The Sickle Cell Trait in Jamaica


With the technical assistance of E. F. P. Jelliffe

ECOLOGIC BACKGROUND

JAMAICA, the largest of the British West Indian islands, was originally inhabited by primitive Amerindians known as Arawaks, who dwindled to insignificant numbers during the one hundred and sixty-one years of Spanish rule which followed the discovery of the Island in 1494. During the 17th and 18th centuries, the British and Spanish planters, who had originally settled Jamaica, imported Negro slaves from West Africa. These were of numerous different tribes, including the Ibo, Ibibio, and Yoruba of Nigeria, as well as peoples from the Gold Coast and Angola. Following emancipation in 1834, so-called “East” Indian (i.e. from the Indian subcontinent) and Chinese indentured laborers were brought to the island and now form definite racial entities there. Two unusual Jamaican groups must be mentioned: the Maroons, originally bands of runaway slaves, who still live a free and isolated life in wild and inaccessible country in the northwest of the island, and the rural colony of German artisans, brought over originally in the early 19th century from Hanover and the Weser basin, whose descendants still remain as an intact unmixed Caucasian settlement, several hundred strong.

The 1943 census showed the population of Jamaica to be 1,237,063, of which the main racial groups may be summarized as follows: (1) predominantly African 78.1 per cent; (2) other Afro-Caucasian or Afro-Asiatic mixtures (colored) 17.5 per cent; (3) Caucasian 1.1 per cent; (4) East Indian 2.1 per cent; (5) Chinese 1.0 per cent.

It can, therefore, be seen that the average Jamaican is of African descent with a varying degree of Caucasian mixture.

Racial Index

In view of the impossibility of investigating the ancestry of the large number of children tested, the following rough system of racial assessment was employed. Ten points were allotted to each child and divided among the four main ethnic groups (i.e. African, A.; Caucasian, Ca.; Indian, I.; Chinese C.) according to the more obvious physical characteristics. Thus, a child of apparently unmixed African characteristics would be recorded as A.10:Ca.0:1.0: C.0., while a minimal Chinese-African mixture would be reported as: A.9:Ca.0:1.0:C.1. etc.

Obviously this type of system is very far from perfect and extremely inaccurate, being based only on an individual observer’s opinion as to such charac-
teristics as skin color, facial features, type of hair, color and shape of eyes. It did, however, enable a crude classification to be made.

METHOD EMPLOYED

The Scriver-Waugh technic was used, a drop of capillary blood being transferred rapidly to a coverslip, which was then inverted and placed on a clean slide. The coverslip was ringed with vaseline to exclude oxygen and examined for sickling after twenty-four, forty-eight, and seventy-two hours.

RESULTS

A total of two thousand one hundred sixteen blood slides were examined from subjects in different racial groups. These were predominantly schoolchildren, although some were infants attending the Child Welfare Centre and a few were in-patients in the pediatric ward. In the latter, sickle cell anemia was excluded.

In only two groups, the rural Jamaican village and the Chinese, were adults included.

1. Average Jamaican Children

One thousand two hundred sixty-seven children in the Kingston area were examined. Their racial index varied from A.10:Ca.0:I.0:C.0. to A.1:Ca.9:I.0:C.0, but was mainly A.8:Ca.2:I.0:C.0. A number also showed some degree of Chinese or Indian admixture.

Of the whole group, seventy-one (5.7 per cent) were found to be positive.

2. Rural Jamaican Village

The inhabitants of the small relatively isolated and inbred rural village of Goshen in the Mocho mountains were tested. The racial index varied from A.10:Ca.0:I.0:C.0. to A.5:Ca.5:I.0:C.0., but was mainly A.8:Ca.2:I.0:C.0.

Blood slides from two hundred sixty villagers, ranging in age from 2 months to 80 years, were examined, and ten (3.9 per cent) were found to show sickling.

3. Maroon Schoolchildren

As has been noted, the Maroons have lived a comparatively isolated existence for several centuries, and one hundred sixty-seven children of Accompong (Maroon town) school were tested, as it was felt that they might represent a more African group than elsewhere. In actual fact, the racial index was found to be very much the same as in the average Jamaican children, although no evidence of Chinese or Indian admixture was noticeable.

Only six children (3.6 per cent.) were found to be positive.

4. East Indian Schoolchildren

One hundred fifty-two schoolchildren of apparently unmixed East Indian origin were tested, and one (0.7 per cent) was found to show the sickle cell trait.

5. Chinese Children and Adults

One hundred children and adults of apparently pure Chinese descent were examined for sickling, with entirely negative results.
6. Caucasian Schoolchildren

Seventy schoolchildren of predominantly Caucasian descent were tested and none showed sickling.

7. Caucasian (Jamaican German) Schoolchildren

One hundred German children were tested at Seaford Town school. All were descendants of artisans imported a hundred years previously and were of a remarkably Scandinavian appearance, with very fair Complexions and blonde hair. No sickling was demonstrable.

**DISCUSSION**

The present survey has shown, as was expected, an absence of the sickle cell trait among the Chinese and Caucasians in Jamaica, while the single positive among the East Indian group was probably due to inapparent African ancestry.

