CLEMSON
COOPERATIVE EXTENSION

http://www.clemson.edu/extension/hgic

HGIC 4062 1-888-656-9988

HOME & GARDEN INFORMATION CENTER

Nutrient Density

Why is an apple a better choice than a bag of pretzels? They have roughly the same number of calories, but nutrients count, too. The apple provides fiber,vitamin C and potassium for an equal number of calories. Therefore, the apple has a higher nutrient density.

A serving of watermelon and a 12-ounce soft drink both have 150 calories. However, the watermelon is more nutrient dense, because it has vitamin C and fiber. The soft drink contains only simple sugars or "empty calories."

What is Nutrient Density?

It is a measure of the nutrients provided per calorie of food, or the ratio of nutrients to calories (energy).

Foods that supply generous amounts of one or more nutrients compared to the number of calories they supply are called nutrient dense. Eggs, for example, have a high nutrient density, because they provide protein and many vitamins and minerals in proportion their calories.

Nutrient density is a way of evaluating the nutritional quality of a food by comparing the amount of nutrients supplied in relation to the amount of calories supplied. Table 1 compares the key nutrients found per 100 calories of certain representative foods.

Table 1. Nutrient Density of Representative Foods for Key Nutrients
Amount Supplied Per 100 Calories of Food

Food	Protein (g)	Iron (mg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	B6 (mg)	B12 (mcg)
Beef, composite (lean only)	13.7	1.4	3.2	0.04	0.12	1.89	0.17	1.21
Pork, composite (lean only)	11.6	0.5	1.5	0.30	0.15	2.18	0.18	0.36
Lamb, composite (lean only)	13.7	1.0	2.6	0.05	0.16	3.07	0.08	1.27
Veal, composite (lean only)	16.3	0.6	2.6	0.03	0.17	4.30	0.17	0.84
2% Low-fat Milk	6.7	0.1	0.8	0.08	0.33	0.17	0.09	0.73
Regular Soft Drink	0.1	0.1	0.0	---	---	---	---	---
Cinnamon Danish Pastry	1.8	0.5	0.2	0.07	0.07	0.71	---	---
Bagel, plain	3.8	1.3	0.3	0.19	0.11	1.66	0.02	---
Baked Potato, with skin	2.1	1.2	0.3	0.10	0.30	1.51	0.32	---
Apple, raw with skin	0.3	0.3	0.1	0.03	0.02	0.13	0.08	---
Popcorn, air-popped	3.1	0.7	0.9	0.05	0.07	0.51	0.06	---

Calculated from USDA Composition of Foods – Raw, Processed, Prepared. USDA Human Nutrition Information Service. Agriculture Handbook Series (8-1, 1976; 8-9, 1982; 8-10, 1992; 8-11, 1984; 8-13, 1990; 8-14, 1986; 8-17, 1989; 8-18, 1992; 8-19, 1991).

Nutrient Dense Foods

The following foods are nutrient dense:

- fruits and vegetables that are bright or deeply colored
- foods that are fortified
- lower fat versions of meats*, milk, dairy products and eggs

(See Table 2 for examples of the most nutrient dense ethnic and regional foods.)

*A 3-oz. serving of meat provides about 160-200 calories plus significant amounts of many key nutrients such as protein, B-vitamins, iron, and zinc. By comparison, a snack food or soft drink with essentially the same number of calories per serving is very low or lacking in most nutrients (especially micronutrients) other than fat and/or carbohydrate. Therefore, meat is a "nutrient-dense" food while the snack food is not.

Less nutrient dense foods may:

- be lighter or whiter in color
- contain a lot of refined sugar
- be refined products (white bread as compared to whole grains)
- contain high amounts of fat for the amount of nutrients compared to similar products (fat-free milk vs. ice cream**)

**Milk is denser than ice cream in calcium per calorie. A cup of fat-free milk has about twice the calcium as a cup of ice cream; however, the milk only contains 85 calories and the ice cream has more than 350 calories.

Table 2. Most Nutrient Dense Ethnic & Regional Foods

	Chinese	**Greek**	**Mexican**	**Deep South (West African Influence)**
Bread, Cereal, Rice, and Pasta	millet, rice, rice noodles, steamed buns	Greek breads, flat bread, noodles	cereal, corn or flour tortillas, macaroni, rice	grits, macaroni, rice
Vegetables	baby corn, bamboo shoots, bean sprouts, bok choy, cabbages, scallions, seaweed, snow peas, water chestnuts	cucumbers, eggplant, lentils and beans, onions, peppers, tomatoes	cabbage, cactus, legumes, squash, tomatoes	beans, black-eyed peas, collards (other leafy greens), green beans, okra, tomatoes
Fruits	oranges, pears, plums, and other fresh fruit	dates, figs, grapes, lemons, melons, raisins	bananas, guava, mango, oranges, papaya, pineapple	apples, bananas, berries, melons, peaches, pears
Milk, Yogurt, and Cheese	not traditionally consumed	low-fat yogurt	evaporated low-fat milk, powdered fat-free milk	low-fat buttermilk, low-fat cheeses, low-fat milk
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts	broiled or stir-fried fish and seafood, egg whites	egg whites, fish and seafood, lentils and beans	fish, lean beef, poultry, lamb, and pork, and many bean varieties	beans and peas, grilled or smoked poultry and fish
Fats, Oils, and Sweets	none	none	none	none
Seasonings and Sauces	bean sauce, garlic, ginger root, hoisin sauce, oyster sauce, plum sauce, rice wine, scallions, soy sauce	garlic, herbs, lemons, egg and lemon sauce	herbs, hot peppers, garlic, pico de gallo (finely chopped tomatoes, peppers, and onions with seasonings), salsas, spices	none

Source: Sizer, Frances and Eleanor Whitney. *Nutrition Concepts and Controversies, Ninth Edition*. 2003. pages 40-41.

