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BRIEF COMMUNICATION

A Comparison of Ball-Point Drinking Spouts and Richter Tubes in the Measurement of Ethanol Consumption[1]

M. J. WAYNER AND S. FISHER

Brain Research Laboratory, Syracuse University, 601 University Avenue, Syracuse, New York 13210

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WAYNER, M. J. AND S. FISHER. *A comparison of ball-point drinking spouts and Richter tubes in the measurement of ethanol consumption.* PHARMAC. BIOCHEM. BEHAV. 1(3) 351–352, 1973. –The relative efficiencies of using ball-point drinking tubes and Richter tubes to measure ethanol consumption in rats were determined. There was little difference between the two drinking devices in terms of evaporation and spillage. Although there seem to be some slight differences in ethanol consumption from ball-point spouts as compared to Richter tubes dependent upon the type of tube to which the animals are accustomed, both devices are clearly more efficient than valveless drinking tubes in the measurement of ethanol consumption.

Ethanol consumption Fluid intake measurement Richter tube Ball-point drinking tube Drinking device

DATA have been reported recently [2] which demonstrate that rats consume unusually large quantities of relatively high concentrations of ethanol under certain conditions. The possibility has been suggested that the quantities consumed, particularly at the high concentrations, were spurious and due to leakage of fluid from the stainless steel ball-point drinking tubes and that the literature does not reveal similar effects because previous investigators utilized more reliable and conventional Richter tubes for measuring ethanol consumption. Touch-n-Drink ball-point watering tubes were employed in these experiments. The principle of action and relative efficiency of these ball-point drinking tubes as compared to valveless drinking tubes for watering mice and guinea pigs have been described [1]. The purpose of the present experiment was to compare the relative efficiency of ball-point drinking spouts and Richter tubes in the determination of the consumption of various concentrations of ethanol in the presence of water. Results do not indicate any significant differences between the two types of watering devices.

METHOD

Animals

Twelve male hooded rats, 400–420 g in weight, were selected from our colony and maintained in individual living cages. Cages were equipped with either two glass Richter tubes, Kimble 44880, or inverted graduated plastic cylinders fitted with rubber stoppers and stainless steel ball-point tubes. The drinking tubes were 4 in. long with a 120° center bend and were purchased from Ancare Corporation, 47 Manhasset Avenue, Manhasset, Long Island, New York 11030, Catalogue No. TD-300. An additional Richter tube and graduated cylinder fitted with a ball-point spout were attached to an empty cage in the rack subject to the same environmental conditions to serve as a control for evaporation and drippage due to agitation by the animals and during routine cage handling. Purina laboratory chow mash was available continuously. Food consumption, fluid intake and body weight were measured daily at 0900 hr. Ethanol solutions were prepared v/v from 95% ethyl alcohol and distilled water.

Procedure

Six animals were removed from the colony and placed in individual cages for 40 days. During this 40 day period three animals drank from Richter tubes and the other three drank from ball-point spouts. Each animal had two drinking devices filled with tap water during this period. On Day 41 animals which had been drinking from Richter tubes (RT) were switched to ball-point spouts (BP) and animals which had been drinking from BP were now switched to RT. On

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the same day, Day 41, one of the drinking tubes for each animal was filled with 50% ethanol. The same procedure was followed on Day 42 except that the positions of the drinking tubes were changed according to a predetermined nonsystematic order. On Days 43 and 44 the same procedures were followed except that the concentration of ethanol was decreased by 5% to 45%. The concentration of the ethanol solution was decreased by 5% every two days down to 5% when the experiment was terminated. This phase of the experiment continued for 20 days, Days 42–61. The entire experiment was repeated on six other animals.