The apparently lower incidence among the Maroons (3.6 per cent) and in the rural village of Goshen (3.9 per cent), compared with 5.7 per cent among the average Jamaican group, is not of statistical significance. Nevertheless, in addition, it may be noted that the distribution of the sickle cell trait among the peoples of West Africa varies very considerably, as can be seen in the map. For instance, Pales and Linhardt found only 8 per cent positive in French West Africa, while Jelliffe and Humphreys discovered 23.7 per cent to be trait carriers.

**Table 1.—The Incidence of the Sickle Cell Trait in Different Racial Groups in Jamaica**

<table>
<thead>
<tr>
<th>Group examined</th>
<th>Place</th>
<th>Race</th>
<th>Age (yrs.)</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Per cent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maroon schoolchildren</td>
<td>Accompong</td>
<td>Predominantly African</td>
<td>3-14</td>
<td>167</td>
<td>6</td>
<td>3.6</td>
</tr>
<tr>
<td>Rural village</td>
<td>Goshen</td>
<td>Mainly African</td>
<td>2 mo. to 80 yrs.</td>
<td>260</td>
<td>10</td>
<td>3.9</td>
</tr>
<tr>
<td>E. Indian schoolchildren</td>
<td>Cockburn Pen</td>
<td>Predominantly E. Indian</td>
<td>6-14</td>
<td>152</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Chinese adults and children</td>
<td>Kingston area</td>
<td>Chinese</td>
<td>6 yrs. to adults</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jamaican German schoolchildren</td>
<td>Seaford Town</td>
<td>Caucasian</td>
<td>6-14</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Caucasian schoolchildren</td>
<td>Kingston area</td>
<td>Predominantly Caucasian</td>
<td>9-17</td>
<td>70</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average Jamaican children</td>
<td>Kingston area</td>
<td>Mainly African</td>
<td>4 mo. to 14 yrs.</td>
<td>1267</td>
<td>71</td>
<td>5.7</td>
</tr>
</tbody>
</table>
TABLE 2.—The Incidence of the Sickle Cell Trait in Average Jamaican Children in the Kingston Area, According to Age

<table>
<thead>
<tr>
<th>Age</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Percentage positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mo. to 5 years</td>
<td>293</td>
<td>13</td>
<td>4.4</td>
</tr>
<tr>
<td>Over 5 yrs. to 9 years</td>
<td>289</td>
<td>20</td>
<td>7.4</td>
</tr>
<tr>
<td>Over 9 yrs. to 14 years</td>
<td>705</td>
<td>38</td>
<td>5.5</td>
</tr>
<tr>
<td>Total:</td>
<td>1267</td>
<td>71</td>
<td>5.7</td>
</tr>
</tbody>
</table>

in Nigeria. The African population originally imported to the Caribbean and the Americas was not a uniform one, and although over the centuries considerable fusion of the different African groups must have occurred, an uneven distribution of sickling may still persist to some extent, especially in more remote areas.

Although the first case of sickle cell anemia ever described was in a West Indian Negro from Grenada, comparatively few surveys have been made in the Caribbean to assess the incidence of the sickle cell trait there. Excluding figures from Central and South America, the following results are available from the other West Indian islands: Cuba 5.3 per cent; Puerto Rico 5.6 per cent; Martinique 5.5 per cent; Guadeloupe 8 per cent; Curaçao 11.7 per cent.

In the present investigation, 5.7 per cent of a group of one thousand two hundred sixty-seven average Jamaican children were found to be positive. Analysis of these results into different age groups shows: infants 4.4 per cent; young children 7.4 per cent; older children 5.5 per cent (table 2). These differences are not statistically significant.

Consideration of the group of average Jamaican children according to assessed racial mixture (table 3) shows the following results: predominantly African (with Caucasian) 6.0 per cent and (with Asian) 5.9 per cent; other Afro-Caucasian mixtures 4.9 per cent; predominantly Caucasian 0 per cent. Excluding the last group, there appears to be no statistical significance between these figures.

This finding would appear to be at variance with Hodges' theory that sickling occurs more frequently the greater the non-African admixture, but would seem to be upheld even more strongly by results from elsewhere, which have, indeed, found the contrary to be the case. Thus, de Mendonça found the following distribution of the sickle cell trait in a mixed population in Brazil: light skinned 0 per cent; brown skinned 6.4 per cent; black skinned 9.4 per cent. Calero, working in Panama, found 1.3 per cent, 12.2 per cent, and 14.3 per cent in corresponding groups.

