

Meat and the Protein Gap: Why Protein Quality Matters as Much as Quantity

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Key Points

- **High-quality protein:** Meat provides all nine essential amino acids in highly digestible forms, supporting muscle development, tissue repair, growth and immune function.
- **Rich source of essential nutrients:** Meat supplies bioavailable haem iron, zinc, selenium, vitamin B12 and other B vitamins, helping address nutritional inadequacies when included in a balanced diet.
- **Healthy consumption matters:** Choosing lean cuts, moderate portions, hygienic handling and appropriate cooking methods, while limiting processed meat, helps balance nutritional benefits and potential health risks.

Abstract

Protein deficiency and poor dietary protein quality remain important nutritional concerns, particularly in vulnerable populations. Meat provides high-quality, digestible protein containing all essential amino acids, along with bioavailable haem iron, zinc, selenium, vitamin B12 and other B vitamins. In India, where cereals contribute substantially to dietary protein intake, meat can improve protein quality and support growth, tissue repair and immune function. However, its nutritional benefits depend on appropriate portion sizes, lean cuts, hygienic handling and healthy cooking practices. Fresh, lean meat can therefore serve as a valuable component of a diverse, balanced diet to help address nutritional inadequacies.

Introduction

Protein is the body's building material which repairs tissues, builds muscle, makes enzymes and regulates the immune system. But, an estimated one billion people worldwide, including about 165 million children under five are protein-deficient (Wu et al., 2014). In central Africa and South Asia, up to 30% of children are affected by protein malnutrition (Wu

et al., 2014). Closing this gap is therefore an important part of nutritional security, and meat has a practical role to play. Meat is a concentrated source of nutrients which supplies high-quality protein together with iron, zinc, selenium, vitamin B12 and other B vitamins in forms the body can readily use (Pereira & Vicente, 2013). At the same time, meat attracts genuine health concerns, from fat content to the risks linked with processed products. This article discusses meat as one of the protein source and present Indian scenario.

Keywords: Meat, protein source, Iron, malnutrition

Meat in the diet

Meat is not a modern fashion. Anthropologists describe four broad phases of human meat eating, from opportunistic hunting, to large-scale hunting, to the domestication of animals and plants about 10,000 years ago, and finally to today's food systems (Pereira & Vicente, 2013). Researchers have linked meat eating with changes in human teeth and jaws, with posture, and with the shape of the digestive tract. Humans have a simple stomach and a relatively long small intestine but a reduced caecum and colon, a pattern that suits an omnivore eating energy-dense food in small volumes (Mann, 2007; Pereira & Vicente, 2013). Some nutrients are found almost only in animal tissues. Haem iron, the form of iron in hemoglobin and myoglobin, is present only in meat and other animal foods. Taurine, an amino acid with antioxidant and anti-inflammatory roles that humans make poorly, comes mainly from animal sources such as shellfish and the dark meat of chicken and turkey (Pereira & Vicente, 2013).

The importance of protein quality

Dietary protein is made of amino acids, and nine of them (the essential amino acids) cannot be made by the body in sufficient amounts, so they must come from food. Proteins from animal-source foods such as meat supply all of them in good proportion and are highly digestible. Meat protein has no limiting amino acid (Williams, 2007). Nutrition scientists measure protein quality using the protein digestibility-corrected amino acid score (PDCAAS), where 1.00 is the highest score. Egg white and casein score 1.00 and meat scores 0.92. Common pulses such as pinto beans, lentils, peas and chickpeas score between 0.57 and 0.71, and wheat gluten only 0.25 (FAO/WHO, 1991, as reported by Pereira & Vicente, 2013). FAO has since recommended a newer measure, the digestible indispensable amino acid score (DIAAS), for evaluating dietary protein (FAO, 2013), but animal proteins tend to score higher than most plant proteins. Cereal proteins are especially low in the essential amino acid lysine, while legumes are low in methionine (Elango et al., 2009). A diet that depends mainly on cereals, however, can fall short in protein quality even when the number of grams looks adequate (FAO, 2013).

