

# Alcohol and Your Health: From Grain to Brain

By Doc GP



# Alcohol

- **The character of alcohol**
  - Ethanol
    - The alcohol in beer, wine, spirits
  - **Methanol**
    - **Wood alcohol—poisonous**



# Is alcohol a nutrient?

- **Does supply calories!**
- **Provides energy- 7 kcal/g**
  - No other nutritive value
  - Not stored in the body
  - No necessary or critical function in the body
  - No growth support for body or organs
  - Can only be metabolized in the liver
  - **NOT a nutrient**

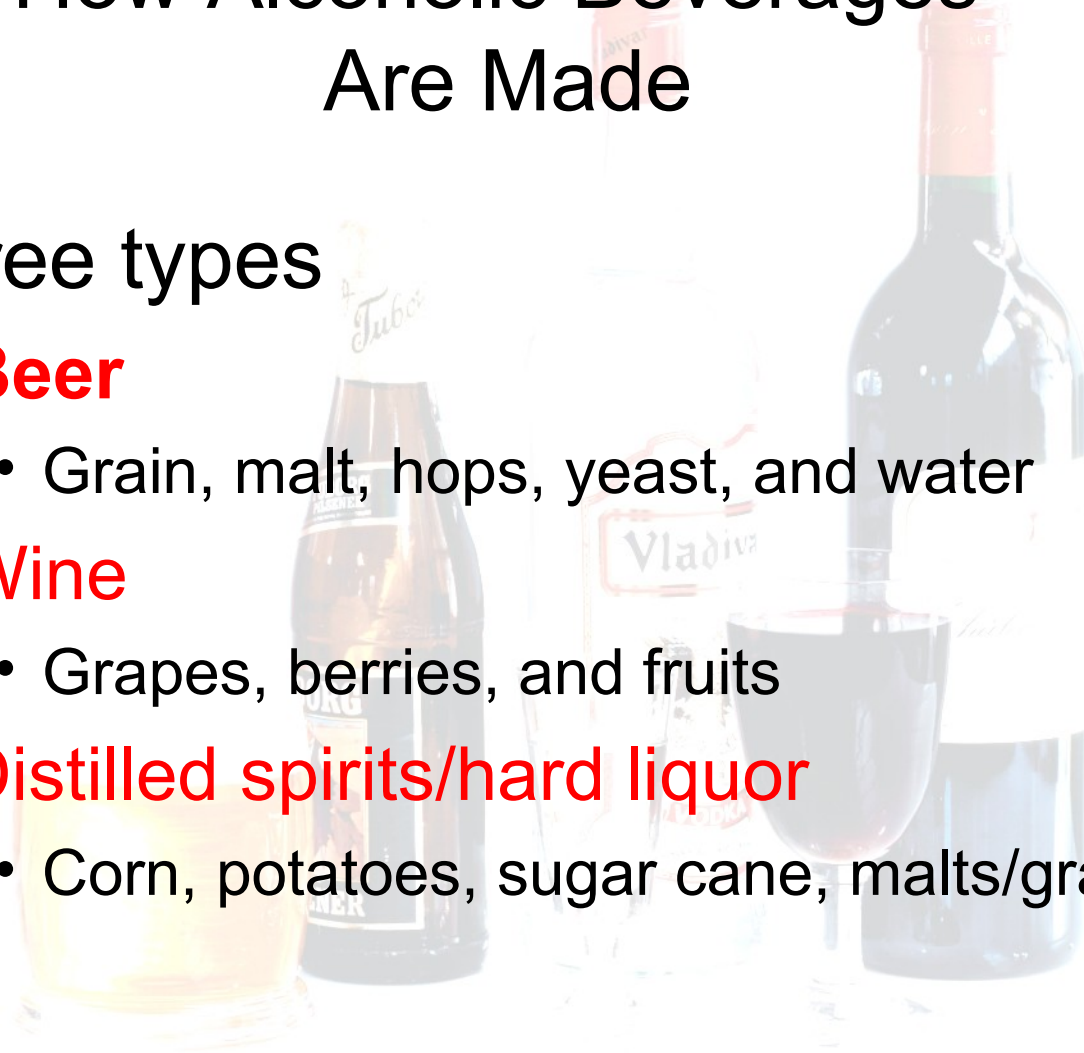
# Alcohol and Its Sources

- **Fermentation**
  - Yeast cells metabolize sugar to make alcohol
- **Alcoholic beverages**
  - Beer: 5–6% alcohol
  - Wine: 8–14% alcohol
  - Liquor: 35–45% alcohol



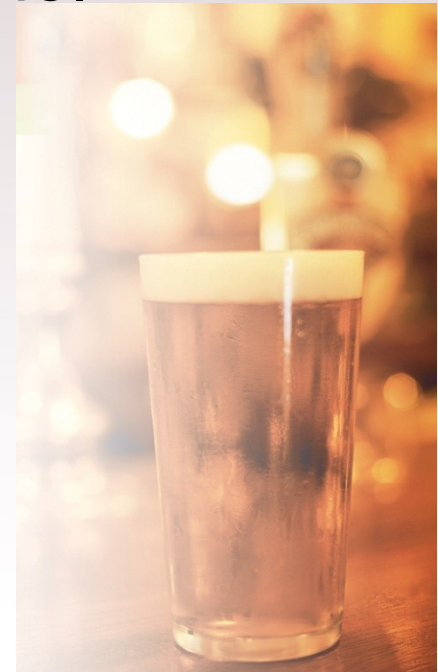
# How Alcoholic Beverages Are Made

- Three types
  - **Beer**
    - Grain, malt, hops, yeast, and water
  - **Wine**
    - Grapes, berries, and fruits
  - **Distilled spirits/hard liquor**
    - Corn, potatoes, sugar cane, malts/grains



