

## INFLUENCE OF VITAMIN-B COMPLEX ON GASTRIC SECRETION OF DOGS

By

T.C. JAIN‡ and B.B. MAITRYA\*

*Department of Physiology and Biochemistry, Sardar Patel Medical College, Bikaner*

Little is known about the effect of vitamins, or vitamin deficiency on the gastric secretion. Diminished gastric secretion during vitamin deficiency has been observed (3). Experimental evidences of the effect of vitamin-B diet on the secretory response of the gastric glands to nervous and chemical stimuli in dogs has been reported (4, 17). Beriberi and pellagra were found to be associated with hypo- or achlorhydria (8). In man vitamin-B deficiency is manifested by functional disturbances in the gastro-intestinal tract (16, 18). To the contrary, other workers (1,5,6,15) could not detect any effect of vitamin-B deficiency on the secretion and composition of gastric juice.

The present work was undertaken as there was no unanimity concerning the role of vitamin-B complex on the composition and secretion of gastric juice, though some investigators had shown that vitamin-B complex was essential for the gastric activity, yet precise information regarding the various fractions of vitamin-B complex responsible for these changes, was lacking.

### MATERIALS AND METHODS

Healthy, mongrel dogs of either sex, weighing on an average 10 kg. were used in this work. Each dog, prior to starting experiments, was administered anti-rabic and anti-helminthic treatments. They were operated for gastrostomy by Ssbanajew-Franck stomach cone transfer technique (14). Experiments were performed only after the complete healing of the wounds. They were fasted for 18 hrs before starting the experiments, but were allowed to drink water *ad libidum*. Fasting gastric contents, if any were evacuated. 0.06 mg/kg of histamine acid phosphate (BDH), given subcutaneously, was used as a stimulus to evoke gastric secretion (9).

Dogs were divided into several groups, and various fractions of vitamin-B complex were injected daily in the doses indicated below, for three days consecutively. On the fourth day half an hour histamine induced gastric juice was collected and analyzed. Gastric juice obtained in similar way in normal dogs, before starting the experiment, was analyzed, and served as control.

- (1) Group I—Thiamine (ANEUVIT-BDH)-100mg.
- (2) Group II—Riboflavin (BEFLAVIN-Roche)-11mg.
- (3) Group III—Nicotinamide (NIACINAMIDE-Roche)-15mg.
- (4) Group IV—Pyridoxin (GLADOXIN-Glaxo)-100mg.
- (5) Group V—Folic acid (FOLVITE-Lederle)-15mg.
- (6) Group VI—Cyanocobalamin (MACRABIN-Glaxo)-100mcg.

---

‡Present address : Department of Physiology, Medical College, Jodhpur.

\*Present address : Department of Physiology and Biochemistry Medical College, Ajmer.

Gastric samples were measured and analyzed for the free and total acid by titrating against 0.01 N. sodium hydroxide solution, using Topfer's reagent and phenolphthalein as indicators. Total chlorides were estimated by the method of Whitehorn and Volhard as described by Baldwin and Bell (2), and pepsin by Volhard and Lohlein's method as mentioned by Hawk *et al* (7). Duplicate estimations were done to ensure the correctness of the results arrived at.

## RESULTS

Table 1 indicates the results of injecting various fractions of vitamin-B complex on the gastric secretion of dogs.

TABLE I

*Effect of injecting various fractions of vitamin-B complex on the histamine induced gastric secretion of dogs.*

