

NUTRITION

Diet in Health and Disease

By

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The Nature of Foods (Cont'd)

Group II — Animal Foods.

These are consumed chiefly for the supply of protein to the system. Proteins are of two types, vegetable and animal. Animal protein is derived from animal foods such as meat, fish, eggs, milk etc., and is "first class protein" and is of very great nutritional value, both from the standpoint of digestibility, and availability, to the organism; the percentage of protein present in animal foods is much higher than that in plants. Cooking concentrates the protein in animal foods as opposed to vegetable and hence the former are a concentrated source of body building materials. The most important foods under this head, containing proteins of high biological value — first class protein — are milks and eggs. Next in order come meat and fish.

Eggs

Contain the nutrients required for the development of a chick. In other words, it contains protein, calcium, phosphorus and iron from which the muscles, bones and blood are developed. It contains fat too since that is the most concentrated form of available energy and because of this it does not contain any carbohydrate. The size and weight of eggs vary with variety of hens; those from indigenous birds are not more than $\frac{3}{4}$ oz each while that of a 'white leg horn' or 'Rhode Island Reds' may be from $1\frac{1}{2}$ to 2 ozs. On the whole, an egg consists of about 12% of shell, 58% white and 30% egg yolk. Shell consists entirely

of carbonate of lime and it loses its weight by about 9% as the hatching time nears completion, which suggests that the developing chick probably draws its requirements of calcium from the shell. The white consists entirely of a substance called egg-albumin and is rich in riboflavin; it also contains a thermolabile substance called avidin which inactivates the action of biotin, a member of B-complex, but is quickly destroyed when the egg is cooked. The yolk is the chief store house of nutrients for the chick and materially differs in composition from that of the egg white as would appear from the following figures : —

	Water	Protein	Fat	Mineral matters
White	85.7	12.6	0.25	0.59
Yolk.	50.9	16.2	31.75	1.09

Egg yolk is rich in vitamin A and carotene and minerals. One most important point to bear in mind from the stand point of diet in diseases is that it is very rich in cholesterol, 200 mgm. in each egg yolk, which is not to be allowed in cases of gall-stones.

Mineral composition of eggs mgm./100g.

	White	Yolk
Calcium	5.2	131.5
Chlorine	170.0	142.0
Copper	0.03	0.02
Iron	0.1	6.13
Magnesium	10.7	14.9
Phosphorus	33.0	495.0
Potassium	148.0	123.0
Sodium	192.0	50.0
Sulphur	183.0	165.0

• Eggs are almost completely free of purine bodies and so are allowed to patient suffering from gout and where purin free diet is recommended. Egg protein is of very high biological value and a food admirably suited for growing children. It is a good supplement to the diet consisting predominantly of cereals, as in this country.

Freshness of an egg can be easily tested. If the egg sinks in a 1-10 solution of salt water it is fresh. It has been observed that the blue colour appearing on the surface of the yolk of a hard boiled egg is due to the sulphide set free in boiling and combining with the iron of the yolk. This can be prevented by boiling for not more than 3 minutes ; then rapidly cooling in cold water.

The digestibility of eggs depends on the form in which they are cooked. Some of the workers have reported the digestibility of different forms as:—

Lightly boiled	1 hour 40 minutes
Raw	2 hours 20 minutes
Poached	2 hours 40 minutes
Hard boiled	3 hours
Omelette	3 hours

Due to its leaving very little residue in the stomach, it has a somewhat constipating effect and this has to be kept in mind while giving eggs to patients. Another point to remember is that some people are susceptible to eggs and develop allergic manifestations soon after eating them. The manifestations may be in the form of pain in stomach or a rash.

To summarise, one egg yields about 90-100 calories and is a very rich source of vitamins A, riboflavin etc. but does not contain any vitamin C.

Milk.

Milk is developed by Nature for feeding the immature and developing animals and as such it can be easily realised that it must be a complete food or else they would not have grown. All of us are agreed that milk is a

very important food in our dietary, not only because it is rich in protein but also because it is the best way in which calcium can be injected and made available to the human system. In feeding the sick, milk in some form or other, is the chief sheet anchor and richly deserves the important place it has in our diet, both in health and disease. Milk is an unique food since it contains protein, fat and carbohydrate in an amount very few foods present.

