EFFECTS OF DIET ON THE PLASMA CHLORIDES AND CHLORIDE EXCRETION IN THE DOG.

BY J. HAROLD AUSTIN AND LEON JONAS.*

(From the William Pepper Laboratory of Clinical Medicine, University of Pennsylvania, Philadelphia.)

(Received for publication, October 17, 1917.)

In the study of the plasma chlorides in a series of nephritics Wolferth (1) recently called attention to the low figures occasionally observed in certain cases. As a rule, this finding was noted in patients who had been for some time upon a chloride-free diet. This observation we (2) have confirmed and have found the plasma chlorides as low as 4.6 gm. per liter in one case of advanced glomerulonephritis, 5 days before death. That this marked depression of the plasma chlorides might be merely the result of a long continued low chloride diet combined with a rather free administration of water seemed to us possible in spite of the well recognized tendency of the blood to maintain constant its inorganic composition. It was observed that in other cases with chronic nephritis, especially those of the so called parenchymatous type, which exhibited a tendency to elevation of the plasma chlorides, even a prolonged period of low salt diet did not bring the plasma chlorides below normal or often even to the normal figure. These, however, do not afford satisfactory evidence of the effect of a continued low chloride diet on the plasma in other diseases of the kidneys or when the kidneys are normal.

In order to obtain some data upon the point the following experiments were carried out upon dogs. The animals were placed upon one of three diets; an ordinary diet, a diet with a high sodium chloride content, or a diet poor in sodium chloride and with a free administration of distilled water. After a vari-

* Woodward Fellow in Physiological Chemistry, William Pepper Laboratory of Clinical Medicine, University of Pennsylvania.
able number of days upon the diet, a period of from 20 to 24 hours was allowed to elapse after the last feeding and the dog was then catheterized and given 100 cc. of distilled water by stomach tube to promote diuresis. About 35 minutes later blood was taken from the jugular vein for chloride analysis, and about 70 minutes after the first catheterization the animal was catheterized again and the concentration of chlorides in the urine determined.

The rate of excretion of chlorides was calculated for a 24 hour period on the basis of the excretion during the interval between the catheterizations. This portion of each experiment is designated in the protocols and table by the letter "A" following the number of the experiment. The series of "A" experiments shows the condition of the plasma chlorides and of the chloride excretion as a result of the continued use of the various diets. The main object of this part of the investigation was to determine whether following several days upon a low chloride diet the plasma chlorides would be found at a lower level than following a period on ordinary diet, and also to determine whether following a series of days on high chloride diet the plasma chlorides would be found increased, and if so whether with or without an increased rate of chloride excretion in the urine. In order to determine whether any injury to the general renal function resulted from the high salt diet, blood urea was determined in certain of the experiments and the figures were considered as evidence of the general renal functional integrity.

In order to test the immediate effect of a large dose of sodium chloride upon the plasma and upon the chloride excretion a second procedure designated "B" in the protocols and table was carried out in many of the experiments. Immediately upon completion of part "A" of the experiment 10 gm. of sodium chloride in two doses an hour apart were given by stomach tube in 5 per cent solution. Immediately after the second dose a period of urinatory collection was instituted as in "A" and blood again taken for analysis in the middle of this period.

In these experiments can be noted: first, the relation between the increase in the plasma chlorides and the increase in the chloride excretion resulting from the administration of the sodium chloride; second, the effect of the previous dietary régime upon this response to the dose of chloride.
In two instances on the day following the administration of the 10 gm. of sodium chloride just described a third period of urinary collection with collection of blood was carried out to determine whether any effect of the large dose of chloride still persisted 24 hours later, either in the plasma or in the rate of chloride excretion. This part of the experiment is designated in the protocols and table as "C."

In Experiment 4, Dog I, the effect of a mild uranium nephritis in an animal on a medium chloride diet was studied for comparison with the effect of high salt feeding.

**Methods.**

_Urine._—The chlorides were estimated by the Volhard-Harvey method (3). The concentration is indicated in the protocols and table as gm. of sodium chloride per liter of urine under "E." The rate of chloride excretion is expressed as gm. of sodium per 24 hours, calculated from the excretion in the number of minutes of urinary collection employed in each experiment; this rate of excretion is given in the protocols and table as "D."

