DAIRY RESEARCH INSTITUTE
NUTRITION • PRODUCTS • SUSTAINABILITY

Protein Throughout the Day Messages 2011

This document summarizes key information regarding developing messages about consuming protein throughout the day

Reference Guide & Scientific Backgrounder

Prepared by
Regulatory Affairs
Dairy Research Institute

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- Your body uses protein all day long. Try protein-rich yogurt to help get your protein throughout the day.
- Your body uses protein all day long. Try yogurt, a good source of protein, to help get protein throughout the day.
- Your body uses protein all day long. Try cheese, a good source of protein, to help get your protein throughout the day.
- Your body uses protein all day long. Try milk, a good source of protein, to help get your protein throughout the day.

II. Experts suggest

- Some experts suggest spacing protein intake throughout the day to optimize how the body uses protein.
- Experts suggest spreading protein intake throughout the day may be more beneficial than consuming one high protein meal.
- A practical way to attain a higher protein diet is to incorporate protein foods throughout the day.

III. Protein at breakfast

- Increasing protein intake at breakfast, typically lower in protein than other meals, can help achieve a higher protein diet. Dairy provides a high-quality source of protein.
- As Americans consume little protein in the morning, adding protein to breakfast may be beneficial.
- Protein intake at breakfast helps break that all night fast.

IV. Curbing hunger

- Foods and beverages made with high-quality protein can help space protein intake throughout the day and, as part of a higher protein diet, help curb hunger.
- Choosing a high quality protein snack can help you be satisfied.

V. Protein muscle benefits

- Protein from dairy helps maintain the muscles that support your skeletal system.
- Whey protein, a high quality protein from milk, together with exercise can naturally increase your metabolism and help your body build and maintain muscle.

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Introduction: Benefits of Consuming Protein throughout the Day

This document provides a summary of scientific support for the benefits of consuming protein containing foods in meals and snacks throughout the day, especially at breakfast.

These food messages may be considered for use in various types of communications. Compliance with regulatory requirements and industry standards set forth by the U.S. Food and Drug Administration (FDA), the Federal Trade Commission (FTC) and other governing agencies is critical.

The term "labeling" is defined broadly in the Food, Drug and Cosmetic Act (section 201(m)) as '*all labels and other written, printed, or graphic matter upon any article or any of its containers or wrappers or accompanying such article."* FDA has indicated that labeling is not limited to actual labels on a food product, but also includes "brochures, booklets…motion picture films, film strips, sound recordings … and similar pieces of printed, audio, or visual matter … which are disseminated by or on behalf of its manufacturer, packer or distributor…" Thus, products that are promoted through written, printed or graphic matter that supplement or explain the product for use in the distribution and sale of the product, such as flyers and brochures in proximity to a product on a shelf in a grocery store, are likely to be considered "labeling." FDA has also indicated that information provided on a website that offers a product for sale, meaning that the product can be ordered through the site for delivery or when the product links to such a site, will be viewed as labeling. [*Source:* Food Regulation. Law, Science, Policy, and Practice. Neal D. Fortin, J.D. Published by John Wiley & Sons, Inc. Hoboken, New Jersey. 2009]

The FTC is responsible for protecting consumers from unfair or deceptive acts or practices and oversees food advertising, which includes materials available on the Internet. FTC's oversight broadly covers advertising materials, promotional activities, and marketing and sales practices in general and includes traditional print, television, telephone and radio advertising and well as materials provided on the internet for the purposes of promoting the sale of a product. The FTC periodically joins with other law enforcement agencies to monitor the Internet for potentially false or deceptive online advertising claims. When advertising materials do not comply with the law, enforcement actions or civil lawsuits may be taken.

