FOOD REQUIREMENTS AND FOOD INTAKES*

BY

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In quantitative work of any kind it is most important always to distinguish clearly between what is actually being measured and the deductions that are being made therefrom. This statement applies to the study of human food requirements and intakes just as much as it does to any other scientific investigation involving measurement, and the purpose of this article is to examine some of the assumptions and deductions commonly made in such work.

Food Requirements

As applied to food or food constituents the term requirement is used in several rather different senses. To most people the unqualified term "requirement" seems to mean the amount of any food constituent which will maintain an individual or a group of individuals in the *status quo ante* over a prolonged period of time. The term is used very loosely because the *status quo,* which is usually average health, is often presumed to be a state of perfect health, but in the absence of any tests must often not be so. This use of the term "requirement" is to be discouraged. The term "minimum requirement" permits of more precise definition, and may be stated for adults to be the least amount of any dietary constituent necessary to maintain a perfectly healthy individual in equilibrium for a given (usually a short) period of time. For children a separate definition is required. Here the minimum requirement is the least amount of any dietary constituent which will support an optimal rate of storage in the growing body.

The minimum requirements of many food constituents can be directly determined both in animals and man. The determination always involves some experimental departure from natural conditions, and the actual method varies with the particular food constituent to be investigated. Thus the determination of calorie requirements may involve a totally different approach and technique from the determination of the various mineral requirements. "Optimum requirements" for both adults and children are of far greater practical importance than minimum requirements, but they are exceedingly difficult to assess. They always exceed the minimum requirements by an allowance for foreseen and unforeseen eventualities. This allowance cannot be experimentally determined. In its assessment many independent lines of evidence may have to be considered, and the final decision is always a matter of judgement and will vary with the investigator. Everyone is agreed, however, that the requirements of different food constituents vary with age, sex, and occupation, and do not necessarily all vary in the same direction. Thus the calorie requirement rises with age up to puberty and thereafter varies with the amount of physical work performed. The calcium requirement, on the other hand, is certainly greater in childhood and adolescence than it is after growth has ceased, and is possibly greatest of all during pregnancy and lactation. Women's iron requirements are probably greater than men's throughout the whole of the child-bearing epoch. Vitamin requirements are admittedly greater during childhood than they are in later life, and, as with calcium, pregnant and nursing women rank with children in this respect.

Food Intakes

Food intakes are usually measured with a view to determining the chemical composition of the diet, although in some cases the kinds and amounts of the actual foods eaten are of primary importance. The determination of food intakes might appear at first sight a relatively simple matter, and so indeed it is, but even here assumptions are usually made. These can be reduced to a minimum if individual diets are weighed, and duplicate portions of all food and drinks are set aside and analysed by reliable chemical methods. In practice this is only possible if relatively few persons are studied. If individual diets are weighed and the composition calculated from food tables it is assumed that the composition of the foods eaten is the same as that of the foods analysed. This is certainly not the case, since the composition of different samples of the same food may vary widely. Experiments have shown, however, that the error introduced under favourable conditions is not a large one. Individual food intakes, therefore, can be assessed with a high degree of accuracy and the result regarded with a corresponding measure of confidence. They are not, however, synonymous with individual requirements and should never be so regarded, although they may be used, but only in special circumstances and with special precautions, as a guide to optimum and even minimum requirements.

In dietary investigations individual intakes have been little studied, and the usual procedure has been to determine the food intake of a group of persons. The accuracy with which this can be done varies with the group to be studied and the method to be employed, but, speaking generally, it can be done with an accuracy little, if at all, inferior to that attending the determination of individual intakes. If the experiment is performed on a group of persons of the same age and sex the average intake for that age and sex can readily be obtained. It is perfectly justifiable to average in this way, although, if one does, the value of the results is limited by the fact that the individual variations—which are of the greatest importance in medicine—remain quite unknown. The moment a less homogeneous group is selected for study difficulties begin to arise, not in the measurement of the food consumption of the group, but in the handling and interpretation of the data. Let us suppose that the group selected for study is a boys' school where the ages vary from 8 to 12. The results obtained expressed as averages on a per capita basis have considerably less significance than those obtained from the homogeneous group discussed above, because it is known that the intakes of boys of 8 are less than those of boys of 12. In most practical nutritional studies the difficulties are very much greater, for the unit or group commonly selected for study is the family, consisting generally of an adult of each sex and a variable number of children of different ages. To average family food intakes on a per capita basis is obviously of little scientific value. The following device was accordingly introduced many years ago and has been employed ever since.

