

8. Wendt, H.: Treatment of Exophthalmic Goitre with large doses of Vitamin A. *Munch. Med. Woch.*, Munich, 82:1143-1184, July 19, 1935.
9. Tarr, E. M., and McNelle, D.: Relation of Vitamin B Deficiency to Metabolic Disturbance During Pregnancy and Lactation. *Amer. J. Obstetrics and Gynec.*, St. Louis, 29:771-926, June, 1935.
10. Boulin, R.: Les Agents therapeutiques renforceurs de L'insuline. *Nutrition*, Tome, IV, No. 2, 181-191, 1934.
11. Drigalski, Von. H.: B-vitamins as a substitute for insulin. *Archiv. fur Verdauung-Krankheit.*, Berlin, 57:1-112, Jan., 1935.
12. Junghans, E.: Vitamin C in Treatment of Gynecologic Hemorrhages. *Klinische Woch.*, Berlin, 14:881-912, June 22, 1935.
13. Quigley, D. T.: Correction of Dietary Errors in Connection with Radium Treatment. *Amer. J. Roentg. and Rad. Therapy*, Springfield, Ill., 34:1-144, July, 1935.
14. Wendt, H.: Changes in Carotene-Vitamin A Economy in Myxedema and in Cretinism. *Munch. Med. Woch.*, 82:1669-1708, Oct. 18, 1935.
15. Wilder, R. M., Higgins, G. M., and Sheard, C.: The Significance of the Hypertrophy and Hyperplasia of the Parathyroid Glands in Rickets and Osteomalacia. *Amer. Jour. Med.*, 7:1059, March, 1934.
16. Gierhake, E.: Fertility Vitamin E and Its Therapeutic Significance for Gynecology. *Deutsch med. Woch.*, Leipzig, 61:1663-1710, Oct. 18, 1935.
17. Kerley, G. Charles: Vitamins and the Child. *New York State Jour. Med.*, 35:1035, Oct. 15, 1935.
18. Sherman, H. C.: Food and Health. Macmillan Co., N. Y., 1935.
19. Sindoni, A., Jr.: Vitamins. The Cyclopedia of Medicine, F. A. Davis Co., Philadelphia, 1935.
20. Quackenbush, F. W., Peterson, W. H., and Steenbock, H.: Study of Nutritive Value of Mushrooms. *Jour. of Nutrit.*, Philadelphia, 10:879-722, Dec. 10, 1935.
21. Thoma, K. M.: Food in Health and Disease. F. A. Davis Co., Philadelphia, 1934.
22. McCollum, E. V.: The Newer Knowledge of Nutrition. 4th Ed., The Macmillan Co., New York, 1929.
23. Harris, L. J., and Ray, S. N.: Diagnosis of Vitamin C Subnutrition by Urine Analysis. *Lancet*, London, 1:69-123, Jan. 12, 1933.
24. Goldberger, J., and Tanner, W. F.: Public Health. Rep. 39:87, Jan. 18, 1924.
25. Evans, H. M.: Vitamin E. *J. A. M. A.*, 99:469, Aug. 6, 1932.
26. Burnett, L. Francis: Progress of Nutrition. *New England Jour. Med.*, Boston, 218:447-504, Sept., 1935.
27. Smith, L. Sybil: Newer Trends in Nutrition. *Jour. Am. Diet. Asso.*, Vol. X, No. 2, July, 1934.
28. Salter, T. Wm.: Quantitative Aspects of Vitamin Requirement. *Jour. Am. Diet. Asso.*, Vol. X, No. 4, Nov., 1934.
29. Strauss, M. B., and Castle, W. B.: The nature of the extrinsic factor of the deficiency state in pernicious anemia and in related macrocytic anemias. *New England Jour. Med.*, 207:55, 1932.
30. Shotgun Vitamin Therapy: Report of the Council on Pharmacy and Chemistry. *J. A. M. A.*, Vol. 105, No. 18, p. 1087, Sept. 28, 1935.
31. Diabetic Foods: *J. A. M. A.*, Vol. 100, No. 6, Feb. 11, 1933.
32. Goddard, R. Verz., Sandifur, M. Florenz, and Beatty, Thelma: Diabetic and Low Calorie Foods. *Jour. Am. Diet. Asso.*, Vol. XL, No. 1, pp. 7-18, May, 1935.
33. Brown, Helen B., Shohl, A. T., Chapman, Edna E., Rose, Catherine S., and Saurwein, Esther M.: *J. Biol. Chem.*, 98:207, Oct., 1932.
34. Sindoni, Anthony, Jr.: The Modern Manual for the Diabetic. McGraw-Hill Book Publishing, Inc., 1937, New York. To be published.
35. Sindoni, Anthony, Jr.: Optimum Time to Administer Insulin. *Arch. Int. Med.*, Chicago, Ill., Vol. 57, pp. 949-958, May, 1936.