The FTC requires that advertising materials be truthful and not misleading and that advertisers have supportive evidence (substantiation) to back up their claims. A claim may be considered misleading if relevant information is left out or if the claim implies something that's not true. A claim can be considered unsubstantiated without adequate documented support. FTC has published a number of rules and guidance documents to help businesses comply with the law

(e.g. Enforcement Policy Statement on Food Advertising; FTC Policy Statement Regarding Advertising Substantiation; Advertising and Marketing on the Internet Rules of the Road; Dietary Supplements An Advertising Guide for Industry; Statement of Policy Regarding Comparative Advertising); for more information see http://www.ftc.gov/bcp/guides/guides.shtm.

This ***Reference Guide and Scientific Backgrounder*** provides a general overview of nutrition labeling terms and requirements associated with use of messages for claims on labels or in labeling and scientific support for messages for use in communication materials. It is only intended as a general summary of information and is not intended to take the place of either the written law or regulations. Since regulations may change over time, it is important to consult the most current regulations prior to making any claims. The Dairy Research Institute expresses no opinion about the suitability of the information for use and suggests that any recipient obtain appropriate expert advice with regard to any statements or information herein contained (*see footnote*).

Messages about Consuming Protein throughout the Day

The following list of messages can be scientifically supported based on a review of available scientific literature and previously developed Scientific Backgrounders on various topics associated with protein in the diet.

I. Dairy protein sources

- Your body uses protein all day. Refueling with [dairy protein/whey protein] is a good option.
- Having a high protein snack or meal can help provide fuel for your day.
- Your body uses protein all day long. Try protein-rich yogurt to help get your protein throughout the day.
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- Protein from dairy helps maintain the muscles that support your skeletal system.
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FOOD LABELS AND LABELING

Product Eligibility Criteria

Products using these claims must be at least a good source of protein (10% of Daily Value for protein per reference amount customarily consumed (RACC)) or more (see 21 CFR 101.54c).

Minimum protein to qualify for nutrient content and structure/function claims.

FDA specifies that structure/function claims should be based on a meaningful amount of the nutrient or dietary substance in the product. For protein, 10% of the Daily Value is consistent with the qualifying criteria for a nutrient content claim as established by FDA. This amount (10% of a Daily Value) has also been used by FDA to set eligibility criteria for several health claims (e.g., food containing fiber related health claims). The Daily Reference Value of protein for adults and children over 4 years of age, which forms the basis for calculating the Daily Value, is 50 grams. Therefore, all dairy foods in the milk, cheese and yogurt groups can qualify for structure/function and nutrient content claims for protein, as long as the product contains at least 5 grams of protein per RACC. Products containing whey protein also can qualify, dependent on the total amount of whey protein per RACC. If the product contains a mixture of proteins that are not all high quality proteins, the total amount and quality of the protein must be considered using the *protein digestibility-corrected amino acid score* (PDCAAS) (see below).

Nutrition Facts Panel

Products using these messages must provide information on the Nutrition Facts panel for all mandatory nutrients including both the amount and percent Daily Value (%DV) for protein.

For labeling purposes, declaration of the percent daily value (%DV) of protein is not required unless a claim about the protein content of the food is made. Manufacturers may voluntarily include the %DV for protein, however, if reported, the value must be based on the PDCAAS method which addresses the quality of the protein (see 21 CFR 101.9). The PDCAAS value is used together with the g of protein to derive the %DV for protein in a food. Determination of the PDCAAS value can require rather expensive and sophisticated analyses, so many foods, including those that do not have complete protein, do not report %DV.

Disclosure Statement

A "*disclosure statement*" is required when a nutrient content claim is made and the food contains one or more of the following nutrients at levels that exceed 13 g for total fat, 4 g for saturated fat, 60 mg for cholesterol and 480 mg for sodium per labeled serving and per RACC (and per 50 g for foods with reference amounts of 30 g or less or 2 tbsp.). The disclosure statement should state, "See nutrition information for [nutrient requiring disclosure] content." Nutrient disclosure levels are not required on products making only structure/function claims. It is advisable, however, for structure/function claims to follow the disclosure criteria for nutrient content claims.