Arbitrary scales for the food requirements of adults and of children of all ages and both sexes have been drawn up by various workers. The requirements of the family studied are worked out from one or other of these scales,

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and the sum of the individual requirements may then be compared with the family intake actually obtained. More usually the scale of requirements may be used to reduce the family intake to a unit value—the so-called "man value" basis. By these means one family may be compared with another and the manipulation of the results generally is greatly facilitated. Now let us consider the shortcomings of this method.

1. Many assumptions have to be made, even in the collection of the data. If any members of the family take meals away from home the amount consumed by them is a matter of guesswork. The same applies if visitors are entertained during the period of investigation.

2. At best the "family" method gives only average results. Individuals within the group may not behave in the predicted manner, and the results obtained therefore have little or no individual significance. To cite a particular instance, if a mother were to starve herself to death for the sake of the other members of the family, the result would merely be a somewhat subnormal intake for the family on the "man value" basis.

3. The use of a scale of requirements to reduce an accurately measured group intake to a unit value is fraught with danger. Requirements are always a matter of judgement, and every investigator either selects one of the thirty-eight scales of requirements already proposed or introduces yet another more in keeping with his own ideas. When, therefore, the same family intake is reduced to a unit value basis, the results shown may vary by 30 per cent., according to the reducing scale adopted.

4. The scales of requirements in current use are scales of calorie requirements. Everything that we know about requirements indicates that a different scale of requirements should be used for each food constituent investigated. It is in fact a serious mistake to apply a scale of calorie requirements to evaluate intakes of calcium—or iron—or indeed of anything other than calories. This mistake, however, is still frequently made (Cathcart and Murray, 1936; Newcastle, 1936). It is no excuse to plead that requirement scales for calcium or iron are not in existence. Better far to give no results for these ions than to give results which are incorrect and misleading. Actually, scales have been drawn up on these lines, and that suggested by Stiebeling and Ward (1933) is probably the best in existence at the present time.

Conclusions

The food intake of a family may be ascertained with considerable accuracy, but the result has little meaning, and the reduction of this result to a unit value basis gives at best an average without individual variations and is achieved only by making some very daring and wholly unwarranted assumptions. Obviously the family method can never be used to assess requirements, since an arbitrary scale of requirements is invariably used in manipulating the results.

It is difficult indeed to understand why the family method of investigation has had such a vogue, but this point lies quite outside the scope of the present critique. The question is rather whether it should ever be used again. If no other method of studying food intakes were available there would of course be no question, but it is difficult to see what advantages, if any, the family method has over the individual method. Any result obtained by the former technique can be obtained with greater accuracy and without assumptions by the latter. The individual method of study is not difficult, and we would urge those desirous of making nutritional investigations to give it a trial rather than to follow slavishly a method the results of which are so very difficult to interpret.

References

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THE TREATMENT OF NON-STENOSING PEPTIC ULCER*

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This discussion has been limited advisedly to the treatment of non-stenosing peptic ulcer, because where stenosis has established a mechanical obstruction there can be no difference of opinion as to the appropriate treatment. Mechanical obstruction demands surgical relief.

In the treatment of non-stenosing ulcers there has been a movement during the past decade, in practice rather than in opinion, towards conservative measures. The best surgical opinion has always upheld a sane conservatism. It was a favourite *obiter dictum* of Lord Moynihan's that he never operated on a case of duodenal ulcer until it had been cured nine times by a physician. But there is no doubt that some years ago there were numerous surgeons who regarded all chronic peptic ulcers as suitable grist for their mill, though, being what are known as "practical surgeons," they were not given to airing their views in the medical literature. The swing of medical opinion that has effectually prevented this wholesale and indiscriminate operating upon non-stenosing ulcers is, it will be agreed, a good thing. But in a discussion such as this we should not be influenced greatly by the vogue of the moment, but should seek to inform medical opinion on the more controversial points of treatment, and to lay down clear and precise indications as to the place of surgery in this field.

The change in practice to which I have alluded has been brought about partly by the unfortunate results of indiscriminate surgery, but chiefly by improved medical technique. The almost universal use of fractional gastric analysis has provided a much better guide to treatment than to diagnosis. Far more attention has been devoted to diet, and it has been widely realized that diet is more important than alkalis in the continuous neutralization of hyperchlorhydria which is the aim of medical treatment. There is also a praiseworthy tendency in many quarters to test the results of medical treatment by repeated radiological studies, though, as we shall see later, there are dangers in placing too much reliance on the picture of an ulcer crater.

These advances in medical technique compel our admiration and approval. A less admirable development of recent years has been the widespread use by patients of the various proprietary alkaline powders and medicines, often in large doses over a prolonged period and often with serious toxic results. On the recent vogue of treatment by histidine injections I will merely say that in my

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