METHODS AND FORMULATIONS FOR THE TREATMENT OF OBESITY

This invention relates to methods and formulations for the treatment of obesity.

BACKGROUND OF THE INVENTION

When it is required to bring about weight reduction in over-weight patients, it is naturally necessary to reduce their food intake, since the object of the weight-reduction treatment is to cause the body to consume its own fatty tissues in meeting its energy requirements. To this end, it has hitherto been necessary for the diet of the patients to be very strictly controlled and supervised during the period of weight-reduction, which might extend to several months. To exercise so complete a control over the patient's diet it is most convenient to incorporate all the food requirements of the patients into a single dietary composition, and this has been the normal practice. Unfortunately, such controlled diets have hitherto been very unsatisfying, and the patients feel constantly hungry, which is of course very unpleasant. This causes many patients to break off the diet; and even those patients who are motivated sufficiently strongly to stay the course often find that the diet is almost intolerable.

Furthermore, many physiological and psychological problems have hitherto been associated with the clinical use of severe dietary restriction. One of these problems arises from the fact that the body requires a constant supply of nitrogen (in the form of aminoacids or their polymers) to replace the endogenous nitrogen losses resulting from the normal "wear and tear" of the body's protein. If an adequate amount of aminoacids is not supplied there is a loss of body protein, with consequent reduction in muscle mass; this leaves the patient feeling weak and languid. If this protein loss continues for too long it can be dangerous, and even the heart muscle may suffer damage. In fact, this loss of muscle mass is one of the main reasons why total fasting is not favoured as a weight-reduction treatment.

Accordingly, sufficient aminoacids must be provided in the diet to prevent serious endogenous nitrogen loss. It has been thought, up to now, that to avoid the consequences of serious endogenous nitrogen loss it is necessary to supply the patient with about 40 g to about 65 g of protein per day — see for example "Human Nutrition and Dietetics", by Davidson, S. and Passmore, R., 4th Edition (1969) published by E. & S. Livingstone, Edinburgh, page 85.

Another problem arising with complete starvation, and with some conventional diets, is that the blood uric acid level rises greatly, which may lead to gout.

Yet another problem arises from the obvious fact that, during dieting, the body must of course break down and consume its own fatty tissues to meet its energy requirements, and will do so only if its calorie intake is very severely restricted. However, in the absence of sufficient carbohydrate, the catabolism of fatty acids leads to a build-up of ketonic waste-products in the body, leading to a condition known as "ketosis". Severe ketosis gives rise to psychological disturbances such as depression and irritability, and has other unpleasant side-effects including acidosis and nausea. Despite the disadvantage from a weight-loss viewpoint, it is therefore necessary to include carbohydrate in the diet so as to reduce the level of body ketones and thus avoid severe ketosis — as well as also reducing the blood uric acid level, thus lessening the likelihood of gout. Till now it has however been thought that at least about 100 g of carbohydrate per day is needed if ketosis is to be completely prevented (see "Human Nutrition and Dietectics", by Davidson, S. and Passmore, R., 4th Edition (1969), page 127) and this is also considered to prevent a rise in blood uric acid level. Some conventional diets in fact give the patient as much as 400–500 g/day of carbohydrate.

If one tries to avoid the problems caused by the absence of sufficient carbohydrate by using instead a low-calorie diet in which a relatively large percentage of the total calories is derived from carbohydrates, then the body tends to retain a considerable amount of water in its tissues. Although this is not desirable, it could be tolerated within reason by the clinician, since the retained water will be largely shed when the patient resumes a normal diet — but it has an adverse effect on the patient, since his weight due to water retention remains almost constant while on the diet, which is frustrating to the patient who can see no visible signs of the diet achieving its purpose. Moreover this water-retention cannot be tolerated even by the clinician beyond a certain point, since it leads to edema. The patient is losing fat, but his tissues are retaining about the same weight of water, and if this continues for a prolonged period, edema results and fluid collects around the ankle joints.

Previous research has revealed the existence of the problem outlined above, but has found no way of resolving the apparently conflicting requirements of patients for carbohydrates during dieting. It has simply been assumed that in order to prevent catabolism of aminoacids the patient must be supplied with a fairly large quantity of carbohydrates.

SUMMARY OF THE INVENTION

It has now been discovered in experimental trials with obese patients that, provided the carbohydrate intake of the patient is at least about 30 to about 45 g/day, the amount of aminoacids required to maintain overall nitrogen equilibrium is only about 15–25 g/day — about one-third to one-half of the amount previously thought necessary. If the carbohydrate intake is below about 30 g/day, larger amounts of aminoacids are required. For example, if the carbohydrate intake is reduced to 15 g, the aminoacid requirement for nitrogen equilibrium rises above 25 g. At these carbohydrate intakes, water retention is absent or minimal. When the carbohydrate intake is increased above about 45 g/day water retention begins to be observable, and with amounts above about 75 g/day the water retention may be severe enough to be diagnosed as clinical edema.

In the light of the above discoveries it can be seen that conventional diets for the treatment of obesity are far from ideal. These conventional diets are usually prepared from normal food ingredients selected to be of high protein content, but relatively low in fat and carbohydrate. The nutrient balance of the preparations may be further adjusted by blending in other food ingredients such as specific proteins isolated from foodstuffs, vitamins and minerals. Since a diet consisting of protein with some carbohydrate and fat is not very bulky, non-calorific substances, such as cellulose and methyl cellulose or similar materials, are sometimes added to provide bulk and hence give a feeling of satiety.