TECHNICAL PAPERS

Absence of Sickling Phenomenon of the Red Blood Corpuscle Among Brazilian Indians

E. M. DA SILVA[1]

Department of Hematology, Instituto Osvaldo Cruz, Rio de Janeiro

In 1910, Herrick (*7*) observed sickle-shaped red blood corpuscles (drepanocytes, meniscocytes, or selenocytes) in the blood of a patient with acute hemolytic anemia. In 1917, Emmel (*5*) discovered the sickling phenomenon, the capacity of red blood cells to assume multipointed bizarre forms leading up to sickle shape when blood is placed in a deficient oxygen medium. This feature (sickle-cell trait) is transmitted as dominant characteristic. Persons whose blood shows this condition are said to be sicklemic. The incidence in a determined population is the sicklemia index. A small percentage of sicklemics develop a type of anemia of chronic evolution and pathological picture, characterized mainly by crisis of hemolysis, siderosis, and atrophy of the spleen, rheumatoid symptoms, and leg ulcers. The importance of Emmel's discovery lies in the fact that for the first time it has been possible to identify the individual in the latency period, the time between birth and the appearance of the first symptoms of the disease (*2*). By comparing this observation with facts quoted in the literature (*3*) it has been possible, in many other hereditary diseases, to identify apparently healthy individuals who are able to transmit the morbid condition ("carriers," "potentially diseased," "healthy carriers of a pathogenic feature," "genetic carriers of inherited disease"). Similar observations have also been made by Neel (*9*). A relationship between such verifications and the skipping phenomenon in heredopathias was suggested by these findings (*6*).

The incidence of sicklemia is high in the Negroid ethnic group. Evans found a sicklemia index of 28.3% in Gambian negroes and a significant difference among some African groups. In Caucasians very few cases have been registered, the majority without sufficient documentation to dispel the hypothesis of miscegenation (*1, 10, 11*). Killingsworth and Wallace (*8*) found sicklemia among Mexicans with Indian ascendants without apparent mixture with Negroid. In Brazil, where the number of negroes, mulattoes, and cafuzoes is high, the percentage of sicklemics is considerable (*2*). Sicklemia has not been found in white Brazilians surely free from Negroid mixture (*2*).

During surveys in Indian villages, 1,545 Brazilian Indians from 15 different tribes have been examined. Some data on these investigations are given in Table 1.

As noted in the table, among 1,379 full-blooded Indians, of which 172 were crossing intertribes, no sicklemics were found. Three sicklemics among 166 Fulniô Indians (Aguas Bellas, State of Pernambuco) have been observed. However, this tribe is very mixed with negroes and mestizos. In the Indian villages of "Taunay" and "Lalima" (Miranda district, State of Mato Grosso) 4 sicklemics with ascendants of Tereno Indian, white and negro, have been found. On the other hand, among 1,424 crossbreeds of white and Indian ("mameluco" or "caboclo") of Mato Grosso (*4*), Federal Territory of

TABLE 1

Place	Tribes	No. obs.
Federal Territory of Amapá		
Region of Uaçá, Urukuá, and Curipy Rivers	Pariukur	98
	Galiby	123
	Caripuna	48
	Crossing intertribes	90
	Emereillon	1
State of Maranhão		
Barra do Corda—Village of Ponto	Canella (Ramkókamekra)	296
	Apinayé	1
	Crossing Canella-Apinayé	2
Barra do Corda	Guajájára	12
State of Mato Grosso		
(South) Districts of Miranda, Ponta Porá, and Dourados	Tereno	230
	Cayuá	239
	Caduéo (Guaycurú)	17
	Guarany	8
	Laiano	10
	Quiniquinau	3
	Crossing intertribes	80
(North) Kejara, Córrego Grande, and Colônia villages (São Lourenço River)	Boróro	121
	Total	1,379*
State of Pernambuco (Aguas Bellas)	Fulniô (Carnijó)	166†
	Total	1,545

* Among these 1,379 full-blooded Indians no sicklemic was found.

† Among Fulniô, a very miscegenated tribe, 3 sicklemics were observed (sicklemia index, 1.8%).

[1] The author wishes to express his thanks to the "Serviço de Proteção aos Indios" of the Brazilian Government for its help and assistance.

