

CARBOHYDRATES	45-65% caloric intake	ENERGY SUPPLY ORDER: CARBS--FAT--PROTEIN
(4 kcals/gram)	* converts to glucose for energy	DIGESTION ORDER: CARBS--PROTEIN--FATS

- * excess converts to glycogen for storage in muscles/liver
- * remaining excess converts to fat for storage in fat cells

SIMPLE CARBS:

(simple sugars)
(< 10% kcals)

MONOSACCHARIDES (1-sugar molecule)

- * **glucose/dextrose** (blood sugar) (5g within blood)
- * **fructose/levulose** (fruit sugar) (fruit, honey)
- * **galactose** (milk sugar)

alcohol sugars: (gum, candy, ice cream)
(2 kcals/g) sorbitol, mannose, mannitol, xylitol, glycerol, inositol

DISACCHARIDES (2-sugar molecules)

- * **sucrose** (table sugar) (glucose + fructose) (beet sugar, cane sugar, honey)
- * **lactose** (milk sugar) (glucose + galactose)
- * **maltose** (malt sugar) (glucose + glucose) (barley, malt)

COMPLEX CARBS:

(> 80% kcals)

POLYSACCHARIDES (>2-sugar molecules)

- (chain of glucose molecules)
- * **starch (amylose, amylopectin)** (sugar stored in plants)
(cereals, potatoes, pasta, breads, wheat, rice, peas, beans, tortillas, crackers, corn)

* **fiber** (sugar stored in plants)

(20-35g daily) (fruits, grains, nuts, seeds, legumes, vgs)

SOLUBLE (pectin, gums, beta-glucans)

- decreases:** (guar gum, oat bran, rolled oats, vgs, fruit, seeds,
--total cholesterol fruit, seeds, rye, barley, legumes)
--LDL cholesterol
- increases:**
--glucose absorption --HDL cholesterol

INSOLUBLE (cellulose, hemicellulose, lignin)

- decreases:** (wheat bran, corn bran, vgs, fruit, legumes, whole grains,
--colon cancer rice bran, wheat germ, brown rice, seeds)
--hemorrhoids --softens stool
--diverticulitis --increases satiety

* **glycogen** (sugar stored in animal liver & muscle)
(75 - 100g) (350 - 400g)

PROTEINS

10-35% caloric intake

(4 kcals/gram)

(RDA: 0.83g / kg BW)

- * some converts to glucose/fat for energy when glycogen/fat reserves are low
- * some for building/repairing lean tissue(skin, nails, bone, muscle, collagen, elastin, hair)
- * some form enzymes/antibodies/hemoglobin/hormones/lipoproteins/neurotransmitters
- * some synthesize to form new amino acids (e.g., methionine, phenylalanine)
- * some amino acids catabolized directly for energy (e.g., alanine, leucine, glutamine)
- * excess converts to fat for storage in fat cells
- * remaining excess excreted within urea

"COMPLETE" PROTEINS (animal foods)

contain ALL essential amino acids (e.g., eggs, milk, meats, fish)

"INCOMPLETE" PROTEINS (plant foods)

does NOT contain all essential amino acids (e.g., rice, soybeans, whole wheat, peanuts, beans)

AMINO ACIDS:

ESSENTIAL must be supplied in the diet (~25% of protein intake)

histidine	enhances tissue growth/repair/anti-inflammatory
isoleucine (BCAA)	regulates blood sugar levels/anti-catabolic/delays fatigue
leucine (BCAA)	insulin,HGH release/delays fatigue/endurance energy source of BCAAs/protein synthesis/converts to glucose
lysine	enhances HGH release/repair/slows protein synthesis/produces L-carnitine/helps form collagen
methionine	fat breakdown/helps reduce cholesterol levels/makes cystine, choline/aids in creatine formation
phenylalanine	stimulates mental alertness/memory/reduces pain/appetite control/collagen growth/repair/decreases depression/can make tyrosine
threonine	enhances tissue growth/repair/reduces fatty acid buildup/improves immune system/helps form collagen
tryptophan	stimulates serotonin/enhances HGH release/helps alleviate insomnia/reduces depression/helps reduce cholesterol levels
valine (BCAA)	tissue repair/nitrogen balance/muscle metabolism/delays fatigue

