Chemical composition and nutritional content of raw poultry meat

Poultry meat is widely accepted as a good source of high-quality protein, the B vitamins and minerals. The fact that poultry meat is considered to be a good source of lean meat has resulted in a significant increase in poultry meat consumption around the world. Overall, the composition of poultry meat is dependent on the kind, class, sex, age and diet.

Consumers worldwide demand a protein supply that is safe, healthy, nutritious, numerous, and affordable. Poultry meat is supplied chiefly by chicken and turkey, although ducks, geese, guinea fowl and quail. Poultry meat is economical and quick and easy to prepare and serve.

Poultry meat continue to be the most efficient and economical way to convert feed grains to animal protein. Poultry meat also enjoys popularity in developed markets, due to its price and perceived safety health advantages compared to other meat sources.

Development of new and efficient processing systems, adoption of advanced technologies, and introduction of novel products that meet market chain requirements and end-consumer needs have contributed significantly to the increase in global poultry meat consumption.

Contributions of poultry to the human diet

Animal source foods can provide a variety of micronutrients that are difficult to obtain in adequate quantities from plant source foods alone. Six micronutrients are particularly low in the primarily vegetarian diets. Negative health outcomes associated with inadequate intake of these nutrients include anemia, poor growth, rickets, impaired cognitive performance, blindness, neuromuscular deficits, and eventually, death. Animal meat is a particularly rich source of vitamin A, vitamin B12, riboflavin, calcium, iron, and zinc.

Nutritionally, people eat poultry meat for its high content of high-quality protein. Various types of poultry meat have similar approximate chemical compositions, as shown on Table 1.

Turkey meat is usually lower in fat than chicken, while goose and duck meat are higher in fat. When skin is present, the fat level is higher because skin includes subcutaneous (under the skin) fat. When fat content goes up, moisture is reduced and, therefore, it is commonly said that there is an inverse relationship between moisture and fat content. The protein content is not affected as much by this change. Higher fat also translates to a higher caloric value, but in general, poultry is considered to be a lean meat when compared to red meat sources.

Table 1. Composition and Nutritional Value of Different Raw Poultry Meats. (g/100 g)

Source of Meat			Water%	Protein%	Fat%	Ash%	Iron (mg)	Calories (kcal)
Species	Meat	Skin						
Chicken	**White**	+	68.6	20.3	11.1	0.86	0.8	186
		-	74.9	23.2	1.6	0.98	0.7	114
	Dark	+	65.4	16.7	18.3	0.76	1.0	237
		-	75.9	20.1	4.3	0.94	1.0	125
Turkey	**All**	+	70.4	20.4	8.0	0.88	1.4	160
Duck	**All**	+	48.5	11.5	39.3	0.68	2.4	400
Goose	**All**	+	50.0	15.9	33.5	0.87	2.5	370
	All	-	68.3	22.7	7.1	1.10	2.5	160
Quail	**All**	+	69.7	19.6	12.1	0.9	3.9	192

Expressed on a 100 gram portion of meat with/without skin.

White chicken meat is very high in protein, 20 to 23%, with and without skin, respectively. When the skin is removed, the fat level drops from about 11% to 1.6%.
Eating chicken with the skin on doubles the amount of fat and saturated fat in the dish. For this reason, chicken should best be skinned before cooking. Chicken consumption is increasing as people look for alternative ways to reduce fat such as cholesterol in their diets. To reduce fat in cooked poultry, cooking methods such as broiling, roasting, baking, simmering, or microwaving have been suggested. Cooking methods affect the chemical composition in different ways. While roasting results in the highest protein content (29%), stewing and frying also result in elevated protein content due to moisture and fat loss (or protein concentration). Stewing results in a more moist product compared to roasting due to the cooking medium that reduces cooking losses. (Table2).

Table 2. Effect of three different cooking methods on the nutritional composition of light chicken meat with skin.

