

California Food Guide

Protein Foods

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What's New

A key recommendation from the Dietary Guidelines for Americans 2005 is to make choices that are lean, low-fat, or fat-free when selecting and preparing meat, poultry, dry beans, and milk or milk products. The USDA MyPyramid uses "ounce equivalents" (oz-eq) to identify standard portion sizes within the Meat and Beans group. Recommended intakes of protein in terms of ounce equivalents are based upon energy intakes between 1,000 and 3,200 calories per day. Actual protein intake requirements range from 2 ounce equivalents at the 1,000 calorie level up to 7 ounce equivalents for intakes at the 3,200 calorie level. A one ounce equivalent from the Meat and Beans Group is one ounce of meat, poultry or fish, $\frac{1}{4}$ cup dry beans or peas, 1 egg, 1 tablespoon of peanut butter, $\frac{1}{2}$ ounce of nuts or seeds, or $\frac{1}{4}$ cup of tofu.¹

Soy Protein Approved Health Claim on Food Labels

In 1999, the U.S. Food and Drug Administration approved a health claim for labels of soy-based foods after reviewing studies that demonstrated soy's ability to lower total and LDL cholesterol. The following model claim may be used: *"Diets low in saturated fat and cholesterol that include 25 grams of soy protein a day may reduce the risk of heart disease. One serving of (name of food) provides ___ grams of soy protein."* To use this claim, the food must contain at least 6.25 grams of soy protein, less than 3 grams of fat, less than 1 gram of saturated fat, less than 20 milligrams (mgs) of cholesterol per serving, and less than 480 mgs of sodium for individual foods or less than 960 mgs for foods considered a meal. Foods made with the whole soybean are exempt from the low fat requirement if it has no fat other than that which naturally occurs in the soybean.²

Public Health Implications

- Protein foods from animal sources contribute a significant amount of calories, saturated fat, and cholesterol to the diet of most Americans. Saturated fat and cholesterol are linked to cardiovascular disease, the major cause of death in Americans. The American Heart Association recommends that saturated fat be limited to less than seven percent of energy intake and cholesterol be limited to less than 300 milligrams per day, choosing lean meats and limiting processed meats, removing the skin from poultry before eating, and using vegetable alternatives.³
- High protein diets, popularized in low-carbohydrate weight loss plans, do not appear to impair or cause a decline in renal function in healthy individuals.^{4, 5} However, a high intake of protein, specifically proteins not from dairy sources, is associated with an increased decline in renal function in individuals with mild renal insufficiency.⁵
- To avoid food-borne illnesses, restaurants, institutions and home kitchens should observe safe food handling practices for eggs, meat, poultry, and fish. Foods must be stored, cooked, and held at proper temperatures to minimize growth of pathogens. To reduce the risk of cross-contamination, raw meat and poultry need not be rinsed before cooking, so that bacteria from raw meat will not be spread to counter tops, sinks, kitchen utensils, and ready-to-eat foods.¹
- The Dietary Guidelines for Americans 2005 provide these key recommendations for specific population groups:¹
 - Infants and young children, pregnant women, older adults, and those who are immuno-compromised should not eat or drink raw (unpasteurized) milk or any products made from unpasteurized milk; raw or partially cooked eggs or foods containing raw eggs; raw or undercooked meat and poultry; raw or undercooked fish or shellfish; unpasteurized juices; and raw sprouts.
 - Pregnant women, older adults, and those who are immuno-compromised: only eat certain deli meats and frankfurters that have been reheated to steaming hot.

Definition

Beef, poultry, fish, dry beans or peas, eggs, soybean products, nuts and seeds, milk, cheese, yogurt, and foods made from these provide protein for essential body functions. Foods from the Meat and Beans and the Milk Group of MyPyramid supply the major source of protein in the diets of most Americans. Plant-based foods, such as those found in legumes, provide excellent and inexpensive sources of protein as well as dietary fiber. This chapter will focus on the Meat and Beans Group of MyPyramid; additional information about the Milk Group can be found in the Milk and Milk Products chapter of this guide.

