

THIAMINE METABOLISM of WOMEN on CONTROLLED DIETS

III. DAILY PYRUVIC ACID VALUES OF WHOLE BLOOD

By BETTY E. HAWTHORNE, M.S., MEI-LING WU, PH.D.,* AND CLARA A. STORVICK, PH.D.

KEYS *et al.*¹ and Foltz, Barborka, and Ivy² have found no correlation between thiamine intake and the concentration of pyruvic acid in the blood when their subjects were at rest. Kirk and Chieffi³ found no relation between fasting blood thiamine levels and fasting blood pyruvate levels in old and middle-aged institutionalized subjects. However, Berryman *et al.*⁴ noted an increase in resting pyruvic acid values of blood of subjects receiving a diet deficient in thiamine. It was thought to be of interest to determine pyruvic acid levels in blood as part of a more extensive study of the effects of two levels of thiamine intake on biochemical findings in women on controlled diets.

EXPERIMENTAL

The determination of daily blood thiamine values and the daily urinary excretion of thiamine and creatinine have been reported elsewhere (Dubé *et al.*,⁵ and Louhi *et al.*⁶). In these reports values are given which were obtained during the years 1949, 1950, and 1951, in which four, three, and four subjects, re-

spectively, were studied. In 1951 blood pyruvic acid values were also determined for 7 days while the subjects were receiving each day 500 μ g. of thiamine per 1000 calories (period 1) and for 14 days while the subjects were receiving 300 μ g. per 1000 calories (period 2). Determinations were made by the micromethod of Tsao and Brown.⁷ A complete description of the subjects and diets may be found in the report of Louhi *et al.*⁶

RESULTS AND DISCUSSION

In Table I are given the fasting blood pyruvic acid values and fasting blood thiamine values for the last 7 days of each dietary period. It can be seen that for each subject there was an increase in the pyruvic acid content of the blood. (Subject MLW exhibited consistently higher values for pyruvic acid in both periods than did the other subjects.) The average increase for all subjects in period 2 was 11 per cent of the average value for period 1. At the same time, there was a decrease of 11 per cent in the average blood thiamine. Analysis of variance showed that both the rise in pyruvic acid concentration and the fall in thiamine concentration in the blood were significant. It was previously noted (Louhi *et al.*⁶) that these subjects all exhibited a concomitant decrease in the urinary excretion of thiamine.

SUMMARY

Values are reported for pyruvic acid in the blood of four women receiving a controlled diet containing two levels of thiamine intake. There was a rise in pyruvic acid levels and a fall in blood thiamine concentration when thiamine intake was reduced.

From the Nutrition Research Laboratory of the School of Home Economics and the Experiment Station Department of Home Economics, Oregon State College, Corvallis, Oregon.

Published as Technical Paper No. 735 with the approval of the Director of the Oregon Agricultural Experiment Station. Contribution of the Experiment Station Department of Home Economics and the Department of Foods and Nutrition, School of Home Economics, Oregon State College.

* Present address: Department of Pharmacology, Washington University Medical School, St. Louis, Missouri.

TABLE I
Pyruvic Acid and Thiamine Values of Whole Blood

Subject	Day of dietary period	Mlw	Hal	Cas	Rbd	Mlw	Hal	Cas	Rbd
		Pyruvic acid				Thiamine			
		Mg./100 ml.				μg./100 ml.			
Thia- mine intake									
μg./1000 cal.									
500	9	—	0.88	0.70	0.74	3.8	3.9	3.9	5.1
	10	1.08	0.68	0.78	0.69	3.1	3.1	3.5	4.5
	11	—	0.77	0.71	0.62	3.9	4.4	4.3	5.5
	12	0.65	0.53	0.50	0.60	3.8	4.1	4.0	5.9
	13	0.90	0.74	0.61	0.61	4.4	3.9	4.7	5.1
	14	0.96	0.76	0.72	0.78	4.0	3.9	5.0	5.3
	15	1.18	0.82	0.63	0.64	—	—	—	—
	Aver.	0.95	0.74	0.66	0.67	3.8	3.9	4.2	5.2
300	8	0.84	0.90	0.68	0.77	3.7	4.3	3.7	4.6
	9	1.01	0.77	0.77	0.82	3.6	3.5	3.7	3.7
	10	0.97	0.75	0.84	0.75	3.7	3.4	3.8	4.1
	11	1.19	0.75	0.86	0.90	3.1	3.5	3.6	4.6
	12	0.84	0.70	0.62	0.74	3.3	3.4	3.7	4.6
	13	1.20	0.77	0.84	0.72	3.2	3.9	3.7	4.3
	14	0.97	0.78	0.90	0.80	4.2	4.0	3.5	4.6
	Aver.	1.00	0.77	0.79	0.79	3.5	3.7	3.7	4.4

REFERENCES

- KEYS, A., HENSCHER, A., TAYLOR, H. L., MICKELSEN, O., and BROZEK, J.: Absence of rapid deterioration in men doing hard physical work on a restricted intake of vitamins of the B complex. *J. Nutrition* 27: 485, 1944.
- FOLTZ, E. E., BARBORKA, C. J., and IVY, A. C.: The level of vitamin B-complex in the diet at which detectable symptoms of deficiency occur in man. *Gastroenterology* 2: 323, 1944.
- KIRK, E. and CHIEFFI, M.: Vitamin studies in middle-aged and old individuals. III. Thiamine and pyruvic acid blood concentrations. *J. Nutrition* 38: 353, 1949.
- BERRYMAN, C. H., HENDERSON, C. R., WHEELER, N. C., COGSWELL, R. C., JR., SPINELLA, J. R., GRUNDY, W. E., JOHNSON, H. C., WOOD, M. E., DENKO, C. W., FRIEDEMANN, T. E., HARRIS, S. C., IVY, A. C., and YOUNG, J. B.: Effects in young men consuming restricted quantities of B complex vitamins and protein, and changes associated with supplementation. *Am. J. Physiol.* 148: 618, 1947.
- DUBÉ, R. B., JOHNSON, E. C., YÜ, H. H., and STORVICK, C. A.: Thiamine metabolism of women on controlled diets. II. Daily blood thiamine values. *J. Nutrition* 48: 307, 1952.
- LOUHI, H. A., YÜ, H. H., HAWTHORNE, B. E., and STORVICK, C. A.: Thiamine metabolism of women on controlled diets. I. Daily urinary thiamine excretion and its relation to creatinine excretion. *J. Nutrition* 48: 297, 1952.
- TSAO, M. C., and BROWN, S.: Pyruvic acid determination: a micromethod. *J. Lab. & Clin. Med.* 35: 1, 1950.

RESUMEN

Metabolismo de la tiamina de mujeres sometidas a dietas controladas. III. Niveles diarios de ácido pirúvico en sangre total

Se presentan los valores de ácido pirúvico en la sangre de 4 mujeres recibiendo una dieta controlada conteniendo dos niveles de tiamina. Con reducción de la ingestión de tiamina hubo una elevación de los niveles de ácido pirúvico y un descenso de la concentración de tiamina en la sangre.