Amapá, Amazonas and Pernambuco States, no sicklemics were found. These data indicate that the sicklemia test may be useful as an auxiliary test in anthropology.

Emmel's method (*2, 5*) is the most practical for determination of the sicklemia index. It consists in sealing a drop of blood between slide and cover slip with vaseline, balsam, or any similar substance. Results should be read at the end of 6 hrs at the earliest, but 24 hrs is preferable. This delay has been removed by using a highly reducing substance (sodium hydrosulfite), with which sickling begins to show in a few minutes. The diagnosis can be made in 15 min. A drop of 2 gm of sodium hydrosulfite per cent solution in saline is placed on a slide and a drop of blood mixed with it. After being covered with a cover slip, the slide is examined under a microscope. No sealing is needed.

Detailed articles on these studies will be published in the *Memorias do Instituto Osvaldo Cruz.*

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Nutritional Requirements of the Rat for Reproduction and Lactation[1]

ALBERT J. SICA and LEOPOLD R. CERECEDO

Department of Biochemistry, Fordham University

It has been generally assumed that the requirements in the rat for lactation are greater, qualitatively, than those for reproduction, and many investigators have attempted to find new dietary factors exerting a specific effect on lactation. This viewpoint can be summed up in the words of Nelson and Evans (*2*): "The requirements for growth in weanling rats and for reproduction are satisfied . . . but the function of lactation has additional dietary requirements."

In humans, according to Macy (*1*), "the evidence indicates that the well-being of the child before birth and after are influenced by the nutrition of the mother before and at the time of conception and by the adequacy of her diet during pregnancy."

Observations made in this laboratory lead us to believe that reproduction has dietary requirements as great qualitatively as lactation and that there are no specific dietary factors required for lactation only.

Birth weights of rats have been determined in 117 litters born to mothers on stock and experimental diets. The basal experimental diet (diet R-5a) consisted of casein (Labco) (30%), sucrose (48%), salt mixture (5%), Ruffex (2%), lard (5%), hydrogenated vegetable oil (10%), and contained the following supplements per kilo of diet: thiamin, 20 mg; riboflavin, 20 mg; pyridoxin, 20 mg; calcium pantothenate, 40 mg; α-tocopherol, 20 mg; vitamin A concentrate, 67.5 mg (67,500 I.U.); vitamin D (Drisdol), 5,000 units; and choline chloride, 500 mg. The other experimental diets were modifications of diet R-5a and contained such supplements as folic acid, biotin, xanthopterin, and milk. Stock mothers received Rockland diet.

TABLE 1

DATA SHOWING THE RELATIONSHIP BETWEEN BIRTH WEIGHT AND CAPACITY TO SURVIVE IN RATS

	Group I Young born in surviving litters	Group II Young that failed to survive
No. of litters	71	46
No. of young	537	327
Avg. weight at birth (gm)	5.7	4.9
No. of young below 5.0 gm	22	155
Percentage of young below 5.0 gm	4.1	47.4
No. of young above 5.4 gm	399	31
Percentage of young above 5.4 gm	74.3	9.5
No. of young given to nurse	383	
No. of young weaned	356	
Percentage weaned	92.9	

The young have been divided into two groups. Group I comprises young born in surviving litters, and Group II includes litters in which none of the young survived the lactation period. The results are summarized in Table 1. The average weight of the surviving group was 16.3% greater than that of the nonsurviving group. The high percentage of young weaned in Group I indicates that viable, healthy young were included in this group. In this laboratory it is customary to reduce litters to 6 young on the third day of lactation. This accounts largely for the difference in the number of young born and the number given to nurse.

The distribution of young according to birth weight has been plotted (Fig. 1). It will be noted that the surviving young are grouped largely about the average, while nonsurviving young are more scattered. It appears that a birth weight of 5.0–5.4 gm is the critical range, lighter young having little chance of survival, while a heavier weight does not preclude the possibility that the young will fail to survive due to other causes. Especially significant is the fact that 74.3% of surviving young weighed over 5.4 gm, while only 4.1% weighed under 5.0 gm. These figures compare favorably with those obtained for the nonsurviving group.

[1] This investigation was aided by a grant from the Nutrition Foundation, Inc., New York. A preliminary report of the study has appeared (American Chemical Society Abstract, New York Meeting, September, 1947).

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Science **107** (2774), 221-222.
DOI: 10.1126/science.107.2774.221