Additional Guidance Material

Further guidance on key nutrition labeling terms associated with claims for food labels and labeling and further details about key regulatory concepts and definitions that are applicable to dairy nutrition and health-related claims is available in the ***Quick Reference Guide: Nutrition Claims for Dairy Products*** at www.usdairy.com and www.innovatewithdairy.com and on FDA websites. A comprehensive guide for labeling regulations for fluid milk products is also available from the International Dairy Foods Association (IDFA; see http://store.idfa.org/).

SCIENTIFIC SUPPORT

Scientific support for messages about consuming protein throughout the day can be built on the following key support points, which are summarized below.

- Role of protein in the body
- Protein throughout the day
- Protein in the diet from meals and snacks
- Protein and satiety

Role of protein in the body

Protein is an essential structure of the human body and it is used throughout each day for normal physiological functions, making it essential for a healthy body. Muscle synthesis and breakdown is a continual process dependent on availability of protein building blocks, amino acids. It is necessary for children and adults to consume adequate dietary protein every day to help maintain nitrogen balance (IOM, 2005).

The Institute of Medicine/Food and Nutrition Board (2005) specifically states:

> "Protein is the major structural component of all cells in the body. Proteins also function as enzymes, in membranes, as transport carriers, and as hormones; and their component amino acids serve as precursors for nucleic acids, hormones, vitamins, and other important molecules."
>
> "Nitrogen balance is the difference between nitrogen intake and the amount excreted in urine, feces, skin, and miscellaneous losses. As discussed below, nitrogen balance remains the only method that has generated sufficient data for the determination of the total protein (nitrogen) requirement. It is assumed that when needs are met or exceeded adults come into nitrogen balance; when intakes are inadequate, negative nitrogen balance results. In determining total protein (nitrogen) needs, high-quality proteins are utilized as test proteins to prevent negative nitrogen balance resulting from the inadequate intake of a limiting indispensable amino acid."
>
> "The Recommended Dietary Allowance (RDA) for both men and women is 0.80 g of good quality protein/kg body weight/d and is based on careful analyses of available nitrogen balance studies."

National Institute of Health (2011) states:

> **"**Proteins are worker molecules that are necessary for virtually every activity in your body."

Protein and Amino Acid Homeostasis (Institute of Medicine/Food and Nutrition Board, 2005)

> The human body has limited protein and amino acid reserves that must be replenished on a daily basis. Breakfast may be an optimal time to replenish the body's amino acid and protein reserve after an overnight fast.
>
> The body of a 70-kg man contains about 11 kg of protein. Nearly half of this protein (about 43 percent) is present as skeletal muscle, while other structural tissues such as skin and blood each contain approximately 15 percent of the total protein. The metabolically active visceral tissues (e.g., liver and kidney) contain comparatively small amounts of protein (together about 10 percent of the total). Other organs such as the brain, lung, heart and bone contribute the remainder. The distribution among the organs varies with developmental age, as the newborn infant has proportionately less muscle and much more brain and visceral tissue than the adult. It is also notable that, despite the very wide variety of enzymes and proteins within a single organism, almost one half of the total protein content of the human is present in just four proteins

(myosin, actin, collagen and hemoglobin). Collagen in particular may comprise 25 percent of the total. Even in the adult, when the protein mass of the body has reached a plateau, it can be influenced by a variety of nutritional and pathological factors. Thus, when diets high or low in protein are given, there is a gain or loss of body protein over the first few days, before re-equilibration of protein intake with the rates of oxidation and excretion. This phenomenon has led to the concept of a "labile protein reserve," which can be gained or lost from the body as a short-term store for use in emergencies or to take account of day-to-day variations in dietary intake. This labile protein reserve in humans is unlikely to account for more than about 1 percent of total body protein. Thus, the immediately accessible stores of protein (which serve as the source of indispensable amino acids and amino nitrogen) cannot be considered in the same light as the huge energy stores in the form of body fat; the labile protein reserve is similar in weight to the glycogen store. However, it should be recognized that this protein reserve is unlike the fat and glycogen stores, whose primary roles are for energy use. The protein lost during fasting is functional body protein and thus there is no evidence for a protein reserve that serves only as a store to meet future needs. However, pathological conditions, such as severe disease states, can cause substantial rates of protein loss due to the increased demand for either amino acids or carbon skeletons to meet local energy demands. If certain conditions (e.g., fasting and pathological conditions, such as severe disease states) go unchecked for more than a few days, there may be a serious depletion of the body's protein mass.

