Nutrition, Health, and Fitness

What is Nutrition?
- Study of food and the way the body uses food to produce energy, build and repair the body
- Good nutrition – the diet provides all necessary components to maintain a healthy body
- Bad nutrition – the diet has a deficit or excess of one or more components, leading to less than optimal health

Two Main Categories of Nutrients: Macro and Micro
- Macronutrients: carbohydrates, fats, and proteins
  - Provide energy
  - Provide building blocks for growth and repair of tissues
- Micronutrients: vitamins and minerals
  - Affect enzyme function in cells
  - Affect other cellular functions, e.g., nerve impulses, muscle contraction, oxygen transport
Macronutrients: Carbohydrates

- Include: simple sugars, starch, glycogen, cellulose (fiber)
- Simple sugars (also called simple carbohydrates in the book) include glucose, lactose, sucrose (table sugar), etc. See table 7.2
- Starch is the CHO storage form of plants. It is found in grains, potatoes, and legumes
- Fiber is also found in plants, e.g., in the forms of cellulose & pectin. It is not digestible by humans.
- Glycogen is the CHO storage form of animals. It is digestible.

Carbohydrates

- For healthy, physically active adults, 55-70% of calories consumed should come from CHO
- Glucose is stored in the liver and muscles as glycogen or is converted into fat for storage
- To use CHO for energy, the body first converts the CHO into the simple sugar glucose
- CHO supplies 4 calories/gram

Fiber

- Indigestible CHO from plants
- Soluble – found in fruits, vegetables, legumes, oat bran
- Insoluble – found in whole grains
- Both can be beneficial to health, and can aid in weight loss
- Higher intake appears to lower risk of colon cancer & coronary heart disease, can aid in diabetes control
- Mean dietary fiber intake in USA is 15g/day – about half of the AHA recommended amount of 25-30 g/day (however, excess is not good)
Macronutrients: Fats

- Include simple fats (primarily triglycerides), compound fats (lipoproteins – esp. LDL, HDL), and derived fats (cholesterol)
- Can be found in both animal and plant-based foods
- Essential fats (must be provided by diet): linoleic and linolenic acids
- Important for absorption, transport, and storage of the fat-soluble vitamins
- Provide 9 cal/gram

Triglycerides

- Comprise 95% of dietary fat
- The form in which fat is stored in the body
- Consist of one glycerol molecule and three fatty acids
- Saturated: more H's, found in meat and dairy, coconut
  - Linked to blood cholesterol levels
  - Possible link to coronary heart disease
- Unsaturated: more carbon double bonds, found in plants
  - Monounsaturated – e.g., olive oil, may be least harmful
  - Polyunsaturated – e.g., safflower, corn oils

Triglyceride

- Saturated
- Monounsaturated
- Glycerol

Dietary fats:
- Provide 9 cal/gram
- Include simple fats (primarily triglycerides)
- Compound fats (lipoproteins – esp. LDL, HDL)
- Derived fats (cholesterol)
- Essential fats (must be provided by diet): linoleic and linolenic acids
- Important for absorption, transport, and storage of the fat-soluble vitamins
- Provide 9 cal/gram
Omega-3 Fatty Acid

- A type of polyunsaturated fatty acid
- Found in fish such as salmon, tuna, mackerel, and herring (but not canned)
- May lower blood cholesterol and triglyceride levels, higher intake has been associated with lower levels of CHD in men and women
- Some nutritionists recommend ~2 servings of fish/week for health benefit

Lipoproteins

- A type of compound fat made of triglycerides, protein, and cholesterol
- LDL – low-density lipoprotein – sometimes called “bad cholesterol” – high LDL is associated with health risk
- HDL – high-density lipoprotein – sometimes called “good cholesterol” – high values not associated with health risk

Protein

- All proteins are made of amino acids, there are 20 different amino acids
- Essential amino acids – 9 cannot be made by the body, must be consumed in diet
- Nonessential amino acids – 11 can be made by the body, so not necessary in diet
- Can be used for energy (4 cal/g), but primary use is for growth and repair of body tissues
- Some proteins act as hormones, enzymes, or in immunity
Protein

- Recommended daily intake for adults is 0.8 g/kg. Increased for pregnancy and lactation.
- Protein should comprise 12-15% of daily calories
- Athletes may need slightly more protein, but also need more calories, so 1-1.2 g/kg, still ~15% of calories
- For initial stages of resistance-training for muscle building (i.e., high load, low reps), increasing protein intake to ~1.5 g/kg may help
- Most Americans eat MORE than enough protein, very few need supplements (like protein powders or bars)!!

