AN EARLY REFERENCE TO NIGHT-BLINDNESS IN INDIA, AND ITS RELATION TO DIET DEFICIENCY

By W. R. AYKROYD
(Nutrition Research Laboratories, I.R.F.A., Coonoor)

REFERENCES to the treatment of night-blindness by liver are to be found in ancient medical writings. In an Egyptian medical treatise, Eber's Papyrus, to which the date 1500 B.C. has been assigned, the roast liver of an ox, and the liver of a black cock, are mentioned as curative agents. Hippocrates recommends "ox liver, raw and dipped in honey". The curative effect of liver on night-blindness appears, indeed, to be part of traditional medical lore in many parts of the world including India.

After the discovery of vitamin A in the present country, the association between night-blindness and vitamin A deficiency was established and an explanation provided of the efficacy of liver in the treatment of the condition. Later work revealed that vitamin A is required for the regeneration of visual purple, which sensitises the retina for vision in dim lights. A large amount of inconclusive work has been carried out on dark adaptation tests to detect early evidence of vitamin A deficiency. There are other causes of night-blindness besides vitamin A deficiency and the physiological process of dark adaptation is a complicated one. But unquestionably there is a classical form of night-blindness, occurring in malnourished people, which responds to treatment with vitamin A in the form of liver or liver oil, and other concentrated sources of vitamin A and carotene. The response in the classical conditions is often dramatic; the tradition of the value of liver could scarcely have been established unless this were so. The author[1] has described night-blindness among Newfoundland fishermen living on a diet deficient in vitamin A. The fishermen treated themselves by taking cod liver oil, cod liver, seal liver, hen's liver, gull's liver, etc., and by such means cured themselves to their own satisfaction within 24 to 48 hours. It is possible, of course, that dark adaptation did not become completely normal within this short period, but a fisherman on a dark and rocky coast cannot to any serious extent deceive himself and his comrades about the acuity of his night-vision.

Much of the recent work on dark adaptation has been carried out on relatively well-nourished individuals who were not night-blind in the clinical sense—*i.e.*, their condition was not such as to lead to social disability because of failure to see in a dim light and impel them to seek treatment. Investigations have been concerned largely with minor degrees of impairment of dark adaptation detectable only by refined dark adaptation tests. Under such conditions no very clear-cut relation between impaired dark adaptation and diet deficiency has been observed. The growth of the literature describing experimental work along these lines has tended to obscure earlier clinical observations on night-blindness which clearly showed that there is a common form of the disease occurring in malnourished subjects and responding to treatment with vitamin A. It is, therefore, interesting to find that the dietetic origin of night-blindness (or of one kind of night-blindness) was recognised in India over a hundred years ago.

The passage quoted below is from "Narrative of a Journey through the United Provinces of India from Calcutta to Bombay, 1824-25", by the Right-Rev. Reginald Heber, Lord Bishop of Calcutta (Third Edition, 1828, Vol. 11, p. 485). The town referred to is Chitoor in Rajputana.

> "In our way back through the town a man begged of me, saying that he was blind. On my calling him, however, he came forwards so readily to the torches, and saw, I thought so clearly, that I asked him what he meant by telling me such a lie. He answered that he was night-blind (*'rat unda'*), and I, not understanding the phrase, and having been a good deal worried during the day with beggars, for the whole fort is a swarm of nothing else, said peevishly, 'darkness is the time for sleep, not for seeing'. The people laughed as at a good thing, but I was much mortified afterwards to find that it was an unfeeling retort. The disease of night-blindness, that is, of requiring the full light of day to see, is very common, Dr. Smith said, among the lower classes in India, and to some professions of men, such as soldiers, very inconvenient. The Sepoys ascribe it to bad and insufficient food, and it is said to be always most prevalent in a scarcity. It seems to be the same disorder of the eyes with which people are afflicted who live on damaged or inferior rice, in itself a food of very little nourishment, and probably arises from a weakness of the digestive powers. I was grieved to think I had insulted a man who might be in distress, but Dr. Smith comforted me by saying that, even in respect of night-blindness, the man was too alert to be much of a sufferer from the cause which he mentioned."

Bishop Heber, author of the well-known hymn which begins "From Greenland's icy mountains", was unquestionably a remarkable man, who when not occupied in establishing missions and preaching long sermons, studied the people, social customs, archæology, and agriculture of India with eager scientific curiosity. His dynamic career came to an early close. He died of apoplexy at the age of 43 in a swimming bath at Trichinopoly, having entered the bath to cool himself off after a strenuous morning occupied in devotional and administrative duties. The bath, with a commemorative inscription to Bishop Heber, is still in existence.

