

The Whey to Optimal Health?

Leslie Bonci, MPH, RD, CSSD, LDN
Director of Sports Nutrition-
UPMC

Protein Recommendations

- Recommended Dietary Allowance:
 - 0.8 grams per kg body weight (adults)
 - 55 grams of protein per day for 150-lb. person
- Institute of Medicine Dietary Reference Intake:
 - 10-35 percent of total daily calories
 - 2,000-calorie daily diet: 50-175 grams of protein/day

How Much Protein?

- The AMDR for protein is 10-35% of your daily calorie intake
- To estimate recommended protein intake, multiply your weight (in lbs.) by the number below that matches your activity level or goals:
 - Recreational exercise: 0.5-0.7 grams
 - Endurance athlete: 0.5-0.8 grams
 - Muscle building: 0.5-0.8 grams
 - Weight loss with exercise and calorie restriction: 0.8-0.9 grams

IOM, 2005; Rodriguez, *Am Coll Sports Med*, ADA, *Dieticians of Canada*, 2009; Clark, *Sport Nutrition Guidebook*, 2008

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RECOMMENDATIONS FOR CHILDREN

- | • AGE | • Gms protein/kg BW |
|--------|---------------------|
| • 1-3 | • 1.1 |
| • 4-8 | • 0.95 |
| • 9-10 | • 0.95 |

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Muscle Protein Balance

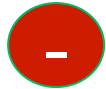
Net Protein Balance

difference between rates of protein synthesis (PS) and protein breakdown (PB)



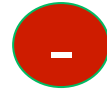
Positive Net Balance

$PS > PB = \uparrow$ lean body mass



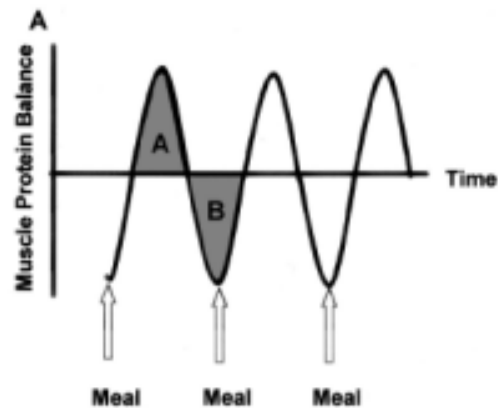
Negative Net Balance

$PB > PS = \downarrow$ lean body mass



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Protein Balance During Feeding and Fasting



Phillips SM et al., *J Am Col Nutr*, 2005

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Protein and Muscle Synthesis

- Dietary protein is critical to build and maintain muscle
- Quality of dietary protein matters
- Essential amino acids
 - necessary to build protein
 - stimulate muscle protein synthesis
 - play a unique role in muscle metabolism (BCAAS)

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BENEFITS OF WHEY

- More BCAAs:
 - Leucine
 - Isoleucine
 - Valine
- Absorbed/utilized by skeletal muscle to promote muscle protein synthesis and/or provide fuel for muscles for endurance-type activities

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Muscle Mass and Health

- Weight management
- Improved response to exercise
- Better response to injury
- Reduced muscle wasting and increased vitality in elderly
- Improved bone health and reduced risk of osteoporosis

