The average weight of each seed was for the ungerminated, 0.17 g., for the germinated, 0.16 g., and for the green 0.11 g. Despite the fact that the weight of green material offered group C was less than the weights of germinated and ungerminated material offered groups A and B, respectively, group C thrived, whereas rats of groups A and B developed xerophthalmia and declined..

Since vitamin A is associated with xerophthalmia, these results show conclusively that there was a synthesis of vitamin A during the course of greening.

This is a preliminary report.

[1] Harrow, B., and Krasnow, F., *J. Med. Res.*, 1923, iv, 491; PROC. SOC. EXP. BIOL. AND MED., 1924, xxi, 232.

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Changes in CO_2 Combining Capacity of Blood Following Exercise in Individuals with Organic Heart Disease.

HERBERT W. SCHMITZ AND MARJORIE PRESTON.
(Introduced by R. H. Halsey.)
From the Convalescent Home for Cardiac Children, Irvington, N. Y.

Changes in the carbon dioxide combining capacity of the blood in normal individuals following vigorous exercise have been reported by a number of investigators. These changes consisted chiefly of a decrease in this constituent. Barr, Himwich, and Green[1] found that easy muscular exercise may be performed with little or no change, but that with heavier work the degree of change in carbon dioxide combining capacity increases rapidly with each small increase in the amount of work.

The purpose of this investigation was to determine whether or not similar changes in the carbon dioxide combining capacity occur in individuals with organic heart disease after performing a definite amount of work. The majority of the cases studied were children between the ages of 8 and 16 years, with organic heart disease caused by the infection of rheumatic fever. We also made observations on two normal individuals, and one case of congenital heart disease. The exercise consisted of climbing thirty feet of stairs in forty seconds. In a number of milder cases, the effect of climbing sixty feet was studied. The patients were ambulatory, but varied in their ability to carry on physical activity. The cases were classi-

fied according to the classification adopted by the American Heart Association: Class I. Organic—able to carry on habitual physical activity. Class II. Organic—able to carry on: A. Slightly diminished physical activity; B. Greatly diminished physical activity. Class III. Organic—unequal to any physical activity. Class E. Possible—having doubtful murmurs, mainly accidental, possibly organic. Class F. Potential—having a predisposing history.

Blood was taken from a cubital vein without pressure after the patients had rested at least one half hour, and again approximately three minutes after the exercise was completed. The carbon dioxide combining capacity was determined immediately by means of Van Slyke's apparatus.

It will be noted from Table I that the two normal individuals and the three Class I cases did not show any decrease in the CO_2 combining capacity following the exercise, but a small increase. Of the seven cases which were classified as II A, three presented an increase, and four a decrease in this constituent. The decrease in subject 12 is quite marked. Of the six Class II B cases, three showed a slight increase, and the remainder a marked decrease in the CO_2 combining capacity. It is quite obvious that decreases in the CO_2 combining capacity occurred only in the Class II A and Class II B cases, and that the greatest decreases were noted in the

TABLE I.

Changes in CO_2 Combining Capacity of Venous Blood in Individuals with Organic Disease after Exercise (Stair-climbing—30 ft. in 40 sec.).

Subject	Class	CO_2 Combining Capacity			Diagnosis
		Before Vol.%	After Vol.%	Difference Vol.%	
1. L. D.		56.7	57.6	+0.9	No disease.
2. M. K.		61.7	62.1	+0.4	No disease.
3. S. B.	I	65.3	69.1	+3.8	Mitral insufficiency.
4. M. B.	I	62.4	62.4	0.0	Aortic & mitral insufficiency
5. M. D.	I	68.1	69.1	+1.0	Mitral stenosis &insufficiency
6. R. K.	IIA	61.4	74.8	+13.4	Aortic & mitral insufficiency
7. S. B.	IIA	60.5	62.4	+1.9	Aortic & mitral insufficiency
8. J. K.	IIA	60.5	66.2	+5.7	Aortic & mitral insufficiency
9. V. M.	IIA	66.2	65.3	—0.9	Mitral stenosis &insufficiency
10. B. C.	IIA	57.6	55.7	—1.9	Congenital dextrocardia
11. P. L.	IIA	72.9	68.1	—4.8	Mitral insufficiency
12. T. L.	IIA	70.0	62.4	—7.6	Aortic & mitral insufficiency
13. M. B.	IIB	60.5	63.3	+2.8	Mitral stenosis &insufficiency
14. F. R.	IIB	64.3	65.3	+1.0	Mitral stenosis &insufficiency
15. R. N.	IIB	61.4	64.3	+2.9	Aortic insufficiency, mitral stenosis
16. J. H.	IIB	65.3	55.7	—9.6	Aortic insufficiency
17. A. M.	IIB	71.0	60.5	—10.5	Mitral stenosis &insufficiency
18. A. N.	IIB	64.3	56.7	—7.6	Aortic insufficiency, mitral stenosis

