

NUTRITION DEFINED: science of how body uses foods as source of **NUTRIENTS**.

ANIMAL dietary requirements for (1) pre-formed nutrients as source of energy (by respiration) and (2) components for body function and structure. (Plants require only solar energy and inorganic elements)

Animal/Human dependence upon foods as a continuous supply of external “nutrients.”

HISTORY: Identification by chemists in 19th century of carbohydrates, fats, and proteins. 1896: identification of 1st “micronutrient” (riboflavin), leading to research identifying “most” vitamins and minerals.

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FIRST: NUTRITION IN POSITIVE MODE – description and requirements of nutrients for healthy bodily function, followed by description of **negative (pandemic) aspects** of Nutrition - malnutrition / hunger/ starvation/ famine

Quantitative description of nutrient content of foods – based on analytical schemes developed over 100 years ago, is still basis of food analysis and continues to be used in food labeling.

Energy is not a nutrient but a property of food components/nutrients, which can be used as sources of energy (carbohydrates, fats, proteins).

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Dietary Requirements for **MICRONUTRIENTS**:

VITAMINS, AND MINERAL ELEMENTS

Requirements quantitatively small; ...but essential function primarily as factors in metabolic reactions, presence in compounds (hormones, blood) and in skeletal structure [General reference: Nestle, sections 6,7]

VITAMINS: GROUPED AS FAT OR WATER SOLUBLE

VITAMIN NOMENCLATURE related to initial identification and based on chemical characteristics - and is not “consistent ”

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FAT SOLUBLE VITAMINS: A, D, E, K
common characteristics:

- *present in plant or animal fats,
- *dietary supply can be erratic, and dependent on the variety of food available,
- *surplus stored in liver (i.e. traditional supplement fish liver oils)
- *dietary intake in large excess can be toxic.

VIT. A (RETINOL):** present in animal (fat) tissue only; plant content as provitamin or precursor - CAROTENE - rich supply in pigmented vegetables

Primary function in eyesight (night vision), plus many other body reactions.

**human deficiencies “common”

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VITAMIN D (calciferols), both non-dietary origin, ultra-violet irradiation on skin (is it vitamin or hormone?), and as diet supplement.

functions in bone formation, with Ca and P.

VITAMIN E (tocopherols)

occurs in vegetable seed oils, functions as biological antioxidant, exact metabolic function(s) not understood and vary in different animal species

VITAMIN K synthesized by intestinal bacteria. functions in blood coagulation (rat poison “Warfarin” is anti-Vit. K, causes hemorrhage; same compound “Coumadin” in humans used as anti-clotting agent)

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WATER –SOLUBLE VITAMINS:

body does not store, used in daily metabolism, surplus excreted in urine

B- COMPLEX GROUP [Ref.: Nestle, Table 6-1]

BIOTIN, COBALAMIN (B12)*, FOLACIN (folic acid)*, NIACIN*, PANTOTHENIC ACID, PYRIDOXINE (B6), RIBOFLAVIN, THIAMINE (B1)

and **VITAMIN C* – ASCORBIC ACID**, rich source in fresh fruits- especially citrus, and some vegetables. Functions as antioxidant – blood coagulation (“scurvy” is deficiency condition).

*human clinical deficiencies

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MINERAL ELEMENTS	
MACRO:	sources:
CALCIUM*	dairy products, CaCO ₃ leafy vegetables (poor availability)
PHOSPHORUS	grains
MAGNESIUM	leafy vegetables
-all 3 are bone constituents, + other body functions-	
SODIUM	salt (NaCl), animal products
CHORIDE	“ “ “ “ “ “ “
POTASSIUM	dairy, grain, fruits, vegetables
- three elements function in body fluid, electrolyte balance-	

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MINERALS: TRACE ELEMENTS
IRON**: hemoglobin, in red-blood cells
IODINE**: in hormone thyroxin (thyroid)
COBALT: in Vit. B12 (only in animal source)
COPPER: functions in blood, etc.
ZINC : enzyme cofactor
MANGANESE: “ “
SELENIUM: metabolic, antioxidant
FLOURIDE: bone, teeth hardness
CHROMIUM: metabolic function
MOLYBDENUM: “ “ “ “
toxic in “slight” excess: F, Cu, Se