RESULTS

As the experiment was repeated and there were no obvious differences in the results, the data for all 12 animals were combined. Results are presented in Fig. 1A where the mean water (HOH) and ethanol (ETOH) intakes in ml for each 2 day period are plotted as a function of the concentration of the ethanol solution. The solid lines represent the data for the groups which drank first from the ball-point spouts (BP) and then were switched to Richter tubes (RT). The broken lines represent the data for groups which drank first from the RT and then were switched to the BP. A 2 x 10 ANOVA was carried out on the water intakes. There was no significant differences between the two groups, BP → RT (solid circles connected by a solid line) and RT → BP (solid circles connected by a broken line) $F = 0.14$, $df = 1, 22$. The decrease in water consumption by both groups was significant, $F = 36.67$, $df = 9, 198$, $p<0.01$. The interaction was signigicant, $F = 2.02$, $df = 9, 198$, $p<0.05$. A 2 x 10 ANOVA was also carried out on the ethanol intakes. The differences between the two groups, BP → RT (solid squares connected by a solid line) and RT → BP (solid squares connected by a broken line) were not significant, $F = 3.85$, $df = 1, 22$, but close with a required F of 4.30 at an α of 0.05. The increase in consumption of ethanol by both groups as the concentration was decreased is significant, $F = 38.94$, $df = 9, 198$, $p<0.01$. The interaction was not significant, $F = 1.82$, $df = 9, 198$. The group which drank ethanol from the Richter tubes (BP → RT) consumed more at each concentration with the largest intakes occurring with concentrations of 15, 10, and 5%.

The mean quantities of fluid lost due to drippage and evaporation over the 20 day period were 0.55 ml for the Richter tubes and 0.30 ml for the ball-point spouts. The mean losses for each two day period are plotted as a function of concentration in Fig. 1B. The solid line represents the losses from the Richter tubes and the broken line losses from the ball-point spouts.

Although body weight increased during the course of the experiment there were no significant changes of any interest in this context. For example, when ethanol consumption increased there was an associated decrease in daily food intake.

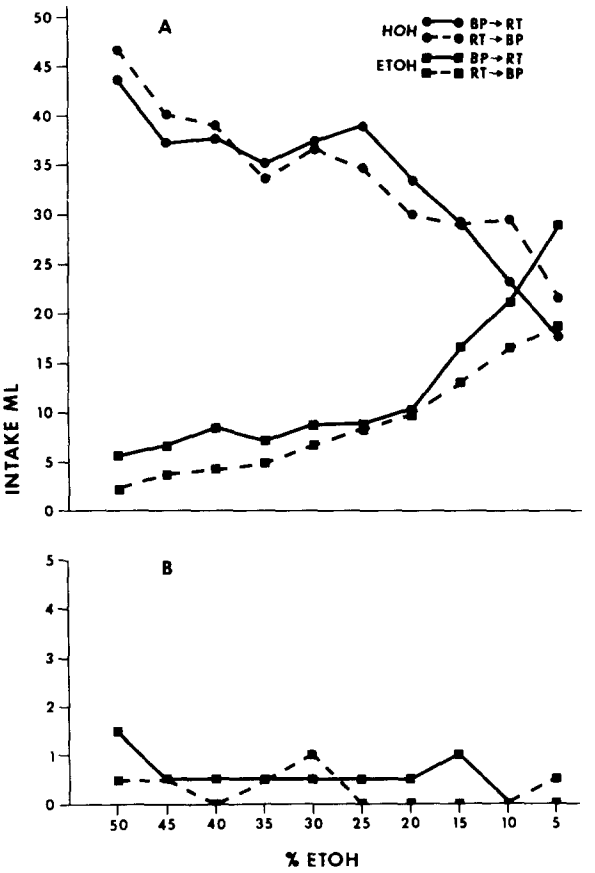

FIG. 1. A. Mean water and ethanol consumption plotted as a function of ethanol concentration for both groups. B. Amount of fluid lost by evaporation and spillage from the RT indicated by a solid line and broken line for the BP. BP = ball-point and RT = Richter tube.

DISCUSSION

These data demonstrate clearly that previous results [2] cannot be attributed to spillage or evaporation from ball-point drinking tubes even for high concentrations of ethanol. There was actually very little difference between the two drinking devices in terms of evaporation and spillage. For the group which drank first from ball-point spouts and was then switched to Richter tubes, more ethanol was consumed at each concentration with the greatest difference occurring at the lowest concentration. Although there seem to be some slight differences between ball-point spouts and Richter tubes in measuring ethanol consumption particularly at low concentrations, both devices are obviously more efficient than valveless drinking tubes [1,2].

REFERENCES

1. Collins, G. R. The relative efficiencies of ball-bearing-equipped drinking tubes and valveless drinking tubes. *Lab. Anim. Sci.* **22:** 507–508, 1972.

2. Wayner, M. J., I. Greenberg, R. Tartaglione, D. Nolley, S. Fraley and A. Cott. A new factor affecting the consumption of ethyl alcohol and other sapid fluids. *Physiol. Behav.* **8:** 345–362, 1972.