Chapter 3: The Remarkable Body

Nutrition: Concepts and Controversies, eleventh edition
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Lectures by Judy Kaufman, Ph.D.

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Your genes, in the form of DNA, direct your body’s development and basic functions.

Many of your genes are ancient in origin and have not changed for thousands of centuries.
The human body is made of trillions of cells.

Inside the nucleus is the hereditary material, which contains the genes. The genes control the inheritance of the cell’s characteristics and its day-to-day workings. They are faithfully copied each time the cell duplicates itself.

On these membranes, instructions from the genes are translated into proteins that perform functions in the body.

Many other structures are present. This is a mitochondrion, a structure that takes in nutrients and releases energy from them.
**The Body’s Cells**

- **Cell**: smallest unit in which independent life can exist.

- Cells work in cooperation to support the whole body.

- Cells need:
  - Energy
  - Oxygen
  - Nutrients (essential)
  - Water
The Workings of the Genes

Gene: a blueprint that directs the production of a piece of protein machinery

- Enzymes help do cell’s work

Different genes are active in different cells.

- intestinal cells have active genes for making digestive enzymes
- fat cells have active gene for making enzymes that metabolize fat
1. Each cell’s nucleus contains DNA — the material of heredity in all living things.

2. Long strands of human DNA coil into 23 pairs of chromosomes. If the strands of DNA in all the body’s cells were uncoiled and laid end to end, they would stretch to the sun and back four hundred times. Yet DNA strands are so tiny that about 5 million of them could be threaded at once through the eye of a needle.

3. Genes contain instructions for making proteins. Genes are sections along the strands of DNA that serve as templates for the building of proteins. Some genes are involved in building just one protein; others are involved in building more than one.

4. Many other steps are required to make a protein. See Figure 6-6 of Chapter 6.

5. Proteins do the work of living cells. Cells employ proteins to perform essential functions and provide structures.

6. Communities of functioning cells make up the living tissue.
Genes affect the way the body handles nutrients and how nutrients are absorbed, metabolized and excreted from the body.
Cells are organized into **tissues** that perform specialized tasks.

Tissues are grouped into **organs**.

Organs work together to form **body systems**.

**100 trillion cells make up the human body!!!!**
The Body Fluids and the Cardiovascular System

- **Lungs**: Oxygenate blood, remove carbon dioxide from blood, return blood to heart.
- **Heart**: Right side pumps blood to lungs, left side pumps oxygenated blood to body.
- **Liver**: Filters toxins from blood, stores, transforms, and mobilizes nutrients.
- **Intestines**: Absorb nutrients.
- **Kidneys**: Filter wastes from blood, form urine.
- **Pelvis and Legs**
The Body Fluids and the Cardiovascular System

- Body fluids supply the tissues with energy, oxygen, nutrients, water.

- Blood and lymph deliver nutrients to all the body’s cells and carry waste materials away from them.

- Blood also delivers oxygen to cells.

- The cardiovascular system ensures that these fluids circulate properly among all organs.
Lungs

- Oxygenate blood
- Remove carbon dioxide from blood
- Return blood to the heart

Heart

- Right side: pumps blood to lungs
- Left side: pumps oxygenated blood to body
Liver

- Removes toxins from blood
- Stores, changes, mobilizes nutrients

Intestines

- Absorb nutrients

Kidneys

- Filter waste from blood
Blood carries chemical messengers, **hormones**, from one system of cells to another.

Hormones communicate changing conditions that demand responses from the body organs.
Glands secrete (produce) hormones.

Hormones affect nutrition by:

- Regulating hunger and affecting appetite
- Carrying messages to digestive system
- Regulating blood glucose levels
  - Pancreas (a gland) secretes insulin (a hormone) to remove glucose from the blood
  - Pancreas also secretes glucagon (another hormone) to release stored glucose from the liver into the blood
What are some ways that nutrition can affect the hormonal system?

- Fasting, feeding, exercising changes hormonal balances
- Very thin people will lose minerals from bones
- Weak bones
How do hormones affect nutrition?

• Regulate hunger and affect appetite
• *Leptin* suppresses appetite
• *Ghrelin* increases appetite
• Regulate body's reaction to stress by suppressing hunger and digestion/absorption of nutrients
How Does the Nervous System Interact with Nutrition?

