

An apparatus for the regulation of the food supply to rats

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1. An apparatus is described for supplying small amounts of food to rats uniformly and continuously.
2. The apparatus consists of a Perspex disc carrying a groove containing food, which is rotated once each day by an electric motor. Access of rats to the food is restricted by suitably placed baffles.

Many experimental treatments in nutritional studies result in a decrease in food consumption. In such studies it is often desired to distinguish between the metabolic consequences arising solely from a decreased consumption of food and those more directly related to changes in dietary composition. In such situations a commonly employed technique is pair-feeding, in which the daily food intake of animals receiving a nutritionally adequate 'control' diet is equated with that of experimental animals receiving the modified diet. When the effects of experimental treatment in depressing food intake are severe, the technique of pair-feeding as conventionally employed leads to undesirable complications. When a small amount of food is allocated to 'control' animals it is usually consumed rapidly and the animal starves for the remainder of the day, whereas experimental animals consume the same quantity of food gradually throughout a 24 h period. This behavioural difference is undesirable, particularly in metabolic studies where the type of feeding pattern adopted by the control animals, known as meal-eating, results in a number of anatomical, biochemical and physiological modifications (Fábry, 1967), which can vitiate comparisons with the experimental animals.

The importance of regulating food intake of control animals has been recognized in work with biotin deficiency (Patel & Mistry, 1969), fluoride toxicity (Suttie, 1969) and in RNA metabolism in zinc deficiency (Williams & Chesters, 1970).

In this paper a simple automatic feeder is described which will deliver to the rat small quantities of food, 0–10 g, uniformly and continuously over a period of 24 h. Such feeders have been used in this laboratory in studies of growth rate and food intake (Chesters & Quarterman, 1970) and in studies of nucleic acid and carbohydrate metabolism (Mills, Quarterman, Chesters, Williams & Dalgarno, 1969; Quarterman, 1968).

Cages

The cages into which the feeders were fitted have been used for studies of trace-element deficiencies for several years. They are made of Perspex with floors of glass rods (Pl. 1) and are similar to those described by McCosker (1967). Each cage is divided at the centre and accommodates one rat in each half, allowing the rat a floor

space of 15×21 cm and a height of 17 cm. For convenience of access, only one feeder is fitted into each cage. The remaining half of the cage usually contains the *ad lib.* fed rat with whose food intake the food intake of the automatically fed rat is equated. Water was provided in glass pots.

Feeders

The feeders consist of a Perspex disc, which is mounted on an electric clock motor (Sangamo Weston Ltd, Great Cambridge Road, Enfield; Model S7, $1/24$ rev/h) and which contains a circular groove in which the food can be distributed (Pl. 1). The disc is inserted just far enough through a slot in the front of the Perspex cage to allow the rat access to the food. Perspex barriers inside the cage prevent the rat having access to

