

Introduction to Nutrition

dotFIT recognizes that a proper nutritional background is an essential component to being a well-rounded fitness professional. This section of the course explores basic nutritional concepts and the components of a healthy diet. Proper nutrition is vital to an individual's health and wellness as well as peak athletic performance. Major causes of death and disease are intimately linked to poor diet and a lack of physical activity¹, and an inadequate diet is associated with several chronic diseases including heart disease², certain cancers^{3,4}, hypertension, Type II diabetes⁵ and osteoporosis.⁶ Given the importance of optimal nutrition to health and longevity; it is imperative for health and fitness professional to gain knowledge of proper nutrition and dietary habits. The objectives of this section are to specifically explore basic nutritional concepts and recommendations, dietary supplements, and how they relate to maintaining health, fitness and longevity.

Nutrition Terms

Diet is a term used to describe the foods and beverages we consume, whereas a **nutrient** is any substance found in food and beverages that can be used by the human body for energy, building tissue or regulating bodily functions. **Essential** components to optimal health and wellness must be obtained through the diet and cannot be made by the body. The term **macronutrient** is used to describe nutrients needed in large amounts, and includes carbohydrates, protein and fats. Vitamins and minerals are considered **micronutrients** because they are required in smaller amounts.

Dietary Guidelines for Americans

The Dietary Guidelines for Americans (DGA) are based on peer-reviewed, scientific data and are updated every five years by the United States Department of Agriculture and the Department of Health and Human Services (USDA-DHHS). The goal of these recommendations is to promote health and prevent major chronic diseases such as cardiovascular disease and osteoporosis. The top causes of death in the United States are linked to a poor diet, lack of physical activity and excessive calorie intake. The take home message of the DGA is to encourage Americans to eat less, move more and make wiser food choices.

Making Wise Choices

Making wise food choices includes consuming a wide variety of nutrient-dense foods such as whole grains, fruits, vegetables, legumes and lean protein. Saturated and trans fats, salt, cholesterol, added sugar and alcohol should be limited. To prevent unwanted weight gain, calorie intake should be equal to calories expended. This can be accomplished by adopting eating patterns established by My Plate (formerly the Food Guide Pyramid) or the Dietary Approaches to Stop Hypertension (DASH) diet. Both plans have a wide range of calorie levels that meet the needs of various age and gender groups. The DGA also recommends regular physical activity while minimizing sedentary behaviors.

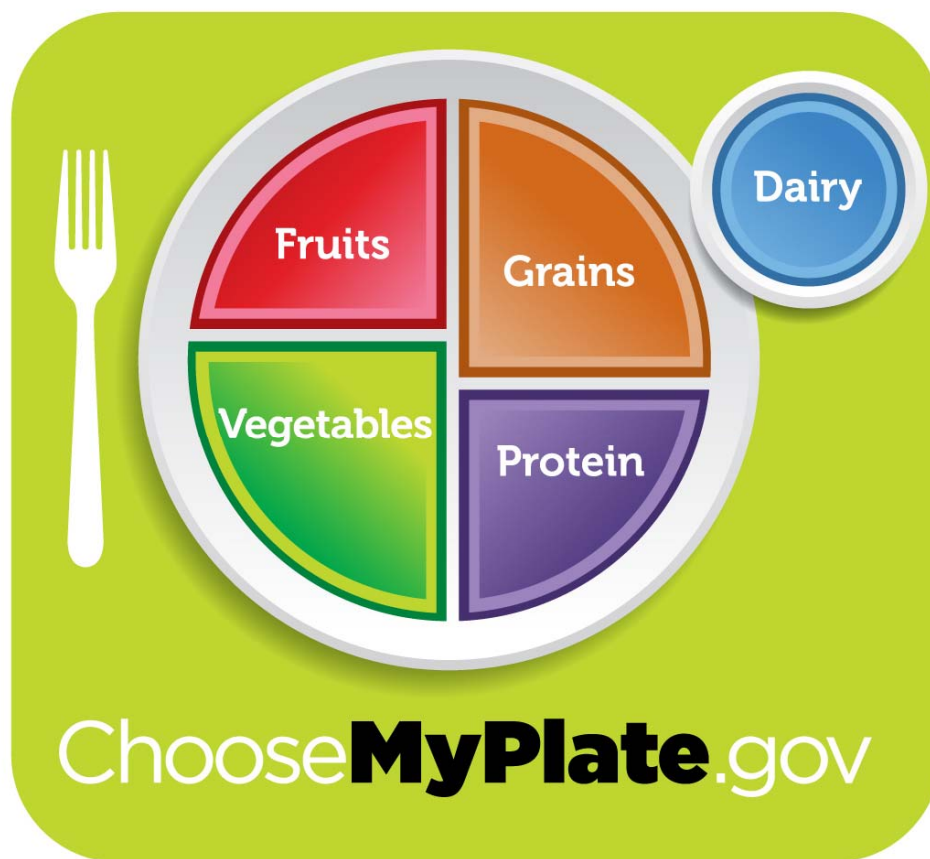
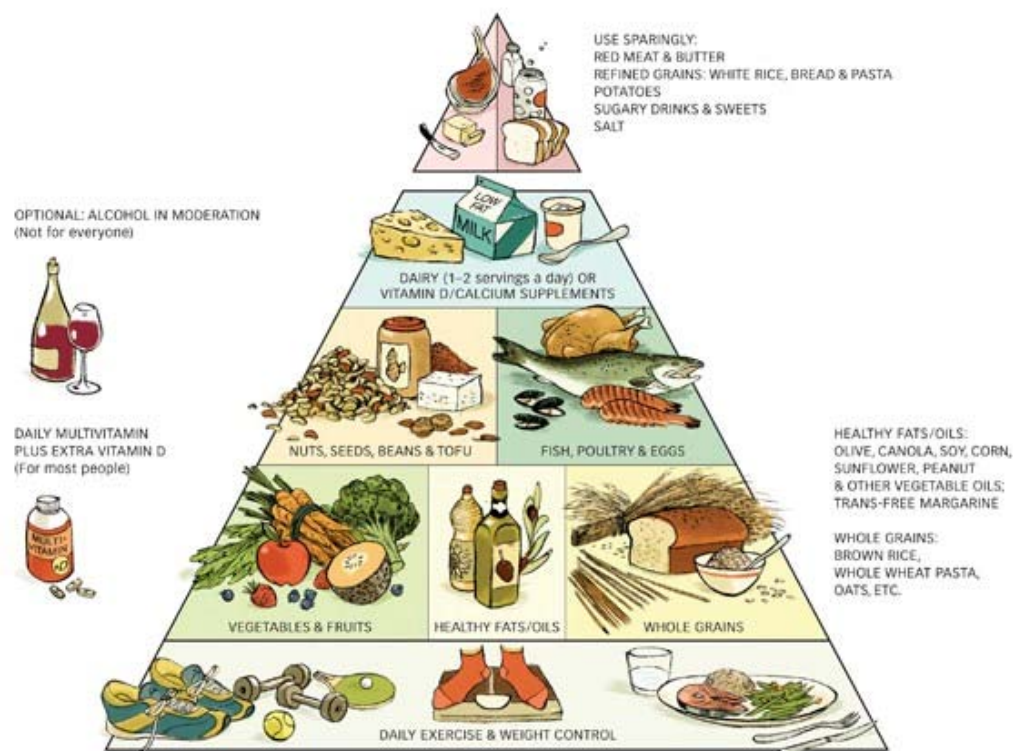


