What is Nutrition?

The science of:

- Food, nutrients and the substances they contain
- Actions and interactions in the body to sustain and improve health
  - Ingestion
  - Digestion, Transport, and Absorption
  - Metabolism
  - Storage
  - Excretion

Why is Nutrition Important?

Food provides the body with essential and non essential nutrients to:

- Ensure adequate growth and development
- Act as regulators in key metabolic reactions
- Participate in chemical reactions to provide energy
- Repair and maintain cell tissues, organs and vital body processes
- Prevent deficiency diseases
- Reduce risk of chronic diseases

Why Do We Eat The Food That We Eat?

The Nutrients

- Energy Yielding
  - Carbohydrates
  - Protein
  - Lipids
- Non Energy Producing
  - Vitamins
  - Minerals
  - Water

Energy

- Comes from energy yielding nutrients
- Measured in Calories or Kilocalories

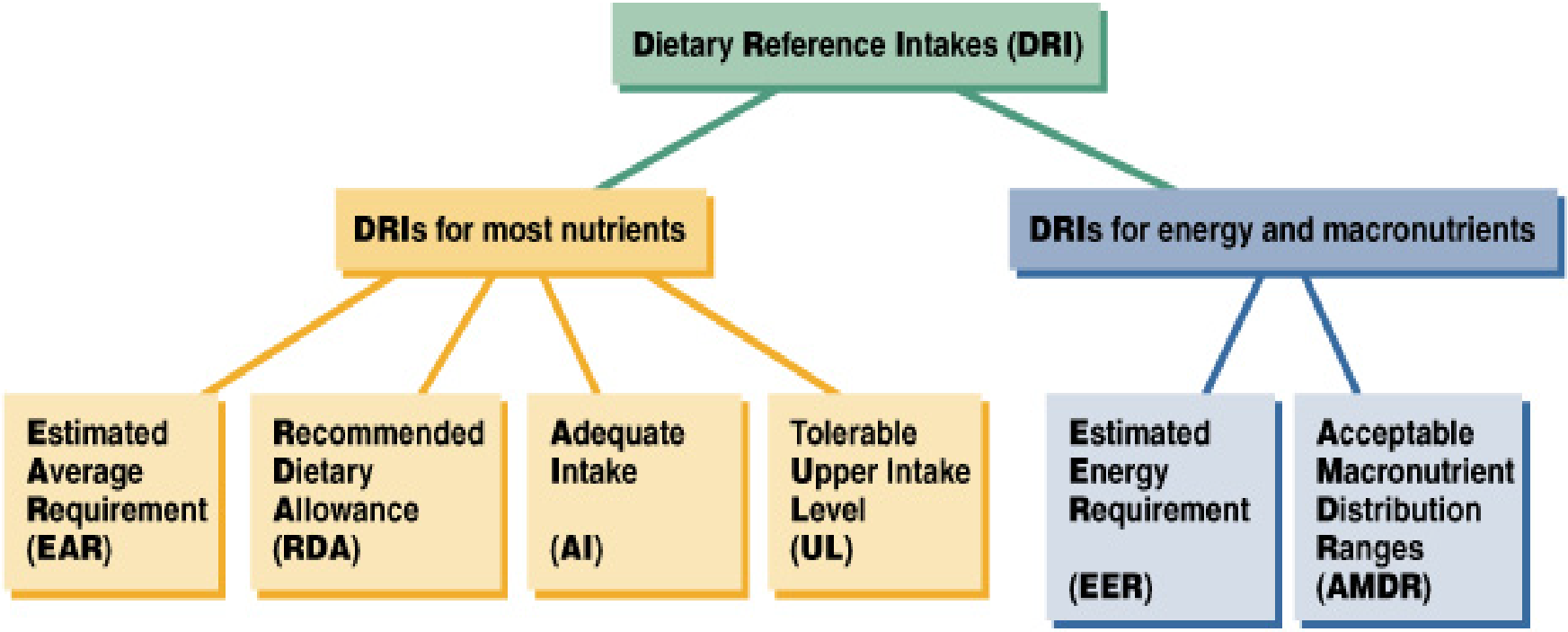
  The amount of heat to raise 1000 gms (1 Liter) of water 1 degree Celcius

- Food energy:
  - Carbohydrates: 4 kcals/gm
  - Protein: 4 kcals/gm
  - Lipids: 9 kcals/gm
  - Alcohol: 7 kcals/gm

Dietary Reference Intakes

- Set of standards that best define the amounts of energy and nutrients required to support health
  - Estimated Average Requirements (EAR)
  - Recommended Dietary Allowance (RDA)
  - Adequate Intake (AI)
  - Tolerable Upper Intake Levels (UL)

Dietary Reference Intakes



Nutrition Information & Misinformation

- Red Flags of Nutritional Quackery
  - Satisfaction guaranteed
  - Quick and easy fixes
  - Natural
  - One product does all
  - Time tested
  - Paranoid accusations
  - Personal testimonials
  - Meaningless medical jargon

Diet Planning Guides

- Dietary Guidelines for Americans
  - Science based advice to promote health and reduce risk of chronic disease
  - Apply to people two year or older
  - Choose healthy diet based on USDA Food Guide
- USDA Food Guide
  - Foods assigned to 5 major food groups
  - Provides recommended servings of each group
  - Each group provides key nutrients
- Food Guide Pyramid
  - Pictorial description of the USDA Daily Food Guide

The Food Label

- Helps consumers make healthy food choices and compare food products
- Daily Values set at 2000 calories per day
- Labels must provide:
  - Ingredient Listing
  - Serving Sizes
  - Nutrition Facts
- May include:
  - Nutrient Claims
  - Health Claims
  - Structure/Function Claims

What are Carbohydrates?