# Beer

- **Fermentation**
  - Grains + yeast + water = Alcohol production
- **Alcohol content: 3–6%**
- **Malts and lagers: up to 14%**



# Wine

- Crushed fruit
- Yeast sometimes added
- Alcohol content: 9–14%
- Fortified wines
  - Approximately 20%



# Distilled Spirits

- Fermentation
- Distillation
  - Heating substance, collecting steam
- **Less water, more alcohol**



# Proof and Percent Alcohol

- Percent alcohol = “Proof” divided by 2
- “Proof” is twice the alcohol percentage
- Example: 80 proof = 40% alcohol
- Higher proof does not mean healthier!



# BAC (Blood Alcohol Content)

- Percent of alcohol in blood
  - 0.1% = 1 part per alcohol per thousand parts blood
- BAC determining factors:
  - Male or female
  - Weight
  - Empty stomach
  - Physical fitness
- Legal limit = 0.08 % BAC

# What Is a Drink?

## WHAT IS **MODERATE** DRINKING ?

*Women:*

No more than **1** drink a day

*Men:*

No more than **2** drinks a day

### COUNT AS A DRINK...



**12 ounces  
of regular beer**



**5 ounces  
of wine**



**1.5 ounces  
of 80-proof  
distilled spirits**

# What Is One Drink?

- One mixed drink with 1.5 fl oz (44 ml) of 80-proof liquor (such as vodka, gin, scotch, bourbon, brandy, or rum)
- 5 fl oz (148 ml) of wine
- 12 fl oz (355 ml) of beer or wine cooler

# Calories in Alcoholic Beverages

- Beer (regular), 12 fl oz 139 kcals
- Beer (light), 12 fl oz 103 kcals
- White Wine, 5 fl oz 100 kcals
- Sweet dessert wine, 3.5 fl oz 165 kcals
- 80 proof distilled spirits, 1.5 fl oz 97 kcals  
(gin, rum, vodka  
whiskey)

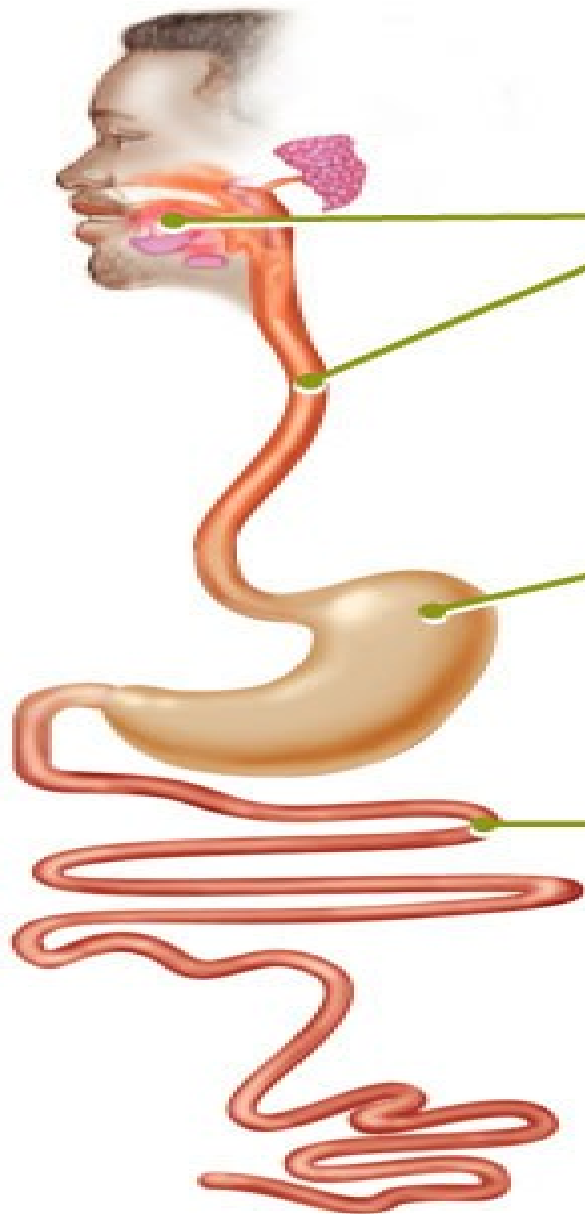
# Levels of Consumption

- Light: 3 drinks per week
- Moderate:
  - Men: 4–14 drinks per week; Women: 4–7
- Heavy:
  - Men: more than 14; Women: more than 7
- Binge drinking (within a two-hour period):
  - Men: more than 4; Women: more than 3

# Digestion and Metabolism of Alcohol

- No digestion required
- Absorbed from mouth, esophagus, stomach (20%), and small intestine(80%)
- Absorbed more quickly on empty stomach
- Absorption slowed by food, especially fat
- Only liver can metabolize
  - Converts to acetaldehyde
  - Then converted to acetic acid
  - Which can enter Krebs cycle as acetyl-CoA

# ALCOHOL ABSORPTION



Small amounts of alcohol are absorbed in the mouth and esophagus

Alcohol is readily absorbed in the stomach, but food will dilute the alcohol and delay gastric emptying

