

CALORIE INTAKE IN RELATION TO BODY-WEIGHT CHANGES IN THE OBESE

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MANY different types of diet have been successfully used to reduce weight in those considered obese. The principle on which most of them are constructed is to effect a reduction of calorie intake below the theoretical calorie needs of the body. Experience with these patients has suggested, however, that this conception may be too rigid. Many of them state that a very slight departure from the strict diet which can hardly affect calorie intake, results in them failing to lose weight for a time. Though it is realised that evidence from such patients is notoriously inaccurate owing to their approach to this particular condition, it is too constant a belief among them to be entirely discarded.

Furthermore, most of the diets in common use not only restrict the intake of calories but also radically alter the proportions provided by protein, fat, and carbohydrate. In this country a healthy sedentary person may be supposed to consume some 2200 calories daily, made up of about 70 g. of protein, 60 g. of fat, and 350 g. of carbohydrate: protein supplies 12% of the calories, fat 24%, and carbohydrate 64%. On most reducing diets, however, the carbohydrate and fat will be restricted while the protein remains about the same; and in a diet yielding 1000 calories protein may provide 30%, fat 37%, and carbohydrate 33%.

Finally, Lyon and Dunlop (1932) observed that patients on isocaloric reducing diets lost weight more rapidly when the largest proportion of the calories was supplied by fat than when it was supplied by carbohydrate. Anderson (1944) attributed these findings to the different amounts of salt (causing water retention) in the diets used by these workers. More recently, Pennington (1951, 1954) has recommended high-fat diets in the treatment of obesity. It therefore seemed important to establish which factor has the greater effect—restriction of calories, or alteration in the proportions of protein, fat, and carbohydrate in the diet.

Materials and Methods

The subjects selected for our study were definitely obese. It has been debated whether an increase of weight above that laid down in normal height-weight charts is a satisfactory criterion of obesity, and other definitions have been suggested; but all the persons chosen for the present investigation were manifestly obese, and this description could not have been questioned either by skilled or by lay observers. All had weights more than 35% above the standard weight for height according to the tables compiled by the Metropolitan Life Insurance Company (1942, 1943).

All were admitted to hospital and allowed a moderate amount of exercise in the ward. During the first few days after admission they lost weight

even when given free choice of food (fig. 1). observation has been made before (Newburgh 1937) and therefore a period of stabilisation was arranged to precede our studies. After that period their daily weight became relatively stable, and at this point all were placed on one or other of three series of diets prepared by Miss Wilkinson Hughes, chief dietitian to the Middlesex Hospital. These diets were drawn up from the tables of McCance and Widdowson (1946), and in every case aliquot samples of all the diets were turmixed and analysed. The results agreed within

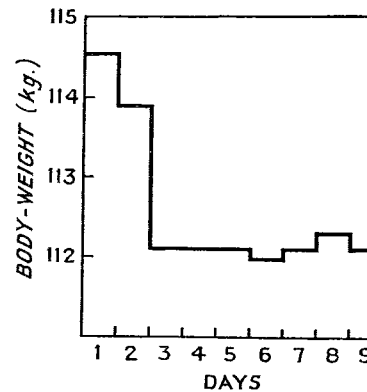


Fig. 1—Loss of weight on full diet after admission to hospital.

The results agreed within

Diets of Series 1

In the first series the proportions of protein, carbohydrate, and fat were kept constant and the intake of calories was varied. In all of them protein supplied about 20%, fat 33%, and carbohydrate 47% of the calories. The water in the diet was determined as a supplement of water given to each patient to make up 3000 ml. per day. The same procedure was adopted with sodium chloride, which totalled 10 g. per day. In periods of 7–9 days the patients were kept on either 2000 calories, 1500 calories, 1000 calories, or 500 calories per day (fig. 2). Six patients were studied in this series, each patient having each diet for 7–9 days, and a definite relation was found to exist between the deficiency of calories and the amount of weight lost.

Diets of Series 2

The final proof that the amount of weight lost depends directly on the deficiency of calories should be added by observing a constant loss of weight in each patient whose calorie intake is constant regardless of the composition of food making up the diet.

Fourteen patients were put on diets in which the calorie intake was kept constant at 1000 a day and 90% of it was provided in turn by carbohydrate, fat, or protein. Measured amounts of water and of sodium chloride were again added to each diet to make up an intake of 3000 ml. of water and 10 g. of sodium chloride per day (fig. 2). So different were the rates of weight loss on these isocaloric diets that the composition of the

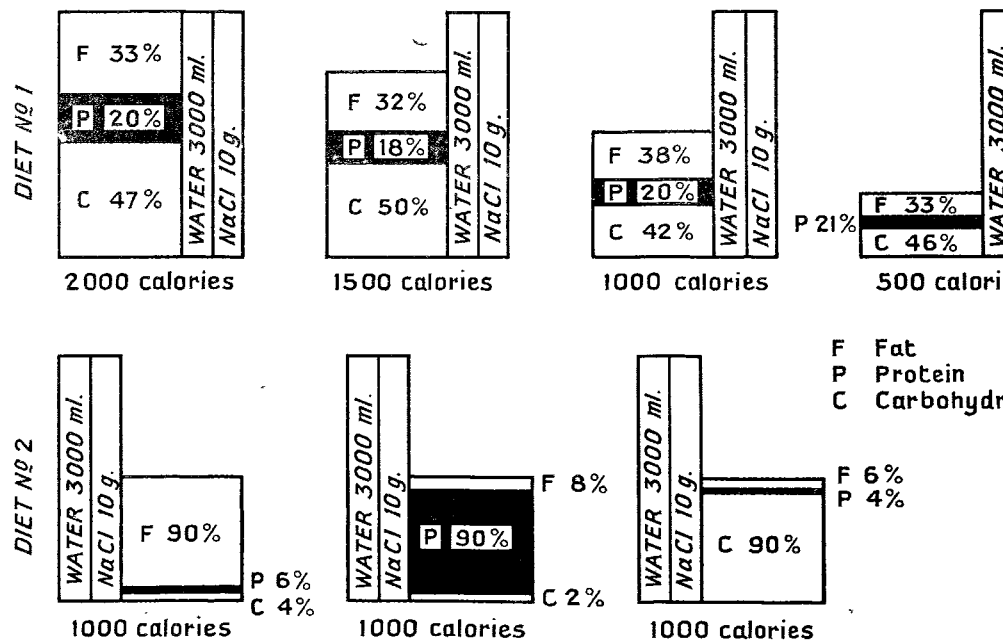


Fig. 2—Composition of diets of series 1 and 2.