Studies in the Gastric Juice.

I.

Relation of Lack of Chlorids in the Animal Body to Hydrochloric Acid of the Gastric Juice.

By

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It is almost a truism to say that, when lack of chlorids occurs in the animal organism, it will restrain the production of hydrochloric acid of the stomach. But, their quantitative relation could be elucidated only by means of the most accurate investigations. Thus the early experiments, as made by Cahn[1], quoted in most text-books even now as the most trustworthy, must be considered not to be of much practical importance.

Rosemann[2], putting Cahn's report to the test, found that it was fundamentally defective. Putting aside that it has much to be desired from the present view of gastric secretion, the dog he experimented with did not actually lack chlorids, at least to a degree of manifesting any marked influence. Upon this, Rosemann experimented anew on this subject with dogs having gastric fistula. He believed that he was able to establish the fact that lack of chlorids in the animal body would cause serious gastro-intestinal disturbances, besides the decrease of the amount and the acidity of the gastric juice.

While engaged in other researches, I have gained various experiences bearing upon this problem, which differ in many points from the early statements. So, I shall present the main results in the following pages.

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1) A. Cahn, Zeitschr. f. physiol. Chem., **10** (1886), 522.

2) R. Rosemann, Arch. f. d. ges. Physiol., **118** (1907), 467; **142** (1911), 208.

Experimental.

Reduction of chlorids in the body.

The present observation was conducted on a dog which had the Pawlow's small stomach. To reduce chlorids in the body, the most convenient method is, of course, to drive out all the secreted gastric juice by means of shamfeeding, as recommended by Rosemann. Yet, if this method be resorted to, chlorids will diminish too rapidly, which will be very injurious to the animal. To get rid of these inconveniences for my purpose, I adopted the usual method of diminishing chlorids by means of a fixed allowance of food and a repeated administration of potassium nitrate.

Removal of chlorids of meat.

The ordinary method of removing chlorids from meat is to boil it with water. After I had, too, used that method in the earlier days of the experiment, I came to the conclusion that it was not appropriate. To be more exact, beef to be fed was boiled with distilled water more than ten times, not infrequently over twenty times. But, for all that, it was found that there always remained 0·020–0·024 per cent of chlorin.

From the following test it will be more clearly seen that the desalination by means of boiling is very difficult and requires a very troublesome procedure.

350 grms. of meat poor in fat were cut in pieces, added from 500 to 700 c.c. of water, and boiled for 30 minutes each time. It was only after water was renewed for the seventh time, that any chlorin reaction could not be determined; a portion of the meat then ashed and analyzed; there was found yet 0·045% Cl. Then water was renewed and boiled ten times more. In the meat thus boiled seventeen times in all, water being renewed each time, there remained still 0·012% Cl.

Table I.

Time of boiling	0	7	12	17
Chlorin content in meat %	0·070	0·045	0·015	0·012
Remark	After the seventh time of boiling, any chlorin reaction could not be detected in water.			

Not only is it difficult to try to remove chlorids from meat by boiling, but fats and extractive substances will disappear also; its smell, too, will be changed. Since he was fed on such meat, even when extrakt of meat, cane-sugar, lard, etc. were added, the animal came to refuse it more and more. As his appetite decreased, the gastric secretion diminished also. The former authors seem to have misconcluded such absence of appetite caused by a disagreeable diet, and such decrease of gastric secretion caused by the absence of appetite, to be the effect of lack of the salt.

The method of desalination without boiling.

Ultimately, a method of removing salt without boiling was devised, for it was supposed that one source of the difficulty of desalination by boiling was due to the coagulation of protein.

The method is as follows.

It is to add water to hashed meat, and, after a good shaking for from half to an hour, to filter through cloth and then to press out moderately. This procedure is repeated twice; it is washed three times in all at room-temperature.

