Extremely rare anti–Kp$^a$ was found in a Chinese blood donor: A case report

Ziyi He*, Yingming Hu, Ciping Cui, Jialin Che
Department of Research Transfusion Laboratory, Dongguan Blood Center, Dongguan, Guangdong 523006 China

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INTRODUCTION

The Kell blood group system contains 36 antigens. There are seven sets of antigens in the Kell system with allelic relationships: K and k; Kp$^a$, Kp$^b$, and Kp$^c$; Js$^a$ and Js$^b$; K11 and K17 (Wk$^a$); KEL14 and KEL24; KEL25 and KEL28; KEL31 and KEL38[1]. The most common antigen is K and k, which are highly immunogenic and often trigger immune reactions. The KEL gene is situated on chromosome 7q33, consists of 19 exons, spans about 21.5 kb and is organized into 19 exons of coding sequence. In Europe, irregular antibodies to Kell antigen constitute the most common erythrocyte antigen system following the ABO and Rh systems, as the negative frequency of the K antigen in Europe is found up to 9%, but is almost 100% positive in Asian population. Conversely the Kp$^a$ antigen (KEL3) is found in about 2% of the European population and between 0%~0.01% in the Asian population. Tests with anti–Kp$^a$ on around 1/19,000 white people from Europe and North America [1/(3,440–3,442)] showed 2.28% to be Kp$^a$ antigen positive, with a gene frequency of 0.0114 for Kp$^a$. The Kell alloantibodies are usually IgG type: clinically significant antibodies, capable of causing hemolytic disease of the fetus and newborn and delayed hemolytic transfusion reactions. Anti–Kp$^a$ is extremely rare in the Asian population.

Anti–K and anti–Ku are capable of causing severe reactions, but milder reactions are caused by anti–k, anti–Kp$^a$, anti–Kp$^b$, anti–Js$^a$, and anti–Js$^b$. The anti–Kp$^a$ alloantibody may be associated with acute and delayed hemolytic transfusion reactions[2]. In our review of literature, only one case of anti–Kp$^a$ antibody was found in hemolytic disease of the fetus and newborn. Here we reported a rare case of anti–Kp$^a$ antibody in a blood donor, which was first found and reported by spontaneous generation.

CASE REPORT

The blood donor’s data was collected from a male, 37 years old, Chinese Han nationality, from Langzhong City, Sichuan Province. The donor participated in 4 times blood donation, including 3 donations of whole blood, plus 1 apheresis platelets donated once. The pre–donation health examination was in line with the requirements of blood donation, and all the tests were qualified. Irregular antibody screening was negative in the four donations. The blood donor had no blood transfusion history before donation.

Polybrene reagent, Antibody screening cells (Shanghai Blood Biopharmaceutical Co., Ltd., China) and Screening Panels (123, Sanquin, Netherlands, Lot: 8000230101, Exp Date: 2016–08–05). Panel cells I (Shanghai Blood Biopharmaceutical Co., Ltd., China). Panel cells II (Sanquin, Netherlands; Lot: 8000227405, Exp Date: 2016–05–13). Panel cells III (Hungary, Lot:731723; Exp Date:2018.05.25). Modified polybere kit (Shanghai Blood Biopharmaceutical Co., Ltd,China). Microcolumn gel and Antiglobulin Cards (Sanquin, Netherlands), DG Gel Coombs(Diana, Grifols, Spain), Microcolumn gel

*Correspondence to: Ziyi He, MD, Department of Research Transfusion Laboratory, Dongguan Blood Center, 19 Ningjing Road, Humen Town, Dongguan 523006, Guangdong Province, China. TEL: 0086–769–85152673, E-mail: zyhe_8@163.com.
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Card Incubator (Diana Incubator, Grifols, Spain). Microcolumn gel Card Centrifuge (Dienofuge, Grifols, Spain). Centrifuge (KA–2200, KUBOTA, Japan). Automatic blood group analyzer (Sanquin, Netherlands). The anti−Kp\(a\) monoclonal antibody reagent was provided by Biotest(Lot:MKPaM035).

The first irregular antibody screening was completed by the Sanquin automatic blood group analyzer, with the column agglutination method and a 3-cell screen (Sanquin Panel 1123). The positive samples were confirmed for antibody type by the salt medium method and the Polybrene/microcolumn gel agglutination method with antibody screening cells. Irregular antibody specificity was identified by panel cells, which showed a clear pattern of erythrocyte antigen coverage. The Kp\(a\) antigen was identified by immediate agglutination method with an anti−Kp\(a\) monoclonal antibody.