Figure 1 – My Plate, USDA

Alternative approaches include the Healthy Eating Pyramid and the Healthy Eating Plate, created by the Harvard School of Public Health. ⁷ According to the experts at Harvard, these provide more specific guidelines free from influence by U.S. agricultural policy or the food

industry. The Healthy Eating Pyramid addresses the shortcomings of the Food Guide Pyramid and My Plate by distinguishing between whole grains and refined, processed foods, separating red meat from other protein sources and emphasizing healthy fats. Furthermore, the Healthy Eating pyramid is grounded in daily exercise in conjunction with weight control and incorporates alcohol in moderation. The Healthy Eating pyramid recognizes the value of a daily multivitamin to make up for dietary shortcomings and vitamin D/calcium supplements, nutrients most Americans are lacking due cultural food preferences, poor food choices or lactose intolerance (the inability to breakdown milk sugar).



For more information, visit WWW.THE NUTRITION SOURCE .ORG

Figure 2 – Healthy Eating Pyramid, Harvard School of Public Health

Understanding What We Eat

Despite the numerous and widespread guidelines for adopting a healthy diet, most people miss the mark. Only three percent of the U.S. population meets four of the five recommendations for the intake of fruits, vegetables, grains, milk products, meat and bean food groups.⁸ In a 2005 national survey of fruit and vegetable intake, 76 percent of Americans consumed less than the

recommended five or more servings of fruits and vegetables per day. In contrast, the top five consumed foods among Americans include 1) sugared beverages; 2) cake and sweet rolls; 3) hamburgers; 4) pizza; 5) potato and corn chips.⁹ These items are high in added sugars, fat, salt and calories which experts agree should be consumed in limited amounts. It is imperative to recognize that eating these foods frequently is indicative of poor dietary habits which ultimately lead to excessive calorie intake, inadequate nutrient intake, unwanted weight gain and related health problems.

The Nutrients

There are six classes of nutrients:

Carbohydrates

Proteins

Lipids – fats and oils

Vitamins

Minerals

Water

Normal growth, development and optimal functioning of the human body require 45 essential nutrients that must be supplied by the diet. Essential nutrients are needed by the body but are not produced by the body. A low intake of any of the essential nutrients increases the risk of developing a deficiency or adverse changes in health.

Macronutrients

Carbohydrates

Carbohydrates make up the bulk of a healthy diet by providing energy, several vitamins, minerals, fiber and phytochemicals, which are substances in plant foods that support health. They provide four calories per gram and are the chief source of energy for all bodily functions. The brain requires a continuous supply of carbohydrates exclusively (blood sugar) and during exercise carbohydrates are the primary fuel. By consuming adequate amounts, the body receives the energy needed for activity and basic metabolic functions and allows protein to be spared for its primary functions. That is, when adequate carbohydrate is supplied by the diet, lean muscle mass can be preserved and dietary protein is used for supporting the immune function, growth,

recovery and other important functions. Unlike fat, the body’s ability to store carbohydrates is limited and must be constantly replenished by the diet.