This method, compared with the boiling one, not only saves trouble and time, but is far more effectual. Since this method was adopted, chlorin in beef used as food has become very little and nearly constant, oscillating between 0·006–0·009 per cent. Chlorin in the flesh thus washed only three times is about half of that in the flesh boiled seventeen times. The advantage of this method is that, besides its greater effectuality of desalination, the loss of fats is very little, and the meat smells as before, only its bloody color being lost. The dog was given for two months meat prepared in this manner, without his ever refusing it. Making use of this method, I have been enabled to remove obstructions in the way of the experiment, owing to unpalatable diet.

If one try to remove chlorids from diet by boiling or washing, all the mineral constituents will surely be removed simultaneously. Accordingly, an animal fed on such meat will surely be pressed by the so-called "salt hunger." On that account the meat will not be fitted for the purpose of investigating the effect of lack of chlorids only. Much less fitted is the boiled meat, for it is much changed in its constituents and quality. I have paid particular attention to this point, and added to salt-free meat used as food cane-sugar or starch,

lard and a mixture* of salts described below. Attention was given, too, to the supply of a sufficient number of calories. Besides, the dog received daily several hundred cubic centimeters of water.

Mixture of salts.

Potassium biphosphate	8·0 grms.
Sodium sulphate	4·0 grms.
Calcium lactate	0·4 grms.
Potassium acetate	1·0 grms.
Magnesium biphosphate	0·2 grms.
Distilled water	1000·0 c.c.

Afterwards, as to this view-point, I found only a proposition made by Jacobson[1], to the effect that, in prescribing diet poor in salt for superacidity, one should take this into consideration. Yet, as for desalination, he adhered, like the rest, to the conventional method of boiling.

Condition of the dog during experiment.

The dog weighing 18 kilos was fed on chlorin-free diet for sixty days. Notwithstanding that he always ate it up eagerly, except when some particular cause prevented it, he so wasted by degrees that he weighed only 14 kilos at the end. The liveliness left him gradually, and sleekness disappeared from the hair. Towards the end, the motion grew inert and slack, the respiration counted eight per minute, the appetite decreased, and the gait became a little staggering. Owing, apparently, to the distilled water given, he did not feel thirsty. The urine, which measured several hundred cubic centimeters daily, had an acid reaction and density of 1·025–1·032. Protein or sugar was not even once detected in it. The stool was regular, solid feces excreted once in every two or three days. No case of vomiting and diarrhea ever occurred.

On the fourth day after the completion of the experiment, the dog lost his life by an accident. I left him entirely to himself by way of relief after the fatigue of a prolonged experiment. But this very liberty caused his abdomen to get wet with the secretion of the small stomach. The dog, feeling itchy, scratched that part, with the result that he got large lacerated wound which caused his death. At autopsy, it was noted that it was mainly adipose tissue and muscles

* About 80 c.c. per day.

1) E. Jacobson, Jl. of americ. med. assoc., **69** (1917), 1767.

that had wasted; and the spleen especially was abnormally small. *Any trace of hemorrhage in the digestive tract was not noticed.*

The amount of chlorin lost.

Chlorin of the whole body. In order to ascertain the chlorin balances, food on the one side, and the secretion of the small stomach and urine on the other, were analyzed daily. The estimation of chlorin was made by the Volhard's method, after incineration with a mixture of soda and lime (4:1). The analysis of the feces was not made, for we know that only the slightest possible trace of chlorin was eliminated through them. The results are summarized in the subjoined Table II.

