Plant Eater!
Where Do You Get Your Protein?

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FOOD IS MEDICINE!

Like any medicine

Food Can Have Benefits

and

Food Can Have Side Effects

Dietary Nutrients

MACRO NUTRIENT	CALORIES PER GRAM
FAT ✓ Saturated ✓ Unsaturated	9
CARBOHYDRATE ✓ Fiber [1] ✓ Starch ✓ Sugar	4
PROTEIN ✓ Plant Protein ✓ Animal Protein	4
WATER	0

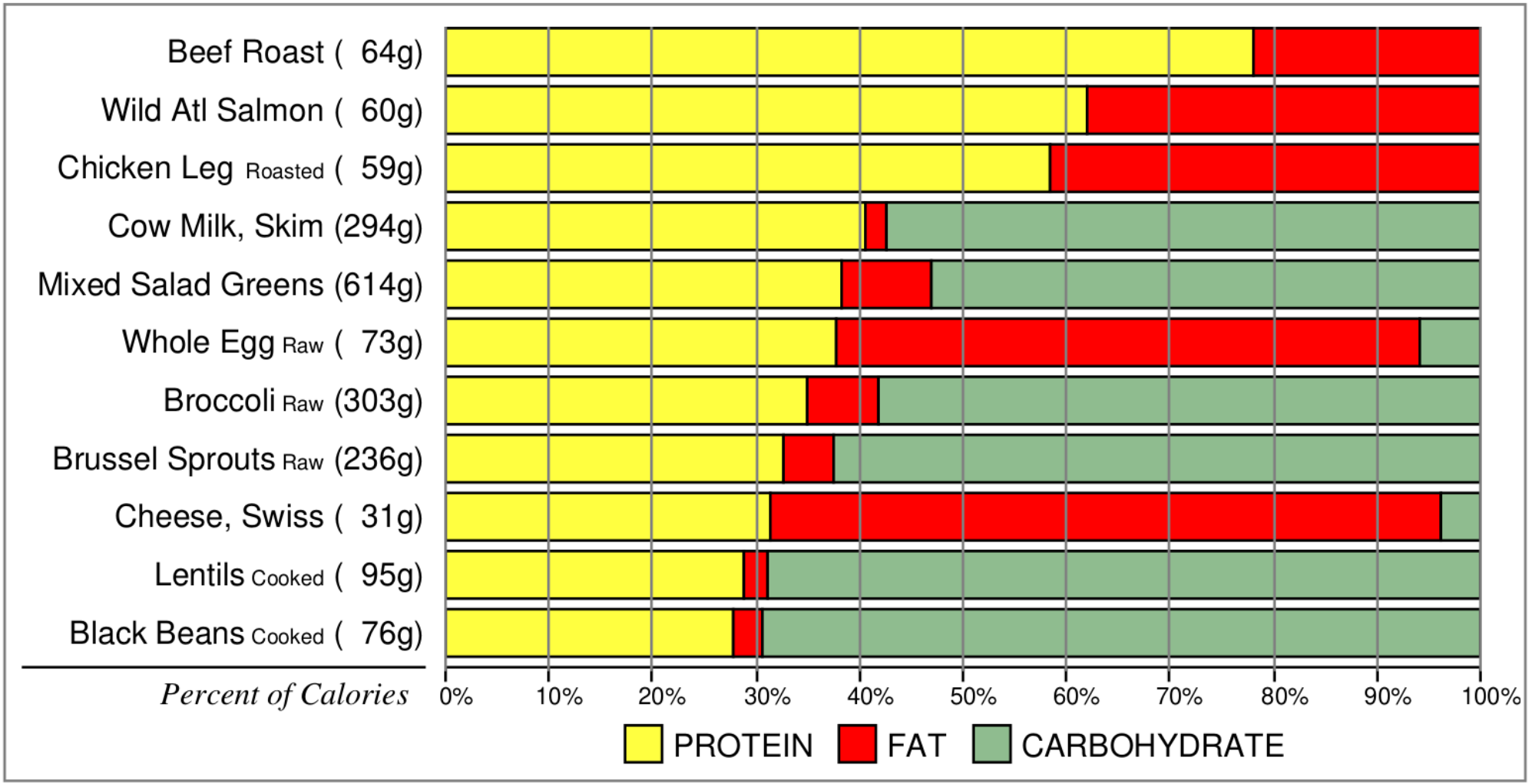
[1] *Fiber is digested by colon bacteria and only provides about 2 calories per gram.*

MICRO NUTRIENT	CALORIES PER GRAM
VITAMINS[1] ✓ Vitamin C ✓ Vitamin E ✓ Vitamin K ✓ : : : :	0
PHYTOCHEMICALS[1] ✓ Carotenoids ✓ Resveratrol ✓ Flavonoids ✓ : : : :	0
MINERALS[2] ✓ Sodium ✓ Potasium ✓ Calcium ✓ : : : :	0

[1] *Many Are Antioxidents*

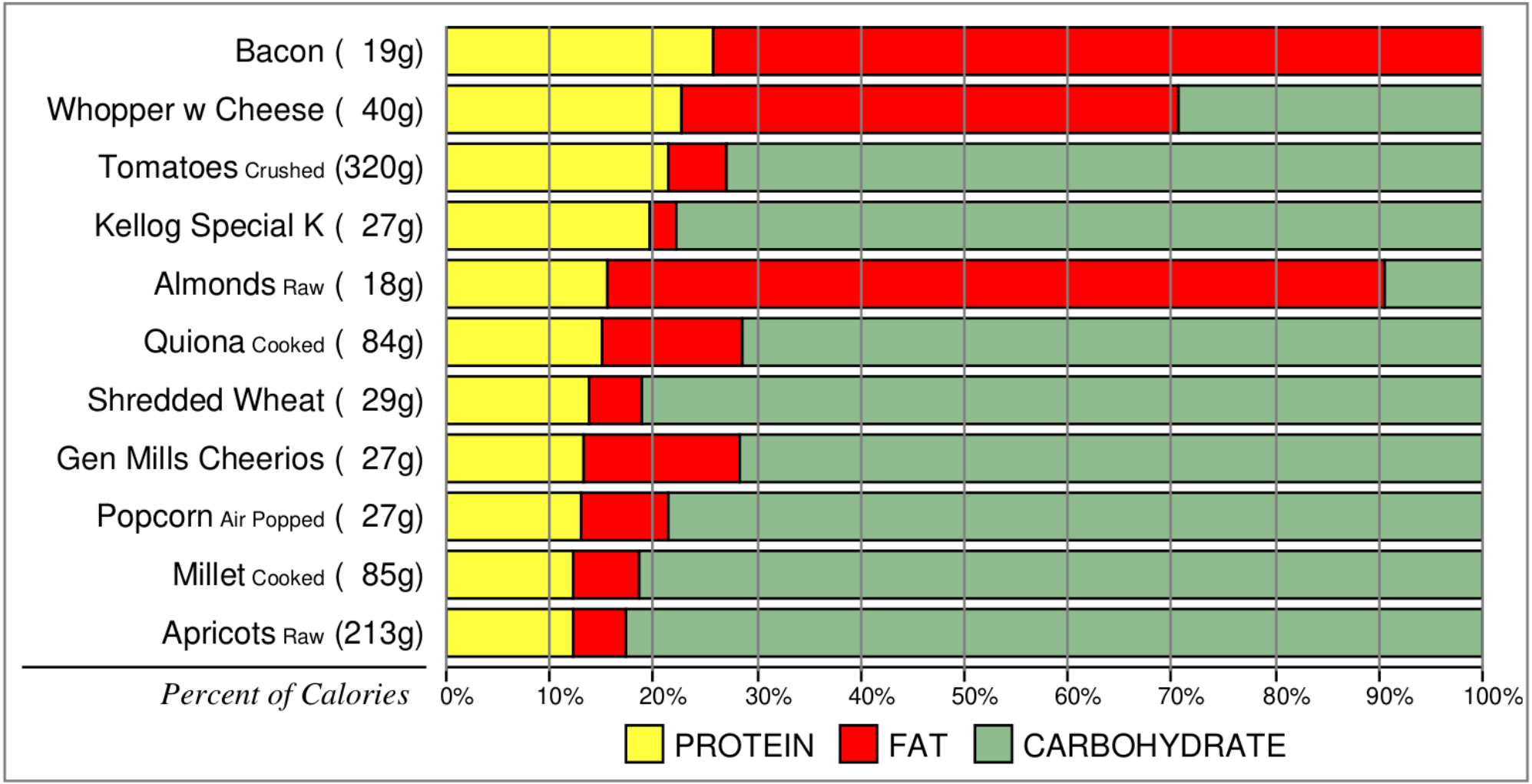
[2] *A Few Are Antioxidents*

100 CALORIE SERVING



Data Source: USDA Food Central Legacy Database

100 CALORIE SERVING



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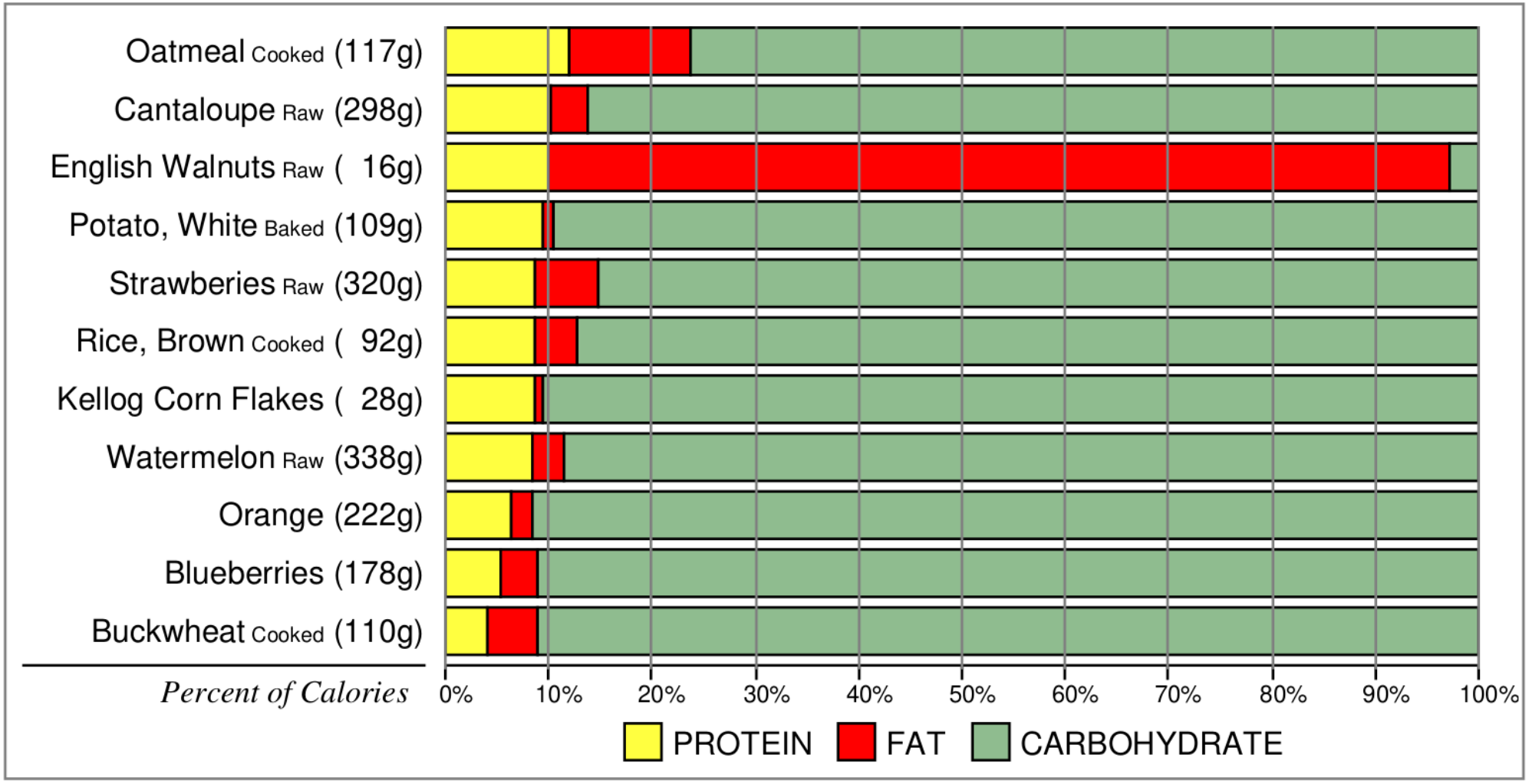
100 CALORIE SERVING



Data Source: USDA Food Central Legacy Database

Human Body Composition

COMPONENT	PERCENT
Water	65%
Protein	20%
Lipids (fats)	12%
Other	3%

Other includes DNA, RNA and minerals

Protein Functions

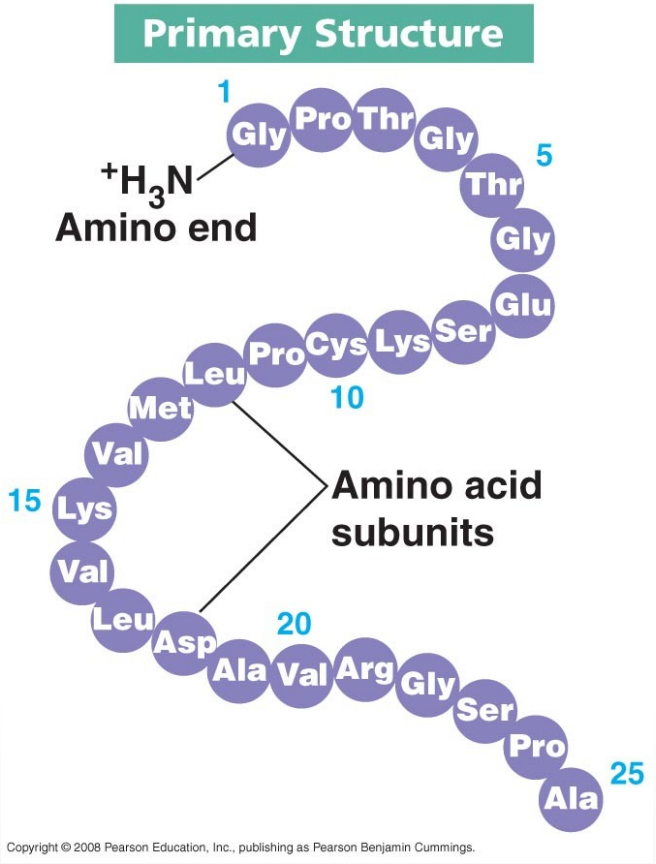
- Provide structure
  - Muscles, hair, etc.
- Regulate Body Processes
  - Enzymes power chemical reactions
- Transport Materials
  - Hemoglobin transports oxygen, etc.
- Supply Energy
  - Excess protein can be converted to glucose.

Questions

- What are proteins?
- What is the source of your protein?
- What is the daily requirement for protein?
- Can a variety of whole plant foods provide the daily requirement?
- Is whole plant food protein “complete protein?”
- Is whole plant food protein “high quality protein?”
- What happens when you eat more than the daily requirement for protein?

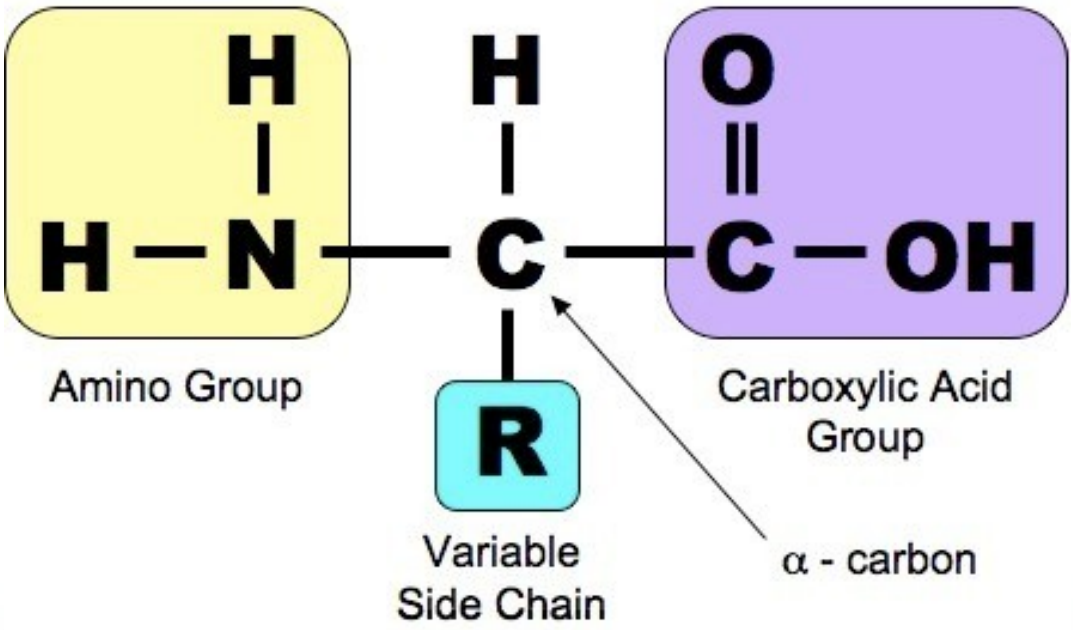
What are proteins?

Protein Structure

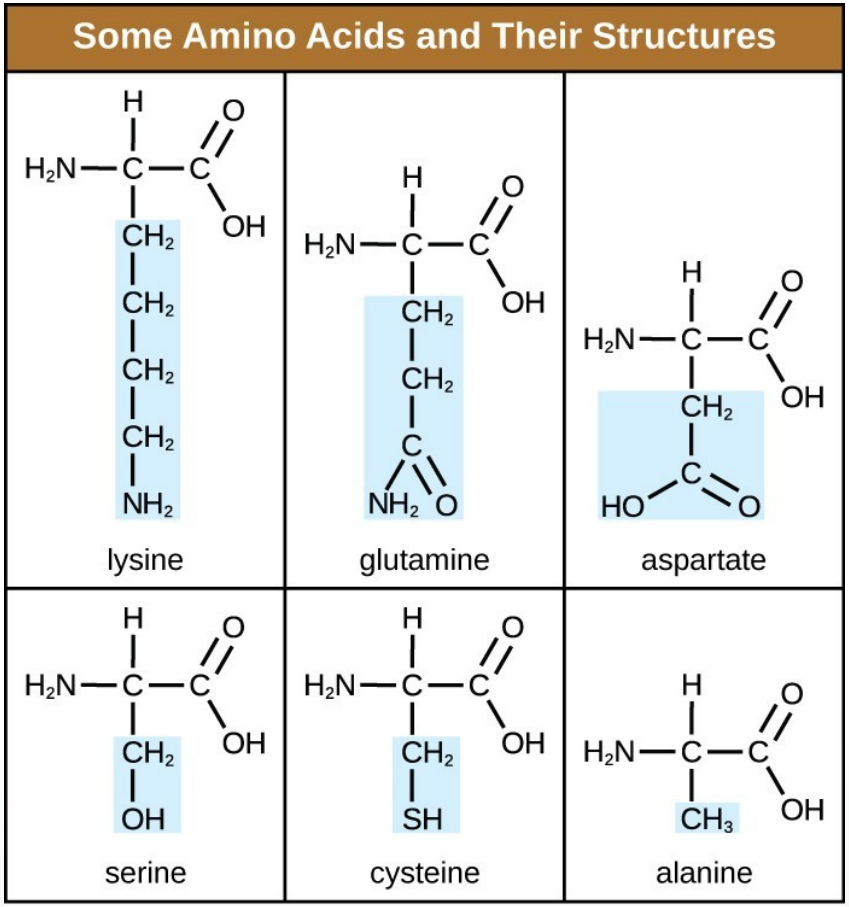


Proteins are long strings of different molecules called Amino Acids.

Amino Acid Structure



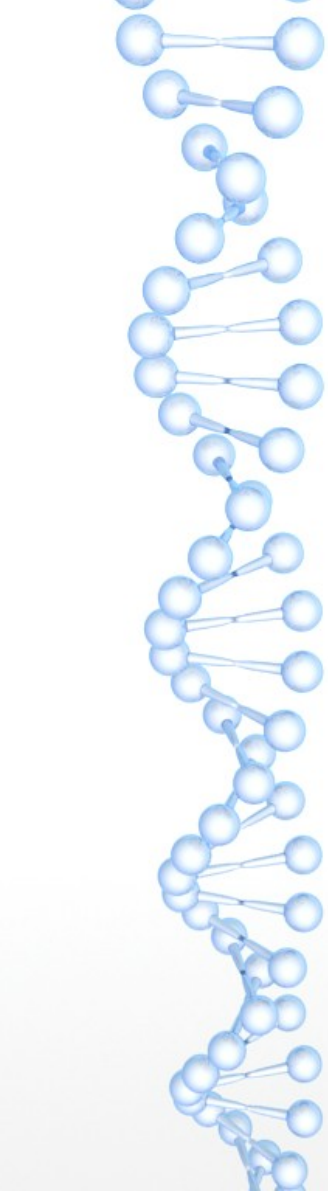
Amino Acid R Groups



What is the source of your protein?

Human Protein Synthesis

- **Your body** uses combinations of 21 different amino acids to **make all of** the amino acid chains that are in **your proteins.**
- **The sequence of the amino acids** chains in your proteins **is determined by** the genetic codes in **your DNA**.
- Different proteins have different sequences of amino acids.
- A typical small protein has 40-350 amino acids. Large proteins can have several times that number.
- At least 10,000 different proteins make us what we are and how we live.



Key Takeaway

You make all of your proteins from amino acids by following the instructions in the genetic code from your DNA.

Your proteins are not the same as the proteins created by the genetic code from the DNA of a cow, a chicken, a pig, wheat, corn, or rice.

You can not make direct use of the protein from any other organism.

A Better Question

Original Question

Where do you get your protein?

Better Question

Where do you get your amino acids?

