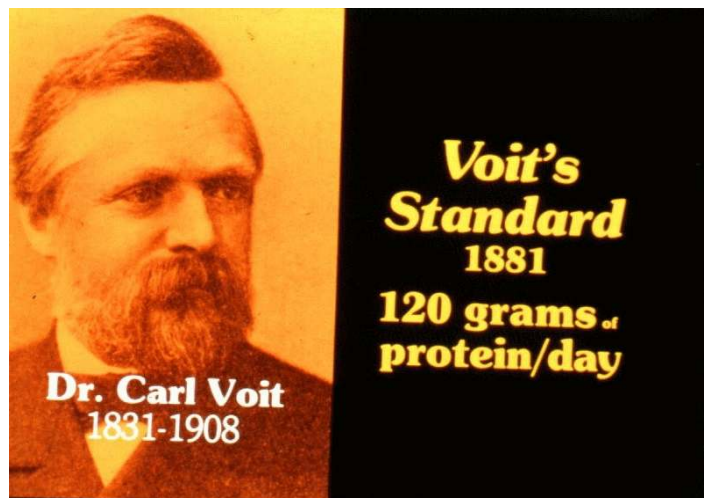


V. THE PROTEIN PERPLEX

The big question encountered by vegans: "How do you get enough protein?" The answer should be: "How much do you think you need?"

Over the years dietary protein recommendations have gone up and down like a yo-yo. In 1881 Carl Voit M.D. surveyed German laborers and found they consumed 118 grams of protein/day.¹ Voit had a deserved reputation in nutritional physiology² so when he said, "That's how much you need!" it stuck.

In 1904 Chittendon lowered the figure after extensive research,³ but then the USDA brought it back up to 125 grams.⁴ In 1920 after extensive nitrogen balance studies, Sherman⁵ cut the figure to 1 gram/kg body weight/day which translated to ≈ 70 gram/day for a 154-pound person. In 1946 Hegsted⁶ cut the figures to 30-40 grams/day, but by 1958 the Minimum Daily Requirement (MDR) was back up to 1 gram/kg/day.



Alas, that was about the time the MDRs went down the Orwellian memory hole. The Food and Nutrition Board (FNB) of the National Research Council (NRC), of the National Academy of Sciences (NAS), had switched to Recommended Dietary Allowances (RDAs). RDAs are set 2 standard deviations above the mean nutrient requirement to insure that only 2.5% of the population will fall below nutrient needs, but this insures that 97.4999...% of the population meeting the RDAs will exceed its nutrient *and* Calorie requirements.⁷

The Canadians, in an independent turn of thought, set their protein RDA at 50 grams/day in 1967,⁸ and the US responded with a counter bid of .8 grams/kg/day which comes out to about 56 grams a day for that 154-pound person. To keep things jumping, in the '70s the Food and Drug Administration (FDA) came out with the U.S. RDAs which are different from the RDAs of the (FNB) of the (NRC) of the (NAS)⁹ which, parenthetically, is *not* a branch

¹Voit C. *Über die entwicklung die lehre von der quelle der muselkraft und einiger theile der ernährung seit 25 jahren.*(Development of the source of muscular power during 25 years). Zeitschr. f. Biol.1870;6:389.

²See note 22. *Encyclopedia Britannica*. Vol. X, p 482.

³Chittendon RH. *Physiological Economy in Nutrition With Special Reference to the Minimal Proteid Requirements of the Healthy Man. An Experimental Study*. Frederick Stokes Co. New York, 1904

⁴Messina V. *Protein: Exploding the Myths*. Guide to Healthy Eating. Physicians Committee for Responsible Medicine. Sept-Oct 1990.

⁵Sherman HC. *Protein requirements of maintenance in man and the nutritive efficiency of bread protein*. J Biol Chem. 1920;41:97.

⁶Hegsted DM, Tsongas AG, Abbott DB, and Stare FJ. *Protein Requirements of Adults*. J Lab Med. 1946;31:261.

⁷See note 3. *Human Nutrition*. p 165.

⁸See note 56. Wohl and Goodhart. p 588.

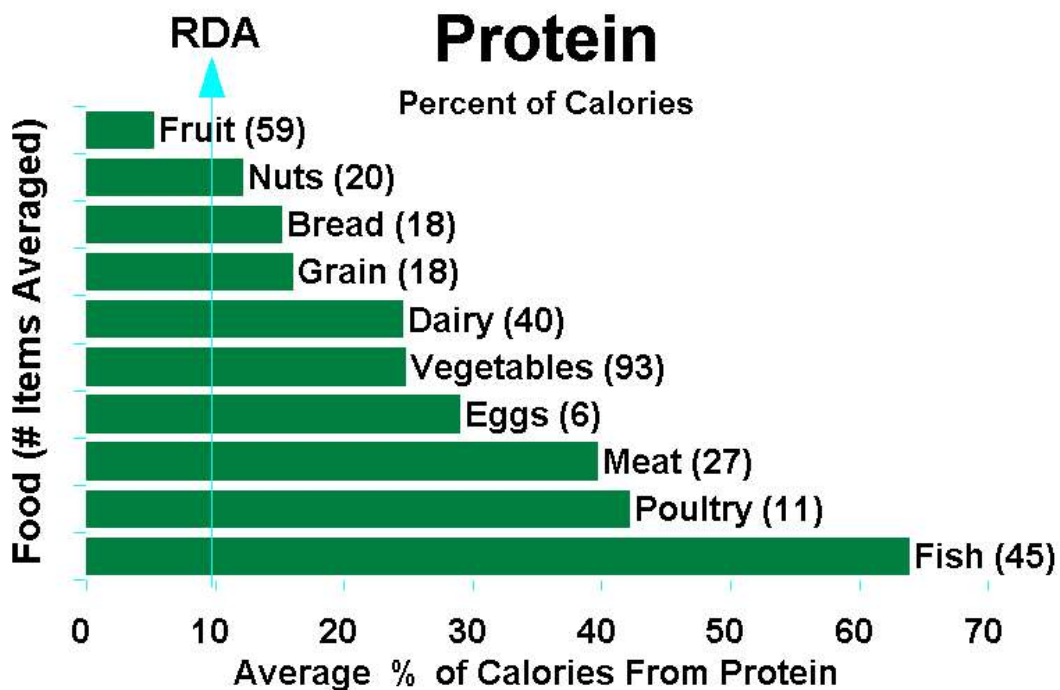
⁹See note 1. Leveille. p I-10.

