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Nutrition 101 – Class 3

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Protein

- Protein is the most abundant nitrogen-containing compound in the body and in the diet
  - Molecule made up of amino acids that are needed for the body to function properly
  - Proteins are the basis of body structures such as skin and hair and of substances such as enzymes and antibodies
  - Protein is used for building, maintaining, and repairing muscle, skin, blood, and other tissues

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Functions of Protein

- Enzyme catalysis
- Transport B12
- Messengers/signals for insulin and growth hormone
- Movement
- Structure: collagen, elastin, actin
- Storage of ferritin
- Immunity
- Growth

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Amino Acids

- Organic compounds that are the building blocks of protein
- The human body uses amino acids to build and repair body tissue
- Non-essential (dispensible) amino acids
  - body can make some of its own amino acids from other nutrients in the diet
- Essential (indispensible) amino acids
  - those that cannot be made by the body but must be consumed in the diet
- Animal proteins (like meat, eggs, fish, and milk) provide all of the amino acids.

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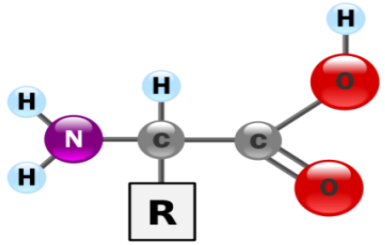
Amino Acids

- Essential
  - Valine, leucine, isoleucine, methionine, phenylalanine, tryptophan, threonine, histidine, lysine, arginine
- Non-essential
  - Glycine, alanine, proline, aspartic acid, glutamic acid, tyrosine, cysteine, serine, asparagine, glutamine



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Functions of Amino Acids

- Substrate for protein synthesis
- Regulator of protein turnover
- Regulator of enzyme activity
- Neurotransmitter
- Transport of nitrogen
- Regulator of gene transcription
- Regulator of mRNA translation

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Functions of Essential Amino Acids

- Valine
  - Required for healthy cell and organ function
- Isoleucine
  - Provides cells with energy
  - Proteinogenesis – building block for the proteins your body cells make
- Phenylalanine
  - Used to make neurotransmitters, norepinephrine, epinephrine, and L-dopa
  - Used by the thyroid to make hormones that are responsible for metabolic stimulation

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Functions of Essential Amino Acids

- Arginine
  - Produces creatine phosphate
  - Regulates blood pressure
  - Removes waste products generated from protein metabolism
  - Assists the body with the proper folding of DNA, or your genetic code
- Histidine
  - adults generally produce enough, but children do not
  - Chemical precursor to histamines
  - Low levels found in people with rheumatoid arthritis

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Functions of Essential Amino Acids

- Methionine
  - Powerful antioxidant
  - Lipid metabolism
  - Immune system
- Threonine
  - Aid in tissue maintenance by supporting protein synthesis
  - Drives metabolism
- Tryptophan
  - Used to make the B vitamin niacin as well as melatonin and serotonin

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Functions of Essential Amino Acids

- Leucine
  - Helps regulate blood sugar during fasting
  - Stimulates insulin release
  - Enhances muscle-protein metabolism
  - Decreases exercise-induced protein degeneration
  - Supports oxidative metabolism in muscles during strenuous exercise
  - Constituents of neuropeptides which produce calming and pain-relieving effects

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Functions of Essential Amino Acids

- Lysine
  - used by the body to function and maintain general health
  - Improves symptoms of osteoporosis and herpes virus

Lysine is often the most limiting amino acid, followed by sulfur amino acids (methionine and cystine), and tryptophan and threonine

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Dietary Need for Protein

- As defined by the United Nations Expert Consultation in 1985

  The protein requirement of an individual is defined as the lowest level of dietary protein intake that will balance the losses from the body in persons maintaining energy balance at modest levels of physical activity. In children and pregnant or lactating women, the protein requirement is taken to also include the needs associated with the deposition of tissues or the secretion of milk at rates consistent with good health.

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Protein Requirements

- Varies based on age, weight, physical activity, and stress induced to the body by illness or trauma
- Existing recommendations on requirements differ by various authorities because of a lack of data when some were formulated, different interpretations of data, and different criteria for judging adequate intakes

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Protein Digestion

- Most of the evidence favors the conclusion that there is an almost complete digestion of most dietary proteins in the small bowel
- “True” digestibility of most dietary proteins is high
- Animal protein foods generally have higher concentrations of indispensible amino acids than plant foods

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Recommendations for a Safe Practical Protein Intake for Healthy People

- Infants
  - up to 6 months — 1.5g/kg/day
  - 6 months to 1 year — 1.1g/kg/day
- Children
  - — 1.0g/kg/day
- Adolescent
  - — 0.9g/kg/day
- Young Adults and Elderly
  - — 0.8g/kg/day
- Women
  - Pregnant and lactating — 1.1g/kg/day

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US RDA Recommendations

Sedentary Individuals	0.73g/kg/day
Healthy Individuals	0.8g/kg/day
Endurance Athletes	1.37g/kg/day
Weight Training	2.0-2.2g/kg/day
Very Intense Weight Training	2.0-2.6g/kg/day

