STUDY: 3 square meals a day paired with lean protein help people feel full during weight loss

EurekAlert

WEST LAFAYETTE, Ind. - Eating fewer, regular-sized meals with higher amounts of lean protein can make one feel more full than eating smaller, more frequent meals, according to new research from Purdue University.

"We found that when eating high amounts of protein, men who were trying to lose weight felt fuller throughout the day; they also experienced a reduction in late-night desire to eat and had fewer thoughts of food," said Heather J. Leidy, an assistant professor of nutrition and exercise physiology at the University of Missouri who was a postdoctoral researcher at Purdue for this study.

"We also found that despite the common trend of eating smaller, more frequent meals, eating frequency had relatively no beneficial impact on appetite control. The larger meals led to reductions in appetite, and people felt full. We want to emphasize though that these three larger meals were restricted in calories and reflected appropriate portion sizes to be effective in weight loss."

The findings are reported in this month's issue of *Obesity*. This research was funded by the National Pork Board and the American Egg Board, and additional support was provided by the Purdue Ingestive Behavior Research Center and National Institutes of Health's Indiana Clinical and Translational Sciences Institute.

"Our advice for people trying to lose weight is to add a moderate amount of protein at three regular meals a day to help appetite control and the feeling of fullness," said Wayne W. Campbell, Purdue professor of foods and nutrition. "Egg and lean pork products are good sources for protein, and if they are incorporated at meals when people do not normally consume protein, such as at breakfast and lunch, they may prove to be a nice strategy to control weight; promote satiety, which is the feeling of being full; and retain lean tissue mass, which is essential for people as they age."

Leidy said men were studied because they tend to eat more meat and are not studied as often as women. Twenty-seven obese and overweight men were divided into a high-protein group and a normal-protein group. They all consumed a calorie-restricted diet for 12 weeks - which was 750 calories less than their normal diet - an average of about 2,400 calories per person. The amount of protein varied between each group.

The normal-protein diet was composed of 14 percent of energy from protein, 60 percent from carbohydrate and 26 percent from fat, and the high-protein diet had the same amount of fat but 25 percent of energy from protein and 49 percent from carbohydrate.

For example, the normal-protein group's main sources of protein at a breakfast would be sausage made from vegetable proteins. In comparison, the main source for the high-protein group would be sausage, also made from vegetable proteins, as well as an egg substitute and Canadian bacon. The high-protein diet specifically included 25 percent of total protein intake from pork and 15 percent from egg products. Both sources helped contribute the amino acids and nutrients people need daily, Campbell said. This amount of protein for the high-protein group was estimated at 200 calories per meal.

Another difference between the groups is that the normal-protein diet did not include proteins from flesh foods such as meat.

Beans, legumes and soy products also are high sources of protein, but they are not as prevalent in Americans' diets as dairy and meat products, Campbell said. About 40 percent of the protein Americans consume comes from meat products such as pork, chicken, beef and fish, and another 5 percent comes from eggs and egg products.

"The studies have not been done to show the superiority of these proteins with comparable quantities consumed," he said. "What our studies are showing is that by increasing protein in the diet with these food products, the benefits of higher protein intake are noticeable."

Eating frequency also was tested because it is a common belief that eating more frequent, smaller meals a day can lead to weight loss. One of the reasons for this belief is that older studies suggest people who are overweight and obese tend to eat fewer meals.

"As a result, the idea was that fewer, larger meals were contributing or encouraging overconsumption and resulting in obesity and that the people who were more successful with weight control were eating smaller, more frequent meals," Campbell said. "But our findings turn that on its head. There also seems to be a growing consensus that these other dietary habits may not be accurately reported because obese and overweight people tend to conceal how frequently and how much they eat."

Eating frequency was determined starting at week seven for three days. Participants consumed the same amount of calories but with a different distribution: three times a day by eating every five hours or six times a day eating every two hours. The large meals were about 750 calories each. The smaller meals consumed every two hours were estimated at about 375 calories each. Participants also recorded their feelings about hunger and feeling full on a time-stamped electronic device every waking hour.

"First, although we found that daily hunger, desire to eat and preoccupation with thoughts of food were not different between the normal- verses higher-protein groups, the higher-protein group experienced greater fullness through the day," Leidy said. "Second, we had more individuals struggle with complying with

consuming six meals a day, specifically, of those in the study who were not compliant, 90 percent were specifically unable to follow the six-meal-a-day eating pattern. People told us anecdotally that they couldn't stop work to eat a meal, even if it was small."

It also is important to note that the more frequent meals were literally the main meals split in half, and the participants were not snacking, she said.

"The definition for a snack can vary, but it is usually accepted to be under 250 calories and between meals," Leidy said. "Unfortunately, many people easily exceed that today when they combine oversized soft drinks and large portion sizes."

This study also follows an acute clinical study conducted in a laboratory setting by the same researchers that was published in *Obesity* in September. In that study, they found that higher protein intake promotes satiety and challenged the concept that smaller, more frequent meals increases the feeling of fullness.

Other research by Leidy and Campbell have shown that restricted-calorie diets high in protein also help retain lean body mass as people lose weight, which is critical for older adults, Campbell said. However, a loss in bone density for postmenopausal women was linked to eating high protein from meat sources.

"Unfortunately, older people are not immune to the obesity epidemic, and they also are likely to lose muscle as they age," Campbell said. "The combination of overweight, over fat and under muscle is not a good combination for health or quality of life. One of the themes of our research group is to help adults successfully age, and we would like to evaluate the effectiveness of a higher-protein diet with these types of food in this age group while also monitoring key aspects of long-term health such as metabolic syndrome, which includes blood pressure and glucose and cholesterol levels."

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