Class II B cases, although all the cases performed the same amount of exercise. Increases were noted in cases from all three classes.

In Table II are presented the changes observed in CO_2 combining capacity after the children climbed sixty feet of stairs. These

TABLE II.

Changes in CO_2 Combining Capacity of Venous Blood after Different Amounts of Exercise (stair-climbing).

Subject	Class	CO_2 Combining Capacity			Character of Exercise	Diagnosis
		Before Vol.%	After Vol.%	Difference Vol.%		
L. L.		68.1	67.2	—0.9	60 ft. in 120 sec.	No disease
J. B.	I	65.3	69.1	+3.8	30 ft. in 40 sec.	Mitral insufficiency
		59.5	63.3	+3.8	60 ft. in 125 sec.	
M. D.	I	68.1	69.1	+1.0	30 ft. in 40 sec.	Mitral stenosis and insufficiency
		64.3	61.4	—2.9	60 ft. in 125 sec.	
J. K.	IIA	60.5	66.2	+5.7	30 ft. in 40 sec.	Aortic and mitral insufficiency
		63.3	65.3	+2.0	60 ft. in 120 sec.	
V. M.	IIA	66.2	65.3	—0.9	30 ft. in 40 sec.	Mitral stenosis and insufficiency
		64.3	59.5	—4.8	60 ft. in 122 sec.	
M. B.	IIB	60.5	63.3	+2.8	30 ft. in 40 sec.	Mitral stenosis and insufficiency
		60.5	56.7	—3.8	60 ft. in 125 sec.	
F. R.	IIB	64.3	65.3	+1.0	30 ft. in 40 sec.	Mitral stenosis and insufficiency
		62.4	56.7	—5.7	60 ft. in 120 sec.	

changes are compared with those occurring after climbing thirty feet. The cases studied were taken from those showing no decreases in this constituent after climbing thirty feet. It will be ob-

served that the normal individual showed only a very slight decrease. One of the Class I cases presented no change, the other a slight decrease. One of the Class II A cases showed very little change, but the other presented a moderate decrease. Both Class II B cases showed a moderate decrease.

The results suggest that after performing an equal amount of work, the majority of the cases with severely damaged hearts will show a definite decrease in the CO_2 combining capacity, whereas the normal individual or the patient with a mild degree of heart damage will not present the same degree of change in this constituent. These observations suggest that the determination of the CO_2 combining capacity may be of value in the classification of patients with damaged hearts.

This is a preliminary report.

[1] Barr, D. P., Himwich, H. E., and Green, R. P., *J. Biol. Chem.*, 1923, lv, 495.

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Studies on the Life History of Blepharisma undulans.

LORANDE LOSS WOODRUFF.

From the Osborn Zoological Laboratory, Yale University.

Studies on the life history of *Blepharisma undulans* have been in progress for over five and a half years, all the animals employed being the progeny of a single individual isolated November, 1921. The work was planned to determine, in particular, the viability of this infusorian in the absence of fertilization, and the effects of fertilization on the rate of reproduction, in an attempt to broaden the results from our earlier studies on *Paramecium aurelia*[1] and *Spathidium spatula*.[2] A preliminary statement of the characteristics of this race of *Blepharisma undulans* was presented in 1922.[4]

Whereas earlier workers on this organism found that conjugation occurred rather infrequently and invariably was followed by death, conjugation was readily induced in our pedigree cultures, and the exconjugants proved to be viable in nearly every case. Accordingly excellent material was afforded for the problem at hand.

Two conclusions may be emphasized from the data secured to date:

(1) The animals of this race of *Blepharisma undulans* may reproduce apparently indefinitely without recourse to conjugation; there being no "cycles" in the vitality of the organism, as evinced