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PROTEIN

Technical Bulletin

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Proteins are macromolecules made up of a variety of amino acids. These amino acids are an essential part of the body's own protein production. Proteins function in many different ways in the body, including: structural components in cells, enzymes, antibodies, and messengers. There are about 20 essential amino acids, but not all protein containing foods have all of the essential amino acids. It is important to eat a variety of protein containing foods in order to provide the body with enough of each amino acid.

Protein deficiency is one of the world's most common nutritional disorders. In many underdeveloped nations, food is scarce, and many children suffer from Kwashiorkor, a disease where food energy is present, but protein is deficient. Growth failure is the primary result of protein deficiency. Other symptoms include: apathy; changes in hair color, texture and strength; diarrhea due to lack of digestive enzymes; and anemia.

<i>RECOMMENDED DAILY INTAKE</i>	<i>GRAMS</i>
Infants to 6 months, 6-12 months	2.2, 2.0 x Kg body wt
Children 1 – 3, 4 – 6, 7 – 10 years	23, 30, 34
Males 11 – 14, 15 + years	45, 56
Females 11 – 18, 19 + years	46, 44
Pregnant	Add 30 to age RDI
Lactating	Add 20 to age RDI

<i>PROTEIN CONTENT OF SOME FOODS</i>			
<i>FOOD (SERVING SIZE)</i>	<i>GRAMS OF PROTEIN (% DRV)</i>	<i>FOOD (SERVING SIZE)</i>	<i>GRAMS OF PROTEIN (% DRV)</i>
Apple (212 g)	0.4 (0.8%)	Egg (50 g)	6.1 (12.2%)
Banana (74 g)	1.2 (2.4%)	Fish (poached Cod), (100 g)	20.9 (41.8%)
Bread (25 g)	2.1 (4.2%)	Liver (85 g)	23 (46%)
Beef, pot roast (85 g, (3 oz.))	22 (44%)	Milk (244 g, (8 oz.))	8 (16%)
Cheddar Cheese (85 g, (3 oz.))	21.3 (42.6%)	Peanut Butter (16 g, (1 TBSP))	4.6 (9.2%)

DUMAS COMBUSTION METHOD

A sample weighing 0.1 to 0.5 grams is weighed and purged of any atmospheric gases. The sample is then heated in a high temperature furnace and rapidly combusted in the presence of pure oxygen. The combustion products (mainly CO₂, H₂O, NO_x, and N₂) are collected and allowed to equilibrate. An aliquot of the gas mixture is passed over hot copper to remove any oxygen and convert NO_x to N₂. The sample is then passed through a trap that removes CO₂ and H₂O. The remaining nitrogen is measured by thermal conductivity.

CLASSIC KJELDAHL METHOD

A small sample is weighed into a thick walled reaction tube. Sulfuric acid and a metallic catalyst are added and the sample is heated at approximately 400 °C for one hour. The nitrogen in the sample is converted to ammonium hydrogen sulfate. Water and a strong alkali solution are added to convert the ammonium hydrogen sulfate to ammonia. The resulting ammonia is distilled and titrated with HCl.

Lower Detection Limit	0.1% Nitrogen (Combustion Method)
Reporting Units	% Protein (or % Nitrogen)
Information required with sample	Estimate of protein and fat content

REFERENCES

Approved Methods of Analysis, 46-30, 46-11a, 46-12, AACC

Official Methods of Analysis, 928.08, 960.52, 981.10, 992.15, 992.23, AOAC

Advanced Nutrition: Macronutrients, Carolyn D. Berdainer, CRC Press, Inc., 1995

Handbook #8, USDA, Composition of Foods. U.S. Gov. Printing Office, Washington, D.C.

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