Research summary

Animal and plant proteins: How do they compare?

About the study

Protein is an important part of a healthy diet. It helps the human body build and maintain muscle, fight infections, and grow strong hair and nails. Understanding how protein works in our bodies, and the differences in protein quality, is essential for developing accurate dietary guidelines.

Dietary guidelines exist to help us shape healthy diets and lifestyles. While guidelines often provide various options to meet dietary needs, important information can be missed. For example, the Dietary Guidelines for Americans (DGAs), published by the United States government, present recommendations to help consumers meet protein requirements with a variety of protein food sources through "ounce equivalents". Specifically, the DGAs state that 1 ounce (oz.) of meat is equivalent to 1 cooked egg, 1/4 cup of kidney beans, 1 tablespoon of peanut butter, 2 oz. of tofu and 0.5 oz. of mixed nuts. However, the DGAs do not currently consider potential differences in protein quality.

To understand how protein quality differs across ounce equivalents, researchers at the University of Arkansas for Medical Sciences looked at the human body's anabolic response to protein. An anabolic response occurs when the body uses protein to build and maintain muscle mass, as opposed to simply breaking it down for energy. They hypothesized that the body's anabolic responses to protein food sources directly relate to the essential amino acid content of the protein food source. The body needs 20 different amino acids to maintain good health and normal functioning; nine of them cannot be synthesized in our bodies and must come from our diet. Additionally, most plant-based foods contain incomplete proteins because they are low in one or more essential amino acids. Eggs and other animal-based proteins are complete proteins because they contain all nine essential amino acids. They generally also have higher digestibility, which means they are more easily absorbed by the body and more readily available to fulfill the body's needs.

To further understand these complexities, researchers compared the consumption of ounce equivalents of both animal-based and plant-based protein foods, seeking to understand how effectively the body digests and uses nutrients from different protein sources.

Methods

For this study, 56 healthy adults ranging in age from 18 to 40 years old were randomly assigned to one of seven groups in which they received one of the following: 2 oz. of cooked beef sirloin; 2 oz. of cooked pork loin; 2 cooked eggs; ½ cup of red kidney beans; 2 tablespoons of peanut butter; 4 oz. of tofu; or 1 oz. of mixed nuts. Prior to the study, participants consumed a weight maintenance diet for three days prepared by a dietitian to ensure participants ate a consistent amount of calories and nutrients.

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On the first day of the study, a stable isotope tracer infusion was used to assess participants' net whole-body protein balance, which is calculated as the difference between protein synthesis and protein breakdown. This technique involves injecting a tracing agent into the participant's veins to determine how the body is dividing protein between its two key bodily functions: building and maintaining muscle mass (protein synthesis) and creating energy (protein breakdown). The changes in net whole-body protein balance following consumption of the different protein food sources were then compared with the baseline value for each individual.

Findings

Consumption of ounce equivalents of animal-based protein food sources such as eggs resulted in a greater gain in whole-body net protein balance than ounce equivalents of plant-based protein food sources. In addition, the egg and pork groups also suppressed protein breakdown compared with the plant protein sources. This means when young, healthy adults consume eggs, their body stores and uses the protein more efficiently as opposed to plant protein sources. These results were correlated with the essential amino acid content of each protein source, revealing that protein sources with all nine essential amino acids resulted in greater gains in whole-body net protein balance.

Conclusions

This study provides essential information for policy makers when developing dietary guidelines for consumers by showing that ounce equivalents of protein food sources, such as those as outlined in the DGAs, cannot be considered equivalent, or a substitute for each other, given their unique physiological effects. Further research will be helpful to determine how protein foods can be better categorized to reflect the difference in protein quality between plant- and animal-based foods.

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