_Blood._—Blood was drawn from the jugular vein directly into a centrifuge tube containing potassium oxalate crystals beneath paraffin oil, centrifuged immediately, and the plasma pipetted from the cells (4). In the plasma so obtained chlorides were estimated by the method of McLean and Van Slyke (5). The figures are given under "N" as gm. of sodium chloride per liter of plasma.

Blood urea nitrogen was estimated on the whole blood by the method of Van Slyke and Cullen (6). The figures given are mg. of blood urea nitrogen per 100 cc. of blood. In some of the experiments blood was also drawn from the vein, allowed to clot, centrifuged, and the serum used for the estimation of electrical conductivity. Decinormal potassium chloride solution was used as a standard and determinations were made at 25°C. The specific conductivity is given under "X."

In all analyses duplicate determinations were made.

**RESULTS.**

The results of the fourteen experiments on the three dogs are given in the table. The detailed protocols are appended.

It will be noted that on the same ordinary régime the three dogs differed somewhat in the level of plasma chlorides; Dog I showing the highest, 6.3 gm. per liter, and Dog II the lowest, 5.9 gm. The chloride excretion in all three was small.
On a high salt diet consisting of ordinary diet plus from 5 to 10 gm. of sodium chloride daily continued from 4 to 13 days Dogs I and III showed a definite, although in the case of Dog III a very slight, increase in the level of the plasma chlorides. The study of the blood and urine was made the day following the last feeding and last dose of chloride. The urinary excretion of chloride was still definitely increased in Dog III but was normal in Dog I. Dog II developed a marked diarrhea as soon as the chloride high diet was commenced and this probably accounts for the absence of any increase in the chloride excretion and for the very slight degree of change in the plasma chlorides the day following the last dose of chloride.

In Experiment 14, 48 hours were allowed to elapse between the last dose of chloride and the study of the blood and urine, and this interval proved sufficient to allow a return of the plasma chlorides and chloride excretion to normal, in spite of the fact that the dog had received 7.5 gm. of added sodium chloride daily for 20 consecutive days.

It seems, therefore, that such increases in the plasma chlorides and chloride excretion as were observed in "A" group of experiments 24 hours after the last day of high chloride diet represent merely the persistence of the acute disturbance of these factors which follow each administration of chloride as shown in the "B" group of experiments about to be discussed and which may be seen persisting into the following day in Experiment 7, "C." There is no evidence that the continued use of a high chloride diet leads to a permanent or stable increase in the plasma chlorides or to an elevation of the chloride threshold.

The use of a low chloride diet combined with a free flushing with distilled water failed to reduce the level of the plasma chlorides below normal. In no case were we able to reduce the plasma chlorides below the original level observed in that animal. The same constancy was observed in the electrical conductivity of the serum. These experiments indicate, therefore, that in those cases of clinical nephritis, in which following the use of a low chloride diet the plasma chlorides fall distinctly below normal, this depression of the plasma chlorides is evidence of disease and not merely a consequence of the patient's régime.

In the "B" group of experiments we studied the immediate
effect of administration of 10 gm. of sodium chloride by the stomach in two doses an hour apart upon the plasma chlorides, electrical conductivity of the serum, and rate of chloride excretion. A marked rise in the plasma chlorides resulted, amounting to from 0.5 to 1 gm. per liter. This was associated with a markedly increased chloride output in the urine. Inspection of the table shows that no formula could be applied which would express the relations between the increases in these two factors either with or without inclusion of the urinary chloride concentration in the formula. In Dog I the highest chloride output, absolute and percentile, was associated with the lowest plasma chloride observed in this animal in any of the examinations immediately after chloride administration.

The electrical conductivity of the serum exhibited an increase about commensurate with that of the plasma chlorides. In Dog III, Experiment 7, when the dog had been on a diet of moderate chloride content neither the plasma nor the urinary excretion had returned to normal on the day following the administration of 10 gm. of sodium chloride (Experiment 7, "C"). In Experiment 9, however, when the dog had been on a low chloride diet, the plasma chlorides had returned to normal the day following the administration of 10 gm. of sodium chloride, although the urine still showed a somewhat increased output.