International Olympic Committee (IOC) Consensus Statement on Sports Nutrition for athletes (2010) states:

> "Foods or snacks that contain high-quality proteins should be consumed regularly throughout the day as part of the day's total protein intake, and in particular soon after exercise, in quantities sufficient to maximize the synthesis of proteins, to aid in long-term maintenance or gain of muscle and bone and in the repair of damaged tissues. Ingestion of foods or drinks providing 15-25 g of such protein after each training session will maximize the synthesis of proteins that underpins these goals."

Resources:

Institute of Medicine, Food and Nutrition Board. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington, DC: National Academies Press, 2005. Chapter 10. Protein and Amino Acids, pg. 589.

National Institutes of Health. National Institute of General Medical Sciences. The structure of life. Chapter 1.
http://publications.nigms.nih.gov/structlife/chapter1.html Accessed January 14, 2011

Symons TB, Sheffield M, Wolfe RR, Paddon-Jones D. A moderate serving of high-quality protein maximally stimulates skeletal muscle protein synthesis in young and elderly subjects. J Am Diet Assoc. 2009; 109:1582-86.

International Olympic Committee (IOC) Consensus Statement on Sports Nutrition, 2010. Available at: http://multimedia.olympic.org/pdf/en_report_723.pdf Accessed May, 2011.

Protein throughout the day

Recently several experts have published about the levels of protein needed at meals and throughout the day:

According to Paddon-Jones (2009):

> "Rather than recommending a large, global increase in the recommended dietary allowance (RDA) for protein for all elderly individuals, clinicians should stress the importance of ingesting a sufficient amount of protein with each meal. To maximize muscle protein synthesis while being cognizant of total energy intake, we propose a dietary plan that includes 25–30 g of high quality protein per meal"

According to Layman (2009):

- Protein is a critical part of the adult diet
- Protein needs are proportional to body weight; NOT energy intake
- Adult protein utilization is a function of intake at individual meals
- Most adults benefit from protein intakes above the RDA

This publication also depicts a more ideal distribution of protein throughout the day to ensure maximum protein synthesis. The figure below shows the meal that may need the greatest increase in protein from current patterns is breakfast.

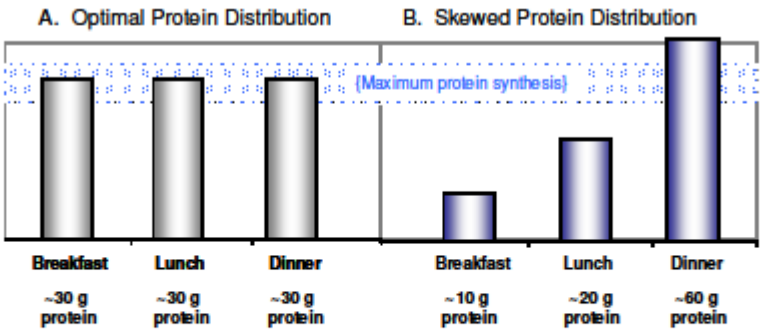


Figure 1
Protein distribution at meals. A) Ingestion of 90 grams of protein, distributed evenly at 3 meals. B) Ingestion of 90 grams of proteins unevenly distributed throughout the day. Stimulating muscle protein synthesis to a maximal extent during the meals shown in Figure 1A is more likely to provide a greater 24 hour protein anabolic response than the unequal protein distribution in Figure 1B. (Adapted from Paddon-Jones & Rassmussen Curr Opin Clin Nutr Metab Care 2009, 12: 86–90.)

