

ROLE OF PROTEIN IN HUMAN NUTRITION

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What is Nutrition?

- **Nutrition:** the study of food, including
 - How food nourishes our bodies
 - How food influences our health
- Nutrition is a relatively new discipline of science

Why is Nutrition Important?

- Nutrition contributes to wellness.
- **Wellness:**
 - Physical and emotional health
 - Absence of disease
 - Nutrient deficiency diseases: scurvy, goiter, rickets, kwashiorkor, marasmus
 - Diseases in which nutrition plays a role: cardiac diseases, osteoarthritis, osteoporosis
- **Critical components of wellness:**
 - Nutritious diet
 - Physical activity



What Are Nutrients?

- **Nutrients:** the chemicals in foods that are critical to human growth and function
- **Macronutrients:** nutrients required in relatively large amounts
 - Carbohydrates
 - Fats and oils
 - Proteins
- **Micronutrients:** nutrients required in smaller amounts.
 - Vitamins and minerals
- **Water:** an essential nutrient

Carbohydrates

- Primary source of fuel for the body, especially for the brain
- Provide 4 kcal per gram
- Carbohydrates are found in grains (wheat, rice), vegetables, fruits, and legumes

Fats and Oils

- Fats and oils are composed of **lipids**, molecules that are insoluble in water
- Provide **9 kcal** per gram
- An important energy source during rest or low intensity exercise
- Found in butter, margarine, vegetable oils

Proteins

- Proteins are chains of amino acids
- Proteins can supply 4 kcal of energy per gram, but are not a primary energy source
- Proteins are an important source of nitrogen

Proteins

- Proteins are important for
 - Building cells and tissues
 - Maintaining bones
 - Repairing damage
 - Regulating metabolism
- Protein sources include meats, dairy products, seeds, nuts, and legumes

Vitamins

- **Vitamins:** organic molecules that assist in regulating body processes
- Vitamins are micronutrients that do not supply energy
- **Fat-soluble vitamins:**
- Vitamins A, D, E and K
- Dissolve easily in fats and oils
- Fat-soluble vitamins can be stored in the body
- **Water-soluble vitamins:**
 - Vitamin C and the B vitamins
 - Remain dissolved in water
- Excess water-soluble vitamins are eliminated by the kidneys and cannot be stored in our bodies

Minerals

- Our bodies require at least 100 mg per day of the **major minerals** such as calcium, phosphorus, magnesium, sodium, potassium, and chloride
- We require less than 100 mg per day of the **trace minerals** such as iron, zinc, copper, iodine, and fluoride

Water

Water is involved in many body processes:

- fluid balance
- nerve impulses
- muscle contractions
- many, many more...
- nutrient transport
- removal of wastes
- chemical reactions

Minerals

- **Minerals:** inorganic substances required for body processes
- Minerals include sodium, calcium, iron, potassium, and magnesium
- Minerals have many different functions such as fluid regulation, bone structure, muscle movement, and nerve functioning

Determining Nutrient Needs: Acceptable Macronutrient Distribution Ranges (AMDR)