In Experiment 4, in which the effect of a mild uranium nephritis was studied, the elevation of the plasma chlorides on an ordinary diet was very marked and the chloride excretion poor. Following the administration of 10 gm. of sodium chloride by stomach, although only a moderate increase occurred in the plasma chlorides, they reached the highest figure observed in any of these experiments, but almost no response resulted in the urinary chloride excretion. The behavior of the kidney in this experiment can clearly not be interpreted as due merely to the elevation of its threshold for chlorides as the result of the nephritis. Obviously in this experiment a given increment in the level of the plasma chlorides excited much less increase in the rate of the chloride excretion than was the case in the other experiments in which the kidneys were normal.

McLean (7) has shown that in the normal animal the chloride threshold is constant and that a definite rise in plasma chlorides
provokes an increment in urinary excretion proportional to the square of the rise. The constancy of this threshold even under a prolonged régime of extremely high or extremely low chloride diet is again demonstrated in our experiments. In the pathological kidney, however, there may be either an alteration in the threshold or a disturbance in the degree of renal response to increments in the plasma chlorides above the threshold. Because of these two variables interpretation of the significance of alterations in the chloride index in pathological cases is complicated.

PROTOCOLS.

**Dog I.**—Female, weight 14 kilos.

*Experiment 1.*—Ordinary diet. On a mixed diet of table scraps. Water *ad libitum.*

*Experiment 1 A.*—No food or water since previous day.

Sept. 28, 11.40 a.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 12.15 p.m. Bled 12 cc. 12.40 p.m. Catheterized. Only 1 cc. of urine obtained. Given 100 cc. of distilled water. 1.55 p.m. Catheterized. 160 cc. of urine (135 minutes). N, 6.3; D, 0.85; E, 0.5.

*Experiment 1 B.*—Sept. 28, 1.55 p.m. Given 100 cc. of 3 per cent sodium chloride solution by stomach tube. 3.00 p.m. Given 100 cc. of 5 per cent sodium chloride solution by stomach tube. Catheterized. 3.25 p.m. Bled 24 cc. 4.20 p.m. Catheterized. 135 cc. of urine (80 minutes). N, 7.3; D, 34.5; E, 14.2.

*Experiment 2.*—High salt diet. Dog placed for 5 days (Sept. 20 to Oct. 3) on a diet of milk, 1 quart, and one dog biscuit each day. In addition given each day (except Oct. 2) 150 cc. of 5 per cent sodium chloride solution by stomach tube. Water *ad libitum.*

*Experiment 2 A.*—No food, water, or salt since previous day.

Oct. 4, 2.45 p.m. Catheterized. Given 90 cc. of distilled water by stomach tube. 3.18 p.m. Bled 24 cc. 3.45 p.m. Catheterized. 15 cc. of urine (60 minutes). N, 6.7; D, 0.36; E, 1.

*Experiment 2 B.*—Oct. 4, 3.45 p.m. Given 95 cc. of 5 per cent sodium chloride solution by stomach tube. 4.43 p.m. Same dose of sodium chloride repeated. Catheterized. 5.20 p.m. Bled 24 cc. 5.45 p.m. Catheterized. 140 cc. of urine (62 minutes). N, 7.4; D, 49.5; E, 15.2.

*Experiment 3.*—Low salt diet. For 10 days (Oct. 18 to Oct. 27) on a low salt diet. (Milk, 1 quart, and dried salt-free bread.) In addition given each day 150 cc. of distilled water by stomach tube.

*Experiment 3 A.*—No food or water since previous day.

Oct. 28, 9.45 a.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 11.20 a.m. Bled 16 cc. 10.50 a.m. Catheterized. 12 cc. of urine (65 minutes). N, 6.3; D, 0.1; E, 0.4.
Experiment 3 B.—Oct. 28, 10.50 a.m. Given 100 cc. of 5 per cent sodium chloride solution by stomach tube. 11.55 a.m. Same dose of sodium chloride repeated. Catheterized. 12.30 p.m. Bled 20 cc. 1.05 p.m. Catheterized. 167 cc. of urine (70 minutes). N, 6.8; D, 53.3; E, 15.5.