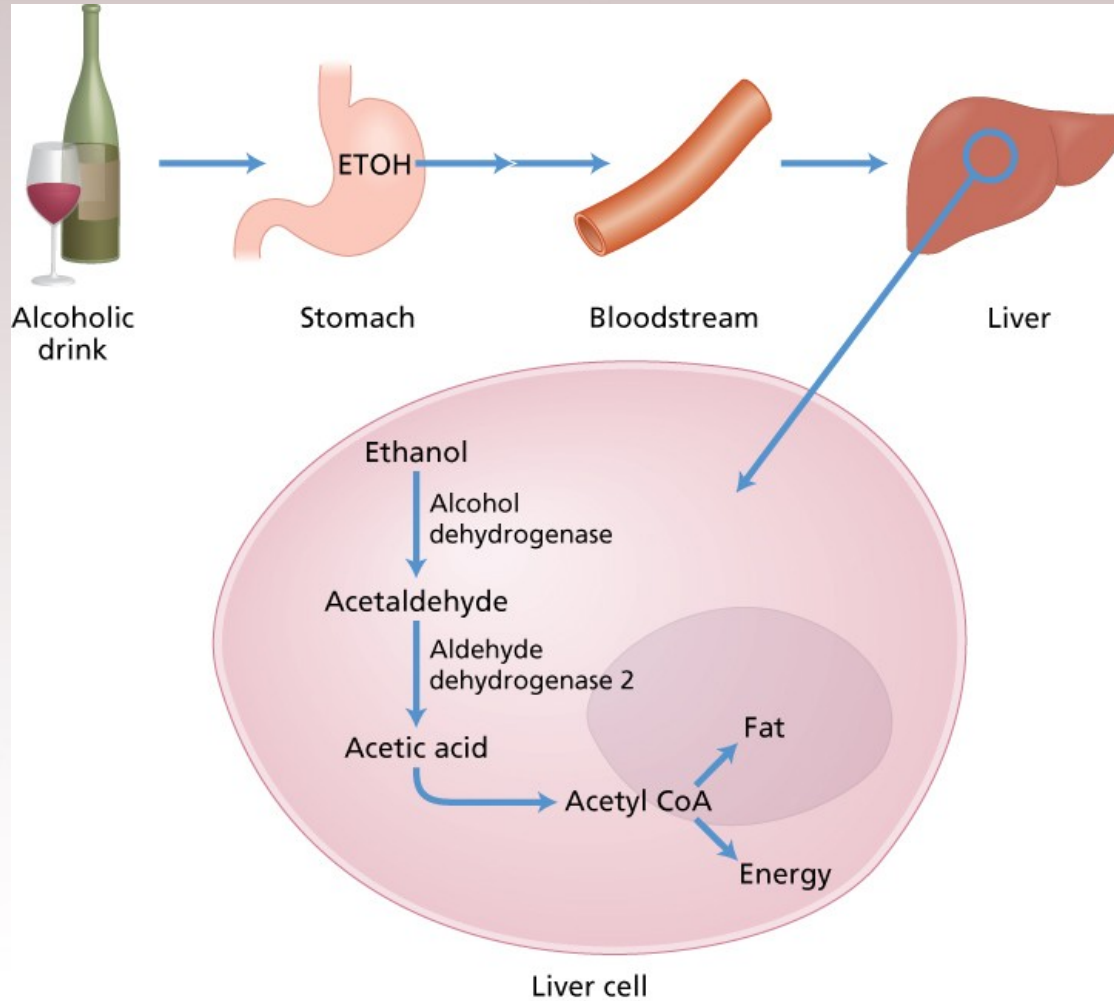
The primary site of alcohol absorption is the upper small intestine



# Alcohol Metabolism

- **Alcohol breakdown takes priority over the breakdown of carbohydrates, proteins, and fats**
- Liver cells detoxify alcohol and use the products to synthesize fatty acids, which are assembled into fats
- Fat accumulation in the liver can be seen after one heavy drinking episode

# The Liver Processes Alcohol



# Alcohol Metabolism

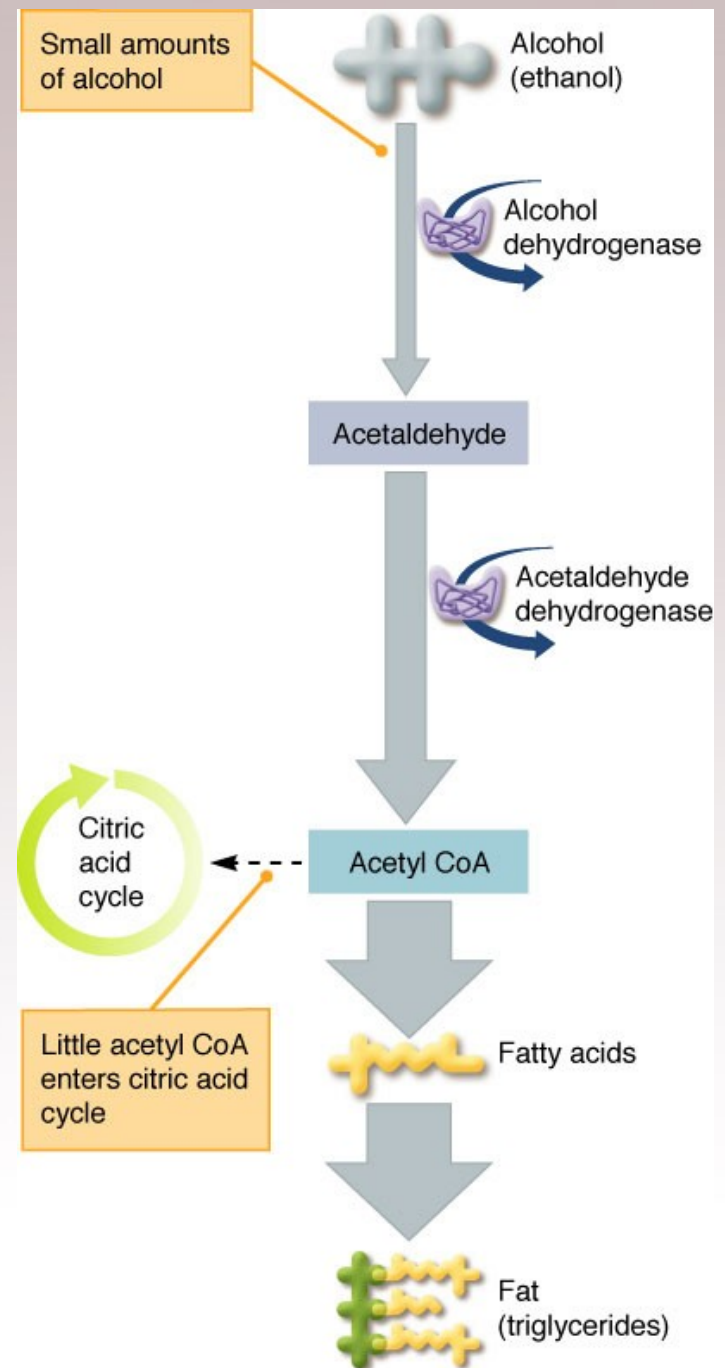
- Removing alcohol from circulation
  - Liver metabolism limited
  - Blood alcohol level falls slowly