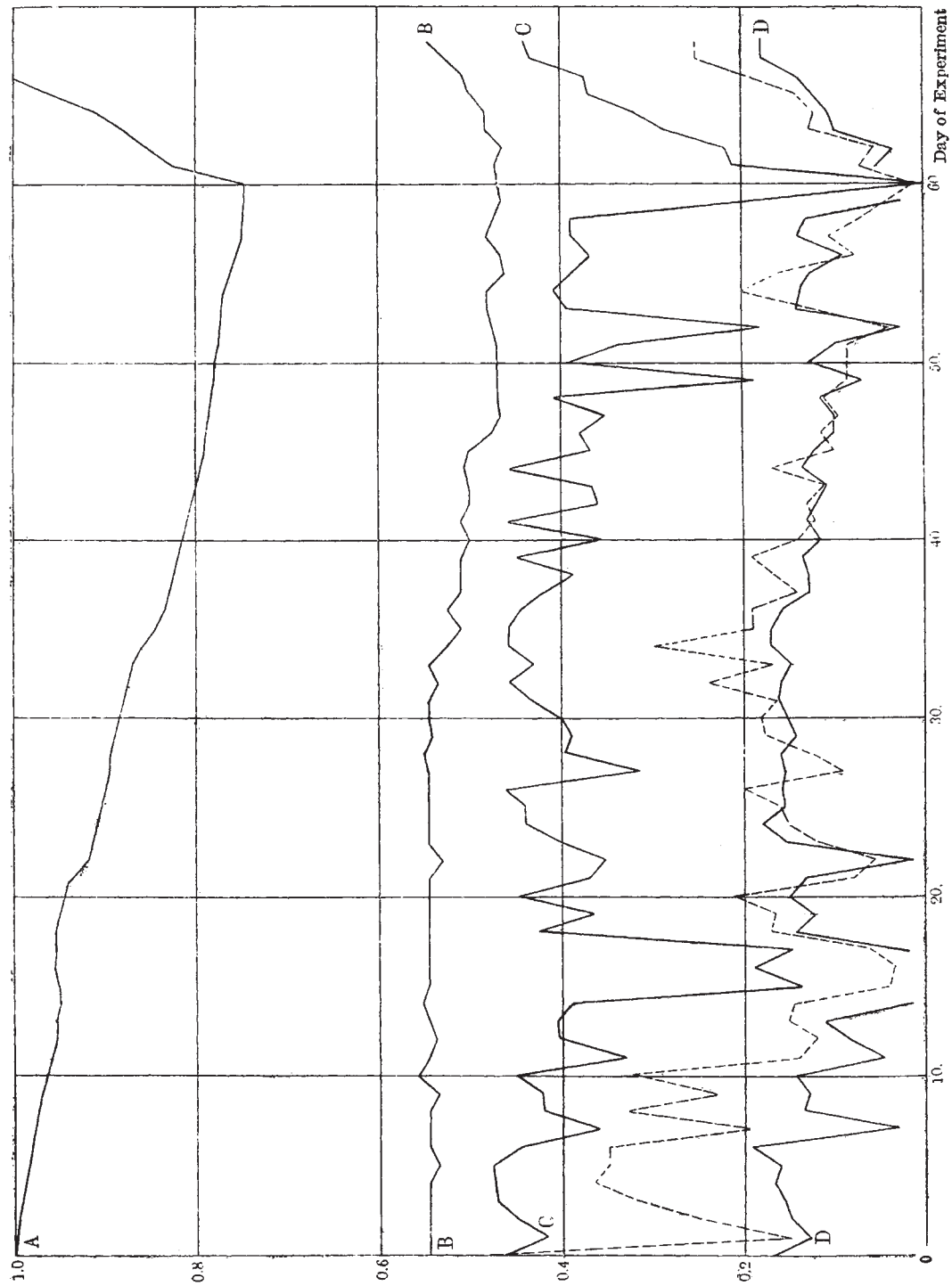
TABLE II.