Experiment 4.—Uranium nephritis. For 5 days (Oct. 29 to Nov. 3) on diet of milk, 1 quart, and one dog biscuit daily. Water ad libitum.

Oct. 30. Given uranium nitrate, 0.02 gm. subcutaneously.

Nov. 4. Shows a moderate cloud of albumin in urine.

Experiment 4 A.—No food or water since previous day.

Nov. 4, 12.03 p.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 12.37 p.m. Bled 12 cc. 1.25 p.m. Catheterized. 25 cc. of urine (82 minutes). N, 7.4; D, 0.13; E, 0.3.

Experiment 4 B.—Nov. 4, 1.25 p.m. Given 100 cc. of 5 per cent sodium chloride solution by stomach tube. 2.32 p.m. Same dose of sodium chloride repeated. Catheterized. 3.10 p.m. Bled 24 cc. 3.42 p.m. Catheterized. 35 cc. of urine (70 minutes). N, 7.7; D, 0.78; E, 1.04; blood urea N, 39.

Dog II.—Female, weight 16 kilos.

Experiment 5.—Ordinary diet. Diet of milk, 1 quart, and one dog biscuit daily beginning Dec. 27. Water ad libitum.

Experiment 5 A.—No food or water since previous day. Dec. 29, 11.07 a.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 11.52 a.m. Bled 25 cc. 12.25 p.m. Catheterized. 25 cc. of urine (78 minutes). N, 5.9; D, 0.67; E, 1.46; X, 0.0129; blood urea N, 14.

Experiment 5 B.—Dec. 29, 12.25 p.m. Given 100 cc. of 5 per cent sodium chloride solution by stomach tube. 1.50 p.m. Same dose of sodium chloride repeated. Catheterized. 2.32 p.m. Bled 35 cc. 3.10 p.m. Catheterized. 50 cc. of urine (80 minutes). N, 6.7; D, 17.1; E, 16.1; X, 0.0142.

Experiment 6.—High salt diet. Dog continued on the same diet of milk and dog biscuit. For 4 days (Jan. 2 to 5) received in addition sodium chloride as follows: Jan. 2 and 3, 130 cc. of 5 per cent sodium chloride solution by stomach tube; Jan. 4 and 5, 200 cc. of same. Water ad libitum. Diarrhea beginning Jan. 3.

Experiment 6 A.—No food, water, or salt since previous day.

Jan. 6, 11.00 a.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 11.35 a.m. Bled 30 cc. 12.25 p.m. Catheterized. 9.5 cc. of urine (85 minutes). N, 6.0; D, 0.56; E, 3.5; blood urea N, 10.

Dog III.—Female, weight 14 kilos.

Experiment 7.—Ordinary diet. Placed on a diet of milk, 1 quart, and one dog biscuit, beginning Dec. 27. Water ad libitum.

Experiment 7 A.—No food or water since previous day.

Jan. 2, 11.40 a.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 12.25 p.m. Bled 20 cc. 1.10 p.m. Catheterized. 5 cc. of urine (90 minutes). N, 6.0; D, 0.1; E, 1.2; X, 0.0132.
Plasma Chlorides and Chloride Excretion

**Experiment 7 B.**—Jan. 2, 1.10 p.m. Given 100 cc. of 5 per cent sodium chloride solution by stomach tube. 3.00 p.m. Same dose of sodium chloride repeated. Catheterized. 3.35 p.m. Bled 30 cc. 4.10 p.m. Catheterized. 32 cc. of urine (70 minutes). X, 7.0; D, 14.6; E, 22.1; X, 0.0147; blood urea N, 10.

**Experiment 7 C.**—Received milk, 1 quart, one dog biscuit, and water ad libitum at 4.30 p.m. on Jan. 2. No further food or water.

Jan. 3, 10.20 a.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 11.30 a.m. Bled 12 cc. 12.20 p.m. Catheterized. 76 cc. of urine (120 minutes). N, 6.3; D, 21.5; E, 23.6.

**Experiment 8.**—High salt diet. In addition to diet of milk and dog biscuit as above, received daily 100 cc. of 5 per cent sodium chloride solution by stomach tube. Jan. 3 to 12. Water ad libitum.

