BRIEF COMMUNICATION

Preference for Sodium Chloride over Sodium Carbonate by Sodium Deficient Rats

CAROLYN J. LEVY

Psychology Department, State University of New York at Albany, Albany, New York 12222

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LEVY, C. J. Preference for sodium chloride over sodium carbonate by sodium deficient rats. PHYSIOL. BEHAV. 10(4) 829-830, 1973.-During a brief two bottle test sodium deficient rats consumed more of a 0.3 M NaCl than a 0.03 M Na2CO3 solution. It was concluded that the two solutions did not taste highly similar and that the NaCl solution was more palatable than the Na2CO3 solution to sodium deficient rats.

Taste Sodium appetite Sodium chloride Sodium carbonate

MORRISON [1] has concluded that solutions of 0.3 M sodium chloride (NaCl) and 0.03 M sodium carbonate (Na2CO3) taste highly similar to rats, even though the NaCl solution contains five times more sodium ions than does the Na2CO3 solution. This conclusion was based upon a series of three experiments. In the first two experiments it was found that Na2CO3 solutions are more easily discriminated from water than NaCl solutions of equal concentrations. In addition, the relative aversiveness of these salt solutions was found to be a function of their relative discriminability, when postigestional effects were minimized. On the basis of these results it was predicted that solutions of 0.3 M and 0.03 M Na2CO3 would have similar taste properties. This prediction was tested in a one bottle test in which it was found that rats consumed similar amounts of these two solutions on successive days after 23 hr water deprivation.

A one bottle test yields information about the relative acceptability of two (or more) solutions [5]; however, similar acceptability does not necessarily imply similar taste. If 0.3 M NaCl and 0.03 M Na2CO3 solutions do indeed taste highly similar to rats, they should be equally preferred by rats with acute sodium deficiency in a brief two bottle test where the total intake of each solution is presumed to reflect preference. The present study was undertaken to test the above hypothesis.

METHOD

Animals

The animals were 11 naive male hooded rats of the Long-Evans strain (275--330 g), maintained on lab blox and tap water ad lib and housed in an air conditioned animal room.

Apparatus

Testing was carried out in individual home cages and 100 ml graduate cylinders with attached stainless steel drinking spouts were connected to the fronts of the cages.

Procedure

The rats were anesthetized with ether and injected with 2.5 ml of 1.5% formalin subcutaneously on the back to induce a sodium appetite [4]. Immediately following the injection the rats were returned to their home cages which had been washed to remove any traces of sodium. For the next 22--24 hr the rats were allowed ad lib access to deionized water. At the end of this period they were given a 10 min preference test. The procedure for the preference test was as follows: the two solutions (0.3 M NaCl and 0.03 M Na2CO3) were presented separately, in succession (order of presentation and position were counter-balanced across rats) and the rat was allowed to sample each for approximately 5--10 licks. After sampling, both solutions were simultaneously presented to each rat for 10 min. During this period solution intakes and the rat's behavior were recorded.

RESULTS

During the 10 min preference test the rats generally drank in bursts lasting from 30--60 sec with grooming.
occurring between the drinking bursts. Nine of the eleven rats, at some time during the test period, drank some of the \( \text{Na}_2\text{CO}_3 \) solution. Usually after a few licks of the \( \text{Na}_2\text{CO}_3 \) the rats would switch over to the \( \text{NaCl} \) solution. The mean intakes of the \( \text{NaCl} \) and \( \text{Na}_2\text{CO}_3 \) solutions are 5.6 ml and 0.5 ml respectively \((t=10.2, p<0.001)\).

**DISCUSSION**

The results presented above clearly show that sodium deficient rats prefer 0.3 M NaCl to 0.03 M \( \text{Na}_2\text{CO}_3 \) when they are given a choice between the two solutions. Since the preference test was brief, it is unlikely that this preference was the result of learning based upon the restorative benefits of the more concentrated NaCl solution. Indeed, essentially none of the NaCl should have been absorbed from the small intestine during this period of time \((3)\). It is more reasonable to conclude that the two solutions do not taste highly similar and that the NaCl solution is more palatable than the \( \text{Na}_2\text{CO}_3 \) solution to sodium deficient rats.

The results presented here are obviously relevant to the Morrison and Young study \([2]\) in which it was assumed that 0.3 M NaCl and 0.03 M \( \text{Na}_2\text{CO}_3 \) solutions were equally palatable to rats. They reported that two separate groups of sodium deficient rats (given access to either 0.3 M NaCl or 0.03 M \( \text{Na}_2\text{CO}_3 \)) drank similar volumes of the solutions over a 10 hr period even though the NaCl group was ingesting five times more sodium than the \( \text{Na}_2\text{CO}_3 \) group. From these data it was concluded that taste rather than postigestional factors are of primary importance in controlling the amount of sodium consumed by sodium deficient rats. The results presented here strongly suggest that the condition of equal palatability was not met in the Morrison and Young study, and therefore any interpretations of those data should take that possibility into account.

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**REFERENCES**