Day of experiment	KNO_3 given	Gastric juice				Urine		Total Cl intake	Total Cl output	Loss of Cl
		Volume	P_H	Cl in total HCl	Total Cl	Volume	Total Cl			
	grms.	c.c.		%	%	c.c.	grms.	grms.	grms.	grms.
Normal	—	47·0	0·78	0·457	0·545	—	—	—	—	—
1	—	15·0	0·89	0·414	0·545	—	—	0·1171	0·1303	0·0232
2	—	25·0	0·83	0·448	0·545	—	—	0·1080	0·1849	0·0769
3	—	32·0	0·81	0·469	0.545	—	—	0·1080	0·2230	0·1150
4	—	37·0	0·78	0·474	0.545	500	0·0455	0·1080	0·2473	0·1393
5	—	35·0	0·80	0·475	0·533	525	0·0509	0·1236	0·2418	0·1182
6	—	35·0	0·72	0·448	0·545	435	0·0422	0·1236	0·2331	0·1095
7	—	19·0	1·50	0·359	0·545	290	0·0264	0·0848	0·1300	0·0452
8	—	33·0	0·87	0·421	0·545	560	0·0339	0·0848	0·2139	0·1291
9	—	23·0	0·98	0·423	0·533	465	0·0422	0·0848	0·1649	0·0801
10	—	32·0	0·84	0·449	0·576	610	0·0433	0·0848	0·2275	0·1427
11	—	14·0	1·35	0·330	0·545	655	0·0556	0·0969	0·1320	0·0351
12	—	12·0	1·09	0·407	0·533	215	0·0279	0·0969	0·0919	(+0·0050)
13	—	15·0	0·95	0·412	0·545	255	0·0292	0·0485	0·1110	0·0625
14	—	14·6	1·84	0·392	0·561	190	0·0403	0·0969	0·1221	0·0252
15	—	4·0	—	0·137	0·545	275	0·0250	0·0969	0·0468	(+0·0501)
16?	—	3·5	—	0·187	0·545	150	0·0134	0	0·0325	0·0325
17	—	6·5	1·62	0·146	0·545	220	0·0100	0·0606	0·0455	(+0·0151)
18	—	17·0	0·85	0·428	0·545	350	0·0212	0·0158	0·1139	0·0981
19	—	16·6	0·92	0·363	0·545	465	0·0141	0·0158	0·0764	0·0606
20	—	21·0	0·83	0·447	0·545	545	0·0165	0·0158	0·1310	0·1152
21*	—	8·0	0·89	0·370	0·545	167	0·0190	?	0·5486	0·5486
22	—	5·5	1·84	0·353	0·515	195	0·0177	0·0327	0·0477	0·0150
23	—	12·6	0·82	0·402	0·545	510	0·0216	0·0327	0·0903	0·0576
24	—	15·0	0·75	0·439	0·545	472	0·0215	0·0180	0·1033	0·0853
25	—	16·0	0·81	0·441	0·545	275	0·0067	0·0180	0·0940	0·0760