Protein Recycling

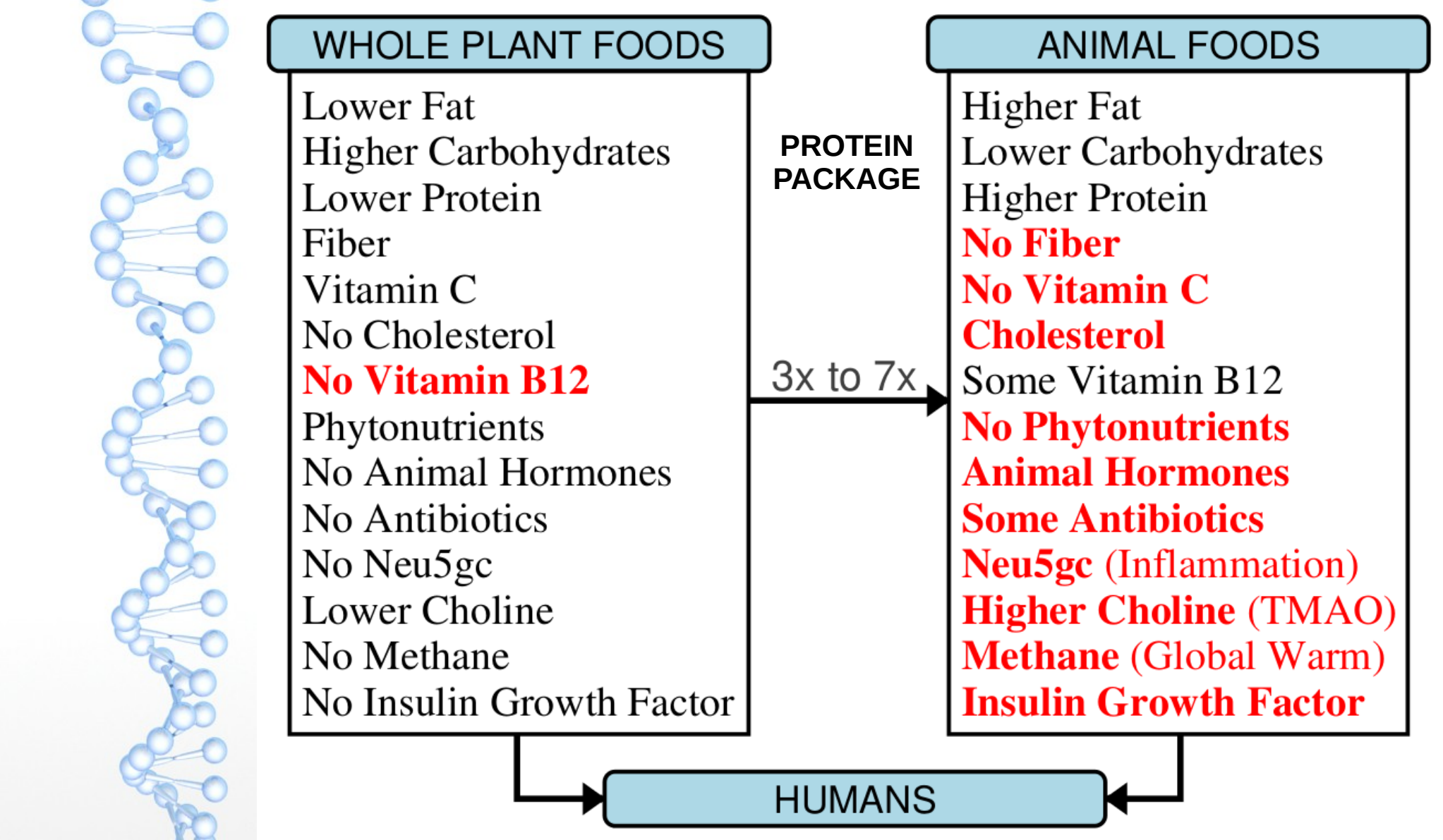
- Degraded proteins are broken down into their amino acids which are used to create new revitalized proteins.
- This recycling process is not completely efficient and some amino acids are lost.
- **A continuous supply of amino acids from your diet is needed to replace these losses.**
- **Amino acids consumed in excess of the amounts needed are not stored** but are broken down and either converted to glucose or turned into intermediates used in a variety of biochemical reactions.
- The leftover nitrogen and sulfur must be eliminated from the body which stresses the bones, liver, and kidneys.

Plant Eater Protein Synthesis

- A plant uses water, carbon dioxide, nitrogen and sulfur from the soil and energy from sunshine to make fat, carbohydrates, and amino acids to build plant proteins.
- A plant eater consumes the plant and their digestive track breaks the plant proteins apart to get amino acids that are then absorbed into their bloodstream.
- The plant eater’s cells use the amino acids and genetic codes from their cell’s DNA to create the proteins they need to build structure or control biological processes.

Animal Eater Protein Synthesis

- An animal eater consumes a plant eating animal and their digestive process breaks down the animal proteins into amino acids that are then absorbed into their bloodstream.
- The animal eater’s cells use the amino acids and genetic codes from their cell’s DNA to create the proteins they need to build structure or control biological processes.

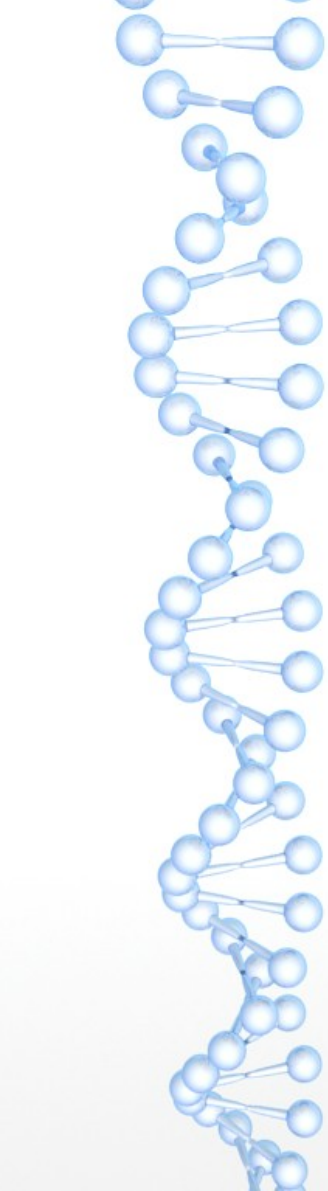

WHOLE PLANT FOODS
Lower Fat
Higher Carbohydrates
Lower Protein
Fiber
Vitamin C
No Cholesterol
No Vitamin B12
Phytonutrients
No Animal Hormones
No Antibiotics
No Neu5gc
Lower Choline
No Methane
No Insulin Growth Factor
PROTEIN PACKAGE
3x to 7x
ANIMAL FOODS
Higher Fat
Lower Carbohydrates
Higher Protein
No Fiber
No Vitamin C
Cholesterol
Some Vitamin B12
No Phytonutrients
Animal Hormones
Some Antibiotics
Neu5gc (Inflammation)
Higher Choline (TMAO)
Methane (Global Warm)
Insulin Growth Factor
HUMANS

100 CALORIES FROM EACH OF THE FOLLOWING FOODS
Plant Foods: Lentils, Sweet Potato, Broccoli, Spinach, Blueberries
Animal Foods: Beef Roast, Chicken Breast, Egg, American Cheese, 1% Milk

NUTRIENT	PLANT	ANIMAL
Calories	500	500
Weight *(pounds)*	2.5	1.2
Weight *(gr)*	1110	523
Water *(gr)*	961	416
Cholesterol *(mg)*	0	394
Fat *(gr)*	3.8	21.4
Saturated *(gr)*	0.8	10.1
Carbohydrate *(gr)*	102	17.7
Fiber *(gr)*	28.1	0
Starch *(gr)*	37.9	3.8
Sugar *(gr)*	32.1	14.5
Protein *(gr)*	31.3	58.9

NUTRIENT	PLANT	ANIMAL
Vitamin A *(IU)*	64061	763
Vitamin B12 *(mcg)*	0	3.9
Vitamin C *(mg)*	425	0
Vitamin E *(mg)*	12.9	1.0
Niacin *(mg)*	8.2	7.4
Folate *(mg)*	1182	52.2
Sodium *(mg)*	144	2064
Potassium *(mg)*	4211	820
Calcium *(mg)*	631	563
Magnesium *(mg)*	450	67.0
Iron *(mg)*	17.0	3.2
Zinc *(mg)*	5.1	8.5

Data Source: USDA Food Central Legacy Database



CONCLUSION

All amino acids that are combined to make your proteins come directly or indirectly from the amino acids plants create to synthesize their own proteins.

CONCLUSION

All amino acids in protein come from plants!

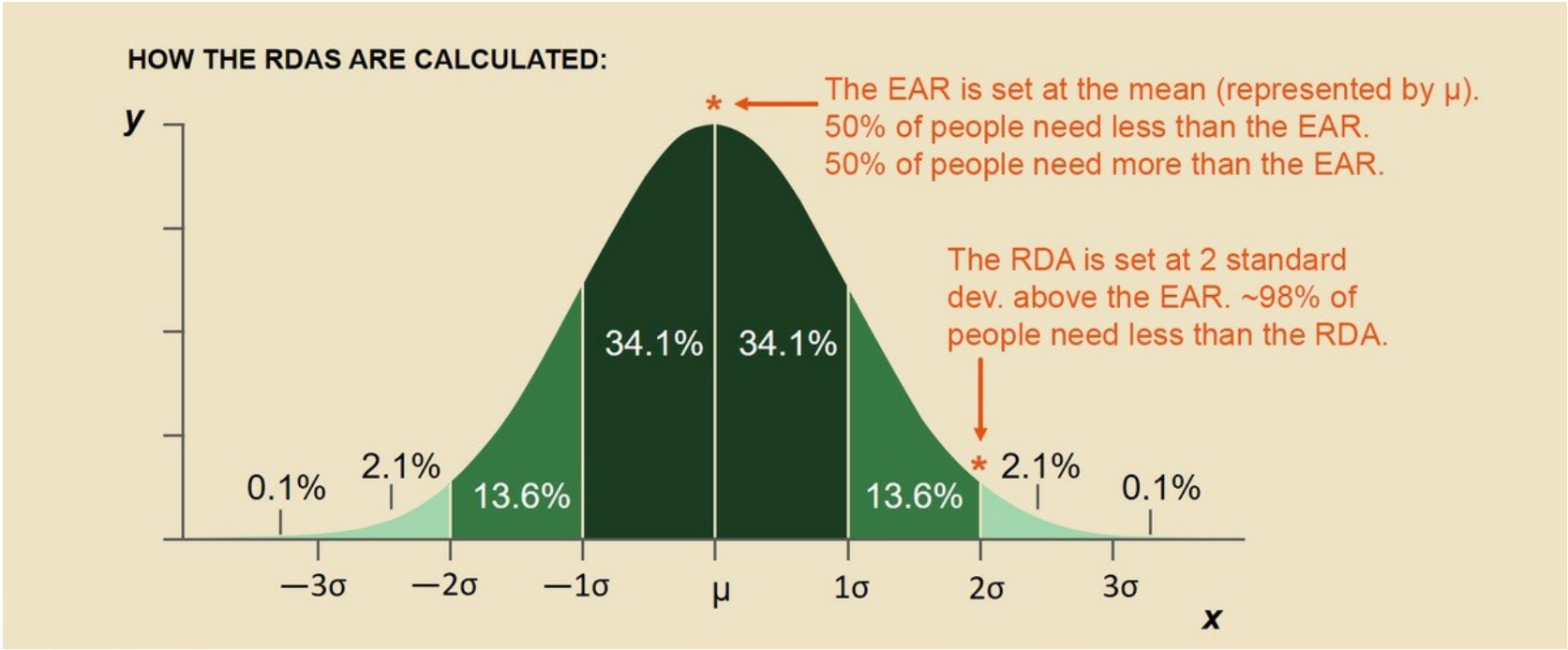
ALL PROTEIN COMES FROM PLANTS!

What is the daily requirement for protein?

Protein in Mother's Milk

MILK SOURCE	PERCENT OF CALORIES FROM PROTEIN	NUMBER OF DAYS TO DOUBLE BIRTH WEIGHT
HUMAN	5%	180
HORSE	11%	60
COW	15%	47
GOAT	17%	19
DOG	30%	8
CAT	40%	7
RAT	49%	4

Recommended Dietary Allowance (RDA)



Daily Protein RDA

AGE	PROTEIN g/kg Body Weight	% OF CALORIES
Infants	1.0 g/kg	5%
Toddlers	1.2 g/kg	6%
Kids	1.0 g/kg	7%
Puberty	1.2 g/kg	10%
Teen Athlete	1.5 g/kg	14%
Adults	**0.8** g/kg	**9**%
Seniors	1.0 g/kg	10%

1 kilogram (kg) = 1,000 grams (g)

1 kilogram (kg) = 2.2 pounds (lb)

1 pound (lb) = 0.45 kilograms (kg)

Daily Adult Protein Requirement

Adult Protein RDA = 0.8 g/kg Body Weight

IDEAL BODY WEIGHT		PROTEIN	PERCENT OF CALORIES			
POUNDS	KILOGRAMS	RDA g	1,800 cal	2,000 cal	2,200 cal	2,400 cal
120 lb	54.4 kg	44 g	10 %	9 %	8 %	7 %
130 lb	59.0 kg	47 g	10 %	9 %	9 %	8 %
140 lb	63.5 kg	51 g	11 %	10 %	9 %	8 %
150 lb	68.0 kg	54 g	12 %	11 %	10 %	9 %
160 lb	72.6 kg	58 g	13 %	12 %	11 %	10 %
170 lb	77.1 kg	62 g	14 %	12 %	11 %	10 %

1 pound (lb) = 0.45 kilograms (kg)

1 gram (g) protein = 4 calories (cal)

Daily Senior Protein Requirement

Senior Protein RDA = 1.0 g/kg Body Weight

IDEAL BODY WEIGHT		PROTEIN	PERCENT OF CALORIES			
POUNDS	KILOGRAMS	RDA g	1,800 cal	2,000 cal	2,200 cal	2,400 cal
120 lb	54.4 kg	54 g	12 %	11 %	10 %	9 %
130 lb	59.0 kg	59 g	13 %	12 %	11 %	10 %
140 lb	63.5 kg	64 g	14 %	13 %	12 %	11 %
150 lb	68.0 kg	68 g	15 %	14 %	12 %	11 %
160 lb	72.6 kg	73 g	16 %	15 %	13 %	12 %
170 lb	77.1 kg	77 g	17 %	15 %	14 %	13 %

1 pound (lb) = 0.45 kilograms (kg)

1 gram (g) protein = 4 calories (cal)

Can whole plant foods provide the daily requirement?

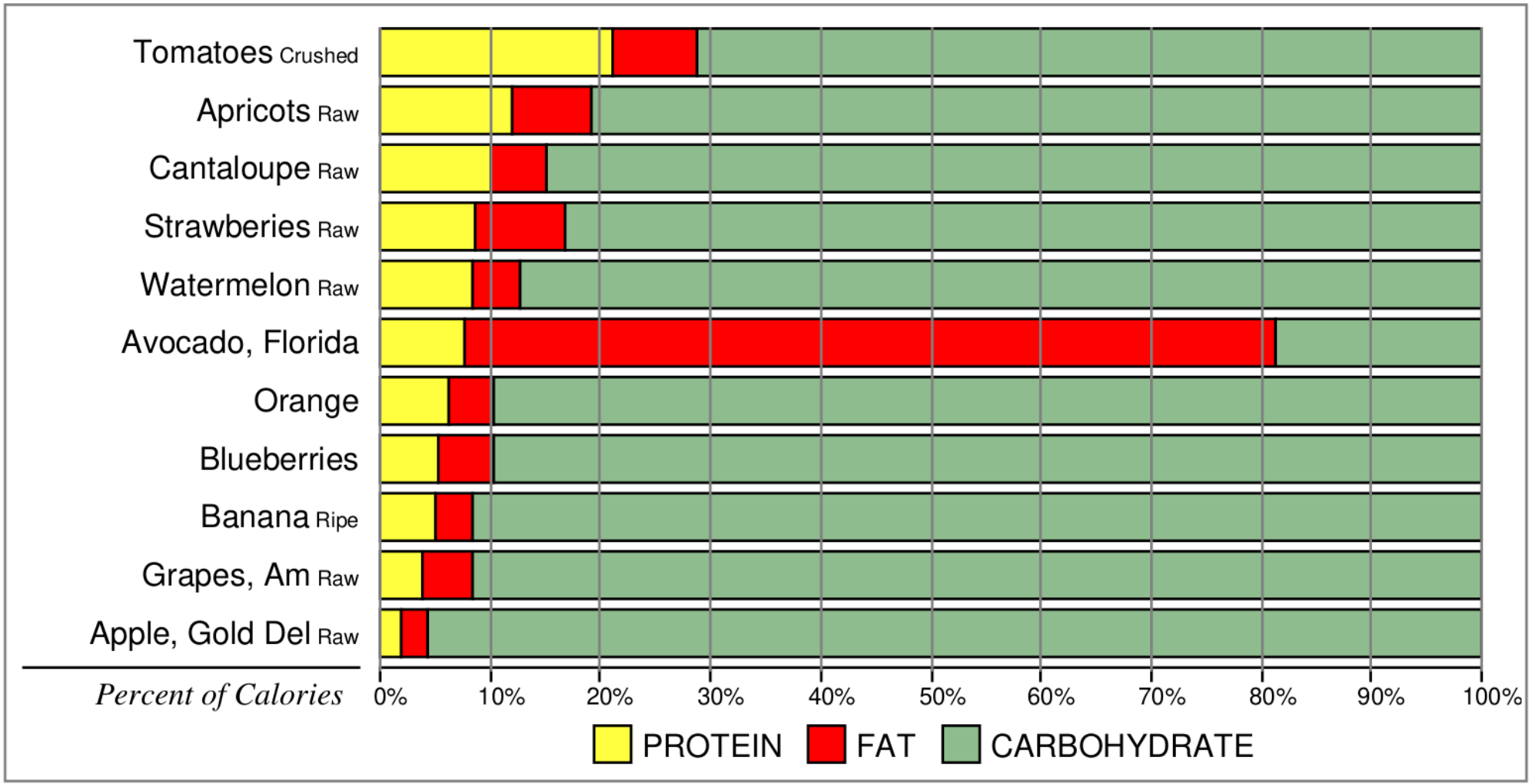
What is the Daily Protein Requirement?

The daily protein requirement is only ten to twelve percent of the calories you need to consume to maintain your ideal weight.

Protein Myth 1

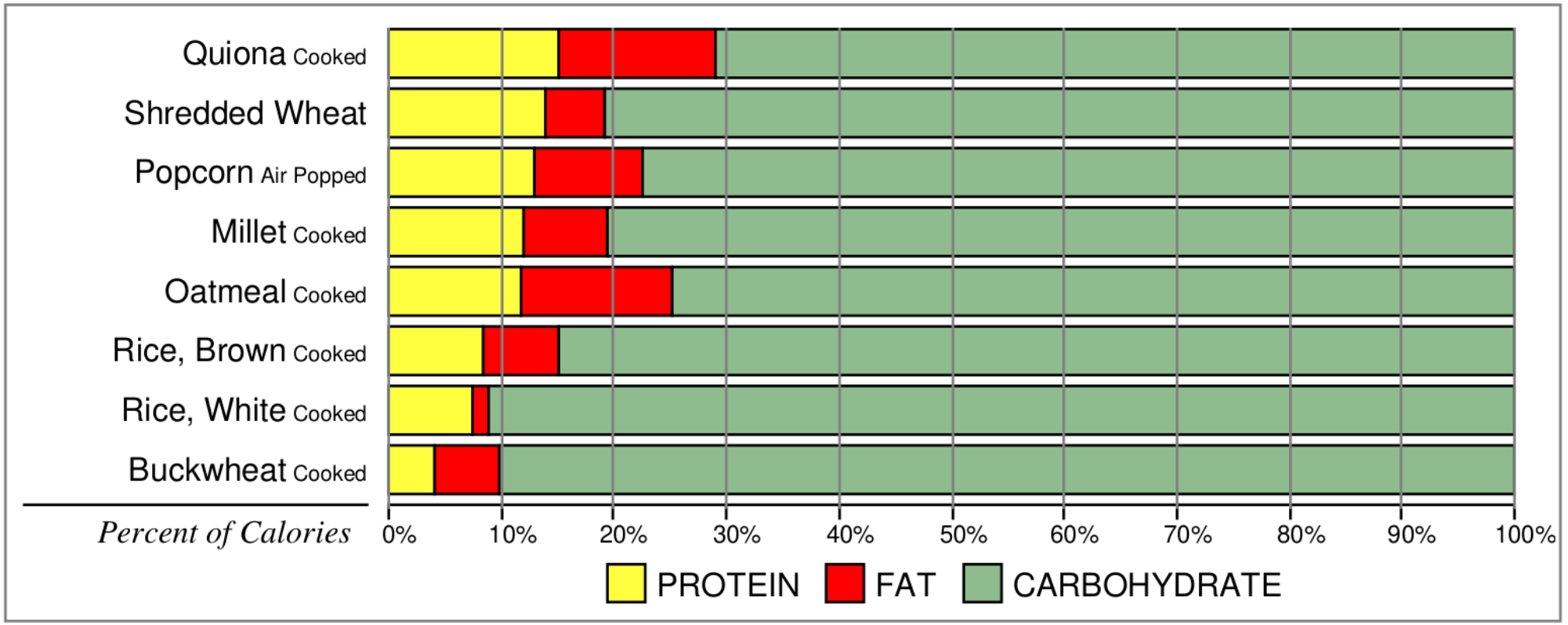
You must eat meat, poultry, eggs or dairy to get enough protein.

