MIDTERM Study Guide

Nutrition

The science that links food and diet to health and disease; includes digestion, absorption, metabolism, transportation and excretion of substances

Nutritional Status

determined by
Anthropometric measurements such as height, weight, circumferences
Biochemical measurements such as the function of nutrition
Clinical examination includes diseases, PMH/PSH, EENT, neuro status etc.
Dietary analysis
Economic evaluation

Malnutrition

includes overnutrition and undernutrition.
Obesity is the clinical presentation of increased adipose tissue and internal fat relative to body weight
Overweight is high body weight relative to height

Other Terms

Hunger is the physiological drive to eat food in order to fulfill bodily needs.
Appetite is the psychological drive to eat food. Can be influenced by a number of things.
Satiety is the physiological state of satisfaction, regulated by the brain.
Nutrient Density refers to amount of nutrients relative to amount
Energy Density (kcals)

Veganism

Nutrient concerns include vitamin B12, iron, zinc, calcium, omega-3 fatty acids, vitamin D

Daily Reference Intakes

Daily Value - the recommended amount of intake for Americans; based off a 2000kcal diet
Recommended Daily Allowances - the amount of kcals needed to meet nutrient requirements of nearly all healthy individuals.
Adequate Intake - estimated intake value based off estimates of a group of healthy people.
~~ in relation to the **Standard American Diet**, the SAD has high animal protein intake, high fat and sugars, not enough fiber and refined grains.

Nutrients

Carbohydrates

4kcal/g -- provide energy for metabolism

Monosaccharides

simple sugars

1. **glucose** - found in table sugar; essential for the bloodstream
2. **fructose** - found in fruits, honey; converted to glucose in the liver
3. **galactose**

Disaccharides

1. **sucrose** - glucose + fructose
2. **lactose** - galactose + glucose
3. **maltose** - glucose + glucose

Polysaccharides

1. **Starches**
    1. amylose (straight)
    2. amylopectin (branched)
2. **Fiber** (recommended DI is 25g/day for women, 38g/day for men)
    1. **Soluble** - found in soft parts ~~ slows digestion, reduces cholesterol and CHD, helps produce bile
    2. **Insoluble** - cellulose ~~ bulks up stool
    3. **Functional Fibers** are added fibers that can usually serve as a prebiotic
3. **Glycogen**
    1. highly branched polysaccharide
    2. the stored form of carbohydrates for animals and humans in the **liver and muscles**

Proteins

4kcal/g -- regulates and maintains bodily functions; **provides the essential form of nitrogen**

RDA is 0.8g/kg (Grains contain 2-3g/serving; vegetables 2-3g/serving; fruits < 1g/serving; dairy 8-10g/serving)

Amino Acids

The building blocks of proteins; linked by peptide bonds; form determines function
9 essential amino acids (meaning our body cannot produce it naturally and must be taken in through the diet)
If a diet is deficient in calories or one of the essential amino acids, protein synthesis will be limited
11 nonessential amino acids
Branched-Chain Amino Acids (BCAA's) - Leucine, isoleucine, and valine
used by muscles for their energy needs
found in meat, dairy products and legumes

Dietary Proteins

Complete means that all 9 essential amino acids are found in the food; usually only animal proteins, but soy is the only plant-based protein source that is complete.
Incomplete means that it is lacking in one or more essential amino acids.
Complementary proteins are two or more proteins that can make up for lacking essential amino acids.

Protein Deficiencies

Kwashiorkor -- severe protein deficit
S/S include edema, distended belly, fatty liver, rapid onset
Marasmus -- severe protein and energy deficit
S/S include severe weight loss, gradual development]

Fats/Lipids

9kcal/g -- most efficient storage of energy; insulate and protect the body; aid with transport; cholesterol

Phospholipids

lipid bilayer in cell membranes

Triglycerides

Saturated - solid fats
Unsaturated - oils
monounsaturated - one double bond (olive oil)
polyunsaturated - multiple double bonds (omega-3; omega-6)
- omega-3 is anti-inflammatory (sources: fish, chia seeds, walnuts, flax seeds, fat in milk, meat and eggs of grazing)

