Composition and Nutritive value of Meat
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Meat

Amount Per			
100 grams			
Calories 143			
			% Daily Value*
Total Fat 3.5 g			5%
Saturated fat 1.2 g			6%
Polyunsaturated fat 0.5 g			
Monounsaturated fat 1.3 g			
Trans fat 0 g			
Cholesterol 73 mg			24%
Sodium 57 mg			2%
Potassium 421 mg			12%
Total Carbohydrate 0 g			0%
Dietary fiber 0 g			0%
Sugar 0 g			
Protein 26 g			52%
Vitamin A	0%	Vitamin C	0%
Calcium	0%	Iron	6%
Vitamin D	2%	Vitamin B-6	35%
Cobalamin	10%	Magnesium	7%

Meat ranks among one of the most significant, nutritious and energy-rich natural food product, utilized by the humans to fulfil their regular body requirements. It is considered quite important in maintaining a healthy and balanced diet, which is essential in accomplishing optimum human growth and development. Although, few epidemiological studies have also pointed a possible relationship between its consumption and the elevated risks of having cardiovascular diseases, various forms of cancers and metabolic disorders but still its role in the human species evolution, specifically in its brain and intellectual development cannot be ignored.

It is a rich source of high value proteins, variety of fats including omega-3 polyunsaturated fatty acids, zinc, iron, selenium, potassium, magnesium, sodium, vitamin A, B-complex vitamins and folic acid. Its composition varies with reference to its breed, type of feed being ingested, climatic conditions and also on the meat cut, which imparts a considerable difference on its nutritional and sensorial properties.

From the nutritional point of view, meat is considered as a rich essential amino acids source whereas, mineral contents to a lesser extent. Apart from it, essential fatty acids and vitamins also make a part of it. Organ meat like liver is quite an enriched source of Vitamin A, Vitamin B_1 and nicotinic acid. It is quite evident from the previous research that the meat having lesser connective tissues is likely to have low scores of digestion and absorption. Moreover, the meat having more connective tissues are supposed to have less contents of essential amino acids, which make them less nutritious as compared to the meat piece having lesser connective tissues and results in more digestibility and nutritional value.

Carbohydrates

The main source of the carbohydrate in the animal body is its liver, which contains about ½ of the total carbohydrates present in the body. They are stored in the form of "glycogen" mainly in the liver and muscles but also in glands and organs to lesser extent. Its substantial quantities are present in blood in the form of glucose. The glycogen has an indirect impact on the meat color, texture, tenderness and water holding capacity of it. The conversion of stored glycogen to glucose; and from glucose to lactic acid is quite a complex process and all these modifications are governed by the action of hormones and enzymes.

During the early stage of aging, the lactic acid content of muscles increases, thus lowering the pH. The pH has a very strong influence on the muscle texture, tenderness, colour and also on water-holding capacity. The normal pH of the muscle considers being around 5.6. If an animal suffers from severe stress or exercise just before the slaughter and have no chance to regain its normal glycogen levels, then a minute amount of glycogen will be there to convert into lactic acid causing an elevated pH (i.e. 6.5) and as a result, meat muscles get dark, firm and dry (DFD). This type of meat results from exhaustion and then causes depletion of glycogen before slaughter. This occurs not so often in beef (2%), but also affected the other ones that are called as "Dark Cutters". The main reason for the dark coloured meat with high pH is owing to the higher water holding capacity. This causes the muscles to absorb more water, which makes them to absorb the incident light rather than to reflect it from the meat surface, thus causing the darker appearance of the meat. This DFD defect is quite disliked by the retailers and customers, affecting heavily on its sensorial and nutritional properties, so stress and rough handling of animals should be avoided just prior to slaughtering.

A quite speedy postmortem causes a drop in the muscle pH (i.e. 5.0) is recognized by pale, soft and exudative condition (PSE), which is quite common in pork meat. PSE affected muscle portion is recognized by low water-holding capacity, soft texture and pale yellow color. The softer muscle structure of PSE meat causes its lower water-holding capacity, which is then accountable for more reflectance of incident light, thus making the color of meat as pale yellow.

Fat

Meat contains fatty tissues (fat cells filled with lipids) that have varying amount of fat. In meat, fat content functions as energy deposits, protective padding in the skin and around organs especially heart and kidney as well as provides insulation against body temperature losses. Fat content in animal carcass varies from 8 to 20% (latter is only in pork). External body fat is softer than the internal fat that surrounds the organs owing to the higher content of unsaturated fat in external animal parts. Skin is the main fat source in poultry meat. In the main retail cuts, fat content in chicken and turkey ranges between 1 and 15% and meat cuts with skin have higher percentage. Scientific evidence reported the considerable losses of fat in numerous meat cuts which were referred to broiling, grilling and pan-frying without added fat.