- Carbohydrates are sugars
- Consist of carbon, hydrogen, and water
- Derived from plant via photosynthesis
- Main energy source for the body

Type of Carbohydrates

- Simple Carbohydrates
  - Single or double sugars
- Complex Carbohydrates
  - Starches and Glycogen
- Fiber
  - Soluble and Insoluble

Fiber

- Carbohydrate that is not digested
- Provides bulk to the intestines, increases transit time, makes elimination easier
- Types:
  - Water Soluble
  - Water Insoluble
- Dietary recommendation is 25-35 grams per day
- Lack of fiber can lead to constipation, hemorrhoids, diverticulosis

Carbohydrate Functions

- Provide energy to the body
- Impart sweetness to foods
- Protein Sparing
- Prevent ketosis

Carbohydrate Digestion and Absorption

- Mouth (Salivary Amyl*ase*)
- Stomach
  - Stomach acid (HCL) and enzymes inhibit CHO digestion
- Small Intestine
  - Pancreas secretes carbohydr*ases*
  - Enzymes on small intestine surface breakdown CHO
    - Maltose ------ ***Maltase***--------- Glucose + Glucose
    - Sucrose ----- ***Sucrase*** --------- Glucose + Fructose
    - Lactose ----- ***Lactase*** ---------- Glucose + Galactose
- Large Intestine
  - Water reabsorbed
  - Fiber holds water, regulates bowel activity, binds cholesterol

Digestion, Absorption, and Metabolism Problems

- Gas
  http://www.beanogas.com/UofGas.aspx
- Lactose Intolerance
- Diabetes
- Hypoglycemia
- Constipation
- Diverticulosis

Types of Lipids

- Triglycerides
  - Saturated Fatty Acids
  - Unsaturated Fatty Acids
    - Monounsaturted Fatty Acids
    - Polyunsaturated Fatty Acids
      - Essential Fatty Acids
      - Omega 3 Fatty Acids
- Phospholipids
- Sterols
- All are found in the body and in foods

Triglycerides

- Organic compound
- Consists of a glycerol backbone with various fatty acids attached
- Type of Fatty Acid determined by:

  degree of saturation and location of double bonds
- Saturated Fatty Acids
- Monounsaturated Fatty Acids
- Polyunsaturated Fatty Acids

Omega 3 Fatty Acids (Linolenic)

- Essential for growth and development especially eyes and brain
- May protect against heart disease, stroke, cancers, arthritis
- Dilate blood vessels, reduce inflammation & blood clotting
- Food sources
  - Fatty fish: EPA and DHA
  - Canola oil, flaxseed, walnuts, dark green leafy vegetables
  - Enriched food products
  - Fish oil supplements – use caution

Omega 6 Fatty Acids (Linoleic)

- May do opposite effect of Omega 3
  - Increase blood clotting, lead to vasoconstriction
- Ideal ratio of omega 3 to omega 6:
  - 1:5
- Typical ratio is 1:20-25
- Food sources include:
  - Vegetable oils (soy, corn, sunflower, peanut)
  - dark green leafy vegetables,
  - seeds, nuts,

Phospholipids

- Similar to triglycerides except a phosphate and choline molecule is attached
- Important component of cell membranes
- Soluble in both fat and water thus enabling lipids to move back and forth across cell membranes
- Act as emulsifiers in the body keeping fat suspended in the blood and body fluids

Sterols

- Important to make bile acids, steroid hormones, vitamin D, cell membranes (especially nerve and brain)
- Present in both plants and animals
- Animals = cholesterol
- Plants = plant sterols
- Cholesterol is manufactured in the liver as well as obtained in the diet

Digestion and Absorption of Lipids

Dietary Sources:

Mouth: → Lingual Lipase → Triglycerides

Stomach: → Minor role in fat digestion → Diglycerides + Fatty Acids

Small Intestine: →

Bile emulsifies fat

Pancreatic Lipase: Monoglycerides, Glycerol, Fatty Acids

Glycerol and Fatty Acids (<12 C – bloodstream)

Monoglycerides and larger F/A – make micelles – into intestinal cells

Repackaged into chylomicrons – into lymphatic system

Large Intestine:

Some fat and cholesterol trapped in fiber – excreted

Lipid Transport

Chylomicrons:

Transport diet related lipids from intestine to the body

High in fat, low in phospholipid, cholesterol, protein

VLDL:

-Liver may make lipids and ship them out as VLDL's

-VLDL (high in TG, moderate in phospholipids, cholesterol, protein)

LDL:

-VLDL shrinks as travel t/o the body; remove TG

-End result is LDL (high cholesterol, low in TG, phospholipids, protein)

-Receptor cells can remove LDL from circulation

HDL

-Produced by liver– picks up cholesterol

-Transported to the liver for disposal

-High in protein, low in TG, moderate phospholipid, cholesterol

Dietary Fat and Serum Cholesterol Levels

- Saturated Fat and Trans Fats
  - ↑Total Cholesterol & LDL
- Polyunsaturated Fat
  - ↓ Total Cholesterol
  - ↓ LDL
  - ↓ HDL
- Monounsaturated Fat
  - ↓ Total Cholesterol
  - ↓ LDL
  - No effect on HDL

Reducing Trans fats

- Trans fats are unsaturated fats hardened in the food manufacturing process
- Trans fats act like saturated fats and can raise LDL levels
- Reduce “hydrogenated” fat intake as much as possible

Increase Omega 3 Fatty Acids

- Omega-3 fatty acids are a type of polyunsaturated fat
- Benefits include:
  - anti-inflammatory and anti-blood clotting actions,
  - lowering cholesterol and triglyceride levels,
  - reducing blood pressure.
- EPA and DHA found in fatty fish and fish oil supplements
- Other omega 3 fatty acids (ALA) found in dark green leafy vegetables, flax, and walnuts

Increase Dietary Fiber

- Fiber is an undigested component of plant foods
- Insoluble fiber:
  - Add bulk to diet and helps with regularity
  - Found in fruits, vegetables, grains
- Soluble fiber:
  - Forms a gel in liquids, can help control cholesterol and blood sugar levels
  - Oats, beans, lentils, barley, some fruits/vegs
  - Ground flax seed and Metamucil (psyllium)
- Consume 25-35 grams dietary fiber/day

What are Proteins?
Why are they important?

