Ribeye-eating pigs demonstrate protein quality for humans

September 21 2020, by Lauren Quinn

Nearly a decade ago, the UN's Food and Agriculture Organization (FAO) developed a new index to assess protein quality in foods. The goal, writ large, was to address food security for the world's most vulnerable populations, creating more accurate tools for food assistance programs seeking to provide balanced nutrition.

Hans H. Stein at the University of Illinois knew he could help.

The new index, known as the digestible indispensable amino acid score (DIAAS), parses out the digestibility of individual amino acids making up proteins. And it relies on pigs, not rats, as the preferred model for humans.

Stein has been evaluating nutrient digestibility, including amino acids, in pigs for 30 years.

"The FAO determined the pig is the preferred model for humans when you evaluate proteins, moving away from the rat, which had been used for the last hundred years. They also recommended human foods should be evaluated exactly the same way as we evaluate feed ingredients for pigs. So, when I saw that I thought, 'Well, we know how to do this,'" says Stein, professor in the Department of Animal Sciences and the Division of Nutritional Sciences at Illinois. "We started doing some research in this area and published the very first paper on DIAAS values for proteins in 2014."

His team has completed multiple studies since then, including a new one published in the *British Journal of Nutrition*. In this work, Stein and his co-authors show meat products, including ribeye steak, bologna, beef jerky, and more, score above 100 on the DIAAS chart, meaning their amino acids are highly digestible and complement lower-quality proteins.

"If the protein quality is greater than 100, that means it can compensate for low protein quality in another food. In developing countries where people are eating a lot of maize or rice, they are typically undernourished in terms of amino acids. But if they can combine that with a higher-quality protein such as a small amount of meat, then you have improved quality overall," Stein says.

Other meats, as well as dairy products, have already been shown to have high DIAAS scores, but this is the first study to evaluate cooked and processed meat products. Since cooking and processing can affect proteins, Stein knew it was important to feed the pigs the same form of meats that humans consume.

"We did feed ribeye steaks to the pigs," Stein says. "They loved it."

Nine pigs were fed each of nine meat products for a week: salami, bologna, beef jerky, raw ground beef, cooked ground beef, and ribeye roast cooked medium-rare, medium, and well-done. Researchers collected material from the ileum, part of the small intestine, through a small surgically placed port called a cannula. Amino acid digestibility and DIAAS scores were calculated for various human age groups using this material.

For all the meat products and age groups, DIAAS values were generally greater than 100 regardless of processing, although scores tended to be higher when calculated for older children, adolescents, and adults than

children between 6 months and 3 years of age.

"The reason for that is the amino acid requirement, and the requirement for higher quality protein, is greater for younger children because they're actively growing. Adults don't necessarily need a very high protein quality because their protein needs are not very high, unless they are bodybuilders or nursing women," Stein says.

The results also showed bologna and medium-cooked ribeye steak offered the highest DIAAS values in the study for the older children, adolescents, and adults age group. That bologna, a highly processed, low-cost meat product, offers high-quality protein could come as welcome news for lower-income families.

Stein points out that meat proteins aren't the only low-cost option. His earlier research shows milk and other dairy products are excellent sources of protein for children. And he plans to evaluate fish, eggs, plant-based meats, and more products in the future.

More information: Hannah M. Bailey et al, Most meat products have digestible indispensable amino acid scores that are greater than 100, but processing may increase or reduce protein quality, *British Journal of Nutrition* (2020). DOI: 10.1017/S0007114520000641

Provided by University of Illinois at Urbana-Champaign