of the U.S. government.¹⁰

Now, an adult male on a fast only puts out 4.32 grams of urinary nitrogen per day.¹¹ Each gram represents 6.25 grams of broken down protein, so under conditions in which some protein is actually being catabolized and used for fuel, only about $4.32 \times 6.25 = 27$ grams/day are actually needed. Furthermore, 75-80% of the amino acids from used protein are pooled and used over again for new protein synthesis.¹² Therefore, it's not clear why a non-fasting subject should even need 56 grams/day, since carbohydrate will be burned before protein under ordinary conditions.

Confused? Fortunately, there's an easy way out. We can take the RDA of 56 grams protein/day, be generous and raise it to 60, then match it to a Calorie RDA of 2400. Each gram of protein carries 4 Calories, so the percent of Calories/day needed from protein comes to $60 \times 4 / 2400 = 240 / 2400 = .10 = 10\%$. It's interesting to note that human milk, which seems to support adequate growth in human infants, has only 5.9% Calories from protein.¹³ Most plant food is well above the 10% figure, watercress (78%) and spinach (53%) being good examples, so most vegan diets exceed even the good ol' MDR of 70 grams protein/day. The average American consumes about 103 gm protein/day, of which 70 gm is animal protein.¹⁴

Some day a computer will doubtless find a way to display all the foods in the USDA database at one time, but for now it can only be done piecemeal. Excluding junk foods, processed foods, and recipes, 100 gram portions of various foods in 10 categories of the Nutritionist III database¹⁵ were averaged for protein. The large number of fruits (59) and vegetables (93) reflects only the abundance of species available. By contrast, eggs (6) and poultry (11) had a relative paucity of species. (See appendix A).



¹⁰See note 22. *Encyclopedia Britannica*. Vol VII. p 207.

¹¹See note 20. Cantarow. p 331.

¹²See note 6. *Harper's 1985*. p 283.

¹³See note 1. Leveille. p 178.

¹⁴See note 49. FAO 1987.

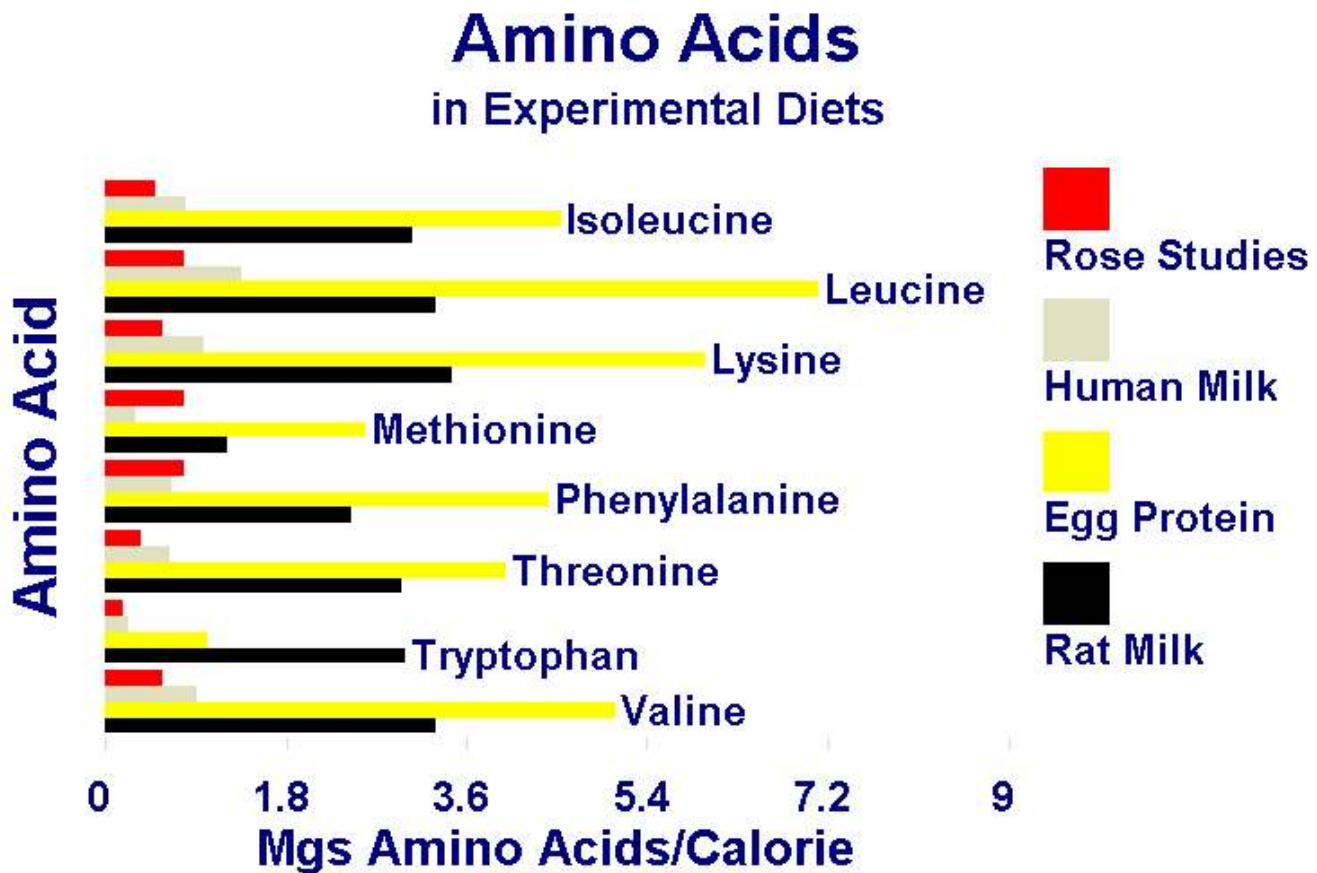
¹⁵See note 52. *Nutritionist III*.