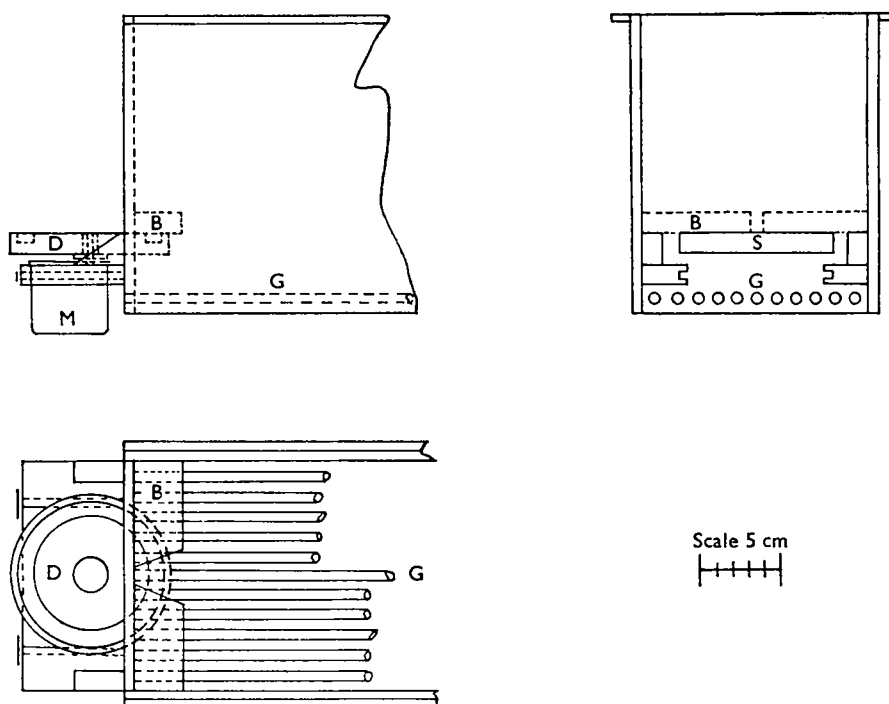
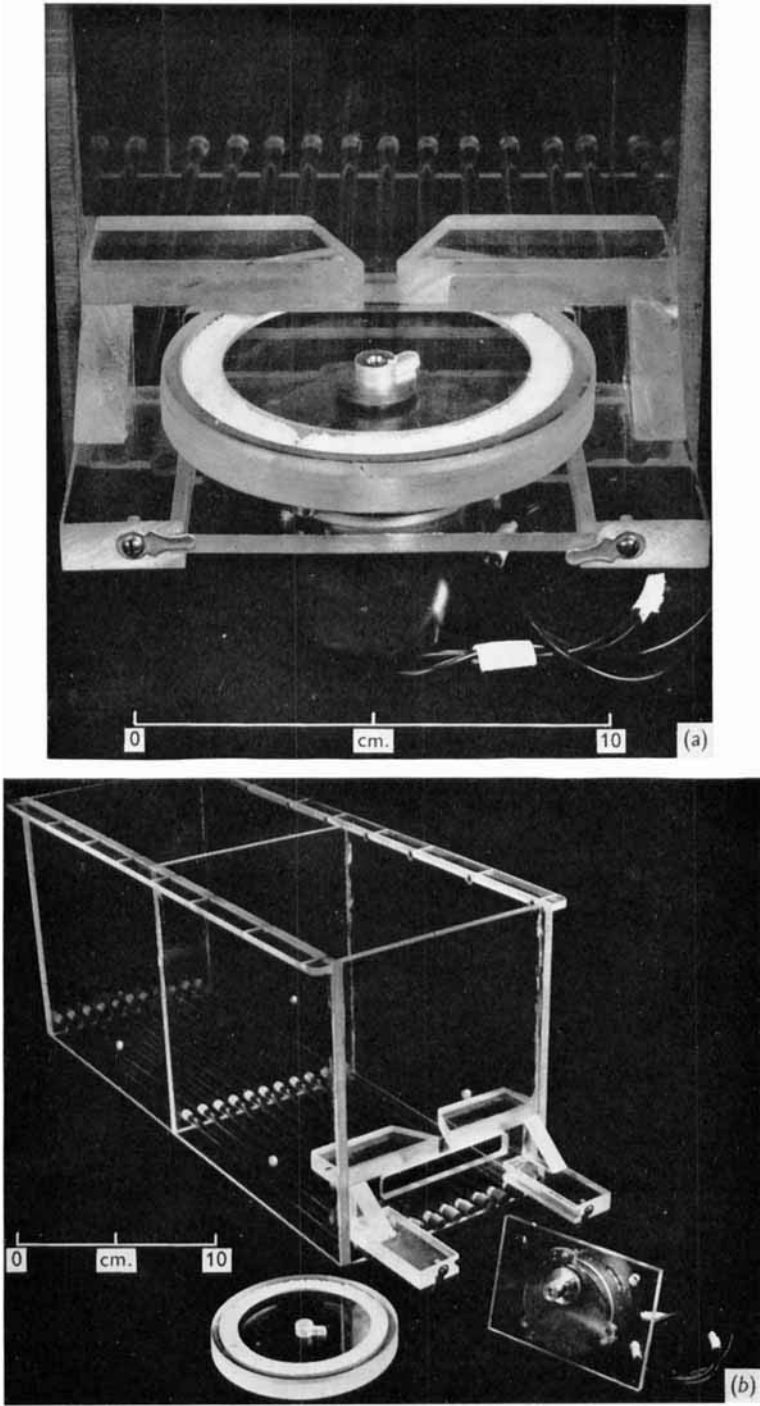


Fig. 1. Scale-drawings of the apparatus for the regulation of the food supply to rats. Top left, side view, and bottom left, plan of cage with continuous feeder attached; right, front view of cage adapted for feeder (shown without feeder attached). D, feeder disc; M, feeder motor; G, glass-rod floor; S, slot which accepts the disc; B, barrier inside the cage which allows the rat access only to a small section of the groove containing food.

more than about a 2 cm sector of the groove. This length of groove passes the barrier in about 2 h, as the motor rotates the disc once in 24 h. The assembly is illustrated in Pl. 1 and Fig. 1. The weight of the disc and motor is taken by Perspex brackets and the whole held in place by two clips. The electric motors are wired up in such a way that one row of feeders can be isolated at a time and a suitable low-current fuse is installed in each row.

Many variations of feeding pattern are possible with this apparatus including



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changes in time-distribution of food and changes of diet. It is also possible, by measuring the food left in the groove, to observe how an animal's *ad lib.* intake varies with time and to reproduce the pattern of intake in other experimental subjects.

König, Schmid & Schmid (1968) have described an automatic feeder which is similar to the apparatus described in this paper but which is more complicated in design and could not be so easily or cheaply produced. In the apparatus now described food can be supplied to the animals continuously so that some is available all the time or it can be supplied in discrete, separate quantities. The feeder described by König *et al.* (1968) can only supply the day's feed in a limited number of separate quantities.

Dr J. K. Chesters made valuable contributions to the development of these feeders. We are indebted to Messrs Nicol Smith Co., Belmont Street, Aberdeen for manufacturing these feeders to our specifications.

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EXPLANATION OF PLATE

An apparatus for the regulation of the food supply to rats. (a) Assembled Perspex-and-glass cage and continuous feeder apparatus; (b) components.