

# Vegetarianism

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The resurgence of consciousness about nutrition and diet has led to an examination, from a global perspective, of meat consumption in the U.S. and other Western countries. The average per capita consumption of red meat, poultry, and fish in the U.S. in 1979 was nearly 265 lb. Argentina is famous for its consumption of beef, the world's highest per capita; there the grilled steak, *churrasco*, takes on the proportions of a minor religion. In decades past, the Eskimo diet was composed almost exclusively of meat and fish.

It has often been argued on biological grounds that by nature man was meant to be a meat-eater. Prehistoric cave paintings have given us a romantic view of early man as a hunter-trapper, gorging himself with large quantities of game after a successful catch, discarding the well-picked bones by the fire, and fasting until the next hunt. To provide a more factual picture, the fossilized teeth of Paleolithic man have been examined. The stress impressions on the molars suggest that the principal source of calories was not meat, but rather roots, fruits, and nuts. Although the record of the mundane activities of gathering these foods may not have been painted on the walls of his caves, it has been etched in the enamel of the teeth of prehistoric man, and tells us that the caveman was to a large extent a vegetarian.

Still today, the majority of the world's population does not have access to abundant supplies of animal protein, which, in this context, signifies the flesh or organs of meat, fish, or fowl, but not dairy products or eggs. Animal protein is either unavailable or priced beyond the reach of the majority of the people. It constitutes so little of the dietary intake in most less developed countries that much of the world is de facto vegetarian. In Lebanon, the average yearly intake of meat is about 11 lb per capita. In some regions, this vegetarianism has been formalized; the Hindu and Jain religions proscribe the consumption of meat, and this practice is widely adhered to. Thus, in the global and historical perspective, the meat-eaters in the prosperous industrialized countries of today represent a minority of the world's population and constitute an exception in the long history of the human species.

## Vegetarianism in Western societies

Since meat is relatively abundant and generally affordable in the West, the exclusion of meat from the diet represents a conscious choice for moral, esthetic, or

dietary reasons. Traditionally, vegetarian practices have been observed by some religious or philosophic groups. The Trappist monks, as an expression of humility and discipline, observe an austere dietary regimen which eliminates meats and emphasizes grains and fruits. Most strict adherents of the Seventh-day Adventist Church do not consume the flesh of animals. Members of a movement originating in England, the vegans, abhor the use of any product derived from living, sentient beings. Their diet is exclusively of plant origin. No milk (other than human breast milk) nor eggs are permitted. From similar ethical considerations, clothing articles of leather or fur are also spurned.

In the latter half of the 20th century a new wave of vegetarianism has arisen in the United States and other Western countries. In the early 1970s, the U.S. was confronted by numerous manifestations of dissent in its youth; from this caldron of social and political protest and expressions of alternative life-styles emerged what nutritionist Johanna Dwyer and others were to designate the "new vegetarians." The incentives and motivations for vegetarianism in this new wave were various. Some were derived from philosophical underpinnings in the teaching of yoga or in the Zen macrobiotic movement founded by Georges Ohsawa and popularized in the West in the 1970s.

Many more, however, adopted vegetarian practices from ethical concerns related to gentleness and nonviolence. Explicit health concerns were also important. The notion that meat, because it comes from animals dying in terror in the slaughterhouses, was injurious to health became popular. The new vegetarians also expressed concern about the use of hormones and antibiotics in animal feeds and about excessive concentrations of pesticides, heavy metals, and other toxic substances in animal tissue. For some, the motivation for vegetarianism was political and environmental. Many were impressed by the oft-quoted figure that 16 pounds of grain are required to produce one pound of beef. Frances Moore Lappé's *Diet for a Small Planet*, a vegetarian handbook published in 1971 (revised 1975), deals explicitly with the environmental issues in the commercial production of meat from livestock. Thus, to a greater or lesser degree, a blend of philosophical-religious precepts and health concerns prompted the adoption of vegetarianism.

