

NUTRITIVE VALUE OF MEAT

Definition

- Nutritive value – proteins, fats, carbohydrates, vitamins and minerals
- Meat provide energy (calories)
 - maximum - protein, fat, minerals and vitamins
 - minimum - carbohydrates
- Calorie value of meat depends upon the amount of fat in and on the meat taken.
- 100 gm of cooked meat provide-
 - 10 % RDA of calories
 - 50 % protein recommended (normal = 56 gm/day)
 - 35 % iron recommended
 - 25 to 60 % B-complex vitamins

Proximate composition of meat

Kind of meat	Protein %	Moisture %	Fat %	Ash %	Cholesterol mg/100g	Energy Kcal
Beef	21.5	69.5	8.0	1.0	70	160
Pork	19.5	60.5	9.5	1.0	70	170
Mutton	19.5	71.5	7.0	1.5	70	145
Chevon	20.0	73.5	2.3	1.0	57	109
Emu	21.2	73.6	1.7-4.5	1.0	39-48	113-121
Chicken	23.4	73.7	1.9	1.0	60	117
J.Quails	20.73	66.89	6.0	1.90	64	123
Turkey	20.4	70.4	8.02	0.88	68	270
Duck	11.49	48.5	39.34	0.68	76	300
Goose	15.86	49.66	33.62	0.87	80	371
Ostrich	20.9	76.6	0.5	1.0	59	390
Fish	20.9	76.5	1.2	1.4	70	100

Proximate composition of non skeletal portion of beef carcass

Carcass grade	Protein %	Moisture %	Fat %	Ash %	Calories / 100gm
Prime	13.6	44.8	41	0.6	428
Choice	14.9	49.4	35	0.7	379
Good	16.5	54.7	28	0.8	323
Standard	18.0	60.1	21	0.9	266
Commercial	15.8	52.4	31	0.8	347
Utility	18.6	62.5	18	0.9	242

PROTEINS

- Meat -concentrated protein source
- High biological value
- Rich in AMINO ACIDS, not synthesized by the body
- Myofibrillar and sarcoplasmic proteins – **HIGH QUALITY PROTEIN** -rich in all essential AA
- 8 Essential AA- phenylalanine, valine, tryptophan, threonine, methionine, leucine, isoleucine, lysine - man
- Meat - Rich in lysine content


Contd...

- Connective tissue proteins – low level of Tryptophan and sulphur containing AA
- Collagen is poor in lysine content
- Non protein nitrogenous substances – free AA, simple peptides, amines, amides and creatine
- Potential source of nitrogen- AA and protein synthesis

Amino acid levels - meat

Essential AA	Beef	Lamb	Pork
Lysine	8.4	7.6	7.8
Methionine	2.3	2.3	2.5
Cystine	1.4	1.3	1.3
Tryptophan	1.1	1.3	1.4
Leucine	8.4	7.4	7.5
Isoleucine	5.1	4.8	4.9
Phenylalanine	4.0	3.9	4.1
Valine	5.7	5.0	5.0

FAT

- Meat fat – ample amount of essential Fatty Acids
- Caloric value of fat in meat – FA in triglycerides
- Nutritive demand- met – intramuscular fat itself
- **Two types**
 - 1) unsaturated FA – oleic acid
 - 2) saturated FA – palmitic, stearic acid
- Essential FA for human – linoleic, linolenic, arachidonic acids
- Pork and organ meats – good source of linoleic and linolenic
- Excess linoleic acid  arachidonic acid in human body
- Organ meat – high cholesterol than skeletal meat

Fatty acids (%) – Meat fat

Fatty acids	Beef	Lamb	Pork
Palmitic acid	29	25	28
Stearic acid	20	25	13
Palmitoleic acid	2	-	3
Oleic acid	42	39	46
Linoleic acid	2	4	10
Linolenic acid	0.5	0.5	0.7
Arachidonic acid	0.1	1.5	2

Fat composition – Poultry meat

(gm/100gm of total lipid)

Lipid	Chicken	Turkey	Duck	Goose
Saturated fat	29.9	29.5	33.3	27.8
MUFA	44.7	42.9	49.4	56.8
PUFA	21	23.2	13.0	11.0

Saturated FA

- Pork & beef (half), 51% of lamb, poultry(30%)-fat—saturated
- Carcass meat provide 6.7% - total saturated fat intake
- Stearic acid (C18:0), palmitic acid (C16:0) – predominant
- Saturated fats – ‘**BAD FATS**’ – raise blood cholesterol cause atherosclerosis
- Stearic acid – 1 / 3rd saturated fat in beef
- Myristic acid (C14:0)
 - most atherogenic FA, 4 times cholesterol raising potential of palmitic acid
 - Found in minor quantities in meat

Unsaturated FA

- Meat contains mixture of unsaturated fatty acids
- 1) Polyunsaturated FA or PUFA
- 2) Monounsaturated FA or MUFA

Turkey and chicken > beef or pork

MONO UNSATURATED FA:

- Neutral with respect to blood cholesterol levels
- MUFA – dominant in meat and approx. 40 % of total fat
- Oleic acid (C18:0) – principal MUFA, most abundant fatty acid in meat