FRUIT - PERCENT OF TOTAL CALORIES



Data Source: USDA Food Central Legacy Database

GRAINS - PERCENT OF TOTAL CALORIES



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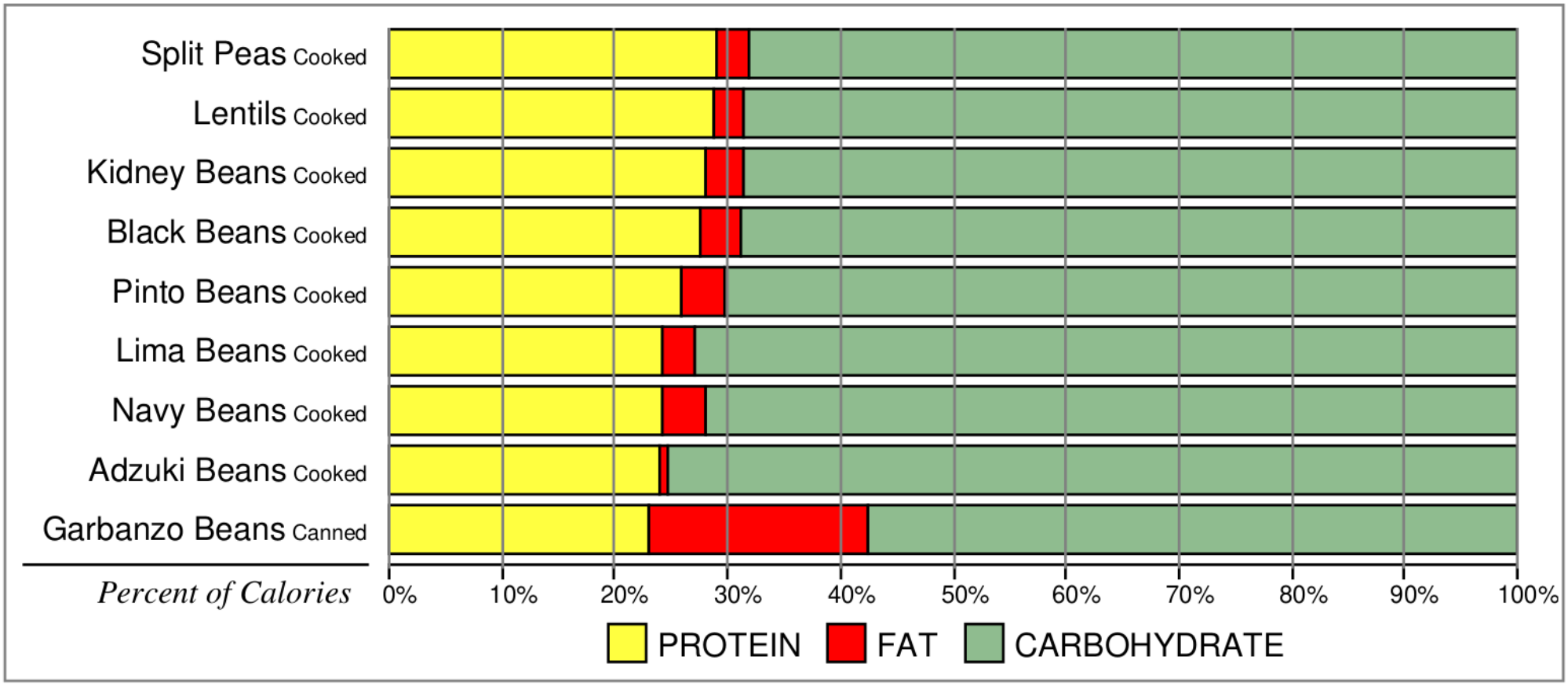
LEGUMES - PERCENT OF TOTAL CALORIES



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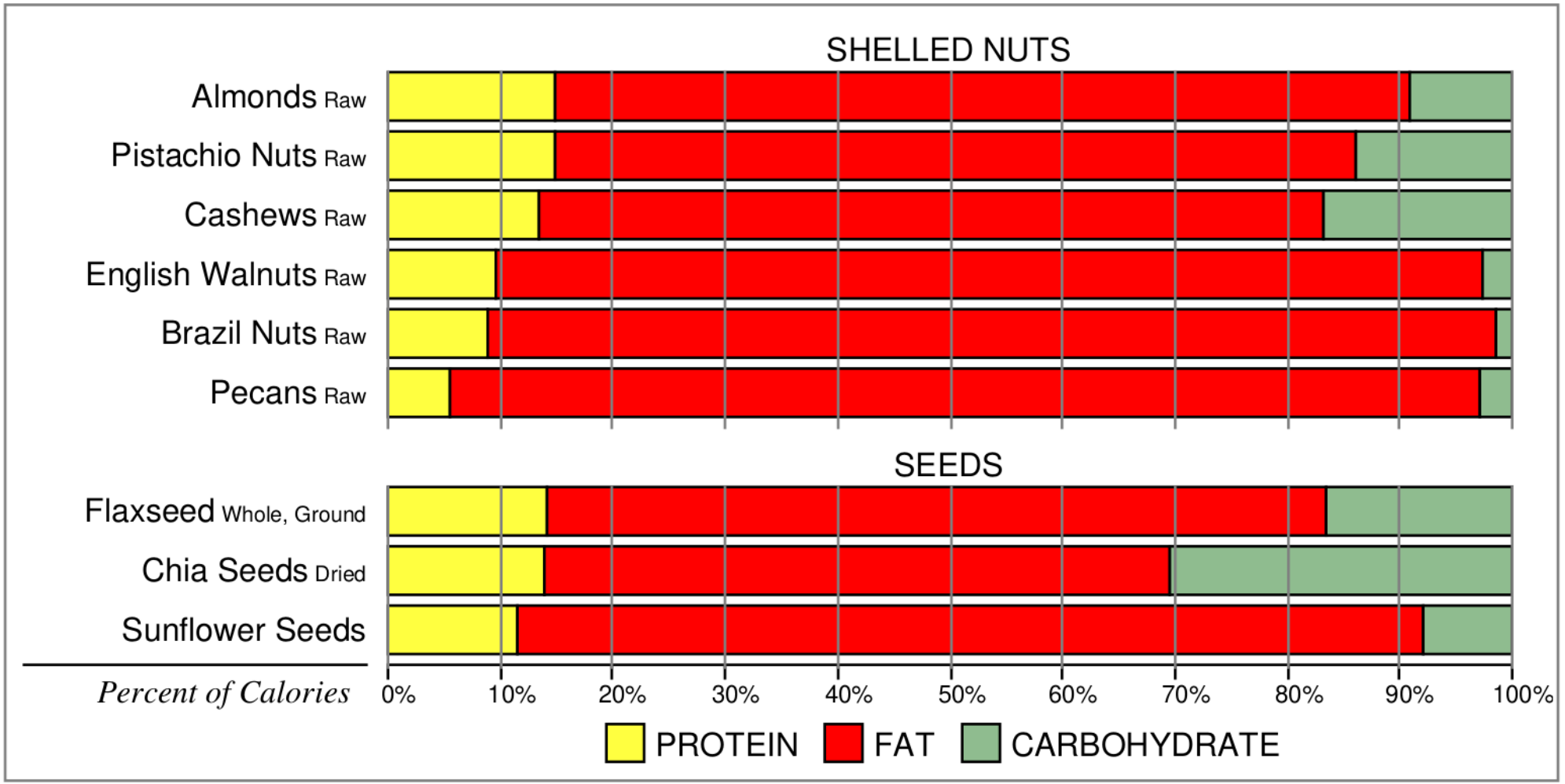
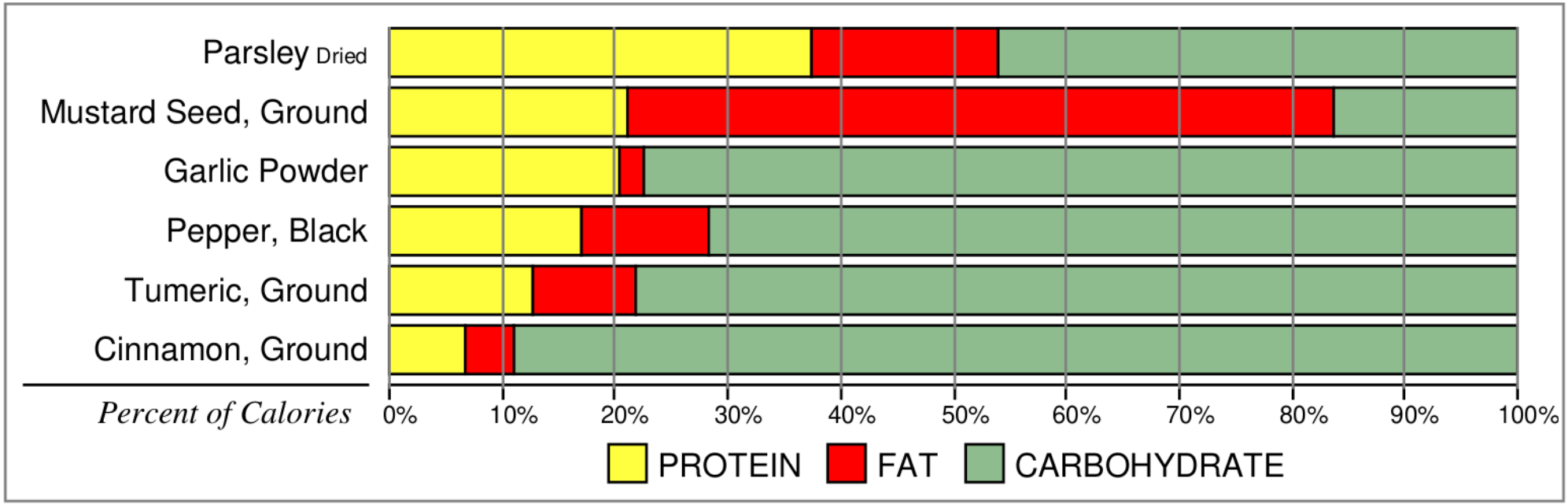
NUTS AND SEEDS - PERCENT OF TOTAL CALORIES



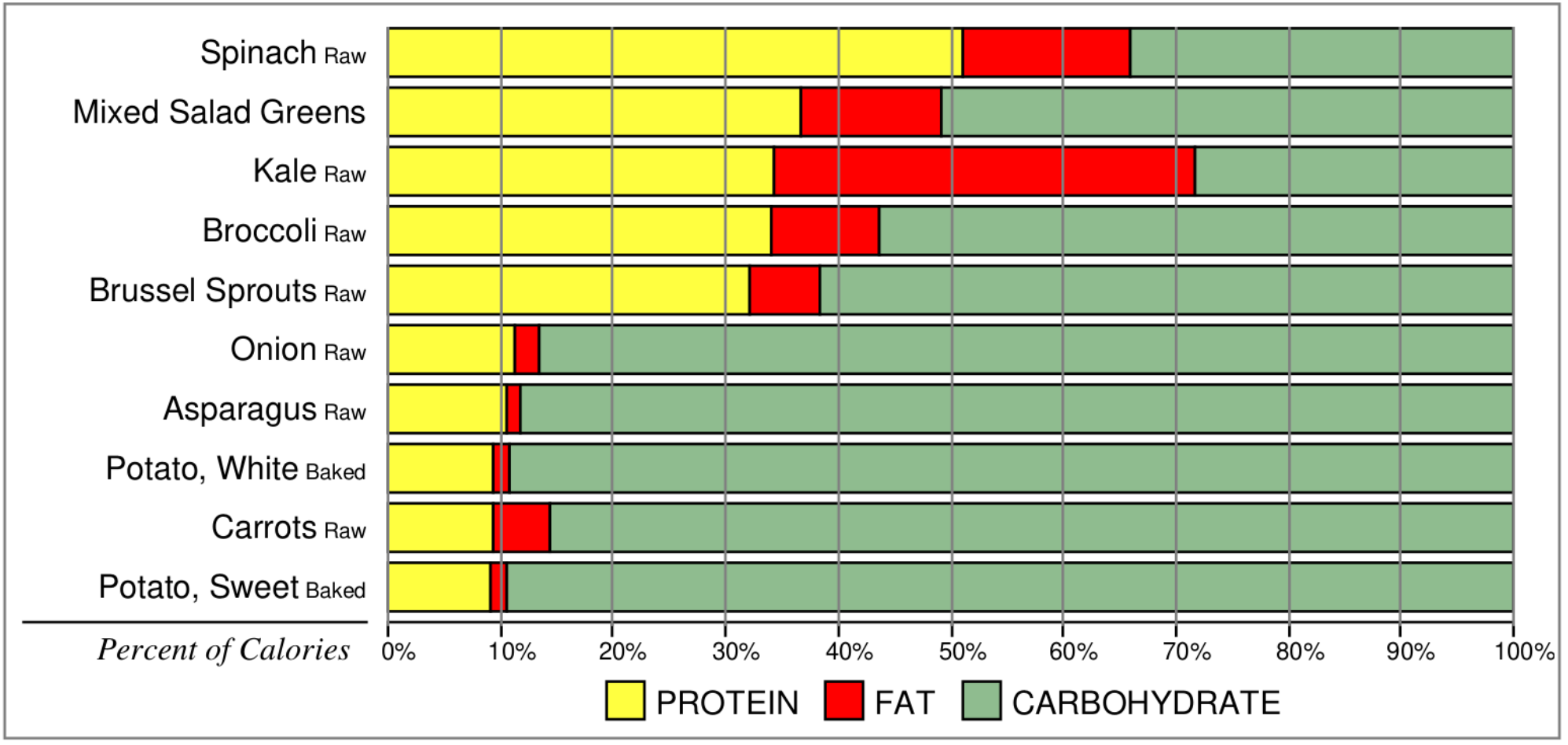
Data Source: USDA Food Central Legacy Database

SPICES - PERCENT OF TOTAL CALORIES



Data Source: USDA Food Central Legacy Database

VEGETABLES - PERCENT OF TOTAL CALORIES



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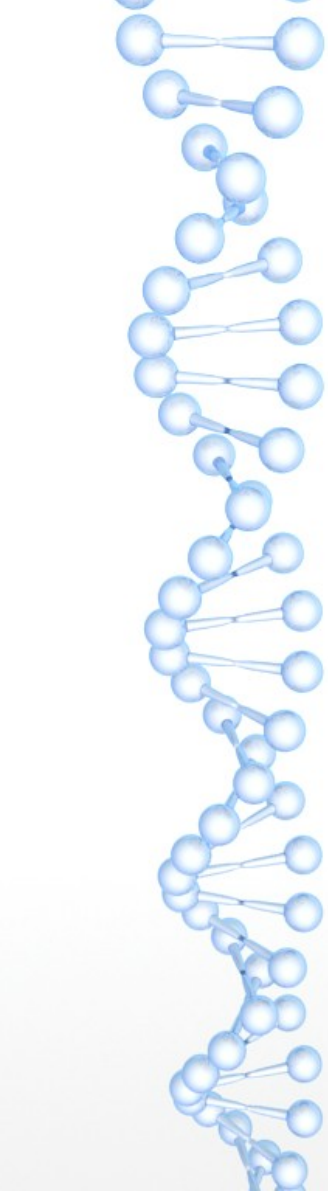


CONCLUSION

Many whole plant foods contain the the recommended daily amount of protein but some do not.

However, eating a variety of whole plant foods each day does provide the recommended daily amount of protein.

Is whole plant food protein “complete protein?”

21 Amino Acids in Human Proteins

ESSENTIAL		
NAME	ABBREV	
Histidine	HIS	H
Isoleucine (BCAA)	ILE	I
Leucine (BCAA)	LEU	L
Lysine	LYS	K
Methionine (SULF)	MET	M
Phenylalanine	PHE	F
Threonine	THR	T
Tryptophan	TRP	W
Valine (BCAA)	VAL	V

CONDITIONAL		
NAME	ABBREV	
Arginine	ARG	R
Cysteine (SULFUR)	CYS	C
Glutamine	GLN	Q
Glycine	GLY	G
Proline	PRO	P
Tyrosine	TYR	Y

NON-ESSENTIAL		
NAME	ABBREV	
Alanine	ALA	A
Asparagine	ASN	N
Aspartic Acid	ASP	D
Glutamic Acid	GLU	E
Serine	SER	S
Selenocysteine	SEL	-

Essential: Your body can not make
Conditional: Your healthy body can make
Non-essential: Your body can make

There are 300 different amino acids found in nature.
But only 21 different amino acids are found in the human body.

What is a “Complete Protein?”

A “complete protein” includes all nine of the essential amino acids.

Protein Myth 2

You must eat meat, poultry, eggs or dairy to get “complete protein.”

The following tables show the amount of each of the essential amino acids in 100 grams (3.5oz) of various plant foods.

Note that there are no zeros in any of the tables!

All of the plant foods contain some amount of each of the essential amino acids.

FOOD ITEM	PROT	GRAMS OF ESSENTIAL AMINO ACID								
100 GRAMS = 3.5 OUNCES	TOTAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Beef Chuck Roast	27.0	0.891	1.183	2.236	2.431	1.076	2.011	1.224	0.310	1.250
Chicken Leg Roasted	24.0	0.712	1.149	2.000	2.215	0.965	1.836	1.114	0.270	1.166
Whole Egg Raw	12.6	0.309	0.671	1.086	0.912	0.652	1.179	0.556	0.167	0.858
Brocolli Raw	2.8	0.059	0.079	0.129	0.135	0.066	0.167	0.088	0.033	0.125
Kale Raw	2.9	0.172	0.175	0.205	0.175	0.067	0.253	0.131	0.035	0.159
Cow Milk, 1%	3.4	0.101	0.174	0.319	0.282	0.108	0.344	0.143	0.043	0.220
Lentils Cooked	7.4	0.208	0.320	0.537	0.517	0.163	0.563	0.265	0.066	0.367
Black Beans Cooked	8.9	0.247	0.391	0.708	0.608	0.229	0.729	0.373	0.105	0.464
Almonds Raw	21.2	0.539	0.751	1.473	0.568	0.372	1.582	0.601	0.211	0.855
Popcorn Air Popped	12.0	0.367	0.431	1.473	0.338	0.469	1.078	0.452	0.085	0.607
Potato, White Baked	2.1	0.035	0.068	0.100	0.109	0.057	0.132	0.068	0.021	0.105
Rice, White Cooked	2.4	0.056	0.103	0.197	0.086	0.105	0.207	0.085	0.028	0.145
Banana Raw	1.1	0.077	0.028	0.068	0.050	0.017	0.058	0.028	0.009	0.047

Data Source: USDA Food Central Legacy Database

FRUITS

FOOD ITEM	PROT	GRAMS OF ESSENTIAL AMINO ACID								
100 GRAMS = 3.5 OUNCES	TOTAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Apple, Gold Del Raw	0.3	0.005	0.006	0.014	0.013	0.002	0.008	0.006	0.001	0.013
Apricots Raw	1.4	0.027	0.041	0.077	0.097	0.009	0.081	0.047	0.015	0.047
Avocado Raw	2.2	0.055	0.094	0.160	0.147	0.073	0.162	0.082	0.028	0.120
Banana Raw	1.1	0.077	0.028	0.068	0.050	0.017	0.058	0.028	0.009	0.047
Blueberries Raw	0.7	0.011	0.023	0.044	0.013	0.020	0.035	0.020	0.003	0.031
Cantaloupe Raw	0.8	0.015	0.021	0.029	0.030	0.014	0.037	0.017	0.002	0.033
Grapes, Am Raw	0.6	0.023	0.005	0.013	0.014	0.022	0.024	0.017	0.003	0.017
Honeydew Raw	0.5	0.005	0.013	0.016	0.018	0.010	0.025	0.013	0.005	0.018
Orange Raw	0.7	0.013	0.019	0.017	0.035	0.022	0.035	0.011	0.007	0.030
Tomatoes Crushed	1.6	0.023	0.037	0.057	0.057	0.033	0.067	0.040	0.012	0.040
Tomato Raw	0.9	0.014	0.018	0.025	0.027	0.015	0.041	0.027	0.006	0.018
Strawberries Raw	0.7	0.012	0.016	0.034	0.026	0.008	0.041	0.020	0.008	0.019
Watermelon Raw	0.6	0.006	0.019	0.018	0.062	0.008	0.027	0.027	0.007	0.016

Data Source: USDA Food Central Legacy Database

GRAINS

FOOD ITEM	PROT	GRAMS OF ESSENTIAL AMINO ACID								
100 GRAMS = 3.5 OUNCES	TOTAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Buckwheat	13.3	0.309	0.498	0.832	0.672	0.401	0.761	0.506	0.192	0.678
Millet Raw	11.0	0.236	0.465	1.400	0.212	0.433	0.920	0.353	0.119	0.578
Popcorn Air Popped	12.0	0.367	0.431	1.473	0.338	0.469	1.078	0.452	0.085	0.607
Quiona	4.4	0.127	0.157	0.261	0.239	0.159	0.268	0.131	0.052	0.185
Rice, Brown Cooked	2.3	0.059	0.098	0.191	0.088	0.080	0.206	0.085	0.030	0.136
Rice, White Cooked	2.4	0.056	0.103	0.197	0.086	0.105	0.207	0.085	0.028	0.145
Spelt	14.6	0.360	0.552	1.070	0.409	0.588	1.114	0.443	0.132	0.681
Sprouted Wheat Raw	7.5	0.196	0.287	0.507	0.245	0.250	0.625	0.254	0.115	0.361

Data Source: USDA Food Central Legacy Database

LEGUMES

FOOD ITEM	PROT	GRAMS OF ESSENTIAL AMINO ACID								
100 GRAMS = 3.5 OUNCES	TOTAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Adzuki Beans Cooked	7.5	0.198	0.300	0.632	0.567	0.149	0.622	0.255	0.072	0.387
Black Beans Cooked	8.9	0.247	0.391	0.708	0.608	0.229	0.729	0.373	0.105	0.464
Chickpeas, Canned	4.9	0.136	0.212	0.352	0.331	0.132	0.388	0.184	0.048	0.208
Kidney Beans Cooked	8.7	0.238	0.410	0.736	0.607	0.194	0.716	0.319	0.104	0.500
Lentils Cooked	7.4	0.208	0.320	0.537	0.517	0.163	0.563	0.265	0.066	0.367
Lima Beans Cooked	6.1	0.206	0.390	0.477	0.401	0.134	0.494	0.257	0.080	0.379
Navy Beans Cooked	8.2	0.206	0.387	0.700	0.520	0.187	0.668	0.289	0.100	0.504
Pinto Beans Cooked	9.0	0.247	0.426	0.765	0.630	0.201	0.744	0.331	0.108	0.519
Soybeans Cooked	18.2	0.449	0.807	1.355	1.108	0.492	1.499	0.723	0.242	0.831
Soybeans Sprout, Cooked	8.5	0.225	0.375	0.607	0.486	0.191	0.724	0.325	0.103	0.401
Split Peas Cooked	8.3	0.203	0.344	0.598	0.602	0.212	0.626	0.296	0.093	0.394

Data Source: USDA Food Central Legacy Database

NUTS & SEEDS

FOOD ITEM	PROT	GRAMS OF ESSENTIAL AMINO ACID								
100 GRAMS = 3.5 OUNCES	TOTAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Almonds Raw	21.2	0.539	0.751	1.473	0.568	0.372	1.582	0.601	0.211	0.855
English Walnuts	15.2	0.391	0.625	1.170	0.424	0.444	1.117	0.596	0.170	0.753
Flaxseed Whole, Ground	18.3	0.472	0.896	1.235	0.862	0.710	1.450	0.766	0.297	1.072

Data Source: USDA Food Central Legacy Database

SPICES

FOOD ITEM	PROT	GRAMS OF ESSENTIAL AMINO ACID								
100 GRAMS = 3.5 OUNCES	TOTAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Cinnamon Ground	4.0	0.117	0.146	0.253	0.243	0.136	0.282	0.136	0.049	0.224
Garlic Powder	16.6	0.263	0.414	0.728	0.768	0.364	0.970	0.374	0.121	0.667
Mustard Seed Ground	26.1	0.878	1.180	2.080	1.840	1.163	1.979	0.838	0.256	1.510
Parsley Dried	26.6	0.718	1.546	2.794	2.098	0.894	2.871	1.193	0.475	2.201
Pepper, Black	10.4	0.159	0.366	1.014	0.244	0.234	0.929	0.244	0.058	0.547
Tumeric Ground	9.7	0.150	0.470	0.810	0.380	0.290	0.850	0.330	0.170	0.660

Data Source: USDA Food Central Legacy Database

VEGETABLES

FOOD ITEM	PROT	GRAMS OF ESSENTIAL AMINO ACID								
100 GRAMS = 3.5 OUNCES	TOTAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Asparagus Raw	2.2	0.049	0.075	0.128	0.104	0.062	0.127	0.084	0.027	0.115
Brocolli Raw	2.8	0.059	0.079	0.129	0.135	0.066	0.167	0.088	0.033	0.125
Brussel Sprouts Raw	3.4	0.076	0.132	0.152	0.154	0.054	0.098	0.120	0.037	0.155
Carrots Raw	0.9	0.040	0.077	0.102	0.101	0.103	0.104	0.191	0.012	0.069
Kale Raw	2.9	0.172	0.175	0.205	0.175	0.067	0.253	0.131	0.035	0.159
Onions Raw	1.1	0.014	0.014	0.025	0.039	0.006	0.039	0.021	0.014	0.021
Potato, Sweet Baked	2.0	0.039	0.070	0.118	0.084	0.065	0.158	0.107	0.040	0.110
Potato, White Baked	2.1	0.035	0.068	0.100	0.109	0.057	0.132	0.068	0.021	0.105
Spinach Raw	2.9	0.064	0.147	0.223	0.174	0.088	0.237	0.122	0.039	0.161

Data Source: USDA Food Central Legacy Database

CONCLUSION

All whole plant foods contain “complete protein.”