Multiple Moderate Serving Sizes of High Quality Protein and Lean Body Mass

Symons et al. (2009) found that a moderate serving of high quality protein maximally stimulates skeletal muscle protein (lean body mass) synthesis in both young and elderly adults. Ingestion of sufficient high quality dietary protein is a fundamental prerequisite for muscle synthesis and maintenance of lean muscle mass and function. The research indicated that 30 g of high quality protein in an eating occasion are needed to help maximize muscle synthesis and higher levels do not provide additional benefits. The research findings found that instead of consuming a large protein-rich meal, ingestion of multiple moderate-size servings of high quality protein-rich foods over the course of a day may represent an effective means of optimizing muscle mass and function.

KidsHealth states:

"The good news is that you don't have to eat all the essential amino acids in every meal. As long as you have a variety of protein sources throughout the day, your body will grab what it needs from each meal."

Resources:

Paddon-Jones D and Rasmussen B. Dietary protein recommendations and the prevention of sarcopenia. Curr Opin Clin Nutr Metab Care. 2009, 12:86–90.

Layman, DK. 2009. Dietary Guidelines should reflect new understandings about adult protein needs. Nutr & Metab. 2009, 6:12.

Symons TB, Sheffield M, Wolfe RR, Paddon-Jones D. A moderate serving of high-quality protein maximally stimulates skeletal muscle protein synthesis in young and elderly subjects. J Am Diet Assoc. 2009; 109:1582-86.

KidsHealth. Nemours Foundation. Learning about Proteins. *http://kidshealth.org/kid/stay_healthy/body/protein.html* *Accessed January 14, 2011*

Protein in the diet from meals and snacks

According to analyses of What We Eat In America (the dietary component of the National Health and Nutrition Examination Survey, NHANES) provided by Agricultural Research Service of USDA, for Americans 2 years and older:

- On average about 15% of daily protein is consumed at breakfast (about 12.3 g/day)
- On average about 14% of daily protein is obtained from snack consumption (about 11.5 g/day)
- 43% of daily protein is consumed at dinner (about 35.2 g/day)with 28% of daily protein consumed at lunch (22.9 g/day)

***Resources**:*

U.S. Department of Agriculture, Agricultural Research Service. 2010. Breakfast: Percentages of Selected Nutrients Contributed by Foods Eaten at Breakfast, by Gender and Age. What We Eat in America, NHANES, 2007-2008. Available: www.ars.usda.gov/ba/bhnrc/fsrg

U.S. Department of Agriculture, Agricultural Research Service. 2010. Lunch: Percentages of Selected Nutrients Contributed by Foods Eaten at Lunch, by Gender and Age, What We Eat in America, NHANES, 2007-2008. Available: www.ars.usda.gov/ba/bhnrc/fsrg

U.S. Department of Agriculture, Agricultural Research Service. 2010. Dinner: Percentages of Selected Nutrients Contributed by Foods Eaten at Dinner, by Gender and Age, *What We Eat in America*, NHANES, 2007-2008. Available: www.ars.usda.gov/ba/bhnrc/fsrg

U.S. Department of Agriculture, Agricultural Research Service. 2010. Snacks: Percentages of Selected Nutrients Contributed by Foods Eaten at Snack Occasions, by Gender and Age, What We Eat in America, NHANES, 2007-2008. Available: www.ars.usda.gov/ba/bhnrc/fsrg

Protein and satiety

Diets and meals higher in protein have been shown to increase satiety (feelings of fullness after a meal). This is based on a large body of scientific evidence that includes many studies with higher daily protein intakes ranging from a few days to months. Research that supports consumption of individual foods for satiety benefits is limited. Protein and satiety claims for ingredients and foods, therefore, should include a statement to indicate 'as part of a diet higher in protein'. The summary and conclusions of an extensive literature review of the topic is provided below:

