Singapore rare donor program

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In Singapore, rare blood donors are those whose red blood cells (RBCs) lack a high-prevalence antigen or lack a combination of common antigens that can only be found in 1 in 1000 or fewer blood donors (Table 1).

The Health Sciences Authority's Blood Services Group (BSG) is the national blood service in Singapore. The BSG has been maintaining a registry of donors with rare blood types since 2004. RBC units from these donors are cryopreserved using the high-concentration (40%) glycerol method and a slow freezing rate. Frozen rare donor RBC units are stored at −65°C or lower in mechanical freezers and are kept for up to 10 years.

With more patients receiving blood transfusions for complex surgeries and undergoing aggressive treatments for hematological diseases (chemotherapy, bone marrow transplant, etc.) in Singapore, our national Red Cell Serology Reference Laboratory started to notice an increase in the number of multiple RBC alloantibodies in transfusion recipients and the appearance of RBC antibodies not previously seen in Singapore (e.g., anti-k).

Since 2011, BSG has been maintaining a regular inventory of non-cryopreserved phenotyped blood to ensure that antigen-negative RBC units are readily available for patients because the thawing and deglycerolization process of frozen blood units takes several hours. This inventory includes Fy(a–), Fy(b–), Jk(a–), Jk(b–), S–, and s– RBC units, as well as units with multiple common antigen–negative combinations such as R_1R_1 Fy(a–) or Fy(b–); R_2R_2 s–; or R_1R_1 Jk(a–) or Jk(b–), and s–.

The Singapore Rare Donor Program aims to meet the rare blood requirements of patients in Singapore through appropriate targeted screening among the regular voluntary blood donors. An example of this initiative was the mass screening of blood donors in 2013 using the urea lysis test on the Olympus PK7300 as a rapid screening for Jk(a–b–) donors after having to supply blood for a surgical patient with alloantibody to Jk3. We were able to identify an additional 10 donors, all confirmed to be Jk(a–b–) by serology. Our study also showed that the prevalence of Jk(a–b–) phenotype was 1 in 3600 in the Singapore donor population.

If rare blood cannot be found among our donor population, we first discuss with the clinician if autologous transfusion is possible. If not, we screen the patient's immediate family members (siblings and parents) to look for the rare blood phenotype. We apply similar stringent selection criteria as for any other blood donor before accepting blood donations from these family members. In 2014, we had to supply blood for a neonate with hemolytic disease of the fetus and newborn caused by anti-Hr_0. Because of the urgency of the transfusion requirement and ABO incompatibility with the mother, we screened the mother's siblings and found one of them to be negative for Hr_0; this individual became a regular voluntary blood donor.

Because knowledge of the distribution of blood groups present in our donor population can help in the identification of rare phenotypes, we are presently revising our screening strategies using our local antigen prevalence data to make the screening process for rare blood types more efficient. We are also in discussion with the Singapore Red Cross to design a program for maintaining our existing rare blood donors and recruiting new blood donors. Under a unique partnership with BSG, the Singapore Red Cross is responsible for the national blood donor recruitment and retention program.

BSG follows a policy of voluntary non-remunerated blood donation, and rare blood donors are managed in the same way as the rest of the blood donors, with no material rewards or incentives. However, they are informed that they will be given priority access to the rare blood inventory in the event that they need blood themselves.

Currently, we have 37 active donors that meet our definition of a rare blood donor, and we have included them in our rare blood donor registry (Table 1). From these donors, we were able to collect 43 RBC units, which are currently in our frozen inventory. Between 2012 and 2014, there were three cases (liver transplant, lung resection, and placenta previa) of patients in Singapore requiring rare blood, and these patients were fully supported. Besides screening for donors of rare blood required locally, we also hope to find some donors of other rare blood types encountered in other Asian countries [Rh_{null}, Di(b–), etc.]. We have not transfused incompatible blood to recipients requiring antigen-negative RBC units.

Rare donor units collected and kept in frozen inventory starting from 2006 follow the International Society of Blood Transfusion (ISBT) 128 standard for labeling, which is the

Table 1. Donor and cryopreserved unit information for blood types considered rare in Singapore (in ≤1:1000 donors) as of 2015.

High-prevalence antigen-negative		
Phenotype	**Number of donors**	**Number of cryopreserved RBC units**
Jk(a–b–)	32	36
H– (O_h)	4	5
Hr_0– (D––)	1	2
Multiple antigen-negative combinations		
R_1R_1, Jk(a–) or Jk(b–), Fy(a–) or Fy(b–), and s–	0	0
R_2R_2, Jk(a–) or Jk(b–), Fy(a–) or Fy(b–), and s–	0	0
R_2R_2, Fy(a–), s–	0	0
rr, Jk(a–) or Jk(b–), Fy(a–) or Fy(b–), and s–	0	0
r″r″, Fy(a–), or s–	0	0

global standard for the identification, labeling, and information transfer of human blood, cell, tissue, and organ products across international borders and disparate health care systems. This system will facilitate international shipping of blood products available in Singapore to other countries if there is a request for rare blood units, although BSG has not imported or received a request from other countries or blood centers to provide rare donor units in recent years.

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