- Amino acid chains linked by peptide bonds via condensation reactions
  - Dipeptides
  - Tripeptides
  - Polypeptides
- Importance
  - Part of every cell
  - Needed in chemical reactions
  - Structural components

Protein Structure

- Consist of amino acids in varying array
- 20 amino acids required by the body:
  - 9 essential; 11 non-essential
- Uniqueness of amino acids is the side group
- A..A.Sequence makes up each unique protein shape and function
- Animal and plant proteins vary greatly in terms of protein composition
  - Animal proteins contain all essential amino acids
  - Plant proteins low in 1 or more essential amino acid

Protein Functions

- Produce vital body constituents:

  muscles, connective tissues, blood clotting factors, blood transport proteins, lipoproteins, support structure of bone
- Maintain fluid balance
- Acid Base balance
- Form hormones and enzymes
- Transporters
  - Oxygen
  - Lipids
  - Vitamins/Minerals
- Immune Function
- Form Glucose via gluconeogenesis
- Provide energy

Protein Requirements

- RDA = 0.8 gm/kg body weight
- Endurance athletes, body builders need more to support lean tissue
  1.0-1.8 gm/kg
- Excess protein is not stored
- Maximum usable amount = 2.0 gm/kg
- Protein and amino acid supplements do not provide the balanced array of amino acids; best to get protein from food

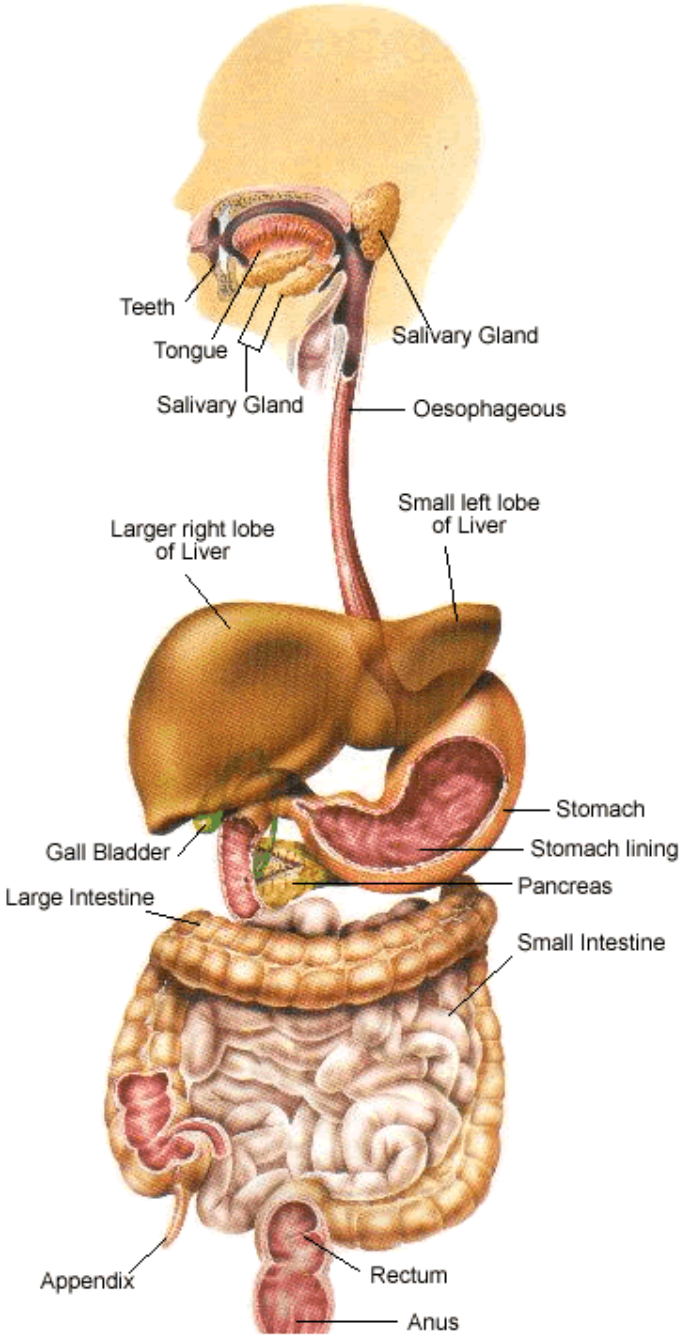
Digestion

- Complex process involving hormones, nerves, and enzymes to transform food into nutrients and usable energy
- Digestive tract is a flexible muscle, approximately 26 feet long, which includes the mouth, stomach, small intestine, large instestine, and anus
- Movement through the digestive tract is controlled automatically via muscular process called peristalsis

Digestive Process

Anatomy:

- Mouth
- Stomach
- Small Intestine
- Large Intestine



Organs Involved:

- Salivary Glands
- Stomach
- Pancreas
- Liver
- Small Intestine

Digestion Videos

- Carbohydrates
- http://wps.prenhall.com/wps/media/objects/488/500694/CDA40_1/CDA40_1d/CDA40_1d.htm
- Protein Digestions
- http://wps.prenhall.com/wps/media/objects/488/500694/CDA40_1/CDA40_1f/CDA40_1f.htm
- Fats
- http://wps.prenhall.com/wps/media/objects/488/500694/CDA40_1/CDA40_1h/CDA40_1h.htm

Nutrient Absorption

- Most absorption takes place in small intestine
- Inner surface of small intestine comprised of finger-like projections called villi
- Villi recognize, select, and regulate nutrients needed by the body
- Nutrients enter the bloodstream (if water soluble) or lymphatic system (fat soluble)

Circulatory System

- Delivers nutrients to any cell needed
- Blood leaving the digestive tract first goes to the liver via portal vein to prepare the absorbed nutrients for the body
- Blood then leaves the liver, travels to the heart and throughout the body