With the exception of fruit, all the categories exceed the 10% protein requirements. If one consumed nothing but averaged foods from the vegetable category, one would get about 25% of the day's Calories from protein.

Therefore, unless fruit is the only food, if the day's Calorie requirements are met, so is the 10% protein requirement.

"Well, then," asks the questioner, "you may be getting enough protein but is it *quality* protein; does it have the right proportion of amino acids?" The question originates from studies^{16,17} that showed that weanling rats grow fastest on an amino mix which resembles rat's milk, which has about 26% of its Calories from protein.

William Rose studied minimum amino acid requirements in adult males and then doubled his figures.¹⁸ The preceding graph shows the similarity between Rose's adult human requirements and the amino composition of human milk. It also shows the disparity between human requirements and the foods that make weanling rats grow fast.¹⁹ Whole eggs (32% of Calories from protein) grow rats just fine, so for many years eggs were the amino gold standard and infant health was measured by the pound.



¹⁶Slonaker JR. *The Effect of a Strictly Vegetable Diet on the Spontaneous Activity, the Rate of Growth, and the Longevity of the Albino Rat.* Stanford University. Stanford, Calif. 1912.

¹⁷Wu H, and Chen TT. *Growth and reproduction of rats on vegetarian diets.* Chin J Physiol. 1929;3:157.

¹⁸Rose WC. *Amino Acid Requirements in Man.* Federation Proceedings. 1949;8:546-52.

¹⁹Luckey TD, Mende TJ, and Pleasants J. *The Physical and Chemical Characterization of Rat's Milk.* Journal of Nutrition. 1954;154:345-59.

Next came a zoo full of amino acid efficiency formulas²⁰:

Protein Efficiency Ratio:

(PER)=(Weight gain of a growing animal)/(protein intake).

Mitchell's Biological Value:

(BV)=The ratio of nitrogen retained to nitrogen absorbed.

Net Protein Utilization:

NPU=the proportion of food nitrogen retained.

Coefficient of utilization of test products:

$P_r(\text{The coefficient})=P_p(\text{test protein})/P_{em}(\text{evaporated milk protein}).$

After all this, Arnould concluded that the formulas were inadequate.²¹

The amino acid content of plant food has been described as incomplete or inadequate by many authors, and the impression is often gained that amino acids are entirely missing from plant foods. In general, that's not correct; however a milled corn-only diet may lead to pellagra since tryptophan and its derivative niacin are limited but not absent in the protein (zein) of corn. The niacin in corn is present in a bound form, niacytin;²² Mexican cooks deal with this problem by treating their corn tortilla flour with alkali, which unbinds the niacin.

In Africa there's a disease called kwashiorkor, "the disease the first child gets when the second child is born,"²³ that results from early weaning onto cassava root (from which Westerners make tapioca). Cassava leaf is a good protein source²⁴ but unfortunately it contains cyanide.²⁵ The root is low in methionine and has only 2% of Calories from protein.²⁶

Using the same 10 categories of foods, the following two graphs show their amino acid patterns. The X axis gives the percent of the RDA required from each Calorie of food "the percent of (RDA per Calorie)."

²⁰See note 56. Wohl and Goodhart. p 109.

²¹Arnould: *L'Utilisation des Proteines Pour la Croissance*. University of Louvain. Doctoral Dissertation. Louvain, Belgium 1961.

²²See note 2. *Harper's 1990*. p551.

²³See note 56. Wohl and Goodhart. p 747.

