

Short note

A simple system for nutritional studies with chronic consumption of liquid diet in rats

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Summary — A feeding system allowing liquid diet distribution to rats without any loss by evaporation is described. A liquid diet stirred continuously is offered to rats in water bottles. The diet is made available to the animals without any clotting throughout the 24-h period. Such a system could be applied to alcohol administration.

feeding system / alcohol feeding / rat

Résumé — **Système simple pour des études nutritionnelles avec consommation chronique d'aliments liquides chez le rat.** *Un système d'alimentation pour rats permettant la distribution d'un aliment liquide sans aucune perte par évaporation a été décrit. Un aliment liquide continuellement mélangé est offert aux rats dans des flacons à eau. L'aliment reste disponible pour les animaux pendant une période de 24 h sans aucune coagulation. Un tel système pourrait être utilisé pour administrer de l'alcool.*

système d'alimentation / administration d'alcool / rat

INTRODUCTION

Feeding experimental liquid diets presents some difficulties. If the liquid diet is offered in open air it evaporates at a rate which cannot be estimated. Such a problem arises if alcohol distribution is compared to a glucose liquid rich diet. Sugar-rich liquid diets tend to dry and clot in the vessels. Barch *et al* (1987) attempted to

offer a liquid diet to rats in water bottles bearing a stopper with a 4-inch bent ball valved sipper tube. Such a system is rapidly blocked by the diet drying around the ball valve.

We have designed a new system adapted from a new type of water bottle. This system was tested, comparing the growth of rats receiving the same liquid diet through the water bottle or from open cups.

MATERIALS AND METHODS

Water-bottle design

The water bottle is made from 250 ml polyethylene (IFFA-CREDO ref^{ce} 08.85.11) covered with a stainless steel screw top (IFFA-CREDO ref^{ce} 08.85.30). The top is drilled with a 9-mm hole to retain a stainless steel ball (12.7 mm in diameter). This ball is kept in place by a stainless steel grate with 8-mm holes. The grate is tightened by the stopper. The axle (2 mm in diameter) of a flat propeller enters the bottom of the bottle through a plastic seal (Würth SA, Erstein, ref 0561-112). This propeller is driven by an electric motor (Crouzet ref 82520447, 375 rounds/min). The junction between the axle and the motor is made with plastic tubing to allow some flexibility (fig 1).

Animals and diets

The system was tested for 4.5 wk on 2 groups of 9 rats after weaning, weighing approximately

94 g on average. They were housed in plastic cages (3 animals/cage) and were weighed once a week. Thus, the 3 rats shared a water bottle or a cup in each cage.

The diet composition is given in table I. The powder was mixed with water to obtain a rather liquid consistency (60 g of powder + 18 ml water). This mixture was poured either into water bottles for 9 of the rats or in cups for the other 9 rats. All animals received drinking water *ad libitum*.

Statistical analysis

The growth rates were compared by analysis of variance of one factor from repeated measurements. The means were compared by the Neumann-Keuls test (PCSM R program).

RESULTS AND DISCUSSION

The two groups of rats had similar growth rates. The cup group gained 6.14 g/day

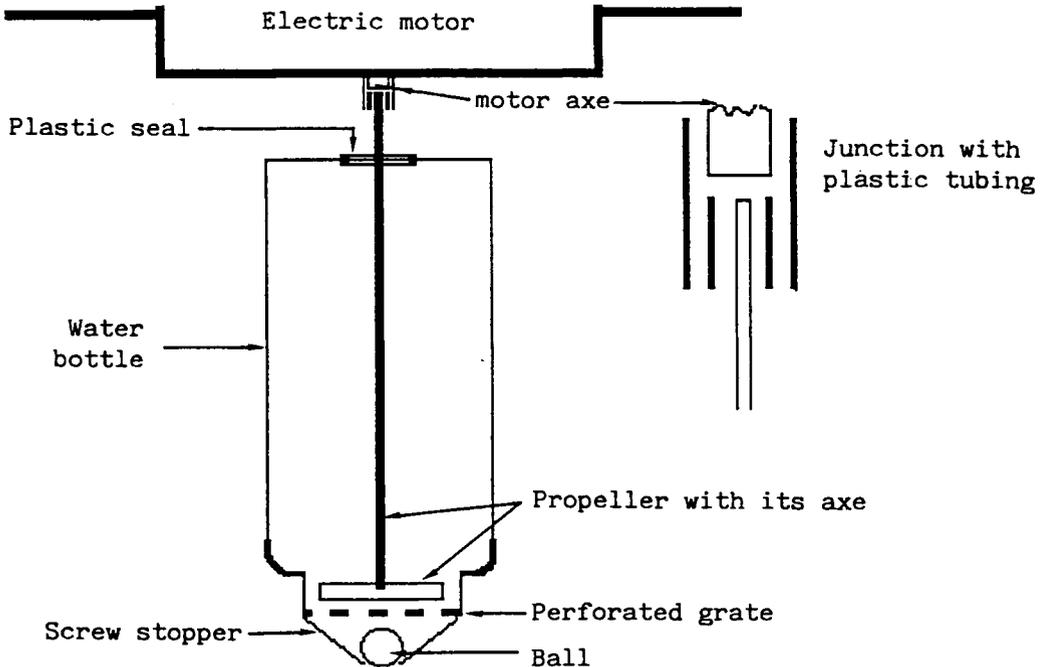


Table 1. Diet composition (g/kg).

| | |
|-------------|-----|
| Egg albumin | 142 |
| Starch | 380 |
| Saccharose | 380 |
| Corn oil | 48 |
| Mineral mix | 40 |
| Vitamin mix | |

* Mineral mix and vitamin mix are commercial products (UAR, Villemoisson/Orge) known to be adequate for rats.

and the water bottle group 6.39 g/day ($P = 0.20$).

The animals adapted easily to their feeding system and no clotting appeared even during the night period. The balls enabled free delivery of the feed throughout the 24-h period.

In a system using bottles bearing a ball valved sipper tube, clotting occurred frequently. By contrast, the conic topped bottle used here resulted in effectively no clotting and a far more efficient means of feeding. If the liquid diet contains alcohol, it tends to separate quickly into 2 phases

even with the addition of agar to increase fluidity; a solid phase sediment thus causes clotting and prevents feeding. With continuous mixing this phenomenon does not occur. Some authors have tried to overcome the difficulty, giving the alcohol through the drinking water but the rats lowered their water consumption (Richter, 1926). The system designed is very versatile and allows the use of any liquid diet containing either alcohol or glucose which is often given to control animals to equilibrate the caloric intake from the diets. It can be concluded that such a system is adequate for any type of liquid diet. Furthermore, the control of feed ingested is far easier, easy as the water bottle may be weighed without any loss through evaporation.

REFERENCES

- Barch DH, Fox CC, Bennett BT (1987) A simple system of feeding bottles for the study of zinc deficiency and ethanol consumption in the rat. *Lab Anim Sci* 37, 504-506
- Richter CP (1926) A study of the effect of moderate doses of alcohol on the growth and behavior of the rat. *J Exp Biol* 44, 397-418