

Food & Nutrition

Ziser, 2013

Most of the 'food' we eat consists of three kinds of organic molecules (**carbohydrates, proteins and lipids**) as well as vitamins and minerals

'food' = energy (organic foods (especially carbohydrates and lipids) broken down to make ATP and heat; ATP converted to chemical, mechanical & electrical energy

+

building blocks (use to synthesize new molecules; include basic elements and some molecules that cannot be synthesized by body)

>45-50 nutrients (elements &/or molecules) are **essential**: ie, you must get them in your diet, your body can't make them out of building blocks

Carbohydrates [broken down into **simple sugars (monosaccharides)**]

A. Kinds in food:

mainly from plants (fruits, vegetables, and grains)

simple sugars: mono & disaccharides (plants, except lactose is from milk)

complex carbohydrates: starches and fiber from plants; glycogen from meats

B. Uses in body

energy

ribose and deoxyribose to synthesize DNA and RNA

fiber enhances digestion

excess sugars converted to: glycogen & fats

C. Requirements

*no essential carbohydrates

*recommend 120-175 g/day; minimum 100g/d to prevent shift to proteins and fat catabolism

*enough fiber to promote digestion

*recommended sugar intake \leq 10% total energy intake

D. US consumption

-200-300 g/day; much refined sugar (45 lbs/yr); >46% caloric intake

E. Imbalances

Deficiencies: tissue wasting, metabolic acidosis (from excessive fat breakdown)

Excesses: sugar:

dental caries

obesity

heart disease (in carbohydrate sensitive people)

starch & fiber: (generally, high carbohydrate diets benefit by reducing fat intake and obesity, reduce risk of heart disease, reduce risk of cancer, reduced risk of diabetes, and better GI tract health), but excessive fiber intake in malnourished, elderly & children can reduce mineral absorption

Lipids [broken down (mostly) into **fatty acids**]

A. Kinds in foods

responsible for much of the flavor, tenderness, aroma and palatability of food

95% of dietary fats & oils are triglycerides:

saturated fats (bad) mostly in animal products (meat and fish, eggs, dairy, coconut & palm oil)

unsaturated fats (good) mostly in grains, seeds, nuts, leafy vegetables, oils such as olive, peanut, safflower, corn, sesame, etc)

trans fats (very bad) created in processing unsaturated fats into foods; mostly found in fried foods, processed cookies, crackers, baked goods and chips

other kinds of fats include phospholipids, sterols (including cholesterol; cholesterol only in animal products: meat, dairy, etc)

B. Uses in Body

triglycerides: alternate fuel (concentrated stored energy)

shock protection

insulation from cold

insulation around neurons and nerves

phospholipids: cell membranes

emulsifiers to keep fats suspended in blood and fluids

sterols: hormones (adrenal cortex, gonads)

bile salts

cell membranes

C. Requirements

*2 essential fatty acids: omega 6 (linoleic acid) and omega 3 (linolenic acid)

*80-100g; $\leq 30\%$ of calories should be from fats; no more than 10% saturated

*fats carry with them fat soluble vitamins (A,D,E & K)

*<250 mg cholesterol

D. US Consumption

40% of calories in our diets are from fats

only get 10% of required amount of linoleic acid

E. Imbalances (*of all nutrients **fats** are most often linked to chronic diseases*)

Deficiencies:(mainly due to inadequate amounts of essential fatty acids; mainly seen in infants and young children fed nonfat milk and low-fat diets):

retarded growth reproductive failure

skin lesions kidney and liver disorders

neurological and visual problems

Excesses-Total Fats: obesity (>50% US overweight; costs \$117 Bil/yr)

cardiovascular disease (esp. high cholesterol & high LDL)

some cancers (total fat intake)

In addition to the total amount of fats in your diet, the kinds of fats we eat also affect your health mainly due to the effects they have on blood HDL and LDL levels:

HDL = 'good guys' → decreased heart attack risk (need >35 mg/dl)

LDL = 'bad guys' → increased heart attack risk (need <130 mg/dl)

unsaturated fats generally raise HDL and lower LDL levels in the blood

saturated fats generally lower HDL and raise LDL levels in the blood

trans fats: trans fats are the 'tobacco' of the nutrition industry

eg. eating 5g/dl of trans fat/day (the equivalent of 1 pc fried chicken & fries) → 25% > risk of heart attack

[a nutrition labeled "0 trans fats" may contain up to .5 grams]

Proteins [broken down into **amino acids**]

A. Kinds in food:

complete protein (animal protein) = all essential amino acids (meats, fish, cheese, milk, eggs)

incomplete protein (most plant protein) = missing essential amino acids (nuts, cereals, legumes)

(soybeans have complete proteins)

B. Uses in Body

amino acids to synthesize the 50,000 or so proteins in our cells

enzymes	hormones	regulators
transport	antibodies	actin/myosin
fiber(collagen)	active transport	hemoglobin
clotting	complement	salt/water balance
buffers		

energy alternative (last resort, muscle wasting)

C. Requirements

*8 of 20 amino acids are essential (adults), must be gotten in diet (body cant make proteins if any one of the amino acids are in short supply)

*need to maintain nitrogen balance, body cant store excess amino acids, it converts them to lipids by removing nitrogen group to make urea

*recommend 15% of calories from proteins (0.8g/kgwt/day ≈ 1 - 8oz serving of meat/d)

D. US Consumption

1.5 - 2 lbs per day, also mostly high in fats

E. Imbalances

Deficiencies: Protein-Energy Malnutrition (Marasmus & Kwashiorkor; affect >500 million children worldwide; includes most of 40,000 children who die PER DAY)
anemia
edema (due to deficits of plasma proteins)
during pregnancy – miscarriage or premature birth

Excesses: heart disease
cancer (colon, breast, pancreas, prostate, kidney)
obesity (protein rich foods are usually fat rich foods)

Protein and amino acid supplements:

all reasons touted for their use are unfounded

athletes take them to build muscle
dieter to spare protein while losing weight
women to strengthen fingernails
individual AA's to: cure herpes (lysine); sleep better (tryptophan); lose weight; relieve pain & depression (tryptophan)

normal healthy people NEVER need protein or amino acid supplements:

they are expensive
they are less completely digested
when used as “replacement” they are dangerous
eg. liquid protein diets caused death in many users
single AA's do not occur naturally in foods and offer no benefit to the body; the body was not designed to handle the large amounts of individual AA's in supplements
→ can create such a demand for a carrier that it prevents the absorption of other AA's
some can be toxic at high levels