The results shows: ABO blood group: A, RhD antigen: positive, irregular antibody screening; negative (Table 1), the specificity is anti−Kp\(a\) with Panel cells I and Panel cells III (Table 2 and 3). The Kp\(a\) antigen on the donated erythrocyte membrane was found negative by immediate agglutination method with anti−Kp\(a\) monoclonal reagents.

### Table 1 The results of irregular alloantibody screening with screen cells

| Rh−Hr | C | D | E | c | c' | f | V | K | k | Kp | Kp\(a\) | Js\(a\) | Js\(b\) | Js | Jk | Jk\(a\) | Jk\(b\) | Le\(a\) | Le | Le\(b\) | P | M | N | S | s | La\(a\) | La | Lu | Lu\(a\) | Lu\(b\) | Xg | MGT |
| 1     | R<sub>R</sub> | R<sub>R</sub> | + | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2     | R<sub>R</sub> | R<sub>R</sub> | + | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3     | rr | rr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Table 2 The result of irregular antibody identification with panel cells (Sanquin)

| Rh−Hr | C | D | E | c | c' | f | V | K | k | Kp | Kp\(a\) | Js\(a\) | Js\(b\) | Js | Jk | Jk\(a\) | Jk\(b\) | Le\(a\) | Le | Le\(b\) | P | M | N | S | s | La\(a\) | La | Lu | Lu\(a\) | Lu\(b\) | Xg | MGT |
| 1     | R<sub>R</sub> | R<sub>R</sub> | + | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2     | R<sub>R</sub> | R<sub>R</sub> | + | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3     | rr | rr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### Table 3 The result of irregular antibody identification with panel cells (Hungary)

| Rh−Hr | D | C | E | c | c' | K | k | M | N | S | s | Pl | Le\(a\) | Le | Le\(b\) | P | M | N | S | s | La\(a\) | La | Lu | Lu\(a\) | Lu\(b\) | Xg | MGT |
| 1     | R<sub>R</sub> | K<sub>R</sub> | + | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2     | R<sub>R</sub> | K<sub>R</sub> | + | + | + | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3     | rr | rr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

### DISCUSSION

Kp\(a\) is a low−frequency antigen occurring in less than 2 percent of the Caucasian population, but is extremely rare in the Asian population. The development of an antibody to this rare antigen is highly limited in the Chinese population due to a lack of exposure. Alloantibodies usually develop following transfusion or fetomaternal immunization, but rarely happen naturally. Correspondingly, mild to moderate delayed
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Kidd or Kell systems on their first transfusion, the rate of alloimmunization is very low. However, the significance of transfusion of phenotypically matched blood in multi-transfused patients cannot be over emphasized in preventing alloimmunization. Ideally an increased number of phenotypically matched transfusions would reduce the rate of irregular alloantibodies, however mismatched donated samples for extremely rare antigens are extremely difficult to eliminate.

References


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Features

- **LISS color change reaction**: Distinct color change from blue to purple after plasma is added to LISS.
- **Indicator RBCs**: Anti-human globin sensitized RBC acts as key tech to distinguish weak positive and negative results.
- **High quality antibodies coating tech**: High quality antibodies coating supervised by FDA, producing perfect results.
- **Fast and accurate**: 1-96 reactions promoted per hour under standard operation procedure.
- **Flexible**: Platelet rich plasma, apheresis and platelet preservation solution use as antigens.

Package

- Capture platelet 8 wells×12 strips well

Purpose

- **Antibody screening**: Antibody screening can be conducted to prevent the Ab-Ag complex induced.

- **Cross match**: Cross match can make sure apheresis is transfused to patients appropriately.

- **Pregnant screening**: HPA Abs can induce recurrent abortion easily as compared to Abs negative (RR=7.5)

JiangSu ZoJiWat Bio-pharmaceutical Co., Ltd.

Address: No. 78 West Dongsheng Road, Jiangyin, Jiangsu 214400, P.R.China
Tel: 0510-81695399, 81695092
Fax: 0510-81695129
Web site: www.jszojiwat.com

Sales: 15370255367
Mail: 3246683473@qq.com
Technical services: 15190368370
Mail: caochen0910@163.com