Carbohydrates are generally classified as sugars (simple), starches (complex) and fiber. Natural sugars (e.g., fructose or galactose) can be found in fruit, milk and honey. Refined or added sugars originate from plant sources such as corn. A monosaccharide is a single sugar unit, such as glucose (commonly referred to as blood sugar), fructose (fruit sugar) and galactose.

Disaccharides include sucrose (table sugar), lactose (milk sugar) and maltose. Refined or added sugar (Table 1 and Table 2) is often found in soft drinks, candy and sweet desserts. Most Americans consume adequate amounts of sugar each day. However, consuming foods high in refined or added sugars can lead to excess calorie consumption, particularly when the food is also high in fat and calories. Therefore, it is important to limit these foods and select more natural sugars found in fruits, vegetables and low-fat dairy. Ideally, added sugars should be limited to no more than ten percent of total daily calories.¹⁰

Table 1 - Sugar Forms on Nutritional Labels

Sucrose	Granulated sugar
Corn syrup	Brown sugar
Sorbitol	Mannitol
Invert sugar	

Table 2 - High Sugar Foods

Soft drinks	Fruit drinks/punch	Candy
High sugar breakfast cereals	Cookies	Cake
Fat-free foods	Sweet desserts	Ice cream

Starches are long chains of glucose in plant food. After digestion and absorption, the glucose units that are not used for immediate energy can be put back together in chains and stored in the liver and muscle as glycogen. Sources of starches are grains, legumes, beans and potatoes. The Dietary Guidelines encourage the consumption of whole grains in the diet. They contain more nutrients and fiber than refined products. Fiber is the non-digestible component of the plant. Higher intakes of dietary fiber are associated with lower incidence of heart disease and certain types of cancer.^{11,12} Additional benefits of fiber are listed here:^{13,14}

- Provides bulk in the diet and slow digestion, thus increasing feelings of fullness¹⁵
- Prevents constipation and establishes regular bowel movements¹¹
- Contains very few calories (cannot be absorbed by the human gut)¹⁶

High fiber foods tend to be greater in volume, low in fat and low in calories. The recommended daily intake of fiber is 38 grams for men and 25 grams for women, and 30 and 21 grams per day for men and women, respectively, over 50 years of age. However, most Americans only consume half of the recommended intake.¹⁷

Fiber can be categorized into soluble and insoluble. These differences can explain their effect on health. Soluble fiber (Table 3) partially dissolves in water, forming a gel-like material. This type of fiber has been shown to help reduce cholesterol.¹² Insoluble fiber does not dissolve in water and promotes the movement of food through the gut.¹¹

Table 3 - Soluble Fiber

Oat bran, oatmeal	Lentils	Nuts/Seeds	Apples
Legumes	Pears	Beans	Strawberries
Dried peas	Blueberries		

Table 4 - Insoluble Fiber

Whole Wheat bread	Barley	Seeds	Couscous	Bulgur
Brown rice	Whole grain cereals	Wheat bran	Carrots	Cucumbers
Zucchini	Celery	Tomatoes		

Summary

The recommended range for carbohydrate is 45 to 65 percent of total calories. Choose mostly whole grain sources while limiting the intake of added sugars. Aim for at least 25 grams of fiber every day.

Protein

Protein provides amino acids, the building blocks of all structures and organs. Besides providing the materials needed for building muscle, protein is required for the formation of hormones, enzymes and antibodies. There are 20 amino acids which are classified as *essential* and *non-essential*. If a food supplies all of the essential amino acids in appropriate ratios, it is a complete protein. Sources of complete protein include meat, fish, poultry, dairy and soy products. If a food source is low or lacking in one or more essential amino acids, it is an *incomplete protein*.

Grains, vegetables, nuts, seeds and beans are incomplete protein sources. Combining different incomplete proteins, (i.e. beans and rice) provides a complete spectrum of the essential amino acids.

The Recommended Dietary Allowance (RDA) for protein is 0.8 grams per kilogram of body weight per day or 0.4 grams per pound per day.¹⁸ However, protein requirements for active exercisers range from 0.5 to 0.8 grams per pound per day.^{19,20} In general, your daily needs for protein (in grams) equate to approximately half your weight in pounds. For example, if you weigh 150 pounds, you need approximately 75 grams of protein every day. The recommended range for protein is 10 to 35 percent of daily calories. Lean protein sources such as chicken, fish, low- and non-fat dairy, soy products and beans are good protein sources and are a part of an overall healthy diet. Common foods and their protein content are listed in the table below.

