dark ones. The fact that blue is added to some colours and subtracted from others accounts, I think, for the fact that white remains unaltered.

Further experiments are in progress in order to determine more exactly the nature of the colour change, and the means by which it is brought about.

I should like to thank J. E. T., J. L. de S., G. N. J. and E. C. T. for the trouble they have taken in acting as observers for me.

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Feb. 13.

[1] *Nature*, **153**, 774 (1944).

Nutritive Value of Coconut

IN NATURE of September 30, 1944, p. 437 occurs the statement: "and from these accounts it appears that babies fed entirely on coco-nut prepared in various ways until they are more than eighteen months old may be as healthy as those that are breast-fed".

The kernel of the coconut contains 35–45 per cent of oil, about 15 per cent of carbohydrates and a little less than 5 per cent of proteins of low biological value for infants. The kernel is very indigestible for adults and more so for infants when taken in large amounts, because of the great quantity of fibrous matter it contains.

The commonest preparation in the diets of those who consume much of this nut is 'coconut milk'. This is prepared by kneading grated coconut into two or three lots of water and mixing them together; the emulsion thus formed has much the appearance of cow's milk.

The analysis of coconut milk shows that the greater part of the oil has gone into emulsion with some of the protein and carbohydrates, and the residue of the grated nut contains all the cellulose and other indigestible matter of the kernel. It must be in this form, perhaps after mild fermentation, that coconut is given to infants. Supposing an ounce of grated coconut is used to prepare two ounces of milk, then the milk will contain less than 0·5 gm. of protein, about 5 gm. of fat and 1·5 gm. of carbohydrates per oz.; there will be about as much sodium chloride and about half as much calcium as in human milk. Coconut is notoriously deficient in vitamins, and the milk contains a little thiamine, probably enough to deal with the metabolites from the small amount of carbohydrates in the milk; but there are only traces of carotene and ascorbic acid.

Undoubtedly biological adaptations have taken place, whereby some races are able to digest and find ample sustenance in foodstuffs which would not bring health and longevity to peoples of some other races. Probably coconut milk can supplement human milk to a small extent. It is, however, difficult to believe that the infants of any race can be weaned and thrive for a year or more on an oily diet deficient in proteins and calcium and containing only traces of vitamin A (carotene) and ascorbic acid.

Statements concerning native diets in many parts of the world are often at variance with our newer knowledge of nutrition; very little knowledge exists of the dietary habits of the races of the world. There is an urgent need for dietary surveys to be carried out by scientific workers well acquainted with the difficulties of the subject. Such surveys will be of the greatest importance to supplement and perhaps modify some of the present views on human nutrition founded to a great extent on animal experiments. But all such surveys must be accompanied by surveys of the growth and state of nutrition of all classes among each people.

LUCIUS NICHOLLS.

THE term 'coconut milk' is usually applied to the fluid contained in the centre of the nut. It seems to have a very low nutritional value, containing only about 0·4 per cent of protein; 5 per cent of carbohydrate and a negligible vitamin and calcium content. Its calorific value is only about 20 per 100 gm.

The flesh of the fresh coconut, on the other hand, contains, according to the figures I have by me, a little more than 4 per cent of protein, which is certainly of poor biological value; about 39 per cent of fat and rather less than 9 per cent of carbohydrate, giving the relatively high calorie value of 400 per 100 gm. The calcium and iron contents are low. The only vitamin analyses I have for the flesh of the fresh fruit show a very small vitamin B_1 content of 0·03 mgm. per 100 gm. and about 2 mgm. of ascorbic acid per 100 gm. Vitamin A, either preformed or as carotene, is almost certainly absent.

Broadly speaking, therefore, the criticisms contained in Dr. Nicholls' letter can be sustained.

J. C. DRUMMOND.

Linoleic Acid, α-Tocopherol and Other Fat-Soluble Substances as Nutritional Factors for Insects

IT is now well established that, for growth, insects require a sterol in the diet. We have now established the need for other fat-soluble factors in experiments on the nutrition of a number of insects. Thus the caterpillars of *Ephestia kuehniella* grow very badly on an artificial diet consisting of casein, glucose, yeast, cholesterol, salt mixture and water. A few reach the pupal stage after a long time, but moths invariably fail to emerge. With *Ephestia elutella*, growth is relatively better on such a diet; but again, the moth fails to emerge. This deficiency is entirely overcome by adding wheat germ oil in quantities of approximately ½–1 per cent of the diet.

We have saponified wheat germ oil and tested the two resulting fractions (saponifiable and unsaponifiable) separately and combined. With both these fractions growth is as good, or almost as good, as with wheat germ oil. With the saponifiable fraction alone, *Ephestia kuehniella* still grows rather slowly, but those which reach the pupal stage ultimately emerge as normal moths. With *E. elutella* growth is almost as good as with wheat germ oil; and emergence is normal. In the presence of the unsaponifiable fraction alone both species grow very badly, and the few moths formed never emerge. Thus it appears that *Ephestia kuehniella* requires two factors contained in wheat germ oil, one saponifiable and the other unsaponifiable, while *E. elutella* probably requires only the saponifiable factor.

Further tests have made it beyond doubt that the saponifiable factor is linoleic acid. With linoleic acid and the unsaponifiable fraction, the moths of *E.*