In fact, **all natural foods** contain “complete protein.”

Is whole plant food protein “high quality protein?”

Essential Amino Acid Requirements

Milligrams / Kilogram Body Weight

AMINO ACID	INFANT 4-6 MONTHS	CHILD 10-12 YEARS	ADULT 1985	ADULT UPDATED
Histidine	29	------	------	10
Isoleucine (BCAA)	88	28	10	20
Leucine (BCAA)	150	44	14	39
Lysine	99	49	12	30
Methionine + Cysteine (SULFUR)	72	24	13	15
Methionine				*10*
Phenylalanine + Tyrosine	120	24	14	25
Theonine	74	30	7	15
Tryptophan	19	4	3	4
Valine (BCAA)	93	28	13	26
TOTAL	**715**	**231**	**86**	**184**

Merck Manual Professional Version, Overview of Nutrition
https//www.merckmanuals.com/professional/nutrition

WHO 2007

What is a “High Quality Protein?”

A “high quality protein” includes the recommended dietary allowance for all nine of the essential amino acids.

Protein Myth 3

You must eat meat, poultry, eggs or dairy to get “high quality protein.”

The following tables show the percent of the recommended daily amount (RDA) for each of the essential amino acids that is consumed by a 140 pound person who gets all 50.8 grams of their recommended daily requirement for protein by eating just one food.

Note that the RDA can easily be accomplished by combining plant foods that have less than 100% with plant foods that have more than 100% of the RDA of the essential amino acids.

FOOD ITEM		ESSENTIAL AMINO ACID PERCENT OF RDA FOR A 140 LB BODY WEIGHT								
50.8 GRAMS PROTEIN	CAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Beef Chuck Roast	323	264 %	175 %	170 %	240 %	212 %	238 %	242 %	229 %	142 %
Chicken Leg Roasted	389	237 %	191 %	171 %	246 %	214 %	244 %	247 %	225 %	149 %
Whole Egg Raw	578	197 %	214 %	177 %	194 %	277 %	300 %	236 %	266 %	210 %
Brocolli Raw	613	167 %	112 %	**94** %	128 %	125 %	190 %	166 %	234 %	136 %
Kale Raw	609	471 %	240 %	144 %	160 %	122 %	277 %	239 %	240 %	168 %
Cow Milk, 1%	633	240 %	207 %	194 %	223 %	171 %	327 %	226 %	255 %	201 %
Lentils Cooked	498	225 %	173 %	149 %	186 %	117 %	243 %	191 %	179 %	153 %
Black Beans Cooked	757	223 %	177 %	164 %	183 %	138 %	263 %	225 %	237 %	161 %
Almonds Raw	1,391	204 %	142 %	143 %	**72** %	**94** %	239 %	152 %	200 %	124 %
Popcorn Air Popped	1,617	245 %	144 %	252 %	**75** %	208 %	287 %	201 %	142 %	156 %
Potato, White Baked	2,226	133 %	130 %	**98** %	138 %	145 %	201 %	173 %	200 %	154 %
Rice, White Cooked	2,775	188 %	173 %	170 %	**96** %	235 %	278 %	190 %	235 %	187 %
Banana Raw	4,148	565 %	103 %	128 %	122 %	**83** %	170 %	137 %	165 %	133 %

Data Source: USDA Food Central Legacy Database

FRUITS

FOOD ITEM		ESSENTIAL AMINO ACID PERCENT OF RDA FOR A 140 LB BODY WEIGHT								
50.8 GRAMS PROTEIN	CAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Apple, Gold Del Raw	10,342	143 %	**86** %	103 %	124 %	**38** %	**91** %	114 %	**71** %	143 %
Apricots Raw	1,742	154 %	117 %	113 %	185 %	**34** %	185 %	179 %	214 %	103 %
Avocado Raw	2,734	197 %	169 %	147 %	176 %	175 %	232 %	196 %	251 %	166 %
Banana Raw	4,148	565 %	103 %	128 %	122 %	**83** %	170 %	137 %	165 %	133 %
Blueberries Raw	3,913	119 %	124 %	122 %	**47** %	144 %	151 %	144 %	**81** %	129 %
Cantaloupe Raw	2,056	143 %	100 %	**71** %	**95** %	**89** %	141 %	108 %	**48** %	121 %
Grapes, Am Raw	5,403	292 %	**32** %	**42** %	**59** %	186 %	122 %	144 %	**95** %	**83** %
Honeydew Raw	3,387	**74** %	**96** %	**61** %	**89** %	**99** %	148 %	128 %	185 %	103 %
Orange Raw	3,338	149 %	109 %	**50** %	133 %	168 %	160 %	**84** %	200 %	132 %
Tomatoes Crushed	991	112 %	**90** %	**71** %	**93** %	107 %	131 %	130 %	146 %	**75** %
Tomato Raw	1,039	127 %	**82** %	**58** %	**82** %	**91** %	149 %	164 %	136 %	**63** %
Strawberries Raw	2,426	143 %	**96** %	104 %	103 %	**64** %	196 %	159 %	239 %	**87** %
Watermelon Raw	2,498	**79** %	125 %	**61** %	271 %	**70** %	142 %	236 %	230 %	**81** %

Data Source: USDA Food Central Legacy Database

GRAINS

FOOD ITEM		ESSENTIAL AMINO ACID PERCENT OF RDA FOR A 140 LB BODY WEIGHT								
50.8 GRAMS PROTEIN	CAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Buckwheat	1,315	187 %	150 %	129 %	135 %	161 %	184 %	204 %	290 %	157 %
Millet Raw	1,743	171 %	169 %	261 %	**51** %	210 %	267 %	171 %	216 %	161 %
Popcorn Air Popped	1,617	245 %	144 %	252 %	**75** %	208 %	287 %	201 %	142 %	156 %
Quiona	1,386	231 %	143 %	122 %	145 %	193 %	195 %	159 %	236 %	129 %
Rice, Brown Cooked	2,453	203 %	169 %	169 %	101 %	184 %	284 %	195 %	259 %	180 %
Rice, White Cooked	2,775	188 %	173 %	170 %	**96** %	235 %	278 %	190 %	235 %	187 %
Spelt	1,179	198 %	152 %	151 %	**75** %	215 %	245 %	162 %	181 %	144 %
Sprouted Wheat Raw	1,343	209 %	153 %	139 %	**87** %	178 %	267 %	181 %	307 %	148 %

Data Source: USDA Food Central Legacy Database

LEGUMES

FOOD ITEM		ESSENTIAL AMINO ACID PERCENT OF RDA FOR A 140 LB BODY WEIGHT								
50.8 GRAMS PROTEIN	CAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Adzuki Beans Cooked	865	211 %	160 %	172 %	201 %	106 %	265 %	181 %	191 %	158 %
Black Beans Cooked	757	223 %	177 %	164 %	183 %	138 %	263 %	225 %	237 %	161 %
Chickpeas, Canned	909	221 %	172 %	147 %	179 %	143 %	252 %	199 %	195 %	130 %
Kidney Beans Cooked	744	220 %	189 %	174 %	187 %	119 %	264 %	196 %	240 %	177 %
Lentils Cooked	498	225 %	173 %	149 %	186 %	117 %	243 %	191 %	179 %	153 %
Lima Beans Cooked	862	271 %	257 %	161 %	176 %	118 %	260 %	226 %	264 %	192 %
Navy Beans Cooked	864	200 %	188 %	174 %	168 %	121 %	260 %	187 %	243 %	188 %
Pinto Beans Cooked	806	219 %	189 %	174 %	186 %	119 %	264 %	196 %	240 %	177 %
Soybeans Cooked	480	197 %	177 %	153 %	162 %	144 %	263 %	212 %	266 %	140 %
Soybeans Sprout, Cooked	486	213 %	177 %	147 %	153 %	120 %	274 %	205 %	243 %	146 %
Split Peas Cooked	719	195 %	165 %	147 %	192 %	136 %	240 %	189 %	223 %	145 %

Data Source: USDA Food Central Legacy Database

NUTS & SEEDS

FOOD ITEM		ESSENTIAL AMINO ACID PERCENT OF RDA FOR A 140 LB BODY WEIGHT								
50.8 GRAMS PROTEIN	CAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Almonds Raw	1,391	204 %	142 %	143 %	**72** %	**94** %	239 %	152 %	200 %	124 %
English Walnuts	2,182	205 %	164 %	158 %	**74** %	155 %	235 %	209 %	223 %	152 %
Flaxseed Whole, Ground	1,483	206 %	196 %	139 %	126 %	207 %	254 %	223 %	325 %	180 %

Data Source: USDA Food Central Legacy Database

SPICES

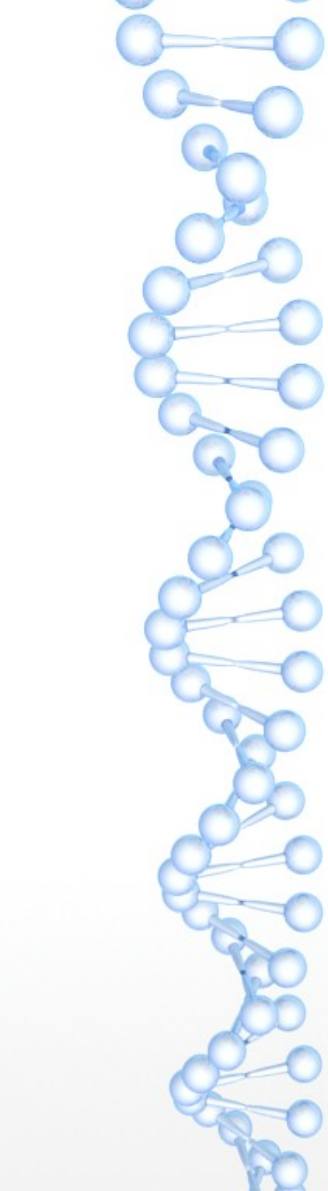
FOOD ITEM		ESSENTIAL AMINO ACID PERCENT OF RDA FOR A 140 LB BODY WEIGHT								
50.8 GRAMS PROTEIN	CAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Garlic Powder	1,016	127 %	100 %	**90** %	124 %	117 %	188 %	121 %	146 %	124 %
Parsley Dried	557	216 %	232 %	215 %	210 %	179 %	345 %	239 %	357 %	254 %
Pepper, Black	1,227	122 %	141 %	200 %	**63** %	120 %	286 %	125 %	112 %	162 %

Data Source: USDA Food Central Legacy Database

VEGETABLES

FOOD ITEM		ESSENTIAL AMINO ACID PERCENT OF RDA FOR A 140 LB BODY WEIGHT								
50.8 GRAMS PROTEIN	CAL	HIS	ILE BCAA	LEU BCAA	LYS	M+C SULFUR	P+T	THR	TRP	VAL BCAA
Asparagus Raw	462	178 %	136 %	119 %	126 %	150 %	185 %	204 %	245 %	161 %
Brocolli Raw	613	167 %	112 %	**94** %	128 %	125 %	190 %	166 %	234 %	136 %
Brussel Sprouts Raw	646	180 %	156 %	**92** %	121 %	**85** %	**93** %	189 %	219 %	141 %
Carrots Raw	2,240	344 %	331 %	225 %	290 %	591 %	358 %	1095 %	258 %	228 %
Kale Raw	609	471 %	240 %	144 %	160 %	122 %	277 %	239 %	240 %	168 %
Onions Raw	1,847	102 %	**51** %	**47** %	**95** %	**29** %	113 %	102 %	255 %	**59** %
Potato, Sweet Baked	2,275	155 %	139 %	120 %	111 %	172 %	252 %	284 %	398 %	168 %
Potato, White Baked	2,226	133 %	130 %	**98** %	138 %	145 %	201 %	173 %	200 %	154 %
Spinach Raw	409	179 %	206 %	160 %	162 %	164 %	265 %	228 %	273 %	173 %

Data Source: USDA Food Central Legacy Database



CONCLUSION

Many whole plant foods contain “high quality protein” but some do not.

However, eating a variety of whole plant foods each day does provide “high quality protein.”

Summary

- All amino acids that are combined to create proteins come directly or indirectly from plants.
- The recommended daily protein requirement (RDA) is only 10% to 12% of the calories you need to maintain your ideal weight.
- The recommended daily protein requirement can be satisfied by eating a variety of whole plant foods.
- All whole plant foods contain “complete protein.”
- Many whole plant foods contain “high quality protein” but some do not. Eating a variety of whole plant foods each day does provide “high quality protein.”

What happens when you eat more than your daily requirement for protein?

Macronutrient Storage

When you eat a meal:

- carbohydrates that are not immediately burned for energy are stored in the liver and in muscle cells.
- fats that are not immediately needed for energy or metabolic processes are stored in fat cells to supply energy during times of fasting or food scarcity.
- amino acids that are not needed to replace degraded amino acids, repair physical damage, or remodel muscle are not stored for later use.

The body does maintain a small reserve of amino acids to ensure all of the essential amino acids are available when they are not included in sufficient amounts in a meal.

Excess Amino Acid Breakdown

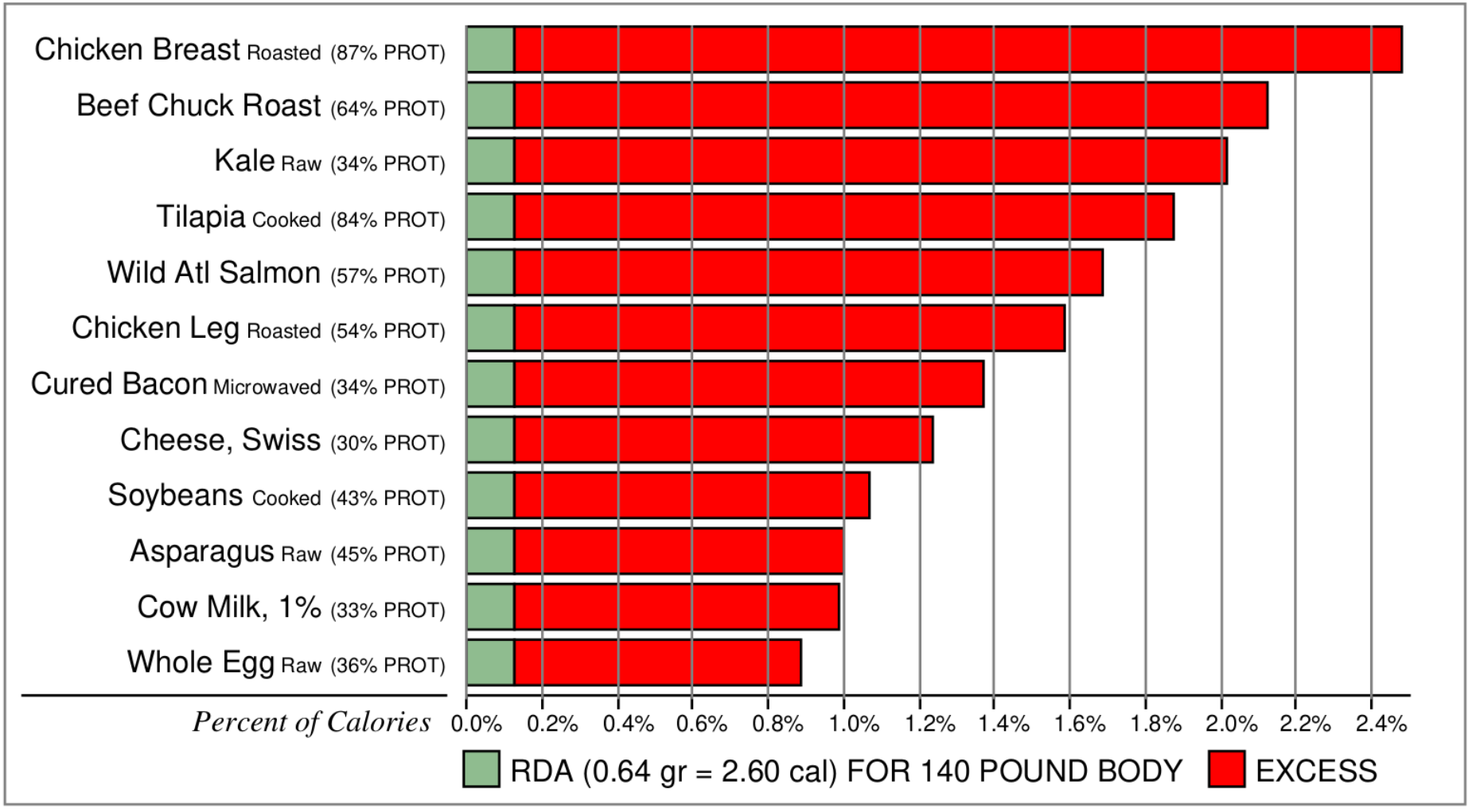
Each amino acid is a short molecule made of nitrogen, carbon, oxygen, and hydrogen. Some amino acids also include sulfur:

- the nitrogen is removed from excess amino acids and the liver incorporates the nitrogen into urea which passes through the kidneys and is excreted in the urine.
- the other parts of excess amino acids are converted to glucose, fatty acids, ketones or an intermediate used in a biochemical reaction.