Table 5 – Protein content in common foods

Protein Source	Amount	Protein Content (grams)
Sirloin Steak	4 oz	34.2
Chicken Breast	3 oz	26.7
Cooked Ground Turkey	3 oz	22.4
Cooked Ground Beef	3 oz	22.0
Tuna, Drained	3 oz	21.7
Salmon	3 oz	18.8
Cottage Cheese	4 oz	14.0
Tofu	3 oz	12.8
Milk, Skim	8 fl oz	8.7
Milk, 1%	8 fl oz	8.5
Lima Bean	½ cup	7.3
Cheddar Cheese	1 oz	7.0
String Cheese	1 each	7.0
Kidney Bean	½ cup	6.7
Large Egg	1 each	6.3
Low-fat Yogurt	4 oz	4.9

Lipids

Lipids include fats, oils and cholesterol. They add flavor to food and provide a dense source of energy (i.e., nine calories per gram). Lipids are a necessary component for growth and

maintenance and are carriers for the fat-soluble vitamins A, D, E and K. Most Americans consume excessive amounts of fat.^{21,22} Constant overconsumption of high-fat, high-calorie foods can lead to obesity, heart disease and other chronic diseases. Note that any macronutrient (carbohydrate, protein and fat) can be stored as body fat when daily calorie needs are exceeded. There are three types of fats. Saturated fat, found mostly in animal products can increase “bad” (LDL) cholesterol levels and should be limited to no more than ten percent of total calories.²³ This means limiting the amount of butter, lard, high-fat meats such as bacon, sausage, poultry with the skin, fried foods and baked foods. Trans fats or “partially hydrogenated oils” are contained in stick margarine, baked goods, snack foods and fast foods. They can increase “bad” cholesterol and also lower “good” (HDL) cholesterol.^{24,25,26} Nutrition and medical experts agree that trans fats should be limited as much as possible. Unsaturated fats are liquid at room temperature and include various oils including olive, corn, canola and peanut oil. The essential fats are often referred to as omega-3 and omega-6 fats which are required by the body. They may reduce the risk of heart disease by lowering cholesterol and/or blood triglycerides.^{27,28} Fatty fish (e.g., salmon, tuna) and flaxseed are rich sources of essential fats.

Cholesterol is a lipid found in all animal tissue. It provides the structural components of cell membranes, helps form hormones needed for growth and various bodily functions, and are necessary for producing vitamin D and bile, which helps breakdown dietary fat. Excessive cholesterol accumulation in the blood can lead to plaque buildup in the arteries, increasing the risk of heart disease and stroke. Although saturated and trans fats can increase “bad” cholesterol levels, essential fats in the proper ratios may have positive impacts on cholesterol levels.^{27,28} The richest sources of cholesterol include organ meats, eggs and seafood. Daily intake should be limited to less than 300 milligrams per day and the recommended range for total fat in the diet is 20 to 35 percent. This can easily be met by choosing lean protein sources, dairy, nuts and oils as fat is contained in these foods.

Micronutrients

Vitamins

Vitamins are substances required in small amounts for normal growth, development and reproduction. They are needed to extract the energy from food and assist in regulating bodily processes. Vitamins are contained in a wide variety of foods including meats, grains, fruits,

vegetables, dairy, fats and fortified foods. Diets that are sub-optimal may lack certain vitamins, leading to deficiencies and possibly chronic disease.^{29,30,31}

Minerals

Minerals are essential for bodily structures and regulation. Calcium and phosphorus can be found in teeth and bones, whereas sodium and potassium are required for fluid balance and muscular contraction. Minerals are found in plant and animal foods and insufficient intake may lead to health problems. Calcium and vitamin D intake tends to be lacking among youth and adults which increase the risk of osteoporosis, or bone weakening.³² Iron intake is typically insufficient in the United States which results in anemia (iron deficiency).³³ Excessive intake of minerals can also lead to adverse health effects. For example, a high salt (sodium chloride) intake is associated with elevated blood pressure.³⁴

Water

Water is the most essential nutrient for the human body. Approximately 60 percent of the adult human body is made up of water. Nearly 75 percent of skeletal muscle is water while only ten percent of body fat is water. Water is required for metabolic, fluid and temperature regulation and is lost constantly through the skin, breathing and elimination. Water must therefore be replenished continuously. The average daily requirement is 10 to 12 eight-ounce cups which most people meet through the foods and beverages they consume. Contrary to popular belief, eight to 10 cups per day of plain water is not necessary since food provides approximately half of the daily fluid needs and beverages provide the rest. It is important to note that caffeine alone does NOT cause dehydration. Rather, insufficient fluid intake and excess fluid loss lead to dehydration. Physical activity and environmental conditions may increase individual fluid requirements.

*Guidelines for exercise*³⁵

- Before exercise
 - Two to three cups (16-24 fluid ounces) two hours prior to exercise
- During exercise
 - Three to six fluid ounces every 15 minutes
 - Water is the preferred choice when exercise is less than 60 minutes and hydration and energy needs are being met through an adequate diet

- If exercise exceeds 60 minutes or multiple bouts of exercise are performed, use a sports drink (four to eight percent carbohydrate)
- Increase your intake of fluids in hot or humid weather
- After exercise
 - Drink 16 ounces of fluid for every pound of weight lost during exercise

Dietary Supplements

A dietary supplement is a preparation—a pill, powder, or liquid—that contains nutrients or other substances and is consumed as part of one's daily food intake to supply adequate or large dosages of a nutrient or compound.³⁶ Nutrients are components of food that provide energy, serve as building materials or regulate metabolic functions. Dietary supplements are used to achieve one or more goals: optimize health (overall health and lack of disease), improve physical performance (muscular capacity or muscle size), or accomplish cosmetic goals (weight loss or bodybuilding).

