

from human pathology (*Cf.* Askanazy<sup>2</sup>) that leucemia is the sequence of a tumor-like proliferation of the bone marrow which, in a few instances, is the sole site of the pathological process. A mere entrance of immature elements into the blood stream as is the case when leucemic blood injected into the vein of healthy animals does not result in extramedullary blood formation. This appears to take place only after extreme hyperplasia of the bone marrow has been established.

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### Changes of Blood Gases and Lactic Acid After Exercise in Patients With Rheumatic Heart Disease.

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(Introduced by R. H. Halsey.)

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It has been demonstrated by a number of investigators<sup>1</sup> that changes in the oxygen unsaturation, carbon dioxide combining power, and lactic acid content of the venous blood occur in normal individuals after exercise. These changes seem to bear a definite relation to the amount of work performed. Very slight, or no differences are observed following mild exercise. When the exercise or amount of work performed is increased, greater changes are noted. The changes consist of an increase in the oxygen unsaturation and lactic acid content, and a decrease in the carbon dioxide combining power.

The object of the present study was to determine what changes occurred in the oxygen unsaturation, lactic acid, and carbon dioxide combining power of the venous blood in patients with rheumatic heart disease after performing measured amounts of work. The cases included in this study were children between the ages of twelve and sixteen years, with various valvular and muscular defects caused by the rheumatic infection. Their response to effort was

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<sup>2</sup> Askanazy, M., *Handbuch der speziellen pathologischen Anatomie und Histologie*, V. I. pt. 2, Berlin, 1927.

<sup>1</sup> Lundsgaard, C., and Möller, E., *J. Biol. Chem.*, 1923, iv, 315, 477, 599; Barr, D. P., and Himwich, H. E., *J. Biol. Chem.*, 1923, iv, 525, 539; Barr, D. P., Himwich, H. E., and Green, R. P., *J. Biol. Chem.*, 1923, iv, 495; Hewlett, A. W., Barnett, G. D., and Lewis, J. K., *J. Clin. Inv.*, 1926, iii, 317.

tested clinically and they were classified according to the Classification of the American Heart Association.<sup>2</sup>

The three determinations, oxygen unsaturation, lactic acid content, and carbon dioxide combining power, were made in the same case after the same amount of work in the majority of cases. The oxygen unsaturation was determined at rest and approximately one minute after the exercise was completed, and the lactic acid and carbon dioxide combining power at rest and again four minutes after the exercise. The exercise consisted of climbing thirty feet in forty seconds. In a number of instances the determinations were made after double and triple the amount of work was performed.

The following changes were observed when the work consisted of climbing thirty feet in forty seconds: the 2A cases showed only slight changes, whereas the children classified as 2B showed, with few exceptions, a definite increase in the oxygen unsaturation and lactic acid, and a decrease in the carbon dioxide combining power. Several of the 2A and milder 2B cases were given double the amount of work. Of these children, the 2B cases manifested the greater changes. (Table I.) In five of the 2A cases it was necessary to triple the amount of work before definite changes were noted. Three cases

TABLE I.  
Changes in O<sub>2</sub> Unsaturation, CO<sub>2</sub> Combining Power and Lactic Acid of Venous Blood After Exercise.

Cases	Class	No. of Determinations	Stairclimbing	Range of changes after exercise		
				O <sub>2</sub> Unsaturation Increase—Vol. %	CO <sub>2</sub> Combining Power Decrease Vol. %	Lactic Acid Increase mg. 100 cc.
5	2A	5	30 ft. in 40 sec.	0.17—0.64	0.08—1.15	1.8— 8.2
7	2B	15	30 ft. in 40 sec.	0.31—9.17	1.12—6.18	3.4—105.2
6	2A	7	60 ft. in 80 sec.		0.03—3.88	0.3— 7.0
4	2B	4	60 ft. in 80 sec.	3.61—6.83	4.41—6.8	11.1—122.8
5	2A	5	90 ft. in 120 sec.	0.89—4.93	3.44—5.12	9.4— 24.8

TABLE II.

Class	Stairclimbing	CO <sub>2</sub> Combining Power Increase—Vol. %	Lactic Acid Increase—mg. 100 cc.
2A	30 ft. in 40 sec.	1.45	7.6
2A	30 ft. in 40 sec.	2.70	11.6
2A	60 ft. in 80 sec.	1.59	0.3
2B	30 ft. in 40 sec.	3.80	—

<sup>2</sup> According to the Classification of the American Heart Association, Class 2 cases are patients with organic heart disease unable to carry on ordinary physical activity without discomfort; A, activity slightly limited; B, activity greatly limited.

classified as 2A, and one classified as 2B showed increases in the carbon dioxide combining power after exercise. (Table II.) We shall not attempt to explain these increases in the present report.

The results indicate that children whose tolerance for work is greatly diminished show greater changes in the oxygen unsaturation, lactic acid, and carbon dioxide combining power after performing measured amounts of work than children whose exercise tolerance is slightly diminished.

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Chemistry of the Lipoids of Tubercle Bacilli: XV. Water-soluble Sugars Obtained on Hydrolyzing Phosphatides from Human and Avian Tubercle Bacilli.\*

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The phosphatide A-3 obtained from the human type of tubercle bacilli, strain H-37,<sup>1</sup> yielded on hydrolysis about 33% of water-soluble material, but when the preliminary analysis was published only 2 of the water-soluble constituents had been identified, *viz.*, glycerophosphoric acid and glucose. Mention was made in the former publication<sup>1</sup> that a slightly soluble phenylhydrazine derivative was obtained from the aqueous solution and this compound was regarded as a phenylhydrazine salt of a sugar acid. In addition, we also obtained a small amount of a colorless crystalline compound from the concentrated syrup. This unidentified substance was more specifically referred to in the paper dealing with the analysis of the phosphatide isolated from the avian tubercle bacilli.<sup>2</sup> We have recently examined more thoroughly the sugar fractions obtained from the phosphatide A-3 as well as those obtained from the phosphatide from the avian bacillus and we have been able to identify 2 other substances which are present in the hydrolysis mixture, *viz.*, mannose and inosite.

\* The present report is a part of a cooperative investigation on tuberculosis, and it has been supported partly by funds provided by the Research Committee of the National Tuberculosis Association.

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<sup>1</sup> Anderson, R. J., *J. Biol. Chem.*, 1927, lxxiv, 537.

<sup>2</sup> Anderson, R. J., and Roberts, E. G., *J. Biol. Chem.*, 1930, lxxxv, 519.