

Nutrition

By

Dr. S. B. Lal, M.B., B.S., D.P.H. (EDIN.)

Asstt. Director of Public Health (Nutrition),

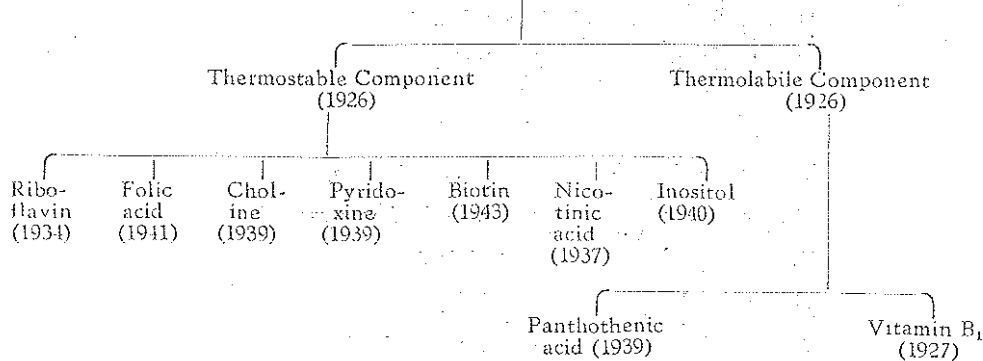
Public Health Laboratories, Patna-4.

Water soluble Vitamins.

Vitamin B—Complex—

Till the year 1926, it was the general belief that "vitamin B" was a single entity. Subsequent work showed that it consisted of a number of components some of which are thermostable while others are thermolabile. The different components and the year when each of them were isolated is given below :

Vitamin B—Complex (1897)



Aneurin or Thiamin or Vitamin B₁.

The most predominant manifestation of this vitamin is the disease called beriberi the origin of which dates from the introduction of milled rice. Between the years 1878-82 the mortality of the Japanese naval ratings on a diet of rice, fish and salt was 2.3 to 4.5 per cent due to beriberi, and Admiral Takaki reduced it to 0.5 per cent by dietetic measures. Eijkman noticed that fowls fed on polished rice developed polyneuritis whereas those on unpolished rice did not suffer. Confirmatory proof that polished rice caused the disease was put forth by Fletcher. He was working in an asylum at Kula Lumpur. The patients were divided into two groups; one fed with polished rice and another with brown rice; 30 per cent of the

first group suffered from beriberi. In 1926 pure B₁ was isolated by Janson and was chemically synthesised by Williams in 1936.

Richest sources are cereals, pulses, liver, yeast. Of these, cereals are the most important source for a cereal eating nation like India. The vitamin B₁ content of cereals is increased by germination e.g., 7 to 9 micrograms per gram in the case of wheat. Milk is a poor source and pasteurisation results in a loss of 10-20 per cent, and commercial sterilisation from 26 to 45 per cent of the B₁. Human milk is poor in B₁, colostrum contains practically nil. Molasses is very rich and contains as much as 2.1 mgm per 100 grams.

Vitamin B₁ is intimately associated with the metabolism of carbohydrates.

Vitamin B₁ minimises the toxæmia following a severe burn and it is claimed that this effect is due to the stimulation of the liver function.

Vitamin B₁ influences riboflavin metabolism. In deficiency conditions riboflavin content of liver is increased. It has been observed clinically that administration of B₁ in cases of nutritional deficiency of the whole B complex, symptoms of riboflavin and nicotinic acid deficiency are precipitated. Symptoms of hypovitaminosis A are intensified with larger doses of B₁. Vitamin C acts better with Vitamin B₁ and *vice versa*.

It is rapidly excreted in urine and not stored, hence in therapy, after saturating the body, the concentration has to be maintained by daily oral doses to have a lasting effect.

Deficiency manifestations :

The manifestations of vitamin B₁ deficiency depend on its degree. In mild cases there may be anorexia, lassitude, general lowering of the tone of the muscular system, vague muscular pains, tenderness of calf muscles. In more severe forms there may be patchy areas of hyperesthesia or parasthesia of the limbs. In acute forms the syndrome is known as beriberi which may be either wet or dry. Beriberi is commonly observed in people whose staple diet is highly refined or milled raw rice.

Diseased conditions which interfere with the ingestion, absorption, utilisation or cause increased excretion, create a demand for more of this vitamin. Some of the conditions are peptic ulcer, hyperemesis gravidarum, diarrhoea, sprue, tubercular colitis, cirrhosis of liver.

The daily requirement as suggested by the Nutrition Advisory Committee, I. R. F. A. is : Adults 1.2 mgm ; children 0.5 to 1.0 mgm/daily.