Day of experiment	KNO_3 given	Gastric juice				Urine		Total Cl intake	Total Cl output	Loss of Cl
		Volume	P_H	Cl in total HCl	Total Cl	Volume	Total Cl			
	grms.	c.c.		%	%	c.c.	grms.	grms.	grms.	grms.
26	—	20·0	0·80	0·460	0·545	575	0·0175	0 0180	0·1266	0·1086
27	—	9·5	0·98	0·314	0·545	635	0·0192	0·0158	0·0710	0·0552
28	—	13·0	0·80	0·395	0·551	545	0·0165	0·0180	0·0882	0·0702
29	—	18·0	0·84	0·389	0·539	565	0·0137	0·0180	0·1109	0·0929
30	—	18·0	0·82	0·408	0·545	440	0·0107	0·0180	0·1089	0·0909
31	3·0	17·0	0·78	0·432	0·545	470	0·0256	0·0342	0·1183	0·0841
32	5·0	24·5	0·79	0·456	0·527	585	0·0922	0·0180	0·2214	0·2034
33	6·0	16·5	0·83	0·431	0·545	505	0·1102	0 0121	0·2002	0·1881
34**	6·0	30·2	0·77	0·458	0·521	570	0·1244	0·0121	0·2808	0·2687
35**	3·0	19·2	0·77	0·458	0·509	530	0·0771	0·0121	0·1748	0·1627
36	—	19·0	0·80	0·445	0·527	315	0·0229	0·0121	0·1231	0·1110
37	—	14·0	0·89	0·421	0·509	365	0·0244	0·0180	0·0957	0·0777
38	—	17·0	0·89	0·387	0·509	510	0·0296	0·0180	0·1161	0·0981
39	—	19·0	0·87	0·448	0·509	515	0·0437	0·0180	0·1404	0·1224
40	—	14·3	0·94	0·357	0·503	555	0·0218	0·0180	0·0937	0·0757
41	6·0	12·5	0·88	0·460	0·515	620	0·0789	0·0135	0·1433	0·1298
42	6·0	13·0	0·92	0·358	0·503	395	0·0550	0·0135	0·1204	0·1069
44	3·0	11·0	0·96	0·365	0·497	445	0·0485	0·0135	0·1032	0·0897
44	3·0	17·0	0·87	0·458	0·509	650	0·0473	0·0180	0·1338	0·1158
45	—	10·0	0·92	0·369	0·497	550	0·0133	0·0180	0·0630	0·0450
46	—	11·5	0·99	0·378	0·473	605	0·0184	0·0180	0·0728	0·0548
47	—	9·6	1·01	0·347	0·461	600	0·0182	0·0160	0·0624	0·0464
48**	—	11·0	0·97	0·409	0·467	550	0·0267	0·0160	0·0780	0·0620
49	—	8.5	1·16	0·186	0·467	560	0·0238	0·0160	0·0635	0·0475
50	—	8·6	0·90	0·392	0·467	575	0·0279	0·0160	0·0680	0·0520
51	—	8·5	1·01	0·334	0·467	630	0·0305	0·0180	0·0702	0·0522
52	3·0	3·8	1·60	0·177	0·479	540	0·0262	0·0180	0·0444	0·0264
53**	6·0	13·0	0·85	0·392	0·485	530	0·0385	0·0180	0·1015	0·0835
54**	6·0	20·0	0·87	0·407	0·485	340	0·0391	0·0180	0·1361	0·1181
55**	3·0	16·0	0·90	0·386	0·461	365	0·0442	0·0135	0·1179	0·1044
56	6·0	7·5	1·06	0·369	0·467	430	0·0521	0·0135	0·0871	0·0736
57**	3·0	10·5	0·85	0·388	0·485	600	0·0545	0 0135	0·1054	0·0919
58	—	7·0	0·89	0·388	0·473	445	0·0296	0·0200	0·0627	0·0427
59	—	4·1	1·57	0·178	0·467	510	0·0490	0·0250	0·0681	0·0431
60	—	trace	—	—	—	355	0·0237	0·0270	0·0280	0·0010
							Sum	2·2744	7·5836	5·3092

? No food taken. * vomiting. ** alcohol given.

The animal throughout the experiment of sixty days' duration took in 2·27 grms. Cl, while he excreted 7·58 grms. Cl; so that the total chlorin lost amounted to 5·31 grms. But the actual loss must have been still larger, for the experimentized dog, having a fistula of the parotid gland as well as an accessory stomach, put out chlorin from the former also. But the saliva not only could not be collected



A=chlorin in the whole body, the original amount as 1.0. D=H' concentration.
B=total chlorin of the gastric juice in per cent. The dotted line indicates the volume of the gastric juice, divided by 100.
C=Cl in total hydrochloric acid in per cent.

quantitatively, but, as it was analyzed in a few cases only, the loss by this way could not be ascertained accurately. Undoubtedly, however, a considerable amount have been eliminated by the saliva. In addition to this, the dog lost chlorin also by the blood drawn for analysis and through the urine of first three days, which was not examined. In computing the entire loss, therefore, we must make allowance for these unestimated parts, probably not small in quantity.

