

Nutrition Close-Up

Egg Nutrition Center



Fall 2011

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ENC is a National Strategic Partner of the MyPlate/ MiPlato Program

SPECIAL FEATURE

The Role of Protein In Weight Management

By David Heber
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Protein is the most satiating of the major energy nutrients which include carbohydrate and fat. That is, when you eat protein-rich foods such as eggs, you will control your hunger over a longer period of time than when you eat either carbohydrates or fats. There is compelling evidence regarding the consumption of increased dietary protein for better appetite control and satiety. Johnson randomly assigned twenty healthy adults to low fat diets with protein intake at 15 or 30 percent of total calories for six weeks using a controlled feeding design so that calorie intake was the same in both groups.^[1] As expected, the controlled calorie diets were equally effective in reducing weight and fat mass, but the group consuming the high protein diet reported greater satiety with the diet using a seven point scale. Two individuals in the low protein group dropped out of the study due to unendurable hunger. Devkota and Layman have found that a higher ratio of carbohydrate to protein in a meal keeping fat constant promotes fat storage over protein synthesis.^[2]

“The protein-supplemented group demonstrated greater satiety and experienced half the weight regain observed in the lower protein group.”

Westerterp-Platenga and co-workers have demonstrated in careful metabolic studies that a weight loss diet providing 25% of calories from protein resulted in a 2.6% higher 24-h total energy expenditure than did a diet with 10% protein.^[3] With the 25% protein diet compared with the 10% protein diet, the subjects were in greater positive protein balance (0.57 +/- 0.05 compared with -0.08 +/- 0.03 MJ/d; P < 0.0001) and more negative fat balance (-0.83 +/- 0.14 compared with 0.11 +/- 0.17 MJ/d; P < 0.0001). In addition, satiety was 33% higher with the 25% protein diet compared to the 10% protein diet (P < 0.05). In another study by the same group, 148 subjects followed a very low calorie diet for 4 weeks and then were randomly assigned to consume either 15% or 18% of calories from protein amounting to an additional 48 grams of protein per day for 3 months.^[4] The protein-supplemented group demonstrated greater satiety and experienced half the weight regain observed in the lower protein group.

These findings argue strongly for increasing protein intake during weight reduction. The current Recommended Dietary Allowance for protein is based on pioneering research by Vernon Young in 1973.^[5] A small group of male volunteers consumed egg white protein and attained zero

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Importance of Eating a Nutrient-Dense Diet During Pregnancy

Pregnancy is a unique time for a woman as she needs to consider not only how her diet may influence her own health, but she also needs to recognize that her diet will influence the growth of her child in utero. Equally, or perhaps more importantly, is the fact that there is also a growing body of literature suggesting that the long-term health of a child may actually be programmed before birth^[1], emphasizing the need for pregnant women to eat nutrient-rich foods during pregnancy. In addition to carbohydrates, protein, and fat, it is of particular importance for a pregnant woman to eat a diet that is “*nutrient dense*”, one that is rich in micronutrients, such as calcium, vitamin C, folate, vitamin A, and iron.

“Of particular importance is the protein intake of a pregnant woman...”

Of particular importance is the protein intake of a pregnant woman as she needs protein to maintain her own lean body mass and to provide amino acids for her developing baby. A recent study conducted in Brazil found that dietary intake becomes more important as a woman’s total energy intake decreases (unpublished data). This is most probably due to the observation that essential nutrients decreased in absolute amounts as total caloric intake decreased. In terms of specific foods, there has been much discussion as to the amount of fish a pregnant woman should consume. Some fish are excellent sources of protein and omega-3 fatty acids that promote fetal growth and neurodevelopment, but warnings have been given regarding the mercury content of some fish. At the same time, epidemiological studies in countries with a high fish intake (e.g. Japan) have found no adverse effects of fish intake on newborn status or even among adolescents whose mothers consumed high amounts of fish during pregnancy.^[2] It should be noted that pregnant women do not need to consume large amounts of oily fish to increase their omega-3 fatty acid intake as even two portions a week of farm salmon may be sufficient to achieve the recommended intake for pregnancy.^[3]

Specific advice for ensuring the adequate intake of micronutrients can be found in a variety of resources, including the pregnancy eating guide from the Egg Nutrition Center.^[4] Briefly, it is important to eat dairy products and other foods rich in calcium (such as sardines, dark vegetables, calcium fortified foods, and enriched grains) to support the growth of bone as the baby develops.