NONESSENTIAL body can manufacture from essential amino acids

alanine	can convert to glucose for energy for endurance exercise/anti-catabolic/improves immune system/synthesized from pyruvate, glutamate
arginine	stimulates HGH release/reduces ammonia/increases nitric oxide levels to increase blood flow/aids in creatine formation improves immune system/increases collagen/enhances insulin release
asparagine	regulates nervous system/enhances HGH release
aspartic acid	reduces ammonia levels/spares glycogen/improves endurance/improves immune system
citrulline	reduces ammonia levels/improves immune system/converts to arginine in body
cysteine	antioxidant/energy metabolism/improves immune system
cystine	detoxifying agent/improves healing/reduces pain/improves immune system/synthesized from methionine
gamma-aminobutyric acid (GABA)	calming agent/reduces stress levels
glutamic acid	regulates carb metabolism/reduces ammonia levels/improves mental functioning
glutamine	enhances recovery/immunity/anti-catabolic/enhances HGH release/increases protein synthesis/glucose, glycogen synthesis
glutathione	antioxidant/detoxifying agent/aids immune system
glycine	enhances tissue growth/repair/detoxifying agent/improves immune system/neurotransmitter/aids in creatine formation/helps form collagen
ornithine	enhances HGH release/reduces ammonia/anti-catabolic/improves immune system
proline	enhances growth/tissue repair/helps form collagen
serine	enhances fat metabolism/healthy immune system/nerve function
taurine	regulates nervous system/blood pressure/anti-catabolic/boosts water uptake for muscle cells/decreases cholesterol
tyrosine	stimulates mental alertness/appetite control/lessens anxiety/stimulates HGH release/aids fat loss/stimulates norepinephren release synthesized from phenylalanine

* BCAA's make up about 35% of muscle tissue and provide energy, spare muscle tissue, and maintain nitrogen balance

* collagen comprised of lysine, threonine, glycine, and proline

* D-amino acid: not biologically active isomer

* L-amino acid: biologically active isomer

* highlighted AA: conditionally essential

FATS 20-35% caloric intake

- (9 kcals/gram)
- * some released into blood as energy (FFA's) for low-intensity exercise
 - * some fat provides sustained energy (ketones)
 - * glycerol converts to glucose (within liver) for energy when glycogen reserves are low
 - * excess stored in fat/muscle cells as triglycerides
 - * remaining excess excreted

PHOSPHOLIPIDS maintain cell membrane integrity & fluid movement/clot blood

(ie. lecithin) (transport cholesterol & fatty acids)
(egg yolks/liver/soybeans/wheat germ/peanuts)

STEROLS found in bile, hormones, fat-soluble vitamins (e.g., vit D)

cholesterol found in animal food/primarily produced by liver/found in brain, blood
(<300mg daily) (maintains cell membrane integrity & synthesizes vitamin D)

(egg yolks/meats/dairy products/butter/shrimp/tuna)

lipoproteins protein combined with triglycerides & phospholipids/transport lipids & fat-soluble vitamins

HDL: transports cholesterol from peripheral tissues to liver for excretion

(contains mostly protein)

LDL: transports cholesterol from liver to peripheral tissues/creates plaque

(contains mostly cholesterol)

VLDL: transports endogenous lipids to peripheral tissues

(contains mostly triglycerides)

CHYLOMICRONS: transports lipids within lymph/blood to peripheral tissues

(contains mostly triglycerides)

TRIGLYCERIDES chief form of fat in foods & within the human body

(glycerol + 3 fatty acids)

MCT: rapidly digested, absorbed, and used for energy

SATURATED FATTY ACID no C=C bonds / max H attached / straight chain

(<10% total fat kcals)