Vitamin B Complex Therapy in Chronic Arthritis*

By

CHAS. LEROY STEINBERG, M.D.
ROCHESTER, NEW YORK

AN atonic bowel associated with chronic arthritis has been found by several clinicians. These clinicians differ somewhat in their remedy. Whereas Fletcher and Graham (1) and Gatewood, et al (2) recommend vitamin B along with restricted carbohydrates as a means to bring about a normal bowel, Pemberton and Pierce (3) on the other hand have been able to return the bowel to a normal contour with the aid of low carbohydrate—low calorie diets which were obviously not very rich in vitamin B. Haft (4) has suggested that any chronic disease may cause the same intestinal abnormalities that are found in chronic arthritis. This thought suggests that treatment of the chronic disease itself should correct the bowel abnormality.

Most research workers have shown that diets deficient in vitamin B cause an atonic bowel. McCarrison (5) fed monkeys food which was first autoclaved and a ballooning of the large bowel occurred. Fletcher (6) could demonstrate atrophy and metaplastic changes in the mucous membrane of the rat's colon by means of a diet high in carbohydrate and low in vitamin B. He was able to demonstrate atony of the colon in the rat by diets low in vitamin B. Elsom (7) showed that loss of tone and motility of the gastro-intestinal tract could be brought about in human beings by the administration of diets deficient in vitamin B. McCollum (8) believed that the neurotic element caused by the deficiency of vitamin B in the average American diet was a predisposing element in the etiology of ulcer.

A careful study of the systemic history of the chronic arthritic, omitting the symptoms confined to the joints, shows a marked similarity to that which may be induced by diets deficient in vitamin B.

STRIKING SIMILARITY OF SYMPTOMS CAUSED BY DIETS DEFICIENT IN VITAMIN B COMPLEX AND SYSTEMIC SYMPTOMS IN CHRONIC ARTHRITIS

Chronic Arthritis

1. Digestive disturbances
2. Lack of vigor
3. Disturbance of carbohydrate metabolism
4. Weakness
5. Poor appetite
6. Lowered metabolism

Deficient Vitamin B Diet

1. Digestive disturbances
2. Lack of vigor
3. Impairment of tissue respiration
4. Weakness
5. Poor appetite
6. Glandular dysfunction.

The following findings were obtained in a study of the gastro-intestinal history of 118 patients having chronic arthritis. 105 of this group had atrophic arthritis and 13 had hypertrophic arthritis. Gas, constipation, and anorexia were symptoms present in almost the entire group of 118 patients. Occasional diarrhea, heartburn and epigastric pain were present in a few cases. The gastro-intestinal symptoms were associated in most cases with a systemic complaint of weakness or apathy. Duodenal ulcer symptoms corroborated by the finding of a deformed duodenal cap were noted in four patients in the atrophic arthritic series.** Barium enema studies were made on 24 patients of the atrophic group and the most common abnormality noted was spasticity and not atony of the

*From the Department of Medicine, Rochester General Hospital. Submitted September 11, 1936.

**Since this paper was written two more cases of duodenal ulcer associated with chronic arthritis have been encountered.

colon. In fact, the former was found in 79% and the latter in only 4.1% of the 24 patients.

Are the diets of these arthritic patients deficient in the B complex? Hall and Myers (9) found a deficient or borderline deficient general vitamin diet in 50% of the cases of infectious arthritis, 42.5% of the atrophic arthritics, and in 26.7% of the hypertrophic cases. The non-arthritic control group showed a general vitamin deficiency of 33.3%. Brownson and Steinberg (10) found that whereas the average fruit and vegetable intake of the nonarthritic was two and one-third cups per day, the arthritic ate one and one-half cups of fruits and vegetables per day. With this small difference between the arthritic and the nonarthritic, one could hardly surmise that a lack of vitamin B intake was an etiological factor in chronic arthritis. This, however, does not imply that the vitamin B requirement is not greater in the arthritic than the non-arthritic.

The effect of vitamin B on the gastro-intestinal symptomatology was studied in the series of 118 cases of chronic arthritis. The vast majority had the atrophic type of chronic arthritis. 108 patients were given "Vitamin B Complex" in doses of 4 c.c. to 12 c.c. daily. The usual dose was 4 c.c. twice daily. Ten patients received one cake of brewer's yeast daily. Three patients were given 30 c.c. of a live strain of brewer's yeast which was alternated with the "Vitamin B Complex" preparation with practically identical effects. These preparations were successful in alleviating the gastro-intestinal symptoms in over 95% of the cases. Of the nineteen patients in this study who did not have any gastro-intestinal upsets, a mild diarrhea was occasioned in only one case. The cessation of administration of the vitamin B preparations resulted in the return of symptoms in about 50% of the cases. One to three weeks were required to obtain the beneficial effects of the vitamin preparations. All of the cases preferred the palatability of the "Vitamin B Complex" to the other vitamin products.