Group of animals	Treatment	Volume ml	Free acidity mEq/L	Total acidity mEq/L	Total chloride mEq/L	Peptic activity unit/ml
I (5)	<i>Thiamine</i> Before	13.4±1.3	60.0± 5.7	101.4±10.9	844.6±29.6	9.4±2.3
	After	8.4±0.1	61.0±18.4	86.6±12.1	811.4±10.9	6.2±1.2
	't' value	3.1@	0.05	0.9	1.1	1.3
II (4)	<i>Riboflavin</i> Before	12.7±1.4	58.2± 7.1	99.2±13.8	841.5±37.4	10.4±2.6
	After	8.2±4.1	39.0±21.2	85.2±17.7	806.2±41.9	11.9±3.1
	't' value	0.2	0.8	1.5	0.6	0.4
III (6)	<i>Nicotinamide</i> Before	13.5±1.1	58.1± 3.7	101.5± 8.9	848.3±24.1	8.7±1.9
	After	9.0±1.4	42.6± 8.5	112.8±19.9	782.6±25.6	9.1±2.5
	't' value	2.6@	1.7	0.5	1.9	0.1
IV (6)	<i>Pyridoxin</i> Before	13.5±1.1	58.1± 3.7	101.5± 8.9	848.3±24.1	8.7±1.9
	After	9.0±1.6	5.57± 5.1	122.3± 8.9	914.2±19.4	9.9±1.3
	't' value	2.5@	0.2	1.7	2.0@	0.5
V (6)	<i>Folic Acid</i> Before	13.5±1.1	58.1± 3.7	101.5± 8.9	848.3±24.1	8.7±1.9
	After	9.5±2.2	40.6± 8.9	91.0± 7.8	839.8±12.3	10.6±3.1
	't' value	1.7	1.8	0.9	0.3	0.5
VI (7)	<i>Cyanocobalamin</i> Before	13.4±0.9	55.4± 5.1	104.0± 7.9	846.0±20.6	8.3±2.0
	After	10.7±2.3	54.9±11.4	87.0± 9.5	767.1±40.8	4.5±1.3
	't' value	1.1	0.4	1.3	1.7	1.7

Values are Mean ± SE; Figures in parentheses indicate the number of animals used;  
@ Significant 't' values at 5% level.

Significant diminution in the volume of gastric juice was caused by thiamine, nicotinamide and pyridoxin, though slight reduction was noted in all cases (riboflavin, folic acid and cyanocobalamin). Apparent diminution in free acidity was observed in all cases except in case of thiamine which registered a slight rise. Augmentation in total acidity was observed on administering nicotinamide and pyridoxin while the rest showed inhibition. Pyridoxin alone resulted in a significant elevation in the level of total chlorides. Peptic activity was diminished by thiamine and cyanocobalamin, but others augmented it.

#### DISCUSSION

Cowgill (3), on feeding thiamine deficient diet in Heidenhain pouched dogs, noted depressed secretory response, thereby concluding that thiamine was essential for the secretory activity of stomach. On the other hand Komarov (10) reported that thiamine was secreted in the gastric juice of normal dogs, thus no depression in gastric secretion be caused by thiamine deficiency. Present studies indicated that thiamine, except causing a very meagre rise in the free acidity, produced a significant reduction in the volume of gastric juice, while alteration in other components of gastric secretion was not significant. Variations produced by riboflavin were also not of statistical significance. Our studies were not in corroboration with the observations of Joffe and Jolifee (8), who reported diminished secretion of hydrochloric acid in pellagra. Pyridoxin also produced marked diminution in the volume of gastric juice, but at the same time elevated the total chlorides of the gastric secretion, possibly by increasing the non-parietal secretion of the stomach, as an apparent rise in the total acidity as well as peptic activity has been recorded simultaneously. Patients with pernicious anaemia due to lack of extrinsic factors, (folic acid and vitamin B<sub>12</sub>), usually suffer from hypo- or achlorhyria. Both these vitamins are essential, but no significant changes in the composition and secretion of gastric juice were brought about by them in this study.

Some of these vitamins were administered in high doses as they were found to be ineffective when administered in their physiological doses, and were administered only for 3 days. Also chronic experiments in vitamin deficient animals were not employed as previous workers (16, 18) had described many abnormalities produced as a result of malnutrition arising from anorexia in animals kept on vitamin deficient diet. They concluded that true course and the specific effect of vitamin-B deficiency could not be shown in such animals due to the above mentioned reasons. Reduction in the volume of gastric secretion, as observed in this work, might be due to the specific effect of vitamins on the stomach, or due to the passage of gastric contents through the pylorus. However, to know the exact mechanism of their action further work need be carried out in various types of preparations of animals, as these vitamins might act locally, through the myenteric plexus (15) after absorption, or through the adrenals (11, 12, 13).

