a variant form of ALDH which is less able to metabolize alcohol. Also present in some persons of Chinese ancestry.
- Levels of acetaldehyde may be 10X higher than in persons with normal ALDH

Variations in alcohol metabolism

- Excess acetaldehyde produces “alcohol flush reaction”

Alcohol Flush Reaction

- facial flushing
- vasodilation
- tachycardia
- headache

Alcohol Flush Reaction

- nausea
- vomiting
- edema (fluid build-up/"water weight")
- hypotension

Alcohol Flush Reaction

- Same reaction occurs when individuals on Antabuse drink
- Presence of ALDH variant seems to lessen tendency to drink alcohol
- The ALDH variant is rare in Japanese alcoholics with liver disease

Blood alcohol level (BAL)/Blood alcohol concentration (BAC) & Behavior

BAL

Behavior

0.05%

Relaxation, decreased inhibitions & alertness, possible personality change

0.08

Legal level in Illinois for DUI

Blood alcohol level (BAL)/Blood alcohol concentration (BAC) & Behavior

BAL

Behavior

0.10

Slowed reaction time, impaired judgment, personality changes

0.15

Large, consistent in reaction time, increasing intoxication, mood/personality changes

Blood alcohol level (BAL)/Blood alcohol concentration (BAC) & Behavior

BAL

Behavior

0.20

Significant impairment of sensory and motor functions, marked intoxication

0.25

Severe motor and sensory disturbance, staggering gait, marked intoxication

Blood alcohol level (BAL)/Blood alcohol concentration (BAC) & Behavior

BAL

Behavior

.30

Semi-stupor, marked decrease in awareness and breathing rate, blackouts

.35

Surgical anesthesia, level of LD₁, minimal level normally required to cause death

Blood alcohol level (BAL)/Blood alcohol concentration (BAC) & Behavior

BAL

Behavior

0.40

LD₅₀

- **On average, fifty percent of drinkers with a blood alcohol level of 0.40 will die of alcohol poisoning.**

“HE IS.....”

WHAT ABOUT “SHE”?

SEX DIFFERENCES AND ALCOHOL INTOXICATION

**IN GENERAL, AT THE SAME
LEVEL OF ALCOHOL
CONSUMPTION, WOMEN
ACHIEVE A HIGHER BAC THAN
MEN**

SEX DIFFERENCES AND ALCOHOL INTOXICATION

- **Women's body weight is usually less than men's**
- **Women tend to have less water in their bodies and a higher percent of body fat, so there is less tissue in which alcohol can dissolve**
- **Women tend to metabolize alcohol less efficiently than men.**

SEX DIFFERENCES AND ALCOHOL INTOXICATION

- **Food in the stomach tends to slow the absorption of alcohol**
- **Men tend to drink and snack, thus increasing the amount of food in the stomach**
- **Women tend to diet more than men, and may not very much prior to drinking**

PHYSIOLOGICAL EFFECTS OF ACUTE ALCOHOL CONSUMPTION

- Dilation of the peripheral blood vessels = flushing, increased warmth of skin, possibly sweating.
- Small doses produce slight in respiration. Large doses ($>.39$) can produce respiratory arrest.

GASTROINTESTINAL (G.I.) SYSTEM: THE G.I. TRACT

- **mouth**
- **esophagus**
- **stomach**
- **small intestine**
- **large intestine (colon)**
- **rectum**
- **anus**

GATROINTESTINAL (G.I.) SYSTEM : ACCESSORY ORGANS

- **salivary glands**
- **pancreas**
- **liver**
- **gallbladder**

EFFECT OF ALCOHOL ON THE GASTROINTESTINAL SYSTEM

Responsible for:

- ingestion, digestion, absorption of food
- ingestion, absorption, and breakdown of some drugs
- the elimination of solid wastes.