Riboflavin or B₂.

It was called vitamin B₂ or G till 1937 when the American Council of

Pharmacy decided to call it riboflavin. Warburg and Chertian in 1932 reported presence of a yellow enzyme which played an important role in the transference of oxygen molecules to the cells. It is found that it was essential for proper growth, good health and normal carbohydrate and protein metabolism. Deficiency is characterised by such symptoms of pellagra as dermatitis and ophthalmia. Since it is found in milk and eggs, it is also called lactoflavin and ovoflavin.

The riboflavin content of some foods is as below :—

Ribo flavin micrograms per 100 grams = 3½ oz.	
Foods	
Barley	120 — 250
Rice (unpolished)	120
Wheat whole	180
Apricot	100
Banana	56 — 75
Pomogranate Juice	100
Almond	300
Peanut raw	500
Bean	110 — 175
Beet tops	300
Cauliflower	105 — 130
Lentil (dry)	315
Mango	330
Spinach	230 — 400
Cheese	200 — 830
Egg (whole)	250 — 440
Cows milk	150
Human milk	16 — 52
Lamb Kidney	2000
Lamb Liver	3300

Requirements are not yet known but recommendations are : adults 1.5 to 3 mgms and 0.5 to 2.5 mgms for children.

Biotin or Vitamin H.

It is water soluble, heat stable, and not decomposed by acid or alkalies. The exact action in man is not known but it is thought that it may be involved in the metabolism of carbohydrates. In egg white there is a substance called avidin which combines with and inactivates biotin ; but the avidin being highly thermolabile is destroyed on cooking of eggs. Men kept on biotin free diet developed fine, scaly dermatitis, greyish pallor of the skin, atrophy of lingual papillae

giving rise to "Geographical tongue" and later there was lassitude, muscular weakness and pains, anorexia, nausea and hyperæsthesia. This shows that biotin is essential for human nutrition.

Yeast, liver, kidney, chicken, meat, eggs, peas, cocoa, cereals are rich sources of it. Biotin content of cereals is increased on germination.

Pyridoxine or B₆.

It was observed by Gyorgy in 1934 that lack of this factor caused dermatitis in rats. It is soluble in water and alcohol, stable to heat and alkali, but not to light.

It is widely distributed in nature. Yeast, liver, cereal polishings, and pulses are rich sources; on germination of the cereals, the pyridoxine content increases. Fish is a moderately good source but vegetables and milk are poor. Its assimilation is better when the food is cooked.

Pyridoxine content of some foods

<i>Foods</i>	<i>Microgram per gram</i>
Bananas	3.2
Dry beans	5.5
Liver	1.7
Beet	1.2
Cabbage	1.2
Carrot	1.2
Chicken	1.3
Molasses	2.7
Peas Dried	3.0
Potato	2.2 — 3.2
Turnip	1.1
Whole wheat flour	4.2
Whole flour	1.8
Yeast	3.6

It has been recently observed that pyridoxine is concerned with fat metabolism in human beings. Its suggested daily requirements are 1.5 to 2 mgm.

Pantothenic Acid.

It is not definitely known as to what its action is in human nutrition though there is evidence that it is concerned in fat and carbohydrate metabolism, but on the basis of animal

experiments 5-11 mgm has been suggested as the daily human requirement. It was first believed that it may be useful in the treatment of human grey hair and wide publicity was given in America about this vitamin as a cure for grey hair but experiments have shown that it has no such action. It has been found to be useful in the persons suffering from burning sensation of palms and soles.

It is widely prevalent in nature. Yeast, wheat bran, peas, kidney are very rich. Wheat though a rich source, but 50 percent of it is removed during milling. Germination of cereals increases their pantothenic acid content. One third of the total present in meat is lost during cooking.

Requirements about 5 mgms for adults daily.

Choline.

As far back as 1932, it was shown that choline prevents fatty infiltration of liver in rats and was called "lipotropic factor". It also prevents damage to rat livers by toxins such as chloroform. It is widely distributed as a component of lecithin and green vegetables, eggs and liver are rich sources. It is now being used in the treatment of cirrhosis of liver, specially Infantile Cirrhosis. It is believed that the body can synthesize choline out of methionine. It is an accepted fact that choline is essential for human beings. Due to its availability in a wider range of foods, it is unlikely that deficiency may occur in man on normal diet.

Inositol.

It is a normal constituent of all plant and animal tissues. Its exact relation to human nutrition has not yet been assessed. It has been recently claimed that it is essential for the metabolism of fats. Fruits, vegetables, cereals, and yeast are very rich sources and it is available in meat, kidney, eggs. Daily human requirement is probably a gram.