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## Dehydration and Ketosis.

EATON M. MACKAY, ARNE N. WICK AND FRANK E. VISSCHER.
*From The Scripps Metabolic Clinic, La Jolla, California.*

The antiketogenic influence of fed protein is well known. This action is presumably dependent upon the excess of antiketogenic metabolites (glucogenic amino acids) over ketogenic metabolites (fatty acid residues from amino acids) which protein may furnish during its catabolism. Mineral acids are antiketogenic when fed[1] and the most reasonable explanation for this in the light of our present knowledge is that more carbohydrate becomes available for oxidation due to the increased rate of protein catabolism induced by the acidosis. The experiments reported here were carried out to determine whether or not the condition of dehydration influences ketosis. Water hunger of such degree that dehydration results has an accelerating influence upon protein catabolism.[2-9]

In Experiment 1 male rats were fasted from the stock diet (Tioga dog pellets), the control groups being allowed water while the dehydration groups received no fluid of any kind. There were 3 rats in each group with an average body weight of 254 g. Twenty-four-hour urine collections were made on each group for the determination of total nitrogen. At the end of every 24-hour period a group of 3 rats from each series was sacrificed for blood ketone[10] and liver glycogen determinations.[11]

Female rats averaging 190 g in weight were used in Experiment 2 in groups of 3. They had been receiving a synthetic diet[12] for some time and were fasted with water allowed *ad lib.* for 48 hours

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TABLE I.

| Hr Fasting | Avg of control groups: *Body wt, g | Urine N, mg/rat/day | †Blood ketone bodies, mg% | Liver glycogen, % | Avg of dehydration groups: *Body wt, g | Urine N, mg/rat/day | †Blood ketone bodies, mg% | Liver glycogen, % |
|---|---|---|---|---|---|---|---|---|
| | | | Experiment 1—Male Rats. | | | | | |
| 24 | 228 | 144 | 5.6 | .04 | 224 | 158 | 5.5 | .04 |
| 48 | 225 | 153 | 9.4 | .18 | 220 | 196 | 8.2 | .25 |
| 72 | 215 | 111 | 8.3 | .38 | 204 | 136 | 4.1 | .67 |
| 96 | 210 | 100 | 6.2 | .80 | 185 | 144 | 3.1 | 1.49 |
| | | | Experiment 2—Female Rats. | | | | | |
| 24‡ | 185 | 73 | 31.3 | .07 | 178 | 82 | 21.6 | .12 |
| 36 | 185 | | 32.9 | .29 | 170 | | 20.3 | .37 |
| 48 | 180 | 63 | 36.8 | .09 | 164 | 77 | 21.1 | .32 |
| 60 | 177 | | 27.9 | .27 | 162 | | 10.8 | .88 |
| 72 | 167 | 68 | 32.5 | .14 | 157 | 140 | 16.5 | .43 |

*When sacrificed.
†As acetone.
‡These fasting periods followed a preliminary fast of 48 hours.

prior to the fasting periods recorded in Table I. Fasting of both groups was continued during the period observations were made. At the beginning of this both groups received 2 cc each of 5% NaCl solution by stomach tube. The dehydration rats were given no other drinking fluid while the controls were allowed water *ad lib.* as usual.

The data summarized in Table I show the usual increase in urine nitrogen excretion with dehydration, a result of the increased protein catabolism. Accompanying this are higher liver glycogen levels, evidence of more available carbohydrate from protein break-down in the dehydrated animals than in the controls. The dehydrated rats have a uniformly lower degree of ketosis as measured by the blood ketone levels than the normally fasting controls. This reduced ketosis is particularly evident where the differences in liver glycogen level from the controls are most definite. It seems reasonable to suppose that the antiketogenic effect of the dehydration is due to the extra carbohydrate provided by the increased protein break-down but there remains the possibility that a general depression in the metabolism of the dehydrated animals may contribute to the reduction in the ketosis level.

*Summary.* Dehydration is antiketogenic when ketosis is measured by the level of ketone bodies in the blood of fasting albino rats. Protein catabolism is increased during dehydration and it is probable that the larger amount of carbohydrate provided by the protein break-down accounts for the antiketogenesis.