Further studies were made to determine any incompatibility between vitamin B complex and two other vitamins: A and D. This group included 20 cases of chronic arthritis with marked gastro-intestinal symptoms of gas and constipation. This group included 13 cases of atrophic arthritis, 3 cases of mixed arthritis with the atrophic factor predominating, 2 cases of Marie-Strumpel arthritis, and two cases of hypertrophic arthritis. Vitamin B complex in doses of 8 c.c. to 12 c.c. daily was given to thirteen cases of this group in periods varying from three months to twelve months with complete cessation of the untoward gastro-intestinal symptoms. At the end of this varying period, massive doses of vitamin D, 250,000 to 750,000 units were given daily for periods varying from two to six weeks in ten of the preceding cases with no change in the already improved status of the gastro-intestinal symptomatology. Two cases that had received improvement with the vitamin B complex were also given 18,600 units of vitamin A and 2700 units of vitamin D daily for another three months with no change in the already attained intestinal improvement. In another case the liquid vitamin B complex preparation was replaced with a capsular form and doses of 18,600 units of vitamin A, 2700 units of vitamin D, and 135 Sherman units of B₁ and 30 Sherman units of B₂ were given daily with-

out any change in the improvement attained with the vitamin B complex preparation. Four patients received massive doses of vitamin D (250,000 to 750,000 units) daily at the same time that the vitamin B complex was started in periods varying from two to three months, with the same beneficial pharmacological effect on the gastro-intestinal tract. Three patients received capsules of 18,600 units of A, 2700 units of D, 135 Sherman units of B₁ and 30 Sherman units of B₂ daily without any initial period of the vitamin B complex with identical beneficial gastro-intestinal symptomatology.

COMMENT

The present trend in thought that vitamin B complex increased the tone of the atonic bowel needs modification. This study indicates that vitamin B complex aids in restoring an abnormal bowel tone to a normal status; the vitamin B complex possesses pharmacological value in restoring this tone whether the bowel be atonic or hypertonic. This is an entirely new concept as to its value. The discovery of four cases of duodenal ulcer in four cases of chronic arthritis along with the suggested apparent increased demand for vitamin B complex in the chronic arthritic opens up another possible attack upon the unknown etiology of peptic ulcer.

CONCLUSIONS

1. Spasticity of the colon is commonly associated with chronic atrophic and hypertrophic arthritis.
2. There is no vitamin B deficiency which accounts for the gastro-intestinal symptomatology present in the cases of chronic arthritis reported in this paper.
3. There probably is an increased demand for vitamin B complex in the chronic arthritic.
4. Four cases of duodenal ulcer are reported in a relatively small number of cases of chronic arthritis.
5. There is no pharmacological incompatibility amongst vitamins A, B, or D as regards the gastro-intestinal effect in the group reported in this paper.
6. In a study of 118 cases of chronic arthritis of which 99 had gastro-intestinal symptoms, it was found that the vitamin B complex is of adjunct value in the treatment of chronic arthritis.

The author takes this opportunity to thank Dr. E. A. Sharp, Director Department of Experimental Medicine, Parke, Davis & Co., for his assistance in supplying the vitamin preparations for this study.

He also expresses his gratitude to Dr. L. R. Lingman, Director Department of Radiology, Rochester Central hospital for the radiographic interpretations.

REFERENCES

1. Fletcher, A. A., and Graham, D.: The Large Bowel in Chronic Arthritis. *Am. J. M. Sc.*, 179:91, Jan., 1930; also *Tr. A. Am. Phy.*, 44:231, 1927.
2. Gatewood, W. E.: Mechanics of Colon. *Northwest Med.*, 29:1, Jan., 1930.
3. Pemberton, R., and Pierce, E. G.: Relation of Intestinal Tract and Diet to Treatment of Arthritis. *Ann. Int. Med.*, 5:1221, April, 1932.
4. Haft, H. H.: The Colonic Changes in Chronic Arthritis Compared with Other Chronic Diseases. *Am. J. M. Sc.*, 185:811, June, 1933.
5. McCarrison, R.: Studies in Deficiency Diseases. London, Oxford University Press, 1921.
6. Fletcher, A. A.: Nutritional Aspects of Chronic Arthritis. *Med. Jr. and Rev.*, 138:363, 1933.
7. Elsom, K. O.: Experimental Study of Clinical Vitamin B Deficiency. *Jr. Clin. Investig.*, 14:40, Jan., 1935.
8. McCollum, E. V. Cited by Harris, Seale: Role of Vitamins in the Etiology and Cure of Gastric and Duodenal Ulcers. *J. A. M. A.*, 91:1452, Nov. 10, 1928.
9. Hall, F. C., and Myers, W. K.: Diet in Chronic Arthritis. *Arch. Int. Med.*, 55:403, March, 1935.
10. Brownson, I., and Steinberg, C. L.: Unpublished Data.