Cholesterol

- A derived fat
- Found in animal sources including eggs, dairy, meat, and shellfish
- Essential for health, but can be made in the liver
  - Part of cell membranes
  - Building block for all steroid hormones, including testosterone, estrogen, and progesterone
- High blood levels of cholesterol are associated with health risk, drugs available to lower blood cholesterol

Micronutrients: Vitamins

- Water soluble: Vit C, Vit B’s, generally not stored in body
- Fat soluble: Vit A, Vit D, Vit E, Vit K – stored in body fat
- Vitamins play roles in regulation of growth and metabolism
- See Table 7.6 for sources, roles, deficiency, & overdose of each vitamin
Micronutrients: Minerals

- Minerals are chemical elements (think periodic table)
- Examples include calcium (Ca), sodium (Na), potassium (K), iron (Fe), iodine (I), copper (Cu), and fluorine (F)
- Some play a role in regulating body functions, e.g. oxygen delivery, nerve impulses, & muscle contraction, while others have structural roles, e.g. calcium in bones and teeth, fluoride in teeth
- See Table 7.7 for sources, roles, deficiency and overdose of each mineral

Putting it all together: Basic Nutritional Guidelines

- Caloric balance – calories in = calories out
- Sources of calories
- Meeting the RDA or adequate intake (AI) for vitamins and minerals
- Salt, and simple sugars
- Adjusting for special conditions
- Food safety

Caloric Balance

- In order to maintain body weight, calories consumed must equal calories spent – focus of Chapter 8
- Chapter 8 discusses how to estimate calories spent.
- In general, for active, young people the target caloric intake will be between about 1800 and 3000 cal/day
- Chronically consuming more calories than are spent will result in weight gain (fat gain)
Sources of the calories

- The AMA and AHA recommend that the majority of the calories consumed come from carbohydrates – 55-70% of cal.
- More micronutrients will be gained from foods with complex carbos rather than only simple sugars (I.e., potatoes and beans rather than coke and gummy bears).
- The AMA and AHA recommend that fat comprise < 30% of calories (average American diet is 34% cal from fat) and saturated fat less than 10% of cal.
- Protein should comprise 12-15% of the calories.

The Food Pyramid

Can you get what you need in a vegetarian diet?
Meeting the RDA's or AI's

- Dietary analysis may be needed to be sure RDA's/AI's are met (see book, also computer and on-line programs)
- Eating a well-balanced, varied diet is a good start
- Tables 7.6 and 7.7 list good sources of each vitamin and mineral
- Deficiencies in iron and calcium are not uncommon in women
- Vegetarians and especially vegans must pay special attention, e.g., B12 is found only in animal-based foods

Salt and Simple Sugars

- Although there is some controversy, many sources recommend limiting sodium intake to < 3 g (3000 mg) per day (hypertension, bone effects)
  - This can be difficult, particularly if eating a lot of pre-prepared foods (pizza, deli sandwich, canned soups etc.)
  - Most Americans consume simple sugars in large quantities – note how many products are sweetened with sucrose and/or corn syrup and you will understand why!
  - Increasing the proportion of complex carbs and fiber while decreasing the proportion of simple sugars would benefit many

Adjusting for Special Conditions

- RDA's/AI's for growing children (see Table 7.8)
- RDA's/AI's for pregnancy and lactation (see Table 7.8)
- Exercise
  - Increases total caloric need
  - Esp. endurance athletes recommended to choose high % of cal from carbohydrates
  - Increases protein need, but usually not as a % of cal
  - Increases vit/mineral need, esp. for B's and sometimes iron. Usually this need is accommodated by the higher food intake
Food Safety

- Foodborne infections may be more common than people think – sometimes people don’t realize their symptoms came from food
- Salmonella – can be found in chicken, eggs, and processed meats
- Campylobacter, E. coli (certain strains) – also found on meats
  - All meat and eggs must be cooked thoroughly
  - Wash everything that touched raw meat or eggs
- Botulism – rare, but fast and potentially fatal, usually from improper canning or damage to cans

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Nutrition Facts

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</table>

Start here

- Limit these nutrients
- Quick guide to % daily value 9% or less to 9% or less
- Get enough of these nutrients

Footnote:

- Total and Daily values are based on a 2000 calorie diet.

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Why CHO When Training?

- High Carbohydrate Diet (15% of total calories)
- Low Carbohydrate Diet (4% of total calories)

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Supplements and Health

- Dietary Supplement Health and Education Act (DSHEA)
- Supplement manufacturers not required to get FDA approval
- Manufacturers may claim effects on the “structure or function” of the body
- Never rely on supplements to provide a major source of dietary nutrients