## The classification of vegetarians

Individuals who exclude all forms of foods derived from sentient organisms are called *vegans*. Their diet is composed exclusively of plant foods. A subgroup of vegans whose diet is based primarily on fruits and nuts are called *fruitarians*. Those who include eggs are called *ovovegetarians*; those who include milk or dairy products are called *lactovegetarians*; those who include both nonflesh forms of animal-derived protein foods are called *ovolactovegetarians*. Still other peo-

ple reject red meat from game or domestic livestock, but accept fish and seafood (*pescovegetarians*) or fowl (*pollovegetarians*). The latter two are often motivated by the health concerns mentioned above, but cannot be considered vegetarians in the strictest sense of the word.

### Potential nutritional liabilities

Vegetarians have been concerned about the quality and quantity of essential nutrients in their diets and about the effects of such a diet on children.

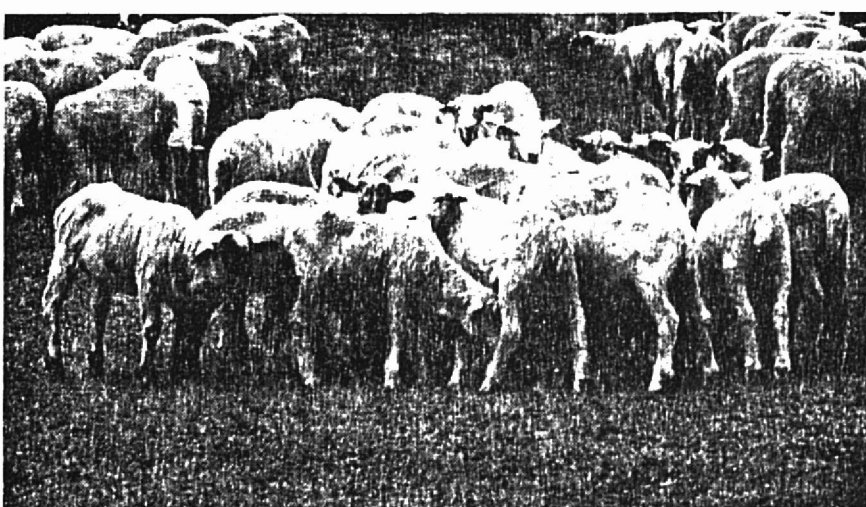
Protein-containing foods are essential to provide amino acids, the chemical building blocks for the manufacture of new proteins for the body's tissues. Of the 22 amino acids in mammalian tissues, 9 cannot be synthesized efficiently from scratch in the human body, but must be provided to the body in food. They constitute the so-called essential amino acids. The ability of a food's protein to adequately supply the metabolism of the human body is dependent not only on the amount of protein present, but also on the composition and relative proportion of the essential amino acids in the food. The balance of essential amino acids in milk or eggs is ideal for utilization by the human body. Meat protein is also of excellent quality.

Some foods of plant origin also have a high content of protein. Beans and other legumes have a protein content of up to 23%, whole grains up to 14%. However, the protein from plant foods does not contain the same ideal proportions of essential amino acids that proteins of animal origin do. (See diagram, page 207.) Because of this, strict vegans run the risk of a very low intake of utilizable amino acids from the protein in cereal grains, beans, fruits, and vegetables. This is especially true if the diet is based primarily on one source of calories, such as brown rice.

M. A. Crawford, a British neurochemist and nutritionist, has introduced a new note of concern about the vegetarian's nutrients, one regarding the quality of fats. Crawford conducted research on the biochemistry of brain development, and concluded in a report published in 1975 that the preferred structural fats for membranes in the brain must come to humans preformed from other animals. He has speculated that if "synthetic" meats, milks, cheeses, and butter from isolated vegetable protein ever became dominant, the full potential of human brain development would be jeopardized.

