All About Protein

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FMTown Lecture Series

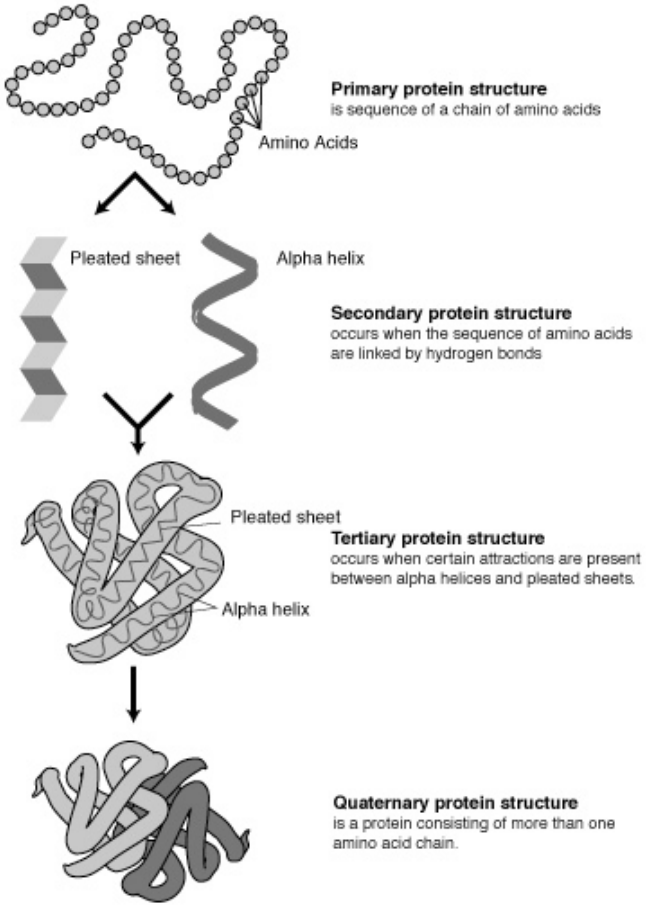
www.infectionconnection.net

Why Protein?

- Anabolic
- Immune System
- Protein deficiency=Metabolic Acidosis
- Detoxification
- Blood Sugar
- Neurotransmitters
- Gut Lining
- Hormones

Why Protein?

- High Thermic Effect of Food (TEF)
- 30% of the calories from protein are used to metabolize the protein itself. Compared to 8% for carbs and 3% fat
- Filling
- Prevents muscle wasting when dieting
- Increases glucagon which helps control weight
- Increased energy
- Better mood
- Improves athletic performance



A diagram of protein structures. For more reading on protein structure, check out Madison Technical College's Lab Manual on Protein Structure here: Image from http://matcmadison.edu/biotech/resources/proteins/labManual/chapter_2.htm

ESSENTIAL AMINO ACIDS	CONDITIONALLY ESSENTIAL AMINO ACIDS	NONESSENTIAL AMINO ACIDS
• Histidine	• Arginine	• Alanine
• Isoleucine	• Cysteine	• Asparagine
• Leucine	• Glutamine	• Aspartic acid
• Lysine	• Tyrosine	• Glutamic acid
• Methionine		• Proline
• Phenylalanine		• Serine
• Threonine		
• Tryptophan		
• Valine		

How to Measure Protein Deficiency

- Grip Strength-Dynamometer
- Gluteal fold and triceps
- Gait speed
- Body composition: Ideal for males 12-18% and females 22-28%
- Diet Diary
- Blood Chemistry

Signs of Protein Deficiency

Hair splitting
Hair loss
Brittle nails
Fatigue
Excessive sleeping
Constipation
Low blood pressure
Fluid retention
Cognitive deficits
Skin rashes

Increased susceptibility to infections
Weight loss
Diarrhea
Scaly skin
Moon face
Loss of hair pigmentation
Slow wound healing
Decubitus ulcers
Muscle weakness
Muscle wasting
Food cravings

Muehrcke's Lines

Transverse white lines that don't indent

Dynamometer

Have the patient squeeze as hard as they can with both hands and record.