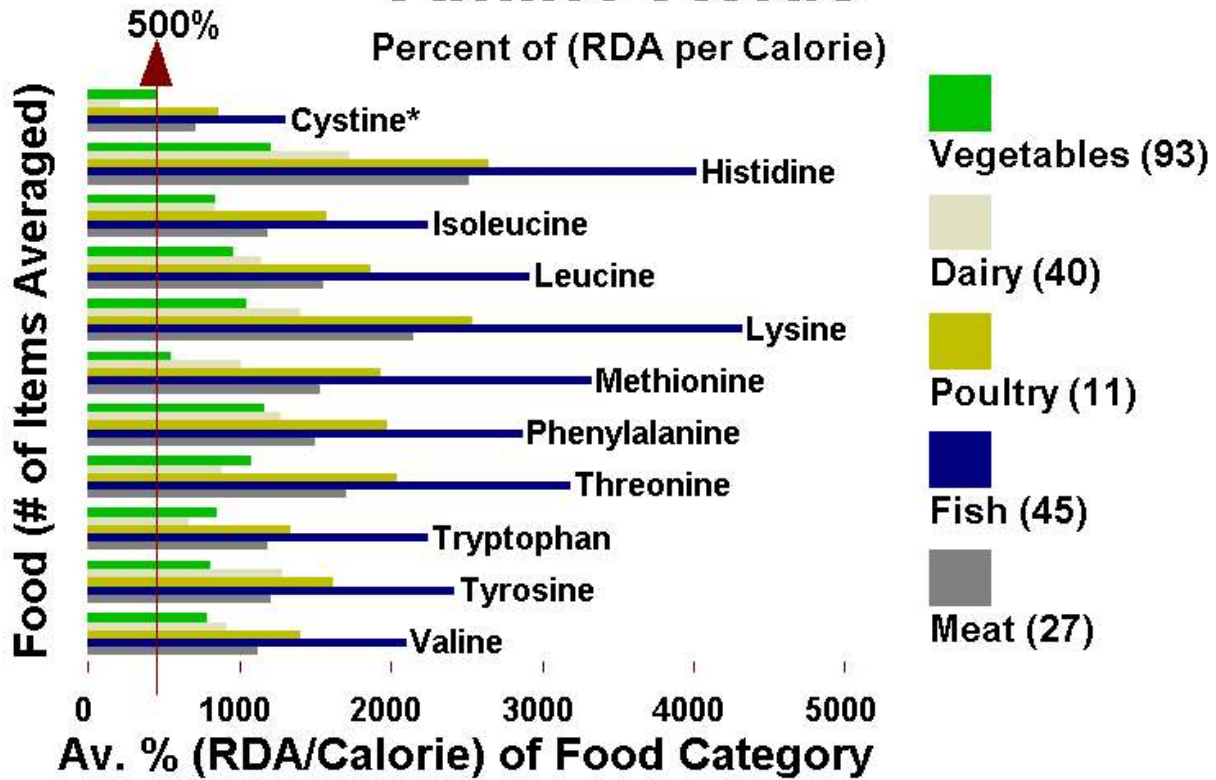
²⁴Adrian J, and Peyrot F. *Possible use of the cassava leaf (manihot utillissima) in human nutrition*. Plant Foods for Human Nutrition. Jan 1971;2(2):61-65.

²⁵See note 22. *Encyclopedia Britannica*. Vol.3 p1166-7.

²⁶Bowes A deP, and Church CF. *Food Values of Portions Commonly Used*. J.B. Lippincott Co. Philadelphia, 1966. p 18.

Amino Acids

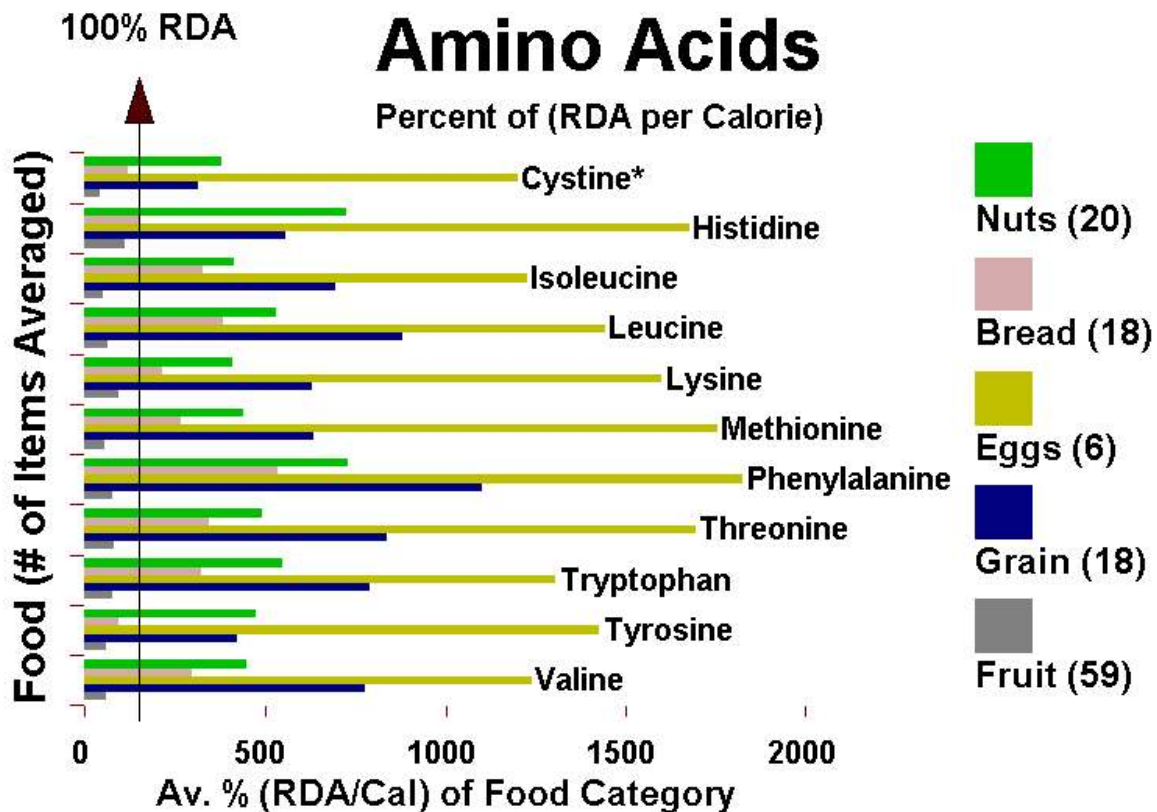
Percent of (RDA per Calorie)



*Cystine is non-essential so actually has no RDA.