The amount of protein in meat varies with species and cut. In the Indian Food Composition Tables (IFCT 2017), the main muscle cuts of chicken, goat, sheep, beef and pork contain about 17–23 g of protein per 100 g (Longvah et al., 2017), close to the average of about 22% (Pereira & Vicente, 2013). Table 1 shows selected cuts.

Table 1. Protein, fat, iron and zinc in 100 g of raw edible meat (Indian Food Composition Tables 2017; Longvah et al., 2017)

Meat cut (IFCT code)	Protein (g)	Fat (g)	Iron (mg)	Zinc (mg)
Chicken, breast, skinless	21.81	9.00	0.83	0.78
Chicken, leg, skinless	19.44	12.64	1.27	1.77
Goat, chops	20.39	5.98	1.87	4.55
Goat, legs	22.07	7.94	1.77	3.52
Sheep, leg	21.42	8.69	1.54	2.67
Beef, round (leg)	22.64	7.38	2.30	3.36
Pork, chops	19.41	11.30	1.00	1.34
Pork, ham	18.83	18.55	1.27	1.76

Values apply to the cuts sampled and will vary with breed, cut and cooking.

Protein content is similar across species, but minerals are not. Goat and beef cuts contain about 3.4–4.6 mg of zinc per 100 g, compared with 0.8–1.8 mg in chicken and 1.3–2.1 mg in pork (Longvah et al., 2017). Iron in raw meat is modest (about 0.8–2.3 mg per 100 g across the cuts in Table 1).

The Indian scenario

The ICMR–NIN *Dietary Guidelines for Indians* (2024) set the recommended dietary allowance for healthy adults at 0.83 g of protein per kg of body weight per day, or about 54 g/day for a 65 kg adult. The latest national consumption survey (HCES 2023–24) estimated average protein intake at 61.8 g per person per day in rural India and 63.4 g in urban India (MoSPI, 2025). Cereals still supply roughly 46–47% of protein in rural diets and about 39% in urban diets (MoSPI, 2025). Averages cannot give each individual and households that eat far less than the average. So the real challenge in India is as much about protein *quality* and dietary diversity as about quantity. Combining cereals with pulses, milk products, eggs, fish or meat, together with nutrition education, is the most practical route to better protein quality.

Meat as a source of iron

Iron carries oxygen in the blood, and iron deficiency affects growth and development in children (Pereira & Vicente, 2013). Diet plays an essential role in keeping iron in balance (Hurrell & Egli, 2010). Food iron comes in two forms. Haem iron comes from hemoglobin and

myoglobin, is present only in animal foods, and is absorbed as an intact molecule, which makes it highly bioavailable. Non-haem iron, found in vegetables, legumes and dairy products, is absorbed poorly, with bioavailability ranging from only 2% to 20% (Turhan et al., 2004). Plant foods also contain substances that block iron absorption, including phytate and some polyphenols found in beans (Kumar et al., 2010; Petry et al., 2010). Haem iron, even when eaten in smaller amounts, is two to three times more bioavailable, with about 15–35% absorbed (Turhan et al., 2004). Meat is the best dietary source of haem iron with haem iron making up roughly a quarter to three quarters of the iron in meat, with the highest share in beef (average about 58%), a lower share in pork and the lowest in chicken, where dark meat has about 39% and light meat up to 26% (Clark et al., 1997; Pereira & Vicente, 2013). Meat and meat products can contribute up to 18% of daily iron requirements (Geissler & Singh, 2011). Very high iron intakes can damage the intestine and have been associated with oxidative damage and with higher risks of some chronic diseases, and the tolerable upper intake level set in the USA for adults is 45 mg/day (Geissler & Singh, 2011).