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The need for calcium during pregnancy increases by almost one-third to support both the mother and the baby. A recent study found that calcium supplementation during pregnancy reduced the risk of pre-eclampsia by 50% and also reduced the risk of a pre-term birth.^[5] It should also be noted that calcium needs for a woman who breastfeeds may be twice as high as normal. Folate is an important nutrient that promotes development of the brain and nervous system and prevents certain birth defects, such as spina bifida.^[6] A study in Norway reported that folate supplementation during pregnancy may promote language development in early childhood^[7], an effect that goes well beyond pregnancy and birth. Finally, some essential fatty acids and other nutrients (such as choline) have been reported to promote optimal development of the brain and nervous system. While choline is associated with reduced risk of neural tube defects, the relationship between maternal choline intake and later cognitive development is equivocal and rests primarily on studies in rodents.^[8] Nonetheless, it is clear that eating foods rich in these nutrients, such as eggs, support healthy growth and normal development of the growing baby. ✨

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MESSAGES

- A growing body of literature suggests that the long-term health of a child may actually be programmed before birth, emphasizing the need for pregnant women to eat nutrient-rich foods during pregnancy.
- Low-income women reportedly spend more money for better quality diets. In fact, vegetables, fruit, and high quality lean protein are among the food groups with increasing prices that are first eliminated from their diet.

Addressing Childhood Obesity: Helping Kids Eat Better in Restaurants

In July 2011, the National Restaurant Association launched a new nationwide initiative that provides parents and children with a growing selection of healthful menu options when dining out. Kids LiveWell™ in collaboration with Healthydiningfinder.com, provides better-for-you menu options for children when eating out. Restaurants that participate in the voluntary program commit to offering healthful meal items for children, with a particular focus on increasing consumption of fruit and vegetables, lean protein, whole grains and low-fat dairy, and limiting unhealthy fats, sugars and sodium.

Kids LiveWell™ menu choices are available at more than 20,000 participating restaurant locations nationwide. Restaurants that join Kids LiveWell™ agree to offer and promote a selection of items that meet qualifying nutrition criteria based on leading health organizations’ scientific recommendations, including the 2010 USDA Dietary Guidelines.

Full meals must include two sources & sides must include one source of the following:

- **Fruit:** > ½ cup = 1 star (includes 100% juice)
- **Vegetable:** > ½ cup = 1 star

By Joy Dubost, PhD

Director of Nutrition and Healthy Living,
National Restaurant Association



- **Whole grains:** contains whole grains = 1 star
- **Lean protein (skinless white meat poultry, fish/seafood, beef, pork, tofu, beans, egg):** > 2 ounces meat, 1 egg or egg equivalent, 1 oz nuts/seeds/dry bean/peas = 1 star (lean as defined by USDA)
- **Lower-fat dairy (1% or skim milk and dairy):** > ½ cup = 1 star (while not considered low-fat, 2% milk is allowed if included in the meal and the meal still fits the full meal criteria)

Dr. Robert C. Post, Deputy Director of the USDA’s Center for Nutrition Policy and Promotion (CNPP), praised the new initiative. “*This is a great start to help empower consumers—kids and parents especially—with more healthier choices at restaurants,*” said Dr. Post. “*And, the program’s intent is a good complement to the Department’s MyPlate and Dietary Guidelines messages—we need more choices to help shift eating patterns to healthier ones.*” Parents can find Kids LiveWell™ options in their communities by visiting the Kids LiveWell™ section on <http://www.healthydiningfinder.com/>. For more information on the program please visit www.restaurant.org/kidslivewell. ✨

SPECIAL FEATURE

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The Role of Protein In Weight Management

nitrogen balance at 0.6 gm/kg body weight per day and positive nitrogen balance at 0.8 g/kg body weight per day. The RDA was then set at 56 g/day for men and 46 g/day for women based on these studies. In later research in endurance athletes with a greater lean body mass to body weight ratio than normal volunteers, 1.2 g/kg/day were required for positive nitrogen balance.^[6] In weightlifters 1.5 to 2.5 g/kg/day were required to attain positive nitrogen balance.^[7] One interpretation of this set of studies is that as lean body mass increases greater amounts of protein are needed to maintain protein balance. Weight reduction diets providing one gram of protein per pound of lean body mass would increase protein intake to an effective level below the accepted upper limit set for protein intake of 35 percent of calories established by the Institute of Medicine National Academy of Sciences.^[8] ✨

MESSAGES

- Weight reduction diets providing one gram of protein per pound of lean body mass would increase protein intake to an effective level below the accepted upper limit set for protein.
- A position paper jointly issued by the American Society for Nutrition and the Obesity Society recommends that elderly subjects undergoing weight loss regimens consume protein at 1.0 g/kg/day.