The protein of milk consists mostly of caseinogen or casein and a small amount of lactalbumin whereas in the case of human milk the proportion of the two are reversed. Milk is rich in amino-acid methionine and as such the former is very useful in the regeneration of tissues especially that of liver.

Carbohydrate in milk consists of lactose. It differs from cane sugar not only in chemical composition but also in sweetness. Lactose is not easily broken down and fermented in the bowels, so is well tolerated by persons with dilation of stomach complicated with fermentation ; it is easily converted by lactic acid bacteria to lactic acid.

Fat in milk consists of low unsaturated fatty acids which when removed is used as butter. In milk it is in the form of very fine emulsion, so fine that it is easy to digest. When allowed to stand specially in cold, the fat globules coalesce and float to the top. When the cream form milk is removed by a cream separator it is called skimmed or separated milk.

Milk is rich in minerals specially calcium and phosphorus. Iron is present in very small quantity. The calcium in the milk is in an ionised form and is easily utilised by the human system. One ounce of milk supplies about 34 mgm., so one seer of milk would supply the daily requirements of calcium of an average adult. Children or adults who are kept on

pure milk diet only, for a long time, will suffer from anaemia due to the lack of iron and this serious defect has to be remembered and diet fortified with iron rich foods. It is because of this that artificially fed children require supplements of iron. Milk is a good source of carotene, vitamin A, and riboflavin. The fluorescent greenish hue of whey is due to the presence of riboflavin. Milk of Indian cows contain about 51 u. of vitamin A, and 57 micrograms of riboflavin, per ounce.

Curdling of milk is due to the breakdown of the milk sugar to lactic acid by the lactic acid bacteria. In curdling, the casein is precipitated without any change but when milk clots the casein undergoes partial digestion which combining with the calcium forms the clot.

When milk is heated in an open pan on slow fire a thick skin forms on the surface which is a concentration of casein, lactalbumin, fat and calcium. Heating the milk will change its colour and taste.

When milk is injected it forms a tough, leathery clot in the stomach and offers great resistance to the digestive efforts of the organ. It is because of this that digestion of butter-milk is easier than ordinary milk. The dense clot of milk formed in the stomach is acted upon by the acid juice and a much denser clot is formed which takes long to be digested by pepsin. In view of this if the intention is to lighten the burden of the stomach and make the milk easily digestible it must be so given that no dense clot is formed. The density of clot depends on the acidity of stomach juice and upon the casein and calcium salts that it contains. The richer the casein and calcium salts and greater the acid, the denser the clot. Obviously if the milk is diluted with water digestion will be easier. Addition of lime water to milk does not very much aid diges-

tion. Dilution with barley water to some extent facilitates the matter since by the colloidal properties of starch in barley water, it prevents formation of a tough clot. Addition of 25 per cent sodium citrate solution to milk in proportion of 1 to 50 acts by converting the soluble lime salts into insoluble calcium citrate, and softer curd is formed. Milk and soda also favour this process due to the clot being friable which occurs by aeration and dilution, the clot being like a sponge. Boiling of milk hinders the speed of clotting and the clot is less dense.

It has been observed that milk drunk rapidly leaves the stomach also rapidly as against sipping when the emptying time is delayed and clot is denser. Raw milk produces leathery curd as opposed to boiled milk, and a skimmed milk clot is tougher and stays longer in stomach. Milk can be digested even in cases where secretion of acid in the stomach is not normal.

In this country we consume the milk of buffalos and goats as well as of cows. It has been observed in this laboratory that the biological value of goat milk is lower than either, a finding contrary to popular belief.

The suggested standard for daily consumption of milk for an average adult Indian is 10 ounces per day. As against this the average consumption is 0.75 ounces in Assam, 1.38 Bihar, 1.21 Bombay, 1.10 Madhya Pradesh, 2.18 Hyderabad, 1.95 Madras, 1.03 Orissa, 7.98 Punjab, 1.69 Travancore and 3.7 West Bengal. An average consumption per head per day is 1.06 ounces or less than 2 seers a month. Our production of milk also is very low and if the production of milk is to be increased, the cows and buffalos must be fed properly. What to do with the useless cattle is a problem worth serious consideration by all of us.

(To be continued)