**Experiment 8 A.**—Jan. 13. No food or water. 2.18 p.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 2.50 p.m. Bled 30 cc. 3.22 p.m. Catheterized. 23 cc. of urine (66 minutes). N, 6.2; D, 2.8; E, 5.7; X, 0.0138.

**Experiment 8 B.**—Jan. 13, 3.22 p.m. Given 100 cc. of 5 per cent sodium chloride solution by stomach tube. 4.05 p.m. Same dose of sodium chloride repeated. Catheterized. 4.32 p.m. Bled 20 cc. 5.20 p.m. Catheterized. 73 cc. of urine (75 minutes). N, 7.2; D, 27; E, 19.3; X, 0.0148.

**Experiment 9.**—Low salt diet. For 8 days (Jan. 18 to 25) given daily milk, 1 quart, and dried salt-free bread. In addition given daily 200 cc. of distilled water by stomach tube. Water ad libitum, but not taken.

**Experiment 9 A.**—No food or water since previous day.

Jan. 26, 1.32 p.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 2.05 p.m. Bled 30 cc. 2.35 p.m. Catheterized. 9 cc. of urine (63 minutes). N, 6.1; D, 0.4; E, 2.1; blood urea N, 10.

**Experiment 9 B.**—Jan. 26, 2.35 p.m. Given 100 cc. of 5 per cent sodium chloride solution by stomach tube. 3.35 p.m. Same dose of sodium chloride repeated. Catheterized. 3.55 p.m. Bled 20 cc. 4.45 p.m. Catheterized. 90 cc. of urine (80 minutes). N, 7.0; D, 25.3; E, 15.6.

**Experiment 9 C.**—Received milk, 1 quart, and salt-free bread at 5 p.m., Jan. 26. Water ad libitum. No further food or water.

Jan. 27, 9.35 a.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 10.15 a.m. Bled 20 cc. 10.45 a.m. Catheterized. 27 cc. of urine (70 minutes). N, 6.0; D, 1.2; E, 2.1.

**Experiment 10.**—Low salt diet. Same diet and distilled water as in Experiment 9 (Jan. 27 to Feb. 2).

**Experiment 10 A.**—No food or water since previous day.

Feb. 3, 2.42 p.m. Bled (No. 1) 20 cc. Catheterized. Given 100 cc. of distilled water by stomach tube. 3.30 p.m. Bled (No. 2) 30 cc. 4.07 p.m. Catheterized. 42 cc. of urine (85 minutes). No. 1: N, 6.1; X, 0.0133. No. 2: N, 6.0; D, 0.3; E, 0.4; X, 0.0132.

**Experiment 11.**—Low salt diet. Same diet and distilled water as in Experiments 9 and 10 (Feb. 5 to 11).
<table>
<thead>
<tr>
<th>Dog.</th>
<th>Experiment No.</th>
<th>Diet.</th>
<th>No. of days on diet</th>
<th>A. Before chloride administration</th>
<th>Blood urea N.</th>
<th>B. After chloride administration</th>
<th>C. 24 hrs. later</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N.</td>
<td>D.</td>
<td>E.</td>
<td>X.</td>
</tr>
<tr>
<td>I</td>
<td>1</td>
<td>Ordinary</td>
<td></td>
<td>6.3</td>
<td>0.35</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>High salt</td>
<td>5</td>
<td>6.7</td>
<td>0.36</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Low &quot;</td>
<td>0</td>
<td>6.3</td>
<td>0.10</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Uranium</td>
<td>5</td>
<td>7.4</td>
<td>0.13</td>
<td>0.3</td>
<td>39</td>
</tr>
<tr>
<td>II</td>
<td>5</td>
<td>Ordinary</td>
<td></td>
<td>5.9</td>
<td>0.67</td>
<td>1.46</td>
<td>0.0129</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>High salt</td>
<td>4</td>
<td>6.0</td>
<td>0.56</td>
<td>3.5</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(diarrhea)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| III  | 7              | Ordinary      |                     | 6.0 | 0.10 | 1.2 | 0.0132 | 7.0 | 14.5 | 22.1 | 0.0147 | 6.3 | 21.5 | 23.6 |-
|      | 8              | High salt     | 10                  | 6.2 | 2.80 | 5.7 | 0.0133 | 7.2 | 27.0 | 19.3 | 0.0148 |    |    |    |
|      | 9              | Low "         | 8                   | 6.1 | 0.40 | 2.1 | -- | 7.0 | 25.3 | 15.6 | -- | 6.0 | 1.2 | 2.1 |
|      | 10             | "             | 7                   | 6.0 | 0.30 | 0.4 | 0.0132 | -- | -- | -- | -- | -- | -- |    |
|      | 11             | "             | 7                   | 6.2 | 0.60 | 1.2 | 0.0135 | 14 | -- | -- | -- | -- | -- |    |
|      | 12             | "             | 8                   | 6.2 | 0.36 | 0.6 | 0.0133 | -- | -- | -- | -- | -- | -- |    |
|      | 13             | High "        | 13                  | 6.35 | 1.50 | 5.8 | 0.0134 | 14 | -- | -- | -- | -- | -- |    |
|      | 14             | "             | 6                   | 6.2 | 0.50 | 0.7 | -- | 13 | -- | -- | -- | -- | -- |    |