Sterols

cholesterol; precursor to hormones such as testosterone, estrogen; active D hormone

Micronutrients

Vitamins

help with chemical reactions
Water-soluble vitamins - B&C
Fat-soluble vitamins - ADEK

Minerals

aid in nervous system, water balance, musculoskeletal processes
Major minerals >100mg/d
Trace minerals <100mg/d

Digestive System

Process by which large ingested molecules are mechanically and chemically broken down, producing basic nutrients that can be absorbed across the wall of the GI tract

Mouth

1. prepares food for swallowing
2. begin digestion of starch with amylase enzyme
3. begin digestion of fat with lingual lipase

Esophagus

1. moves food to stomach using peristalsis
2. lower esophageal sphincter —> prevent backflow of stomach contents into esophagus

Stomach

1. holds up to 4 cups
2. secretes gastric juice containing acid, enzymes and hormones —> mixes food with gastric juice —> converts it to liquid chyme (which leaves the stomach 1 tsp at a time)
3. **stomach acid (HCl)**
    1. destroys proteins
    2. activates digestive enzymes - pepsin, gastric lipase
    3. partially digests dietary protein

    4. assists in calcium absorption
4. secretes intrinsic factor, B12 absorption

Small Intestine

1. Sections
    1. **Duodenum** - first segment and receives juices from pancreas and gallbladder (10inches)
    2. **Jejunum**
    3. **Ileum**
2. mixes chyme with bile and pancreatic juice
3. secretes hormones and digestive enzymes
4. Other
    1. **Villi** - fingerlike protrusions that participate in digestion and absorption of food
    2. **Absorptive cells** - intestinal cells that line villi and participate in nutrient absorption
    3. **Microvilli** - extensive folds on mucosal surface of absorptive cells
5. **Nutrient absorption** - passive diffusion, facilitated diffusion, active absorption, phagocytosis and pinocytosis

- typically absorbs Ca, Mg, Fe, glucose, amino acids, fats, vitamins, water and alcohol

Large Intestine

1. absorption of Na, K, vitamin K, fatty acids, gases
2. houses gut bacteria that keep the GI system healthy and absorbs water and electrolytes such as Na and K+
    1. protect against infection by pathogens
    2. produce antimicrobial substances
    3. vitamin synthesis
3. **Feces:** some water and undigested fiber, touch connective tissues and bacteria

Rectum & Anus

Lower esophageal sphincter - Circular muscle constricts opening of esophagus to stomach
Chyme - Mixture of stomach secretions and partially digested food
Pyloric sphincter - Ring of smooth muscle between stomach and small intestine

Accessory Organs

1. **Liver**
    1. releases number of unwanted substances that travel with bile to gallbladder
    2. produces bile to aid fat digestion and absorption
2. **Gallbladder**
    1. attached underneath liver
    2. stores and concentrates bile and releases it to small intestine
3. **Pancreas**
    1. has both endocrine and digestive functions
    2. secretes pancreatic juice containing digestive enzymes and bicarb into small intestine
    3. creates insulin and glucagon

Alcohol

7kcal/gram -- standard drink provides 14g of alcohol
Alcohol is rapidly absorbed through the GI tract by simple diffusion (mostly absorbed in the stomach and small intestine).
People who drink consistently (even in small amounts) experience increases in cortisol release from adrenal glands when not drinking so feel more stress and more anxiety when not drinking

Possible Benefits

Moderate alcohol intake may reduce stress and anxiety, stimulate appetite and increase dietary intake in elderly, lower the risk of cardiovascular disease (lower LDL, increase HDL, decrease platelet aggregation)

Excessive Alcohol Intake

causes HTN, stroke, cognitive impairment, suppression of immune system, sleep disturbances, abdominal obesity, nutritional deficiencies

Metabolism Pathways

Alcohol dehydrogenase pathway (ADH)

low to moderate intakes -- stomach and liver
metabolizes about 90% of alcohol

Microsomal ethanol oxidizing system (MEOS)

moderate to excessive alcohol intake -- increases with increased intake -- liver
allows for efficient metabolism and greater tolerance
more alcohol is required to produce the same effects

Catalase pathway

Minor contribution to alcohol metabolism -- liver and other cells