- Brain + Spinal Cord = Nervous System

- Nervous system’s role is coordinated by the brain
  - **Cortex** – senses hunger and appetite
  - **Hypothalamus** – monitors many body conditions, including nutrients and water availability
Fight-or-flight reaction or stress response –

- When danger is sensed, nerves release epinephrine and norepinephrine.
  - Metabolisms speeds up
  - Pupils of eyes widen to see better
  - Breathing quickens for more oxygen
  - Muscles tense
  - Blood glucose increases
  - Digestive system shuts down so that all the body's systems can serve the muscles and nerves
A properly functioning immune system enables the body to resist disease.
The Immune System

Defense against infection

- White blood cells (1/100 cells in the body)
  - Phagocytes - 1st to defend the body tissue against invaders
  - Lymphocytes
    - B cell release antibodies to fight invaders
    - T cells read and remember the chemical messages released by phagocytes to identify the invaders
A flexible, muscular tube that digests food and absorbs its nutrients and some nonnutrients.

Includes: mouth, throat, esophagus, stomach, small/large intestine, rectum, anus

- 26 feet long!!
The Mechanical Aspect of Digestion

- Begins in the mouth with chewing.
  - Saliva moistens food for easier swallowing.

- Stomach and intestines liquefy foods by mashing and squeezing.
  - **Peristalsis** – wavelike muscular squeezing of the digestive tract that pushes their contents along.
The Mechanical Aspect of Digestion

Cross section of the digestive tract, showing muscles.

As the circular and longitudinal muscles tighten and relax, the food moves ahead of the constriction.

Swallowed food

Longitudinal muscles are outside.

Circular muscles are inside.
The stomach’s pyloric valve at its lower end controls the exit of the **chyme (kime)**.

Chyme is squirted into small intestine after a few hours in the stomach.

Small intestine contracts to move contents to large intestine (**colon**).
Colon’s main roles:
- Reabsorb water
- Absorb minerals

Rectum – stores feces until excretion
- Feces
  - fiber
  - undigested material
  - shedded intestinal cells
  - bacteria
Several organs of the digestive system secrete juices that contain enzymes.

- Salivary glands
- Stomach
- Pancreas
- Liver
- Small intestine
How Do “Digestive Juices” Work?

- Digestion begins in the mouth.

- Saliva contains an enzyme that begins starch digestion, and another enzyme that initiates a little digestion of fat.

- Washes away food particles

- Neutralized acids that can cause decay in the mouth
How Do “Digestive Juices” Work?

- Protein digestion begins in the stomach.

- Gastric juice contains water, enzymes, and hydrochloric acid.
Why aren’t the stomach lining cells digested along with food?

Answer: specialized stomach cells secrete mucus, which coats and protects the digestive tract lining.
Small intestine – *the* organ of digestion and absorption.

- Gallbladder sends **bile**, an emulsifier, into the intestine.
- Pancreas sends **bicarbonate** to neutralize stomach acid that entered small intestine.
- Pancreas sends the largest number and variety of digestive enzymes to act on chemical bonds that hold the large nutrients together.
Intestinal cell walls also have digestive enzymes on their surfaces.

Absorption of carbohydrate, fat, protein, vitamins and most minerals occurs.

Water, fiber, and minerals remain in the tract.
In large intestine (colon)

- some fiber is broken down by resident bacteria
- small fat fragments released from the fiber provide a tiny bit of energy
Are Some Food Combinations More Easily Digested Than Others?

- The digestive system adjusts to whatever mixture of foods is presented to it.
- All foods, regardless of identity, are broken down by enzymes into the basic molecules that make them up.
- Digestion is continuous unless you are sleeping or exercising
If “I Am What I Eat,” Then How Does A Sandwich Become “Me”? 