Lymphatic System

- Provides transport of fluid from the tissue spaces to enter the bloodstream
- Lymph is a yellowish fluid without red blood cells or platelets and is moved as muscles contract
- Byproducts of fat digestion enter the lymphatic system, eventually entering the circulatory system in a duct behind the heart

Types of Absorption

- Simple diffusion
  - Nutrients cross into intestinal cells freely
  - Water and small lipids
- Facilitated diffusion
  - Requires specific carrier to transport nutrient from one side of the cell membrane to the other
  - Water soluble vitamins and fructose
- Active Transport
  - Requires energy to be absorbed
  - Glucose and amino acids

Metabolism

- Transfer of food energy to chemical energy
- Energy for chemical reactions comes from the bonds of the macronutrients
- Includes anabolic and catabolic reactions
- Goal: meet body's need for energy (ATP)

Anabolic or Catabolic

A cracker becomes glucose

Glucose becomes glycogen

You consume more energy than your body expends.

Fasting.

A piece of ham becomes amino acids.

Amino acids become your muscles.

A cookie becomes fatty acids

Fatty acids become body fat.

Fatty acids provide energy.

Nutrient Metabolism

- During metabolism, the body separates atoms from energy yielding nutrients
- Net result:
  - Carbs → glucose
  - Lipids → glycerol + fatty acids
  - Proteins → amino acids

Carbon Backbones of Energy Yielding Nutrients

- 3 carbon compounds can make glucose
- 2 carbon compounds cannot make glucose

  - Glucose ~~3 carbon~~
  - Glycerol ~~3 carbon~~
  - Fatty Acids ~~2 carbon~~
  - Amino Acids ~~2 and 3~~ carbon

Stages Of Metabolism

- Digestion
  - Macronutrients to individual components
  - Absorbed into cells
- Glycolysis (cytosol of the cell)
  - Anaerobic
  - Creates 2, 3 carbon units
- Citric Acid Cycle (mitochondia of the cell)
  - Aerobic
  - Reaction produces CO_2 and electrons, NADH
  - Extracts most energy to power generation of ATP
- Electron Transport Chain (inner mitochondria of the cell)
  - Most ATP produced here
  - NADH and FADH deliver high energy electrons
  - At the end of the chain, O_2 + electrons + H = H_2O

Metabolism of Nutrients: Carbohydrates

- Cells extract energy from carbs in 4 ways
  - Glycolysis (anaerobic)
  - Pyruvate to Acetyl-CoA (anaerobic)
  - Krebs (Citric Acid or TCA cycle) (aerobic)
  - Electron Transport Chain (aerobic)
- End products CO_2, H_2O, ATP

Metabolism of Nutrients: Lipids

Triglycerides

can only be used as energy source if broken down to glycerol and fatty acids

Glycerol

- can make glucose
- can enter TCA cycle
- *3 Carbon Unit*
- 5% of TG can make glucose

Fatty acids:

- Beta oxidation
  - Cleave f/a 2 C's at a time
  - Each 2C combines with Acetyl CoA
  - 95% of TG cannot make glucose

Metabolism of Nutrients: Proteins

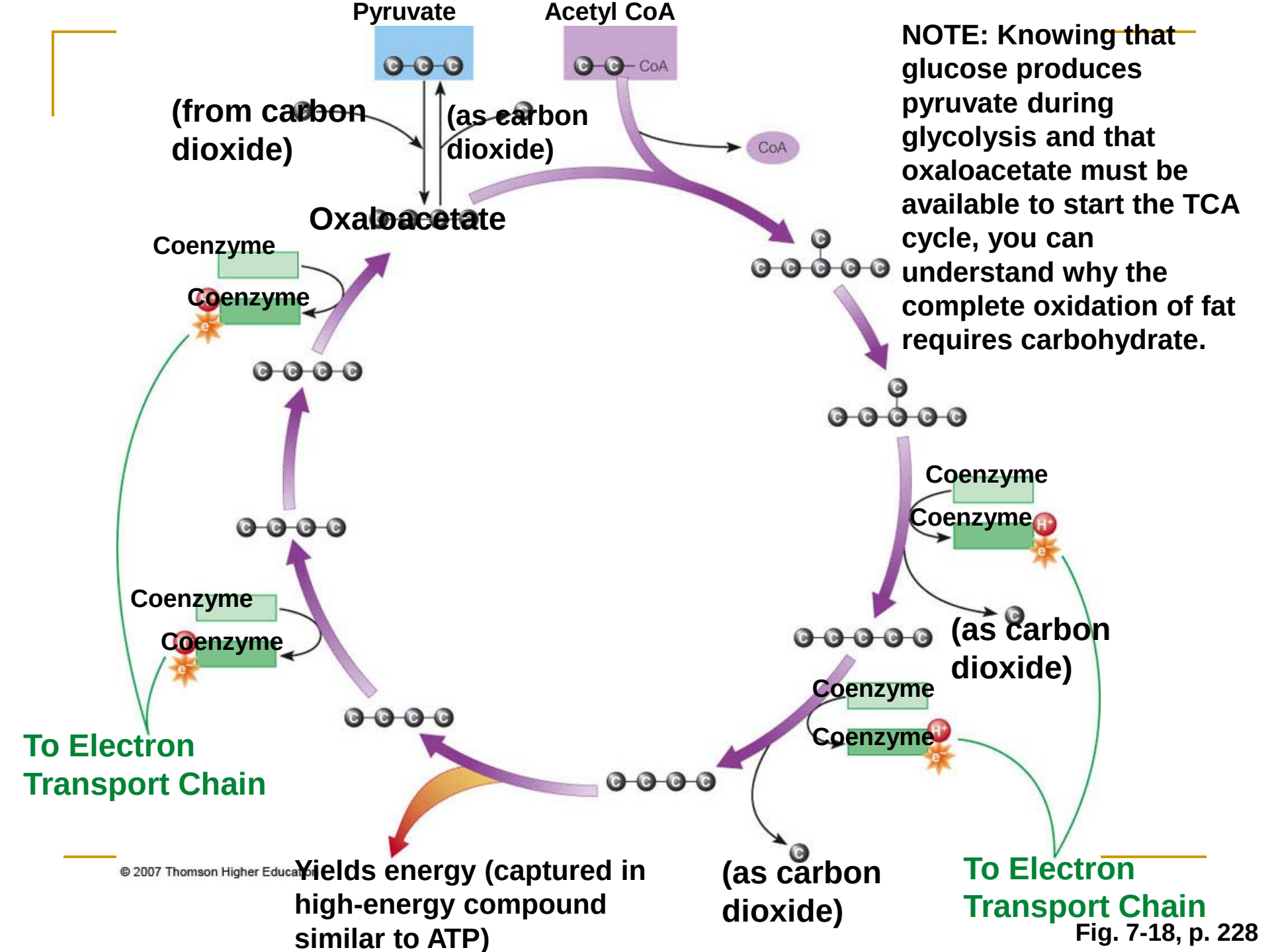
- Deamination – Nitrogen removed
  - Liver converts ammonia to Urea
  - Carbon skeletons provide energy, glucose or convert to fat
    - 2 carbon units: directly into AcetylCoA
    - 3 carbon units: can make glucose
    - 3 carbon units: directly into TCA cycle
  - Kidney excretes Urea from body