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PLANT FOODS AS SOURCES OF NUTRIENTS			
FOOD GROUP -	ENERGY	PROTEIN	VIT/MIN
CEREAL GRAINS	**	*	*
SUGAR(S)	**	0	0
OILS/ FATS	***	0	0
ROOTS/TUBERS	**	low	low
PULSES/NUTS	** (+for fats)	**	*
VEGETABLES/ FRUITS	low (high water)	low	** (+pigments)
ALCOHOL	**	0	0

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PLANT FOODS AS SOURCES OF NUTRIENTS: SUMMARY
ENERGY CONTENT: Varies with <u>nutrient</u> and <u>water</u> percent - carbohydrates & proteins 4 kcal/100g <u>fats 9 kcal/100g (2.25x)</u> ***
GROUPS: <u>grains</u> – generally low fat, and “dry” (breads). <u>vegetables/fruits</u> – “ “ , but <u>high H₂O</u> (“90%”), ...therefore not good energy or protein source, but good “supplemental” source of <u>pro Vit. A</u> (carotenoids – pigments), and ... <u>minerals</u> (in leaves), but of low bio-availability. <u>sugars and oils/fats (separated): “empty calories”</u> – calories but no nutrients.

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CHARACTERISTICS OF (PLANT) “STAPLE FOODS”
...predominant diet component: cereal grains, roots or tubers
...primary supply of energy from “CH ₂ O” (starch)
...easily grown and stored (long-term)
...low cost, grown locally
...cultural acceptance (often “dependence”)
BUT
...needs <u>dietary supplementation</u> for complete nutrition: + <u>high-quality protein source</u> (leguminous seeds and/or animal products); + <u>vitamins, minerals,</u> (vegetables and fruits – the more plant pigments, the better).

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PLANT FOODS AS SOURCES OF NUTRIENTS: SUMMARY (continued)...
PROTEIN CONTENT (%) AND QUALITY (eaa's): All plant proteins of low-medium quality - <u>except soy.</u> <u>Grains</u> lower protein content, lower protein quality. <u>Legume seeds (pulses)</u> vary in fat and protein content, but higher protein content than cereal grains, with soy highest, also higher protein quality. (other pulses: beans, chick peas, peas, peanuts...)

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Note on soybeans and its byproducts:
 ...seeds contain 42% protein and 20% fat.
oil extracted seeds “ “ 50%protein “ 0% fat
 ...this byproduct termed soybean meal, is fed to animals as protein supplement.
or can be used as soybean flour (humans), in limited amounts in bread (mx 5%), and recently in dried soy “foods”
 ... other soybean food products (tofu, soy milk, soy drinks, soy sauce) contain varying amounts of protein, water and fat. Soybean protein can also be “isolated and textured” for use in “meat analog” products (for vegetarians)
 ...the extracted oil (100% fat) is used in cooking oils,– often hydrogenated/ saturated →shortenings, (hard) margarine.
 ...soybeans contain isoflavens (plant estrogens): + or – (?)

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ANIMAL FOODS AS SOURCES OF NUTRIENTS

<u>FOOD GROUP</u>	<u>ENERGY</u>	<u>PROTEIN</u>	<u>VIT/MIN</u>
MEAT	**	**	*
MILK	**	**	*
EGGS	**	**	*
FATS (butter, tallow, lard)	***	0	Vit. A

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ANIMAL FOODS AS SOURCES OF NUTRIENTS: SUMMARY
ENERGY CONTENT:
meats – varies with fat content: intramuscular (“marbling”) and extra muscular (separable). Influenced by genetics (i.e. lean pigs), method of feeding(extensive=lean, intensive=fatter)
milk - fat content varies with breed (Holsteins lowest at “3.5%” and separation in processing (2, 1, 0 % fat); high- moisture dairy products (soft cheeses, yogurt, ice milk) lower in fat vs low- moisture products (hard/aged cheeses) higher in fat content.
PROTEIN CONTENT AND QUALITY:
Meat sources (muscles), dairy products (milk of many species), fish/seafood, and eggs: protein always of “high quality,” but quantity varies as it is naturally “diluted” by water content and often by fat.