Are dietary supplements beneficial?

Consider the following – 1) the typical American diet is high in fat and calories and limited in fruits, vegetables and whole grains; 2) current recommendations by the Department of Health and Human Services and the USDA are based on preventing deficiency disease rather than optimizing health and longevity and 3) it has been established that certain nutrients may prevent specific chronic diseases.³⁷ Unlike prescription drugs, there is minimal risk and little cost to ingesting certain nutrients above levels required to prevent deficiency and below levels that may result in adverse effects. Many well-known scientific and medical institutions including the American Medical Association and the Harvard School of Public Health recommend that everyone investigate the use of a multivitamin which provides insurance for a less than optimal diet.³⁸ Aside from a daily multivitamin there are other nutrients with sound, scientific evidence that warrant consideration.

Calcium and Vitamin D

Despite the importance of calcium and vitamin D in reducing the incidence of osteoporosis, intakes remain sub-optimal.^{39,40} Populations at risk for inadequate intakes are adolescents, postmenopausal women and the elderly.^{41,42,43} Sufficient amounts of calcium and vitamin D are required for bone health. Vitamin D is required for the absorption of calcium and increased

levels of vitamin D have been shown to slow the rate of bone loss in the elderly.⁴⁴ It has been estimated that one billion individuals worldwide have inadequate vitamin D stores and deficiencies occur across all ages and ethnicities.⁴⁵ Furthermore, an association has been established between lower intakes of vitamin D and the risk of certain cancers (e.g., colorectal cancer).^{46,47} Groups that are especially at risk for low vitamin D status are the elderly and those who lack exposure to sunlight. However, even populations with sufficient sunlight exposure are at risk for vitamin D insufficiency, which underscores the importance of this fat-soluble vitamin.⁴⁸ Good sources of calcium and vitamin D are found in fortified dairy products, soybeans and sardines.

Fish Oils

Omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) found in fatty fish and fish oil supplements have been shown to have cardioprotective effects⁴⁹, reduce triglyceride levels²⁸, reduce the progression of atherosclerosis,⁴⁹ possess anti-inflammatory properties⁵⁰ and support cognitive function.⁵¹ Major public health recommendations include consuming fatty fish such as herring, salmon and mackerel at least twice a week. However, those who do not eat fish should consider taking a daily omega-3 supplement of 500 to 1000 milligrams with an EPA to DHA ratio of 1.75 to 1.^{52,53,54}

Protein

People who engage in regular exercise or live an active lifestyle are likely to seek out the use of protein supplements to either enhance their training or health. Protein supplementation is appropriate for individuals with increased needs (e.g., athletes⁵⁵) who do not get adequate protein through their diet or have a personal preference for additional protein barring certain health conditions. Table 5 contains protein guidelines for various exercisers. To date, research indicates there is no benefit to consuming protein in amounts greater than those listed here.²⁰ Doing so replaces foods that provide other essential nutrients.

Table 5 - Protein Guidelines

Group	Guidelines
Active exercisers	0.5 – 0.8g/lb/day
Bodybuilders/strength athletes	0.5 – 0.9g/lb/day
Endurance athletes	0.6 – 0.9g/lb/day

Summary of Dietary Supplement Recommendations

A daily multivitamin is recommended for everyone to shore up various nutrients including the B vitamins, iron and vitamin C. For most people, obtaining the recommended daily intake of calcium and vitamin D is best achieved by taking a separate supplement since the levels in most multivitamins are inadequate. Therefore, if you do not consume at least three servings of dairy each day or you do not get daily sunlight exposure, taking a separate calcium and vitamin D may be beneficial. In adults, an additional 500 to 1000 milligrams of calcium per day will meet daily requirements and taking up to 2,000 IU of vitamin D is considered safe.⁵⁶ If you do not consume fatty fish twice a week, a fish oil supplement containing 500 to 1000 milligrams of EPA and DHA may be beneficial.

Summary

In summary, strive to eat a well-balanced diet that includes mostly whole grains, fruits, vegetables and lean protein. Fish, poultry, legumes and low-fat dairy products are excellent sources of lean protein. Minimize saturated and trans fats while increasing your intake of healthy fats from oils, nuts and protein sources (fatty fish). Alcohol and foods high in added sugar, fat and calories should be limited. At the very least, take a multivitamin as nutritional insurance, and due to the recent attention given to calcium and D and their beneficial effects on health, it would be wise to investigate the use of a supplement if dietary sources and sunlight exposure are lacking.

Nutrition Myths

Protein

Myth #1 - The RDA for protein (.8g/kg BW) is all you need.

The RDA for protein is quite specific in its application: Adults with low activity levels who are getting their energy needs met by dietary carbohydrates (CHO) and fat and are not growing or changing. Based upon these criteria, the RDA of .8g/kg BW is sufficient, even providing a margin of safety to ensure enough protein.

However, our clients generally present a different scenario. They are often active, eating reduced calorie diets (energy needs NOT being met by dietary CHO and fat), or breaking down and rebuilding muscle (physiological adaptations). All of these factors affect protein requirements.

