The Diego Factor in a Puerto Rican Family: A Case of Anti-Diego

By Hubert J. Van Peenen, John Scudder, James A. Jack and Erika Awer

INTRODUCTION

The Diego (Di⁺) blood factor, first described by Levine,1,27 and Layrisse2,3 has been extensively studied.2,26 It is serologically distinct from other known blood factors,3 does not appear to be linked to any of them13 and may represent a separate blood group system.11,12

The factor is of anthropological interest because of its presence in most North and South American Indian tribes2,6,7,10,11,14,15,16,17,18 and in orientals.5,6,11 It has even been used as a marked to trace Mongoloid racial migrations.19

The Diego factor is absent in Negroes,6,29 Australian aborigines,21 Polynesians22,23 and Caucasians except where Amerindian or Mongoloid admixture may have taken place. Its allele (Di⁺), if it exists, has not yet been discovered.

Three cases of anti-Diego have been described.3,25,27 This paper presents a fourth with unusual features.

CASE HISTORY

Mrs. P. F. M., a Di⁻ negative thirty seven year old Puerto Rican woman, para VI, gravida IX, had four full-term deliveries by her first husband who was Diego negative. Her second husband was Diego positive. By him she underwent three pregnancies ending in abortion before her delivery of monozygotic female twins on May 22, 1959, at the Metropolitan Hospital, New York City. The children weighed 1410 and 1460 Gm. respectively. Because of this prematurity they were transferred to the Babies Hospital of Columbia-Presbyterian Medical Center. In this institution the direct Coombs test done routinely on all premature infants yielded an unexpected 4+ reaction.

Close observation for seven weeks revealed no physical or laboratory evidence of hemolytic disease.

On physical examination prior to discharge rectal strictures were discovered and dilated. Following this, twin "B" developed peritonitis and septicaemia due to a Paracolon species. She was cured with vigorous antibiotic and infusion therapy. Even with this stress no signs of hemolytic disease of the newborn developed.

Serological Tests

Mrs. P. F. M., the mother, had never been transfused. Blood from the twins, Mrs. P. F. M., her husband, and all the husband's available relatives, was submitted for study against a panel of known cells and sera. As can be seen from table 1, the mother's serum contained an antibody which reacted by indirect Coombs test with her husband's red cells and with those of the twins, but failed to agglutinate any of the cells in the selected panel. On further investigation in two reference laboratories (see acknowledgement), Mrs. P. F. M. was proven to be Di⁻ negative. Her serum agglutinated known Di⁺ positive cells.


Table 1.—Serological Studies on Mrs. P. F. M., Her Husband’s and Her Di⁺ Positive Children

<table>
<thead>
<tr>
<th>Group</th>
<th>D</th>
<th>C</th>
<th>e</th>
<th>E</th>
<th>e</th>
<th>Di⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husband No. 1</td>
<td>B</td>
<td>+</td>
<td>+</td>
<td>0</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Husband No. 2</td>
<td>O</td>
<td>+</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Mrs. P. F. M.</td>
<td>A</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Twin “A”</td>
<td>A</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Twin “B”</td>
<td>A</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1.—The Diego factor in four generations of a Puerto Rican family.

Di⁺ was demonstrated in the blood of the father and the twins. The father’s family in Puerto Rico was investigated (table 2, figure 1). The Diego factor was found to be present in the husband’s aunt, paternal grandmother and great uncle. These persons had Amerindian features.

Through the courtesy of Dr. O. Costa-Mandry of the Departamento de Salud, San Juan, Puerto Rico, serum from Mrs. P. F. M. was used to test 603 inhabitants of Puerto Rico. All were Di⁺ negative.

**DISCUSSION**

This is the first demonstration of Di⁺ in Puerto Ricans. Carib Indian admixture may be responsible for its presence. As would be expected the subjects were of an Amerindian appearance.

Less expected may be the finding of an anti-Diego so mild it resulted in no disturbances. Each of the three previously reported cases resulted in hemolytic disease of the newborn. The prematurity of the twins would ordinarily have increased their susceptibility in the case presented here, yet both infants were asymptomatic prior to the septicemia in twin “B.”