Wolfe, RR. *AJCN*, 2006

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Protein Quality Ratings

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

Journal of Sports Science and Medicine, 2004

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SOY PROTEIN

Only complete vegetable protein

May help to decrease cholesterol

Can also help weight loss

Whole soy is a source of fiber in addition to being a source of protein

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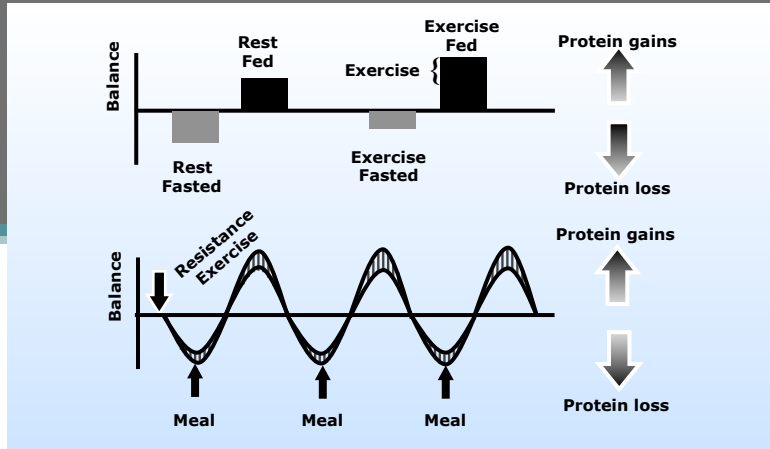
BCAA Content of Foods

	LEUCINE	ISOLEUCINE	VALINE
1 scoop (36g) whey protein isolate	3.2 g	1.8g	1.7g
1 scoop (36g) soy protein isolate	2.4 g	1.5g	1.5g
4 oz. sirloin steak	2.0 g	1.1g	1.3g
4 oz. chicken breast	2.0 g	1.4g	1.4g
1 cup low-fat yogurt	1.1 g	0.6g	0.9g
1 cup skim milk	0.8 g	0.4g	0.4g
1 egg	0.5 g	0.3g	0.4g
2 T peanut butter	0.5 g	0.2g	0.2g
1 slice wheat bread	0.1 g	0.05g	0.07g

Sources: USDA National Nutrient Database for Standard Reference, Release 20. and GNC WPI 28

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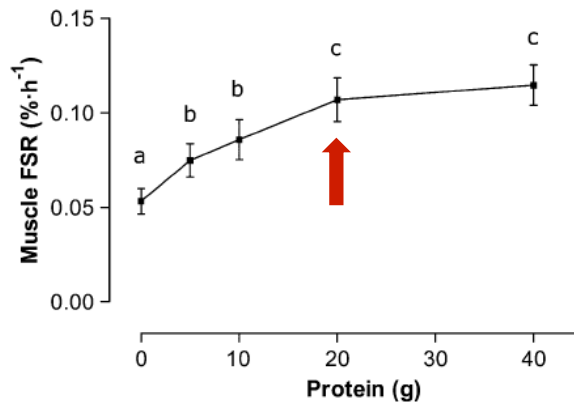
Resistance Exercise and Protein Work Together to Promote Muscle Gain



Phillips SM., *Nutrition*, 2004

Protein Dose to Maximize Muscle Protein Synthesis

- 20 grams = *maximum* protein synthesis stimulation



Moore et al., *AJCN*, 2009

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PROTEIN VS PROTEIN/CARB FOR MUSCLE SYNTHESIS POST EXERCISE

- Whey protein : 25 gms or 25 gms + 50 gms carbohydrate post exercise
- Same effect on muscle protein synthesis post exercise
- Implication: fewer calories consumed with whey protein alone than protein+ carb
 - Med Sci Sports Exerc Dec 2010

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Higher Protein Diets May Help Maintain a Healthy Weight

- Eating a higher protein diet has been shown to increase a feeling of fullness, which may contribute to people consuming fewer calories, which can help maintain or lose weight.
- As part of a reduced calorie diet, higher protein diets may improve the quality of weight loss by helping people lose more fat and/or maintain more lean muscle.
 - Lean muscle helps to promote a healthy metabolism and burn more calories.