Athletes	12-20% of total calories
Obese Weight Loss	25% of total calories

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High Quality Protein Foods

- Eggs
- Milk
- Beef
- Chicken
- Eggs
- Greek Yogurt
- Pork
- Lamb
- Turkey
- Fish
- Cheese
- Kefir

About 1 ounce of protein = 7 grams of protein

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Other Protein Sources

- Beans/Legumes
- Rice
- Corn
- Wheat
- Tofu
- Barley
- Rye
- Nut Butters
- Nuts/Seeds
- Peas
- Potatoes
- Vegetables
- Rice
- Oats
- Lentils
- Couscous

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Complimentary Proteins

FOODS	LIMITING AMINO ACIDS (low levels, not completely missing)	COMPLEMENTARY FOODS	MENU ITEM EXAMPLES
Legumes: lentils, peas beans	Tryptophan Methionine	Grains, nuts & seeds	Stir-fry veg w/green soybeans, served over brown rice, sesame seeds garnish or Hummus (chickpeas & tahini spread), served with whole wheat pita bread
Grains: wheat, corn, rice, oats barley, rye	Lysine Isoleucine Threonine	Legumes, dairy	Grilled cheddar on whole wheat bread or Cornbread & chili beans, grated cheddar
Nuts & Seeds Almonds, peanuts, sunflower, cashews	Lysine Isoleucine	Legumes	Lentil-walnut loaf, cashew gravy or Fried tofu cubes on mixed salad, peanut-coconut dressing

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Protein Chart

MindfulEats Protein Chart

Body Weight	Normal Requirement (.36 gms per pound)	Sample Menu	Athletic Requirement (.45-.72 gms per pound)	Sample Menu
100 lbs / 45.4 kg	36 gms	•2 eggs/12 gms •1 c. Greek yogurt/19 gms •1 oz almonds/ 6gms	45-72 gms	Same as normal, plus: •8 oz milk/ 8gms •3/5 oz tofu/10 gms •1 c quinoa/8 gms
125 lbs / 56.7 kg	45 gms	Same as above, plus: 2T peanut butter/8 gms	56-90 gms	Same as above, plus: 4 oz chicken breast (no skin) / 32 gms
150 lbs / 68.0 kg	54 gms	Same as above, plus: 10 oz fresh spinach/8 gms	68-108 gms	Same as above, plus: 1/2 c. black beans/8 gms
200 lbs / 90.7 kg	72 gms	Same as above, plus: 3.5 oz most fish / 22gms	90-144 gms	Same as above, plus: 4 oz. hamburger patty/28 gms

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PROTEIN COMPARISON CHART - SORTED BY PROTEIN LEVELS

	Description	Amount	Protein (grams)	Cholesterol (milligrams)	Fat (grams)	Fiber (grams)	Calories
Vegan	Wheat Gluten (aka Seitan)	approx 1 cup	75	0	2	1	370
Vegan	Soybeans	1 cup	68	0	37	17	830
Vegan	Lentils (raw)	1 cup	50	0	2	59	678
Vegan	Kidney Beans	1 cup	44	0	1	46	607
Vegan	Black Beans	1 cup	42	0	3	30	662
	Tuna, canned	4 oz	30	35	9	0	210
	Ground Beef Patties	4oz patty	26	95	27	0	333
Vegan	Peanut Butter, chunky	1/3 cup	24	0	50	8	589
	Salmon	4 oz	23	62	15	0	235
	Steak, Porterhouse	4 oz	23	64	17	0	252
Vegan	Tofu, raw, firm	approx 1/2 cup	20	0	11	3	183
Vegan	Tempeh	approx 1/2 cup	19	0	11	?	193
	Chicken - uncooked	1/2 breast	18	56	8	0	150
	Ham, deli slices	4 slices	18	64	10	2	183
	Turkey Breast	4 slices	14	36	1	0	87
	Eggs, whole raw	2 eggs	13	423	10	0	143
	Bacon	4 slices	11	62	34	0	351
Vegan	Walnuts	1/2 cup	9	0	38	4	383
Vegan	Brown Rice, cooked	1 cup	5	0	2	4	216

SOURCE: USDA FOOD NUTRITION INFORMATION (www.nal.usda.gov/fnic/foodcomp/search/)

10 tips
Nutrition Education Series

with protein foods, variety is key

10 tips for choosing protein

Protein foods include both animal (meat, poultry, seafood, and eggs) and plant (beans, peas, soy products, nuts, and seeds) sources. We all need protein—but most Americans eat enough, and some eat more than they need. How much is enough? Most people, ages 9 and older, should eat 5 to 7 ounces* of protein foods each day.

1 vary your protein food choices

Eat a variety of foods from the Protein Foods Group each week. Experiment with main dishes made with beans or peas, nuts, soy, and seafood.

2 choose seafood twice a week

Eat seafood in place of meat or poultry twice a week. Select a variety of seafood—include some that are higher in oils and low in mercury, such as salmon, trout, and herring.

3 make meat and poultry lean or low fat

Choose lean or low-fat cuts of meat like round or sirloin and ground beef that is at least 90% lean. Trim or drain fat from meat and remove poultry skin.