Blood Urea Nitrogen (BUN)

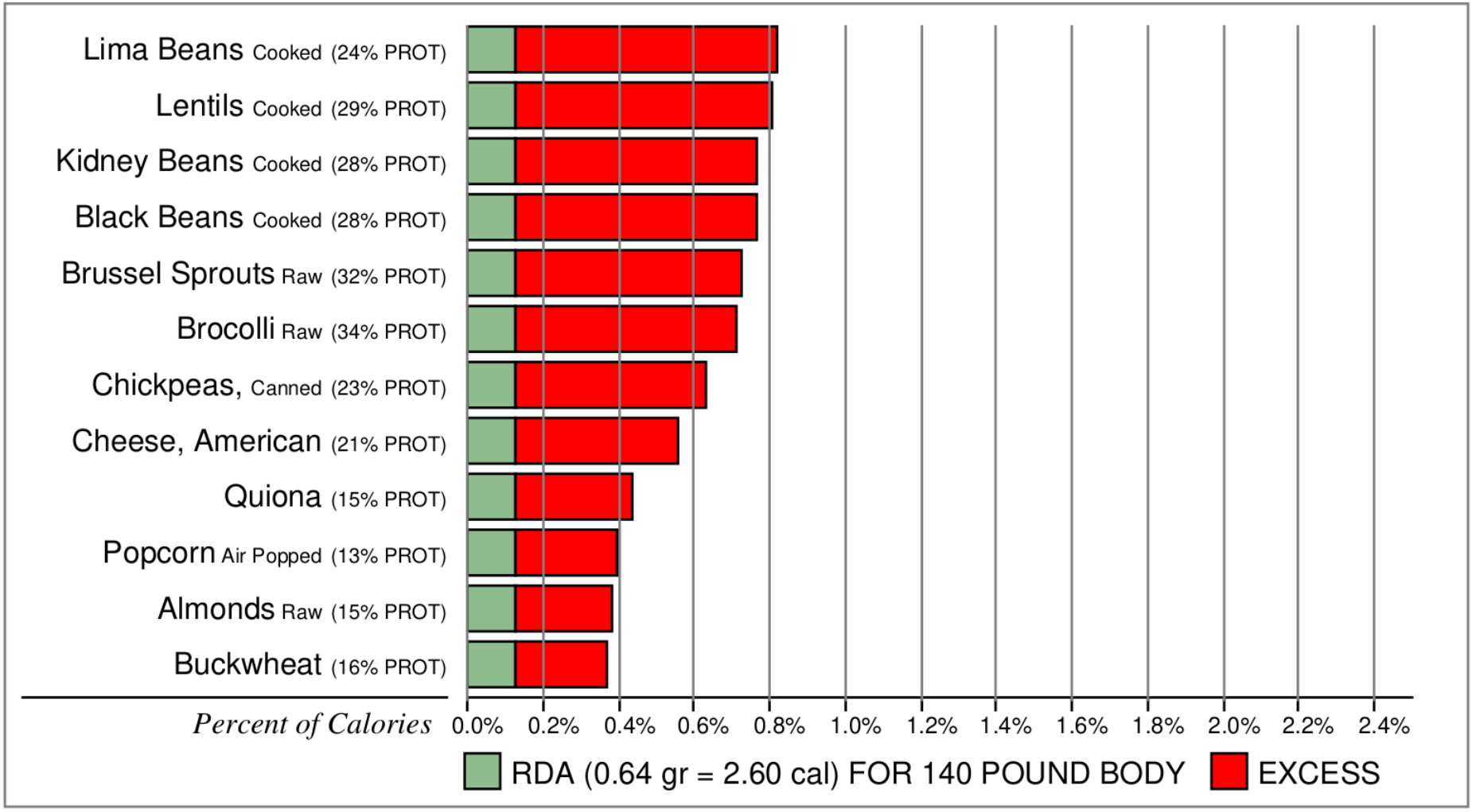
- The urea produced by the liver travels through the bloodstream to the kidneys.
- Healthy kidneys filter the urea from the bloodstream and flush it though the urine.
- Filtering large amount of urea over extended periods of time can add stress to the kidneys and contribute to the cause of kidney disease.
- A common blood test, the Blood Urea Nitrogen (BUN) test reveals information about how well your kidneys are working.
- High values for BUN can be caused by high amounts of excess protein or by a decline in kidney function.

PERCENT OF CALORIES FROM TRIPLE NITROGEN AMINO ACIDS



Data Source: USDA Food Central Legacy Database

PERCENT OF CALORIES FROM TRIPLE NITROGEN AMINO ACIDS



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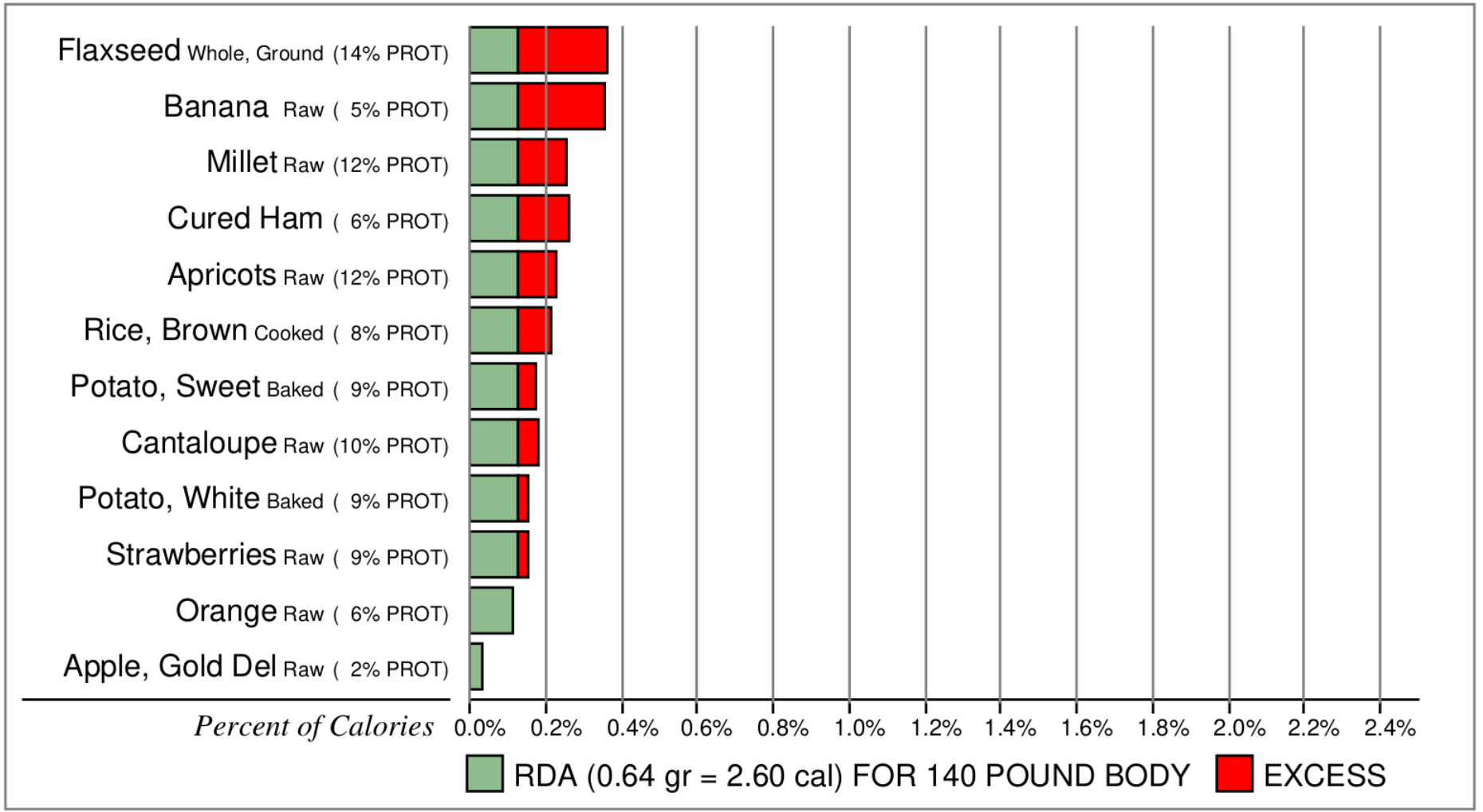
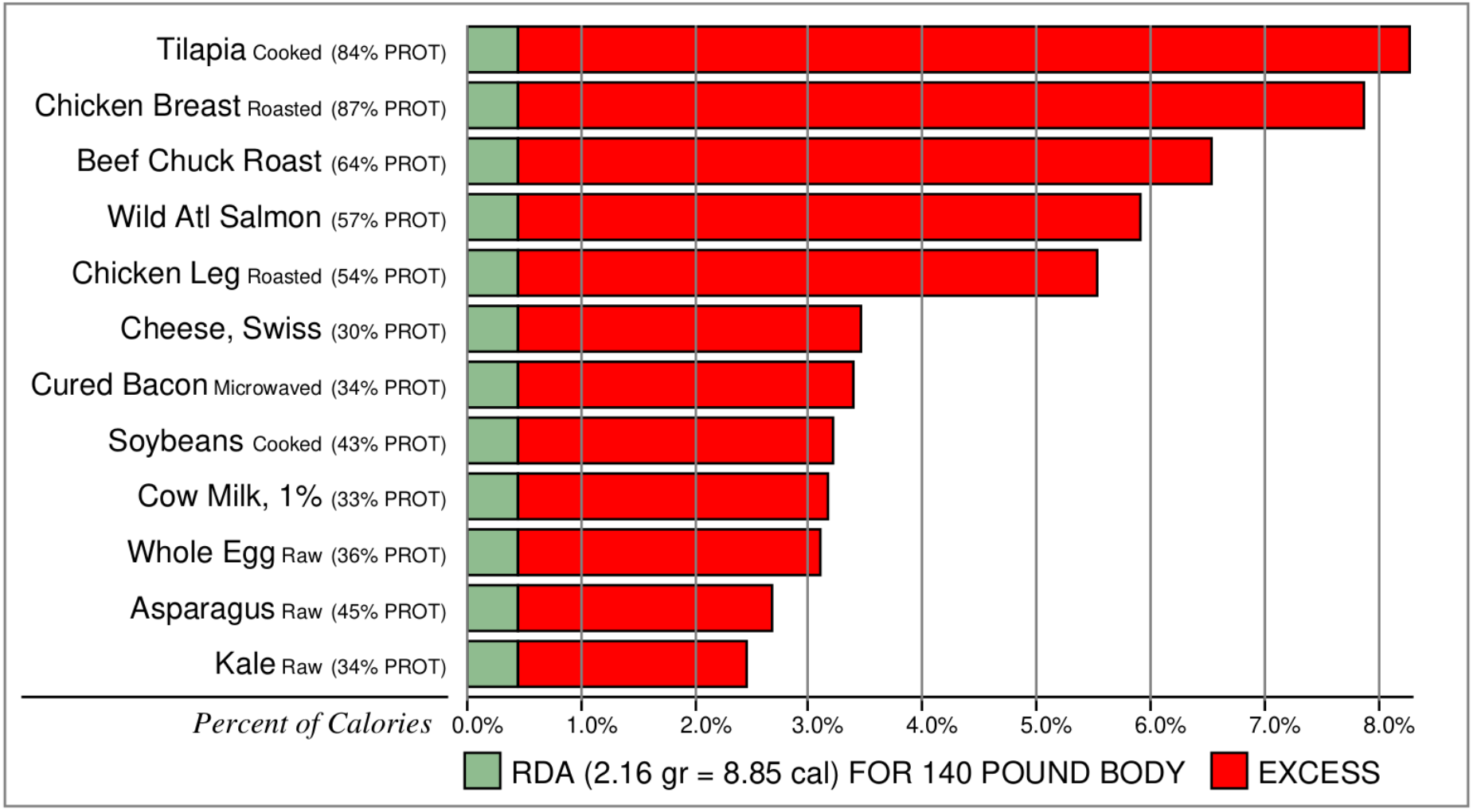
PERCENT OF CALORIES FROM TRIPLE NITROGEN AMINO ACIDS



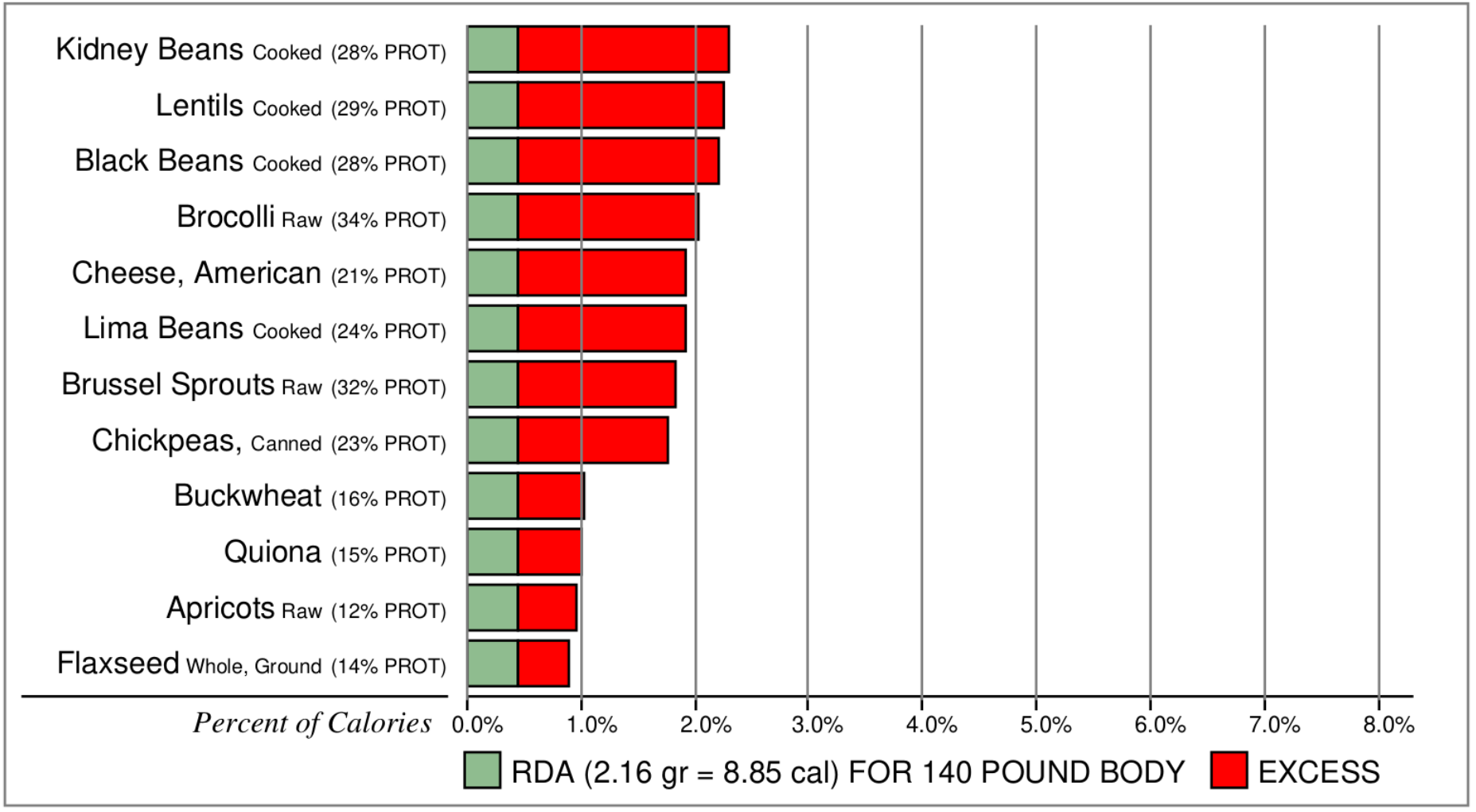
Data Source: USDA Food Central Legacy Database

PERCENT OF CALORIES FROM DOUBLE NITROGEN AMINO ACIDS



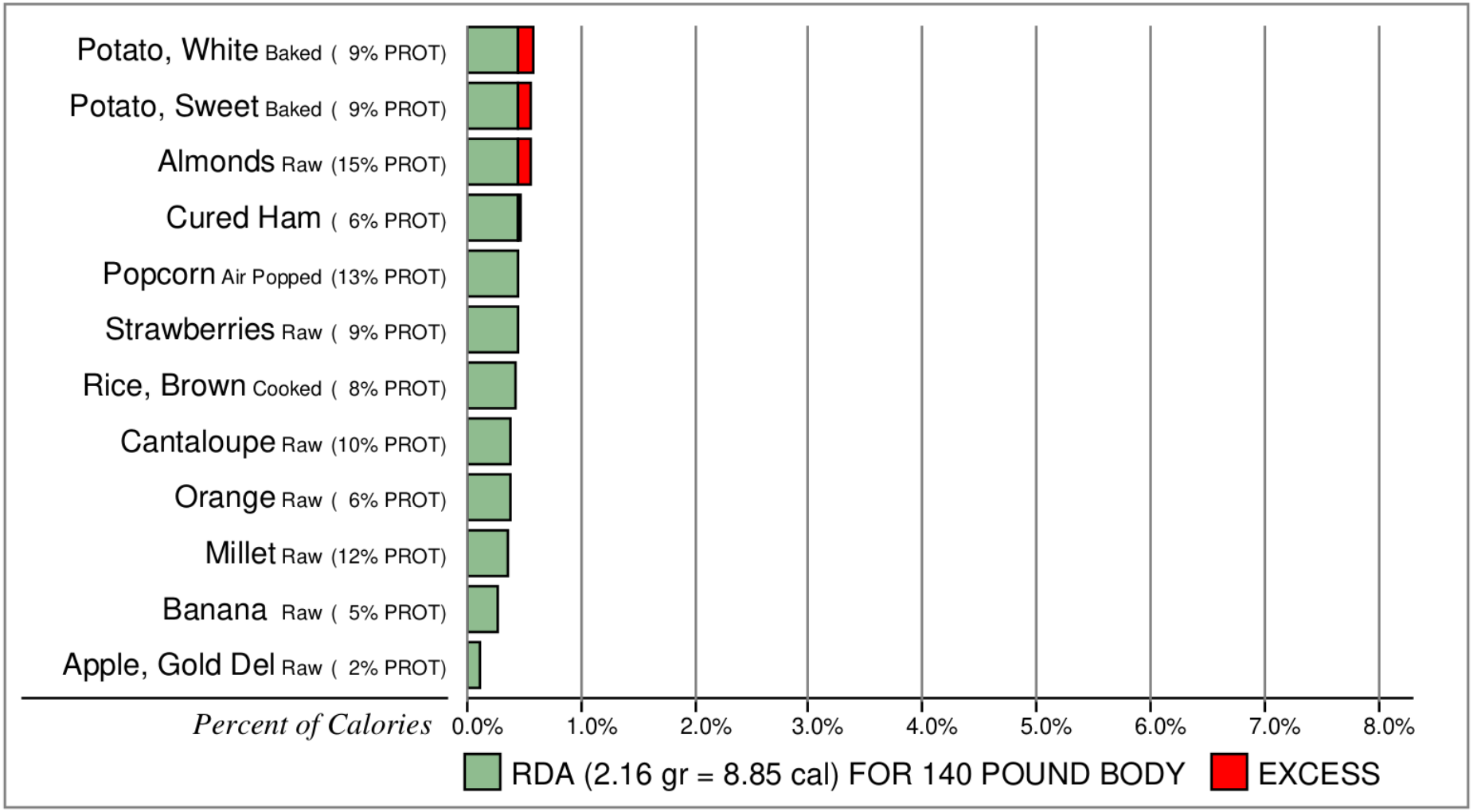
Data Source: USDA Food Central Legacy Database

PERCENT OF CALORIES FROM DOUBLE NITROGEN AMINO ACIDS



Data Source: USDA Food Central Legacy Database

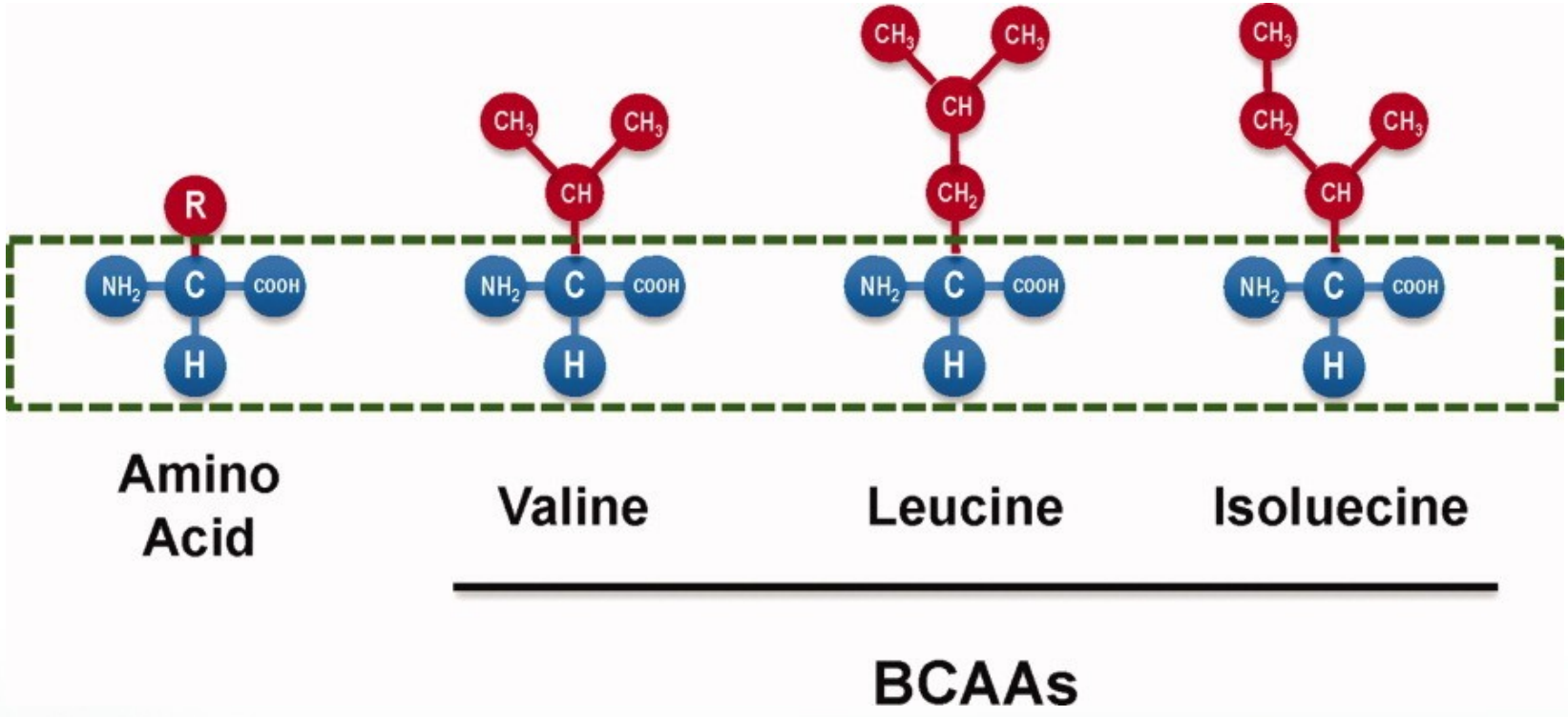
PERCENT OF CALORIES FROM DOUBLE NITROGEN AMINO ACIDS



Data Source: USDA Food Central Legacy Database

What are the health effects of excess branch chain amino acids?