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**FOOD LABELING –
 WHAT, HOW, AND WHY?**
 CORPORATIONS, COMPANIES, STORES...
 ARE IN BUSINESS TO MAKE MONEY.
 ...IN ORDER TO MAXIMIZE THEIR PROFIT THEY SELL THEIR GOODS AND SERVICES AT THE “HIGHEST PRICE THE MARKET CAN BARE”

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THEY MUST ALSO OBEY GOVERNMENT LAWS AND REGULATIONS...
 WHICH THEY CAN USE TO THEIR ADVANTAGE – TO MINIMIZE COSTS AND MAXIMIZE PROFITS...
 (and add elements of confusion)
CONSUMERS ARE GENERALLY AT A DISADVANTAGE IN THE MARKETPLACE

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THE CANADIAN FOOD INDUSTRY IS NO EXCEPTION !
 IT FOLLOWS REGULATIONS RE FOOD LABELLING –SOME ARE VOLUNTARY, AND SOME ARE BASED ON U.S. PRACTICES
 THE U.S. AND CANADA ARE COMMITTED TO ESTABLISHING COMMON FOOD RULES –
 IN PROCESS

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ONE ASPECT OF FOOD RULES ARE THE FOOD "NAMES"*

example: FRUIT JUICE MEANS PURE JUICE BUT FRUIT DRINK OR FRUIT COCKTAIL MEANS WATER, SUGAR AND OTHER THINGS CAN BE ADDED WITH THE ACTUAL FRUIT CONTENT MINOR... (OR IN SOMECASES MISSING – assumed present because of food name or label illustrations – "TANG," etc...).

another example: MILK (DAIRY) MUST BE PURE, only fat can be removed (0,1%,2%.vs. reg.); but SOY MILK PRODUCTS are most often Soy Drinks/ Beverages (sugar, fat added)

*based on government regulations 19

WHEN THERE IS A LIST OF INGREDIENTS ON THE LABEL...

ALL ITEMS IN THE PRODUCT MUST BE LISTED – AND ARE IN DESCENDING ORDER, IN RELATION TO AMOUNT PRESENT...

EXAMPLE: IF THE FIRST ITEM IS SUGAR, AND/OR FRUCTOSE-GLUCOSE, THEN SUGAR IS LARGEST INGREDIENT. IF SUGAR IS LISTED SECOND, IT IS THE NEXT LARGEST AMOUNT (%) 20

A GENERALIZATION: THE MORE PROCESSED A FOOD PRODUCT, THE MORE LOWER COST ITEMS LIKE SUGARS, FATS, AND STARCH ARE ADDED...AND FOR WHICH YOU ARE PAYING AN INFLATED PRICE.

CHECK OUT BREAKFAST CEREALS FOR CHILDREN – SOME ARE OVER 50% SUGAR! 21

THE MOST CONFUSING PART OF A FOOD LABEL IS THE "NUTRITIONAL INFORMATION" (TABLE)

YOU NEED TO KNOW CONVERSION UNITS AND HAVE TO USE A CALCULATOR

BUT...IF YOU KNOW WHAT TO LOOK FOR... YOU CAN LEARN IMPORTANT FACTS ABOUT THE FOOD...LIKE HOW MUCH FAT, SUGAR, PROTEIN IT CONTAINS (per serving) 22

...consumers are very often "exploited" in that pay excessive amounts for processed foods of minimal nutritional value. This is a particular problem in N. America with people of low income, and in developing countries, low income and minimal legal enforcement.

i.e. sugars and salt are very low cost additives:

Soft drinks (11% sugar + flavors) can be high cost.
Soy Drinks, with added sugar + fat: cost seemed to be related to and higher than dairy equivalent.
Chicken or beef bullion cubes: contain primarily salt and msg (monosodium glutamate) and no animal product (vs. chicken or beef broth) 23

SO...since consumers are not educated in matters relating to nutrition, understanding and using food label information offers minimal help to improve nutrition and make appropriate choices.

a further complication is the prevalence of misleading, inaccurate, and distorting information relating to foods and diet - from vested interest groups, and authors of best selling books (few popular authors reflect accurate nutritional science – exceptions: Jane Brody, N.Y. Times, and many books; Marion Nestle, Food Politics (2002), Safe Food (2003). 24