The Australia antigen in Brazilian healthy persons and in leprosy and leukaemia patients

F. M. SALZANO AND B. S. BLUMBERG
From the Departament de Genètic, Institut de Ciències Naturals, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil, and the Institute for Cancer Research, Fox Chase, Philadelphia, Pennsylvania, USA

SYNOPSIS The distribution of the Australia antigen was investigated in 633 white and negroid healthy persons, 218 white and negroid leprosy patients, and 50 white leukaemia patients. The subjects were living at the time of the investigation in two southern Brazilian cities. Two of the patients with leukaemia showed the antigen, as also did three out of 358 negro subjects, but no reactors were found among the healthy white subjects and leprosy patients.

Australia antigen, so called because it was first found in the serum of an Australian aborigine, is detected using antisera from patients who have received large numbers of transfusions. The studies on the antigen have been summarized recently (Blumberg, Sutnick, and London, 1968). Soon after its discovery, the association of the antigen with hepatitis virus was established (Blumberg, Gerstley, Hungerford, London, and Sutnick, 1967a). Although the antigen is rare in normal American populations, it is found fairly often in patients with acute viral hepatitis (both 'infectious' and 'post-transfusion'), but not in patients with a variety of other liver diseases. Also it is often found in sera from cases of chronic disease characterized by a prolonged and (usually) severely impaired immune mechanism (Blumberg et al, 1968; Sutnick, London, Gerstley, Cronlund, and Blumberg, 1968; London, Sutnick, and Blumberg, 1969). In these patients the presence of the antigen identifies chronic anicteric hepatitis. The sera from chronic diseases in which the antigen is found include Down's syndrome (mongolism), leukaemia, and chronic renal disease in patients undergoing haemodialysis. The antigen has been isolated from blood, and under the electron microscope is seen to be a particle of 200 Å diameter which has the appearance of a virus (Bayer, Blumberg, and Werner, 1968). In addition to these disease associations, the antigen is common in apparently normal people living in parts of the tropics and tens of millions of people probably carry it. These apparently normal people do not have overt evidence of hepatitis but appear to be carriers of the disease. Their identification is useful in the screening tests to eliminate carriers of hepatitis.
Materials and Methods

Blood was collected from (1) healthy white and negro subjects between December 1961 and June 1965 for gene flow studies and other investigations (Salzano, Suñé, and Ferlauto, 1967; Salzano, Rocha, and Tondo, 1968); (2) healthy whites and leprosy patients between August 1965 and March 1964 for the study of the relationships between genetic polymorphisms and leprosy (Schwantes, Salzano, Castro, and Tondo, 1967; Salzano et al., 1967); (3) leukaemic patients and their relatives between June and November 1963 for the investigation of blood group changes in leukaemia (Ayres, Salzano, and Ludwig, 1966).

In the material obtained in Brazil, if possible the red cells and plasma were immediately separated after collection, the plasma being kept in the deep freeze at about –20°C until they were sent by air to Philadelphia for the determination of Australia antigen. Otherwise plasma was frozen immediately and later with the other material sent to Philadelphia.

Australia antigen determinations were carried out in Philadelphia from June to August 1966, by precipitation in agar gel using the double diffusion micro-Ouchterlony technique described elsewhere (Blumberg and Riddell, 1963; Blumberg et al., 1966). The antiserum used was rabbit antiserum no. 6 (Melartin and Blumberg, 1966) against a human antiserum. The material tested, therefore, was stored between four and a half years and seven months. Since the Australia antigen was present in sera or plasma stored for up to six years (Blumberg, Alter, and Visnich, 1965), the long storage of some of our material has probably not affected the results.

Results and Discussion

Table I shows the distribution of Australia antigen in the samples tested and Tables II and III furnish additional clinical information.

Fewer than half of the individuals studied were males and about half were distributed in the age group 0 to 29 years. Some 80% of the leprosy patients had lepromatous leprosy which was generally of the mild type, and 20% of those with leukaemia showed the acute myeloblastic form.