Amino Acids

Percent of (RDA per Calorie)



Some conclusions can be drawn:

1. Once again, fruit is shown to be the only non-junk category consistently short in protein constituents (amino acids).
2. The vegetable category averages at least 500% of (RDA per Calorie) for its limiting amino, methionine.
3. Animal foods are higher in amino acids to the point of overkill. The well documented allergic reactions to fish are due to its high content of histidine, which undergoes bacterial decomposition to histamine.

Appendix A.

To produce the protein and amino acid graphs above, 10 categories in the Nutritionist IV database were edited to exclude recipes and proprietary foods. The remaining foods were loaded in 100 gram portions and the mean protein content in each category was calculated. The large number of fruits (59) and vegetables (93) reflects only the abundance of species available. By contrast eggs (6) and poultry (11) had a relative paucity of species.

For those interested in more detailed information the numbers to the right of each food are the percent of Calories from protein in that food. Foods failing the 10% RDA are shown below the ===== cutoff line. It's interesting to note that human milk (see Dairy), which seems to support adequate growth in human infants has only 5.9% Calories from protein.

Breads (18):

	Calories from protein	%
BREAD-MELBA TOAST/PLAIN		25.0
BREAD-OATMEAL/BRAN		17.7
BREAD-OAT BRAN/NOCHOL		16.6
BREAD-WHOLE WHEAT-FIRM		15.7
BREAD-WHEAT-FIRM-TOASTED		15.7
ROLL-WHOLE WHEAT-HOMEMADE		15.6
BREAD-MIXED GRAIN		15.5
BREAD-PITA		15.1
BAGEL-WATER		14.8
BREAD-PUMPERNICKEL		14.4
BREAD-CRACKED WHEAT		14.2
BREAD-ITALIAN-ENRICHED		14.1
BREAD-VIENNA-ENRICHED		13.6
BREAD-FRENCH-ENRICHED		13.6
MUFFIN-ENGLISH-PLAIN		13.4
BREAD-RYE-AMERICAN-LIGHT		12.9
BREAD STICK-VIENNA TYPE		12.4
BREAD-WHITE-SOFT		12.4
MEAN VALUE (Breads)		15.1%

Dairy (40):

	Calories from protein	%
CHEESE-COTTAGE-LOWFAT-1%		68.3
CHEESE-COTTAGE-4%-LAR CURD		48.5
CHEESE-PARMESAN-GRATED		36.4
CHEESE-ROMANO		32.8
MILK-BUTTERMILK-FLUID		32.8
MILK-1% FAT-LOWFAT-FLUID		31.5
CHEESE-SWISS		30.1
CHEESE-PROVOLONE		29.1

CHEESE-GRUYERE	28.9
CHEESE-TILSIT	28.8
MILK-2%-PROTEIN FORTIFIED	28.4
CHEESE-EDAM	28.0
CHEESE-GOUDA	28.0
CHEESE-MOZZARELLA-WHL MILK	27.5
CHEESE-CARAWAY	26.7
CHEESE-FONTINA	26.5
CHEESE-CAMEMBERT-WEDGE	26.4
CHEESE-MONTEREY	26.2
CHEESE-RICOTTA-WHOLE MILK	25.9
CHEESE-MUENSTER	25.6
CHEESE-BRICK	25.1
CHEESE-CHEDDAR-CUT PIECES	24.8
CHEESE-BRIE	24.8
CHEESE-LIMBURGER	24.4
CHEESE-BLUE	24.2
CHEESE-CHESHIRE	24.1
CHEESE-COLBY	24.1
CHEESE-ROQUEFORT	23.3
YOGURT-PLAIN-WHOLE	22.7
MILK-SHEEP-WHOLE-FLUID	22.2
CHEESE-FETA	21.5
MILK-WHOLE-3.3% FAT-FLUID	21.4
MILK-GOAT-WHOLE-FLUID	20.7
MILK-INDIAN BUFFALO-WHOLE	15.5
CHEESE-NEUFCHATEL	15.3
WHEY-SWEET-FLUID	12.7
=====	
CHEESE-CREAM	8.7
CHEESE-GJETOST	8.3
*MILK-HUMAN-WHOLE-MATURE	5.9
CREAM-WHIPPING-HEAVY	2.4

MEAN VALUE (Dairy) 24.5%

Eggs (6):

Calories from protein	%
EGG-WHITE-RAW-LARGE	82.8
EGG-WHOLE-RAW-LARGE	33.3
EGG-POACHED-WHOLE-LARGE	33.3
EGG-HARD-LARGE-NOSHELL	33.3
EGG-DUCK-WHOLE-FRESH-RAW	27.6
EGG-YOLK-RAW-LARGE	18.9