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Protein Distribution to Preserve Lean Body Mass with Age

By Madonna Mamerow, PhD
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Sarcopenia is characterized as the progressive loss of lean muscle mass with increasing age. Loss of skeletal muscle typically begins at age 40 and diminishes at a rate of 0.5 to 1.0 percent per year.^[1] This rate of muscle loss not only results in decreased strength, balance, and coordination, but also increases the individual's risk for falls, longer hospital stays and recovery times, loss of independence, and overall reduced quality of life. The condition affects as many as 30 percent of individuals older than age 60 and more than 50 percent of individuals 80 years and older.^[2] This is significant considering 77 million baby boomers are now reaching age 60. The causes of sarcopenia are not clearly understood, however changes in protein metabolism and cell signaling have been observed in older adults, and the condition is further exacerbated by decreased physical activity and malnutrition.

Studies examining changes in protein synthesis and muscle mass in healthy adults subjected to bed rest indicate that healthy older adults experience an approximate three-fold greater loss of lean leg muscle mass in 10 days as compared to younger individuals confined to bed for 28 days.^[5] An even more impressive rate of loss was observed in hospitalized elderly who lost nearly the same amount of lean leg muscle mass (~1 kg/leg) in 3 days of bedrest as healthy older adults in over 28 days of bedrest (Figure 1).^[5]

Researchers have renewed debates as to whether the recommended dietary allowance (RDA) for protein is adequate to maintain muscle mass in the elderly.^[4] The current recommendation for protein intake for adults is 0.8 g/kg–1.0g/kg/day which is ~60 g protein/day or ~20 g/meal for a 75 kg adult. Yet, aging appears to be associated with an impairment of skeletal muscle to response

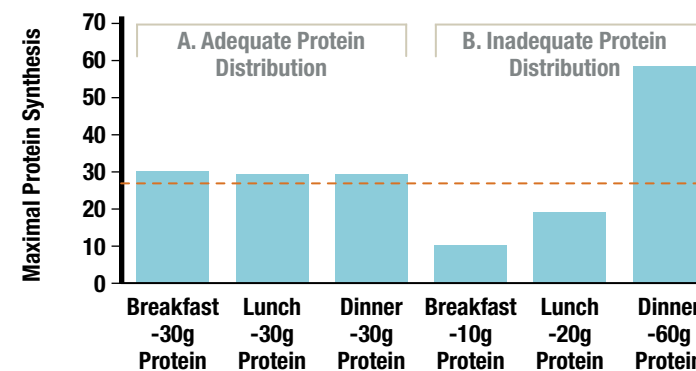


Figure 3. Distributing 90 g protein evenly across three meals provides a greater 24-hour protein anabolic response than a skewed protein distribution.

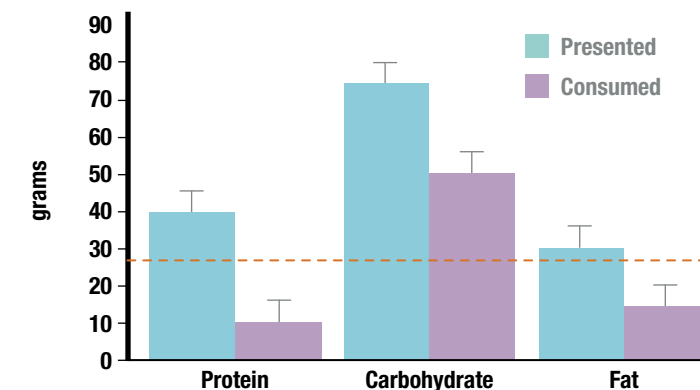


Figure 4. Elderly inpatients do not consume the optimal protein synthetic threshold of 30 g protein/meal to maintain muscle synthesis rates.

“These data indicate that not only can high quality protein-rich foods optimally stimulate muscle protein synthesis, but the anabolic process is not blunted by age.”