The quality of certain minerals is also inferior in foods of plant origin. Iron from red meat, fish, or fowl, for instance, is absorbed much more readily because of its chemical form. The iron in plants is in the form of an inorganic iron salt. Moreover, certain constituents of plants, such as their fibrous strands, gums, and waxes, and phosphated organic molecules, bind iron in the intestine so that it is not well absorbed. Zinc, another mineral important to human health, appears to be more

(Top) John Colwell—Grant Heilman, (others) Grant Heilman



*There are political and environmental as well as nutritional motivations for vegetarianism. The average Westerner eats 1 cow, 7 steers, 36 pigs, 36 sheep, and 550 poultry in his lifetime. Nearly five people could be fed for a lifetime on the amount of plant food necessary to raise these animals.*



**Table 1: Vegetarian dishes with complete protein**

**grains with legumes**

rice with lentils  
rice with black-eyed peas  
peanut butter sandwich  
bean taco  
macaroni enriched with soy flour  
bean soup with toast  
falafel (chickpea cake) with pita bread

**grains with milk**

oatmeal with milk  
wheat flakes with milk  
rice pudding  
pancakes and waffles  
breads and muffins made with milk  
pizza  
macaroni and cheese  
cheese sandwich  
creamed soup with noodles or rice  
quiche  
meatless lasagna  
granola with milk

**legumes with seeds**

bean curd with sesame seeds  
hummus (chickpea and sesame paste)  
bean soup with sesame meal

**grains with eggs**

rice pudding  
kasha (buckwheat groats)  
fried rice  
oatmeal cookies  
quiche  
egg-salad sandwich  
noodle pudding  
french toast

**vegetables with milk or eggs**

potato salad  
mashed potatoes with milk  
eggplant parmesan  
broccoli with cheese sauce  
cream of pumpkin soup  
cheese and potato soup  
vegetable omelet  
scalloped potatoes  
spinach salad with sliced egg

available to the body if it comes from animal foods than if derived from plants.

The average amount of nutrients essential to adequate human nutrition has been established by a committee of the Food and Nutrition Board of the National Academy of Sciences. These Recommended Dietary Allowances, or RDA's, specify the amount of essential nutrients that are necessary in the diet of persons of various ages to provide for normal metabolism. Some nutrients are in short supply in vegan diets. It is difficult to meet the recommended intakes of calcium and riboflavin (vitamin B<sub>2</sub>) in a diet devoid of flesh, eggs, and milk. Vitamin B<sub>12</sub> is another critical nutrient. In nature, vitamin B<sub>12</sub> is synthesized by microorganisms. It is abundant in the liver and other animal tissues, and is present in small quantities in eggs and milk. The only

plant foods that provide nutritionally relevant amounts of the vitamin are fermented bean curds and pastes such as Japanese *miso* and Indonesian *tempeh*; the vitamin is synthesized by bacterial action during fermentation. Vegetarians generally have much lower intakes of vitamin B<sub>12</sub> than meat-eaters, and this is reflected in lower circulating levels of this nutrient in the blood. Deficiency of vitamin B<sub>12</sub> ultimately leads to anemia and neurological abnormalities, but these conditions are nonetheless extremely rare in practicing vegetarians. A much-cited case of presumed nutritional deficiency of vitamin B<sub>12</sub> in the totally breast-fed infant of a vegan mother was reported by a team of pediatricians in California in 1978 in *The New England Journal of Medicine*. Other physicians, however, have failed to detect this condition in the progeny of vegetarian mothers. It should be noted that vitamin B<sub>12</sub> is easily available in fortified nutritional yeast or as vitamin supplements.

The vegetarian practices of some individuals rely heavily on one or two foodstuffs to provide the bulk of the dietary calories. In this circumstance, other nutrients can become severely limited as well. Rickets, a bone disease due to vitamin D deficiency, was diagnosed in 1979 in several infants in Boston who were largely breast-fed by mothers following Zen macrobiotic practices. The weaning food used by orthodox adherents of Zen macrobiotics is called *kokoh*, and consists of sesame seeds, brown rice, aduki beans, and oats in water, a bulky preparation. Considering the limited capacity of an infant's stomach, it is difficult to provide the recommended protein and energy intake with this food. Several cases of severe protein-deficiency syndrome have been seen in babies weaned to *kokoh*. An occasional adult vegetarian has also gotten into serious nutritional trouble on a vegetarian regimen. A report in the *Journal of the American Medical Association* in 1967 described the case of a woman in New York, evaluated at the Cornell Medical College, who developed clinical signs of protein deficiency, scurvy (vitamin C deficiency), and folic acid deficiency anemia on a diet based primarily on boiled rice and sesame seeds. Her regimen was based on the most restrictive diet of the Zen macrobiotic program, and she had subsisted on this diet for eight months. She was admitted to the hospital near death, but responded rapidly to nutritional repletion.

