A DEVICE FOR MEASURING FLUID INTAKE BY PRIMATES¹

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A leakproof, accurate system of measuring water or other fluid consumption in larger primates was needed by the Brown Primate Behavior Laboratory. The various mouth-operated, fluid-delivery devices commercially available dripped when shaken, or flowed when fingered by the animals, or lost fluid while the animal lapped at the device. While gravity-fed, capillary-tube-type dispensers like those commonly used for watering rats and mice served reasonably well for small primates such as the squirrel monkey, they were not suitable for the rhesus, cynomolgus, or stump-tailed macaques, where leakage was a great problem when the cages were shaken by the animals.

Grunzke and Rohles (1963), working with chimpanzees and monkeys, suggested the possibility of a nonleaking device which would depend solely on the sucking response. They equipped the inside of a cage with a metal watering tube (nipple) which was connected by polyethylene tubing to a water container located outside of the cage and above the level of the nipple. Since water dripped from the nipple, the thirsty animal readily found it and drank. While the animal was drinking, the polyethylene tube was transferred to a water container, with water level below that of the nipple. It was found that the animal promptly learned to provide the suction necessary to get the water.

At the Brown Laboratory the macaques were easily trained to use such a device, but as the water level became lower in the reservoir, proportionately greater effort had to be expended to get the water. The animals stopped drinking entirely when water had to be sucked vertically more than 4 or 5 in. To

avoid variations in sucking effort, with changes in water level, the device illustrated in Fig. 1 was designed. A graduate cylinder (A), in this case 1000 ml, was used as the fluid reservoir. This reservoir was fitted with a rubber plug into which was inserted a glass, plastic, or metal tube (B), with $\frac{5}{8}$ to $\frac{1}{2}$ in. inside diameter (smaller diameter tubes hamper the flow of liquid), which fed into a small plastic water cup (C), of about 200 ml capacity. A hole for a one-hole rubber stopper containing a metal nipple (D) was cut in the middle of the cup's side. The device was mounted on the

Fig. 1. Leakproof fluid dispenser for primates. (A) Graduate cylinder reservoir. (B) Glass, metal, or plastic reservoir tube. (C) Dispensing cup. (D) Metal nipple.

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outside of the cage and the nipple allowed to extend in approximately 1 in.

The water level in the cup was determined by the level of the reservoir tube (B) in the cup. Thus, for training purposes the level was set above that of the nipple so that water dripped slowly from the nipple. When the animal learned to use the nipple, usually in one to three days, the level of the reservoir tube was lowered, thus forcing the animal to increase the sucking effort to draw up the water. One cynomolgus out of four tried did not use the nipple in the allotted one-week training period. Three rhesus and three stump-tails, which were the first tried, used the device within the prescribed time.

Greater versatility in placing the nipples in "two-bottle" preference tests was achieved by using a polyethylene tube to connect the plas-

tic cup to the metal nipple. Thus, the nipples could be placed a fixed distance apart, independently of the size or location of cups, reservoirs, and other equipment.

The present system has special advantages for those who must accurately measure fluid consumption, or for animals in restraint chairs where leakage could be a problem. The constant fluid level eliminates any marked variation in effort required to obtain the fluid and lends versatility to the device by permitting its use by smaller primates, where the effort to lift a column of water might be too great.

REFERENCES

- Grunzke, M. S. and Rohles, F. H., Jr. Ad lib water dispensing. *Lab. primate Newsltr.*, 1963, 2 (No. 1), 8.