Krebs/Citric Acid/TCA Cycle

- Acetyl CoA----- TCA/Krebs/Citric Acid
  - Acetyl CoA (2 carbon) combines with Oxaloacetate
  - Oxaloacetate = 4 C compound
  - Makes 6 carbon compound called Citrate (citric acid)
  - Reactions continue to pull off carbons and expel as CO2

- This cycle extracts most of the energy that powers ATP generation.

- This cycle important building blocks of amino acids and fatty acids
  - If alternate use depletes supply of oxaloacetate, the cycle can slow or stop, made directly from pyruvate so readily available



NOTE: Knowing that glucose produces pyruvate during glycolysis and that oxaloacetate must be available to start the TCA cycle, you can understand why the complete oxidation of fat requires carbohydrate.

Fig. 7-18, p. 228

Electron Transport Chain

- Coenzymes deliver electrons from the TCA cycle, glycolysis and beta oxidation to a carrier
- Inner membrane of the mitochondria
  - Carrier passes them to another carrier
    - Oxygen accepts electrons combines with hydrogen = water
  - During electron transfer energy released to move H to outer compartment of mitochondria
  - Hydrogen ions float “downhill” – inner compartment
  - ATP synthesized
- ATP leaves mitochondria, enters cytoplasm, used for energy

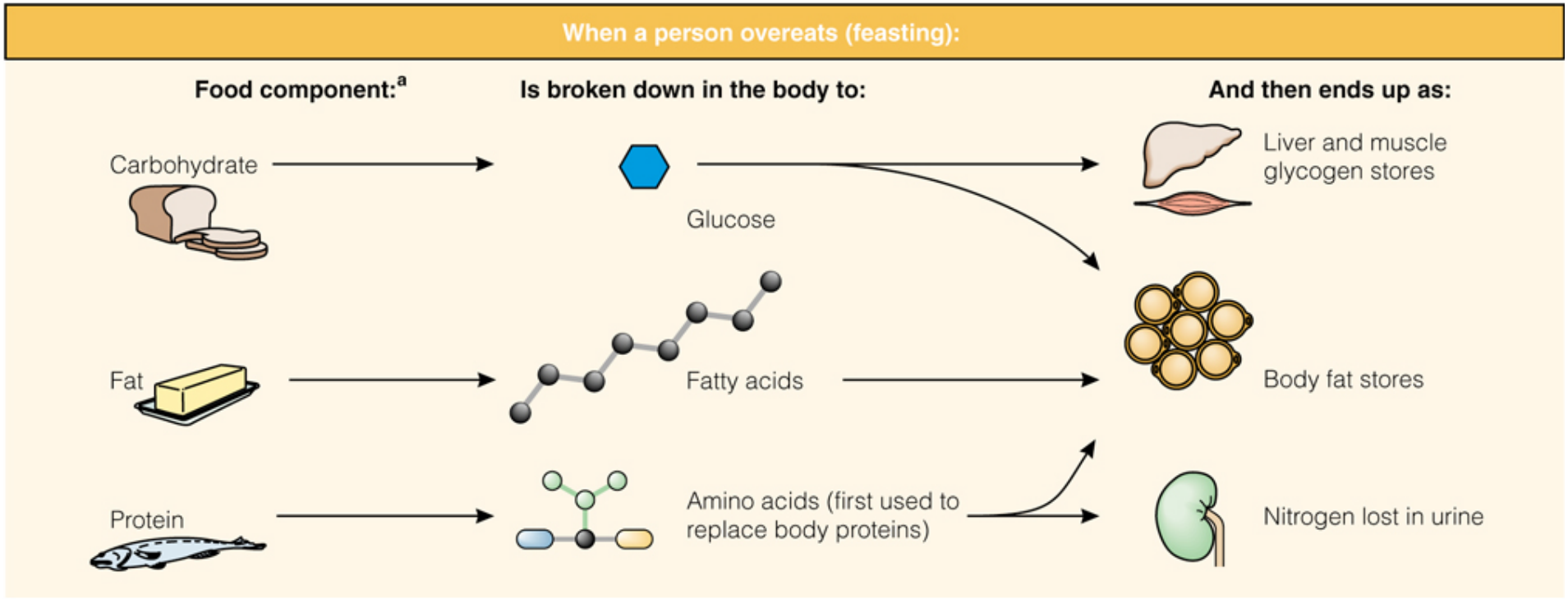
Glycolysis Video

- http://scholar.hw.ac.uk/site/biology/activity3.asp

Feasting

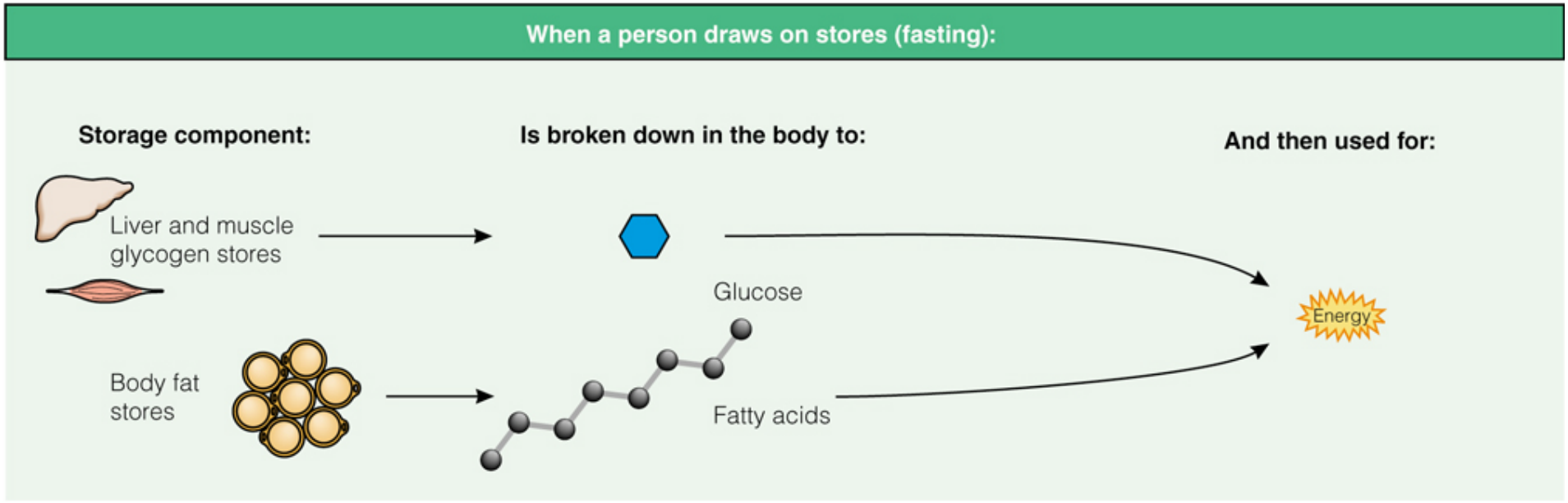
- Anabolic state
- Food consumption triggers hormone release
- Insulin inhibits release of other hormones and stores byproducts of nutrient digestion
  - Carbs --- glycogen
  - Fatty Acids ---- glycerol and fatty acids – t/g
  - Amino Acids --- amino acid pool or fat stores

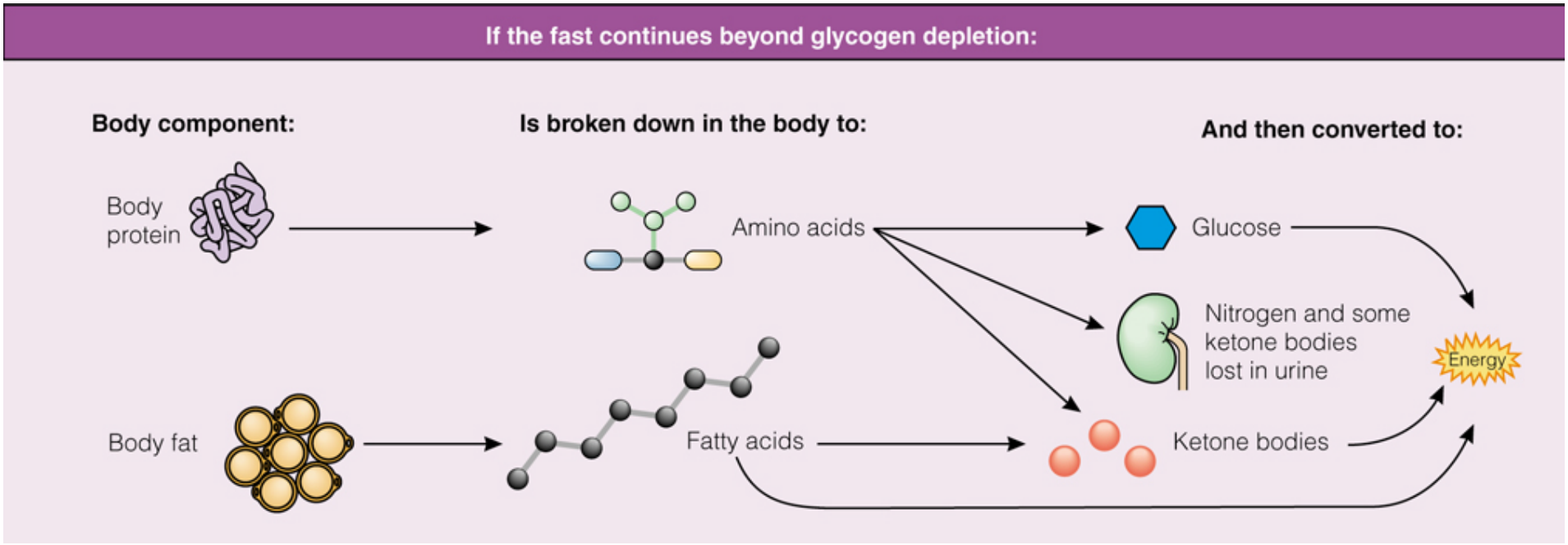
The Body's Response to Feasting



Fasting

- Catabolic State
- All nutrients eventually used for energy
- Glycogen from liver and fatty acids from adipose tissue yield Acetyl CoA and provide energy for cells
  - Glucose – needed for brain, RBC and nerves
  - Protein – 3 carbon can provide glucose – body protein must be broken down to provide these
  - Ketosis – produced by Acetyl CoA fragments
    - Can provide fuel for some brain cells
    - Suppresses appetite
    - Changes acid/base balance of body
- Metabolism slows – lean tissue shrinks – muscles do less work - less calorie demands


