

embryonic potency longer than those tissues entering into arm or forearm development at any given stage.

In so far as the gross study of the animals of this series is concerned, they show no more than do the preceding series concerning the potentiality of regeneration. Tissue proliferation and the steps in the healing of wounds in the embryo are now being studied histologically. These studies will form a separate communication.

The present results show that in rat embryos, operated subsequent to the fourteenth day of gestation, there is not regeneration sufficient to restore an amputated limb. The embryonic age at the time of operation represents two-thirds of the gestation period in this form. If, therefore, there exists a period in the rat embryo during which it is capable of reforming or replacing an amputated limb this potency must be restricted to a stage earlier than those here recorded.

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Fixed base in gastric juice.

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The authors in a study of the effects of pyloric obstruction in rabbits¹ noted a large loss of fixed base as well as of chloride ion into the stomach. Gamble and Ross² found sodium in vomited stomach secretions from a dog, following experimental obstruction of the pylorus, to the extent of about one-half the equivalence of the chloride ion loss. The experiments to be here reported were undertaken for the purpose of determining whether or not fixed base is contained to an appreciable extent in gastric juice produced under conditions permitting normal gastric function. So far as we are aware the only published measurements of

¹ Gamble, J. L., and McIver, M. A., *J. Clin. Invest.*, 1925, i, 531.

² Gamble, J. L., and Ross, S. G., *J. Clin. Invest.*, 1925, i, 403.

fixed base in gastric juice are those of Rosemann.³ These were obtained from two large samples collected from dogs by the "sham feeding" method of Pawlow. The average amount of fixed base found in this "hunger juice" was 20 cc. 0.1 N per 100 cc., and of this approximately 11 cc 0.1 N was sodium and 9 cc. 0.1 N potassium. The chloride ion content of the samples was in average 147 cc. 0.1 N. The secretion of an alkaline juice by the mucosa of the pyloric antrum was noted by early workers and has recently been confirmed by several investigators.^{4, 5} No measurements of fixed base in this secretion have been reported.

In this study gastric secretions were obtained from isolated pouches constructed in the fundic and pyloric regions of the stomach. These pouches were provided with external fistulae but were found to retain the secretions entering them until removed by catheterization. In the table are given data obtained from samples of juice withdrawn from a pouch in the fundus at intervals following ingestion of high protein food (meat or fish) and of low protein food (cereal and cream or bread and water). Juice taken from the pouch in the morning before food was given was also analyzed. As may be seen in the table the chief finding from these three groups of data is a wide range of fixed base concentration in the presence of a fairly constant value for chloride ion. The amounts of fixed base found in juice from the pouch during digestion of high protein food in the stomach are in average somewhat larger than Rosemann found in "hunger juice" from dogs. A much higher level of fixed base obtains following ingestion of low protein food. There is thus indicated the probability that, with a nearly constant chloride ion concentration, the fixed base level is adjusted in terms of the amount of ingested material capable of binding chloride ion. The "morning specimens" should not, we believe, be regarded as consisting entirely of secretions produced during fasting. It was found that when the pouch was emptied late in the preceding evening no juice could be withdrawn from it the following morning. If, however, it was drained during the afternoon, morning specimens of varying size were obtained. These probably consist of juice from an unfinished period of gastric function mixed with the

³ Rosemann, R., *Arch. ges. Physiol.*, 1907, cxviii, 467.

⁴ Ivy, A. C., and Ayama, Y., *Am. J. Physiol.*, 1921, lvii, 51.

⁵ Limb, R. K. S., and Dott, N. M., *Quarterly J. Exp. Physiol.*, 1923, xiii, 159.

mucous and faintly alkaline secretion of the resting fundus.⁶ This surmise is supported by the larger amounts of fixed base found in the smaller specimens, and also by the presence of a slight milkiness in contrast with the water-clear character of the specimens obtained during active digestion in the stomach. The measurements of potassium given in the table indicate a roughly stationary value for this base factor. The pH of the samples obtained during digestion of food was beyond the reading range of the indicator at hand, thymol blue, *i. e.*, was less than pH 1.2. The pH of one of the morning specimens, No. 3, was 2.2. The organic substance (dried substance—ash) was, for a combined specimen composed of several morning collections, 0.265 gm.

Food	Spec. No.	Interval after food hrs.	Amount of juice cc.	Cl'	B·	Cl'·B·	K·
				cc. 0.1 N	cc. 0.1 N	cc. 0.1 N	cc. 0.1 N
Meat	1	1	2	160	22	138	
	2	2	7	166	17	149	
	3	3	4	167	24	143	
	4	6	8	168	44	124	
Fish	5	2	9	156	31	125	12.5
	6	4	3	157	38	119	
	7	2	9	171	32	139	
	8	2	11	169	30	139	11.7
	9	2	21	173	24	149	11.8
	10	4	3	152	35	117	11.6
Averages				164	30	134	12
Cereal and Cream	1	6	10	160	72	88	14.6
	2	6	14	162	77	85	10.4
	3	8	8	157	83	74	9.6
	4	6	7	151	80	71	8.9
	5	2	4	139	34	105	
	6	2	8	167	71	96	10.9
Bread & Water	7	2	4	165	65	100	
	8	2	6	162	48	114	
Averages				158	66	92	11
Morning Specimens	1		24	155	72	83	12.1
	2		13	158	89	69	
	3		5	164	142	22	11.8
	4		8	157	138	18	15.6
Averages				157	110	47	13

Data from samples of gastric juice taken from an isolated pouch in the gastric fundus of a cat.