Now, if a dog has, according to Rosemann[1], chlorin equivalent to 0·112 per cent of his body-weight, my dog must have had 20·16 grms. Cl reserved in the body. Then he must be considered to have really been discharged of more than 26·4 per cent of the store.*

Chlorin of the blood. For the purpose of determining the change of the chlorin content in the blood, the blood was drawn and analyzed. The analytical data, besides the results of saliva analysis, are given in Table III. As the bleeding looked injurious to the states, particularly to the appetite, of the animal, the blood was not many times analyzed. Nevertheless, the gradual fall of the concentration in chlorin, making up about 29 per cent in all, is distinctly demonstrated by the table. If a dog has 0·07 kilo of the blood per kilo body-weight, as generally accepted, my dog must have had before experiment 1·26 kilos blood, containing 0·31% or 3·91 grms. Cl. Hence the loss of chlorin during the experiment was more than the total sum originally contained in the blood. A great deal of chlorids, therefore, must have migrated into the blood from the tissues.

TABLE III.

Chlorin content of the blood and of the saliva %.

Day of experiment	4	12	15	31	43	58
Blood	0·31	0·28	—	—	—	0·22
Saliva	0·28?	—	0·27	0·25	0·15	0·13

The acidity and hydrochloric acid of the gastric juice.

The dog was fed once daily at 10 A.M. and then in the course of 5 hours the gastric juice was collected and the following three most

1) R. Rosemann, Arch. f. d. ges. Physiol., **135** (1910), 177.

* I have good reason to believe that the unestimated part of Cl was over 1 grm. Then the whole loss would be about 30 per cent.

significant determinations were executed:—

(1) The concentration of hydrogen ions.
(2) The total hydrochloric acid.
(3) The total chlorin.

For hydrogen ions, the gas-chain method was used; for total hydrochloric acid, the Mörner-Sjöquist's method; and for total chlorin, the Volhard's method. The results are shown in Table II and in the accompanying figure.

It should be added that the gastric juice examined had always strong peptic and lipolytic actions.

On looking into the accompanying figure, one must be suggested, that the daily variation of the three values shows, on the whole, well-corresponding courses. Among them, the total chlorin is the least subject to fluctuation.

Generally speaking, all of them must be regarded as not affected in the least before the 35th day.* The loss of chlorin up to that day was approximately 3·5 grms., e.g. 17 per cent of the normal content. Though, later, a tendency towards a gradual falling may be seen, yet the variation is so slight, that, if any localized result only be glanced at, it might well be overlooked, regarded as experimental errors or temporary variations. Only when the result of the successive estimations has been looked into, its gradual falling off may be perceived.

In any case, it may be said that, *even when lack of chlorids in the body has reached a high degree, it will affect very slightly, if at all, the chlorin content of the gastric juice and the acidity.* Accordingly, it must be scarcely reasonable to try to reduce the gastric acidity by limiting chlorids of diet.

It does not agree with the statement, that lack of chlorids will sooner or later reduce the acidity, as made by Cahn[1], Martinet[2],

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* There are several irregularities in the curves C and D; as, for example, on the 15th and of the 52nd day. These coincide with the temporary depression of the gastric secretion, owing to lack of appetite. The fall of the secretion was always, throughout the entire period of the experiment, accompanied by the reduction of the acidity. That the depression of secretion and the reduction of acidity were not caused by lack of chlorids, will be obviously seen from the fact that when the appetite was stimulated again and the secretion increased, the acidity also reached the normal level. So, these irregularities may be disregarded in the discussion on the subject.

1) A. Cahn, l.c.
2) A. Martinet, Centralbl. f. inn. Med., **30** (1909), 487.

Rosemann[1], Batke[2] and Pawlow[3], and which appears to be generally believed. Though it is possible that, when an animal wants chlorin to an extreme extent, say so extremely that there is almost nothing left in the body, the gastric acidity may be markedly reduced, yet he will have lost his life long before. The degree of the reduction of chlorids, indeed, brought about by these authors was not at all, so high; on the contrary, much less, even in comparison with the present case.