Nutrient-Dense vs. Energy-Dense

Nutrient-Dense: These foods provide more nutrients and generally fewer calories per unit volume. They are loaded with the nutrients that we need to thrive (e.g. fruits, vegetables, whole grains).

Energy-Dense: These foods provide more calories (energy) per unit of volume than nutrient-dense foods. Although energy-dense sounds healthy, it is not, because these "empty calories" primarily come from refined sugars and fat.

The Better Choice: A nutrient-dense food is generally a better choice than a less nutrient-dense food or an energy-dense food with the same number of calories. If you have a certain number of calories to eat, try to choose the foods with more nutrients. For example, make these healthier food choices:

- a potato instead of potato chips
- a banana instead of a soda
- fruit instead of cake
- extra vegetables instead of a dinner roll
- vegetable snacks instead of candy and sodas
- whole grain bread rather than white bread

Make nutrient density work for you. Increase the amount of nutrients in the foods you eat OR decrease the energy (calorie) content Or both. Nutrient density lets you eat more food, so that you feel fuller for a longer time.

Summary

The 2005 Dietary Guidelines for Americans recommend consuming a variety of nutrient-dense foods and beverages as part of a healthful diet. Center your meals on foods of high nutrient density. Select whole grains, lower-fat dairy products, lean meats, seafood, eggs, beans, and nuts.

Choose foods within and among the basic food groups that also limit intake of saturated and trans fats, cholesterol, added sugars, salt, and alcohol. For example, many fruits and vegetables, as well as whole grain breads and cereals, are low in fat and packed with vitamins, minerals and fiber.

Eat a variety of colorful fruits and vegetables daily, since they are usually low in calories and are nutrient dense. Choose often the non-starchy vegetables, such as broccoli, carrots, mushrooms, peppers, and tomatoes. Eat limited amounts of avocado and some starchy vegetables (potatoes, yams, corn), because they are higher in calories.

Avoid a diet consisting of mostly refined, processed foods that are less nutritious and contain added sugar and fat. Even when foods are fortified or enriched, the whole range of nutrients and non-nutrients lost in refining cannot be replaced. For example, a food's original magnesium and chromium is milled out and is not replaced.

Shop around the perimeter of the supermarket. If limited on time, select nutrient-dense convenience foods like frozen vegetables, bags of ready-to-serve salads, and refrigerated prepared meats.

For more information on food labeling request:

- HGIC 4056, *Reading the New Food Labels*
- HGIC 4057, *Determining Nutritional Value of Foods*
- HGIC 4058, *Food Labels: Fat and Cholesterol*
- HGIC 4059, *Food Labels: Carbohydrates*
- HGIC 4060, *Serving Sizes for Special Diets*
- HGIC 4061, *Nutrient Claims on Food Labels*

Sources:

1. Cason, Katherine L. Clemson University Department of Food Science and Human Nutrition. *Nutrient Density (Consumer Judging--Junior/Senior)*. February 2005.
2. University of Wisconsin Cooperative Extension. *Nutrient Density: Optimize Your Intake!* http://www.uwex.edu/ces/cty/Oconto/wnep/documents/nutrientdensity.pdf
3. Tufts University, Health Sciences Campus. *Expert Recommends Communicating "Nutrient Density" to Consumers*. April 5, 2006. www.newswise.com/p/articles/view/519371/
4. Dooley, Dian A. Island Scene Online. *Nutrient Density: An Idea Whose Time Has Finally Come*. July 27, 2005. www.islandscene.com/Article.aspx?id=2641
5. Sizer, Frances and Eleanor Whitney. *Nutrition Concepts and Controversies, Ninth Edition*. 2003.

This information has been reviewed and adapted for use in South Carolina by J. G. Hunter, HGIC Information Specialist, and K. L. Cason, Professor, State EFNEP Coordinator, Clemson University. (New 11/06.)

This information is supplied with the understanding that no discrimination is intended and no endorsement by the Clemson University Cooperative Extension Service is implied. All recommendations are for South Carolina conditions and may not apply to other areas. Use pesticides only according to the directions on the label. All recommendations for pesticide use are for South Carolina only and were legal at the time of publication, but the status of registration and use patterns are subject to change by action of state and federal regulatory agencies. Follow all directions, precautions and restrictions that are listed.

The Clemson University Cooperative Extension Service
offers its programs to people of all ages, regardless of race, color, sex, religion, national origin, disability, political beliefs, sexual orientation, marital or family status and is an equal opportunity employer.
Clemson University Cooperating with U.S. Department of Agriculture, South Carolina Counties, Extension Service, Clemson, South Carolina. Issued in Furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of May 8 and June 30, 1914
Public Service Activities