- Digestion and absorption are remarkably efficient.
- Within about 24 to 48 hours of eating, a healthy body digests and absorbs about 90 percent of the energy nutrients in meal.
- Let’s follow a peanut butter and banana sandwich on whole-wheat, sesame bread through the tract.
In the mouth:

- Teeth/tongue crush and mash food
- Digestion of starch to sugar in bread, banana, and peanut butter begins

Time in mouth, less than a minute.
In the stomach

- Food is collected in upper storage area
- Starch digestion stops in presence of gastric juices
- Food enters digesting area of stomach
- Proteins in bread, PB, and seeds are unwound
- Enzymes clip proteins
- Chyme

Time in stomach, about 1–2 hours.
In the Small Intestine

- Sugars from banana cross lining of small intestine
- Bile from liver arrives to blend with fat from PB and seeds
- Pancreas and intestinal cells send digestive enzymes
- Small units from energy nutrients absorbed
- Vitamins and minerals absorbed

Time in small intestine, about 7–8 hours.*
In the large intestine

- Fiber fragments, fluid, and some minerals are absorbed
- Fiber in seeds, bread, PB, and banana is partly digested by bacteria
- Most fiber excreted as feces

Time in colon, about 12–14 hours.*
Why do we occasionally belch, have gas, and the hiccups?

Answer: eat or drink too fast, chew gum, drink carbonated sodas
What is a heartburn?

Answer: acidic stomach juices back up into the esophagus.
What should you do to avoid heartburn or GERD (gastroesophageal reflux disease)?

a. Lie down after eating
b. Overeat
c. Smoke
d. Lose weight

Answer: d
What effect do these have on the body?

- Antacids
- Acid reducers
- Laxatives

Answer: Antacids temporarily neutralize stomach acid.
Acid reducers restrict ability of stomach to produce acid.
Laxatives promote a bowel movement.
What is irritable bowel syndrome?

Answer: Intermittent disturbance of bowel function, especially diarrhea alternating with constipation.
What happens when you choke?

**A normal swallow.** The epiglottis acts as a flap to seal the entrance to the lungs (trachea) and direct food to the stomach via the esophagus.

**Choking.** A choking person cannot speak or gasp because food lodged in the trachea blocks the passage of air. The red arrow points to where the food should have gone to prevent choking.
What do you do to help a choking person?

Answer: The Heimlich Maneuver
To lend assistance to a choking person:
1. Stand behind the person.
2. Wrap your arms around him.
3. Place the thumb side of one fist snugly against his body, slightly above the navel and below the rib cage.
4. Grasp your fist with your other hand and give him a sudden strong hug inward and upward.
5. Repeat thrusts as necessary.

If you are choking and alone, you can help yourself:
1. Place the thumb side of one fist slightly above your navel and below your rib cage.
2. Grasp the fist with your other hand.
3. Press inward and upward with a quick motion.
4. If this fails, forcefully press your upper abdomen over any firm surface such as the back of a chair, a countertop, or a railing.
5. Repeat as necessary.

*The Heimlich maneuver may not be effective for unconscious drowning victims as a first aid measure.*
The Excretory System

Cells generate a number of wastes that need to be eliminated

- Carbon dioxide → leaves via the lungs
- Other wastes → are processed by the liver and leave the body with feces or sent to the kidneys for disposal in the urine
The Excretory System

Kidneys

- remove waste and water
- adjust blood’s composition

Nutrients, including water, and exercise help keep the kidneys healthy
Humans are designed to eat at intervals of about 4 to 6 hours.

Cells need nutrients 24 hours a day.

Body’s major storage sites for nutrients are:

- Liver
- Muscles
- Fat cells
When I Eat More Than My Body Needs, What Happens to the Extra Nutrients?

- Nutrients from the digestive system arrive at the liver
- Liver processes nutrients
- Excess nutrients are converted to:
  - Glycogen (a carbohydrate)
  - Fat
When I Eat More Than My Body Needs, What Happens to the Extra Nutrients?

- Liver glycogen can sustain cell activities when the time between meals is long.
- Muscle cells make and store glycogen for their own use.
- Fat made in the liver is shipped to body cells for energy and excess is stored in adipose tissue.
Some nutrients are stored in the body in much larger quantities than others.

- Some vitamins are stored without limit, even in toxic quantities in the liver and fat
- Bones store reserves of calcium and other minerals
- Fat tissue has virtually infinite storage capacity
In addition to the systems just described, the body has many more:

- Bones
- Muscles
- Reproductive
- Etc.

All body systems have to be supplied nutrients from the outside through a human’s conscious food choices.
Controversy: Alcohol and Nutrition: Do the Benefits Outweigh the Risks?

- On average, people in the United States consume from 6 to 10 percent of their total daily energy intake as alcohol.

- A third of U.S. college students are binge drinkers.