EFFECT OF ALCOHOL ON THE GASTROINTESTINAL SYSTEM

- **Esophagitis**
- **Peptic Ulcer Disease**
- **Hemorrhagic pancreatitis**
- **Uric acid elevation---
Gout**
- **Hyperglycemia**
- **Alcoholic hepatitis**
- **Gastritis**
- **Pancreatitis**
- **Pancreatic insufficiency**
- **Hypoglycemia**
- **Alcoholic fatty liver
(hepatosis)**
- **Cirrhosis**

Gastritis

- Presence of alcohol in the stomach initiates release of gastric juices
- If no food is present, the stomach can become irritated

Peptic Ulcer Disease

- Alcohol does not cause ulcers, but if one is already present, both alcohol and unabsorbed gastric juices can make it worse
- If stomach lining is ulcerated enough, bleeding can occur

Pancreatitis

- Pancreas secretes digestive enzymes into the small intestine via the pancreatic duct.
- Alcohol can block the duct by inflaming the small intestine
- Digestive enzymes “stuck” in pancreas; begin to irritate and digest it

Pancreas



Pancreatitis

- Most common symptom pancreatitis is pain.
- May come on suddenly or build gradually.
- Pain usually centered in the upper middle or upper left part of the abdomen.
- May feel as if it radiates through to the back.
- Often begins or worsens after eating.
- Typically lasts a few days, unless drinking continues
- Pain worsen when person lies flat on his/her back
- May be relieved when the person curls up into a ball.

Pancreatitis

■ Other symptoms:

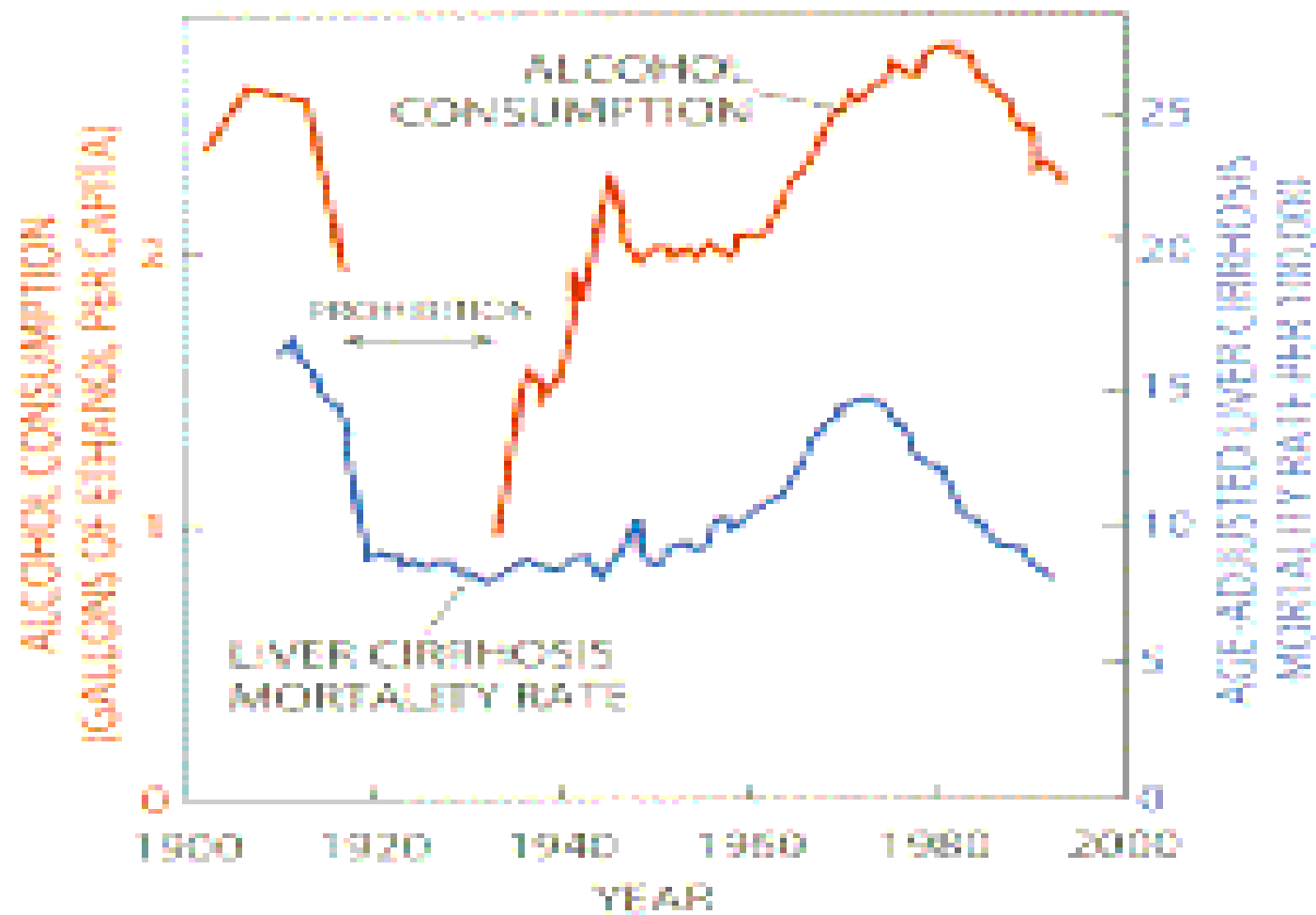
- Nausea, w/ or w/o vomiting
- Fever, chills, or both
- Abdomen swollen and tender to the touch
- Tachycardia (May indicate internal bleeding)
- In very severe cases, dehydration and low blood pressure, fatigue, faintness, lethargy, irritability, confusion or difficulty concentrating, headache.
- If blood pressure ↓ too much, circulatory shock