Weigle et al, *AJCN*,2005; Layman et al, *JNut*, 2009; Leidy et al, *Obesity*, 2007; Skov et al, *IJO*,1999, Gordon et al, *JNut Healthy Aging*, 2008, Halton et al, *JACN*, 2004

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CHANGES IN BODY FAT PERCENTAGE WITH VARYING PROTEIN INTAKES

- Increases in protein intake resulted in small but significant decrease in body fat percentage in a 3 month study of protein supplemented vs control group of 24, 20-42 yo M/F where calories were controlled
- 1.1% decrease in body fat
- 1.2 # decrease in body fat
 - *Physiology and Behavior* 2010;101:635-638

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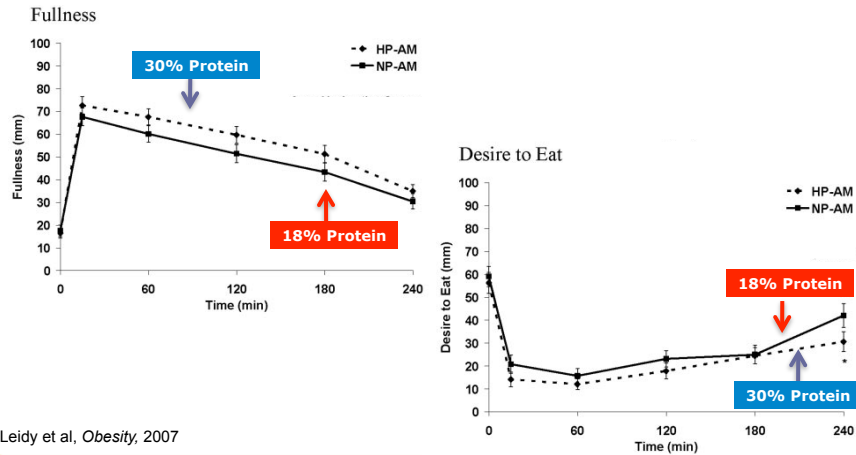
Protein Can Increase Satiety

- Consuming more protein, such as whey protein, may help people feel fuller longer than carbohydrates or fat.
- IOM Dietary Reference Intakes for Macronutrients:
 - *“A number of short term studies indicate that protein intake exerts a more powerful effect on satiety than either carbohydrate or fat”*

Institute of Medicine 2005, Halton et al, JACN,2005

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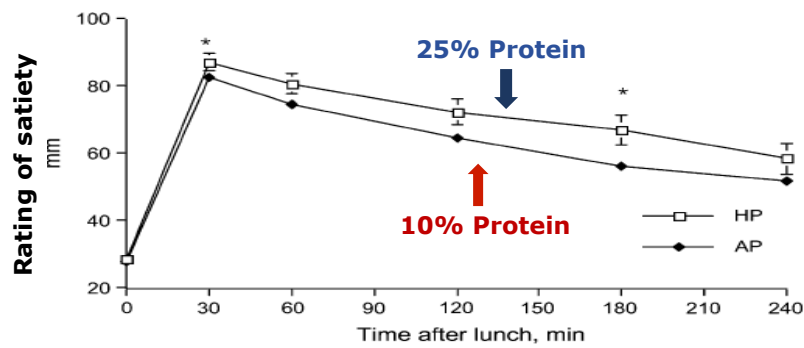
Higher Protein Meals: Increase Fullness and Reduce Desire to Eat



Leidy et al, *Obesity*, 2007

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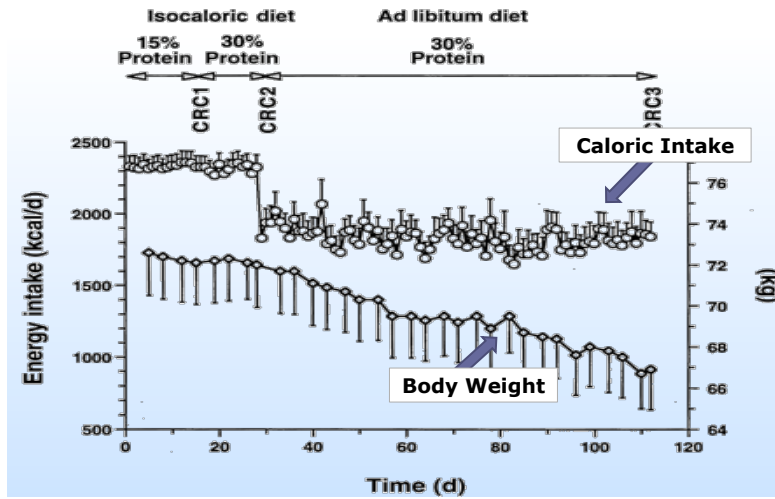
Higher Protein Meals: Increase Fullness and Reduce Desire to Eat