- Alcohol is:
  - An energy-yielding substance - 7 calories per gram
  - A psychoactive drug
  - A toxin to the body
Controversy: Alcohol and Nutrition: Do the Benefits Outweigh the Risks?

<table>
<thead>
<tr>
<th>Table C3-1 Alcohol and Drinking Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>acetaldehyde</strong> (ass-et-AL-deh-hide) a substance to which ethanol is metabolized on its way to becoming harmless waste products that can be excreted.</td>
</tr>
<tr>
<td><strong>alcohol dehydrogenase</strong> (dee-high-DRAH-gen-ace) (ADH) an enzyme system that breaks down alcohol. The antidiuretic hormone listed below is also abbreviated ADH.</td>
</tr>
<tr>
<td><strong>alcoholism</strong> a dependency on alcohol marked by compulsive uncontrollable drinking with negative effects on physical health, family relationships, and social health.</td>
</tr>
<tr>
<td><strong>antidiuretic</strong> (AN-tee-dye-you-RET-ick) <strong>hormone</strong> (ADH) a hormone produced by the pituitary gland in response to dehydration (or a high sodium concentration in the blood). It stimulates the kidneys to reabsorb more water and so to excrete less. (This hormone should not be confused with the enzyme alcohol dehydrogenase, which is also abbreviated ADH.)</td>
</tr>
<tr>
<td><strong>beer belly</strong> central-body fatness associated with alcohol consumption.</td>
</tr>
<tr>
<td><strong>binge drinkers</strong> people who drink four or more drinks in a short period.</td>
</tr>
<tr>
<td><strong>CAGE questions</strong> a set of four questions often used internationally for initial screening for alcoholism.</td>
</tr>
<tr>
<td><strong>congeners</strong> (CON-jen-ers) chemical substances other than alcohol that account for some of the physiological effects of alcoholic beverages, such as appetite, taste, and aftereffects.</td>
</tr>
<tr>
<td><strong>drink</strong> a dose of any alcoholic beverage that delivers half an ounce of pure ethanol.</td>
</tr>
<tr>
<td><strong>ethanol</strong> the alcohol of alcoholic beverages, produced by the action of microorganisms on the carbohydrates of grape juice or other carbohydrate-containing fluids.</td>
</tr>
<tr>
<td><strong>euphoria</strong> (you-FOR-ee-uh) an inflated sense of well-being and pleasure brought on by a moderate dose of alcohol and by some other drugs.</td>
</tr>
</tbody>
</table>
| **fatty liver** an early stage of liver deterioration seen in several diseases, including kwashiorkor and alcoholic liver disease, in which fat accumulates in the liver cells.
- **fibrosis** (fy-ÉBroh-sts) an intermediate stage of alcoholic liver deterioration. Liver cells lose their function and assume the characteristics of connective tissue cells (fibers).
- **formaldehyde** a substance to which methanol is metabolized on the way to being converted to harmless waste products that can be excreted.
- **gout** (GOWT) a painful form of arthritis caused by the abnormal buildup of the waste product uric acid in the blood, with uric acid salt deposited as crystals in the joints.
- **MEOS** (microsomal ethanol oxidizing system) a system of enzymes in the liver that oxidize not only alcohol but also several classes of drugs.
- **methanol** an alcohol produced in the body continually by all cells.
- **moderate drinkers** people who do not drink excessively and do not behave inappropriately because of alcohol. A moderate drinker’s health may or may not be harmed by alcohol over the long term.
- **nonalcoholic** a term used on beverage labels, such as wine or beer, indicating that the product contains less than 0.5% alcohol. The terms dealcoholized and alcohol removed mean the same thing. Alcohol free means that the product contains no detectable alcohol.
- **problem drinkers** or alcohol abusers people who suffer social, emotional, family, job-related, or other problems because of alcohol. A problem drinker is on the way to alcoholism.
- **proof** a statement of the percentage of alcohol in an alcoholic beverage. Liquor that is 100 proof is 50% alcohol, 90 proof is 45%, and so forth.
- **social drinkers** people who drink only on social occasions. Depending on how alcohol affects a social drinker’s life, the person may be a moderate drinker or a problem drinker.
- **urethane** a carcinogenic compound that commonly forms in alcoholic beverages.
- **Wernicke-Korsakoff** (VER-nik-ee KOR-sah-koff) syndrome a cluster of symptoms involving nerve damage arising from a deficiency of the vitamin thiamin in alcoholism. Characterized by mental confusion, disorientation, memory loss, jerky eye movements, and staggering gait.
Defining Drinks and Drinking