# Alcohol Metabolism

- Fatty acid synthesis accelerates with chronic alcohol consumption
- **Fatty liver** is the first stage of liver destruction in alcoholics
- Chronic alcohol intake leads to changes in the liver since alcohol abusers have an increased tolerance to alcohol

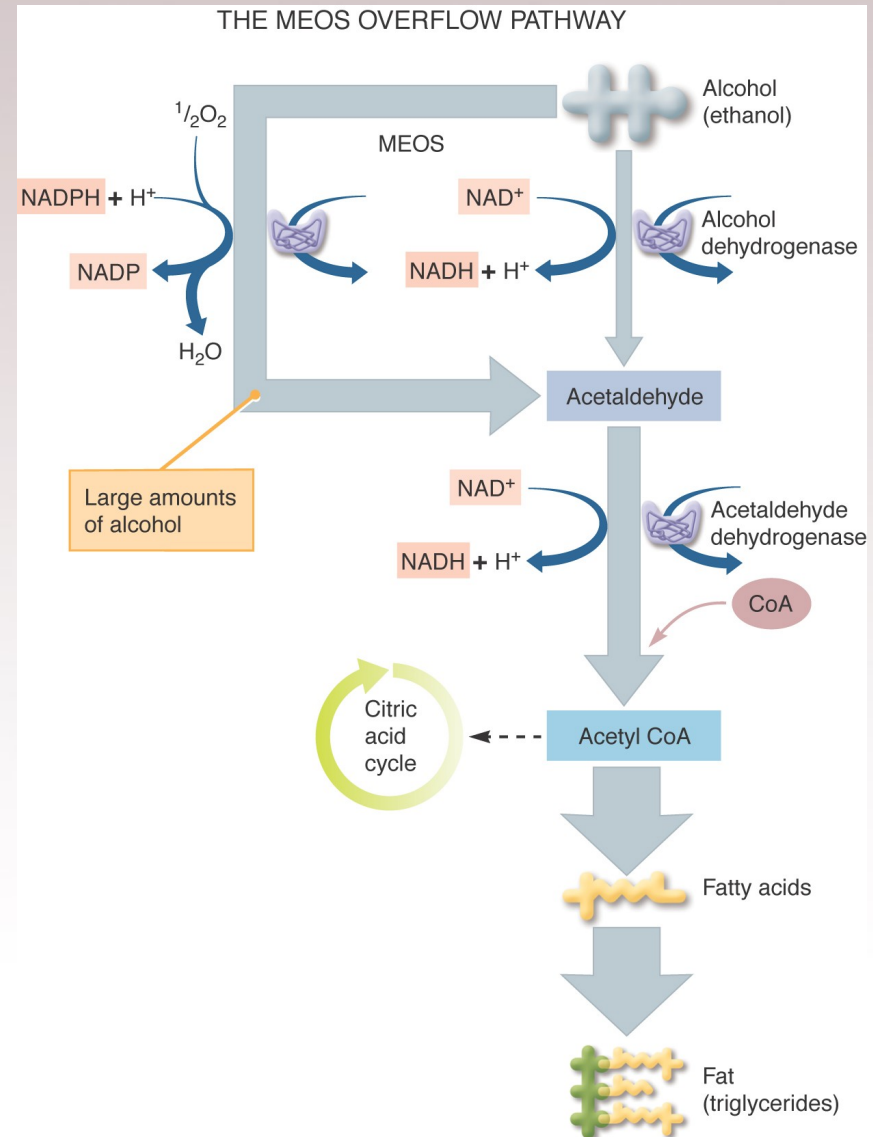
# Alcohol Metabolism

- Small amounts of alcohol
  - Alcohol dehydrogenase
    - Alcohol → acetaldehyde
  - Aldehyde dehydrogenase
    - Acetaldehyde → acetate
  - Acetaldehyde, acetate converted to acetyl CoA
    - Acetyl CoA molecules built into fatty acids