		Males		Females	
Age	*Hand*	*Mean*	*SD*	*Mean*	*SD*
6-7	R	32.5	4.8	28.6	4.4
	L	30.7	5.4	27.1	4.4
8-9	R	41.9	7.4	35.3	8.3
	L	39.0	9.3	33.0	6.9
10-11	R	53.9	9.7	49.7	8.1
	L	48.4	10.8	45.2	6.8
12-13	R	58.7	15.5	56.8	10.6
	L	55.4	16.9	50.9	11.9
14-15	R	77.3	15.4	58.1	12.3
	L	64.4	14.9	49.3	11.9
16-17	R	94.0	19.4	67.3	16.5
	L	78.5	19.1	56.9	14.0
18-19	R	108.0	24.6	71.6	12.3
	L	93.0	27.8	61.7	12.5
20-24	R	121.0	20.6	70.4	14.5
	L	104.5	21.8	61.0	13.1
25-29	R	120.8	23.0	74.5	13.9
	L	110.5	16.2	63.5	12.2
30-34	R	121.8	22.4	78.7	19.2
	L	110.4	21.7	68.0	17.7
35-39	R	119.7	24.0	74.1	10.8
	L	112.9	21.7	66.3	11.7
40-44	R	116.8	20.7	70.4	13.5
	L	112.8	18.7	62.3	13.8
45-49	R	109.9	23.0	62.2	15.1
	L	100.8	22.8	56.0	12.7
50-54	R	113.6	18.1	65.8	11.6
	L	101.9	17.0	57.3	10.7
55-59	R	101.1	26.7	57.3	12.5
	L	83.2	23.4	47.3	11.9
60-64	R	89.7	20.4	55.1	10.1
	L	76.8	20.3	45.7	10.1
65-69	R	91.1	20.6	49.6	9.7
	L	76.8	19.8	41.0	8.2
70-74	R	75.3	21.5	49.6	11.7
	L	64.8	18.1	41.5	10.2
75+	R	65.7	21.0	42.6	11.0
	L	55.0	17.0	37.6	8.9

Blood Chemistry Signs

Low Total Protein
Low BUN
Low Creatinine
Low CO2
Elevated AST, ALT, GGT
Hypothyroid
Low WBC

Protein Intake Guidelines

0.5g/kg body weight – this is the Recommended Daily Allowance (RDA) for protein. Absolute minimum requirement and will maintain general health.

0.5-1.0g/kg body weight – this is a higher range mostly used by health-conscious people or people who are new to exercise and are trying to build some muscle.

1.0-1.5g/kg – this is the range which tends to be recommended for building muscle and reaching athletic goals.

1.5-2.2g/kg (1g/lb) – Anecdotal intake by athletes and weightlifters. Very limited research.

Target intake to build muscle is .7 grams per pound of body which is about 1.5 grams per kilogram

Ideal Protein Sources

- Eggs (Ideally organic and free range)
- Types of fish known to be relatively low in heavy metals
- Chicken, Turkey (Ideally organic and free range)
- Non-commercial, free-range forms of red meat such as grass-fed, locally raised beef, grass fed buffalo, and grass fed lamb.
- Dairy products (Ideally organic from locally raised dairy cows)
- Nuts and seeds, particularly almonds, pecans, and walnuts (Ideally organic)
- Legumes: beans, lentils, peas (Ideally organic)
- Soybeans (only fermented such as miso and tempeh)
- Dairy & Soy should make up the lowest percentage of your daily intake of protein

Protein Reference Sheet

(All portion sizes are 4 oz servings, unless otherwise noted)

Beef- 32 gms.

Turkey- 32.6 gms.

Calf liver- 24.5 gms.

Salmon- 29 gms.

Shrimp- 23.7 gms.

Tuna - 34 gms.

Tofu- 9.2 gms.

Lentils- 1cup 17.9 gms.

Cottage cheese- ½ cup 14 gms.

Kidney Bean- 1 cup 15.4 gms.

Lima Beans- 1 cup 14.7 gms.

Garbanzo- 1 cup 14.5 gms.

Peanuts- ¼ cup 9.42 gms.

Almonds- ¼ cup 7.62 gms.

Almond Butter- 2 TBSP. 7 gms.

Cashew Butter- 2 TBSP 5 gms.

Lamb- 30.2 gms.

Chicken- 33.8 gms.

Venison- 34.3 gms.

Scallops- 23 gms.

Cod- 26 gms.

Sardines- 22.7 gms.

Egg- 1 6 gms.

Dried peas- ½ cup 6 gms

Yogurt- 1 cup 12.9 gms.

Pinto Beans- 1 cup 14 gms.

Black Beans- 1 cup 15.2 gms.

Navy Bean- 1 cup 15.8 gms.

Walnuts- ¼ cup 3.81 gms.

Cashews- ¼ cup 5.24 gms.

Peanut Butter- 2 TBSP. 4 gms.

Table 1. Protein quality rankings.

Protein Type	Protein Efficiency Ratio	Biological Value	Net Protein Utilization	Protein Digestibility Corrected Amino Acid Score
Beef	2.9	80	73	0.92
Black Beans	0		0	0.75
Casein	2.5	77	76	1.00
Egg	3.9	100	94	1.00
Milk	2.5	91	82	1.00
Peanuts	1.8			0.52
Soy protein	2.2	74	61	1.00
Wheat gluten	0.8	64	67	0.25
Whey protein	3.2	104	92	1.00

Adapted from: U.S Dairy Export Council, Reference Manual for U.S. Whey Products 2nd Edition, 1999 and Sarwar, 1997.

Easy Way for Patient to Track Protein Intake

www.loseit.com

Free app allows you to put in all of your daily food and exercise.

Calculates daily caloric intake and a breakdown of macronutrients including protein, carbs and fats.