Protein is a large, complex molecule comprised of amino acids. When proteins are consumed in the diet, digestive processes break down the protein molecule into smaller amino acid components, which are then used to synthesize new proteins for body functions and processes. Thousands of different proteins, each with a unique function, can be formed from the various combinations of amino acids. The configuration of the amino acid sequence in the new protein determines how it will be used in the body. Proteins are crucial for the maintenance and regulation of the body, and are needed to make the body's structural components. Cells, connective tissue, bone, hormones, antibodies, immune factors, and enzymes that regulate the body's chemical reactions all require protein.^{6, 7}

The body uses 20 different amino acids for protein synthesis (Table 1). Eleven of these amino acids can be made in the body, thus they are not required to be consumed from dietary sources. However, the other nine amino acids are considered "indispensable" and must be obtained from foods. Without adequate protein intake, the body will decrease metabolic processes to conserve the indispensable amino acids, and in a prolonged state of depletion will cannibalize its own muscles and internal organs to obtain these indispensable amino acids to build new proteins. One effect of protein malnutrition is the decreased efficiency of the immune system, leading to increased risk for infection, disease and death.⁷

Table 1: Amino Acids Needed in Human Nutrition

Indispensable Amino Acids^a	Dispensable Amino Acids^b
<ol style="list-style-type: none"> 1. Histidine 2. Isoleucine 3. Lysine 4. Leucine 5. Methionine 6. Phenylalanine 7. Threonine 8. Tryptophan 9. Valine 	<ol style="list-style-type: none"> 1. Alanine 2. Arginine 3. Asparagine 4. Aspartic Acid 5. Cysteine 6. Glutamic Acid 7. Glutamine 8. Glycine 9. Proline 10. Serine 11. Tyrosine
<p>^a must be consumed in the diet ^b can be made in the body from other amino acid and carbohydrate precursors; not required to be consumed.</p> <p>Source: Wardlaw, GM and Smith, AM. Contemporary Nutrition: Issues and Insights. 6th Edition. McGraw-Hill Companies, Inc. 2006. p.186</p>	

Foods from animal sources of the Meat and Beans Group supply more than an adequate amount of the indispensable amino acids required for protein synthesis. However, vegetarians whose diets do not include foods of animal origin can easily obtain all nine indispensable amino acids needed for optimal health from plant-based foods.⁸ The requirement to “complete” proteins at each meal, or combining complementary plant proteins, is not supported by scientific evidence and is no longer considered appropriate dietary guidance for vegetarians. Please see the chapter on Vegetarian Diets in this guide for additional information.

Dietary Recommendations

The Dietary Reference Intakes (DRIs) for protein intake is based upon age and sex (Table 2). DRIs for protein represents the Recommended Dietary Allowances (RDA) and Adequate Intakes (AI). The RDAs were determined to encompass the needs of 97 to 98 percent of the individuals within a population

group, and are not applicable in specific anabolic conditions such as wound healing or recovery from severe burns, or in the case of kidney or liver disease. In addition, the RDA may not be sufficient to meet the needs of older adults in order to maintain skeletal muscle.⁹

Table 2: Dietary Reference Intakes For Protein

		RDA/AI^a grams/day	AMDR^b
Infants	0-6 months	9.1*	ND**
	7-12 months	11.0*	ND**
Children	1-3 years old	13	5-20
	4-8 years old	19	10-30
Girls	9-13 years old	34	10-30
	14-18 years old	46	10-30
Boys	9-13 years old	34	10-30
	14-18 years old	52	10-30
Women	19-30 years old	46	10-35
	31-50 years old	46	10-35
	51+ years old	46	10-35
Pregnancy	<18 years old	71	10-35
	19-50 years old	71	10-35
Lactation	<18 years old	71	10-35
	19-50 years old	71	10-35
Men	19-30 years old	56	10-35
	31-50 years old	56	10-35
	51+ years old	56	10-35

*AI is the mean intake for healthy breastfed infants.