Individual protein requirements are based upon the following factors:

- **Weight**- the more you weigh the more protein your body requires.⁵⁷
- **Calorie intake**- when calorie intake is lowered below maintenance, energy needs are not met by carbohydrate and fat, forcing the remaining energy needs to come from protein and related tissues (e.g. muscles).^{58,59,60,61,62,63,64} Therefore, the amount of lean body mass lost in exercising or sedentary persons in negative energy balance can be reduced and often eliminated (depending on the size of the calorie deficit) by increasing protein in the diet.^{65,66}
- **Exercise/Goal**- as early as 1981, scientists Lemon and Nagle⁶⁷ studied the effect of exercise on protein requirements. Following this review, scientists began to recommend protein intakes for athletes well above the RDA. While the effect of exercise on protein metabolism was found to vary by exercise type, protein can supply from 4 to 10 percent of exercise energy needs. Additionally, exercise increases the oxidation of amino acids and the rate of protein turnover in lean body mass during recovery.^{67,68,69,70,71,72,73,74,75,76,77,78,79} Furthermore, cardiorespiratory exercise alone contributes to an increase in protein requirements,^{67,68,69,70,71,72,73,74,75,76,77,78} as does resistance training.^{67,68,80,81} The needs of those participating in both activities may be greater than the highest recommendation for strength training.^{82,83}

Assuming the majority of one’s energy needs are met with carbohydrates and fats, below are the current protein recommendations for active individuals.

Protein Recommendations for Active Individuals

Group	Guidelines
Active exercisers	0.5 – 0.8g/lb/day
Bodybuilders/strength athletes	0.5 – 0.9g/lb/day
Endurance athletes	0.6 – 0.9g/lb/day

Myth #2 - High protein diets are not healthy and are less effective than traditional low fat, high carbohydrate diets in producing weight loss.

Things have changed over the years in how scientists and nutrition professionals view dieting and what is truly considered “high protein.” When it comes to health, as long as the diet falls

within the current and much wider range of acceptable amounts of protein, carbs and fats (45-65% Carbs, 10-35% Protein, 20-35% Fat), then the best diet for producing weight loss is the one that works for the individual. As long as the diet does not vastly exceed the guidelines, weight loss itself trumps the dieting method when it comes to improving health. In other words, weight loss is the primary driver of health improvement rather than the type of diet used. Other important facts to consider are presented here.

The current recommendation for protein is 10 to 35 percent of total daily calories. Therefore, diets that were once considered high in protein (e.g. 40/30/30, Zone Diet) are well within recommended guidelines and are widely acceptable among scientists and nutrition professionals.

Low-carb diets (e.g. Atkins) are those that severely restrict daily carbohydrate intake to below recommended levels (< 130 g/d) and allow unlimited protein and fat intake. Protein intake often falls within guidelines while fat intake exceeds guidelines (>35% of total calories). A recent review evaluating the safety and effectiveness of low-carb versus traditional high-carb, low fat diets has found that low-carb diets produce greater weight loss at six months but the diets are equally effective after one year.⁸⁴ The effectiveness of low carb/high-protein diets is likely be due to 1) protein's increased ability to prolong the feeling of satisfaction when compared to carbohydrates and 2) limiting food choices to mostly protein and fat sources which often leads to fewer calories consumed daily. Despite this, widespread use of low-carb diets is not recommended because of adverse changes in LDL ("bad") and total cholesterol levels. It's also important to note that drop-out rates were significantly high – almost 50% for both diets -- and that most people who lose weight return to their original weight *within three to five years*.^{85,86}

Data accumulated through the National Weight Control Registry and other sources has revealed that people use a variety of dieting and food intake strategies to lose and maintain weight loss long-term.^{87,88,89} While most participants follow a lower fat diet, there is variability in the amount of protein and carbohydrate used. **More consistent among successful losers were certain behaviors** including eating breakfast daily, tracking food intake, maintaining a high activity level (mostly walking), limiting TV time and self-weighing regularly. Although participants of the National Weight Control Registry represent a model for long-term weight loss success, this population represents a very small percentage of those who attempt weight loss. Therefore, to lose weight individuals should select sustainable eating patterns and activity

behaviors that create a calorie deficit and regularly check weight, inches gained/lost or body composition to determine if adjustments are needed. Gaining continuous visibility of weight changes and self-regulating food intake and activity are critical for maintaining losses.

Myth #3 - The more protein you eat the more muscle you build.

In adults, muscle growth, or hypertrophy, is initiated by appropriate training and will manifest with proper rest and nutrition. Calorie and protein needs have to be met, with additional protein made available for the rebuilding of muscle. Inadequate protein and/or caloric intake will negatively affect nitrogen balance, preventing muscle growth.^{90,91,92} However, once protein needs are met, the addition of more protein will not stimulate *further* muscle growth. 90-91 Continued protein intake above needs simply increases the use of protein for energy⁹² immediately for activity or stored as fat for later use.

Myth #4 - I need to use a whey protein powder if I'm working out.