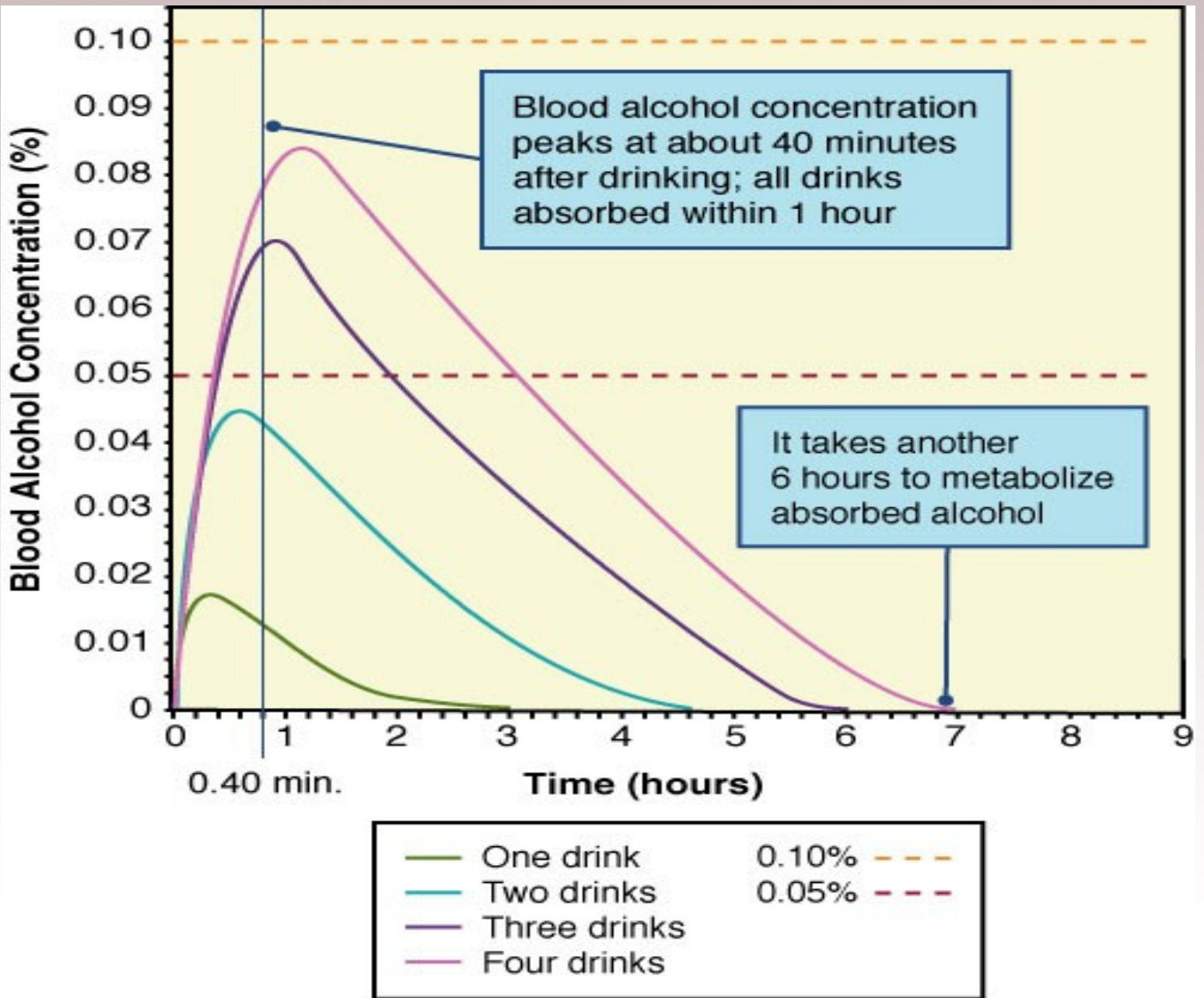
# Alcohol Metabolism

- Large amount of alcohol
  - Overwhelms alcohol dehydrogenase system
  - Uses microsomal ethanol-oxidizing system (MEOS), an overflow pathway



# Alcohol Metabolism

- Individual differences in rate of alcohol metabolism
  - Gender
  - Race/ethnicity
  - Age





# Alcohol Metabolism: Gender Differences

## **Body composition**

Women have a higher percentage of fat than men (size for size women have less water than men to dilute alcohol).

## **Less enzyme activity**

Alcohol dehydrogenase, the primary enzyme involved in the metabolism of alcohol, is up to 40% less active in women than in men.



## **Body size**

Women are smaller on average than men (smaller livers and less total water).

## **Hormonal fluctuations**

Women typically have a heightened response to alcohol which is increased when they are about to have their periods, or when taking birth control pills.

# **When Alcohol Becomes a Problem**

# Binge Drinking

- 3–4 drinks in 2 hours
- Popular among teens and college students
  - Half of college students admitted having 4–5 drinks in one sitting within a two-week period.
  - Fraternity or sorority members have the largest incidence (86% and 80%).
- Highest among whites and lowest among African Americans

# Problems with Binge Drinking

- Health
- Academic performance
- Depression and anxiety
- Violence
- Sexual assaults
- Deaths



# Hangover

- Begins several hours after the last drink
- Headache
- Fatigue
- Muscle aches
- Nausea
- Dizzy
- Depressed

# What causes hangovers?

- Alcohol causes dehydration which leads to headache and dry mouth
- Alcohol directly irritates the stomach and intestines, contributing to stomach pain and vomiting
- Sweating, vomiting and diarrhea that occur with a hangover cause more fluid loss and electrolyte imbalance

# What causes hangovers?

- Alcohol metabolism diverts liver activity away from making glucose so this can lead to low blood glucose, which causes lack of energy and light-headedness
- Alcohol disrupts sleep patterns, which contributes to fatigue