The estimation of acidity, carried on by them, has been effected by titration, either of the vomit or the gastric content, as in the experiments of Voit[4], Cahn[5], Rüttimeyer[6], or of the gastric juice, apparently mixed with pancreatic juice and bile, as in the cases of Rosemann. It is evident from the following fact, that from examination of such a kind any accurate result can hardly be expected.

On the 21st day, when an hour after meal* the dog was given a large quantity of potassium sulphate, he vomited 90 grms. of flesh mixed with 70 c.c. of fluid. On examining the vomit, there were 0·324% total chlorin, inclusive of 0·005% so-called combined HCl; no trace of so-called free hydrochloric acid could be noticed. Its acidity by titration was 0·062. So that the acidity of the gastric juice apparently fell off very much. But, at the same time, the pure gastric juice secreted by the small stomach was analyzed with a record of 0·370% HCl—P_H=0·89—and 0·545% total chlorin, so that no great variation from the normal limits could be noticed in both; a fact differing widely from the results of vomit examination.

Rosemann[7] further held that chlorids available to the production of the hydrochloric acid in the stomach are only 20 per cent of the total amount in the whole body. When they have been used up, the gastric secretion will no longer ensue, the production of hydrochloric acid having been interrupted. Moreover, he ascribed the physiological stoppage of gastric secretion, in a certain space of time after meal, also to having secreted 20 per cent of chlorids. Notwithstanding that

1) R. Rosemann, l.c.
2) V. Batke, Chem. Abstract, **12** (1917), 496.
3) J. P. Pawlow, Maly's Jahresber., **27** (1897), 390.
4) Voit, cited by Cahn.
5) A. Cahn, l.c.
6) L. Rüttimeyer, Centralbl. f. inn. Med., **30** (1909), 233.
7) Rosemann, Arch. f. d. ges. Physiol., **142** (1911), 208.

* No water was added to the food.

he had lost more than 26·4 *per cent of them yet my dog secreted the gastric juice having a strong acidity.*

Influence upon the volume of gastric juice and the appetite.

It was not the chief end of researches to determine the effect of lack of chlorids upon the volume of the gastric juice; on the contrary, I always tried to obtain by various means* as large secretion as possible; so that they were not suited for ascertaing the effect accurately. However, it may be seen from the figure that, on the whole, after lack of chlorids has reached a high degree, the gastric secretion tends somewhat to decrease. But it would be overhasty to ascribe that to lack of chlorids, for a repeated administration of potassium nitrate, the wastedness and others may cause the decrease also.

On the other hand, it is evident that the appetite plays an important rôle in the gastric secretion and that the secreting amount has a pronounced influence upon the acidity. As already described, in first two weeks the dog was furnished with boiled meat. During this period the appetite diminished day by day; at last the entire ration was found wholly untouched. The secreting activity of the stomach and the acidity, too, went together. When the food was changed on the 15th day, the appetite was regained promptly. So it was with the gastric secretion and the acidity. They had a mutual close relation. Also in the later course of the experiments the same was sometimes found. At all events, there *is nothing sufficiently to evidence that lack of chlorids does cause a depression of appetite, followed by the reduction of the gastric secretion and acidity,* as stated by Rosemann[1], Cahn[2], Wohlgemuth[3] and others. In their cases, the diminished secretion might perhaps have been owing essentially to lack of appetite, caused by an unpalatable diet.

Forster[4], too, mentioned that lack of appetite, appreciable in this kind of experiment was not due to lack of chlorids alone.

In his experiments Bönniger[5] considered the reduction of appetite and of secretion, and the vomiting, as the signs of lack of

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* For example, 10 c.c. of alcohol were added to the diet.

1) R. Rosemann, l.c.