When a person draws on stores (fasting):
Storage component:
Is broken down in the body to:
And then used for:
Liver and muscle glycogen stores
Glucose
Energy
Body fat stores
Fatty acids


If the fast continues beyond glycogen depletion:
Body component:
Is broken down in the body to:
And then converted to:
Body protein
Amino acids
Glucose
Nitrogen and some ketone bodies lost in urine
Energy
Body fat
Fatty acids
Ketone bodies

Alcohol Metabolism

- Immediately absorbed in the mouth, esophagus and small amts into bloodstream
- 80-95% absorbed unchanged
- Quickly metabolized by liver to remove from blood and prevent damage
- Metabolized like a fat
  - ETOH – acetaldehyde (toxic)
  - Acetaldehyde – acetate and Acetyl CoA
  - Acetyl CoA – citric acid cycle or made into fatty acids
- Small Amounts of Alcohol Consumption
  - Alcohol Dehydrogenase metabolizes alcohol to Acetyl CoA
  - Little converts to energy – more stored as fat in liver
- Large Amounts of Alcohol Consumption
  - Overtax Alcohol Dehydrogenase
  - Alternate System – MEOS takes over
  - Energy utilized to support MEOS system
- Alcohol Clearance from the body
  - Liver can metabolize a set amount per hour
  - Absorption exceeds livers capacity to breakdown, into circulation
    - Oxygen deprivation to the brain
    - Placental crossing to the fetus if pregnant

Fitness Conditioning

- Overload Principle
- Response
  - Hypertrophy
  - V02 Max
    - Improves cardiac output and 02 delivery
    - Increase stroke volume
    - Slows resting pulse
    - Increases breathing efficiency
    - Improves circulation
    - Reduces blood pressure

Fuel Sources

- Energy is stored in chemical bonds of nutrients:
- Carbohydrates:
  - Necessary to maintain blood glucose
  - Supplement muscle and liver glycogen stores
  - Used in anaerobic energy systems
- Lipids:
  - Provide main source of fuel as fatty acids during low intensity, long duration activity
  - Used in aerobic energy systems
- Protein
  - Infrequently used as a fuel source unless carbohydrate intake is inadequate

Phosphagen System

- ATP-PC system is the first to form ATP when there is an increase in energy demand
- ATP-PC system fuels high intensity, short duration activities such as sprints, weightlifting, etc
- When CP stores are depleted, the glycolysis system is triggered

Anaerobic (Glycolysis) System

- When *CP is exhausted:*
  - ATP production can occur for ~ *1-3 minutes* without oxygen
- *Glucose* is the only fuel source that is utilized
- *Lactate* is formed as a byproduct from the heart and skeletal muscles as they continue to work
- *Lactate formation > clearance* causes decreased acidity in muscle cell - *inhibits fatty acid breakdown for aerobic metabolism*
- Lactic acid buildup leads to fatigue and decreased exercise performance
- Short burst activities such as 100-200 meter runs, swims are primarily fueled by this system

Aerobic System

- Fuel sources
  - Carbs (glucose and glycogen)
  - Fats (fatty acids)
  - Proteins (amino acids)
- Requires oxygen to form ATP via the Krebs cycle and electron transport chain
- Long duration, lower intensity activities generally utilize the aerobic system
- Prolonged activity will utilize both glucose and fatty acids as substrates
- Protein is usually spared for energy pathways, and is conserved for tissue maintenance, repair, and growth
- Failure to consume adequate carbs, however, will result in protein breakdown resulting in decrease muscle protein and lean body mass

Glucose Use During Activity

- High carb diet promotes:
  - Adequate glycogen storage and use
  - Increased endurance
- Exercise Intensity
  - Moderate activities use glycogen slowly
  - Intense activities use glycogen quickly
- Exercise Duration
  - <20 minutes of activity glycogen is used
  - > 20 minutes glycogen and fat are used
- Training
  - Muscles which repeatedly deplete glycogen store greater amounts during recover
  - Conditioned muscles rely less on glycogen and more on fat
  - Untrained muscles depend more heavily on anaerobic pathways

Protein Use During Activity

- Diet
  - Carbohydrate spares protein
  - Energy and carb rich diets use less protein for fuel
  - Protein can supply up to 10% of total fuel as amino acids
- Intensity
  - Glycogen store depletion promotes protein utilization
- Duration
  - Dependent on intensity and carb, fat utilization
- Training and Muscle Building
  - More trained, less protein is used for energy
  - Protein synthesis is suppressed during activity and increases after activity
  - Athletes in training need more protein but must meet energy and carb needs first

Fat Use During Activity

- Diet
  - High fat diet promotes increased fat stores
- Exercise Intensity
  - Oxygen must be present in abundance to breakdown fat
  - Fat contributes less to overall ATP production as intensity increases
- Exercise Duration
  - Fatty acids in bloodstream used at initiation of activity
  - Body fat used as major fuel after 20 minutes of activity
- Training
  - Trained muscles use more fat
  - Strong heart and lungs deliver oxygen to muscles
  - Less glucose and glycogen utilized

Nutrient Recommendations

- Carbohydrates
  - 55-75% total calories
- Fat
  - 15-30% total calories
- Protein
  - 10-15% total calories
- Carb loading
  - Newer research focusing on recovery nutrition
  - Carb:protein 4:1

Fluid Needs during Physical Activity

TABLE 10-5 Hydration Schedule for Physical Activity

WHEN TO DRINK	AMOUNT OF FLUID
2 hr before activity	2 to 3 c
15 min before activity	1 to 2 c
Every 15 min during activity	½ to 2 c (Drink enough to minimize loss of body weight, but don't overdrink.)
After activity	2 c for each pound of body weight lost[a]

[a] Drinking 2 cups of fluid every 20 to 30 minutes after exercise until the total amount required is consumed is more effective for rehydration than drinking the needed amount all at once. Rapid fluid replacement after exercise stimulates urine production and results in less body water retention.