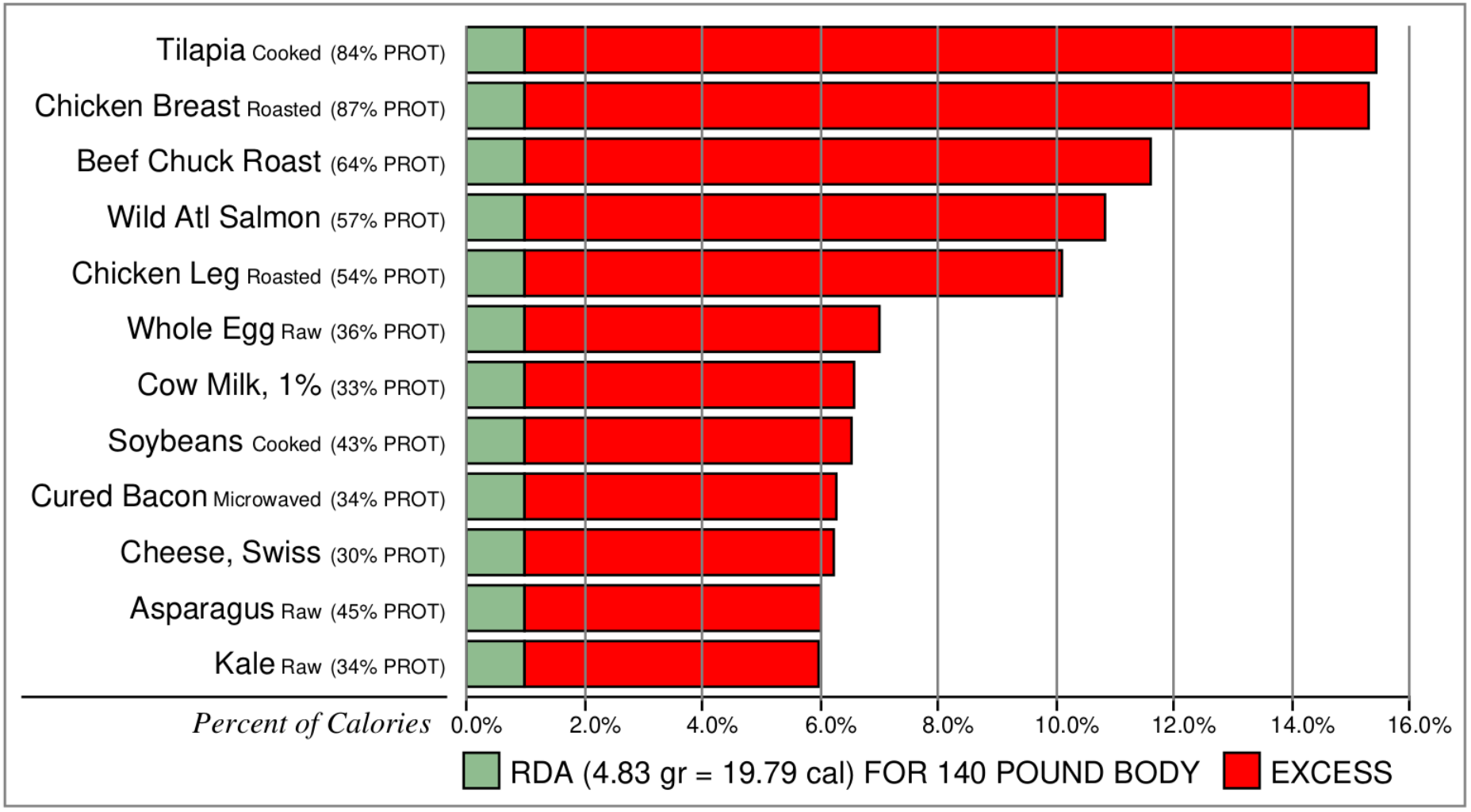
Branch Chain Amino Acids



Health Effects of Branch Chain Amino Acids

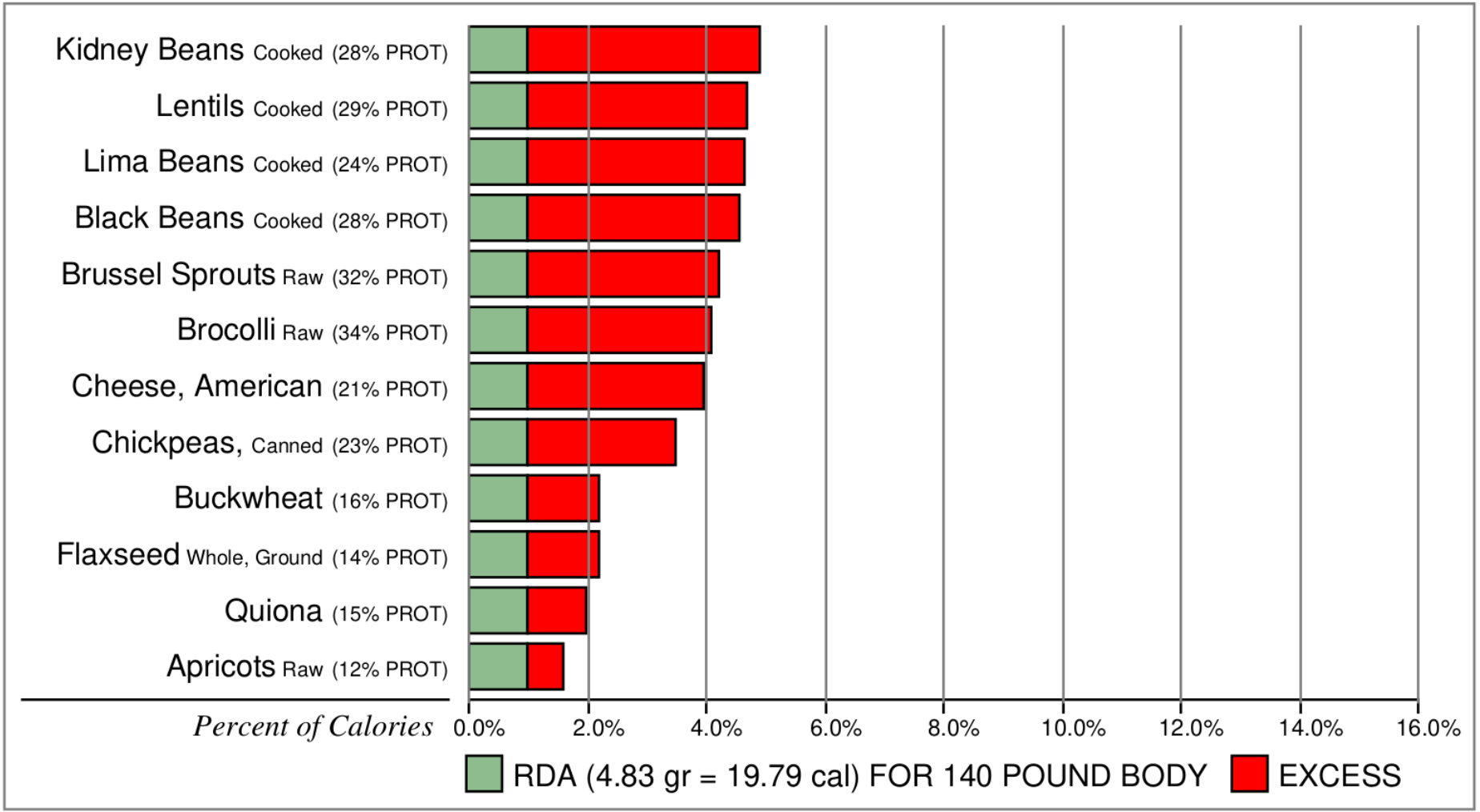
- BCAAs account for about 30% of the amino acids in human muscle proteins and about 40% of the total amino acids required by your body.
- Higher amounts of BCAAs may help build muscle, ease muscle soreness, and decrease exercise fatigue.
- Some research suggests higher amount of BCAAs may:
  > promote insulin resistance leading to Type 2 diabetes.
  > contribute to nonalcoholic liver disease.
  > be a marker for heart disease.
  > reduce the transport of tryptophan into the brain which reduces the production of serotonin, a hormone that enhances mood, promotes sleep, and regulates appetite.

PERCENT OF CALORIES FROM BRANCH CHAIN AMINO ACIDS



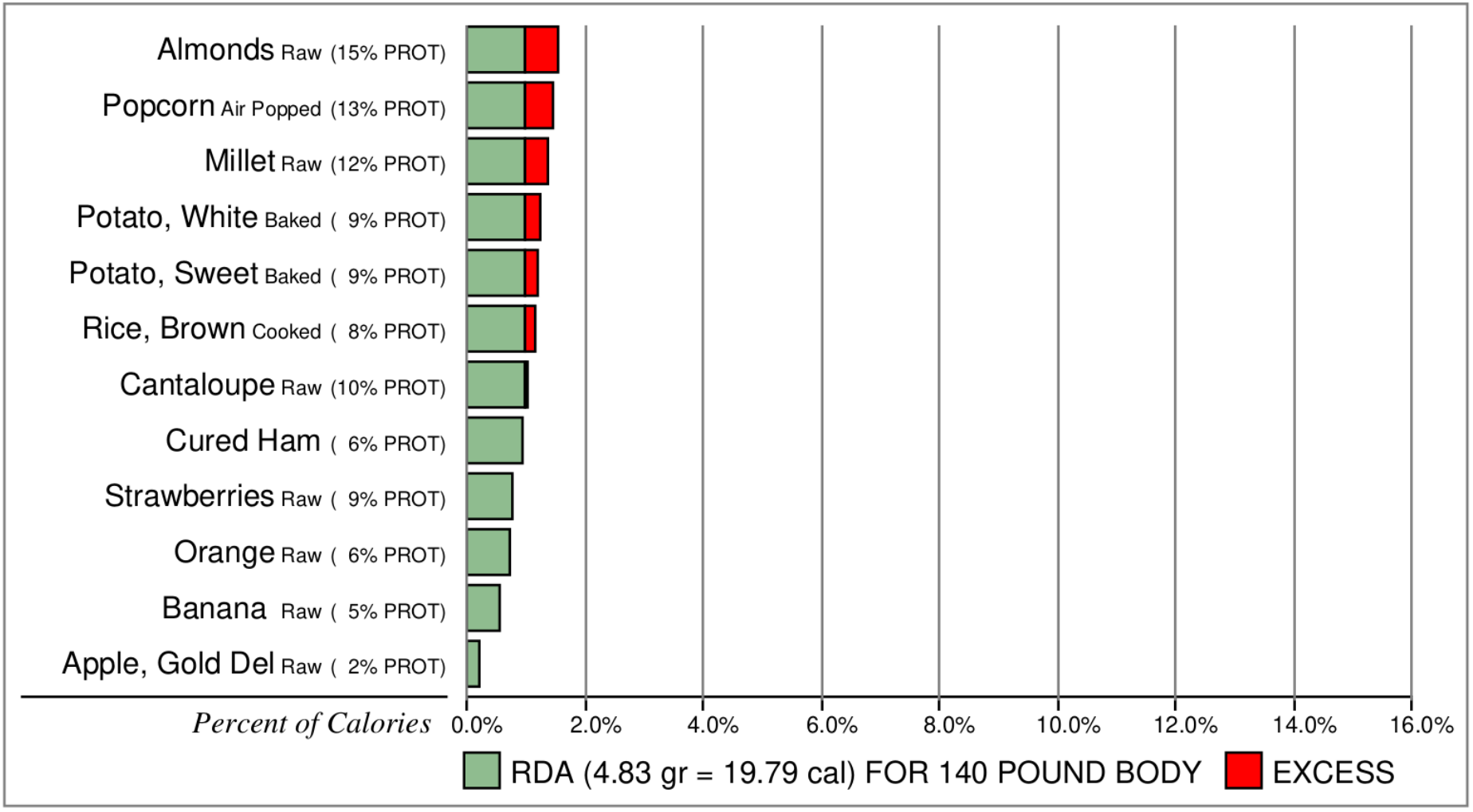
Data Source: USDA Food Central Legacy Database

PERCENT OF CALORIES FROM BRANCH CHAIN AMINO ACIDS



Data Source: USDA Food Central Legacy Database

PERCENT OF CALORIES FROM BRANCH CHAIN AMINO ACIDS



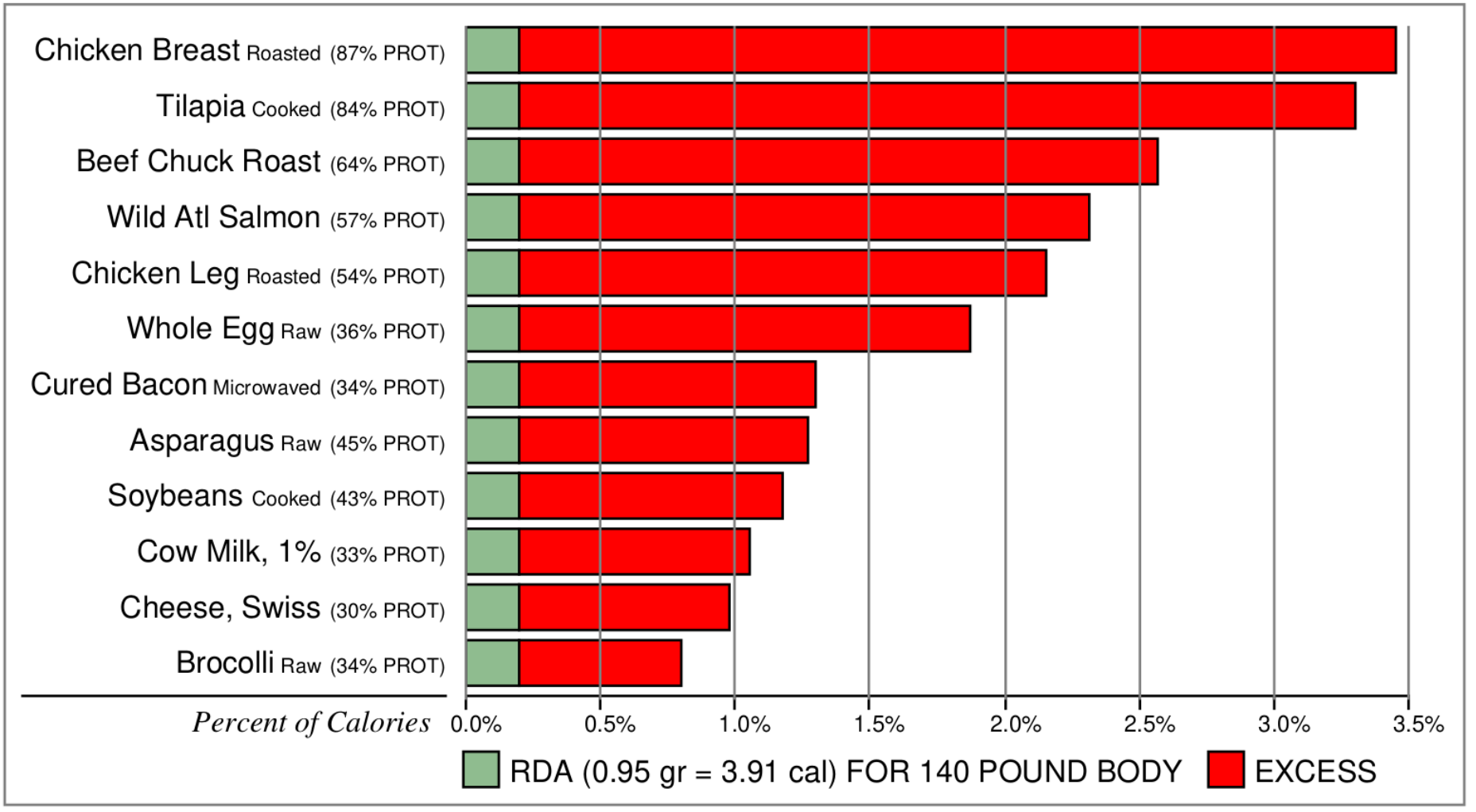
Data Source: USDA Food Central Legacy Database

What are the health effects of excess sulfur amino acids?

Health Effects of Sulfur Amino Acids

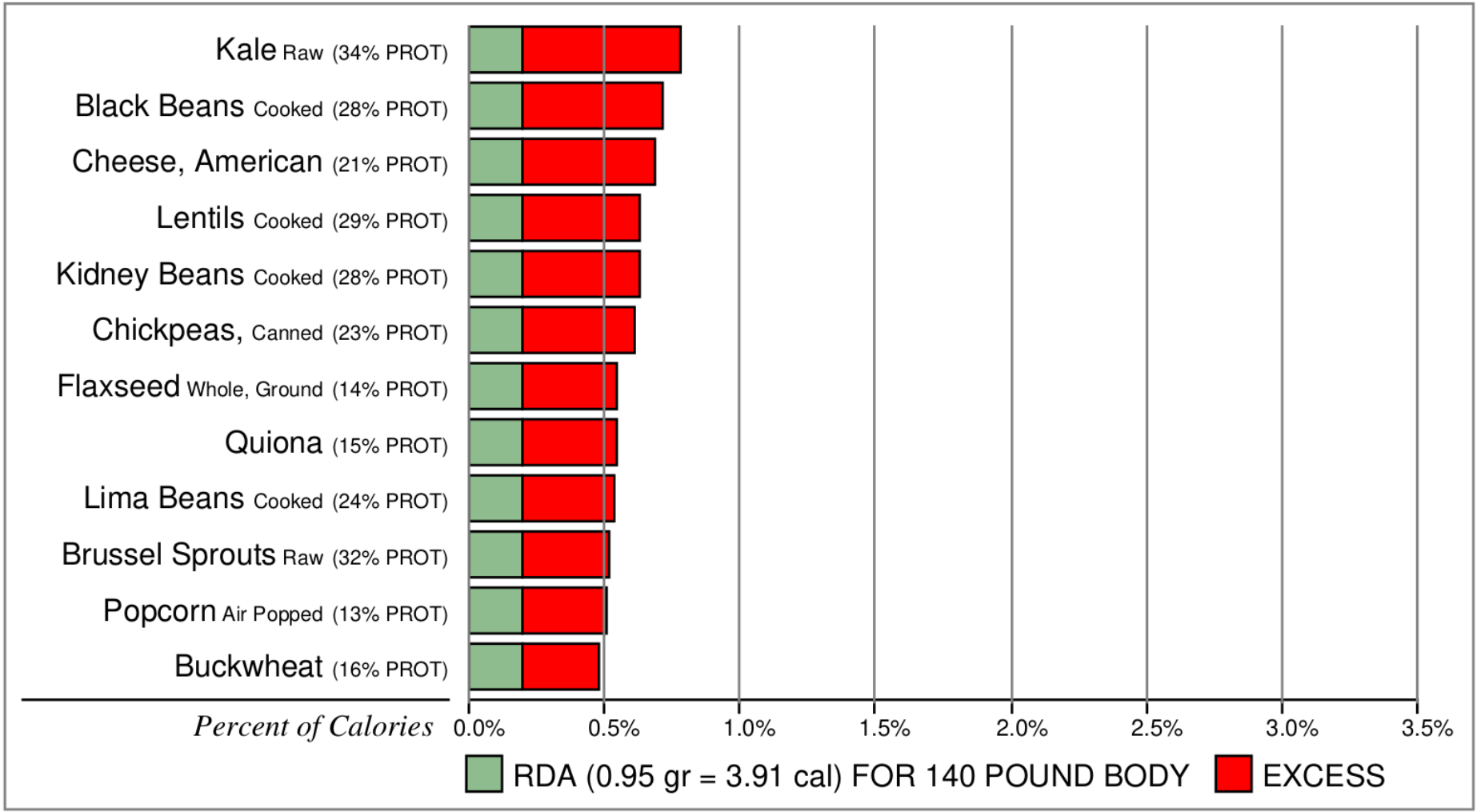
- Methionine can increase blood levels of homocysteine which is linked to an increased risk of diseases of the heart and blood vessels.
- Some specific types of cancer cells require methionine to grow.
- Animal studies indicate that excess methionine can increase various factors that are associated with memory loss and Alzheimer’s disease.
- Excess methionine can contribute to the development of fatty liver disease.

PERCENT OF CALORIES FROM SULFUR AMINO ACIDS



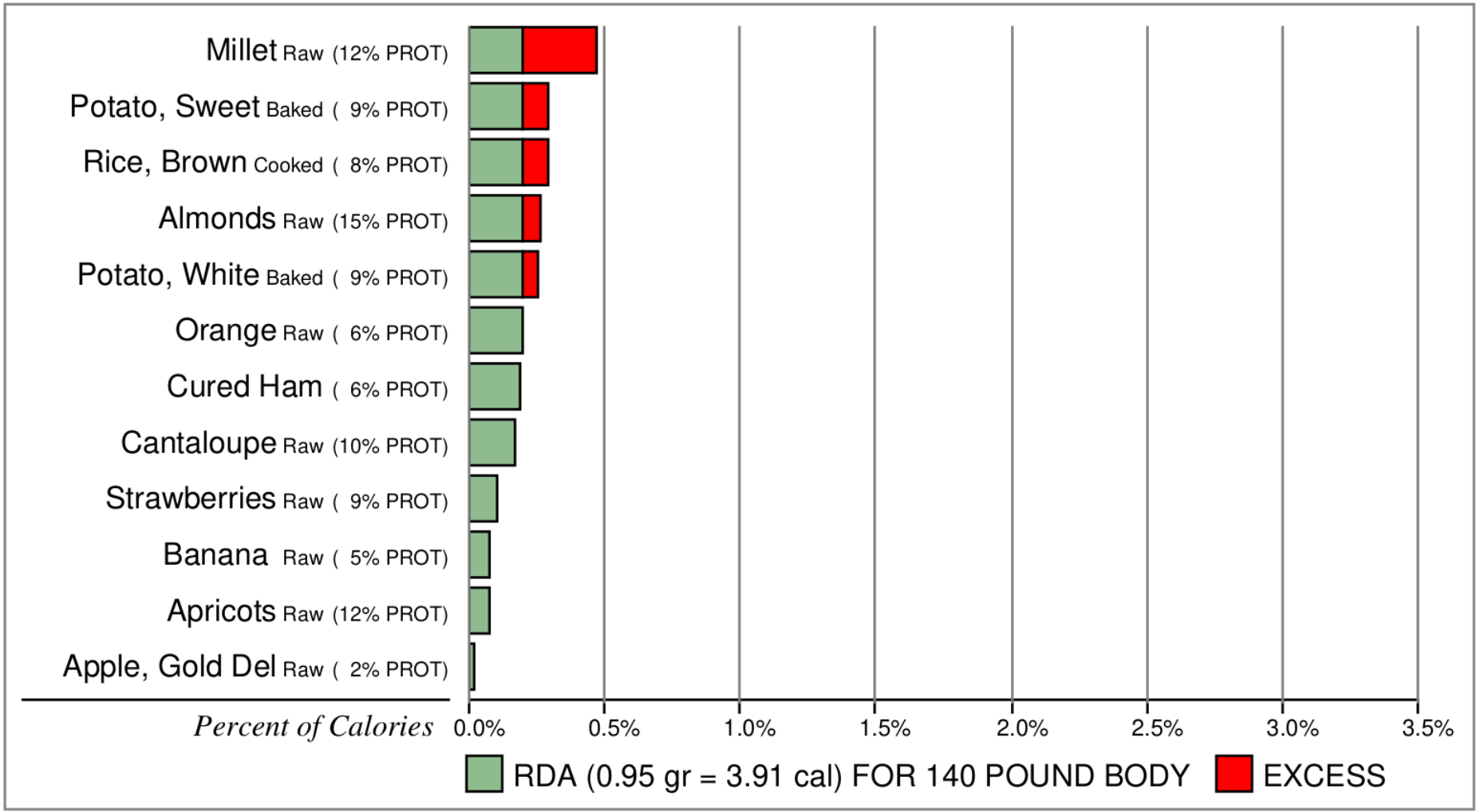
Data Source: USDA Food Central Legacy Database

PERCENT OF CALORIES FROM SULFUR AMINO ACIDS



Data Source: USDA Food Central Legacy Database

PERCENT OF CALORIES FROM SULFUR AMINO ACIDS



Data Source: USDA Food Central Legacy Database

How does excess protein effect the blood acid-base pH?