Questions have arisen as to whether vegetarian mothers produce an adequate quality and quantity of breast milk. The problems with bulkiness and low density of protein and other nutrients in vegan-weaning foods is a further cause of concern. These issues prompted a group of public health investigators in Boston, headed by Johanna Dwyer, to monitor the growth of the children of vegetarian mothers—most of whom were adherents of Zen macrobiotics—during the first years of life. Their findings, reported in the *Journal of*

Amino acid balance in protein foods					
amino acids	milk	soybeans	wheat	corn	rice
tryptophan					
threonine					
isoleucine					
leucine					
lysine					
phenylalanine/ tyrosine					
valine					
methionine/ cystine					
histidine					

*In order to make protein the body requires specific proportions of essential amino acids, which are supplied by foods. Some foods lack certain amino acids. The diagram above superimposes high-quality amino acid levels on the actual levels in five foods. By combining foods, amino acid balance can be adjusted. The lysine missing from rice, for example, can be complemented by the extra lysine in milk.*

the American Dietetic Association in 1978, revealed that the infants of vegetarians tended to lag behind the growth curves of their nonvegetarian peers. However, during the third and fourth years of life, vegetarian children actually consumed more calories than a group of nonvegetarian children during the same interval, and caught up with the growth trajectory of their meat-eating peers. Thus, no permanent retardation in growth seemed to be produced in children raised in vegetarian households. Nonetheless, it is known from studies of famine victims that severe protein deficiency in the first few years of life results in deficits in brain development that cannot be reversed by later nutritional supplements.

### Potential nutritional assets

The body composition of vegetarians tends toward lean tissue, and their body weights are consistently below the accepted standards of weight-for-age. These standards, it should be noted, are based in the United States on a generally overfed population. Changing from a mixed, meat-containing diet to a vegetarian diet almost invariably results in a weight loss. The risk of obesity, therefore, is reduced by following a vegetarian diet.

Studies in the Boston area revealed a considerably lower average blood pressure in members of vegetarian communes, communes largely organized around the teaching of Zen macrobiotics. Similarly, in these

same communities, and among adolescent vegetarians in Great Britain, the circulating concentration of blood cholesterol and triglycerides was reduced below the levels commonly seen in meat-eating populations. It should be pointed out, however, that these groups restricted the consumption of eggs and dairy products as well as meat, and were close to being complete vegans. Moreover, the philosophical and religious components of the Zen macrobiotic life-style may explain part of the protection against hypertension.

A predictable consequence of reducing the animal protein in the diet is the substitution of protein sources of plant origin. Adoption of a vegetarian diet invariably results in an increased intake of dietary fiber, the nondigestible roughage components of plants and fruits. Diets rich in fiber have been credited by some physicians, notably British surgeon Denis Burkitt, with preventing diseases of the colon, hemorrhoids, varicose veins, and cardiovascular disease. Fiber holds water in the colon, increases the bulk of stools, and improves bowel function. In fact, bowel cancer incidence may be lower among people with a high fiber consumption; this association, however, might be due as much to absence of meat and animal fat as to dietary enrichment with fiber.

### Can vegetarians have adequate nutrition?

Since the scarcity and cost of meat make most of the world's people de facto vegetarians, as previously not-



ed, it then becomes important, in light of the liabilities discussed above, to ask whether vegetarians can have adequate nutritional health. The answer, according to many nutritionists, is an emphatic yes.

Several teams of scientists have compared the nutrition of vegetarians and nonvegetarians. M. G. Hardinge and F. J. Stare in 1954 compared the physical and laboratory findings of nonvegetarians, ovo-lacto-vegetarians, and vegans in southern California. The status of the red blood cells and serum proteins was comparable in all three groups. The physical health of all groups was equivalent, although the pure vegans weighed an average 20 lb less than members of the other two groups. Essentially similar findings were reported in 1970 in a comparative study of vegans and meat-eating individuals in London.