- Beverages contribute to sociability
- Social drinkers – choose alcohol over other beverages in social settings
  - Reduces inhibitions
  - Relaxes people
  - Produces euphoria

- Problem drinkers – the effect of alcohol is overwhelmingly negative
Problem drinkers – the effect of alcohol is overwhelmingly negative

- Involved with DUI
- Violence
- Arguments
- Irrational behaviors
Moderation

- No more than 1 drink a day for the average woman
- No more than 2 drinks a day for the average male

- Tolerance differs among individuals
  - Women have lower tolerance than men
  - Asians and Native Americans have lower tolerance than average
The *Dietary Guidelines for Americans 2005* suggest that these people not drink alcoholic beverages at all:

- *Children and adolescents.* The earlier in life drinking begins, the greater the risk of alcoholism later on.
- *People of any age who cannot restrict their drinking to moderate levels.* Especially, people recovering from alcoholism, problem drinkers, and people whose family members have alcohol problems.
- *Women who may become pregnant or who are pregnant or breastfeeding.* A safe level of alcohol intake has not been established for women during pregnancy (see Chapter 13), and alcohol may be especially hazardous during the first few weeks, before a woman knows she is pregnant.
- *People who plan to drive, operate machinery, or take part in other activities that require attention, skill, or coordination to remain safe.* Alcohol remains in the blood for several hours after taking even a single drink.
- *People taking medications that can interact with alcohol.* Alcohol alters the effectiveness or toxicity of many medications, and some drugs may increase blood alcohol levels.
- *People with medical conditions* worsened by alcohol, such as liver disease.

### Behaviors Typical of Moderate Drinkers and Problem Drinkers

<table>
<thead>
<tr>
<th><strong>Moderate Drinkers Typically</strong></th>
<th><strong>Problem Drinkers Typically</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drink slowly, casually.</td>
<td>Gulp or “chug” drinks.</td>
</tr>
<tr>
<td>Eat food while drinking or beforehand.</td>
<td>Drink on an empty stomach.</td>
</tr>
<tr>
<td>Don’t binge drink; know when to stop.</td>
<td>Binge drink; drink to get drunk.</td>
</tr>
<tr>
<td>Respect nondrinkers.</td>
<td>Pressure others to drink.</td>
</tr>
<tr>
<td>Avoid drinking when solving problems or making decisions.</td>
<td>Turn to alcohol when facing problems or decisions.</td>
</tr>
<tr>
<td>Do not admire or encourage drunkenness.</td>
<td>Consider drunks to be funny or admirable.</td>
</tr>
<tr>
<td>Remain peaceful, calm, and unchanged by drinking.</td>
<td>Become loud, angry, violent, or silent when drinking.</td>
</tr>
<tr>
<td>Cause no problems to others or themselves by drinking.</td>
<td>Physically or emotionally harm themselves, family members, or others when drinking.</td>
</tr>
</tbody>
</table>
At least four drinks in a row for women and five drinks in a row for men

- Widespread on campuses, especially among 18 to 24 year olds
- Serious health consequences
### Alcohol-Related Risks to College Students

Over 80% of college students say they drink. In a typical year:

- 2.8 million college students drive under the influence of alcohol.
- 600,000 college students are victims of alcohol-related assault, including sexual assault.
- 500,000 college students suffer alcohol-related injuries.
- 1,700 college students die from these injuries.

What Is Alcohol?

- Class of chemicals whose names end in “-ol”
- Alcohols easily penetrate the cells’ outer lipid membrane
- Denature proteins and kill cells once inside them
- Useful disinfectants and antiseptics
- The alcohol of alcoholic beverages is **ethanol**
The percentage of alcohol is stated as proof.

- Proof equals twice the percentage of alcohol.
  - For example, 100 proof liquor is 50 percent alcohol.

A serving of alcohol is called a drink, and delivers ½ ounce of pure ethanol.
What Is A “Drink”?