Smeets et al., *J Nutr*, 2008

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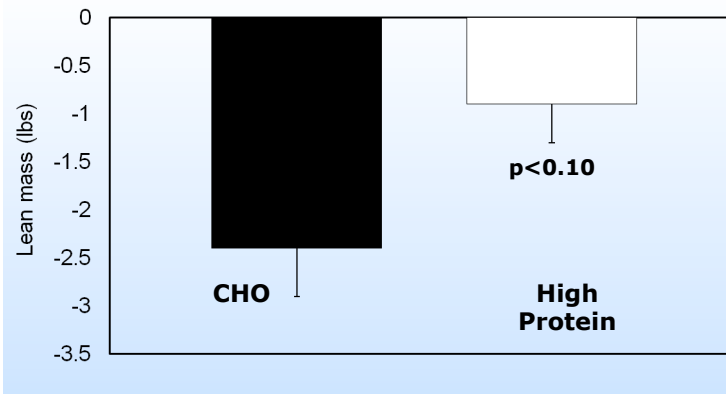
A High Protein Diet Decreased Ad Libitum Caloric Intake & Body Weight



Weigle et al., AJCN, 2005

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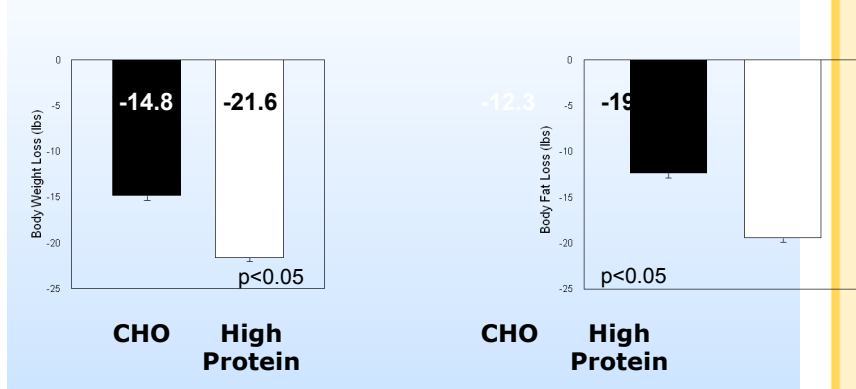
Higher Protein Diets: Preserve Lean Body Mass



Layman D. J. Nutr, 2005

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Higher Protein Diets: Increase Body Weight Loss and Fat Loss



Layman D. J. *Nutr*, 2005

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Sarcopenia: A Public Health Concern

- Average loss of muscle mass $\sim 0.5-1\%/yr$ beginning at \sim age 40*
- Estimated to affect 30% of people over 60 years and $> 50\%$ of people over 80 years
- Census Bureau data: by 2025 elderly population in U.S. is expected to be $\sim 80\%$ greater than number in 2000

**The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 55:M716-M724 (2000)

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Protein Requirement in Older Adults

