How Can I Get All the Molecules I Need to Make Body Proteins?

What is a complete protein?

Although it's important to get enough protein in your diet, it's also crucial to ensure you're getting enough varieties of protein.

Humans use 20 amino acids to make proteins. We can produce about half of these ourselves, but the remaining 9 amino acids must be obtained from our food. We call these 9 amino acids **essential amino acids**. When a food contains all 9 of these amino acids, it is called a *complete protein*. When a food is lacking one or more essential amino acids, it is called an *incomplete protein*.

A child prepares a peanut butter sandwich. Peanut butter and wheat bread together contain all the amino acids types needed to make body proteins.

Which foods provide complete proteins?

Animal-based foods include meat, poultry, fish, eggs and dairy. They provide all 9 essential amino acids and are complete proteins. There are also a few plant-based sources of complete protein, including:

- Buckwheat
- Hempseed
- Soybeans
- Quinoa

"Don't get hung up on having to have a complete protein with every single meal," says Shayna Komar, a licensed and registered dietitian. "Instead, aim for a variety of protein sources in your whole day."

Incomplete proteins combine to meet body requirements

If you do not eat animal-based foods, or if you limit the amount of animal products you consume, it is important to make sure you get all 9 essential amino acids in the different foods from your diet. You can combine incomplete, plant-based proteins to meet your body's needs. Combinations include:

- Nuts or seeds with whole grains (peanut butter on whole wheat toast)
- Whole grains with beans (beans and rice; hummus and pita bread; bean-based chili and crackers; refried beans and tortillas)
- Beans with nuts or seeds (salad with chickpeas and sunflower seeds)

However, "You don't have to eat all of those in every single meal and not even in your full day," says Komar. "But it's a good idea to get a variety."

Breast milk provides all essential amino acids (being an animal-based food) but when babies can't have breast milk, formulas are developed to ensure all essential amino acids are included, and this can be accomplished using only plant-based ingredients.

Combining proteins across cultures

Many cultures incorporate protein complementation into their traditional diets. The best-known example comes from Latin America. Squash provides the amino acid lysine, which corn lacks, and beans provide methionine. The combination of squash, corn, and beans (often referred to as the Three Sisters) provides a complete set of all the amino acids to make proteins.

In East Asia, rice or wheat is mixed with soybean products, including tofu, soy milk, boiled or fermented soybeans, and soy sauce. Soy sauce is typically made with wheat flour, which adds the amino acid methionine, which is missing in soybeans. Even in times of famine, protein malnutrition has been rare in East Asia because of protein complementation.

Many varied eating patterns that include plant-based proteins from complementary sources can provide all the essential amino acids needed by the body.

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In Central Asia, legumes such as beans, peanuts, and peas are often mixed with grains. Legumes lack the amino acid methionine. Grains lack the amino acids lysine and threonine. Together, they provide all 9 essential amino acids.

In the Middle East, South Asia, and Asia Minor, complementary proteins typically involve green vegetables, lentils, and peas (all of which lack the amino acid methionine) with wheat (which lacks the amino acids lysine and threonine).

Sources:
Adapted for the classroom from Piedmont HealthCare. "The Complete Protein Foods List and Facts." https://www.piedmont.org/living-better/what-is-a-complete-protein.

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