**Not determinable due to lack of data of adverse effects in this age group.

^a Based on 1.5 g/kg/day for infants, 1.1 g/kg/day for 1-3 yrs, 0.95 g/kg/day for 14-18 yrs, 0.8 g/kg/day for adults, and 1.1 g/kg/day for pregnancy (of pre-pregnancy wt) and lactation

^b Acceptable Macronutrient Distribution Range (AMDR) expressed as percent of energy intake.

Source: Institute of Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids*. Washington D.C.: The National Academy Press; 2002.

The protein needs of athletes may be greater than the general population, depending upon the type of exercise performed, the intensity and duration of the exercise, the athlete's training regime and his or her usual nutrient intake. Male body-builders have been advised to consume as much as 1.6-1.7 g/kg of body weight per day to repair muscle fibers damage from strength training and to support gains in lean muscle mass. Inherent in this recommendation is that sufficient calories are ingested to prevent protein being used for energy. Athletes who consume an adequate calorie intake while in training normally have an accompanying proportional increase in protein which more than adequately meets any increased need for protein.^{10, 11}

In terms of food choices, the USDA MyPyramid expresses the number of servings needed daily from the Meat and Beans Group in ounce equivalents, based on energy intakes between 1,000 and 3,200 calories per day (Table 3), and per population group (Table 4). Obtaining sufficient protein is not challenging for most Americans, since the standard serving sizes of food in Table 5 are smaller than typical portions found in restaurants and foods served away from home. Excess calories from protein are stored as fat, and do not contribute to increased protein synthesis and lean body mass.

Table 3: Recommended Number of Ounce Equivalents Per Day from the Meat and Beans Group According to Calorie Intake

Calorie Level	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200
oz-eq	2	3	4	5	5	5.5	6	6.5	6.5	7	7	7

Source: Institute of Medicine. *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and amino acids*. Washington D.C.: The National Academy Press; 2002.

Table 4: Recommended Number of Ounce Equivalent Per Day from the Meat and Beans Group According to Population Group*

Children	2-3 years old	2 ounce equivalents*
	4-8 years old	3 – 4 ounce equivalents*
Girls	9-13 years old	5 ounce equivalents*
	14-18 years old	5 ounce equivalents*
Boys	9-13 years old	5 ounce equivalents*
	14-18 years old	6 ounce equivalents*
Women	19-30 years old	5 ½ ounce equivalents*
	31-50 years old	5 ounce equivalents*
	51+ years old	5 ounce equivalents*
Men	19-30 years old	6 ½ ounce equivalents*
	31-50 years old	6 ounce equivalents*
	51+ years old	5 ½ ounce equivalents*

*These amounts are appropriate for individuals who get less than 30 minutes per day of moderate physical activity, beyond normal daily activities. Those who are more physically active may be able to consume more while staying within calorie needs.

Source: www.MyPyramid.gov

Table 5: Common Foods and Ounce Equivalents from the Meat and Beans Group

	Amount that counts as 1 ounce equivalent in the Meat & Beans group	Common portions and ounce equivalents
Meats	1 ounce cooked lean beef	1 small steak (eye of round, filet) = 3 ½ to 4 ounce equivalents
	1 ounce cooked lean pork or ham	1 small lean hamburger = 2 to 3 ounce equivalents
Poultry	1 ounce cooked chicken or turkey, without skin	1 small chicken breast half = 3 ounce equivalents
	1 sandwich slice of turkey (4 ½" x 2 ½" x 1/8")	½ Cornish game hen = 4 ounce equivalents
Fish	1 ounce cooked fish or shell fish	1 can of tuna, drained = 3 to 4 ounce equivalents 1 salmon steak = 4 to 6 ounce equivalents 1 small trout = 3 ounce equivalents
Eggs	1 egg	1 egg
Nuts and seeds	½ ounce of nuts (12 almonds, 24 pistachios, 7 walnut halves) ½ ounce of seeds (pumpkin, sunflower or squash seeds, hulled, roasted) 1 Tablespoon of peanut butter or almond butter	1 ounce of nuts or seeds = 2 oz eq
Dry beans and peas*	¼ cup of cooked dry beans (such as black, kidney, pinto, or white beans) ¼ cup of cooked dry peas (such as chickpeas, cowpeas, lentils, or split peas) ¼ cup of baked beans, refried beans	1 cup split pea soup = 2 oz eq 1 cup lentil soup = 2 oz eq 1 cup bean soup = 2 oz eq
	¼ cup (about 2 ounces) of tofu 1 oz. tempeh, cooked ¼ cup roasted soybeans 1 falafel patty (2 ¼", 4 oz) 2 Tbsp. hummus	

