Section 4

Protein

Protein is a complex chemical structure containing carbon, hydrogen, oxygen, and nitrogen. These four elements are combined into a number of different structures called **amino acids.** There are twenty amino acids, all of which can be combined together in a variety of ways to form the different proteins necessary for human body structure and function. Protein is one of our most essential nutrients, for it is the main structural component of all tissues in the body. Since all enzymes are derived from protein, all physiological processes are dependent upon this nutrient.

Protein is contained in foods from both animal and plant sources. Humans obtain their supply of amino acids from these two sources. The human body cannot synthesize all amino acids. The amino acids that cannot be manufactured in the body are called essential **amino acids;** they must be supplied in the diet. It should be noted that all twenty amino acids are necessary and must be present simultaneously for optimal maintenance of body growth and function. The term *essential* in relation to amino acids is used to distinguish those amino acids that must be obtained in the diet. The nonessential amino acids are formed in the body.

The proteins we ingest from animal products are superior to those found in plants. Animal protein is called a high-quality protein, whereas plant protein is called a low-quality protein.

Animal protein contains all the essential amino acids, it is a complete protein. Second, it contains the essential amino acids in the proper proportion. All amino acids must be present simultaneously in order for the body to synthesize them into necessary body proteins. If one essential amino acid is in short supply, protein production may be blocked. Excellent low-fat sources of protein include skim milk, turkey, and fish.

Generally, proteins exist in smaller concentrations in plants and may be lower in several of the essential amino acids. Most plant foods are unable to meet our total nutritional protein needs. However, if plant foods are eaten in proper combinations, they can provide a balanced supply of amino acids. Navy beans and rice are plant foods considered to be complete proteins.

The average male needs about *56* grams of protein per day, while the average female needs about 44 grams. (To calculate a patient's protein needs, multiply their body weight, in pounds, by 0.36 grams.)

Protein Utilization

After protein is digested, the amino acids are generally utilized to form body tissues and other protein substances, such as enzymes and hormones. Excess protein may be converted to glucose or fatty acids, and protein waste products may be excreted as urea.

Protein, unlike fats and carbohydrates, contains nitrogen in its molecular structure. In order to utilize amino acids as fuel, this nitrogen must be eliminated from your body. This elimination can be measured in body wastes such as urine and sweat. When your body uses more protein for energy than is being consumed, you are in negative nitrogen balance. Conversely, if you are consuming more protein than what is being used for energy, you are in positive nitrogen balance. For athletes, 1.0 grams of protein per kilogram of body weight per day may be insufficient for nitrogen balance.

The Myth of Protein Supplementation

Patients often ask if protein supplements are necessary for muscular size and strength gains while in a weight training program…

The answer is no…By gaining muscle mass, you will ultimately increase your body weight. To accomplish this, your weight training program must be accompanied by a gradual increase in Caloric in-take. These additional kilocalories, from larger or more frequent meals and snacks, will usually provide you with the extra protein needed to reach your goals. The percentage of protein in your diet should remain the same (approximately 15% of total Calories). Many of the protein supplement products are not comprised of complete proteins and consequently represent a bad investment.

The 20 Dietary Amino Acids

Essential	Non-Essential
Histidine(children)	Alanine
Isoleucine	Arginine
Leucine	Asparagine
Lysine	Aspartic Acid
Methoionine	Cysteine
Phenylalanine	Glutamic Acid
Threonine	Glutamine
Trptophan	Glycine
Valine	Proline
	Serine
	Tyrosine

Associated Risks of Excess Protein Consumption:

Anorexia

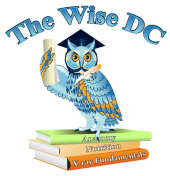
Dehydration

Diarrhea

Impaired kidney function

Impaired substrate utilization

Liver damage



Dietary Protein Health Implications

The body cannot store excess protein for use in times of a deficiency; therefore, daily protein intake is important. The prudent clinician should inform patients on extremely low calorie diets that they may not be ingesting sufficient protein and consequently may experience a loss of protein tissue such as muscle.

Animal protein is typically has substantial amounts of saturated fat and cholesterol, both of which are associated with several health problems. To reduce the intake of fat while maintaining adequate protein intake, you need to be selective in your choice of foods. For example, a glass of whole milk and a glass of skim milk both have about 8 grams of protein, but whole milk has 8 grams of fat compared to only 1 gram or less of fat in the skim milk. Drinking a glass of skim milk instead of whole milk reduces your fat intake by 7 grams and saves you about 60 Calories.