It may be that successive incompatible pregnancies increase the severity of iso-immunization as is the case in Rh disease. The original case (Diego) was that of a Venezuelan child, fourth in birth order, with two Di⁺ positive siblings. He died from hemolytic disease of the newborn. The second case (Woj) was third in birth order and had mild hemolytic disease. The third (Mart) was fifth in birth order and succumbed to severe erythroblastosis fetalis. In the last two cases siblings were not tested so one cannot document repeated anti-
Table 2.—Serologic Studies on Relatives of Husband No. 2. See Figure 1. Numerals Indicate Degree of Agglutination by Appropriate Test. M. G., R. G., and J. G. are Diego Positive

| Subject | Group | Serum PFM | D1a | D | C | E | c | c | Cw | V | K | k | Fyα | Jsα | Lεα & Lεb | Jkα | Jkβ | M | N | S | s | P | Lεα | Lεb |
| I-1     | O     | 2         | 2   | 4 | 0 | 0 | 4 | 4 | 0 | 0 | 4 | 2 | 0 | 0 | 0 | 2 | 2 | 0 | 4 | 0 | 4 | 3 | 0 | 3 |
| (M. G.) |       |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| I-3     | O     | 3         | 2   | 4 | 0 | 3 | 4 | 3 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 0 | 3 | 0 | 4 | 0 | 3 | 0 | 3 |
| (R. G.) |       |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| II-1    | O     | 2         | 2   | 4 | 3 | 0 | 3 | 4 | 0 | 0 | 3 | 2 | 0 | 0 | 3 | 0 | 3 | 0 | 3 | 3 | 3 | 3 | 3 |
| (J. G.) |       |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| II-3    | O     | 0         | 0   | 4 | 4 | 0 | 3 | 4 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 0 | 3 | 4 | 4 | 4 | 3 | 4 | 0 |
| (P. G.) |       |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| II-4    | A     | 0         | 0   | 4 | 3 | 0 | 3 | 4 | 0 | 0 | 4 | 0 | 0 | 3 | - | - | 0 | 4 | 4 | 4 | 0 | 0 | - |
| (A. G.) |       |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| II-5    | A     | 0         | 0   | 4 | 3 | 0 | 2 | 4 | 0 | 0 | 3 | 3 | 3 | 0 | 3 | - | - | 0 | 4 | 0 | 3 | 3 | 4 | - |
| (C. G.) |       |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| III-2   | A     | 0         | 0   | 3 | 3 | 0 | 3 | 4 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | - | - | 3 | 4 | 0 | 4 | 3 | 3 | - |
| (G. C.) |       |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| III-3   | A     | 0         | 0   | 4 | 4 | 0 | 2 | 4 | 0 | 0 | 3 | 3 | 3 | 0 | 3 | - | - | 3 | 4 | 0 | 3 | 3 | 4 | - |
| (C. M. G.) |     |           |     |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
genic stimuli with succeeding pregnancies. Conforming to Layrisse’s concept, both the Diego and Mart cases were part Amerindian. Woj may have had distant Mongoloid admixture.

Since the new case of anti-Diego reported here was discovered only incidentally, it suggests that other asymptomatic anti-Diego sera exist. They may be relatively common in some ethnic groups. The true hazard of sensitization to Diego needs further investigation. It appears to be relatively small. In Layrisse’s 50 cases of Di⁺ incompatible matings no antibodies were formed in an unspecified number of pregnancies. Chinese carry a 2.4 per cent incidence of Di⁺ but have little hemolytic disease.

**SUMMARY**

The Diego blood group factor was shown to be present in a family of Puerto Ricans. 609 other Puerto Ricans were Diego negative.

The fourth reported case of anti-Diego is presented. The antibody was unusual in that it was discovered incidentally and did not cause hemolytic disease of the newborn.

**SUMMARIO IN INTERLINGUA**

Esseva demonstrate le presentia del factor de gruppo de sanguine Diego. Sex centos novem altere portoricanos esseva Diego-negative.

Es presentate le quarte reportate caso de anti-Diego. Le anticorpore esseva inusual in tanto que illo esseva discoperite incidentalmente e que illo non causava ulle morbo hemolytic in le neonato.

**ACKNOWLEDGMENTS**

Dr. R. R. Race of the National Transfusion Service, London, England, and Dr. P. Levine of Ortho Research Foundation, Raritan, N. J., gave serological confirmation of the Diego factor in twins “A” and “B” and the anti-Diego in Mrs. P. F. M. Dr. O. Costa-Mandry of the Departamento de Salud, San Juan, Puerto Rico, performed the screening survey on 609 random blood samples.

**REFERENCES**

10. —, —: The Diego blood factor distribution genetic, clinical and anthro-
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