There is a caveat, however, to the conclusion that vegetarian diets can provide nutritional adequacy. Vegetarians must pay conscious attention to the inclusion of the necessary quality and quantity of nutrients. Useful guides to developing nutritionally balanced vegetarian menus can be found in Lappé's *Diet for a Small Planet* and Laurel Robertson's *Laurel's Kitchen: A Handbook for Vegetarian Cookery and Nutrition* (1976). Both of these books focus on the central issue of protein quality. As noted earlier, foods of plant origin tend to be deficient in one or another essential amino acid; but, by combining foods in a vegetarian diet in such a way that the relative deficit of a given amino acid in the protein of one item is covered by a relative excess in another, the quality of the protein in a meal is markedly enhanced. This approach to balancing amino acids in vegetarian diets is called *complementation* of proteins. Beans, for instance, have a relative deficiency of the essential amino acid methionine, but an excess of lysine; in corn, the situation is reversed. Thus, if one combines these two foods at a meal—as is common in the bean and tortilla diet of southern Mexico and Central America—an overall protein value approaching that of meat or milk can result. There are three basic rules for the complementation of proteins: combine legumes (dried beans and peas, and peanuts) with grains; combine legumes with nuts and seeds; combine dairy products or eggs with any vegetable protein. Table I on page 206 lists some familiar foods that provide complete protein for vegan or ovo-lacto-vegetarian diets.

Milk and dairy products represent an outstanding source of dietary calcium. Thus, sufficient calcium intake is a concern for vegans and ovo-vegetarians. An Ethiopian grain, teff, and the lime-treated corn used in tortillas are excellent sources of calcium in a vegetarian diet, as are green, leafy vegetables, soybeans, molasses, almonds, and dried fruits.

The absorbability of iron and zinc are reduced by the natural binding substances in plants. Iron absorption can be enhanced by consuming foods high in vitamin

**Table II: Menu for an adult male vegan**

<b>breakfast</b>	
orange .....	1 medium
bulgur .....	1 cup
with brewer's yeast .....	1 tablespoon
toasted wheat-soy bread .....	1 slice
with honey .....	1 tablespoon
<b>morning snack</b>	
shelled almonds .....	¼ cup
<b>lunch</b>	
split pea soup .....	2 cups
peanut butter sandwich:	
peanut butter .....	2 tablespoons
whole wheat bread .....	2 slices
honey .....	1 tablespoon
fruit-sunflower seed salad:	
apple .....	½ medium
banana .....	½ medium
sunflower seeds .....	¼ cup
lettuce .....	1 leaf
<b>afternoon snack</b>	
peach .....	1 medium
<b>dinner</b>	
soybeans .....	1 cup
brown rice, cooked .....	1 cup
fried in oil .....	2 tablespoons
with chestnuts .....	2 tablespoons
with sesame seeds .....	2 tablespoons
collards .....	1 cup
pear .....	1 medium
<b>evening snack</b>	
raisins .....	¼ cup

*Nutrition Program News*, U.S. Department of Agriculture,  
Washington, D.C., July/August, 1973

C, such as peppers or citrus fruits, and by preparing meals in iron cookware. The zinc content of wheat grains is high. Thus, despite the inhibitory factors, large amounts of whole grains can provide sufficient zinc to the body. Leavening of baked goods made from whole grains tends to free zinc for intestinal absorption. There is evidence that over the long haul the intestinal cells of most vegetarians adjust to extract more zinc from the diet.

In 1973, consultants to the United States Department of Agriculture put together a sample menu for a vegan male that would provide 100% of the RDA's, except for vitamin B<sub>12</sub>, to an adult. This combination of foods is shown above in Table II. Similarly, for children, considerable attention has been given to the composition of nutritionally sound vegetarian diets. Vegetarian cookbooks such as those mentioned above provide a great deal of information on menu planning and food preparation. Anyone contemplating the adoption of a vegetarian diet for a family should become thoroughly familiar with the nutritional requirements of persons of various ages, and should be aware of possible pitfalls. With careful attention and planning, the vegetarian family can enjoy a diet that is nutritious, varied, tasty, and environmentally sound.