The Australia antigen was present in only three of the 633 healthy persons studied (0.5%), was completely absent among the 218 leprosy patients tested, but was present in two of the five leukaemia patients. The individuals showing the Australia antigen were a dark Mulatto, a woman, age 28; two Negros, both male, aged 40 and 67. All three came to the collecting points because they were receiving some kind of treatment but none presented abnormal haemoglobin (Table II). The following is an account...
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<table>
<thead>
<tr>
<th>Genetic Group</th>
<th>Type of Leukaemia</th>
<th>Type of Leprosy</th>
<th>Severity of the Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute</td>
<td>Lepromatous</td>
<td>Tuberculoid</td>
</tr>
<tr>
<td>Whites, Florianópolis</td>
<td></td>
<td>79.0</td>
<td>9.5</td>
</tr>
<tr>
<td>Negros, Florianópolis</td>
<td></td>
<td>88.9</td>
<td>5.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>79.8</td>
<td>9.2</td>
</tr>
</tbody>
</table>

Table IIIa  Clinical summary of the leprosy patients

<table>
<thead>
<tr>
<th>Genetic Group</th>
<th>Type of Leukaemia</th>
<th>Type of Leprosy</th>
<th>Severity of the Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute</td>
<td>Lepromatous</td>
<td>Tuberculoid</td>
</tr>
<tr>
<td>Whites, mainly from Porto Alegre</td>
<td></td>
<td>26.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>

Table IIIb  Clinical summary of leukaemic patients

of the main clinical findings observed in two patients who carried the antigen.

ILLUSTRATIVE CASES

Case 15704
A white woman, aged 68 (maternal and paternal grandparents of Portuguese ancestry), was living at the time of examination in the city of Rio Grande. She showed the first symptoms of disease in June 1959, and blood was tested on 18 November 1965. At the time of examination the only symptom she presented was splenomegaly and clinically she was considered to be in good health. No information is available about previous treatment and transfusions. Haematological tests performed in 1965 showed 82,000 leucocytes (0.5% leucoblasts), 413 m/cmm red blood cells, and a haemoglobin level of 80% of the normal. She was diagnosed as having chronic myeloid leukaemia. Blood group antigens did not show any abnormality but there appeared to be a depression in the $\alpha$ and $\beta$ agglutinins in the plasma (group O, titre of anti-\(A_1\) 1:2 against 1:32 in the control; anti-\(B\):

41,000 leucocytes (44% leucoblasts) and 214 mc/mm red blood cells. The diagnosis was of chronic lymphoid leukaemia. He presented two abnormalities in blood group antigens, a depression in \(A_1\) (45% of agglutination against 96% in the control) and a rise in an H-like element (14% of agglutination against 3% in the control).

Evidence that he was genetically of group A1 and not an intermediary was obtained through the testing of his daughter, who had a normal group A blood; his wife was group O. No changes in his $\beta$ agglutinin were detected. The inhibition titre of saliva was A antigen, 1:8, and H antigen, 1:1; that of his daughter was A 1:64 and of H, 1:16.

The frequency of Australia antigen in the leukaemia patients appears to be somewhat less than that found in American populations, but since the numbers tested in Brazil are small these differences may not be significant.

As noted above, Australia antigen is not found in increased frequency in lepromatous leprosy in areas where the antigen is not common in the general population. However, it is significantly more common in lepromatous leprosy in areas where its frequency is high in the general population. Thus the frequency of Australia antigen in lepromatous leprosy in the Philippines and India is nearly twice as high as it is in the normal populations or in those patients with tuberculosis leprosy. From this we may surmise that lepromatous leprosy patients are more susceptible to chronic infection with hepatitis, but this would not become manifest unless the organism were relatively common in the general population.

The antigen seems to be rare in healthy white and negro Brazilian populations (no reactors among 275 white and two among 358 negroid subjects; see Table I). This is a finding which is not much at variance with previous results. Thus, Blumberg et al (1966) did not find the antigen among 607 US Negroes or 101 Italians, and only one out of 44 Portuguese living in Hawaii showed it.

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References