ANNOTATION

The Effect of Liver Supplement on the Growth of Children

(Yudkin, J. (1952), *Brit. med. J.*, i, 1388).

There have long been indications that mammalian liver contains nutrients other than those which have as yet been identified. Animals given purified diets containing protein, carbohydrate, fat, mineral elements and all the known vitamins grow better when liver is also given. More recently it has been shown with rats that even on extremely good purified diets, which give almost as good growth without liver as with it, there is a profound difference in reproductive performance (Wiesner and Yudkin, 1951). In the absence of dietary liver, nearly every one of the pups born to the experimental rats dies within three or four days of birth; when liver is included in the diet a large proportion of the pups survive.

During the course of these experiments the authors found that the supplement of liver did not improve reproductive performance on a stock diet containing natural foods, but it did produce a slight though significant improvement in the growth of the animals. This effect was surprising, since there was no reason to suppose that any nutrients were deficient in the stock diet which contained, for example, whole cereals, dried milk, meat and fish meal and dried yeast.

This result seemed to indicate the possibility that some apparently complete human diets might also be lacking in the growth factor or factors which liver appeared to contain. An experiment in children was therefore carried out to test this possibility.

The children selected for the test were attending four day nurseries in West London. They were divided into two groups; one to be given dried liver preparation (Kylon G.F. in chocolate) and the other, the control group, to be given the chocolate

without liver. Great care was taken to make the two groups as similar as possible. All the children were over two and less than three years at the beginning of the experiment. The division into the experimental and control groups was carried out by 'pairing' the children as to sex, age, height and weight in each school. As far as could be determined, the children were normal; they were not suffering from any obvious disease and the average height and weight was up to the reported standard of London children of this age.

The chocolate was given daily for five days each week. The experimental group received 2 g. dried liver each day, equivalent to 12 g. fresh liver. The period of administration was 13 weeks, i.e. 91 days.

The children were repeatedly measured and weighed by the author before, during and after the administration of the chocolate. The examination of all the children was carried out at random and the records were so arranged that the group to which each child belonged was entered only after the completion of the tests.

Owing to children leaving the schools, complete records were obtained for 60 out of the original 75 children. Of these, 32 (17 boys and 15 girls) were in the experimental group and 28 (14 boys and 14 girls) in the control group. The average consumption of dried liver by the experimental group, when allowance was made for week-ends and absences, amounted to 1.2 g. daily over the 13 weeks of the test.

The results showed that there was an appreciable and highly significant increase in the rate of growth in the children receiving the liver. On average, the supplement resulted in an increased gain of 0.22 in. (0.55 cm.) and of 0.63 lb. (285 g.). These gains were approximately 20 per cent. more in height and 40 per cent. more in weight than the control children.

The author discusses in some detail the possibility that his results might have been due to vitamin B₁₂ contained in the liver preparation, and concludes that the evidence points to some other nutritional factor or factors rather than to this nutrient. For example, the liver preparation which was used contained little vitamin B₁₂ and could only have supplied less than 1 microgram a day compared with the 10 or 25 micrograms which have been used by those who have claimed an effect on growth produced by this vitamin. Further, animal experiments showed that vitamin B₁₂ added to the stock diet did not produce enhanced growth as did the liver. It seems likely also that the 'growth factor' may easily be lost during preparation of liver, since several other liver powders tested were not active in animal experiments.

Since the publication of this report, the question has been raised as to the advisability of increasing the rate of growth of children by the administration of such preparations. The question implies some confusion as to the causes of increased growth in children. Since liver is a normal article of food, it is reasonable to assume that an effect on growth produced by it indicates that it contains nutrients which were deficient in the diet. In the same way, an improvement in growth following the administration of milk or meat or indeed of a specific nutrient such as vitamin D, would imply that the previous diet was also nutritionally deficient. It is therefore difficult to understand what disadvantages might accrue to a child in whom such a deficiency was made good by a dietary supplement.

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INFORMATION, MACHINES, AND EXPLANATION

By STEPHEN L. SHERWOOD

'The book stresses the view that man is a product, like so much else, of the play of natural forces acting on the material and under conditions, past and present, obtaining on the surface of our planet.'—Sir Charles Scott Sherrington, Preface to 'Man on his Nature,' 1951, 2nd edition, Cambridge University Press.

Man throughout his history has found it necessary to attempt predictions in order to maintain his own life and the continuity of his race. His own needs for survival from day to day, and the forces of nature in his environment, providing or denying opportunities, had to be understood and become capable of being anticipated, so that he could adapt his own behaviour to the greatest number of contingencies and to the greatest advantage.

It is the aim of this paper to outline the means and methods with which such an end could be achieved; this end, stated above, is taken to be axiomatic as an accepted convention: a teleological discussion would lead too deeply into the fields of metaphysics to serve a useful purpose. The data available to us from clinical and psycho-

logical observations are often recorded in a language which lacks precision because it relies on emotional experience and inference; based on subjective data and analogy it fails to establish an extensive, if not a universal, validity. An attempt is also made to show how the above-named phenomena can be described in terms of the basic sciences and how this enhances accuracy and eases interpretation.

Reaction in response to stimuli is one of the characteristics of living organisms. If we take reaction to mean modification of behaviour, then a stimulus becomes (like a pip on a telegraph wire) a carrier of information or a method by which given conditions and their change are transmitted to the organism. The nature and amount of information one stimulus can supply is variable, depending directly upon the recipient structure and the recipient organism; thus a given ganglion cell can react in one way only: it can transmit an impulse, indicating that something is happening, and that the nature of what is happening represents an adequate stimulus. Thus, a touch corpuscle, when