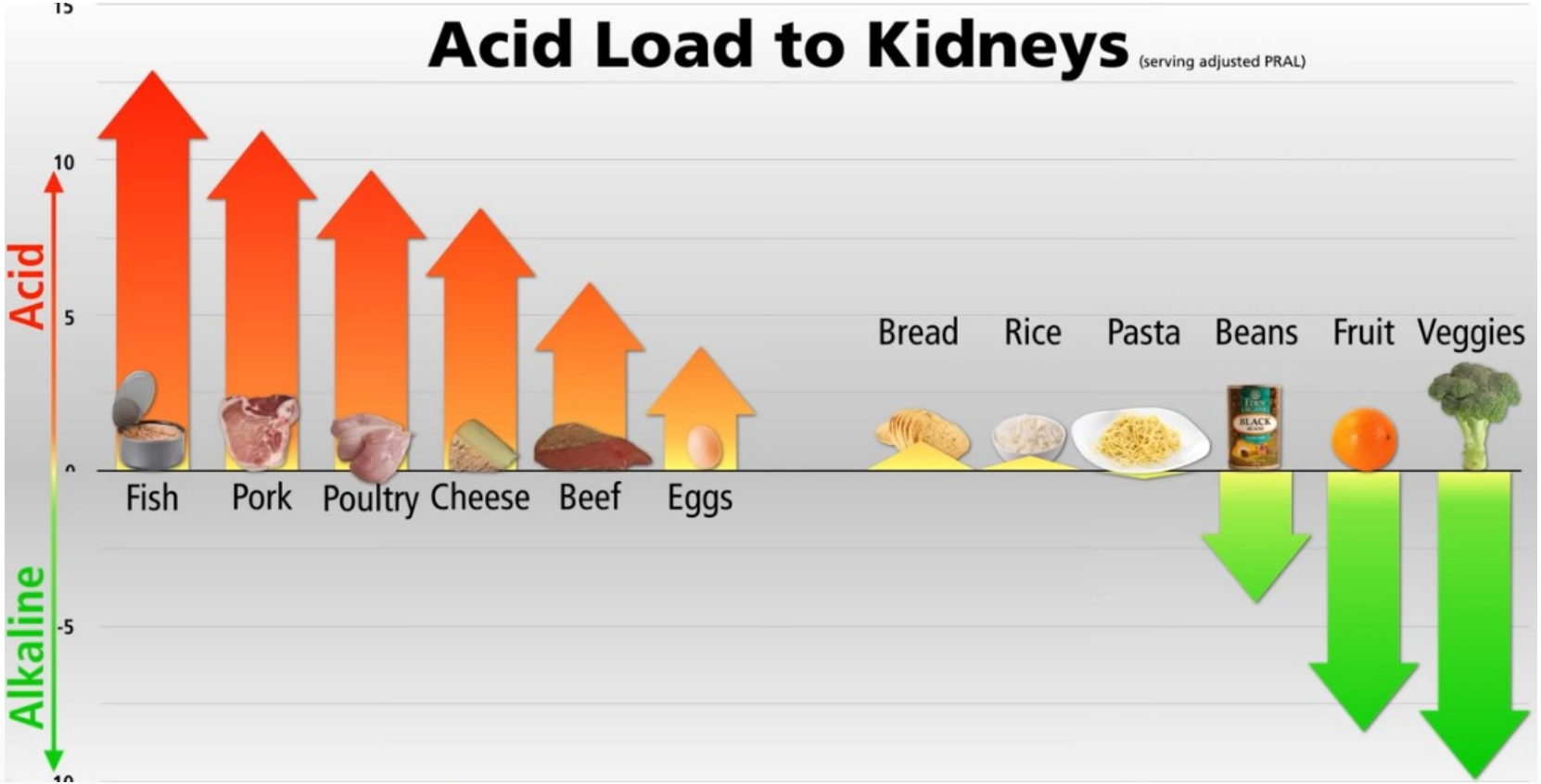
Blood Acid-Base Balance

- The lungs, kidneys, and a complex system of buffers try to maintain the blood acid-base pH balance in the range of 7.35 to 7.45.
- The dietary acid precursors are:
  - > phosphorus
  - > amino acids lysine, arginine, and histidine which generate hydrochloric acid
  - > sulfur amino acids methionine and cysteine which generate sulfurous acid
- The dietary akali (base) precursors are:
  - > potassium
  - > magnesium
  - > calcium

Potential Renal Acid Load (PRAL)

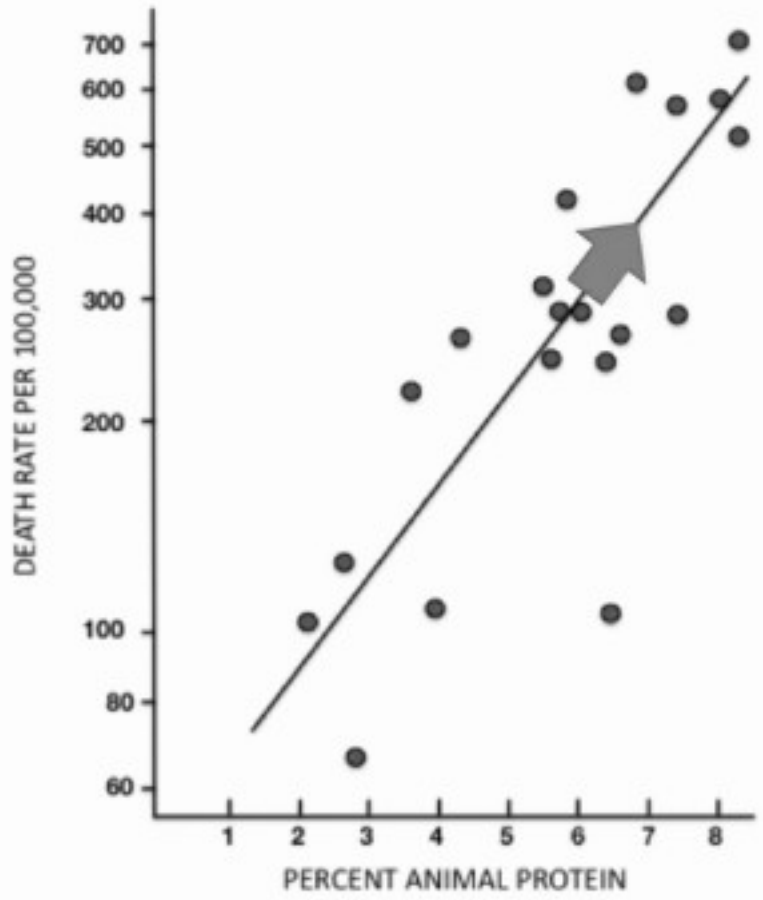
- The capacity of acid or base production of any food is called the **P**otential **R**enal **A**cid **L**oad.
- Diets high in PRAL cause low-grade metabolic acidosis which is associated with the development of:
  - > insulin resistance and diabetes
  - > hypertension (elevated blood pressure)
  - > chronic kidney disease
  - > bone disorders
  - > low muscle mass

Renal Acid Load



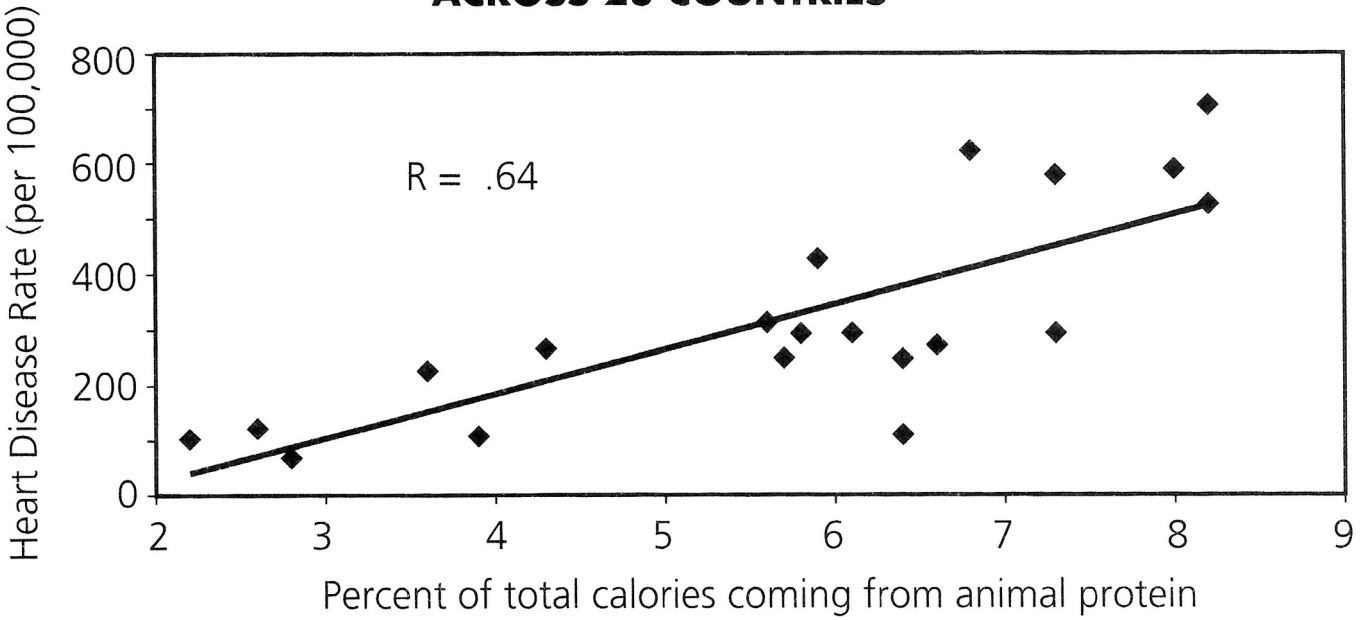
What are the health effects of animal protein?

Animal Protein and Death Rate



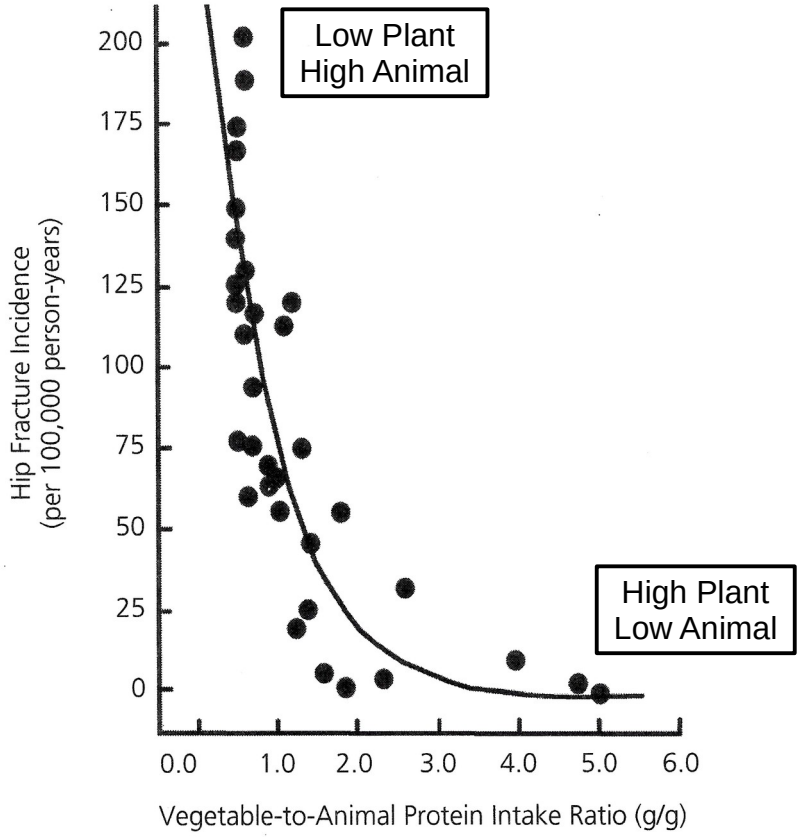
Animal Protein and Heart Disease

CHART 5.3: HEART DISEASE DEATH RATES FOR MEN AGED 55 TO 59 YEARS AND ANIMAL PROTEIN CONSUMPTION ACROSS 20 COUNTRIES[16]



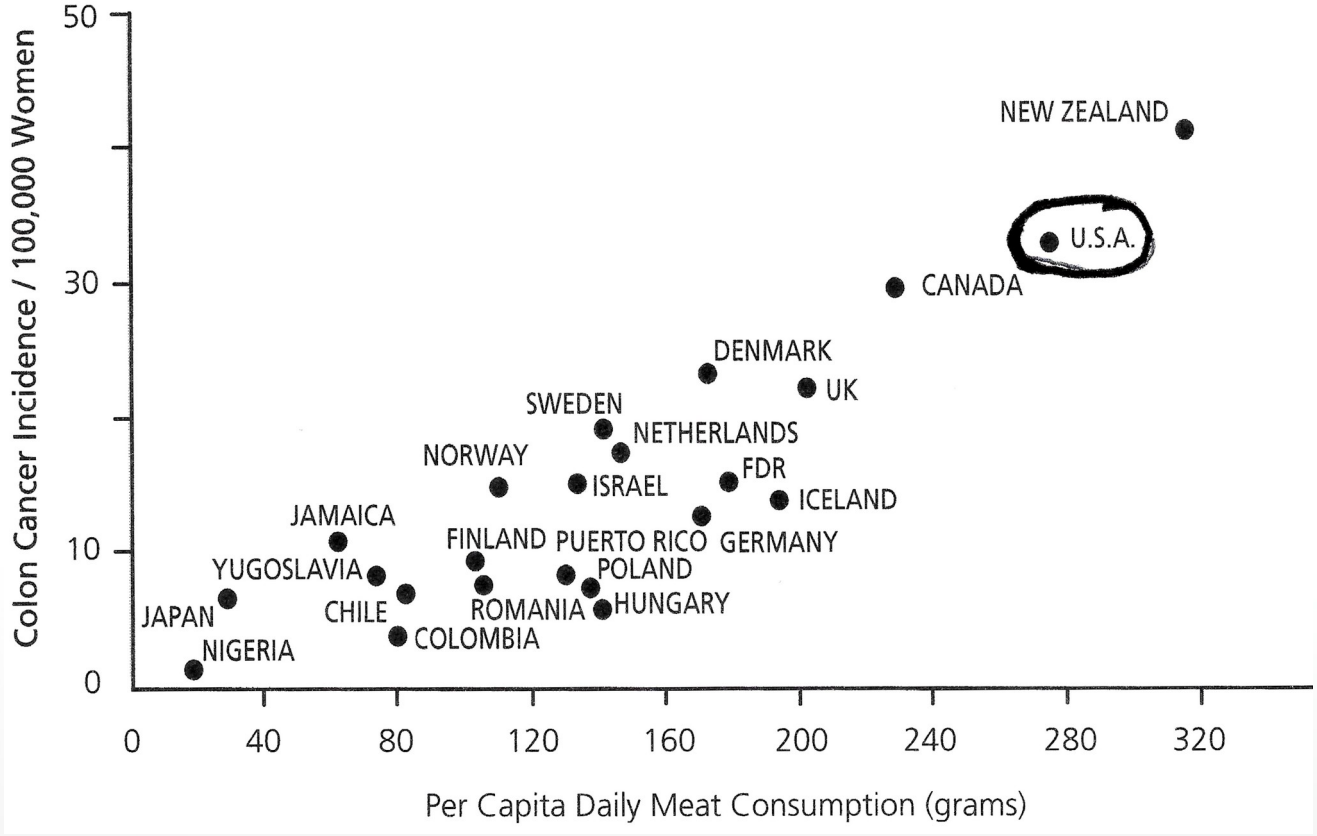
Animal Protein and Hip Fractures

CHART 10.2: ASSOCIATION OF ANIMAL VERSUS PLANT PROTEIN INTAKE AND BONE FRACTURE RATES FOR DIFFERENT COUNTRIES

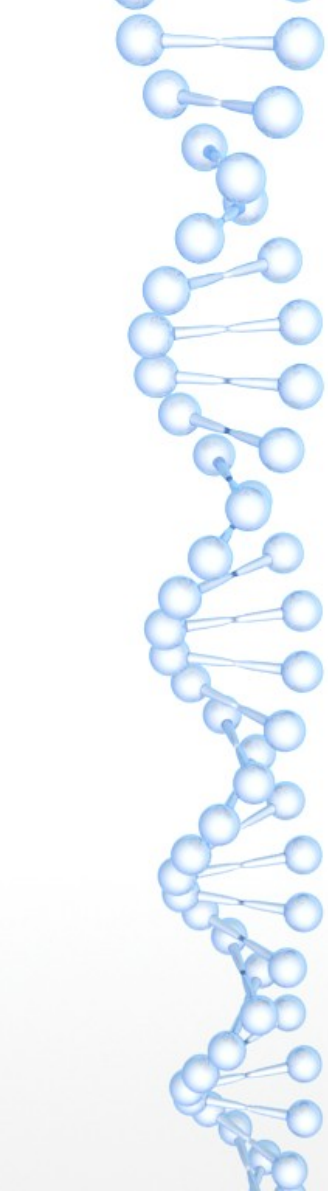


Animal Protein and Colon Cancer

CHART 8.4: FEMALE COLON CANCER INCIDENCE AND DAILY MEAT CONSUMPTION



Final Notes



Whole Foods

Notice that every food in this presentation was either a whole food or a minimally processed whole food without any added sugar, oil, or salt.

It did not include any **C**alorie **R**ich **A**nd **P**rocessed foods.

Adequate Calories

You must eat enough calories
to maintain your ideal weight
to meet the recommended dietary
allowance for protein.

Physical Injury

If you have a physical injury you will need to consume extra protein to restore the damaged muscle, tissue, and bone.