4 have an egg

One egg a day, on average, doesn't increase risk for heart disease, so make eggs part of your weekly choices. Only the egg yolk contains cholesterol and saturated fat, so have as many egg whites as you want.

5 eat plant protein foods more often

Try beans and peas (kidney, pinto, black, or white beans; split peas; chickpeas; hummus), soy products (tofu, tempeh, veggie burgers), nuts, and seeds. They are naturally low in saturated fat and high in fiber.

6 nuts and seeds

Choose unsalted nuts or seeds as a snack, on salads, or in main dishes to replace meat or poultry. Nuts and seeds are a concentrated source of calories, so eat small portions to keep calories in check.

7 keep it tasty and healthy

Try grilling, broiling, roasting, or baking—they don't add extra fat. Some lean meats need slow, moist cooking to be tender—try a slow cooker for them. Avoid breading meat or poultry, which adds calories.

8 make a healthy sandwich

Choose turkey, roast beef, canned tuna or salmon, or peanut butter for sandwiches. Many deli meats, such as regular bologna or salami, are high in fat and sodium—make them occasional treats only.

9 think small when it comes to meat portions

Get the flavor you crave but in a smaller portion. Make or order a smaller burger or a "petite" size steak.

10 check the sodium

Check the Nutrition Facts label to limit sodium. Salt is added to many canned foods—including beans and meats. Many processed meats—such as ham, sausage, and hot dogs—are high in sodium. Some fresh chicken, turkey, and pork are brined in a salt solution for flavor and tenderness.

* What counts as an ounce of protein foods? 1 ounce lean meat, poultry, or seafood; 1 egg; ¼ cup cooked beans or peas; ½ ounce nuts or seeds; or 1 tablespoon peanut butter.

USDA United States Department of Agriculture
Center for Nutrition Policy and Promotion

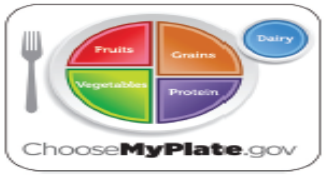
Go to www.ChooseMyPlate.gov for more information.

DG TipSheet No. 6
June 2011

10 tips
Nutrition Education Series

healthy eating for vegetarians

10 tips for vegetarians



A vegetarian eating pattern can be a healthy option. The key is to consume a variety of foods and the right amount of foods to meet your calorie and nutrient needs.

1 think about protein

Your protein needs can easily be met by eating a variety of plant foods. Sources of protein for vegetarians include beans and peas, nuts, and soy products (such as tofu, tempeh). Lacto-ovo vegetarians also get protein from eggs and dairy foods.

2 bone up on sources of calcium

Calcium is used for building bones and teeth. Some vegetarians consume dairy products, which are excellent sources of calcium. Other sources of calcium for vegetarians include calcium-fortified soymilk (soy beverage), tofu made with calcium sulfate, calcium-fortified breakfast cereals and orange juice, and some dark-green leafy vegetables (collard, turnip, and mustard greens; and bok choy).

3 make simple changes

Many popular main dishes are or can be vegetarian—such as pasta primavera, pasta with marinara or pesto sauce, veggie pizza, vegetable lasagna, tofu-vegetable stir-fry, and bean burritos.

4 enjoy a cookout

For barbecues, try veggie or soy burgers, soy hot dogs, marinated tofu or tempeh, and fruit kabobs. Grilled veggies are great, too!

5 include beans and peas

Because of their high nutrient content, consuming beans and peas is recommended for everyone, vegetarians and non-vegetarians alike. Enjoy some vegetarian chili, three bean salad, or split pea soup. Make a hummus-filled pita sandwich.

6 try different veggie versions

A variety of vegetarian products look—and may taste—like their non-vegetarian counterparts but are usually lower in saturated fat and contain no cholesterol. For breakfast, try soy-based sausage patties or links. For dinner, rather than hamburgers, try bean burgers or falafel (chickpea patties).

7 make some small changes at restaurants

Most restaurants can make vegetarian modifications to menu items by substituting meatless sauces or non-meat items, such as tofu and beans for meat, and adding vegetables or pasta in place of meat. Ask about available vegetarian options.

8 nuts make great snacks

Choose unsalted nuts as a snack and use them in salads or main dishes. Add almonds, walnuts, or pecans instead of cheese or meat to a green salad.

9 get your vitamin B_{12}

Vitamin B_{12} is naturally found only in animal products. Vegetarians should choose fortified foods such as cereals or soy products, or take a vitamin B_{12} supplement if they do not consume any animal products. Check the Nutrition Facts label for vitamin B_{12} in fortified products.

10 find a vegetarian pattern for you

Go to www.dietaryguidelines.gov and check appendices 8 and 9 of the *Dietary Guidelines for Americans, 2010* for vegetarian adaptations of the USDA food patterns at 12 calorie levels.

USDA United States Department of Agriculture
Center for Nutrition Policy and Promotion

Go to www.ChooseMyPlate.gov for more information.

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June 2011

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Questions, Comments

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