Protein

Meat ranks among one of the protein-rich foods, providing high biological value.

Water

Meat ranks among the perishable food material, as it contain around more than 70% of moisture in it. Apart from reduction in shelf life, its presence imparts a strong impact on the colour, texture and flavour of muscle tissues of meat. Adipose tissues (tissues on the abdominal part of the animal) contain less moisture content, which leads to the fact that if the animal is fatter it will be having lower water content in its carcass and vice versa. Younger and leaner animals exhibited around 72% of moisture content.

Major portion of water contents in meat tissues exist in free- state within muscle fibers and smaller amount of it is present in the connective tissues. During the processing conditions, such as curing and heat treatment followed by the storage, small percentage of the water remains within the muscle fiber which is termed as the “bound water”. The three dimensional structure of muscle fiber fortified with the pressure and temperature helps the water to retain in the muscles during the processing conditions, while most of the water “lost” during these circumstances known as “free water”. The water holding ability of meat could be altered by the disruptions of its muscle fibers, which resultantly aid in the enhancement of the shelf life of meat products. There are numerous methods involved in this regard containing chopping, grinding, salting, freezing, thawing, breakdown of connective tissues by enzymatic or chemical means, heating application and use of chemicals or organic additives altering the acidity (pH) of meat are the processes that can affect the final water contents of meaty products.

Minerals

Meat is also a very good source of iron, zinc and selenium.

Iron

Iron is one of the key mineral present in meat, which plays a vital role in human health and its deficiency causes several hindrances in the normal functioning of human body, particularly disturbs child growth and development. The mode of metabolism of iron is quite different from the other mineral contents in the sense, that it is excreted and more than 90% of it is utilized internally in the body. Obligatory sources of iron and red blood cells disruption or losses are intestines, urinary tract, skin and also during menstrual bleeding among females. Its

deficiency could be overcome primarily by the diet. Iron is available in a number of food stuffs and occurs in two forms like heme and non-heme iron. The former one comes from the hemoglobin and myoglobin, so it is present in animal foods only and has a high degree of bioavailability that could easily be absorbed in the intestinal lumen.

Vitamins

Meat is a good source of five of the B-complex vitamins including thiamine, riboflavin, nicotinic acid, vitamin B_6 and vitamin B_{12}. It also contains pantothenic acid and biotin, but a poor source of folacin.

Water soluble vitamins

Thiamine

Meat in general is a good source of thiamine with especial reference to fish which provides larger quantities of it as compared to other meat sources except pork.

Riboflavin

Poultry meat, lamb and beef are considered among the good sources of riboflavin.

Niacin

Its sources are meat, fish and poultry etc.

Vitamin B_6

Important meaty sources of vitamin-B_6 are fish, poultry and meat.

Vitamin B_{12}

Liver, beef, lamb and pork are rich sources of this vitamin. Some other sources are oysters, fish, egg yolk and cheese.

Loss of B complex vitamins during meat processing

Vitamins present in the meat get lost during its processing by both methods of conventional heating and microwave heating especially in case of vitamin B1.The loss of vitamin B_1 was mainly observed by leaching. These losses are about 15–40% by boiling, 40–50% by frying, 30–60% through roasting, and 50–70% on canning. Other vitamins of B complex family including B_6, $B_{12}$and pantothenic acid also exhibit same issues like B_1. Contrary to it, vitamin A has the ability to retain even at the temperature of 80°C.

Fat soluble vitamins

Liver is suggested as the greatest single food source of vitamin A. It is also a good source of the other fat-soluble vitamins such as vitamin D and vitamin K.

REFERENCES-

[1] Eze NM, Maduabum FO, Onyeke NG, Anyaegunam NJ, Ayogu CA, Ezeanwu BA, Eseadi C. Awareness of food nutritive value and eating practices among Nigerian bank workers: Implications for nutritional counseling and education. Medicine. 2017 Mar;96(10)
[2] Kihara J, Sileshi GW, Nziguheba G, Kinyua M, Zingore S, Sommer R. Application of secondary nutrients and micronutrients increases crop yields in sub-Saharan Africa. Agronomy for Sustainable Development. 2017 Aug 1;37(4):25
[3] De Smet S, Vossen E. Meat: The balance between nutrition and health. A review. Meat Science. 2016 Oct 1;120:145-156
[4] Pereira PM, Vicente AF. Meat nutritional composition and nutritive role in the human diet. Meat Science. 2013 Mar 1;93(3):586-592
[5] Hocque e JF, Gondret F, Baéza E, Médale F, Jurie C, Pethick DW. Intramuscular fat content in meat-producing animals: Development, genetic and nutritional control, and identi cation of putative markers. Animal. 2010 Feb;4(2):303-319