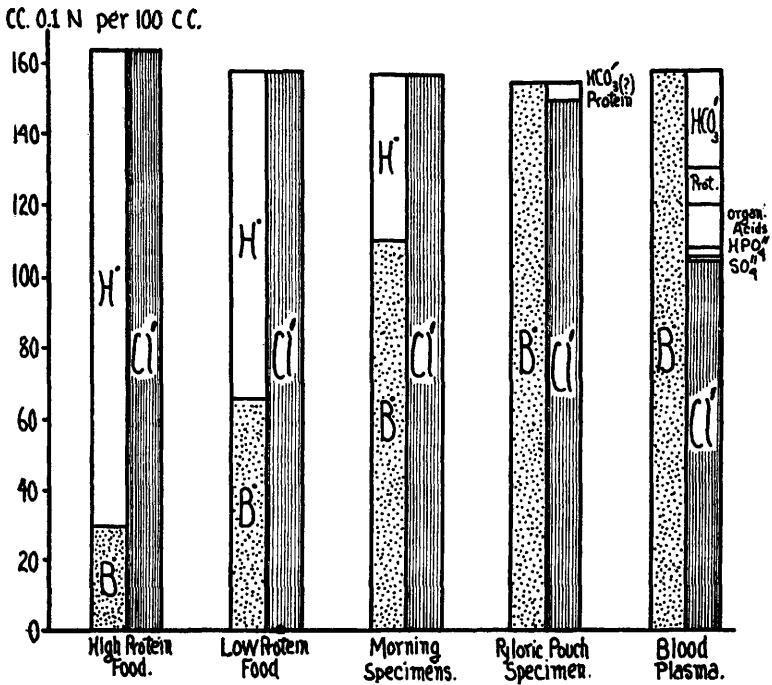
Measurements are per 100 cc. of juice.

⁶ Beaumont, W., *The Physiology of Digestion*, 1833.

per 100 cc.; and for a similar large specimen of juice produced following ingestion of food was 0.103 gm. per 100 cc. In these specimens only minute amounts of Ca^{++} and of PO_4''' (1.22 and 0.24 cc. of 0.1 N per 100 cc. respectively) were found. So that the values for $\text{Cl}'\text{---B}'$ in the table are probably at least approximate measurements of HCl.

From an isolated pouch in the pyloric antrum a few small samples of a thick, viscous, nearly colorless secretion were obtained by patient catheterization. The composition of this material has not as yet been thoroughly determined. Single measurements of several factors which have been obtained are, per 100 cc., as follows: B', 155 cc. 0.1 N., Cl' , 150 cc. 0.1 N., K', 8.8 cc. 0.1 N., HCO_3' , 5.3 cc. 0.1 N., dried substance, 2.49 gm. pH was 8.4. Apparently this secretion contains Cl' at about the same concentration as gastric juice produced in the fundus and owes its alkalinity to its much larger content of fixed base.

Referring again to the measurements of chloride ion concentration in the table, it may be noted that they are in average near the value, 158 cc. 0.1 N per 100 cc., which obtains for total fixed



base in blood plasma. (B·) in blood plasma, owing to the adjustability of (HCO'₃) among the factors of acid equivalence, controls the total ionic content of this fluid. In gastric juice from the fundus (Cl'), other acid factors being nearly negligible and (H·) being the result of (Cl')—(B·), should determine the total concentration of electrolytes. An approximate equivalence of total ionic content in blood plasma and in gastric juice is thus indicated.

To further illustrate this point and also to indicate clearly the size and, in contrast with the nearly stationary concentration of chloride, the mobility of the fixed base factor in gastric juice, the accompanying diagrams are presented. In them the base factors are superimposed in the left hand, and the acid factors in the right hand columns.

The measurements of fixed base and of chloride were obtained by the methods of Fiske. The procedure of Kramer and Tisdall was used in determining potassium.

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Parallelism between serologic and bacteriophagic response in *B. typhosus* and certain avian paratyphoids.

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Although not commonly recognized, there exist two curious and clearly marked discrepancies in the specific action of typhoid immune serum and typhoid antigen. In 1912 Pfeiler and Rehse¹ isolated from an epidemic of the disease, fowl typhoid, an organism which they regarded as a new species and to which they gave the name, *Bacillus typhi gallinarum alkalifaciens*. They demonstrated the agglutinability of this organism to a high titer in typhoid (human) immune serum; also a slightly reduced agglutinability of *B. typhosus* in B. T. G. A. immune serum. I have shown elsewhere² that the organism discovered by Pfeiler and

¹ Pfeiler and Rehse, *Mitteil. d. Kais. Wilhelm's Inst. f. Landwirtschaft im Bromberg*, 1912-13, v, 306-321.

² Hadley, P., *R. I. Agr. Exp. Sta. Bul.*, 1917, No. 172, pp. 1-40; No. 174, 1918, pp. 1-216.