Summary and conclusions of Literature Review*

There is a virtual consensus in the literature that protein is more satiating than the other two macronutrients. The available published literature through 2008 provides convincing evidence that dietary protein contributes to the satiety of the diet. These data also suggest that protein is more satiating than carbohydrate and fat. **Thirty-seven of the 41 short- to medium-term studies reviewed provide strong or suggestive support for a satiety benefit of protein.** While there were some weaknesses in some of the studies described below (e.g., small sample size, multiple items changing in the diet, differing measurements for satiety, etc.) the preponderance of evidence supports the beneficial effects of higher protein intake on satiety. Only four studies (Geliebter, 1978; de Graff *et.al.*, 1992; Raben *et.al.*, 2003; Blom *et.al.*, 2006) failed to support the satiety influence of protein. However, characteristics of the design of these studies limit their applicability to healthy, free-living individuals. Specifically, Geliebter (1978) provided atypical foods (drinks composed of egg albumin, corn starch or corn oil) to subjects who wore nose clips and were given topical anesthesia to block sensory perceptions. The study by de Graff *et.al.* (1992) also used atypical liquid test meals. Tomato juice was mixed with carbohydrate (maltodextrine/maltose/glucose), milk protein or cream and fed to subjects at a constant volume. Although subjects given the protein preload tended to exhibit higher satiety scores than subjects given the other preloads, the results did not reach statistical significance. The study by Raben *et.al.* (2003) was well designed and used preloads composed of everyday foods. It is possible the fact that subjects were required to wear hoods to collect expired gasses throughout the experiment affected satiety ratings. The study by Blom *et. al.* (2006) was also well designed. This study reported a trend (p=0.08) for greater satiety after a protein vs. a high-carbohydrate preload, but it did not reach statistical significance. This study did not measure *ad libitum* food intake at a subsequent meal.

As noted above, despite several negative studies, a clear preponderance of the evidence supports the conclusion that protein is the most satiating macronutrient. Several recent

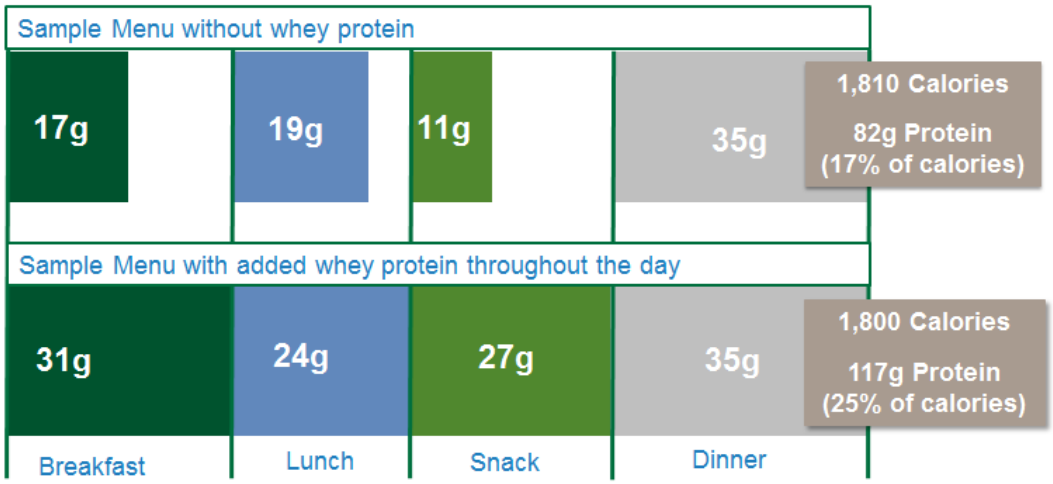
review papers (Stubbs *et.al.*, 2000; Westerterp-Plantenga, 2003; Anderson and Moore, 2004; Halton and Hu, 2004) have concluded that protein is more satiating than carbohydrate or fat in short-term and long-term studies, and as such may play an important role in management of body weight. The satiating effects of protein appears to persist even when energy density (calories per weight of food) is held constant (Stubbs *et.al.*, 2000) although not all studies support this conclusion (Raben *et.al.*, 2003; Vozzo *et.al.*, 2003)."