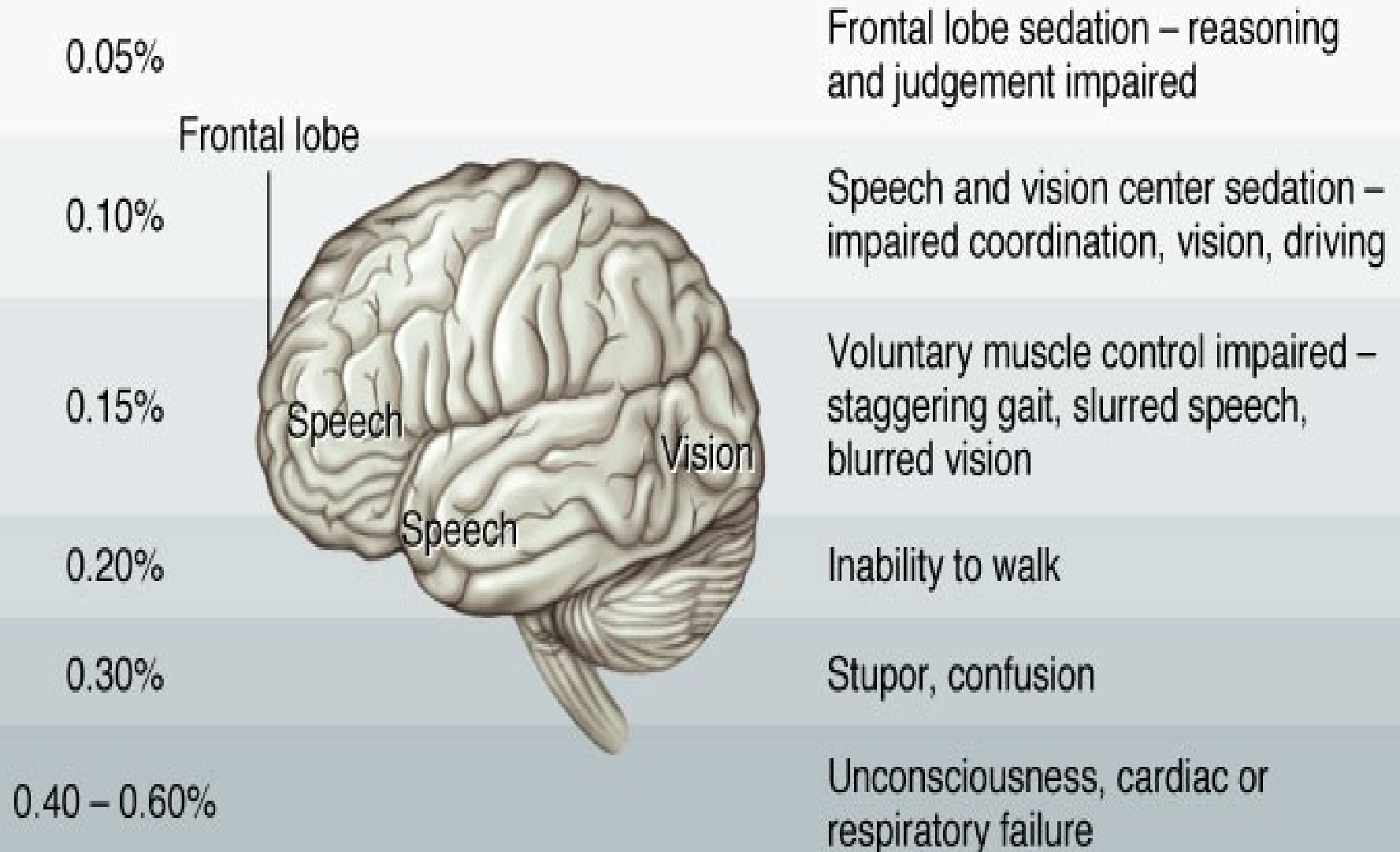
# Treating a Hangover

- TIME -Symptoms disappear in 8-24 hrs
- Eating bland foods that contain complex carbohydrates, like toast or crackers can increase blood glucose and help nausea
- Sleep can ease fatigue
- Drinking nonalcoholic beverages can alleviate dehydration



- **Alcohol and the Brain**
- Inhibition
- Reduced reasoning and judgment
- Impaired speech, vision, and muscle movement
- Impaired respiration and heart contractions
- Unconsciousness
- Potentially fatal

## Blood alcohol concentration

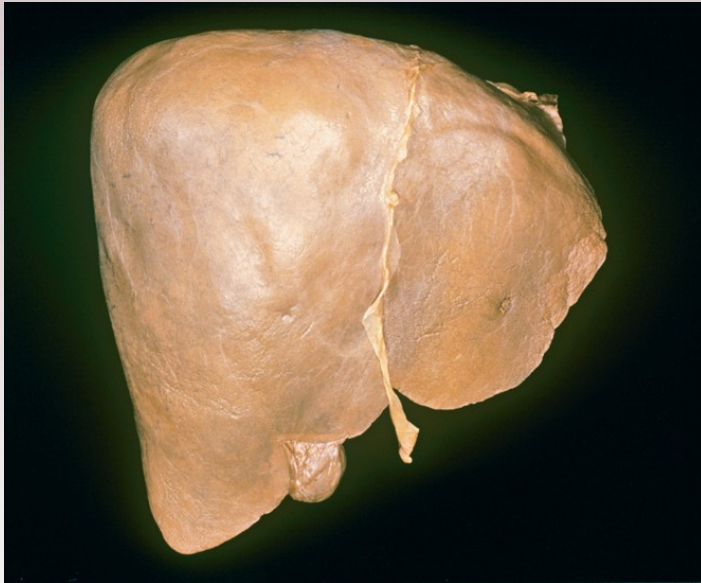


# Alcohol and the Liver

Three types of liver conditions /diseases that may result from alcohol abuse are:

