The Structure of Proteins:

Amino Acids = building blocks from which proteins are made (think Legos). There are 20, but only 9 are _____ (ones that your body HAS to get from the diet and cannot make itself). These amino acids build themselves into chains that eventually make proteins; proteins are used in every part of our body, including structural support, hormones, water balance, genes, immune system function, etc.

"Complete" vs "Incomplete" proteins: "complete" proteins contain all 9_____ _____ _____.

- Some foods that are complete proteins include animal proteins (they are animal organisms like we are) as well as _____, and some specific whole grains (buckwheat and quinoa). Many of the plant proteins are termed "_____" because they do not have all 9 essential amino acids.
- True/False: It is necessary that we eat complete proteins only. _____
    - We can _____ different "incomplete" proteins to build a complete protein. (Again, remember the Lego analogy)
- True/False: we need to eat the components of a complete protein simultaneously in the same meal _____.

Protein Requirements (Recommended Daily Allowance, RDA): 0.8g per kilogram body weight.

So, for a 150lb person (68.2kg), the RDA for protein is 0.8g / kg x 68.2kg = 55g protein per day

In percentages, this same person would only need___% of calories to come from protein, based on 2,000cal/day diet (and knowing that protein is 4 cals/gram).

55g protein x 4 cal/gram protein = 220 cal from protein.

220 cal from protein / 2000 cal total = 11% of total calories need to come from protein

There are certain populations that require increased protein: children, elderly, pregnant women and athletes.

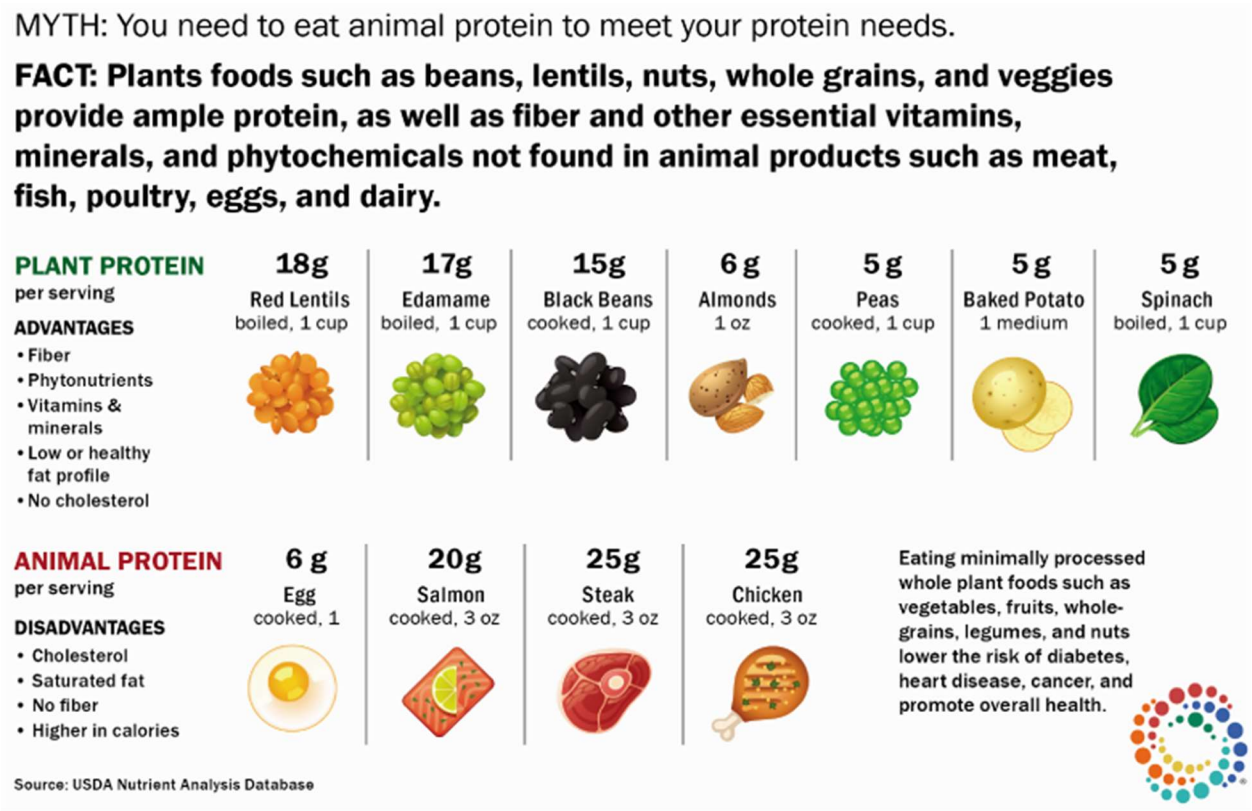

Table 5.2 Plant Protein Content, Ordered by Percent Energy

Foods	Energy (kcal)/100 g	Protein (g)
Spinach	23	2.86
Soybeans	172	18.21
Lettuce	16	1.33
Brussels Sprouts	36	2.55
Broccoli	35	2.38
Seaweed (Wakame)	45	3.03
Peas	84	5.36
Chickpeas	164	8.86
Tomatoes	18	0.88
Oats	389	16.89
Green Peppers	20	0.86
Quinoa	120	4.4
Baked Potatoes	290	7.86
Corn	365	9.42
Walnuts	765	17.82
Bananas	89	1.09
Apples	52	0.26

Table 5.3 Animal Protein Content, Ordered by Percent Ene

Foods	Energy (kcal)/100 g	Protein (g)
Chicken Breast	175	26.37
Tuna Fillet	174	25.29
Lean Pork Chop	211	27.69
Beef (Skirt Steak)	220	26.13
Eggs	143	12.4
Low-Fat Yogurt	63	5.25
Milk, Skim or 1%	43	3.38
Cheddar Cheese	408	23.3
Ice Cream, Vanilla	207	3.5

From Foundations of Lifestyle Medicine Board Review Manual, 4th edition

Based on your knowledge of the RDA for protein and data from the above tables, the Standard American diet (SAD) is usually _____ (devoid/overabundant) in protein intake.