<i>Nutrient</i>	<i>AMDR*</i>
Carbohydrate	45–65%
Fat	20–35%
Protein	10–35%

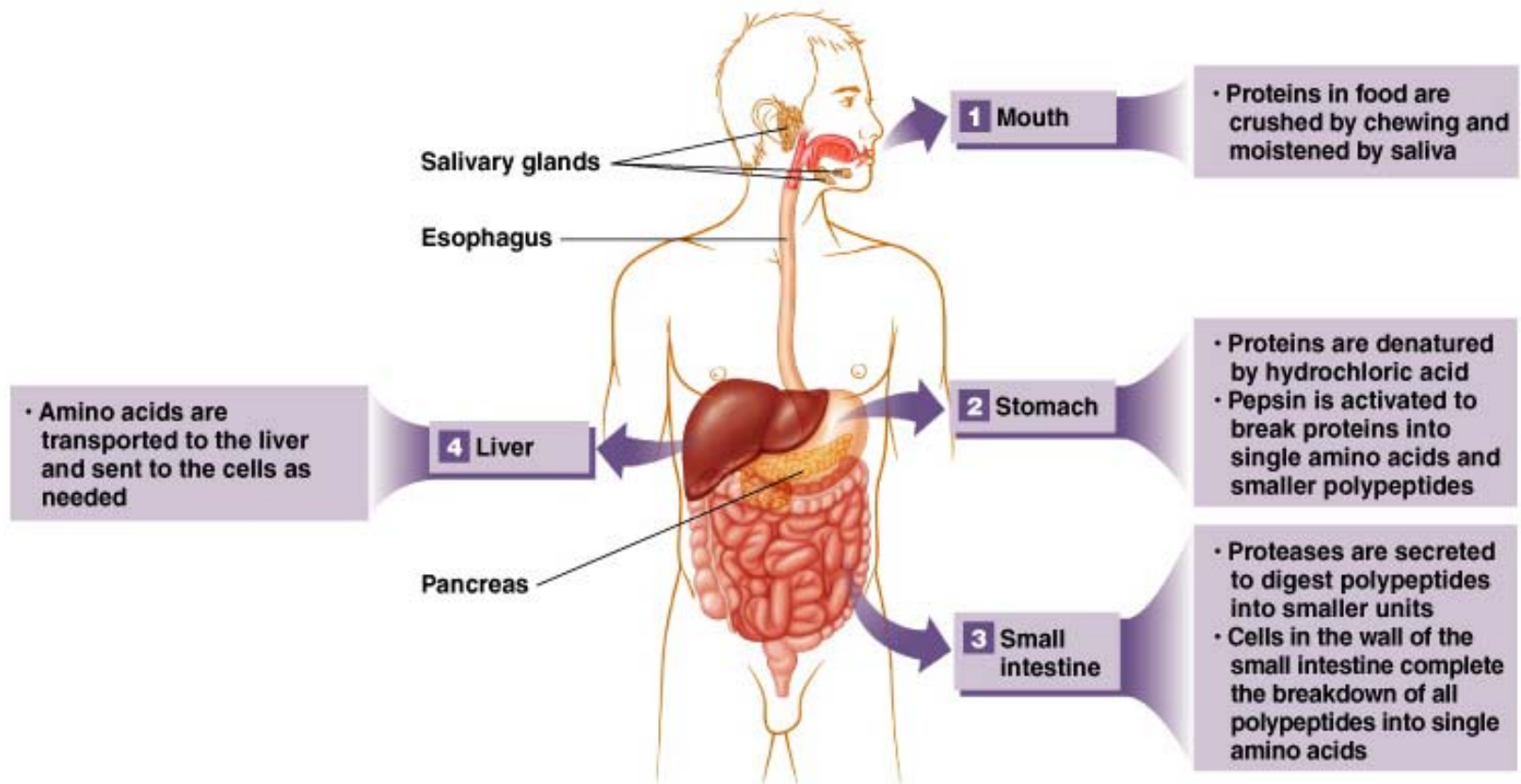
* AMDR values expressed as percent of total energy or as percent of total calories.

Source: Institute of Medicine, Food and Nutrition Board, *Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Protein and Amino Acids (Macronutrients)* (Washington, DC: National Academies Press, 2002).

Proteins in the Diet

- **Incomplete protein:** does not contain all essential amino acids.
 - Not sufficient for growth and health
 - Considered a “low quality” protein
- **Complete protein:** contains sufficient amounts of all 9 essential amino acids
 - Considered a “high quality” protein
- **Complementary proteins:** two protein sources that together supply all 9 essential amino acids
 - Example: beans and rice

Digestion of Proteins



How Much Protein Should We Eat?

- Proper protein intake depends on
 - Activity level
 - Age
 - Health status
- A sedentary adult requires 0.8 grams protein per kg of body weight
- People who require more protein include
 - Infants
 - Children
 - Adolescents
 - Pregnant or lactating women
 - Athletes