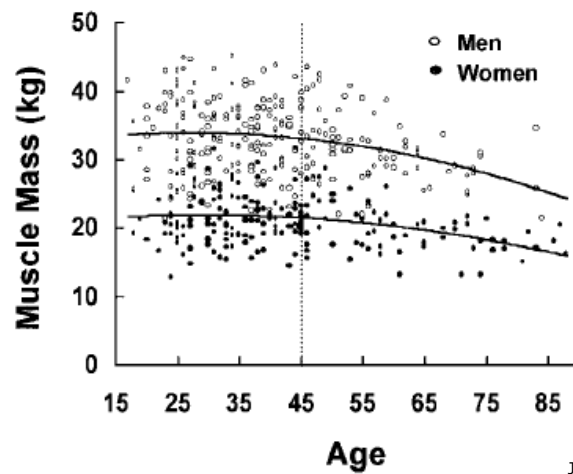
RDA – offset deficiency

Absence of deficiency does not imply optimal level

Quality of protein consumed declines

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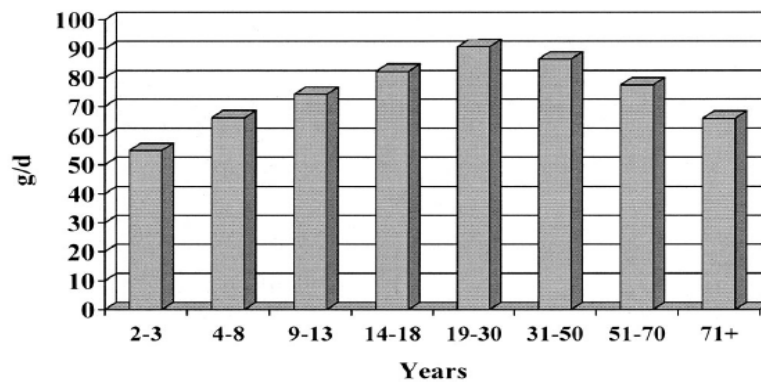
Muscle Mass Declines With Age



Janssen, JAP, 2000

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Protein Intake Declines With Age



Fulgoni, *AJCN*, 2008

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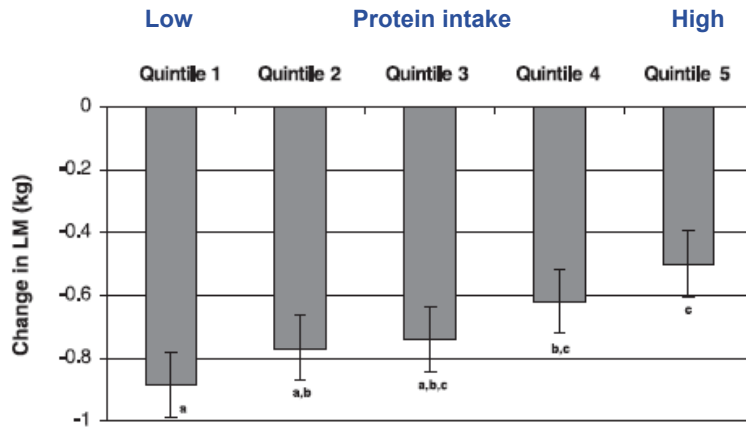
Current Science: Protein and Older Adults

- Protein timing and type are important to short term increases in protein synthesis
 - Acute protein feedings stimulate protein synthesis
- Available data mixed regarding long-term benefit

Dangin et al., *J Phys*, 2003

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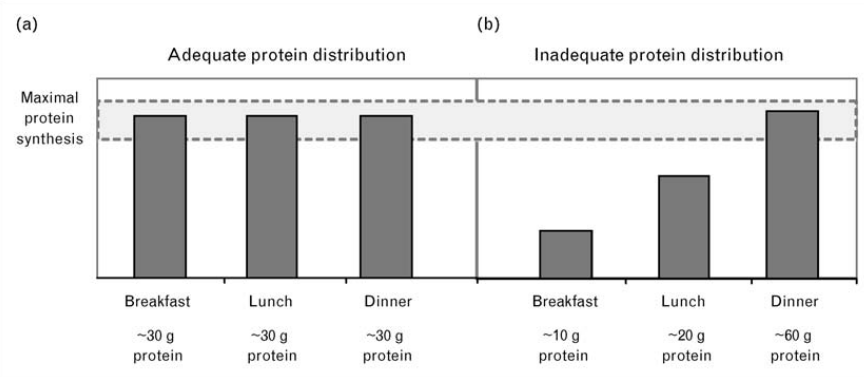
Higher Protein Intakes: Less Lean Body Mass Lost in Elderly