*Dry beans and peas are included in both the Meat and Beans and in the Vegetables group. Source: www.MyPyramid.gov

In addition to protein, foods from the Meat and Beans group provide many other nutrients required for optimal health including niacin, vitamin B₁ (thiamin), vitamin B₂ (riboflavin), vitamin B₆ (pyridoxine), vitamin E, iron, zinc, and magnesium. Animal sources of protein also provide a significant source of vitamin B₁₂ for the diet.

Burden

Diets that are high in cholesterol and saturated fats raise LDL (low density lipoprotein) cholesterol levels in the blood, which increases the risk for coronary heart disease. In 2006, the cost of coronary heart disease in the United States was estimated to be \$142.5 billion, in terms of both direct health care costs, combined with lost productivity resulting from mortality and morbidity.¹²

Some food choices in the Meat and Beans group are high in saturated fat such as fatty cuts of beef, pork, and lamb, regular ground beef, sausage, hot dogs, bacon, bologna, salami, and some poultry, such as duck. Foods high in cholesterol include egg yolk and organ meats, such as liver. The MyPyramid food guidance system encourages Americans to vary their choices from the Meat and Beans group, especially fish, nuts, and seeds to increase their intakes of monounsaturated fatty acids (MUFAs), polyunsaturated fatty acids (PUFAs), including the omega-3 fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid).¹³

Incidence and Prevalence

According to USDA, in 2002 consumption of all meats poultry, and fish was 200 lbs per person, 23 pounds above the level in 1970. Americans consumed, on average, 18 pounds less red meat (mostly less beef) than in 1970, 37 pounds more poultry, and four pounds more fish.¹⁴

Over the previous century, a shift has occurred in the source of protein in the American diet. In 1909, grain products provided 37 percent of total dietary protein in the American food supply. This contribution fluctuated over the remainder of the century, reaching a low of 18 percent in 1970. Since 1934, the predominant source of protein in the food supply has shifted from grain products to meat, poultry and fish. In 2000, meat, fish, and poultry sources of protein contributed 40 percent of the total protein in the food supply, and grain products provided 22 percent. Historically, red meat provided the largest share of protein from the meat, fish, and poultry foods, but has decreased since 1971. However, poultry's contribution to the available protein in the food supply has increased to 14 percent in 2000 from only three percent in 1909.¹⁵

Trends/Contributing Factors

High-Protein/Low-Carbohydrate diets. High protein, carbohydrate-restricted diets for weight loss regained popularity in the late 1990s and early 2000s. In 2002, a telephone survey of 9,300 households found that 3.4 percent of respondents were currently on such a diet, and 12.5 percent of respondents had ever used a low-carbohydrate, high-protein diet.¹⁶ Favorable metabolic responses have been reported, including lowered blood lipids, and lowered fasting serum glucose. The limited success of eating plans to produce short-term weight loss has been attributed to increased feelings of satiety resulting in decreased caloric intake.¹⁶⁻¹⁹ However, side effects associated with the diet have been reported, including constipation, diarrhea, headache, general fatigue, halitosis, and life-threatening metabolic acidosis.²⁰ In addition, a high protein and low vegetable diet produces an altered acid-base metabolic response, leading to increasing calcium excretion which negatively affects bone density.²¹ High protein, low-carbohydrate diets are typically very restrictive in foods such as grains, fruits and vegetables, and high in saturated fats. Because studies of long-term health effects are not available and the requirement for essential nutrients and fiber are difficult to meet from the food restrictions, these diets are not recommended. Individuals who follow these diets can be at risk for vitamin and mineral deficiencies and potential cardiac, renal, bone, and hepatic abnormalities.²²