MEAN VALUE (Eggs) 38.2

Fish (45):

Calories from protein	%
FISH-CRAB-ALASKA KING-RAW	87.9
FISH-PIKE-COOKED-DRY HEAT	87.5
FISH-COD-COOKED-DRY HEAT	87.0
FISH-HADDOCK-COOK-DRY HEAT	86.6
FISH-TUNA-YELLOWFIN-RAW	86.7

FISH-SHRIMP-CKD-MOIST HEAT	84.8
FISH-POLLOCK-ATLANTIC-RAW	84.6
FISH-GROUPER-CKD-DRY HEAT	84.1
FISH-CRAYFISH-CKD-MOIST	83.8
FISH-LOBSTER-NORTHERN/RAW	83.4
FISH-SOLE/FLOUNDER-BAKED	82.6
FISH-FLATFISH-CKD-DRY HEAT	83.2
FISH-REDSNAPPER-RAW	81.9
FISH-WHITING-CKD-DRY HEAT	81.8
FISH-CRAB-STEAMED-PIECES	80.0
FISH-ROCKFISH-CKD-DRY HEAT	79.3
FISH-OCEAN PERCH-CKD-DRY	78.9
FISH-SEABASS-CKD-DRY HEAT	76.3
FISH-HALIBUT-BROILED-DRY	76.4
FISH-SCALLOPS-RAW	76.3
FISH-OCTOPUS-RAW	72.6
FISH-SMELT-COOKED-DRY HEAT	72.3
FISH-TROUT-RAINBOW-CKD-DRY	69.1
FISH-CLAMS-RAW-MEAT ONLY	69.2
FISH-SQUID-RAW	67.7
FISH-TILEFISH-CKD-DRY HEAT	66.6
FISH-MULLET-CKD-DRY HEAT	66.6
FISH-BASS-FRESHWATER MIX	66.1
FISH-BLUEFISH-BAKED/BUTTER	66.0
FISH-SWORDFISH-COOKED-DRY	65.8
FISH-ABALONE-RAW	65.0
FISH-SHARK-RAW	63.9
FISH-ROE-RAW-EGGS	64.3
FISH-STURGEON-STEAMED	61.3
FISH-SALMON-CKD-MOIST HEAT	59.5
FISH-CARP-COOKED-DRY HEAT	56.4
FISH-MUSSELS-BLUE-RAW	55.5
FISH-ANCHOVY-FILLET-CAN	55.2
FISH-SARDINES-CAN/OIL	47.4
FISH-HERRING-ATLANTIC-RAW	45.6
FISH-OYSTERS-RAW-MEAT ONLY	40.9
FISH-EEL-COOKED-DRY HEAT	40.3
FISH-CAVIAR-STURGEON-EGGS	39.4
FISH-MACKEREL-ATLANTIC-RAW	36.3
FISH-CATFISH-FRIED-BREADED	31.8
MEAN VALUE (Fish)	68.8%

Fruit (59):

Calories from protein	%
LEMONS-RAW-PEELED	15.1
MELONS-CASABA-RAW	13.6
MULBERRIES-RAW	13.2
PITANGA-RAW	12.0
APRICOT-RAW-WITHOUT PIT	11.7
LOGANBERRIES-FROZEN	11.1
=====	
MELONS-CANTALOUPE-RAW	9.8
LIMES-RAW	9.4

PASSION FRUIT-PURPLE-RAW	8.9
BOYSENBERRIES-FROZEN-UNSW	8.8
PUMMELO-RAW-SECTIONS	8.1
STRAWBERRIES-RAW-WHOLE	8.1
LONGANS-RAW	8.0
ORANGES-RAW-SECTIONS	8.0
WATERMELON-RAW	7.9
GOOSEBERRIES-RAW	7.9
ROSELLE-RAW	7.9
NECTARINES-RAW	7.6
GRAPEFRUIT-RAW-PINK & RED	7.4
RASPBERRIES-RAW	7.3
PRICKLYPEARS-RAW	7.1
CHERRIES-SWEET-RAW	6.7
PEACHES-RAW-WHOLE	6.6
GUAVAS-COMMON-RAW	6.6
CARAMBOLA-RAW	6.6
KIWIFRUIT-RAW	6.5
PAPAYAS-RAW	6.4
SAPOTES-RAW	6.3
SOURSOP-RAW-PULP	6.0
PLUMS-RAW-JAPANESE/HYBRID	5.8
TANGERINES-RAW-PEELED	5.7
POMEGRANATES-RAW	5.7
BLACKBERRIES-RAW	5.6
CHERIMOYA-RAW	5.5
LYCHEES-RAW	5.3
MELONS-HONEYDEW-RAW	5.1
TAMARINDS-RAW	4.8
AVOCADO-RAW-CALIFORNIA	4.8
BLUEBERRIES-RAW	4.7
BANANAS-RAW-PEELED	4.5
PRUNES-DRIED-UNCOOKED	4.4
RAISINS-SEEDLESS	4.3
PLANTAINS-RAW	4.3
BREADFRUIT-RAW	4.2
FIGS-RAW	4.1
GRAPES-RAW-SLIP SKIN TYPE	4.0
GRAPES-RAW-ADHERENT SKIN	3.7
ELDERBERRIES-RAW	3.6
CARISSA-RAW	3.3
PERSIMMONS-RAW-JAPANESE	3.3
LOQUATS-RAW	3.2
MANGOS-RAW	3.1
PINEAPPLE-RAW-DICED	3.1
DATES-NATURAL-DRIED-WHOLE	2.9
QUINCES-RAW	2.8
PEARS-RAW-BARTLET-UNPEELED	2.7
SAPODILLA-RAW	2.1
APPLES-RAW-UNPEELED	1.3
CRANBERRY SAUCE-CAN-SWEET	0.5
MEAN VALUE (Fruits)	6.2%