(18:0) (stearic acid) **SOLID @ room temp**

(palm/palm kernel/coconut oil/butter/cheese/meats/cocoa butter/cream
lard/whole milk/beef tallow/shortening/egg yolk/baked goods)

INCREASES TOTAL CHOLESTEROL / LDL

UNSATURATED FATTY ACID C=C bonds / open to receive H / bent chain

(>70% total fat kcals)

LIQUID @ room temp

MONOUNSATURATED: (one C=C bond)

(18:1) (oleic acid) (omega-9 fatty acid)

(canola oil/olive oil/peanut oil/peanuts/cashews/egg whites/margarine/olives
peanut butter/safflower oil/sesame oil/almonds/pecans/pistachios/avocado oil)

DECREASES TOTAL CHOLESTEROL / LDL / TRIGLYCERIDES

INCREASES HDL

POLYUNSATURATED: (more than one C=C bond)

(vegetable/safflower/sunflower/soybean/cottonseed/sesame
corn oil/fish oil/sunflower seeds)

ALPHA-LINOLENIC ACID (omega-3 fatty acid) **(ESSENTIAL)**

(18:3) (double C-C bond 3 carbons from the methyl end)

converts to EPA(22:5)/DHA(22:6) within human body

(tuna/salmon/mackerel/sardines/fish, canola, veg oil/walnuts/soybeans/flax seed)

DECREASES TRIGLYCERIDES / INCREASES HDL / DECREASES BP

REDUCES INFLAMMATION / INCREASES INSULIN SENSITIVITY

LINOLEIC ACID (omega-6 fatty acid) **(ESSENTIAL)**

(18:2) (arachidonic acid) (20:4) (double C-C bond 6 carbons from methyl end)

(corn/soybean/sunflower/safflower/cottonseed/sesame/nuts/seeds)

DECREASES TOTAL CHOLESTEROL / LDL / TRIGLYCERIDES

INCREASES HDL

TRANS FATS no C=C bonds / hydrogenated to increase shelf life / straight chain

(ie. elaidic acid) **GENERALLY SOLID @ room temp**

(crisco oil/margarine/butter/shortening/crackers/candies/cookies/cakes/doughnuts/
snack foods/fried foods/baked goods/nondairy creamers/meats/dairy products)

INCREASES TOTAL CHOLESTEROL / LDL / TRIGLYCERIDES

INCREASES INFLAMMATION / DECREASES HDL

VITAMINS

- * about 13 vitamins are known to exist
- * organic compounds
- * essential for human body
- * enhance macronutrient metabolism
- * regulate bodily functions
- * boosts optimal performance
- * repairs/maintains connective tissue
- * enhances energy production/recovery
- * tissue growth/maintenance
- * maintains healthy immune system
- * may act as coenzymes
- * some act as antioxidants (ie. vit B2, vit C, beta-carotene)

WATER-SOLUBLE:

vit C
vit B-complex
biotin

not stored in body
excess excreted by body

FAT-SOLUBLE:

vit A
vit D
vit E
vit K

stored in body
excess can be toxic

MINERALS

- * about 30 minerals known to exist
- * inorganic elements
- * produce/strengthen blood, bones, teeth
- * aid in muscular/nerve function
- * essential for body
- * make up 4% to 6% of body
- * normal metabolism/growth/maintenance
- * maintains optimal performance
- * maintains connective tissue
- * maintains healthy immune system
- * some act as antioxidants
(ie. Se, Mn, Zn)

WATER

- * essential for body
- * 67% of weight of body
- * medium for vitamin/mineral/waist transport
- * regulates body temperature/sweat regulation
- * maintains energy stores
- * prevents glycogen depletion (3g water/1g glycogen)
- * regulates electrolyte balance
- * recommended daily intake: 0.5oz/lb BW
- * regulates blood volume
- * muscle stores more water than fat
- * flushes carcinogens from body, reducing cancer risk
- * increases satiety, reducing caloric intake
- * increased intake may increase lactic acid threshold
- * increases metabolic rate