In addition, it must be noted that Hodges makes no reference to work done in Africa later than 1947. More recent investigations, as shown in the map, clearly demonstrate that the trait incidence in Africa is, in general, very much higher than has ever been recorded in the Western hemisphere—for example, among the Yoruba of Western Nigeria 23.7 per cent, in Tanganyika 29 per cent, and in Northern Mozambique 40 per cent.
### Table 3—The Incidence of the Sickle Cell Trait in Average Jamaican Children in the Kingston Area, According to Assessed Racial Index

<table>
<thead>
<tr>
<th>Racial Index</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Percentage positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainly African (with Caucasian)</td>
<td>A.10:Ca.0:1.0:C.0 to A.7:Ca.3:1.0:C.0</td>
<td>956 56</td>
<td>5.9</td>
</tr>
<tr>
<td>Mainly African (with Asiatic)</td>
<td>A.7:Ca.0:1.0:C.3. or A.7:Ca.0:1.3:C.0 etc.</td>
<td>84 5</td>
<td>6.0</td>
</tr>
<tr>
<td>Other Afro-Caucasian mixtures</td>
<td>A.6:Ca.4:1.0:C.0 to A.4:Ca.6:1.0:C.0</td>
<td>206 10</td>
<td>4.9</td>
</tr>
<tr>
<td>Mainly Caucasian</td>
<td>A.3:Ca.7:1.0:C.0 to A.0:Ca.10:1.0:C.0</td>
<td>21 0</td>
<td>0</td>
</tr>
</tbody>
</table>

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**Fig. 1.—Global distribution of the sickle cell trait**

According to the theory of Lehmann and Cutbush, which is based on blood group and sickling studies, the sickle cell trait may have been spread to East Africa by the migration of aboriginal Veddic tribes from India and has, over the centuries, diffused across Africa to the West Coast. For some unexplained reason, the condition does not seem, according to present evidence, to have pene-
trated into the southern extremity of the African peninsula, so that the trait is found very uncommonly, for example, among the Bantu of South Africa; a recent survey by Foy and his associates has shown that, while the high trait incidence of 40 per cent is found in the Makua and Makonda peoples of Northern Mozambique, only 4 per cent of positives can be detected in the part of that country adjacent to the Union of South Africa, that is south of parallel 22.

While the suggested spread from India may have been a mainly seaborne migration, recent work has tended to suggest that the sickle cell trait may be found near the land bridge from India to Africa—for example, among the Yemenite Jews of Arabia and in Greece, although still later work has tended to throw some doubt on these findings. It is, of course, difficult in these examples to exclude the possibility of African admixture during either the Roman or Turkish Empires, or in the era of medieval Mohammedan expansion, since, in all of these periods, African slaves were usual; the so-called Eastern slave route, with Arab dhows running from Zanzibar to Arabia, was only suppressed at the end of the last century and probably continued furtively on a small scale even later than that.

The hypothesis of Lehmann and Cutbush can only be regarded as tentative and unproven, but it would seem to indicate the necessity for further sickle cell surveys in areas previously ignored, which may have been on the suggested migration route from India westwards—as for example the adjacent territories of Pakistan, Beluchistan, and the land mass of Arabia, together with the Laccadive and Maldive islands lying in the Indian Ocean between the two continents.

Whether this mode of diffusion is correct or not, it is quite apparent that the sickle cell trait is now widely, but unevenly, distributed over the equatorial part of trans-Saharan Africa, becoming, however, much less common in the southern part of the continent. It is felt that the great variability in the incidence among different African peoples, even among adjacent groups on the Western littoral, should be more widely appreciated, as it may, in some cases, be a partial explanation of the variation of incidence of the sickle cell trait in people of African descent in different parts of the Western hemisphere.

Summary

1. A survey was undertaken to determine the incidence of the sickle cell trait among two thousand one hundred and sixteen Jamaican children and adults of different racial groups. The following positives were found: average Jamaican children (Afro-Caucasian mixtures) 5.7 per cent; population of rural Jamaican village 3.9 per cent; Maroon schoolchildren 3.6 per cent; East Indian schoolchildren 0.7 per cent; Chinese children and adults 0 per cent; Caucasian schoolchildren 0 per cent; Caucasian (Jamaican German) schoolchildren 0 per cent.

2. In the group of one thousand and sixty-seven average Jamaican children, no significant difference could be found between the different age-groups (i.e. infants, younger children, older children), or between the predominantly African and lesser Afro-Caucasian mixtures.

3. The incidence of the sickle cell trait in the other West Indian islands is noted.

4. The possible spread of the sickle cell trait from India to Africa, and its present uneven distribution in Africa is discussed.
1. Ha essite interprettate un studio statistic pro determinar le distribution del phenomeno de cellulas falciforme inter 2.116 infantes e adultos jamaican de varie grupplos racial. Le sequente resultatos positive esseva obtenite: typic infantes jamaican (mixtiones afro-caucasian) 5.7 pro cento; population de village jamaican 3.9 pro cento; scholares marron, 3.6 pro cento; scholares est-indian 0.7 pro cento; infantes e adultos chinese 0.0 pro cento; scholares caucasian (de varie origines) 0.0 pro cento; scholares caucasian (germanos de Jamaica) 0.0 pro cento.

2. In le gruppo de 1.067 typic infantes jamaican nulle differentia significative esseva trovabile inter le vane gmuppos de etate (i.e. babies, infantes juvener, infantes plis vetere) o inter le grupplos predominantemente african e le afro-caucasian mixtiones minus african.

3. Le distribution del phenometso de cellulas falciforme in le altere West-Indias es resumite.

4. Le possibile diffusion del phenomeno ab India a Africa e sit present-c dist.ni-but.ioii inequal in Africa es discutit.e.

REFERENCES

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