Nutrients and Units		Mean Values in 100 Grams, Edible Portion			
		Raw	**Fried**	**Roasted**	**Stewed**
Water	**g**	68.6	50.23	60.51	65.13
Food energy	**kcal**	186	277	222	201
Protein (N 6.25)	**g**	20.27	23.55	29.02	26.14
Total lipid (fat)	**g**	11.07	15.44	10.85	9.97
Carbohydrate, total	**g**	0	9.5	0	0
Ash	**g**	0.86	1.29	0.93	0.78

Protein

The nutritional value of proteins is determined first by their content of essential amino acids and their digestibility. Poultry meat, contain complete protein.

Protein Quality

The human body needs 20 different amino acids, nine of which are called essential because the body cannot make them and must get them in the diet. Essential amino acids for adults are **histidine**, **isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan,** and **valine**. Additionally, children need **arginine**. Food proteins that supply all the essential amino acids in the proportions needed by the body are called complete. Animal foods are considered to have high protein qualities, although their qualities are not always similar because of differences in essential amino acids. The higher quality of animal protein is due to the high **lysine** and **methionine** content (Table 3). Poultry meat can be modified by nutrition strategies like amino acid profile of the protein in the breast meat.

Consumers should choose a diet low in fat, saturated fat, and cholesterol to help reduce the risk of getting certain diseases and to help maintain a healthy weight. For this purpose, poultry meat is a very good choice.

Table 3. Comparison of amino acid composition of various animal foods (Percentage of protein).

Amino acid	Turkey[1]	Chicken	Beef	Milk	Eggs
Arginine	6.5	6.7	6.4	4.3	6.4
Cystine	1	1.8	1.3	1	2.4
Histidine	3	2	3.3	2.6	2.1
Isoleucine	5	4.1	5.2	8.5	8
Leucine	7.6	6.6	7.8	11.3	9.2
Lysine	9	7.5	8.6	7.5	7.2
Methionine	2.6	1.8	2.7	3.4	4.1
Phenylalanine	3.7	4	3.9	5.7	6.3
Threonine	4	4	4.5	4.5	4.9
Tryptophan	0.9	0.8	1	1.6	1.5
Tyrosine	1.5	2.5	3	5.3	4.5
Valine	5.1	6.7	5.1	8.4	7.3

1Average values for whole turkey (breast and leg).

The lipid contents of poultry meat contain greater amounts of unsaturated [oleic acid (C18:1) is a dominant fatty acid in all tissues] than saturated fatty acids. The dark meat and skin of fowl contain as much as or even more oleic acid (C18:1) than the total of the saturated fatty acids. The three acids—palmitic (C16:0), oleic (C18:1), and linoleic (C18:2 n-6)—account for at least 68% of the total fatty acids in fowl tissues. The total lipid content of chicken tissues increases with age. Young chicken meat (light plus dark meat) has 2.5% of total fat of the edible portion, which is less fat than that of stewing hens, turkeys, and other fowl. All of them have an approximately equal total fat content (7 to 8% of the edible meat). The fatty acid composition of both chicken and turkey tissues reflects the fatty acid composition of the dietary fat. Breed, sex, and environmental temperature do not have any effects on tissue fatty acid compositions. The skin of all birds contains more fat than the meat and is the major contributor of fat to the edible portions.

The skin of duck and goose is particularly high in fat content. The total fat level in duck meat is 8% of the edible portion, and in the meat plus skin, the total fat content is 28% of the edible portion.

Cholesterol

Knowledge of cholesterol content is important, especially in poultry, because the consumption of poultry is currently increasing based on recommendations regarding healthy nutrition. Chicken or turkey breast meat content is 53 mg/100 g; turkey thigh meat (61.5 mg/100 g) and chicken thigh meat is 82.9 mg/100 g. Hence, a serving of 100 g of poultry meat contributes 18 to 28% of the dietary cholesterol limit per day.

Mineral Salts

Minerals are classified as either essential or nonessential, depending on whether or not they are required for human nutrition and have metabolic roles in the body. Nonessential elements are also categorized as either toxic or nontoxic.