Elderly individuals are particularly at risk of becoming physically incapacitated and may be placed on bed rest for extended periods of time. In fact, recent investigations indicate older patients are inactive/bedridden approximately 95% of the time while hospitalized.^[3] During such periods of inactivity, loss of lean body mass is dramatically increased due to a chronic imbalance between muscle protein synthesis and breakdown, which is facilitated by decreased activation of nutrient signaling pathways.^[4]

to low doses of protein (<20 g) or essential amino acids (EAAs) (<8 g), whereas higher doses (protein >25 g; EAAs 10–15 g) stimulate muscle protein synthesis in the elderly at similar rates as young adults.^[8] Therefore, most researchers agree that a moderate-to-large serving of protein or amino acids is necessary for elderly adults to maintain muscle mass.

Paddon-Jones et al., examined the relationship between protein dose and muscle synthesis. The study demonstrated that a large serving of lean beef (340 g; 90 g protein) increased mixed muscle protein synthesis by approximately 50% in both young and elderly subjects.^[9]

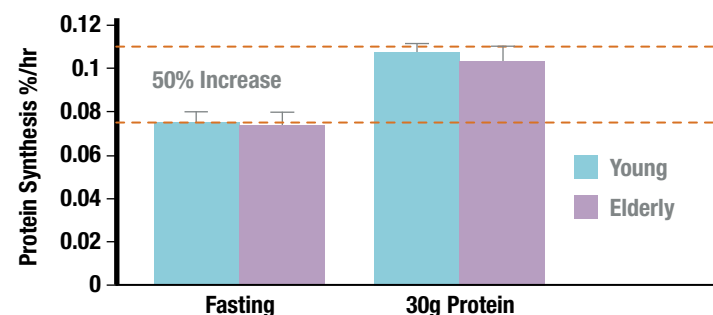


Figure 2. Age does not impair the ability to increase muscle protein synthesis with ingestion of 30 g protein (10g EEA).

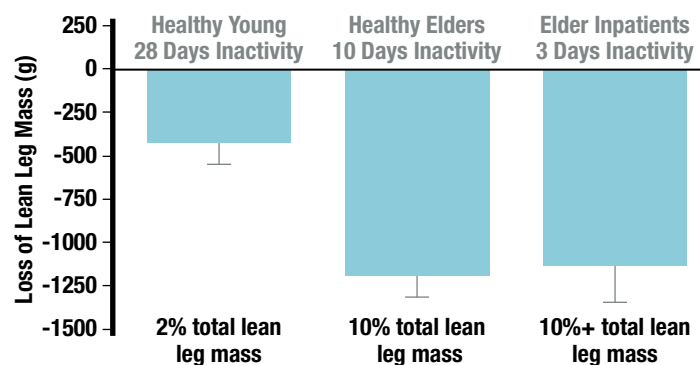


Figure 1. After 3 days of hospitalization, elderly inpatients lost approximately the same amount of lean leg muscle mass as healthy older subjects after 10 days of inactivity, amounting to an approximately three-fold greater loss of lean leg muscle mass than a younger cohort confined to bed for 28 days.

In subsequent studies, a moderate-size portion of lean beef (113 g, 30 g protein) represented an equally effective and more energetically efficient means of stimulating muscle protein synthesis than the threefold larger serving.^[10] These data indicate that not only can high quality protein-rich foods optimally stimulate muscle protein synthesis, but the anabolic process is not blunted by age (Figure 2). Interestingly, preliminary studies indicate that the elderly do not consume enough protein to maintain lean muscle mass. In a cohort of elderly inpatients, despite receiving ~40 g of protein during their mid-day meals, patients only consumed an average of 12.2 ± 3.5 g protein/meal (Figure 3). Thus, elderly patients did not consume the optimal protein synthetic threshold to maintain muscle synthesis rates.