Hemorrhagic Pancreatitis

- Pancreatic enzymes eat through wall of pancreas, causing bleeding in the abdominal cavity

Pancreatic insufficiency

- Pancreas is sufficiently damaged that it stops producing digestive enzymes
- Islands of langerhans are on bottom surface of pancreas. They secrete insulin
- Production and secretion of insulin may slow or stop.
- Tx=Supplemental enzymes and insulins



SOURCE: National Institute on Alcohol Abuse and Alcoholism

REPRODUCED

ALCOHOL AND LIVER DISEASE

- Alcohol-induced liver disease (ALD) is a major cause of illness and death in the United States.
- Alcoholic fatty liver (hepatosis), the most common form of ALD, is reversible with abstinence.

HEPATOSIS

- **At least nine out of ten chronic alcoholics will develop alcoholic fatty liver.**
- **Placques of fat invade the normal structure of the liver to cause this condition.**
- **The disease usually has no obvious symptoms. It is detected by physical exam and blood laboratory studies.**

HEPATOSIS

- If a person stops drinking, fatty liver will disappear on its own in 4 to 6 weeks without formalized medical treatment.
- If drinking continues, fatty liver may progress to hepatitis.

ALCOHOL AND LIVER DISEASE

- **More serious ALD includes**
 - **alcoholic hepatitis, characterized by persistent inflammation of the liver**
 - **cirrhosis, characterized by progressive scarring of liver tissue.**

ALCOHOLIC HEPATITIS

- **Hepatitis" is a general word that refers to swelling or inflammation of the liver.**
- **Alcoholic hepatitis is caused by the toxic effects of alcohol on the liver after long-term use.**
- **Alcoholic hepatitis usually occurs after fatty liver but may appear without any previous liver dysfunction.**

ALCOHOLIC HEPATITIS

- **Ten to thirty percent of all alcoholics will develop hepatitis if they continue to abuse alcohol.**
- **A person with alcoholic hepatitis feels generally ill.**
- **Common symptoms:**
 - **loss of appetite and weight,**
 - **low grade fever**
 - **abdominal pain**
 - **nausea and vomiting**

ALCOHOLIC HEPATITIS

- **Common symptoms:**
 - **enlarged, tender liver**
 - **abnormal laboratory tests of liver function**
- **Treatment of alcoholic hepatitis involves abstinence from alcohol and provision of adequate nutrition.**

CIRRHOSIS

- Five to ten percent of all alcoholics develop cirrhosis of the liver
- It usually develops after a long history of excessive alcohol intake.
- The disease may follow alcoholic hepatitis or may occur without any previous symptoms

ALCOHOL AND LIVER DISEASE

CONSEQUENCES OF LIVER DISEASE

- **inability to synthesize protein**
- **inability to manufacture clotting factors**
- **inability to eliminate estrogen**
- **lessened ability to store vitamins**
- **diminished tolerance**