Increasing the protein content of the diet and meals to achieve satiety benefits can be achieved and will be based on food choices through the day. The example meal plans below illustrate how foods containing at least a good source of high quality protein (5 g per RACC), such as from ingredients like whey protein, can be readily incorporated into a daily eating plan to increase the protein content of the diet. As illustrated, this can be accomplished by consuming protein containing foods throughout the day without increasing calories. The amount of protein needed by an individual to achieve a satiety benefit, however, will vary depending on current protein intakes, age, weight, gender, activity level and overall health.

1,810 Calories Sample Menu (without whey protein)	1,800 Calories Sample Menu (with whey protein)	Approx. Whey Protein (grams)
Breakfast: **1 cup instant oatmeal** 1 cup fat-free milk 1 small banana 1 granola bar Calories: 570 Protein: 17 g (12% of calories)	**Breakfast:** 1 cup "weight control" instant oatmeal 1 cup fat-free milk 1 small banana 1 whey protein bar Calories: 510 Protein: 31 g (24% of calories)	5 g 10 g
Lunch: Tuna salad pita sandwich 2 oz tuna canned in water 1 tbsp mayonnaise 1 lettuce leaf 2 tomato slices 1/2 pita pocket bread 1 cup baby carrots **Iced tea** Calories: 300 Protein: 19 g (25% of calories)	**Lunch:** Tuna salad pita sandwich 2 oz tuna canned in water 1 tbsp light mayonnaise 1 lettuce leaf 2 tomato slices 1/2 pita pocket bread 1 cup baby carrots 2 cups protein water Calories: 280 Protein: 24 g (34% of calories)	5 g
Dinner Chicken fajitas 3 oz chicken breast 1 tsp vegetable oil 1 cup sliced peppers & onions 1/3 cup shredded Monterey Jack cheese 2 whole wheat flour tortillas 1 tbsp sour cream 1/2 cup Spanish rice Calories: 650 Protein: 35 g (22% of calories)	**Dinner:** Chicken fajitas 3 oz chicken breast 1 tsp vegetable oil 1 cup sliced peppers & onions 1/3 cup shredded Monterey Jack cheese 2 whole wheat flour tortillas 1/2 cup Spanish rice Calories: 620 Protein: 35 g (23% of calories)	
Snack: 1 cup low-fat yogurt 1 cup strawberries Calories: 290 Protein: 11 g (15% of calories)	**Snack:** 1 Pomegranate Berry Smoothie (made with yogurt & 1 scoop whey protein) Calories: 390 Protein: 27 g (27% of calories)	20 g
TOTALS **Calories: 1,810** **Protein: 82 g (17% of calories)** **Fat: 58 g (28% of calories)** **Saturated Fat: 19 g** **Sodium: 2,010 mg** **Total Carbohydrate: 259 g (55% of calories)** **Dietary Fiber: 26 g**	**TOTALS** Calories: 1,800 Protein: 117 g (25% of calories) Fat: 47 g (23% of calories) Saturated Fat: 16 g Sodium: 2,180 mg Total Carbohydrate: 246 g (52% of calories) Dietary Fiber: 32 g	40 g

Note: Percentages of total calories and nutrient totals are based on rounded values using FDA rounding regulations.

For illustration purposes only



Resource:

**For a detailed summary of the scientific literature, see:*
Dairy Research Institute. Dietary Protein and Satiety Scientific Backgrounder 2010.
Link: http://www.usdairy.com/DairyResearchInstitute/Pages/RegulatoryTools.aspx