#### SUMMARY

Influence of injecting thiamine, riboflavin, nicotinamide, pyridoxin, folic acid and cyanocobalamin, on half an hour histamine induced gastric secretion, in gastrotomized dogs, was studied. Thiamine, nicotinamide and pyridoxin reduced significantly the volume of gastric secretion, and pyridoxin alone elevated the total chloride level, possibly by stimulating the non-parietal secretion. Riboflavin, folic acid and cyanocobalamin, however, did not reveal significant variations.

## REFERENCES

1. Alvarez, W.C., F. Pilcher, M.A. Foley, A. Mayer and A.E. Osterberg. The effect on the gastric juice of man of six week's deprivation of vitamin-B<sub>1</sub>. *Amer. J. digest. Dis. Nutr.*, 3:102, 1936.
  2. Baldwin, E. and D.J. Bell. *Cole's Practical Physiological Chemistry*, W. Heffer & Sons Ltd. Cambridge, p.134, 1955.
  3. Cowgill, G.R. Studies in the Physiology of vitamins II-Parenteral administration of vitamin B-mammalian experiments. *Amer. J. Physiol.*, 66 : 164, 1923.
  4. Cowgill, G.R., and A.E. Gilman. Physiology of vitamins XXIII-The effect of lack of vitamin-B complex on the secretion of gastric juice in dogs with gastric pouches. *Arch. intern. Med.*, 53 : 58, 1934.
  5. Elsom, K.O. Experimental study of clinical vitamin-B deficiency. *J. Clin. Invest.*, 14 : 40, 1935.
  6. Goldberger, J. and G.A. Wheeler. Experimental black tongue of dogs and its relation to pellagra. *Pub. Health Rep. Washington.*, 43 : 172, 1928.
  7. Hawk, P.B., B.L. Oser and W.H. Summerson. *Practical Physiological Chemistry*, McGraw-Hill Book Company, New York., p,626, 1954.
  8. Joffe, P.M. and N. Jolliffe. The gastric acidity in alcohol with observations on the relation of the B-vitamins to achlorhydria. *Amer. J. med. Sci.*, 193 : 501, 1937.
  9. Kahali, B.S. and B.B. Maitrya. Effect of atropine and physostigmine on the histamine induced gastric secretion of dog. *Ind. J. Physiol. Pharmacol*; 6 : 141, 1962.
  10. Komarov, S.A. Presence of vitamin-B<sub>1</sub> in the gastric juice. *Proc. Soc. exp. Biol. & Med.*, 32 : 398, 1934.
  11. Maitrya, B.B. Effect of DOCA and ACTH on gastric secretion. *Ind. Med. Gaz.*, 1 (9) : 23, 1962.
  12. Maitrya, B.B. and S. Banerjee. Effect of alteration of blood glucose levels induced by hormones on gastric secretion of rats. *Ind. J. exptl. Biol.*, 1 (4) : 201, 1963.
  13. Maitrya, B.B. and S. Banerjee. Hormonal influences on gastric secretion of dog. *Ind. J. exptl. Biol.*, 2 (2) : 98, 1964.
  14. Shackelford, R.T. *Surgery of the Alimentary Tract. Vol. I* W.B. Saunder & Co., Philadelphia, p.272, 1955.
  15. Voit, K. and R. Arnold. Untersuchungen uber den Einfluss von B<sub>1</sub> auf die Saurewerte des Magens. *Klin. Wschr.*, 19 : 98, 1939.
  16. Vorhaus, M.G. The present evaluation of vitamin-B<sub>1</sub> therapy. *Amer. J. digest. Dis.*; 3 : 915, 1937.
  17. Webster, D.R. and J.C. Armour. Vitamin-B complex and gastric secretion. *Proc. Soc. exptl. Biol. & Med.*, 31 : 463, 1934.
  18. Wilbur, D.L. The effects of vitamin deficiency on the gastro-intestinal tract. *Amer. J. digest. Dis.*, 6 : 610, 1939.
-