12 oz beer
10 oz wine cooler
5 oz wine (12% alcohol)
1½ oz hard liquor (80 proof whiskey, gin, brandy, rum, vodka)
Alcohol Enters the Body

- Alcohol needs no digestion and diffuses through the stomach walls and reaches the brain within a minute.
- Too high a dose triggers the body’s response against poisons - vomiting.
- If it is drunk slowly enough, vomiting will not occur.
Alcohol Enters the Body
Alcohol Enters the Body

To drink socially and avoid intoxication:

- Drink slowly
- Eat food
- Add ice to drinks or water to dilute them
- Alternate alcoholic with nonalcoholic beverages
Alcohol increases urine output (by depressing the brain’s production of antidiuretic hormone)

- Water and minerals are lost
If a person drinks slowly enough, the alcohol, after absorption, will be collected by the liver and processed without much effect on the rest of the body.

If a person drinks more rapidly, alcohol bypasses the liver and flows to the brain.
Most sensitive: judgment and reasoning

Next most sensitive: voluntary muscular control

Last to be affected: respiration and heart action
**Alcohol Arrives in the Brain**

**Table C3-6** Alcohol Doses and Average Blood Levels

<table>
<thead>
<tr>
<th>Number of Drinks(^a)</th>
<th>100 LB</th>
<th>120 LB</th>
<th>150 LB</th>
<th>180 LB</th>
<th>200 LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.08</td>
<td>0.06</td>
<td>0.05</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>4</td>
<td>0.15</td>
<td>0.13</td>
<td>0.10</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>6</td>
<td>0.23</td>
<td>0.19</td>
<td>0.15</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>8</td>
<td>0.30</td>
<td>0.25</td>
<td>0.20</td>
<td>0.17</td>
<td>0.15</td>
</tr>
<tr>
<td>12</td>
<td>0.45</td>
<td>0.36</td>
<td>0.30</td>
<td>0.25</td>
<td>0.23</td>
</tr>
<tr>
<td>14</td>
<td>0.52</td>
<td>0.42</td>
<td>0.35</td>
<td>0.34</td>
<td>0.27</td>
</tr>
</tbody>
</table>

\(^a\)Taken within an hour or so; each drink equal to 1/2 ounce pure ethanol.
Alcohol Arrives in the Brain

**TABLE C3-7** Blood Alcohol Levels and Brain Responses

<table>
<thead>
<tr>
<th>Blood Alcohol Level (%)</th>
<th>Brain Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05(^a)</td>
<td>Judgment impaired</td>
</tr>
<tr>
<td>0.10</td>
<td>Emotional control impaired</td>
</tr>
<tr>
<td>0.15</td>
<td>Muscle coordination and reflexes impaired</td>
</tr>
<tr>
<td>0.20</td>
<td>Vision impaired</td>
</tr>
<tr>
<td>0.30</td>
<td>Drunk, lacking control</td>
</tr>
<tr>
<td>0.35</td>
<td>In a stupor</td>
</tr>
<tr>
<td>0.50–0.60</td>
<td>Loss of consciousness, death</td>
</tr>
</tbody>
</table>

\(^a\)A 0.08 percent level is the legal limit for intoxication according to most states’ highway safety ordinances; however, driving ability may be impaired at blood alcohol levels lower than 0.08 percent.
Alcohol Arrives in the Liver

- The liver cells make the largest share of the body’s alcohol-processing machinery
- Liver detoxifies alcohol
Two sets of equipment for metabolizing alcohol:

- Alcohol dehydrogenase (ADH) – removes hydrogens. Handles about 80 percent of alcohol.
- MEOS – a group of enzymes that handles about 10 percent of alcohol.

Breath and urine excrete the remaining 10 percent.
Body takes about 1.5 hours to metabolize one drink. Depends on:

- Person’s size
- Drinking history
- State of health
- Male or female (males have more ADH in the stomach walls)
Only the liver can dispose of significant amounts of alcohol.