Given these data, one useful strategy for combating the progression of sarcopenia in the elderly would be frequent ingestion of high-quality proteins, consumed in adequate amounts of 30 grams/meal. However, statistics show that protein ingestion is not distributed evenly throughout the day, but rather skewed toward the dinner meal (Figure 4), missing the optimal protein synthetic threshold at breakfast and lunch. Therefore, elderly should focus on incorporating more protein into their breakfast and lunch meals. This diet recommendation can be achieved by consuming two eggs (6 g protein each), a half cup of oatmeal (8 g protein), and a cup of milk for breakfast (8 g protein) plus 3 oz. of lean meat for lunch (30 g protein; portion is approximately the size of a deck of cards). Further incorporating regular exercise in close proximity to ingestion of high protein meals would also be a beneficial strategy for enhancing muscle protein synthesis.^[11] *

MESSAGES

- Aging appears to be associated with an impairment of skeletal muscle to respond to low doses of protein often leading to sarcopenia. Therefore, most researchers agree that a moderate-to-large serving of protein or amino acids is necessary for elderly adults to maintain muscle mass.
- One useful strategy for combating the progression of sarcopenia in the elderly would be frequent ingestion of high-quality proteins, consumed in adequate amounts of 30 grams/meal

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Rethinking Dietary Cholesterol

In her latest publication titled *“Rethinking Dietary Cholesterol”*, Dr. Fernandez considers the evidence that convinced Australia, Canada, Ireland, European Union, Korea and India to remove the upper limit for cholesterol in their dietary guidance. Her conclusion can be summarized in this one line *“...the lack of a relationship between dietary cholesterol and CHD should be sufficient to support the policy of no upper limit for dietary cholesterol”*.

A review of the scientific evidence used to restrict dietary cholesterol presented by Dr. Fernandez includes a broad range of approaches. Epidemiological studies have the benefit of large populations but can only indicate an association and are often unable to control variables such as saturated fat intake. Clinical studies using dietary cholesterol challenges are often short-term due to the expense and lack of control of long-term follow-up. Dr. Fernandez goes on to point out the cost to public health of restricting an inexpensive natural source of many beneficial nutrients such as eggs, which supply high quality protein, the carotenoids lutein and zeaxanthin and of growing importance, the essential nutrient choline. ✨

ML Fernandez, Current Opinion in Clinical Nutrition and Metabolic Care, October 2011 doi: 10.1097/MCO.0b013e32834d2259

Protein enhances benefits of exercise during weight loss

Long-term success with weight management is associated with improving body composition during weight loss. Quick weight loss that results from loss of body water and lean tissue generally leads to failure for long-term maintenance. A recent publication from McMaster University in Canada demonstrates the important interaction of dietary protein with exercise to correct body composition during weight loss. The research group led by Dr. Stuart Phillips examined the combination of an energy restricted diet (-500 kcal/day) with three different protein levels plus daily exercise in women (age: 19 - 45 y.o.; BMI ~ 31). Exercise was kept consistent for all three groups with a combination of aerobic exercise and resistance training accounting for 250 kcal/day of energy expenditure. The diet groups consisted of a high protein group (40:30:30 percent of energy from carbohydrates, fat, and protein, respectively) and two adequate protein groups (55:30:15). The high protein group and one of the adequate protein groups received two protein drinks (milk) each day with one immediately after exercise. The second adequate protein group consumed carbohydrate drinks. After 16 weeks of diet and exercise all groups lost ~9.5 pounds. The group consuming the high protein diet lost more body fat, more trunk fat, and actually gained lean muscle tissue while the group consuming the lower protein diet and the carbohydrate drinks lost lean tissue and the least body fat. This study demonstrates that important interaction between dietary protein and exercise in improving body composition during weight loss. ✨

S. Phillips, Journal of Nutrition, 2011, 141:1626-34

A New Look at Middle Aged Weight Gain

This recent study looked at the association between branched chain amino acid (BCAA) intake and the risk of overweight/obesity status in a cohort of 4429 Asian and Western adults. The study was a part of a larger International Study of Macro-/Micronutrients and Blood Pressure Study (INTERMAP) which did not include any intervention in the methodology other than recording dietary recall and 24 hour urinary measurement. Results confirm the hypothesis that across an international population, dietary intake of branch chain amino acid intake was inversely associated with prevalence of overweight status amongst healthy middle age adults and with the prevalence of obesity in Western adults. These results confirm earlier animal studies that have found higher leucine intake (BCAA) associated with lower body weight and fat mass gain. ✨

LQ Qin et al., Journal of Nutrition, 2011, 141:249-254

Leucine Content of Foods

Food /100g	Leucine g/100g
Tuna, canned in water	2.073
Atlantic farmed salmon	1.615
Beef, composite raw	1.477
Egg, yolk, raw	1.399
Egg, whole, raw	1.086
Egg, white, raw	1.016
Yogurt, plain	0.350
Milk, whole w/vitamin D	0.299
Soymilk	0.186