Nutrition Website

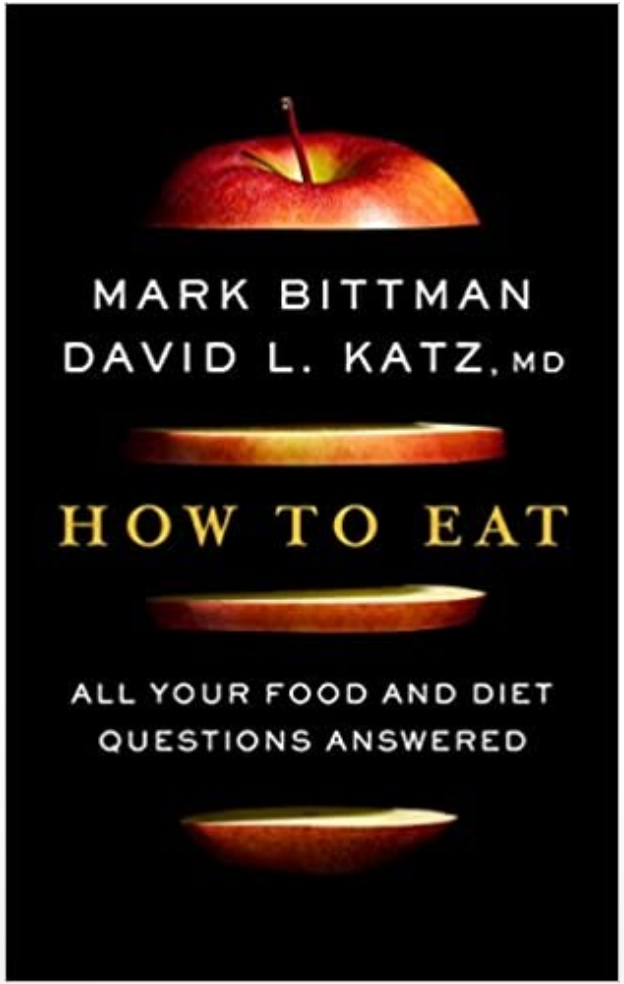
The complete set of slides and
the links to some NutritionFacts.org videos
that support this presentation are available at

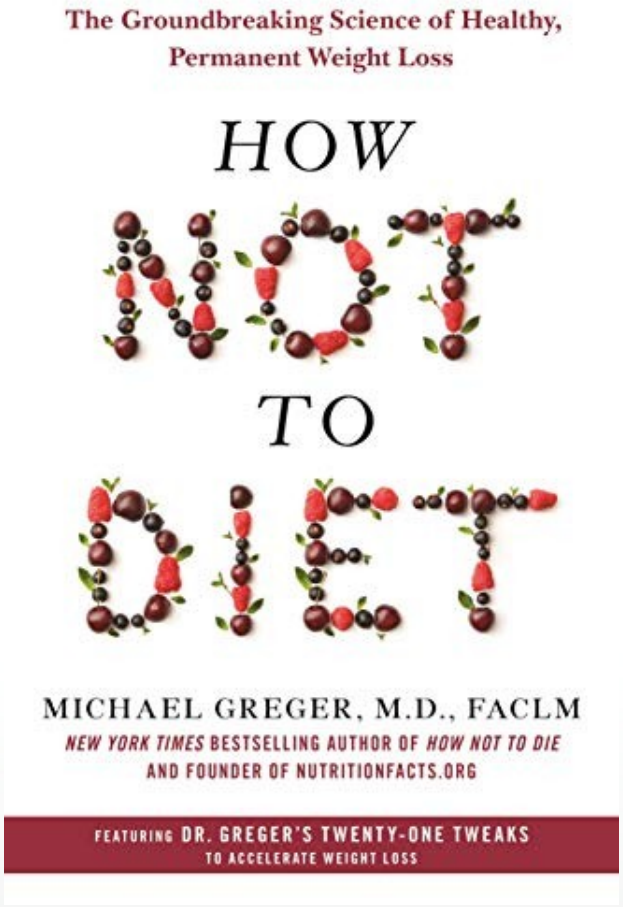
web4dmarch.com/nutrition

Email comments and suggestions to

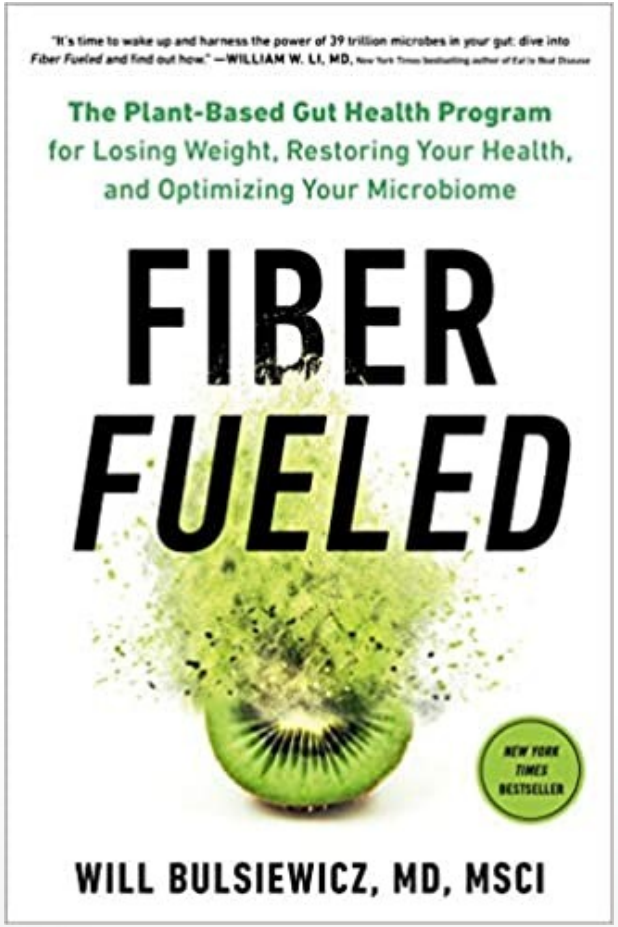
nutrition@web4dmarch.com

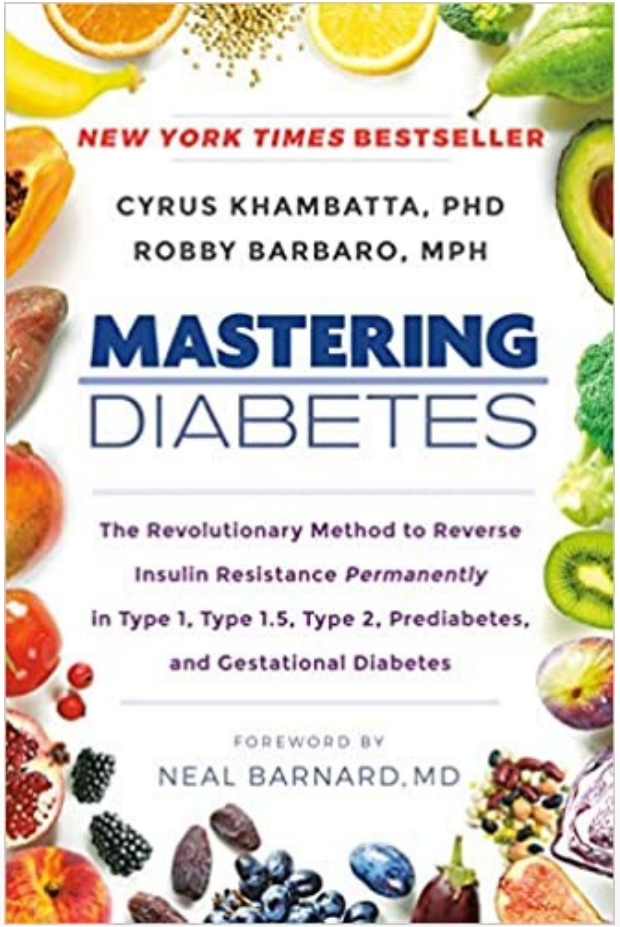
Recommended Books





Recommended Books





What does Dave March eat?

Dave March's Diet

- Mostly **whole plant foods** and some minimally processed whole plant foods with little or no added sugar, oil, or salt. *(SOS Free)*
- About 10-15% fat, 10-15% protein, 70-80% carbs.
- A large variety of whole plant foods each week.
- Vitamin D3 (a hormone), vitamin B-12 and iodine supplements.

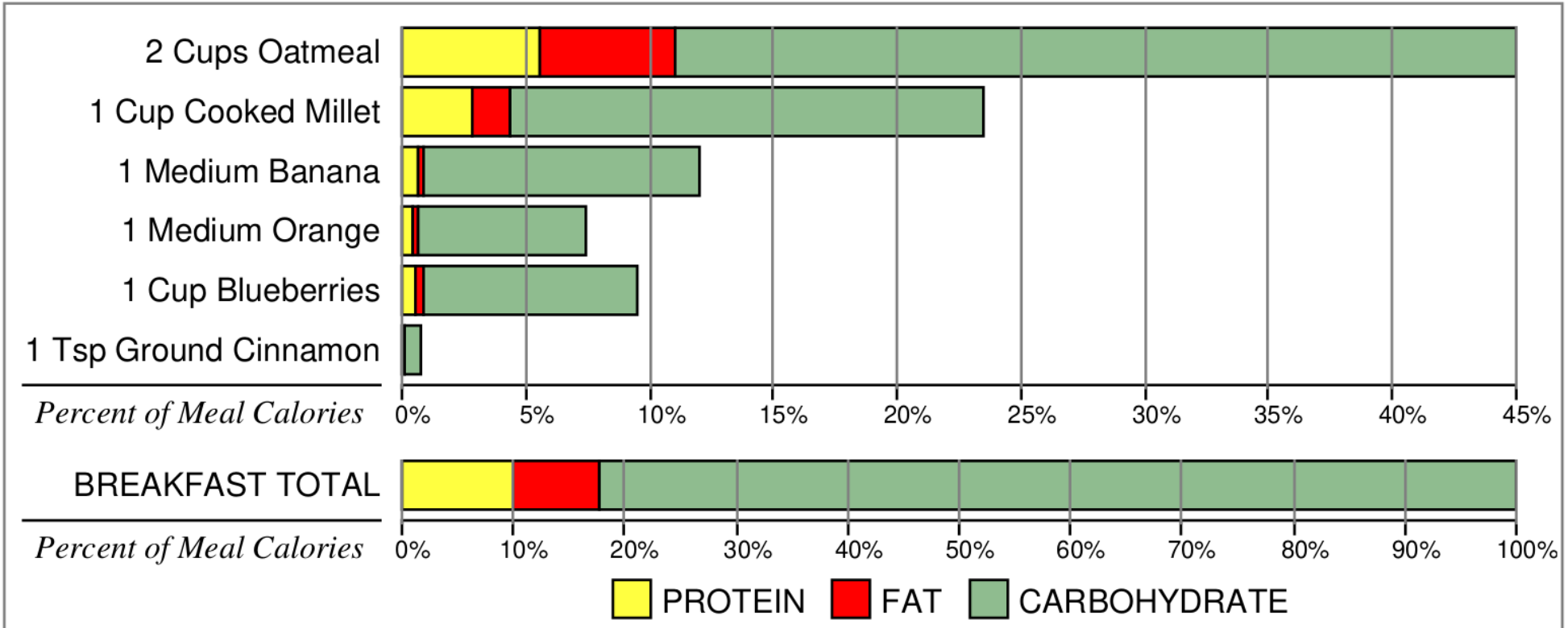
It is a high complex carbohydrate (starch) diet.

It is a very low refined carbohydrate diet.

Dave March's Weekly Food List

- oranges, bananas, blueberries, strawberries, raspberries, black berries, pineapple, grapes, watermelon
- oatmeal, buckwheat, bulgar, millet, brown rice, quinoa, air-popped popcorn
- sweet potatoes, white potatoes, green lentils, split peas, peas, black beans, garbanzo beans (chick peas), red lentil pasta
- mixed soup vegetables, broccoli, Brussels sprouts, spring mix salads, beets, onions, tomatoes, bell peppers, mushrooms
- low sodium V-8, green tea, orange spice herbal tea, cocao powder
- apple cider vinegar, balsamic vinegar, ground flax seeds, nutritional yeast, various spices.

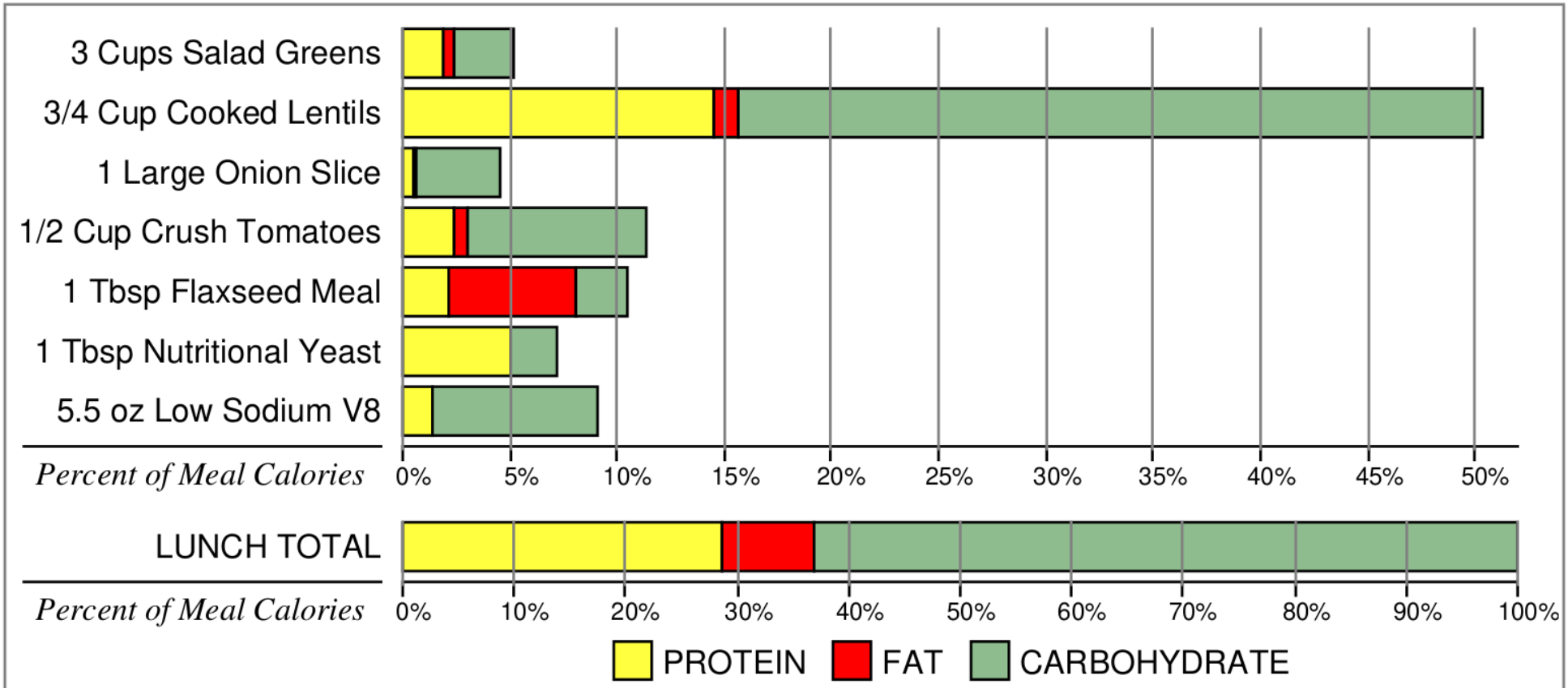
TYPICAL BREAKFAST - CEREAL WITH FRUIT



GRAMS			MILLIGRAMS		CALORIES			
MEAL	WATER	FIBER	CHOL	SODIUM	FAT	PROTEIN	CARBS	TOTAL
1058 (2.3 lb)	830	24	0	414	67 (8%)	87 (10%)	710 (81%)	879

Data Source: USDA Food Central Legacy Database

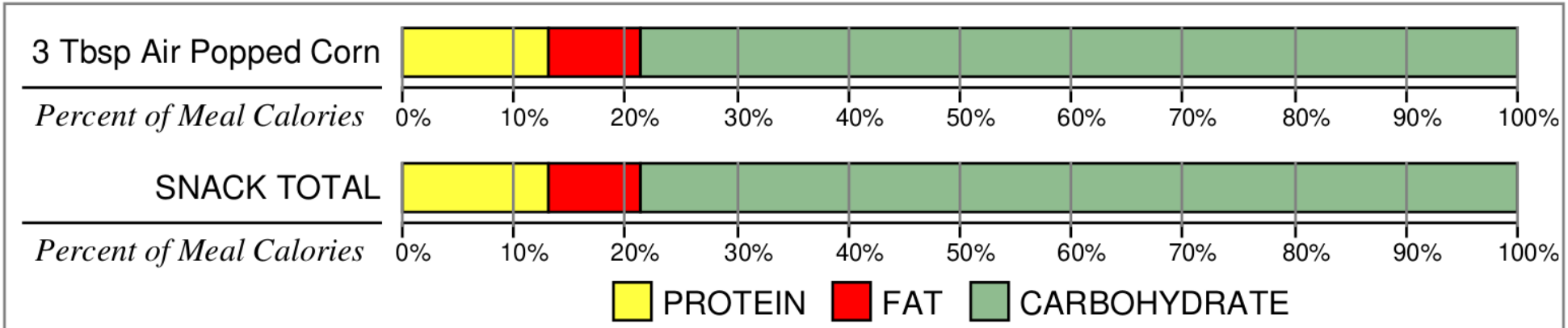
TYPICAL LUNCH - SPRING MIX SALAD TOPPED WITH LENTILS



GRAMS			MILLIGRAMS		CALORIES			
MEAL	WATER	FIBER	CHOL	SODIUM	FAT	PROTEIN	CARBS	TOTAL
584 (1.3 lb)	491	15	0	171	27 (8%)	93 (28%)	207 (61%)	336

Data Source: USDA Food Central Legacy Database

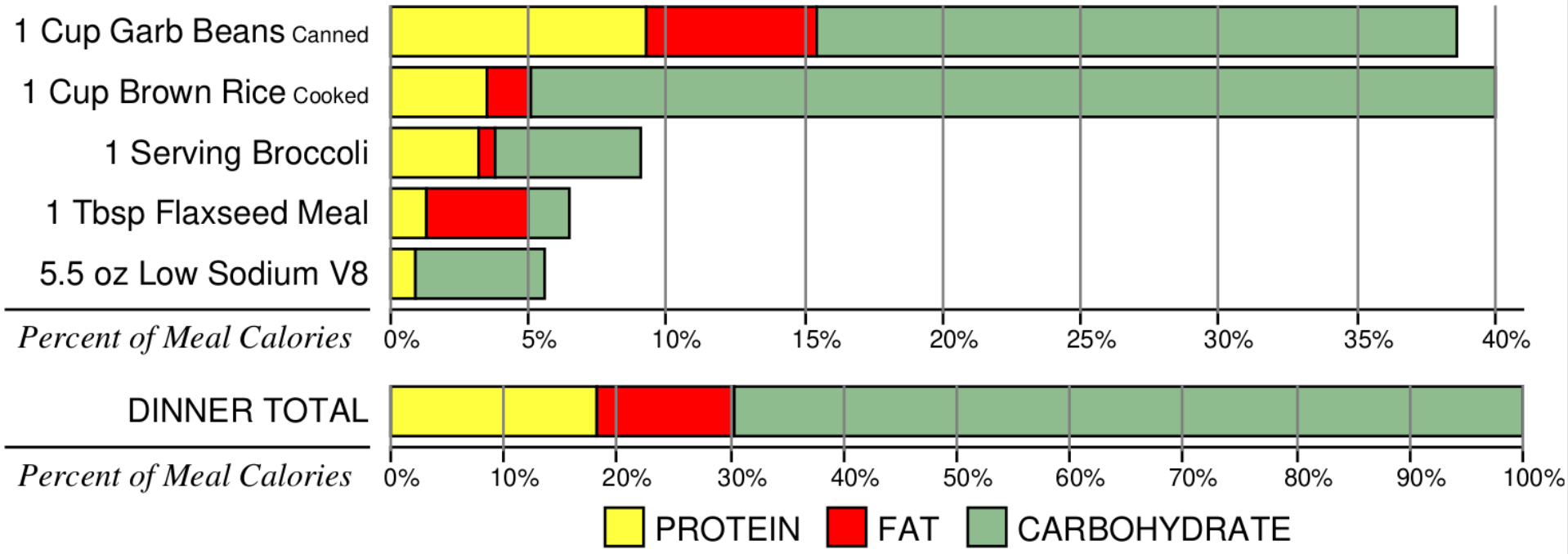
USUAL SNACK - AIR POPPED POPCORN



GRAMS			MILLIGRAMS		CALORIES			
MEAL	WATER	FIBER	CHOL	SODIUM	FAT	PROTEIN	CARBS	TOTAL
50 (0.1 lb)	2	7	0	2	16 (8%)	24 (13%)	146 (77%)	189

Data Source: USDA Food Central Legacy Database

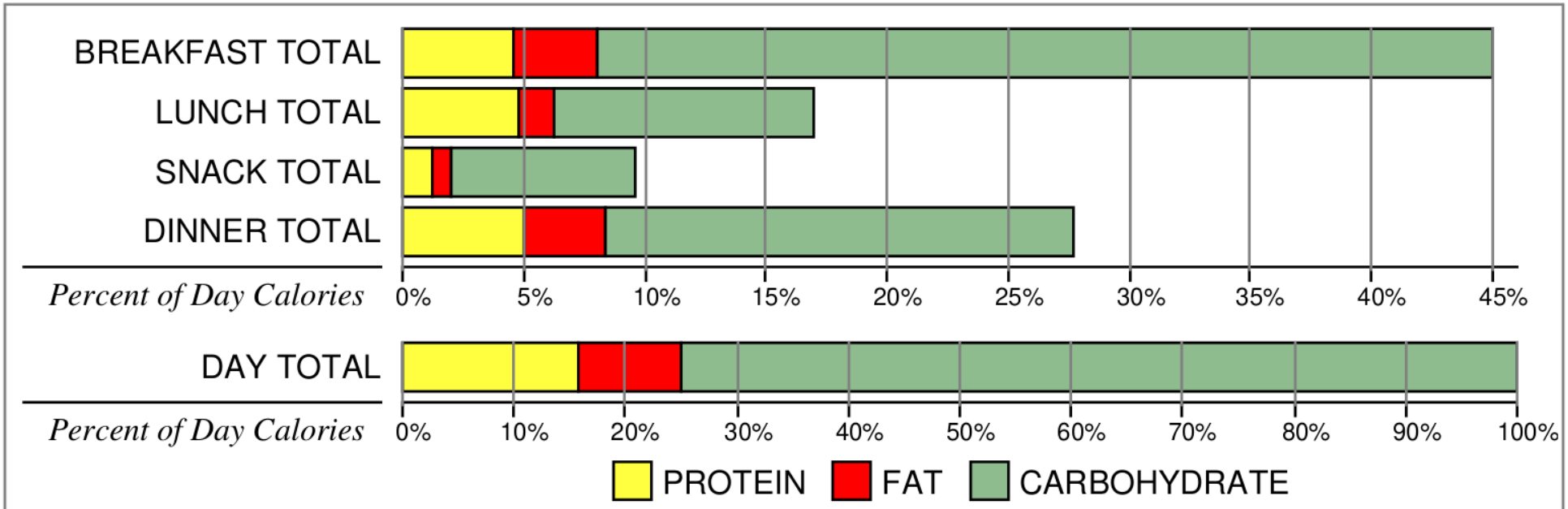
TYPICAL DINNER - SPROUTED BROWN RICE WITH GARBANZO BEANS



GRAMS			MILLIGRAMS		CALORIES			
MEAL	WATER	FIBER	CHOL	SODIUM	FAT	PROTEIN	CARBS	TOTAL
735 (1.6 lb)	598	21	0	463	64 (12%)	96 (18%)	369 (68%)	545

Data Source: USDA Food Central Legacy Database

DAY SUMMARY



GRAMS			MILLIGRAMS		CALORIES			
DAY	WATER	FIBER	CHOL	SODIUM	FAT	PROTEIN	CARBS	TOTAL
2425 (5.3 lb)	1921	67	0	1049	174 (9%)	301 (15%)	1432 (73%)	1949

Data Source: USDA Food Central Legacy Database

Future Presentation

Weight Loss Tips and Tricks

- Why is it easy to gain weight but difficult to lose weight?
- Why does the body store excess calories as fat?
- Why to most weight loss diet plans work in the short run but fail in the long run?
- Why is eating more food the key to consuming fewer calories?
- What is “calorie density” and how does it relate to weight loss?
- What is “satiety” and how does it relate to weight loss?
- What are some strategies to increase calories burned?

Thursday, April 21, at 10:00