Protein powders such as whey have their place and purpose, but they are not a required part of a healthy lifestyle or all training and nutrition programs. Whey and any protein powder, as the name implies, is simply a good source of protein in a powdered form. Instances where use of *any* protein supplement may be beneficial include

- Convenient source of protein when whole food is not available or desired
- Proper timing of protein intake, such as immediately pre- and post-workout^{93,94,95}
- Low calorie protein source when dieting or low calories are required

Use of whey protein as opposed to other proteins of equal grams and times of ingestion in well-fed exercising persons would not likely increase exercise-induced results. Where whey protein and other high biological value (BV) proteins (those high in essential amino acids) may deliver value is in helping to maintain or increase muscle in low calorie situations⁹⁶, such as bodybuilders, wrestlers, or other weight-conscious athletes preparing for competition (these athletes are often underfed and over-trained at this point). Protein needs are based upon essential amino acid (EAA) requirements of the body and due to their high EAA content (especially BCAA and Glutamine), high BV proteins such as whey can more easily meet these requirements thus requiring less total protein and calories.

*Carbohydrate***Myth #1 - Sugar makes you fat.**

All legitimate science agrees that the causes of continuous weight gain in developed nations consists of a variety of environmental, psychological and physiological factors, not sugar and sweeteners⁹⁷. Researchers found that obesity was positively linked with time spent watching TV or at a computer and diets high in fat. Sweeteners are unfortunately guilty by association because of their presence in the foods and drinks (thus calories) *we choose* to consume. In other words, we can get fat on anything if we eat more calories than we burn. According to a 2003 article in *Obesity Research*, “The use of caloric sweeteners has risen across the world, and has contributed to an increasing number of calories consumed per day, which leads to weight gain”.⁹⁸ The sad truth is that as a society we simply make poor food and drink choices. No one would argue that a diet high in sugar and the low nutrient density foods that deliver it is good for you, but in the end these poor food choices are simply a delivery vehicle for excess calories. There is nothing inherently fat producing about sugar. But, the reality is that sugary foods do make up a significant portion of the typical American’s diet. Coupled with low daily activity, this is a recipe for disaster, tipping the scale in favor of weight gain. The take home message should be more accurately, “reduce junk food intake and increase physical activity to improve health and body composition”. Not, “don’t eat sugar, it will make you fat.”

Myth #2 - High Fructose Corn Syrup (HFCS) makes you fat and ruins your health.

Much controversy and misinformation surround this food additive. It has been accused of causing obesity, diabetes, cancer and liver failure. Many of these allegations are outright ridiculous and are spread by non-scientific, uninformed sources with little to no knowledge of human physiology, nutrition and biochemistry. The additional implications relating to weight gain, diabetes and appetite are often based upon animal studies using excessively high levels of fructose given as the sole carbohydrate. Studies have looked at the metabolism of HFCS, its effect on insulin, appetite, leptin and ghrelin (appetite and satiety hormones) and found no significant differences from sucrose (table sugar)⁹⁹ It is important to understand that HFCS is not fructose. HFCS starts as corn syrup, which is primarily glucose. Through an enzymatic process, much of the glucose becomes fructose, making the syrup comparatively high in fructose when compared to regular corn syrup (hence the name high fructose corn syrup). White, granulated sugar is about 50/50 glucose and fructose. HFCS used in beverages or food is either 42% or 55% fructose, not significantly higher and maybe even lower in fructose than regular

sugar (sucrose). To imply that HFCS has some unforeseen physiological impact beyond its fructose and glucose content that does not exist in sugar stretches the boundaries of credibility. The ratio of glucose to fructose in the American food supply has remained quite constant since the 1960s¹⁰⁰. To truly eat a diet high in fructose, one would have to go out of their way and it would not be easy. It would be convenient and simple if HFCS were the hazardous substance that many want it to be. However, consider that the rise in obesity in the US is mirrored around the world in all developed countries, yet HFCS is not a significant contributor of calories to the daily diet of countries outside of the US. In Latin American countries, for example, soft drink consumption makes up a significant portion of total daily calorie intake, obesity is on the rise and they still use sucrose to sweeten their beverages.¹⁰¹ There is no impact of HFCS beyond the calories in the food it is contained in. Spending time trying to blame HFCS for Americans' weight gain and poor health is to take the focus off of the true culprit: excess caloric intake, poor food choices and a lack of physical activity.

Myth #3- Eating carbs past 7pm leads to fat/weight gain.

Weight gain is a result of eating more calories than you burn on a regular basis, not when you eat those calories.^{102,103} Due to their preference or schedule, there are many people who eat later in the evening, before bed or even wake up in the middle of the night to take in calories. If one gained weight doing this, it was due to excess calorie intake, not the timing.

The body does not have an enzyme with a watch that after 7 p.m. preferentially stores items, especially carbohydrates, as fat. We all have a certain number of calories that we can consume without gaining weight. As long as that number is not exceeded, weight gain will not occur. Imagine this scenario: it has been established that you burn 2750 calories in a 24 hour period. You had a busy day and since your 350 calorie breakfast, you have not had the opportunity to eat. You get home late after a long day of meetings and you are ravenous. At 9 pm you eat an enormous 1500 calorie meal. Added to the 350 calorie breakfast this brings your daily total to 1850 calories. After your late meal you are exhausted and promptly go to bed. Will you gain weight? Let's look at the math: your daily energy expenditure is 2750 calories and you ate 1850 calories. This leaves a deficit of 900 calories. The body cannot make/retain body fat from nothing. In this example, considerably more calories were used during the day than were eaten, leading to a reduction in fat stores when all was said and done. The goal is to figure out how many calories you can have during the day to lose or maintain weight and distribute those

calories/foods in a manner that makes you feel your best, including preventing hunger. If you do this regularly, then you will accomplish your goal no matter what time you eat.