Source:
U.S. Department of Agriculture, Agricultural Research Service 2011, USDA National Nutrient Database for Standard Reference, Release 24.
Nutrient Data Laboratory Home Page, <http://www.ars.usda.gov/ba/bhnrc/ndl>

ENC Childhood Obesity Roundtable

ENC hosted a roundtable on October 24th and 25th to discuss obesity and nutrition in children. Participants included research and clinical experts from Harvard University, University of Illinois and University of Missouri, two Registered Dietitians – a school nutrition director and a private practice practitioner. The full day discussion focused on known strengths and gaps in current research, nutrition in schools, counseling strategies and the many factors that impact childhood nutrition. ENC is in the process of developing a teacher’s network to improve childhood nutrition. ✨

ENC Protein Webinar

The Egg Nutrition Center hosted its first webinar on August 31, 2011 attended by 367 health professionals. *“Protein Quality and Timing of Intake: Impact on Satiety, Body Weight and Body Composition”* is now available for viewing at <http://www.eggnutritioncenter.org>. Presenters included Donald Layman PhD, Professor Emeritus University of Illinois and Eileen Behan, MS, RD. The webinar discussed the metabolic reality of how American eating patterns of skipping breakfast, refined carbohydrates at lunch and large portions at dinner contribute to the growing trend of chronic illnesses including obesity, diabetes, metabolic syndrome, sarcopenia and heart disease. ✨

ENC is a National Strategic Partner of the MyPlate/MiPlato Program

The Egg Nutrition Center has become as a National Strategic Partner of the USDA MyPlate.gov communication program and has participated in developing materials to aid in promoting and disseminating consistent consumer messages with other National Strategic Partners. Here are some examples of new posters, a recipe booklet and window clings that are available for purchase or for download, www.eggnutritioncenter.org. ✨

Build a Healthy Plate at Each Meal (English)

- Breakfast:** Make half your plate fruit and vegetables; Switch to skim or 1% milk; Make at least half your grains whole; Vary your protein food choices.
- Lunch:** Make half your plate fruit and vegetables; Switch to skim or 1% milk; Make at least half your grains whole; Vary your protein food choices.
- Snack:** Make half your plate fruit and vegetables; Switch to skim or 1% milk; Make at least half your grains whole; Vary your protein food choices.
- Dinner:** Make half your plate fruit and vegetables; Switch to skim or 1% milk; Make at least half your grains whole; Vary your protein food choices.

Build a Healthy Plate at Each Meal (Spanish)

- Desayuno:** Haga la mitad de su plato frutas y verduras; Cambie a leche descremada o 1%; Haga por lo menos que la mitad de sus granos sean integrales; Varie sus elecciones de alimento de proteína.
- Almuerzo:** Haga la mitad de su plato frutas y verduras; Cambie a leche descremada o 1%; Haga por lo menos que la mitad de sus granos sean integrales; Varie sus elecciones de alimento de proteína.
- Comida:** Haga la mitad de su plato frutas y verduras; Cambie a leche descremada o 1%; Haga por lo menos que la mitad de sus granos sean integrales; Varie sus elecciones de alimento de proteína.

Construya un plato sano en cada comida (Spanish)

- Desayuno:** Cambie a leche descremada o 1%; Haga la mitad de su plato frutas y verduras; Haga la mitad de su plato frutas y verduras; Varie sus elecciones de alimento de proteína.
- Almuerzo:** Haga la mitad de su plato frutas y verduras; Cambie a leche descremada o 1%; Haga por lo menos que la mitad de sus granos sean integrales; Varie sus elecciones de alimento de proteína.
- Comida:** Haga la mitad de su plato frutas y verduras; Cambie a leche descremada o 1%; Haga por lo menos que la mitad de sus granos sean integrales; Varie sus elecciones de alimento de proteína.



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*Credible Science
Incredible Egg*

ENC Mission Statement:

ENC is a credible source of nutrition and health science information and the acknowledged leader in research and education related to eggs.

Nutrition Close-Up is a quarterly publication written and produced by the Egg Nutrition Center.

Nutrition Close-Up presents up-to-date reviews, summaries and commentaries focused on the role of diet in health promotion and disease prevention, including the contributions of eggs to a nutritious and healthful diet.

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