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The biological value of cereal proteins in human nutrition.

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Two different studies, one upon five human subjects, the other upon four, were carried on with a view to discover whether amongst the respective proteins of corn, wheat and oats, as presented to the American public in the form of cereal breakfast foods, any difference in biological value could be detected. In the first study the method of Karl Thomas[1] was followed and the so-called "metabolic nitrogen" determined in control periods of two days each. Alternating with these periods were periods of three days, during each of which the cereals successively supplied nitrogen in amount equal to the total nitrogen excreted in the control periods, or nearly so. The chief objections to the Thomas method were the tendency to diarrhoea during the control periods when the theoretical energy supply was derived solely from cornstarch, heavy cream and sugar, and the difficulty of making such a diet palatable. There was no material difference amongst the three cereals as regards biological value whichever method of calculation was employed.

In the second study control periods of three days each alternated with cereal periods of four days each; but instead of a protein-free diet, a milk-cream-fruit diet was used deriving 80 per cent of the nitrogen from milk, 10 per cent from heavy cream and 10 per cent from fruit. The tendency to diarrhoea was negligible and the diet was palatable. In the cereal periods the milk

[1] *Archiv. f. Physiologie*, 1909, p. 219.

protein was replaced by cereal protein, fruit and cream remaining the same, the total calories being equalized by variations in the amount of sugar and corn starch taken. Wheat products gave slightly better replacement values than oats and corn products.

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Vitamine studies with menhaden fish meal and menhaden oil.

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Experiments were carried out with white rats in which the value of menhaden fish meal and menhaden oil was tested as a preventive or cure of Xeropthalmia, using various basal rations. Without exception the results were as follows:

1. Fish meal fed at levels of 10, 20 and 30 per cent did not prevent Xeropthalmia, nor cure it.
2. Menhaden oil fed at levels from 2 to 30 mg. daily both prevented and cured Xeropthalmia.
3. An alcoholic extract of fish meal fed at levels which made the fat content of the basal ration equal to that of the above mentioned menhaden oil rations, did not cure nor prevent Xeropthalmia.

The fish meal used in these studies was a product that had been on hand for some time. In showing that as small an amount as 2 mg. daily of menhaden oil prevented Xeropthalmia, it became evident that originally the fish meal must have contained vitamin A, since considerable of the oil is left in the residue after pressing. However, since neither the high percentage of fish meal fed, nor the concentrated alcoholic extract was effective, it must be concluded that the vitamin remaining in meal after pressing is destroyed in later processing or in storage.

Further studies were carried out to observe the influence of fish meal and menhaden oil on calcification. For these studies the fish meal and menhaden oil were obtained directly from the manufacturer, the menhaden oil having been expressed from the sample of fish meal in question.