Houston et al., *AJCN*, 2008

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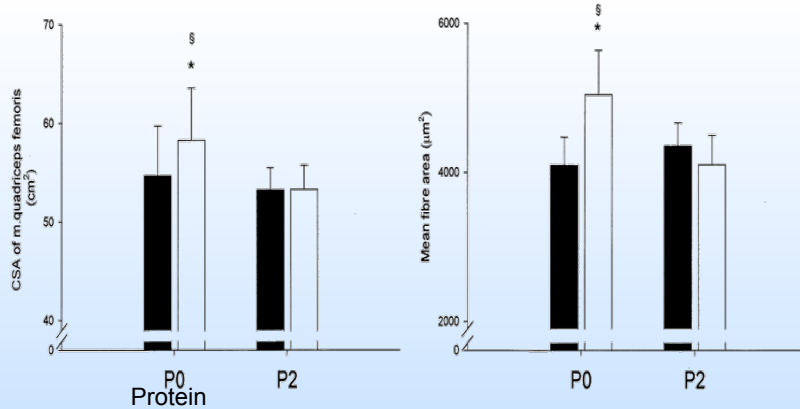
The Importance of Adequate Protein Throughout the Day for Older Adults



Paddon-Jones, *Curr Op in Clin Met Care*, 2009

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Timing of Protein Intake Impacts Muscle Growth in Older Adults



Esmarck et al., *J Physiol*, 2001

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Protein and Bone Health

- Along with calcium and vitamin D, protein is an essential nutrient for bone health and the prevention of osteoporosis.
- Higher protein diets are associated with greater bone mass and fewer fractures when calcium intake is also adequate.
- It is well established that a diet with moderate protein intakes (1.0-1.5 g/kg) is associated with a well-balanced calcium homeostasis and likely no alterations of bone turnover.

Heaney, *AJCN*, 2008; Bonjour, *AJCN* 2005; Isaia, *J Endocrinol Invest.* 2007

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DIABETES

- 1-1.2 g pro/kg BW
- Carbohydrate AND protein at each eating episode
- 25% protein as part of meals

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PRODUCTS WITH WHEY

- BiPro- whey protein isolate
- Starbucks Vivanno smoothie: 15-18 gms whey protein, 260-280 calories
- Better Whey of Life Protein yogurt: 15-17 gms protein, 135-140 calories
- Detour Bars: 15-30 gms whey protein
- Mix1: Protein shake: 15 gms whey protein isolate and Hi-Antioxidant Fiber Drink: 9 gms whey protein isolate

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PRODUCTS WITH WHEY

- Designer Whey Protein Water: 12 gms whey protein isolate, 60 calories
- Quaker Weight Control oatmeal: 7 gms protein, 6 gms fiber, 2 gms whole grains
- Kellogg's Special K protein shake: 180-190 calories, 10 gms protein
- Bolthouse Farms coffee drinks: 160-199 calories, 10-40 gms protein/8 oz

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PRODUCTS WITH WHEY

- XAPP carbonated protein drink: 170 calories, 40 gms whey protein isolate, 5.2 gms leucine, 2 gms carbohydrate
- Gatorade G Series O3 Recover Drink: 15 gms whey protein, 14 gms carbohydrate/8 oz

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PRODUCTS WITH WHEY

- Tera' swhey protein powders: 20 gms whey protein, 5 gms carbohydrate
- Zing bars: 10-13 gms whey protein, gluten, wheat and soy protein free- created and owned by RDs
- Bolthouse Farms Parfait Smoothie: 25 grams whey+soy protein blend, 3 gms fiber, 180 calories

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BOTTOM LINE

- Protein remains an important nutrient throughout the lifecycle
- Quality of protein remains constant
- Quantity may vary depending upon age/activity
- Food is an excellent way to meet protein needs and protein supplements can augment an inadequate protein intake

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CONTACT INFORMATION

- Leslie Bonci, MPH, RD, CSSD, LDN
- 412-432-3674
- boncilj@upmc.edu

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