Eating away from home. The increase of overweight and obesity in the United States indicates that more attention needs to be paid to serving size and total calorie content of foods eaten away from home. The proportion of all meals and snacks from away-from-home sources increased by more than two-thirds between 1977–78 and 1995, from 16 percent of all meals and snacks in 1977–78 to 27 percent of all meals and snacks in 1995. Foods prepared outside of the home tend to have higher saturated fat content, and persons tend to consume more calories when eating away from home. In 1995, the average total fat and saturated fat content of away-from-home foods, expressed as a percentage of calories, was 38 percent and 13 percent, respectively, compared with 32 percent and 11 percent for at-home foods.²³

Barriers to Implementation/Myths

Avian Bird Flu

Avian bird flu does not pose a threat to the United States food supply. Poultry products imported to the United States must meet all safety standards applied to foods produced in the United States. No poultry from countries with confirmed cases of certain strains of the virus can be imported into the United States. Additionally, the USDA has increased its monitoring of domestic commercial markets for illegally smuggled poultry and poultry products.²⁴

Common Concerns/Strategies

The Dietary Guidelines for Americans 2005 contain guidance for preventing food-borne illnesses:¹

To avoid microbial foodborne illness:

- Clean hands, food contact surfaces, and fruits and vegetables. Meat and poultry should not be washed or rinsed.
- Separate raw, cooked, and ready-to-eat foods while shopping, preparing, or storing foods.
- Cook foods to a safe temperature to kill microorganisms.
- Chill (refrigerate) perishable food promptly and defrost foods properly.
- Avoid raw (unpasteurized) milk or any products made from unpasteurized milk, raw or partially cooked eggs or foods containing raw eggs, raw or undercooked meat and poultry, unpasteurized juices, and raw sprouts.

To reduce exposure to environmental contaminants such as mercury:

- Choose canned chunk light tuna, which has less mercury than albacore tuna. Limit consumption of albacore tuna or tuna steaks to six ounces per week.
- Women of childbearing age, pregnant and lactating women, and children should avoid eating shark, swordfish, tilefish, and king mackerel.

For additional information, please see the Environmental Contaminants in Food chapter of this guide and the information posted on websites of the Food and Drug Administration (FDA) (www.cfsan.fda.gov/seafood1.html) and the Environmental Protection Agency (EPA) (www.epa.gov/waterscience/fish/advisory.html).

Opportunities for Improvement

Health professionals and organizations can look for opportunities to:

- Develop strategies to help consumers reduce the amount of cholesterol, saturated fat, and total fat consumed in foods eaten away from home.
- Support consumer education and industry efforts to promote consumer acceptance and availability of vegetable protein-based meals eaten away from home.
- Support educational efforts to assist consumers with choosing lower fat cuts of meat and poultry and healthful cooking methods.
- Support industry efforts to provide lean meats, poultry, and fish to the American consumer.

Resources/Web Sites

The American Dietetic Association (ADA)

www.Eatright.org

Beef Recipes and Nutrition

www.Beefitswhatsfordinner.com

Chicken and Food Safety:

www.fsis.usda.gov/factsheets/chicken_food_safety_focus/index.asp

Dry Bean Recipes and Nutrition

www.Americanbean.org

Environmental Protection Agency, Fish Advisories

www.epa.gov/waterscience/fish/advisory.html

Food and Drug Administration, Center for Food Safety and Applied Nutrition

www.cfsan.fda.gov

Food Safety

www.Fightbac.org

My Pyramid Dietary Guidance

www.MyPyramid.gov

Soy Information Clearinghouse

www.soybean.org

Vegetarian Nutrition Practice Group of ADA
www.Vegetariannutrition.net

Vegetarian Resource Guide
www.vrq.org

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