Myth #4 - Carbohydrates stimulate insulin and fat storage.

Humans, as periodic eaters, need insulin to survive. Insulin helps the body store energy to fuel the body's continuous needs and activities. Insulin is secreted after eating in order to move energy (e.g. glucose, amino acids) into the liver, muscle and adipose tissue (fat)—the body's primary fuel source—for storage. Within about an hour after a meal, insulin levels diminish, leading to an increase in the hormone glucagon. Glucagon signals the body to begin releasing stored energy (glycogen from the liver and muscle, and fatty acids from adipose tissue) into the blood stream to fuel the body's continuous energy needs, essentially reversing the actions of insulin. This cycle is repeated with every meal.¹⁰⁴

Insulin plays a major role in keeping us alive, but in short, this hormone is not responsible for weight loss or continuous body fat gains. Only we are in control of our weight. Whether one increases or decreases the size of their fat stores from day to day depends upon the relationship of calories eaten to the amount of calories used through metabolism and daily activity. If, at the end of the day, you are in a caloric deficit (more calories/fat burned than stored), then fat stores will decrease. However, if calories eaten exceed calories used, body fat stores will increase.^{102,103} Insulin is just doing its job, which is storing things, including amino acids, to build muscle. However, it is the person, through eating, who gives insulin the "things" to store. In other words, insulin does not cause a person to become fat. The excess food one consumes leads to the average adult's growing waistline, and of course that is 100% under the control of the person eating the calories.

Fat

Myth #1 - Eating fat will make me fat.

Eating more calories than you burn makes you fat, whether those calories come from carbohydrates, protein or fat.^{103,104} While it is true that excess fat intake can contribute a lot of calories, there are fats that must be acquired in the diet for optimal health. These include the omega-3 and essential fatty acids. Additionally, appropriate intake of fat can help you get and stay full longer,^{105,106} improve skin and hair quality and feel better. For most Americans, however, fat contributes too many calories to the diet, by way of poor food choices, dressings,

fried foods and added sauces, gravies and butter/margarine.¹⁰⁷ It is easy for the body to store dietary fat as body fat^{108,109} and with 9 calories per gram; fat contributes a lot of calories in most people's diets.¹⁰⁷ It is this excessive caloric contribution that often tips the balance to more calories eaten than burned, leading to weight gain.

Myth #2 - You should not eat any saturated fat.

Saturated fat is found in animal foods, chocolate and tropical oils, such as palm, cottonseed and coconut. It is interesting to note that salmon, eggs, cashews and soybeans also contain saturated fat¹¹⁰ and are considered healthy foods. The Dietary Guidelines for Americans put saturated fat intake recommendations at less than 10% of total calorie intake.¹¹¹ Food surveys have it making up about 11% of most Americans' diets, with cheese, beef, and milk contributing about one-third of the total saturated fat consumed in the United States.¹¹² Simply switching to low or no fat versions of these common foods could significantly reduce this intake. A 2003 meta-analysis published in the *American Journal of Clinical Nutrition* concluded that diets high in saturated fat negatively affected cholesterol profiles — predictors of a heart attack and other cardiovascular diseases.¹¹² However, saturated fat intake recommendations are not zero. Some saturated fat is fine in the diet and it would be unrealistic to eat a diet that contained none. Ultimately, saturated fat intake is symptomatic of a larger problem: excessive food intake comprised of fatty, sugary, processed foods in enormous portions, coupled with a lack of physical activity. Moderate saturated fat intake provided by healthier, lower saturated fat foods and/or appropriate portion sizes coupled with a caloric intake that maintains an ideal weight and exercise should pose no problem to the majority of the population.¹¹³ Additionally, the strategy of replacing most of your saturated fat with healthier monounsaturated fat may reduce heart disease risk and positively affect lipid profiles and health better than simply lowering total fat intake.^{114,115}

Myth #3 - As long as they are healthy fats, you can eat all that you want.

Choosing healthier fats is a great idea. Foods such as nuts and seeds, monounsaturated oils such as olive, peanut, canola and sesame, and avocados all provide higher levels of monounsaturated fats. Additionally, polyunsaturated fats found in vegetable oils such as soybean, corn and safflower, as well as fatty fish like salmon, mackerel, herring and trout, and walnuts and sunflower seeds provide healthy fats and the omega-3 and -6 fatty acids. Higher intakes of these fatty acids have been associated with a reduced risk of heart disease, certain cancers and

maintenance of mental acuity with age.¹¹⁶ It is recommended that Americans replace saturated and trans fat in their diets with more mono- and polyunsaturated fats. However, all fats provide 9 calories per gram and generally do so with little food volume. Calories still add up and excess calories, even if from healthy fats, can be stored as body fat and offset any health benefit they may otherwise deliver. Incorporate more of the food listed above, but keep your total caloric intake within a range that allows for maintenance of your body weight and health.

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