- **Fatty liver**
- **Hepatitis**
- **Fibrosis (excessive fibrous tissue) followed by Cirrhosis (scarring)**

# Alcohol and the Liver



**Normal Liver**



**Liver with Cirrhosis**

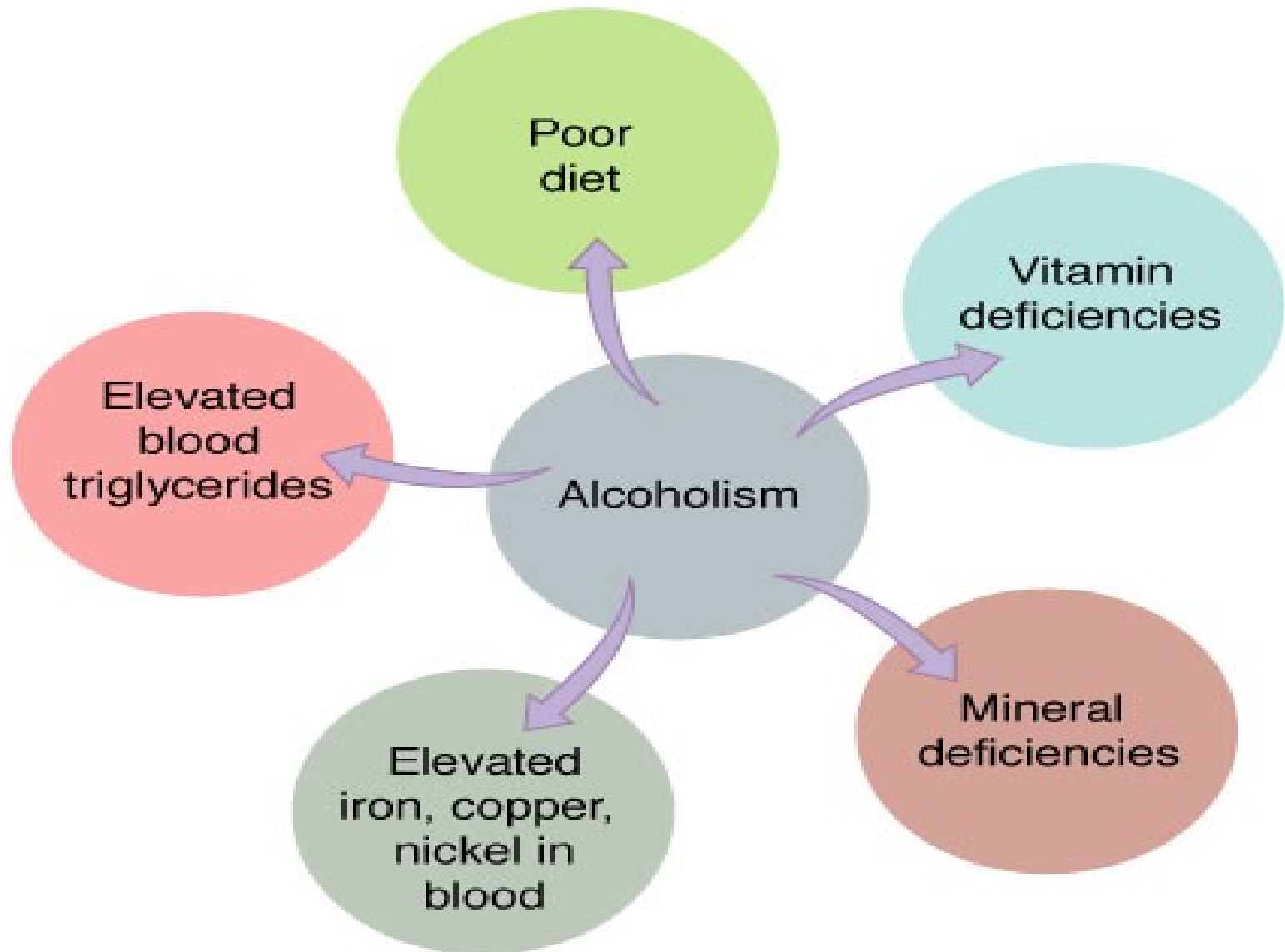
# Fetal Alcohol Syndrome

- *All* alcohol intake should be avoided during pregnancy; and if you are planning a pregnancy, alcohol intake should cease several months before you become pregnant.
- Alcohol crosses the placenta and causes
  - Physical abnormalities
  - Mental retardation
  - Low birth weight; poor growth



# Alcoholics and Malnutrition

- **Poor diet**
  - Alcohol provides energy but no nutrients
  - Economic factors (poverty, homeless)
  - Lack of interest in food; GI problems
- **Vitamin deficiencies**
  - Alcohol interferes with vitamin metabolism
  - Folate, thiamin, vitamin A



# Alcoholics and Malnutrition

- Mineral deficiencies
  - Inadequate diet; fluid losses
  - Calcium, magnesium, iron, zinc
  - Some mineral levels are elevated
- Macronutrients
  - Alcohol interferes with amino acid absorption
  - Alcohol raises blood levels of fats



# Alcohol Dependent

**alcohol tolerant:** Either a need for markedly increased amounts of alcohol to achieve intoxication, or a markedly diminished effect with continued use of the same amount of alcohol