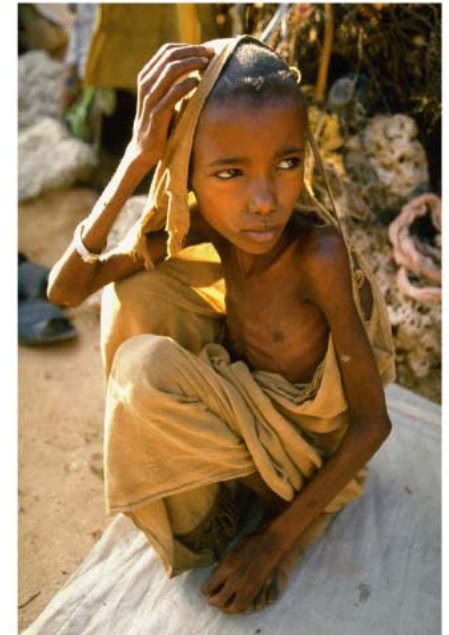
Can You Eat Too Much Protein?

- The risks of too much protein may include
 - High cholesterol and heart disease
 - Diets high in protein from animal sources are associated with high cholesterol
 - Possible bone loss
 - High protein diets MAY cause excess calcium excretion leading to bone loss
 - Kidney disease
 - High protein diets are associated with an increased risk of kidney disease
 - Especially for people who may be susceptible to kidney disease

Protein – Energy Malnutrition

- **Protein-energy malnutrition:** a disorder caused by inadequate intake of protein and energy
- There are two common forms:
 - Marasmus
 - Severe wasting of muscle tissue
 - Stunted physical growth
 - Stunted brain development
 - Anemia
 - Kwashiorkor
 - Some weight loss and muscle wasting
 - Edema resulting in distention of the belly
 - Retarded growth and development

EFFECTS OF PROTEIN CALORIE MALNUTRITION



Role of Soy in Human Nutrition

- Soybean is one of the nature's wonderful nutritional gifts
- In south east Asia, it has been cultivated for many centuries and is a common food item
- Soybeans are excellent inexpensive sources of plant protein with the potential to be used as substitutes for animal protein sources

Why Choose Soy?

Good Nutrition

- Soy contains all 3 macro nutrients
- Soy protein has all essential amino acids
- Soy has good quality fatty acid profile
- Soy is rich in most minerals
- Soy has all important vitamins
- Soy is an excellent source of fiber
- Soy contains many phytochemicals

Health Benefits of Soy

Soy and its products can:

- Help lower cholesterol levels
- Reduce hypertension
- Prevention of certain cancers
- Regulate glucose levels in Diabetes
- Prevent bone loss
- Menopause regulation
- Promote weight loss

Soy Products

- Traditional Soy Foods: Soy milk, tofu, whole dried soybeans, whole soy flour, fresh green soybeans, and fermented foods such as Tempeh, miso, and soy sauce
- Modern Soy Protein Foods: Defatted soy flour, textured soy flour, soy concentrate, and soy isolated proteins
- Second-generation Soy Foods: prepared foods made with soy protein as an alternate for meats, cheese, and other foods. Some examples of such foods are tofu or veggie burgers, yogurt, ice cream etc.

How Much Soy Can I Eat?

- No more than 25 to 30 grams /day of soy protein is recommended which are 4 servings of soy
- Serving size: To qualify as “good soy protein”- 1 serving must provide 6.25 g of soy protein

Typical Portions

Roasted Soybeans	2Tbsp
Soy Flour	¼ cup
Textured Soy Protein	¼ cup
Whole Soybeans	½ cup
Tempeh, uncooked	4 oz.
Tofu, uncooked	4 oz.
Soy Protein Isolate	1 oz.
Soy Concentrate	1 oz.

Higher Protein

Commodity	Protein per 100 gms (in gms)	Calories per 100 gms (in Kcal)
Defatted Soy Flour	53	329
Textured Soy Protein	60.5	334
Wheat Flour	10.3	364
Corn meal	8.5	366
Rice	7.1	365
Wheat Soy Blend	21.5	355
Soy Bulgur	18.2	340
Corn Soy Blend	17.2	376
Lentils	28.1	338
Peas	24.6	341

Better Protein

Product	Protein Digestibility Corrected Amino Acid Score (PDCAAS)
Soy protein	0.90 -1.00
Whole wheat	0.4
Wheat gluten	0.25
Rice	0.47
Corn	0.42
Oats	0.57
Kidney bean	0.68
Chickpeas	0.71
Pea	0.73
Egg white	1.00
Beef	0.92

Questions?

