

ROLE OF PROTEIN IN HUMAN NUTRITION

Vijaya Jain, MS, RD, CDN

Director, Community Nutrition Services

National Soybean Research Laboratory

University of Illinois, Urbana- Champaign

Urbana, IL

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

Determining Nutrient Needs: Acceptable Macronutrient Distribution Ranges (AMDR)

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

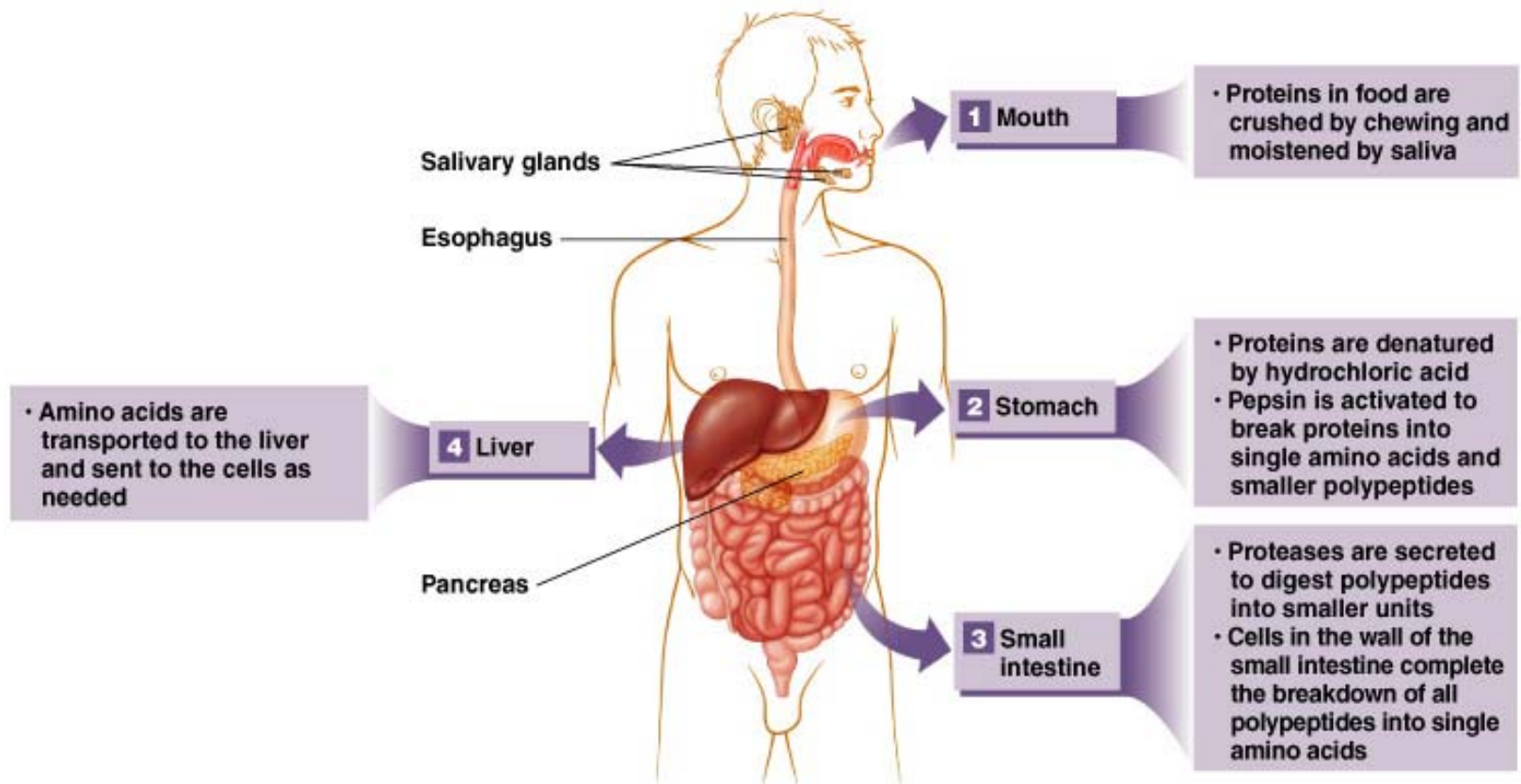
* AMDR values expressed as percent of total energy or as percent of total calories.

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

Protein-Calorie Recommendations

Age	Calories	Protein
Birth to 6 months	570(M) 520(F)	9.1 gms/day
7 to 12 months	743(M) 676(F)	13.5 gms/day
1 to 3 years	1046(M) 992(F)	13 gms/day
4 to 8 years	1742(M) 1642(F)	19 gms/day

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

Malnutrition: It's deadly effects

- Malnutrition is the underlying cause of more than half of all child deaths
- Data from 10 studies of childhood deaths around the world were attributed to under nourishment (American Journal of Clinical Nutrition)
- This study reports: 1 million deaths from pneumonia, 800,000 from diarrhea, 500,000 from malaria and 250,000 from measles
- All of these deaths could be prevented

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

Costs of Malnutrition: Mother

- Maternal malnutrition was one of the most important factors contributing to death during pregnancy or childbirth (Mitra & Choudry 2002)
- Over 100,000 women worldwide die each year as a result of anemia alone (UNICEF 2004)
- Deficiencies of iodine, folate, vitamin A, zinc, and protein also dramatically increase risk of maternal and infant mortality

Costs of Malnutrition: Child

- Preterm birth
- Infant mortality
- Low birth weight
- Growth retardation resulting in stunting & low IQ
- Developmental delays in physical & mental growth
- Predisposition to diseases
- Reduced earning capacity: up to 10% decrease in life long earnings (World Bank, 2006)

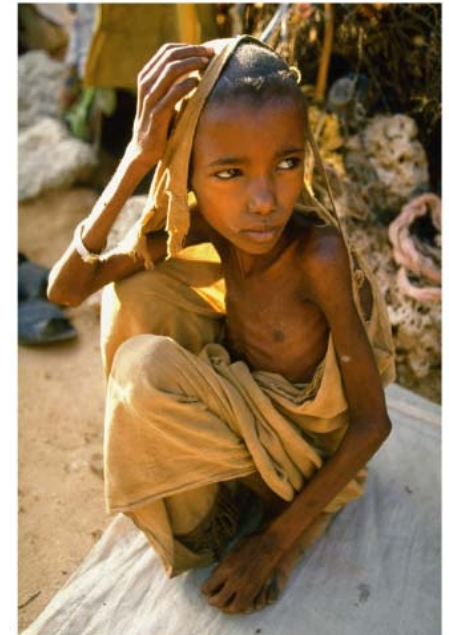
Cost of Malnutrition: Society

- Increased health care costs
- Degradation of human resources
 - * Late schooling
 - * Lower level of education and technical skills
- Disruption of family life
 - * More time/ money spent taking care of sick child
- Lower GDP: 2-3% loss (World Bank, 2006)

Invest in Childhood Nutrition

- Easy to accomplish
 - *Education
 - *Basic health care
 - *Availability of proper weaning foods
 - *Pre-school and elementary school feeding
- It pays for itself
 - *In the US, every \$ spent on nutrition & health care of children results in saving \$4 for medical care.

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

Questions?