Is there a downside to getting too much protein?

1. Calcium loss – scientific evidence is building that there is a "diet-derived metabolic _____" when eating _____ protein causes an acidic condition in the body that needs to be neutralized. The body does this by extracting _____ from the _____ and this can lead to _____. (1-3)
2. Kidney stones – animal proteins cause the kidneys to secrete _____, which then combines with _____ and other compounds to form kidney stones. (4)
3. Cancer – According to a meta-analysis of multiple studies, the Osher Center for Integrative Medicine at UCSF found that a high meat intake was associated with cancers of the esophagus, lung, pancreatic, colorectal, breast, and stomach. There were mixed results seen for high meat intake correlation with endometrial, bladder, or ovarian cancer. (5)
4. The evidence goes on, specifically with diabetes, inflammation, constipation, aging, and others (for another discussion on another day).

Sources (nonexhaustive):

1. Carnauba RA, et al. Diet-Induced Low-Grade Metabolic Acidosis and Clinical Outcomes: A Review. *Nutrients.* 2017;9(6). https://doi.org/10.3390/nu9060538
2. Darling AL, et al. Dietary protein and bone health: towards a synthesized view. *Proc Nutr Soc.* 2020:1-8. http://doi.org/10.1017/s0029665120007909
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4. Gottlieb, S. High protein diet brings risk of kidney stones. *BMJ*. 2002;325(7361):408. PMCID: PMC1169452.
5. https://osher.ucsf.edu/patient-care/integrative-medicine-resources/cancer-and-nutrition/faq/animal-protein-cancer-risk. Accessed 1/7/24.

The Structure of Proteins: ANSWER KEY

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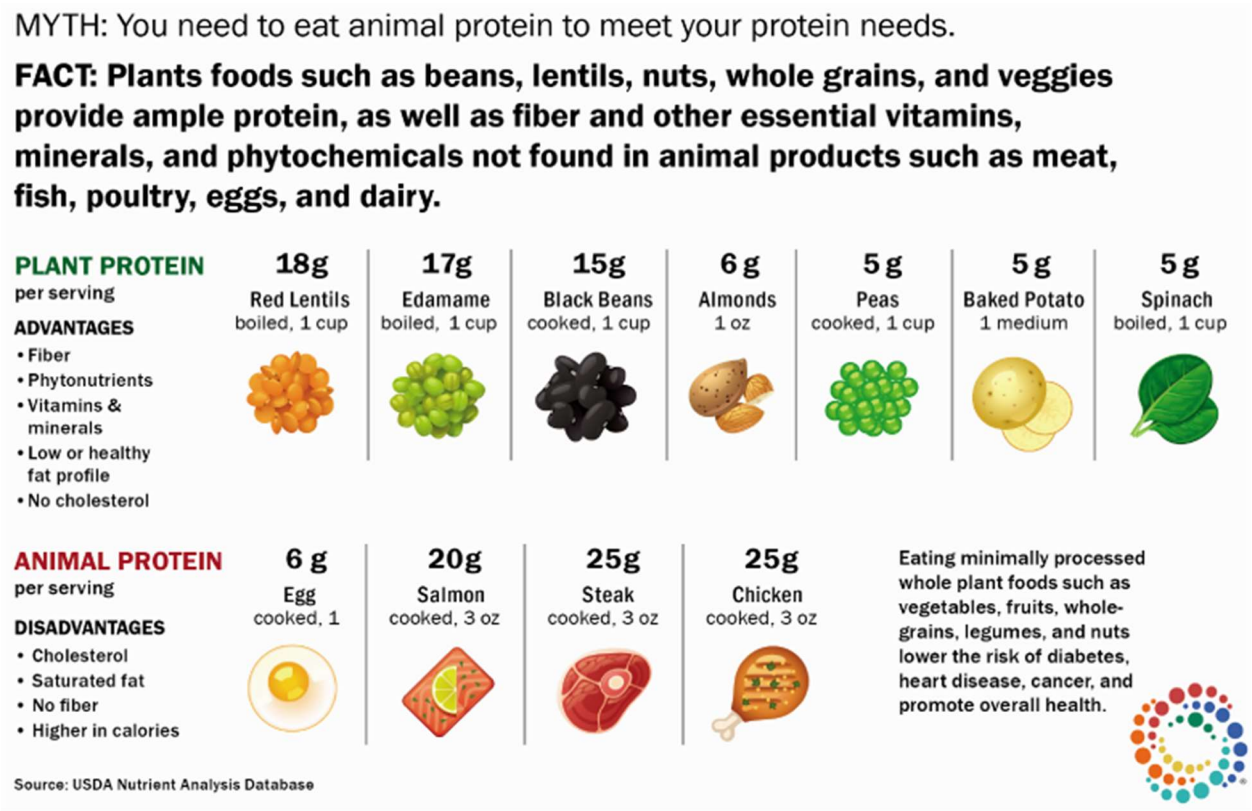

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