26. An Example of Blood Chimeric Twins

By Toshiaki Kato,*) Kanji Fukai,*) Toshiharu Yokota,**) Yasuto Okubo,***) Taiko Seno,***) Nobuo Nagao,***) and Hideo Yamaguchi****)

(Communicated by Ren Kimura, M. J. A., March 13, 1978)

Eight-year-old unlike-sexed twins were grouped as AB at the time of their entrance into school. There was no discrepancy between cell and serum groupings, but the agglutination reactions of the cells of the twins were so characteristic that one could always find many free cells together with definite agglutinates by either anti-A or anti-B. The cells left unagglutinated by anti-A completely agglutinated by anti-B and vice versa.

These serological findings strongly suggested that the twins had a double set of blood groups. As shown in Fig. 1, the brother (II-1) and the sister (II-2) of the Taki family were dizygotic twins both of whom had a mixture of group A_1 and B cells. The proportions of the red cells were approximately the same in the twins, those of the brother were 38% A_1 and 62% B; those of the sister were 61% B and 39% A_1. The two sets of the blood differed in the P blood group only, the A_1 cells being P_1, and the BP_2. The brother secreted A and H in his saliva, therefore his true genetic group was A and his B cells were from his twin. Similarly, the sister who was a secretor of B and H had her own B cells together with A_1 cells grafted from her brother. The sera of the twins contained both A and B group substances of nearly the same level, whereas the sister’s serum showed about 16-fold alpha-galactosyl-transferase activity of her brother’s serum as determined by the method which was designed to convert group O cells into group B with the enzyme. This enzymatic findings gave another support to the view described above that the sister’s true genetic group was B.

In HLA-groupings of the twins we detected only three antigens: A_2, B_12 and BW_16. The karyotypes of lymphocytes of the twins were 71% XX, 29% XY in the brother and 81% XX, 19% XY in the sister. It is noteworthy that the proportions of lymphocytes were considerably different from those of erythrocytes.

*) Kushiro Red Cross Blood Center.
**) Hokkaido Red Cross Blood Center.
****) Osaka Red Cross Hospital and Osaka Red Cross Blood Center.
Fig. 1. Taki. Family.

I

A1B
MNss
P2
CcDEe
Le(a-b-)
kk
Fy(a+b-)
Jk(a+)
Xg(a+)
Jr(a+)
Nonsecretor

II

38% 62%
A1  B
MNss MNss
P1  P2
CcDEe CcDEe
Le(a-b+) Le(a-b+)
kk kk
Fy(a+b-) Fy(a+b-)
Jk(a+) Jk(a+)
Xg(a+) Xg(a+)
Jr(a+) Jr(a+)
Secretor A and H
Serum
A substance (+)
B substance (+)
alpha-galactosyltransferase (+)

HLA
A2, -, Bl2, BW16
Karyotype
XX 71%, XY 29%

II

61% 39%
B  A1
MNss MNss
P2  P1
CcDEe CcDEe
Le(a-b+) Le(a-b+)
kk kk
Fy(a+b-) Fy(a+b-)
Jk(a+) Jk(a+)
Xg(a+) Xg(a+)
Jr(a+) Jr(a+)
Secretor B and H
Serum
A substance (+)
B substance (+)
alpha-galactosyltransferase (+++)

HLA
A2, -, Bl2, BW16
Karyotype
XX 81%, XY 19%
Remarks. The proportions of red cells of the twins shown in Fig. 1 were obtained in separation procedure by use of anti-B. If we used anti-A instead of anti-B in this test, we always obtained somewhat different proportions in spite of repeated experiments. This is probably because, as Tilley et al.\textsuperscript{1} pointed out, some portions of the A and B cells of the twins taking up the B and A substances from the plasma respectively behaved like group AB cells. When we carried out this separation experiment using artificial mixtures of group A and B cells, such a difference of the proportions was not shown to be reproduced.

In 1953 Dunsford et al.\textsuperscript{2} who reported the first example of human blood group chimera stated that such a case was a Nature's experiment of surpassing interest, and that such a mixture of blood could not be common in human twins. Since then 19 further sets have been known according to Race and Sanger.\textsuperscript{3}

As seen in the present case, chimera twins lacked agglutinins for their grafted cells; and Woodruff and Lennox\textsuperscript{4} succeeded in reciprocal skin grafts in chimera twins. Thus, twin chimerism is an excellent example of the acquired immunological tolerance outlined by Burnet.\textsuperscript{5}

As van Rood\textsuperscript{6} suggested, twin chimeras, who tolerate so well each other's tissues, should give some clues to secrets of success in transplantation in general.

As to the difference observed between the proportions of red cells and those of lymphocytes a view was presented by Hosoi et al.\textsuperscript{7} who reported the first Japanese case of twin chimerism.

Acknowledgements. We wish to offer our thanks to Prof. Ren Kimura for his revision of this manuscript. We are indebted also to Mr. S. Koike, Mrs. A. Higuchi, Miss S. Edamura and Miss M. Yamamoto (Osaka Red Cross Hospital) for analyses of chromosome.

Requests for reprints should be addressed to Dr. H. Yamaguchi (Osaka Red Cross Blood Center, Joto-ku, Osaka, Japan).

References

6) Rood, J. von: Personal communication to Race and Sanger.\textsuperscript{9}