Source: R. Murray, Fluid, electrolytes, and exercise in *Sports Nutrition: A Practice Manual for Professionals*. 4th ed., ed. M. Dunford (Chicago: The American Dietetic Association, 2005), pp. 94–115; D. J. Casa, P. M. Clarkson, and W. O. Roberts, American College of Sports Medicine Roundtable on Hydration and Physical Activity: Consensus statements, *Current Sports Medicine Reports* 4 (2005): 115–127.

Determining Energy Requirements

- Balance of Energy Intake and Output
- Energy Intake
- Energy Output (Total Energy Expenditure)
- Basal Metabolic Rate (BMR)
- Thermic Effect of Food
- Stressors
- Physical Activity

Defining a Healthy Weight

- Body Mass Index
  - 19-24 Normal
  - 25-29 Overweight
  - 30 + Obese
- Body Composition
  - Men 13-20 percent
  - Women 20-30 percent
- Fat Distribution

Nutrient Requirement in Pregnancy

- Energy (300 kcals 2nd/3rd trimester)
- Protein (25 grams/day)
- Essential Fatty Acids (omega 3 and 6)
- Vitamins and Minerals
  - Most all increase during pregnancy
  - Pay attention to those required for cell growth and DNA synthesis
    - Folate, Vitamin B12, Iron, Zinc
  - Bone formation
    - Calcium, Vitamin D

Benefits of Breastfeeding

- Protective factors
  - Immunological factors
    - Antibodies
    - Bifidus factors
    - Lactoferrin
    - Lactadherin
    - Growth factor
    - Lipase enzyme
  - Allergies
  - Obesity

Introducing Solid Foods

- Between 4 to 6 months of age
- Nutritional needs
  - Iron
  - Vitamin C
  - Prevent excessive milk intake
- Physical readiness

  Baby can sit up, handle finger foods,

  If teething, hard crackers and other finger foods may be introduced cautiously
- Avoid foods that are choke hazards.

Encouraging Good Nutrition Habits

- Foster a sense of autonomy.
- Discourage unacceptable behavior.
- Let the child explore and enjoy food.
- Don’t force food on children.
- Limit sweets strictly.

Preventing Childhood Obesity

- Insist children consume regular meals and snacks
- Reduce sodas, fruit juices
- Reduce frequency of fast foods and dining out
- Increase fresh fruits/vegetables
- Encourage daily physical activity
- Remove TV from bedrooms
- Limit TV, video games, computer to 1 hr/day

Nutrition and Aging

- Life expectancy has increased in the 20th century
- Factors that enhance longevity include:
  - Alcohol in moderation
  - Consuming regular balanced meals
  - Weight control
  - Regular physical activity
  - Adequate sleep
  - Avoidance of smoking

Aging Process and Effects on Nutrition

- Physiological changes
  - Body weight
  - Body composition
  - Immune system
  - GI tract
- Psychological changes
  - Depression
  - Isolation and loneliness
  - Economic
  - Social

Energy and Nutrient Needs

- Energy needs decline ~2-5%/decade
  - Decreased activity
  - Body composition changes
- Nutrient Needs
  - Protein, carb, fat – similar
  - Vitamins/Minerals
    - B12
    - Vitamin D
    - Calcium
    - Iron
- Water – dehydration risk

Foodborne Illnesses

- Foodborne Infections
  - Foods contaminated with infectious microbes
  - Flu like symptoms are very common
  - Most common link is undercooked or unpasteurized food products

Common Foodborne Illnesses

- Undercooked or unpasteurized products
  - Salmonella
  - E-coli
  - Clostridium perfringens
  - Campylobacteriosis
  - Listeria
- Symptoms generally include nausea, vomiting, diarrhea
- Onset is generally 8-16 hours but can be delayed up to a few weeks

Food Intoxications

- Microbe in food that produces toxin
- Toxin multiplies and produces symptoms

Common Food Toxins

- Staphylococcal
  - Improper cooking and storage
  - Improper food handling techniques
  - Onset 1-6 hours
  - Typical GI disturbances
- Botulism
  - Toxin thrives in low acid environment
  - Onset 4-6 hours
  - Effects nervous system, paralysis, breathing, double vision

Causes of Increased Incidence of Foodborne Illnesses

- Demand by consumers for increased shelf life of products
  - Some bacteria grow at refrigerator temperatures
  - Partially cooked food
- Changes in dietary practices
- Increased consumption of imported foods
- Great awareness of food borne illnesses and increased reporting

Prevention of Food Borne Illness

- Food Industry
  - HACCP
  - Food Preservation
    - Pasteurization
    - Sterilization
    - Fermentation
    - Reducing water activity
  - Aseptic Packaging
  - Irradiation
  - Increase inspection of imported foods

Prevention of Food Borne Illnesses

- Personal
  - Home food safety – would your kitchen pass the test?
  - Avoid danger zone for food
  - Frequently wash hands
  - Avoid cross contamination
  - Purchase locally produced foods
  - Purchase food from respectable producers

Environmental Contaminants

- Pesticides
  - Added to prevent food damage by insects, bugs
  - Are you consuming lots of pesticides?
    - Frequency of food exposure
    - Type of pesticide used and quantity
    - Weather conditions
    - Time between use, harvest, market
    - Preparation
  - Minimizing Exposure
    - Trim fat from meats
    - Wash fresh produce in water, scrub brush
    - Peel citrus
    - Discard outer leaves of leafy vegetables
    - Peel waxed vegetables and fruits

Food Additives

- Intentional
  - Added to improve
    - Color, texture, flavor, stability, nutritional value or resist spoilage
  - GRAS list
    - Artificial color – beta carotene
    - Flavor enhancers – MSG
    - Antimicrobials
      - Sugar, salt, nitrates
    - Antioxidants – BHA and BHT
- Incidental
  - Enter food via harvesting, processing, production, etc