Polyunsaturated FA

- Structural role in membrane phospholipids and involved in EICOSANOID synthesis
- 2 types
 - Omega-3 (n-3) = 19 %
 - Omega-6 (n-6) = 17 %
- It replaces saturated FA, ↑ unsaturated FA — ↑ n-6 FA
- PUFA (n-3) – cardioprotective , anti inflammatory and anti tumourigenic properties
 - Chief source - fish and fish oils
- Pork – n6 :n3 ratio is high – linoleic acid in adipose tissue

Conjugated linoleic acid (CLA)

- Mixture of positional (7,9-; 8,10-; 9,11-; 10,12-; 11,13-) and geometrical (c,c-; c,t-; t,t-; t,c-) isomeres of linoleic acid (9c,12c-,18:2)
- FA occurs naturally in ruminant meats (rumen)
- Same chain length as LA , double bonds are conjugated and double bonds are separated by only one carbon
- The Rumenic acid (c9-t11-18:2) isomer – predominant CLA
- Reduce tumour (**functional foods**), reduce adiposity and delay the onset of diabetes

Trans-fatty acid

- 2 % of the total energy
- Ruminant meats- source - 18 % of total intake
- Formed – biohydrogenation in the rumen
- Raise LDL and decrease HDL

CARBOHYDRATES

- 1% of glycogen
- Reserve polysaccharide of animal tissues
- Several mucopolysaccharides – Heparin, Hyaluronic acid, Chondroitin sulphate, Keratosulphate, Glycoproteins

MINERALS

- Good source of all **except calcium**
- K^+ most abundant, followed by P
- Iron – synthesis of hemoglobin, myoglobin and enzymes
- Meat provides minerals which are easily absorbed in diet

Mineral content – Meat (mg/100gm)

Minerals	Beef	Lamb	Pork	Chicken Broiler	Turkey	Duck	Goose	RDA (NRC)
Sodium	65	75	70	70	65	63	73	-
Potassium	355	295	285	189	266	209	308	-
Mg	18	15	18	20	22	15	18	350
Iron	2.8	1.2	2.3	0.90	1.43	2.4	2.5	18
Calcium	11	10	9	11	15	11	12	800
P	171	147	175	147	178	139	234	800

Iron

- Good source of Iron an essential nutrient for maintaining good health.
- Iron is required for synthesis of hemoglobin, myoglobin and certain enzymes.
- Regular intake is essential as little free iron is stored in the body.
- Heme iron that accounts for 40-60% of the iron in meat is several times more absorbable than non heme iron.
- Meat has unidentified factors that increases absorbable iron from all non –heme sources.

Vitamin B₁₂

- Exclusively animal origin
- 100gm of beef – 2µg vit. B₁₂
- Vegan / ovo-lacto-vegans – ↓ serum vit B₁₂ – ↑ plasma Homocysteine
- Low doses of B₆ – effectively lower fasting plasma homocysteine levels

Vitamin D

- Meat and meat products – 25-hydroxycholecalciferol – 5 times of biological activities of cholecalciferol
- Meat – rich source (21 %)
- Essential for dietary Ca^{++} absorption
- Present in both lean and fat of meat

Definition

- Any food or food ingredients that may provide a health benefit beyond the traditional nutrient it contains
- Those foods which are intended to be consumed as part of the normal diet and that contain biologically active components which offer the potential of enhanced health or reduced risk of disease

History

- Japan (1980) – functional foods concept
- 1991 – concept of Foods of Specified Health Use (FOSHU)
- Approved by Minister of Health and Welfare
- Currently 100 products – licensed – FOSHU



Market trend



Classification

2 types –

- 1) Processed foods – health promoting activities
 - vit. Enriched products
- 2) Fermented foods with live cultures / probiotic benefits

Another classification – EU

- 1) Enhanced function – specific physiological & biological function –no reference to disease
 - Eg: oligosaccharides – ↑ gut microflora
- 2) Reduction of disease risk
 - Eg: Folate – neural tube effects – children.
 - calcium - osteoporosis

FF – Plant sources

- Oats – cholesterol lowering soluble fibre – b-glucan
- Soy (Phytoestrogens) – CVD prevention, cancer, osteoporosis, alleviation of menopausal symptoms
- Flaxseed – Flaxseed oil (37%) – omega 3 FA of linoleic acid
- Citrus fruit - cancer risk reduction – tomato (lycopene)
- Garlic - medicinal properties
- Blueberries (antioxidant therapy) – anti cholesterol drug
- Cranberry – urinary tract infection
- Wine and Grapes – CVD ↓

FF – Animal source

- Fish – omega 3 FA – ↓ cancer and CVD
- Dairy products – Calcium – prevent colon cancer
- Beef – CLA – anti carcinogenic FA
 - Beef fat – 3.1 to 8.5 mg CLA /gm fat
- Selenium in meat – ↓ heart disease and prostate cancer

DESIGNER FOODS

- A new category of foods that are genetically engineered to contain higher than normal amounts of health-promoting nutrients.
- These are enriched with nutraceuticals, antioxidants, and secondary metabolites to improve the physical performance of the body.



Conclusion

- Functional foods are not a magic bullets
- There are no 'good' or 'bad' foods, but there are 'good' or 'bad' diets
- Diet is only one component of an overall life style that can have an impact on health; other components like smoking, physical activity, stress, etc.