Comparison between poultry meat and beef

In general, Beef is a little higher in fats and contains more calories, whereas chicken is richer in protein. Beef has a few nutritious advantages over chicken, as it contains more iron and zinc. These substances are essential for our immune systems and brain development. However, chicken is much better for cardiovascular health, because it has less cholesterol and saturated fat than beef (Table 4).

Table4. Fatty acid composition of fat deposits associated with skin (poultry) and subcutaneous tissue (beef).

Fatty Acid	**Formula**	**%Fatty Acid in Fat**	
		Chicken	**Beef**
Palmitic	C16:0	26	27
Stearic	C18:0	7	21
Palmitoleic	C16:1 (9c)	7	2
Oleic	C18:1 (9c)	20	42
Linoleic	C18:2 (9c, 12c)	21	2
Linolenic	C18:3 (9c, 12c, 15c)	-	0.5
Arachidonic	C20:4 (5c, 8c, 11c, 14c)	0.6	0.4
%Saturated		33	54
%Unsaturated		67	46

Studies have also shown that red meat can increase the risk of heart disease.

Chicken meat is richer in most vitamins: vitamin E, vitamin K, vitamin B1, vitamins B3 and B5, and especially vitamin A. The two essential vitamins that beef has more of are vitamin B12 and folate. Chicken is a source of protein, low in fat, which is less saturated than beef fat.

The two types of meat are approximately equal in vitamin D, vitamin B2, and vitamin B5 and do not contain vitamin C.

Chicken has a much higher concentration of polyunsaturated fatty acids and a lower concentration of saturated fatty acids. Beef has more monounsaturated fatty acids. Chicken and beef are equal in the amounts of cholesterol.

Beef containing a considerably higher amount of iron and zinc and richer in calcium, potassium, and copper. Beef also contains less sodium. The two are roughly equal in the amounts of magnesium and phosphorus.

Table 5. Chemical compositionof of poultry meat and beef

Content%	Beef	Poultry
Moisture	**71.38**[b]	**75.03**[a]
Protein	**16.01**[b]	**17.35**[a]
Fat	**7.93**[a]	**5.12**[b]
Ash	**0.79**[b]	**0.86**[a]

a-b means in same row bearing different spercript letters are significantly different(p≤0.05)

Effect of processing on meat quality

Storage environments are crucial in reducing the rate of putrefaction, and to preserve the taste and appearance of foodstuffs. Storage of meat at a continuous temperature of -20° C is reported to contribute to the safety and shelf life by cooling fresh meat for weeks or months, the shelf-life of meat could be substantially extended to longer periods. The chemical composition decrease while moisture increases during storage. It is recommended store poultry meat at constant freeze temperature to avoid temperature fluctuation and product composition instability. Also, never refreezing a completely thawed poultry meat. Multiple freeze-thaw cycles significantly increased the lipid and protein oxidization and reduced the color stability of broiler chicken breast.

Table 6. Effect of storage period on meat composition

Parameter	**Type of meat**					
	Beef			Poultry		
	Storage period (months)					
	Zero	2	4.5	Zero	2	4.5
Fat content%	7.56	4.83	3.00	9.20	7.63	6.90
Crude Protein%	17.47	15.43	15.03	18.2	17.63	16.67
Moisture content%	70.33	77.47	78.15	69.93	71.77	73.60
Ash content%	0.92	0.87	0.79	1.00	0.77	0.60

Modifying Fatty Acids

The diet of the monogastric birds can significantly affect the composition of the meat. Carcass fat content and composition are particularly sensitive to the type of feed. In general, high-energy diets or low-protein diets have been shown to increase carcass fat. It is also possible to modify the fatty acid content in poultry meat by manipulating the fat source in the diet. Over the past decade, an increased interest in producing meat with an appealing nutritional profile has resulted in studying the effects of incorporating more unsaturated fat, particularly, omega-3 fatty acids. These acids have been reported to assist in the prevention of vascular diseases and some immunological disorders and are also important in early neural development. In trying to increase omega-3 fatty acids in chicken meat, flaxseed and menhaden oil are ingredients commonly considered.