Grains (18):

	Calories from protein	%
FLOUR-SESAME-LOWFAT		60.1
FLOUR-SOYBEAN-LOWFAT		48.9
FLOUR-WHEAT-WHOLEGRAIN		16.1
POPCORN-POPPED-PLAIN		16.0
FLOUR-BUCKWHEAT-GROAT		15.0
SPAGHETTI-COOKED-FIRM-HOT		14.8
BULGUR-DRY-COMMERCIAL		14.3
MACARONI-COOKED-FIRM-HOT		13.5
NOODLES-SOMEN-WHEAT-DRY		12.7
FLOUR-BARLEY		11.4
BARLEY-PEARLED-UNCOOKED		11.3
TORTILLA-FLOUR		10.5
FLOUR-CAROB		10.2
MATZO-MEAL		10.1
=====		
RICE-BROWN-LONG GRN-CKD		9.3
CORNMEAL-WHOLE GRAIN-DRY		9.0
RICE-WHITE-PARBOILED-DRY		7.3
FLOUR-RICE-WHITE		6.5
MEAN VALUE (Grains)		16.5%

Meat (27):

	Calories from protein	%
VENISON-ROASTED		80.8
SWEETBREADS-CALF-BRAISED		77.4
PORK-TENDERLOIN-LEAN-RST		69.7
PORK-KIDNEYS-BRAISED		67.5
BEEF-HEART-COOKED-SIED		66.1
VEAL-RIB-LEAN ONLY-BRAISED		63.3
PORK-LIVER-BRAISED		63.0
LAMB-LEG-LEAN-ROASTED		58.9
RABBIT-STEWED-NO BONES/SKN		59.0
POT ROAST-ARM-BEEF-COOKED		57.1
CANADIANBACON-PORK-GRILL		52.3
HAM-REG-ROASTED-PORK		50.9
STEAK-TENDERLOIN-BROILED		50.2
BEEF-LIVER-FRIED/MARG		49.5
BRISKET-LEAN-COOKED		49.0
PORK-CHOP-LEAN-BROILED		43.8
HAMBURGER PATTY-BEEF/LEAN		36.3
STEAK-SIRLOIN-LEAN/FAT		33.5
HAMBURGER-GROUND-REG-BKED		32.1
SPARERIBS-PORK-BRAISED		29.1
BEEF-LEAN/FAT-SIMM/ROAST		28.6
BOLOGNA-PORK		24.7
FROG LEGS-FRIED/FLOUR		24.7
ROAST BEEF-RIB-LEAN/FAT		23.8
BACON-PORK-BROILED/FRIED		21.4
FRANKFURTER-HOT DOG		14.1
CHITTERLINGS-PORK-SIMMER		13.5

MEAN VALUE (Meats) 45.9%

Nuts (20):

Calories from protein	%
NUTS-SOYBEAN KERNELS-ROAST	32.6
SEEDS-PUMPKIN/SQUASH-DRIED	18.2
NUTS-PEANUTS-SPANISH-DRIED	18.2
PEANUT BUTTER-OLDFASHION	17.7
NUTS-BUTTERNUTS-DRIED	16.2
NUTS-WALNUT-BLACK-DRI-CHOP	16.0
SEEDS-SUNFLOWER-DRIED	16.0
NUTS-PISTACHIO-DRIED	14.2
NUTS-ALMONDS-SHELLED-CHOP	13.5
SEEDS-SESAME-DRIED-WHOLE	12.4
SEEDS-BREADFRUIT-ROASTED	11.9
NUTS-CASHEWS-DRY ROASTED	10.7

=====

NUT-WALNUT-PERSIAN/ENGLISH	8.9
NUTS-BRAZIL-DRIED-SHELLED	8.8
NUT-FILBERT/HAZEL-DRI-CHOP	8.3
NUTS-HICKORY-DRIED	7.7
NUTS-MACADAMIA-DRIED	4.7
NUTS-PECANS-DRIED-HALVES	4.6
NUTS-BEECHNUTS-DRIED	4.3
NUTS-COCONUT-RAW-SHRED	3.8

MEAN VALUE (Nuts) 12.3%

Poultry (11):

Calories from protein	%
TURKEY-LIGHT-NO SKIN-ROAST	76.9
CHICKEN-GIBLETS-SIMMERED	65.6
TURKEY-GIBLETS-SIMMERED	63.1
CHICKEN-LIVER-SIMMERED	62.5
TURKEY-DARK MEAT-NO SKIN	61.0
CHICKEN-HEART-SIMMERED	57.3
CHICKEN-CAPON-ROASTED	50.7
CHICKEN-LEG-ROASTED	44.8
GOOSE-FLESH & SKIN-ROASTED	33.1
DUCK-FLESH & SKIN-ROASTED	22.5

=====

GOOSE-LIVER PATE-SMOKE-CAN	9.9
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MEAN VALUE (Poultry) 49.8%

Vegetables (93):