Dr. Smith I have not been able to trace. He was an army doctor who joined the bishop's party at Meerut and proceeded with it to Bombay.

The striking part of the quotation is the statement that the Sepoys recognized that

night-blindness is a food deficiency disease. This is rather a different thing from traditional knowledge of the value of liver in treatment. To the best of my recollection, the Newfoundland fishermen, while they knew how to cure night-blindness by liver, did not clearly understand that it was caused by their poor diet, and in other parts of world knowledge of the method of treatment does not seem to have involved recognition of etiology. The passage may, therefore, be worthy of a place in the history of ophthalmology and nutrition.

1. *Jour. Hyg.*, 1930, **30**, 357.

COCONUT SHELLS AS AN INDUSTRIAL RAW MATERIAL

III. ESTIMATED WORLD PRODUCTION

DR. REGINALD CHILD
(Director, Coconut Research Scheme, Ceylon)

THE first of this series of articles[17] dealt with the chemical composition of coconut shells; and the second[31] with miscellaneous uses of shells as such and with their value as fuel.

It is convenient at this stage to consider briefly the world output of coconuts and the corresponding availability of coconut shells, since in discussing (in latter articles) potential utilization of shells it is necessary to have a working idea of the quantities produced.

WORLD PRODUCTION OF COCONUTS

Estimates of world production are not very precise. Fairly good statistics are available for the Philippines prior to the Japanese occupation, and the writer's estimates (1939)[32] for Ceylon are believed to be reasonably near the truth. Statistics are usually available for exports of coconut products from countries of origin; local consumption is, however, very difficult to estimate.

Probably the most ambitious attempt to assess world production of coconuts has been that of Leo Schnurmacher, Inc., of the Philippines (1938)[33] and the following table is to a large extent adapted from their publication: (1939),[35] which are only concerned with commodities entering world commerce.

It will be observed that, according to Table I, six major producing countries account for the bulk of world production, and it is certain that these countries provide over 90 per cent. of coconut products entering world trade.

AVERAGE WEIGHT OF SHELLS

Coconuts vary considerably in size, the greatest differences being varietal. Varieties range from the dwarf types, which may weigh as little as 250 grams per husked nut, to the large San Ramon nut of the Philippines, which when husked may weigh as much as 2,000 grams. The weight of the shells, though of course greater for the larger nuts, does not run exactly parallel to the weight of husked nuts. In general, as would be expected on mathematical grounds, the weight of the shell forms a smaller proportion of the total weight of husked nut in the case of the larger varieties. Thus, H. S. Walker (1906)[36] gave for San Ramon nuts an average of 20 per cent. for the ratio of shell weight to husked nut weight; for average Ceylon nuts the figure is about 25 per cent., and for dwarf nuts it may reach 35 per cent. This general rule is not a rigid one, since varietal differences in shell thickness occur. For example the Ceylon "Bodiri" type of nut has a very thin shell, and the "Porapol" type, similar in size, has a very thick one However, within a population drawn from one variety the general rule has some application, as will be seen in the fuller discussion below.

TABLE I
Annual Production of Coconuts (Estimated)

Country	Area Planted (Acres)	% of World Total Acreage	No. of Trees (1000's)	Trees per Acre	Bearing Trees (1000's)	Annual Production of nuts (1000's)	Nuts per bearing tree per yr.	Nuts per Acre per year
Netherlands Indies ..	2,943,700	30·6	169,159	57	152,243	6,000,000	39	2038
Philippines ..	1,571,500	16·3	120,696	77	90,360	4,299,000	48	2736
India ..	1,475,900	15·3	83,917	57	78,815	3,032 600	38	2055
Ceylon ..	1,100,000	11·4	60,500	55	51,425	1,853 200	36	1685
Malaya ..	609,200	6·3	24,357	40	24,039	1,309,100	54	2149
New Guinea ..	296,000	3·1	14,372	49	11,538	438,500	38	1480
Others ..	1,622,300	17·0	84,863	52	62,245	2,598,300	42	1602
	9,618,300	100·0	557,864	58	470,665	19,530,700	42	2030

The estimates in Table I attempt to include locally consumed products, and so are considerably higher than those of Snodgrass (1928)[34] or of the International Institute of Agriculture

* It should be noted that in the whole of this discussion, unless otherwise stated, the reference is to ripe nuts stored in the field one month before husking, as usual in Ceylon estate practice.