2) A. Cahn, l.c.

3) J. Wohlgemuth, Biochem. Centralbl., **5** (1906), 482.

4) J. Forster, Zeitschr. f. Biol., **9** (1873), 297.

5) M. Bönniger, Zeitschr. f. exper. Path. u. Ther., **4** (1907), 414.

chlorids. But the results of the estimation of chlorin as NaCl in the blood-serum, recorded by him, show that the original content of 0·6 per cent never fell below 0·55 per cent, illustrating non-existence of a marked want of chlorin in the body of his dog.

Cahn and Rosemann claimed that lack of chlorids not only reduce the secretion and the acidity, but also it provokes gastro-intestinal disturbances accompanied by profuse hemorrhages. I could not perceive such a fact after all.

Changes of the chlorin content in different body fluids.

Now, consulting Table III, a comparison of the chlorin content of urine, saliva, gastric juice and blood brings to light an interesting fact. As well known, the chlorin, soon after the interruption of supply disappears from the urine, in order to save the important salt. And further, if the organisms are deprived of the salt, then the lowering of the content necessarily takes place in tissues and fluids, and that to different extent. The gastric juice alone, however, retains the chlorin, mainly in the form of the hydrochloric acid, nearly unaffected for ever. This exceedingly characteristic behavior of the chlorin in different tissues and fluids fairly interpretes the sense of its existence and the specific function of gland-cells.

The proceeding results state that, that *reflects the fluctuation of chlorin content in the blood, is not the gastric juice as Goyena*[1] *said, but the readily obtainable saliva itself.* The saliva does not lose chlorin so promptly as the urine, nor retain it so obstinately as the gastric juice; on the contrary, it changes the content, if somewhat more rapidly, with the blood.

That the chlorin of the saliva varies with that in the blood circulating through the gland, is established also by Asher[2] and Demoor[3] in other way.

On the night of the 60th day 3 grms. of common salt were given to the dog, whose life seemed to have been in danger. On the next morning he was somewhat livelier. Thenceforth, he took 2–3 grms. of salt every day; diet the same as before. The results of this additional experiments are shown in Table IV.

1) J. R. Goyena and A. J. Petit, Jl. of americ. med. assoc., **70** (1918), 740.
2) L. Asher, Biochem. Zeitschrift, **14** (1908), 1.
3) J. Demoor, Arch. internat. d. physiol., **10** (1911), 377.

TABLE IV.

Day of experim.	NaCl given	Gastric juice				Urine		Cl in blood	Cl in saliva
		Volume	P_H	Cl in total-HCl	Total Cl	Volume	Total Cl		
	grms.	c.c.		%	%	c.c.	grms.	%	%
61	3·0	7·0	1·27	0·207	0·473	450	0.0355	—	0·14
62	1·0	5·5	1·48	0·218	0·455	580	0·0422	—	—
63	1·0	12·5	1·02	0·283	0·485	650	0·0276	—	—
64	1·0	12·0	0·99	0·323	0·485	545	0·0298	—	—
65	2·0	14·0	0·92	0·368	0·497	525	0·0382	—	0·19
66	2·0	19·0	0·86	0·373	0·509	615	0·0857	—	—
67	2·0	25·0	0·75	0·431	0·527	475	0·0633	—	—
68	2·0	25·0	0·75	0·438	0·545	550	0·0967	0·32	0·28

Since common salt was given, liveliness and appetite were recovered, and the gastric secretion increased also. But *the recovery of appetite, secretion and acidity, was not in so prompt* a manner as Cahn[1] and Wohlgemuth[2], described, *but it was progressive.*

Of striking interest is the fact that, in opposition to the statement of Rosemann[3], the restoration of the normal chlorin content in the fluids takes place just at the time, when chlorin lost was exactly filled up.

1) A. Cahn, l.c.
2) J. Wohlgemuth, l.c.
3) R. Rosemann, l.c.