The Good Factor as a Possible Cause of Hemolytic Disease of the Newborn

By Abraham M. Frumin, Mary McKee Porter and Mary F. Eichman

Immunization in pregnancy has been a fertile source for the demonstration of new blood group factors from the initial demonstration of the Rh to the more recent Diego factor. We have recently observed hemolytic anemia of the newborn due to a heretofore undescribed blood factor which we have named Good. It is the purpose of this paper to present the pertinent clinical and immunologic data on this new human blood factor.

Clinical History

H. G., a 28 year Negro female, Gr VIII, Para VI, Abortus I, was first admitted to Woman's Medical College Hospital on 8/16/58 because of lower abdominal pain occurring in her sixth month of gestation. Her pregnancies in 1948 and 1949 with her first husband were completely normal. The subsequent pregnancies with her present husband in 1954, 1955, 1956 and 1957 were characterized by premature deliveries, still births and abortion. A cesarian section was done on 8/24/58 because of poor fetal heart sounds, but the infant died shortly afterwards.

Studies on the cord blood showed: hematocrit 25 per cent, hemoglobin 5.5 Gm. The serum bilirubin was 3.4 mg. per cent. The direct Coombs' test performed on the cord red blood cells was negative. The mother's serum failed to agglutinate a panel of red cells (Panocell). However, it was noted that the mother's serum agglutinated both the father's and child's cells (but not the offspring of the previous marriage), even though no demonstrable blood group incompatibility was demonstrated by the routine typing sera. It was therefore felt that we were dealing with some blood group antigen-antibody reaction which has subsequently been demonstrated to differ from those previously reported.1,2

Immunologic Observations

We tested the mother's serum against 308 group-compatible blood specimens without finding the Good antigen. Another author tested it against 1395 blood samples without finding agglutination. This attests to the relative scarcity of the Good antigen. Since we were unable to contact both the parents and the siblings of the Good parents, further observations of the familial incidence of the Good antigen-antibody cannot be made at present. The only surviving child is Good negative and did not demonstrate anti-Good antibody. Mrs. Good had two normal children with her first husband. With her present husband (Mr. Good) she had a normal child with her first pregnancy and
lost the following four children with hemolytic disease of the newborn. Mrs. Good had never been transfused until after her fourth pregnancy, so isoimmunization secondary to blood transfusion appears to be excluded. The anti-Good antibody was present in a titer of 1:8 in saline and 1:16 in albumin at delivery. There was no difference as to temperature, i.e., incubations at 37, 22 and 4°C being identical. Two months after delivery a titer of 1:16 in saline and 1:64 (Coombs') was noted. The third month postpartum titer showed 1:8 in saline and 1:64 albumin. Enzyme-treated (papain) red cells were not agglutinated by the mother's serum (according to the method of Löw\(^4\)). This attests to an immunologic similarity to the MNS and Duffy systems. Four other examples of the anti-Good antibody have subsequently been found, all in adult males who had never been transfused.\(^2\) These findings attest to the relative frequency of the anti-Good antibody as compared with the rarity of the Good antigen. Dr. Sanger in a personal communication stated that "the Good antigen did not correspond to any of the following antigens: Hu, He, Mi\(^a\), Vu, Vr, M\(^a\), C\(^a\), E\(^a\), V, Kp\(^a\), Di\(^a\), Js\(^a\), Levay, Wr\(^a\), Be\(^a\), By or Sw\(^a\)." Fractionation of the Good serum by anion-cation cellulose exchange chromatography indicates that the serologic activity was preponderantly associated with gamma globulin of the 7S class which might be expected to cross the placenta and cause fetal damage.\(^3\) Rh saline agglutinins do not appear in this fraction, but those of the ABO system do. Agglutination tests performed after inactivation of serum by heating to 56°C showed no diminution in antibody activity. In vitro hemolysis could not be demonstrated when fresh or upon addition of guinea pig serum.

**SUMMARY AND CONCLUSIONS**

A new human blood factor is described for which the name Good is proposed. The Good factor has not been found in 1703 blood specimens thus far tested, whereas the antibody has been found in five instances. The anti-Good antibody is a gamma globulin of the 7S class, active at 22 and 37°C, both in saline and albumin.

**SUMMARIO IN INTERLINGUA**

Es describite un nove factor sanguinee human. Pro illo le nomine Good es proponite. Le factor Good non esseva detegite in 1703 specimens de sanguine essayate usque nunc, sed le correspondente anticorpore eseva trovate cinque vices. Le anticorpore anti-Good es un globulina gamma del classe 7S. Illo es active a 22 e 37°C, tanto in solution salin como etiam in albumina.

**REFERENCES**

2. Cahan, A.: Personal communication.
3. Abelson, N.: Personal communication.
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