

SODIUM SUCCINATE AND LEUKO-
CYTOSISEFFECT OF THE SUBCUTANEOUS ADMINISTRATION
OF THE DRUG ON THE LEUKOCYTE
CONTENT OF HUMAN BLOOD

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The literature dealing with the physiologic functions and reactions of succinic acid or its salts is far from justifying the possible significance that may be attributed to its constant and fairly widespread occurrence in animal tissues.

The work that has been done seems to give rise to the idea that succinic acid takes an important part in the oxidations in the tissues. Batelli and Stern¹ report on the relative oxidizing powers of various tissues with respect to succinic acid. Thunberg² shows that the oxidative processes in muscle tissue are markedly influenced by the presence of this compound, and from this Mathews³ appropriately points out that the physiologic properties of succinic acid should be further investigated.

As an introduction to additional work on the subject, a study was made of the effect of the subcutaneous administration of sodium succinate on the leukocyte content of human blood from normal and pathologic persons.

The group of normal subjects was composed of four medical students apparently in good health. The other group was made up of nine persons suffering from phthisis. The majority of the latter patients had

The time for making the tests was so arranged that the possibility of error arising from physiologic leukocytosis was minimized. The leukocyte count normal for the individual was determined in all cases preliminary to the administration of the sodium succinate. Within two or three days the first dose of the drug was given in the form of 0.1 c.c. of a 1 per cent. solution subcutaneously. From four to six hours later

TABLE 2.—EFFECT OF THE SUBCUTANEOUS ADMINISTRATION
OF SODIUM SUCCINATE ON THE LEUKOCYTE CON-
TENT OF THE BLOOD OF PATHOLOGIC
PERSONS

Subject	Normal Count		Count After First Dose		Count After Second Dose	
	Date	W. B. C.	Date	W. B. C.	Date	W. B. C.
A	7/19/16	15,400	7/24/16 7/26/16	13,942 14,132	7/31/16 8/ 2/16 8/ 8/16 8/11/16	14,960 16,840 15,750 13,120
B	7/16/16	11,200	7/21/16 7/26/16	15,460 11,950	8/ 7/16	13,750
C	7/17/16	20,200	7/21/16 7/26/16 7/28/16	24,600 25,480 21,480	8/ 1/16 8/ 3/16 8/ 8/16	25,460 18,760 17,640
D	7/17/16	5,450	7/21/16 7/26/16	6,800 8,260		
E	7/19/16	10,160	7/21/16	14,080		
F	7/17/16	10,150	7/24/16	9,860	7/28/16 7/31/16 8/ 2/16	8,640 9,200 9,200
G	7/17/16 7/19/16	14,000 14,800	7/24/16 7/26/16 8/ 2/16	18,400 16,800 14,040	8/ 8/16 8/11/16	16,280 13,760
H	7/17/16 7/19/16	11,680 12,460	7/24/16 7/26/16 7/31/16	12,800 13,560 12,880		
I	7/31/16	6,230	8/ 2/16	8,480		

the first test count was made, and in the majority of cases subsequent tests were made at intervals of two or three days until the leukocyte content of the blood had so far reverted toward the normal that the increase due to the drug was confirmed. Then a second administration of twice the quantity was made and the same procedure followed. No untoward reactions were observed as the result of this method of procedure.

In Table 1 will be found the figures representing the results of these experiments on the normal subjects. Table 2 contains the demonstration of the effect of this treatment on the leukocyte content of the blood in the pathologic cases.

From these tables it will be seen that in the normal subjects the subcutaneous administration of sodium succinate invariably produced an increase in the leukocyte content of the blood, ranging from 30 to 70 per cent., and that in the group of pathologic persons 66 per cent. showed an increase ranging from 20 to 40 per cent. There is apparently no relationship between the initial leukocyte count and the percentage of increase caused by the drug. It is evident that one of the physiologic reactions to sodium succinate is an increase in the cellular mechanism of defense for the organism. How much this is concerned with the body oxidation processes is a subject for further study.

CONCLUSIONS

The subcutaneous administration of sodium succinate in doses of 0.1 c.c. of a 1 per cent. solution causes an increase in the leukocyte content of the blood of both normal and pathologic persons.

TABLE 1.—EFFECT OF THE SUBCUTANEOUS ADMINISTRATION
OF SODIUM SUCCINATE ON THE LEUKOCYTE CON-
TENT OF THE BLOOD OF NORMAL
PERSONS

Subject	Normal Count		Count After First Dose		Count After Second Dose	
	Date	W. B. C.	Date	W. B. C.	Date	W. B. C.
A	2/ 2/17	6,550	2/ 6/17	9,600	2/28/17	9,350
	2/ 5/17	6,800	2/ 8/17	9,160	3/ 2/17	10,800
			2/ 9/17	9,200	3/ 9/17	7,750
			2/14/17	9,200	3/14/17	8,500
			2/21/17	7,200	3/16/17	7,200
B	11/27/16	8,000	12/12/16	11,800	1/ 3/17	13,150
	11/29/16	7,800	12/14/16	10,732	1/ 5/17	11,200
C	3/ 1/17	7,320	3/14/17	10,000	3/28/17	8,650
	3/ 6/17	7,300	3/16/17	9,200	3/30/17	8,600
	3/ 7/17	7,000	3/23/17	7,750		
D	9/12/16	8,520	9/19/16	10,860	9/26/16	11,400
	9/14/16	8,480	9/20/16	11,120	9/28/16	10,460
			9/22/16	9,850	10/ 4/16	8,700

as a result of secondary infections a high original leukocyte count, and hence lent themselves nicely to a determination of whether or not the increase in leukocyte content observed in the normal subjects as the result of the administration of sodium succinate could be superinduced on that already present as the result of the pathologic condition.

1. Batelli, F., and Stern, L.: *Compt. rend. Soc. de biol.*, 1910, **69**, 370, 554; *Biochem. Ztschr.*, 1910, **30**, 172.
2. Thunberg: *Skand. Arch. f. Physiol.*, 1911, **25**, 37.
3. Mathews, A. P.: *Physiological Chemistry*, Ed. 2, New York, 1916, p. 611.