- Walking and fresh air have no effect as muscles do not detoxify alcohol.
- Drinking coffee will not affect the rate.
The Liver Metabolizes Alcohol

<table>
<thead>
<tr>
<th>Myth:</th>
<th>Truth:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A shot of alcohol warms you up.</td>
<td>Alcohol diverts blood flow to the skin making you feel warmer, but it actually cools the body.</td>
</tr>
<tr>
<td>Wine and beer are mild; they do not lead to addiction.</td>
<td>Wine and beer drinkers worldwide have high rates of death from alcohol-related illnesses. It’s not what you drink but how much that makes the difference.</td>
</tr>
<tr>
<td>Mixing drinks is what gives you a hangover.</td>
<td>Too much alcohol in any form produces a hangover.</td>
</tr>
<tr>
<td>Alcohol is a stimulant.</td>
<td>Alcohol depresses the brain’s activity.</td>
</tr>
<tr>
<td>Alcohol is legal; therefore, it is not a drug.</td>
<td>Alcohol is legal, but it alters body functions and is medically defined as a depressant drug.</td>
</tr>
</tbody>
</table>
Upon exposure to alcohol, the liver speeds up its synthesis of fatty acids.
The Fattening Power of Alcohol

- 7 calories per gram
- Alcohol promotes fat storage in the abdominal area – the “beer belly”
The Hangover

Caused by

- toxic effects of *congeners* that accompany alcohol in drinks
- dehydration of the brain
- formaldehyde accumulation in the brain
Alcohol’s Long-Term Effects

- Devastating to a fetus (see ch. 13)
- Cirrhosis develops after 10 to 20 years of heavy drinking
- Bladder, kidney, pancreas, and prostate damage
- Bone deterioration and osteoporosis
- Brain disease, CNS damage, strokes
- Deterioration of testicles and adrenal glands
- Diabetes (type 2)
- Disease of heart muscles
- Feminization and sexual impotence in men
- Impaired immune response
Alcohol’s Long-Term Effects

- Impaired memory and balance
- Increased risk of death from all causes
- Malnutrition
- Nonviral hepatitis
- Severe psychological depression
- Skin rashes and sores
- Ulcers and inflammation of the stomach and intestines
- More...
Alcohol’s Effect on Nutrition

- Alcohol does damage indirectly via malnutrition
  - Not likely a person will eat enough food if they drink a lot
  - Provides empty calories
  - Disrupts tissue’s metabolism of nutrients
  - Wernicke-Korsakoff syndrome – a thiamin deficiency
  - Pellagra, beriberi, scurvy, protein-energy malnutrition
# Alcohol’s Effect on Nutrition

## Table C3-9: Calories in Alcoholic Beverages and Mixers

<table>
<thead>
<tr>
<th>BEVERAGE</th>
<th>AMOUNT (OZ)</th>
<th>ENERGY (CAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pina Colada mix (no alcohol)</td>
<td>4 1/2</td>
<td>180</td>
</tr>
<tr>
<td>Beer</td>
<td>12</td>
<td>150</td>
</tr>
<tr>
<td>Dessert wine</td>
<td>3 1/2</td>
<td>140</td>
</tr>
<tr>
<td>Fruit-flavored soda, Tom Collins mix</td>
<td>8</td>
<td>115</td>
</tr>
<tr>
<td>Gin, rum, vodka, whiskey (86 proof)</td>
<td>1 1/2</td>
<td>105</td>
</tr>
<tr>
<td>Cola, root beer, tonic, ginger ale</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>Margarita mix (no alcohol)</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>Light beer</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td>Table wine</td>
<td>3 1/2</td>
<td>85</td>
</tr>
<tr>
<td>Club soda, plain seltzer, diet drinks</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>
Does Moderate Alcohol Use Benefit Health?

Alcohol in moderation may reduce risk of
- Heart attacks
- Strokes
- Dementia
- Diabetes
- Osteoporosis
- Lower mortality in adults >35 years old
1 to 2 drinks a day are credited with reducing the risk of death from heart disease in people over 60 years old who have an increased risk of heart disease.

A study showed an increased risk of death from all causes with more than 22 drinks per week and that men drinking more than 35 drinks a week had double the mortality from stroke compared with nondrinkers.
Wine and dealcoholized wine, purple grape juice and the grapes themselves contain phytochemicals similar to those of wine but without the potential dangers of alcohol.
Alcohol affects the appetite

- Usually reduces appetite
- In tense or depressed people, may improve appetite
- Improves morale and social interaction
Benefits of moderate alcohol consumption

Risks of excessive alcohol consumption

- Deaths from health problems
- Deaths from
  - Car crashes
  - Falls
  - Suicides
  - Homicides
  - Drowning
  - Other accidents