**alcohol withdrawal symptoms:** Need to have either **a** or **b** below:

**a.** two or more of the following:

- sweating or rapid pulse
- increased hand tremor
- insomnia
- nausea or vomiting
- physical agitation
- anxiety
- transient visual, tactile, or auditory hallucinations or illusions
- grand mal seizures

**b.** alcohol is taken to relieve or avoid withdrawal symptoms

- Alcohol was often taken in larger amounts or over a longer period than was intended
- Persistent desire or unsuccessful efforts to cut down or control alcohol use
- Great deal of time spent in using alcohol, or recovering from hangovers
- Important social, occupational, or recreational activities given up or reduced because of alcohol use
- Alcohol use continues despite knowledge of a persistent or recurrent physical or psychological problem that is likely to be worsened by alcohol (e.g., continued drinking despite knowing that an ulcer was made worse by drinking alcohol)

# Alcohol Poisoning: No Going Back

- Alcohol poisoning
  - Very dangerous
  - Can result in death
- Cannot “sober up”
  - Coffee and cold showers:  
Myth!



# Do These Work?

- Vitamins B and C okay
- Not worth it: over-the-counter “chasers” intended to help avoid hangover symptoms

# Alcohol

- People who should not consume alcohol
  - Those who cannot moderate intake
  - Children and adolescents
  - Those taking certain medications
  - Those with illnesses worsened by alcohol
  - Those who drive or operate machinery
  - Pregnant or breastfeeding women
  - Those with a strong family history of alcoholism

# Health Risk with Alcohol Consumption

- Liver disease
- High blood pressure
- Weakening of heart
- Cancer (esophagus, mouth, throat, colon, and breast)
  - Increased risk with smoking and drinking
- Drug interaction
- Quality of life
- Nutritional complication
  - **Wernicke-Korsakoff syndrome**

### **Addiction**

Alcohol addiction destroys lives, families, and communities. Researchers are trying to learn why some people, and not others, become addicted

### **Accidents and violence**

These result from impairment of mental function and coordination

### **Birth defects**

Fetal alcohol syndrome can occur when pregnant women drink

### **Emotional and social**

Emotional, social, and economic problems are associated with heavy drinking

### **Cardiomyopathy**

Inflammation of the heart muscle is much more common in heavy drinkers

### **Liver disease**

Heavy drinking can lead to alcoholic fatty liver, alcoholic hepatitis, cirrhosis, and liver cancer

### **Pancreatitis**

Both chronic and acute pancreatitis are increased by alcoholism

### **Anemia**

Heavy drinkers often have poor diets and may bleed from the digestive tract

### **Osteoporosis**

Heavy drinking contributes to bone loss, especially in older women

### **Brain**

Acute effects are drunkenness. Long-term effects of chronic alcohol excess are dementia, memory loss, and generalized impairment of mental function

### **Gastritis**

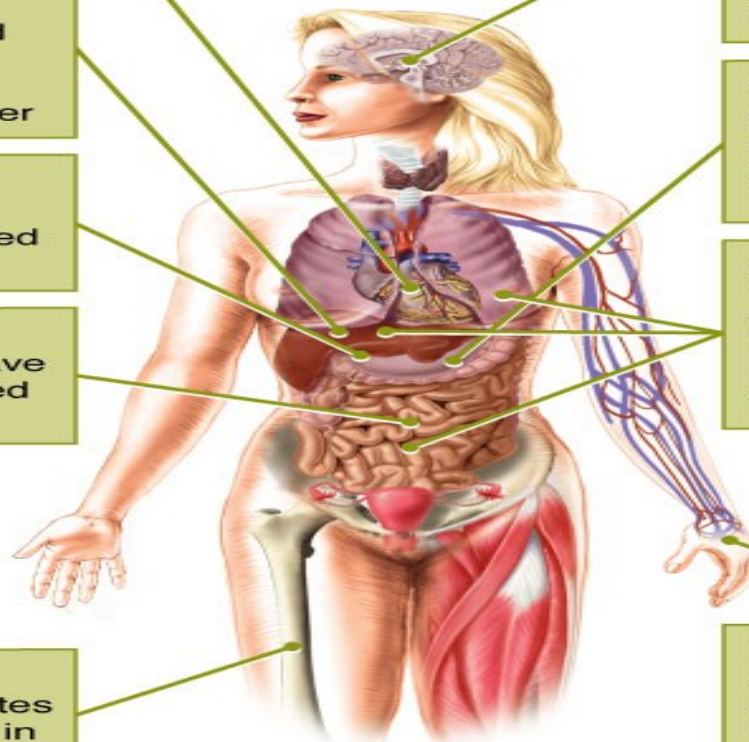
Continued contact with excess alcohol irritates and inflames the stomach lining

### **Cancer**

Excess alcohol increases the risk of gastrointestinal, liver, and breast cancers. Smoking further increases these risks

### **Peripheral neuropathy**

Painful nerve inflammation in hands, arms, feet, and legs is common in long-time heavy alcohol users



# Does Alcohol Have Benefits?

- Moderate drinking has been associated with reduced mortality
- Prevents Heart Disease
  - 25–40% with moderate consumption (1–2 drinks/day)
  - Decreased clotting and increased HDL
  - No benefit to more alcohol
- Low rates of Heart disease, high fat diet
  - French paradox:  
Red wine may have a protective effect (phytochemicals, e.g. the polyphenolics catechin and resveratrol)
  - Same benefit with grape juice
  - Direct connection between red wine  
And health benefits remains unproved

