

evidently only one of the results of a decrease in those lipid elements of the tissues which are necessary for the growth of the invading cells.

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- ¹ Burrows, M. T., *Am. J. Anat.*, 1926, xxxvi, 289.
² Burrows, M. T., unpublished notes.
³ Burrows, M. T., Burns, J. Edw., and Suzuki, Y., *J. Exp. Urol.*, 1917, i, 3,
 Fig. 4.
⁴ Burrows, M. T., *PROC. SOC. EXP. BIOL. AND MED.*, 1927, xxiv, 495.
⁵ Burrows, M. T., unpublished notes.
⁶ Burrows, M. T., and Jorstad, L. H., *Am. J. Physiol.*, 1926, lxxvii, 38.
⁷ Murphy, J. B., and Morton, J. J., *J. Exp. Med.*, 1915, xxii, 800.
⁸ Burrows, M. T., Jorstad, L. H., and Ernst, E. C., *J. Am. Med. Assn.*, 1926.
⁹ Burrows, M. T., *J. Can. Res.*, 1925, ix, 224.
¹⁰ Burrows, M. T., to appear in the *Arch. Path. and Lab. Med.*
¹¹ Burrows, M. T., *J. Can. Res.*, 1926, x, 239.
¹² Burrows, M. T., to appear in the *J. Can. Res.*

3627

Studies on the Mechanism of Gastric Hydrochloric Acid Secretion.

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The following study was planned to throw some light upon the mechanism by which hydrochloric acid is secreted by the stomach. The serum electrolytes of the arterial and of the venous bloods from the stomach were determined before and during gastric secretion in dogs under amytal anesthesia, histamine being used to stimulate secretion. Venous blood from the acid producing portion of the organ was obtained from the coronary vein. The total base was determined by a modification of Fisk's urine method. The anions are expressed in millimols of base combining capacity, assuming a ratio of primary to secondary phosphate of 1 to 4, and calculating the base combined with protein by a formula determined by Van Slyke. The difference between the total determined acids and the total base is taken as representing the organic acid fraction though it contained the small amount of sulfate which was not estimated.

In studies in this laboratory on human subjects it has been shown that during hydrochloric acid secretion the chloride concentration of the gastric juice continues, as in the fasting condition, to be about the same order of magnitude as in serum, but that there is a de-

crease in base proportional to the increase in free hydrochloric acid. This is similar to the observations of Gamble and McIver¹ on dogs. If chloride ions and water are thus secreted at about the same rate little change in the concentration of chloride in the serum from the

TABLE I.
Changes in serum electrolytes of arterial and venous bloods from the stomach before and during gastric secretion, in one of the dogs.

Dog V.

	Before Secretion			After ¾ hr.		After 1¼ hour			After 2¼ h.	
	Arterial	Arterial	Venous from stomach	Arterial	Venous from stomach	Arterial	Venous from stomach	Venous from leg	Arterial	Venous from stomach
	mM	mM	mM	mM	mM	mM	mM	mM	mM	mM
H CO ₃	23.8	23.5	23.3	21.5	24.9	21.5	24.9	23.9	24.0	25.6
Cl	113.0	112.2	111.8	111.8	111.9	110.8	109.0	109.9	110.2	108.1
P O ₄	3.1	3.0	3.0	4.1	4.1	4.1	3.7	4.1	4.2	5.4
Protein	10.7	11.5	11.5	10.0	9.8	10.4	11.4	11.9	10.6	9.1
Total acid	150.6	150.2	149.6	147.4	150.7	146.6	149.0	148.9	149.0	148.2
Total base	175.0	175.0	171.5	189.8	199.8	185.8	193.0	184.3	186.4	197.7
Organic acid	24.4	24.8	21.9	42.4	49.1	39.2	44.0	35.4	37.4	49.5

secreting stomach would be expected. The accompanying table shows clearly that this assumption is correct; there is never more than a slight fall in chloride. But, as water and chloride ions are secreted there is a retention of base, thus liberating free hydrochloric acid. Some factors must therefore be operative to compensate for this increase in base and replace any slight decrease in chloride. The data indicate that this adjustment is partially effected by a gain in bicarbonate. But it is evident that the bicarbonate supplied fails to entirely accommodate for the changes. Organic acids appear to play an equally prominent part. In fact, in the experiments on Dog V the gain in bicarbonate was relatively unimportant, while there was a striking increase in the organic acid fraction. It seemed possible that phosphate might be significant in this replacement mechanism, but any direct action appears to be trivial. No reaction is suggested whereby the weak acids, carbonic and possibly lactic, usual products of cell activity, could replace the strong hydrochloric acid.

This is a preliminary report.

¹Gamble, J. L., and McIver, M. A., *PROC. SOC. EXP. BIOL. AND MED.*, 1926, **xxiii**, 439.