Set goals, track progress

Protein Powders

-Whey: Highest in leucine=most anabolic
-Pea: Gaining popularity. Difficult to find palatable sources
-Rice: Low allergenicity
-Hemp: Good fiber, balanced omega 3:6 ratio
-Soy: Should be used sparingly, low in sulfur-containing amino acids
-Beef, egg and milk not commonly used or recommended

Timing Around Exercise

-Consuming adequate protein immediately after exercise is a myth. The total protein throughout the day and 24-48 hours after is most important.

-Carbohydrates after exercise are actually the most anabolic.

*One exception is if you are fasting

Speed of Absorption

Mainly a marketing tactic that is not relevant.

Hydrolyzed casein >= Hydrolyzed whey > Whey Isolate >= Whey concentrate > Other protein sources > Casein

Amino Acid Supplements

-Free-form amino acids highly useful for protein deficiency and absorption issues. 4 capsules bid on empty stomach

-BCAA's-Leucine, Isoleucine, Valine: prevent muscle wasting

-Glutamine: 20-30 grams/day useful for healing leaky gut

Protein Energy Malnutrition (PEM)

State of insufficient protein intake.
Creates immune system dysfunction.
Muscle wasting.
-Decreased brain size
-Obesity
-Low sperm quality
-Increased stress sensitivity

Metabolic Acidosis

- Increases muscle wasting
- Lowers thyroid hormone
- Increases cortisol
- Lowers growth hormone
- Insulin resistance
- Bone loss?

Metabolic Acidosis

- First morning urinary pH ideal range is 6.4-7.4
- Alkaline diet
- Supplementation with magnesium glycinate and potassium bicarbonate
- Epsom salt baths 15-20 minutes/day
- Deep belly breathing for 5 minutes

Endocrine Effects

-Hypothyroidism can create protein deficiencies via decreased HCL and amino acid metabolism

-Insulin resistance decreases anabolic states

-Adrenal imbalances decrease anabolic states and can increase muscle wasting

Enhancing Protein Digestion

-Instruct patient to eat slowly and chew food until liquefied. No distractions.
-Betaine HCL/Digestive enzymes
-Swedish Bitters (Herbal Bitters)
-Lemon or lime with water
-Ginger tea
-Correct dysbiosis/address GI infections
-Avoid food sensitivities
-Apple Cider Vinegar

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Omega-3 polyunsaturated fatty acids augment the muscle protein anabolic response to hyperinsulinaemia-hyperaminoacidaemia in healthy young and middle-aged men and women.

Smith GI1, Atherton P, Reeds DN, Mohammed BS, Rankin D, Rennie MJ, Mittendorfer B.

Abstract

Increased dietary LCn-3PUFA (long-chain n-3 polyunsaturated fatty acid) intake stimulates muscle protein anabolism in individuals who experiencemuscle loss due to aging or cancer cachexia. However, it is not known whether LCn-3PUFAs elicit similar anabolic effects in healthy individuals. To answer this question, we evaluated the effect of 8 weeks of LCn-3PUFA supplementation (4 g of Lovaza®/day) in nine 25-45-year-old healthy subjects on the rate of muscle protein synthesis (by using stable isotope-labelled tracer techniques) and the activation (phosphorylation) of elements of the mTOR (mammalian target of rapamycin)/p70S6K (p70 S6 kinase) signalling pathway during basal post-absorptive conditions and during a hyperinsulinaemic-hyperaminoacidaemic clamp. We also measured the concentrations of protein, RNA and DNA in muscle to obtain indices of theprotein synthetic capacity, translational efficiency and cell size. Neither the basal muscle protein fractional synthesis rate nor basal signalling element phosphorylation changed in response to LCn-3PUFA supplementation, but the anabolic response to insulin and amino acid infusion was greater after LCn-3PUFA [i.e. the muscle protein fractional synthesis rate during insulin and amino acid infusion increased from 0.062±0.004 to 0.083±0.007%/h and the phospho-mTOR (Ser2448) and phospho-p70S6K (Thr389) levels increased by ~50%; all $P<0.05$]. In addition, the muscleprotein concentration and the protein/DNA ratio (i.e. muscle cell size) were both greater ($P<0.05$) after LCn-3PUFA supplementation. We conclude that LCn-3PUFAs have anabolic properties in healthy young and middle-aged adults.

Vegetarian Protein Combining

-Vegetarians and Vegans must follow proper protein-combining.

-Rice and beans

-Quinoa and lentils

-These individuals usually are not getting enough sulfur-containing amino acids (cysteine and methionine)

Protein Evaluation Flow

1. Patient history: diet review
2. Physical exam: dynamometer, gait speed, gluteals and triceps, overall muscle tone, body composition by bioimpedance
3. Blood chemistry. Amino acid profile. Organic acids.
4. Diet diary review
5. pH testing
6. Address GI, food sensitivities, endocrine etc.
7. Follow-up dynamometer, body composition etc. every 4 weeks

Conclusion

-One of the most important and overlooked aspects of functional medicine practice today.
-Review Jeff Moss's ELCN information on sarcopenia, amino acids, metabolic acidosis
-Protein powders/amino acids are the most commonly prescribed supplements in my practice.