N = gm. of sodium chloride per liter of plasma.
D = " " " " " " day in urine (calculated).
E = " " " " " " liter in urine.
X = Specific conductivity of serum.
Experiment 11 A.—No food or water since previous day.
Feb. 12, 3.00 p.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 3.45 p.m. Bled 30 cc. 4.30 p.m. Catheterized. 30 cc. of urine (90 minutes). N, 6.2; D, 0.6; E, 1.2; X, 0.0133; blood urea N, 14.

Experiment 12.—Low salt diet. Same diet and distilled water as in Experiments 9, 10, and 11 (Feb. 13 to 20).
Feb. 21. 3.12 p.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 3.52 p.m. Bled 25 cc. 4.37 p.m. Catheterized. 37 cc. of urine (85 minutes). N, 6.2; D, 0.36; E, 0.6; X, 0.0133.

Experiment 13.—High salt diet. Dog placed 13 days (Feb. 28 to Mar. 12) on milk, 1 quart, and one dog biscuit daily. Given 150 cc. of 5 per cent sodium chloride solution daily by stomach tube. Water ad libitum.
Mar. 13, 3.25 p.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 4.05 p.m. Bled 30 cc. 4.40 p.m. Catheterized. 13 cc. of urine (75 minutes). N, 6.35; D, 1.5; E, 5.8; X, 0.0134, blood urea N, 14.

Experiment 14.—High salt diet. Same diet and sodium chloride as in Experiment 13 (Mar. 14 to 19). Same diet, no sodium chloride, Mar. 20.
Mar. 21, 2.00 p.m. Catheterized. Given 100 cc. of distilled water by stomach tube. 2.35 p.m. Bled 30 cc. 3.05 p.m. Catheterized. 32 cc. of urine (65 minutes). N, 6.2; D, 0.5; E, 0.7; blood urea N, 13.

CONCLUSIONS.

1. The level of plasma sodium chloride 24 hours after feeding varied in three dogs from 5.9 to 6.3 gm. per liter, but was quite constant for any one animal.

2. By administering large amounts of sodium chloride in solution by stomach tube, the level of the plasma chlorides can be raised in the dog within 1½ hours, 1 gm. per liter. The return to the previous level occurs within from 24 to 48 hours.

3. It is not possible to raise the level of the plasma chlorides other than in this transient manner by a prolonged régime on a high chloride diet, or to lower the plasma chlorides below the normal level even by a prolonged régime on a very low chloride diet.

4. In certain nephritic animals with impaired chloride excretion, whatever may be the hypothetical chloride threshold, a given increment in the plasma chloride concentration excites less increment in the rate of chloride excretion than it would in a normal animal.


EFFECTS OF DIET ON THE PLASMA CHLORIDES AND CHLORIDE EXCRETION IN THE DOG
J. Harold Austin and Leon Jonas


Access the most updated version of this article at http://www.jbc.org/content/33/1/91.citation

Alerts:
- When this article is cited
- When a correction for this article is posted

Click here to choose from all of JBC's e-mail alerts

This article cites 0 references, 0 of which can be accessed free at http://www.jbc.org/content/33/1/91.citation.full.html #ref-list-1