Calories from protein	%
SEAWEED-SPIRULINA-DRIED	79.3
WATERCRESS-RAW	78.0
MUSTARD GREENS-BOIL-DRAIN	60.2
SPINACH-RAW-CHOPPED	53.3
ALFALFA SEEDS-SPROUTED-RAW	52.8
CABBAGE-WHITE MUSTARD-RAW	46.7
LETTUCE-ROMAINE-RAW-SHRED	45.0

BROCCOLI-RAW	43.7
TOFU-RAW-FIRM	43.6
CHARD-SWISS-RAW	42.7
ASPARAGUS-RAW-BOIL-SPEARS	42.4
SOYBEANS-SPROUTED-STEAMED	41.9
BALSAM PEAR LEAFYTIP-BOIL	41.8
NATTO-FERMENTED SOYBEANS	40.5
LETTUCE-BUTTERHEAD-HEAD	39.8
AMARANTH-BOIL-DRAIN	39.7
BEANS-MUNG-SPROUTED-BOIL	38.8
BAMBOO SHOOTS-RAW	38.3
TEMPEH-SOYBEAN PRODUCTS	38.1
BEET GREENS-BOIL-DRAIN	37.0
SOYBEANS-GREEN-BOIL-DRAIN	34.7
LENTILS-SPROUTED-RAW	34.1
CAULIFLOWER-RAW-CHOPPED	33.2
CRESS-GARDEN-RAW	32.5
MUSHROOMS-RAW-CHOPPED	32.4
CHIVES-RAW-CHOPPED	32.0
SQUASH-ZUCCHINI-RAW-SLICED	31.6
COLLARDS-RAW-BOIL-DRAIN	31.1
ENDIVE-RAW-CHOPPED	31.0
LETTUCE-ICEBERG-RAW-LEAVES	30.8
LENTILS-WHOLE-COOKED	30.5
CABBAGE-CELERY-RAW	30.3
COWPEAS-BLACKEYE-RAW-BOIL	30.1
CABBAGE-SAVOY-RAW-SHREDDED	29.5
PARSLEY-RAW-CHOPPED	29.3
CHICORY GREENS-RAW-CHOPPED	29.1
ONIONS-YOUNG GREEN	27.8
BEANS-BLACK-COOK-BOIL	26.8
BEANS-NAVY PEA-DRY-COOKED	26.8
BEANS-GREAT NORTH-DRY-COOK	26.6
PEAS-EDIBLE PODDED-RAW	26.6
BRUSSELSSPROUTS-RAW-BOIL	26.5
BEANS-SMALL WHITE-BOILED	25.5
KOHLRABI-RAW	25.1
KALE-RAW-BOIL-DRAIN	24.1
DANDELION GREENS-BOILED	24.0
OKRA-RAW-BOIL-DRAIN	23.8
BEANS-ADZUKI-BOILED	23.5
MISO-FERMENTED SOYBEANS	23.1
BEANS-GARBANZO-DRY-RAW	22.8
TURNIP GREENS-RAW-BOIL	22.6
BEANS-LIMA-RAW-BOIL-DRAIN	22.4
BEANS-FRENCH-COOKED-BOILED	21.9
BEANS-SNAP-WAX-RAW-BOIL	21.5
BEANS-SNAP-GREEN-RAW-BOIL	21.5
CABBAGE-COMMON-RAW-SLICED	21.0
ARTICHOKES-BOIL-DRAIN	20.8
BEANS-GREEN-FROZ-FRENCH	20.4
CABBAGE-RED-RAW-SHREDDED	20.4
PEPPERS-HOT CHILI-RAW	20.0
GARLIC-RAW-CLOVE	19.0

LOTUS ROOT-RAW	18.7
TOMATO-RAW-RED-RIPE	18.2
SQUASH-SUMMER-BOIL-SLICED	18.1
CELERY-PASCAL-RAW-STALK	17.3
CUCUMBER-RAW-WHOLE	16.7
GOURD-WHITE FLOWERED-BOIL	16.0
SEAWEED-KELP (KOMBU)-RAW	15.6
PUMPKIN-RAW-CUBES	15.5
RADISHES-RAW	15.4
SHALLOTS-RAW	14.3
PEPPERS-SWEET-RAW	14.0
ONIONS-MATURE-RAW-CHOPPED	13.9
BEETS-WHOLE-BOIL-DRAIN	13.7
RUTABAGAS-BOIL-DRAIN	13.0
CORN-KERNELS FROM 1 EAR	12.3
EGGPLANT-BOILED-DRAINED	11.9
HUMMUS	11.5
JERUSALEM ARTICHOKE-RAW	10.5
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GINGER ROOT-RAW-SLICED	9.9
LEEKS-RAW	9.8
CARROT-RAW-WHOLE-SCRAPED	9.5
BURDOCK ROOT-BOIL-DRAIN	9.5
SQUASH-BUTTERNUT-BAKED	8.9
POTATO SKIN-BAKED	8.7
POTATO-BAKED-FLESH & SKIN	8.4
YAM-MOUNTAIN-HAWAII-STEAM	8.4
NUTS-CHESTNUTS-CHINESE-RAW	7.4
SWEET POTATO-BAKE-PEEL	6.6
PARSNIPS-SLICED-BOIL-DRAIN	6.5
TARO-RAW-SLICED	5.6
WATERCHESTNUTS-CHINESE-RAW	5.3
POI	1.4
MEAN VALUE (Vegetables)	25.6%