Meat as source of other nutrients

Animal foods are the major dietary sources of vitamin B₁₂. A 100 g serving of red meat supplies nearly two thirds of the daily requirement, and also about a quarter of the recommended intake of riboflavin, niacin, vitamin B₆ and pantothenic acid (Williams, 2007). Chicken breast is a particularly good source of niacin and vitamin B₆ (Pereira & Vicente, 2013). Low intake is the main cause of vitamin B₁₂ deficiency (Craig, 2009). In older people, B₁₂ deficiency can also arise from poor absorption (Allen, 2008). Deficiency causes megaloblastic anemia and can damage the nervous system (Pereira & Vicente, 2013). Zinc is needed for enzymes, cell division, growth, gene expression, and immune and reproductive function, and deficiency raises the risk of infection (Prasad, 2009). Lean beef provides roughly a quarter of the daily zinc requirement in a 100 g portion (Pereira & Vicente, 2013). Selenium is a component of selenoproteins that work as antioxidants (Rayman, 2000). Fresh meat contains roughly 40–50 µg per 100 g, against a recommended intake of 55 µg/day for adults (Food and Nutrition Board, 2000; Pereira & Vicente, 2013). Seafood is often richer in selenium than meat. Offal such as liver is an outstanding source of vitamin A and folic acid (Biesalski, 2005). A small serving of liver can supply several times the daily requirement of Vitamin A (Pereira & Vicente, 2013).

Fat, cooking and health concerns

Retail beef cuts contained roughly 14–19% fat, pork between 8% and 28%, and chicken and turkey between 1% and 15%, with the skin as the main source of fat in poultry (Pereira & Vicente, 2013). Loin is the leanest part of beef and pork, and breast is generally the leanest part

of poultry. Lean cuts like pork or beef loin do not differ greatly from skinless chicken or turkey breast (Pereira & Vicente, 2013). In IFCT 2017, the raw cuts in Table 1 range from about 6 g of fat per 100 g in goat chops to 18.6 g in pork ham (Longvah et al., 2017). Ruminant meat contains a good amount of stearic acid, which has a neutral effect on cardiovascular risk (Hunter et al., 2010). Animals fed on pasture tend to produce meat with more polyunsaturated fatty acids than grain-fed animals, and meat can contribute up to 20% of long-chain omega-3 fatty acid intake, although seafood is the main source (Russo, 2009; Pereira & Vicente, 2013).

Cooking changes the nutritional value of meat. Grilling, broiling or pan-frying without added fat can remove considerable amounts of fat (Gerber et al., 2009). But cooking also destroys some B vitamins, and vitamin B12 and thiamin are among the most affected. Boiling causes bigger losses because B vitamins are water soluble and heat-sensitive, so shorter cooking times such as stir-frying and not overcooking can reduce losses (Lombardi-Boccia et al., 2005).

Finally, a distinction is needed between fresh meat and processed meat. A large review found that processed meat was associated with higher risks of coronary heart disease and diabetes, so processing and cooking methods are important variables when judging the health effects of meat (Micha et al., 2010). Processed products such as sausages and cured meats are also high in sodium (Pereira & Vicente, 2013).

Eating meat wisely

Meat is a helpful food, not a cure-all. Its benefit depends on the portion, the cut, the cooking method and the rest of the diet. Excess fatty and processed meat is best avoided, and meat should complement, not replace, pulses, vegetables, fruits and whole grains (De Smet & Vossen, 2016). Well-planned vegetarian diets can meet protein needs, especially when cereals are combined with pulses, milk products and eggs. For many families, cost and access are the real barriers, so affordable options such as eggs, milk, fish and poultry deserve attention too.

Hence,

- **Choose lean cuts.** Prefer loin cuts and skinless poultry, and trim visible fat.
- **Keep portions moderate.** A small portion alongside dal, vegetables and whole grains improves the whole meal; meat and cereal–pulse meals also help iron and zinc absorption (Consalez et al., 2022).
- **Cook thoroughly, but not excessively.** Raw or undercooked meat can carry parasites such as tapeworms (Pereira & Vicente, 2013), while overcooking and prolonged boiling destroy B vitamins.
- **Buy safe meat.** Choose meat from inspected animals and hygienic outlets, and keep it chilled.

- **Limit processed meats** such as sausages, ham and other cured products.
- **Add variety.** Include eggs, milk, fish and pulses, and use liver only occasionally.

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