

**RECENT DIAGNOSTIC TOOLS IN RED BLOOD  
CELLS IDENTIFICATION FOR REGULARY  
TRANSFUSED PATIENTS**

**ESSAY**

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## **Introduction**

Red cell transfusion should be based on a sound understanding of the indication of therapy, the principle of red cell selection, compatibility testing and possible adverse effects (*Daniels, 2002*).

One of the major indication of blood transfusion is the restoration of an adequate blood volume after its loss e.g. surgery. However, some patients require frequent blood transfusion for life e.g. congenital hemolytic anemia.

Multiple blood transfusion can be associated with various complications including iron overload, circulatory overload, blood born infection and hemolytic reaction (*Reid et al., 2004*).

Although acute hemolytic reactions are currently rare, they are one of the most dangerous transfusion complications. In addition the risk of delayed hemolytic reaction are estimated to be 1-2% with each of RBCs transfused (*Yazer et al., 2006*).


Therefore a major portion of pre-transfusion testing is directed toward proper RBCs identification. The processes of selecting RBCs for red cell antibodies and in vitro cross-matching (*Dariels et al., 2004*).

Recently, new methods have been developed to enhance our capability for proper selection of RBCs for transfusion e.g. antibody identification and phenotyping. Extended red cell typing is required for the management of transfusion dependent patients to confirm the identity of suspected alloantibodies or to determine the specificity of potential additional antibodies that may be formed in the future. (*Brecher, et al., 2002*)

### **Aim of the essay**

The aim of this essay is to review the currently used protocol for RBCs selection in poly-transfused patients in addition to the recently developed methodologies for RBCs identification.

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## **List of Abbreviations**

<b>Ab</b>	Antibody
<b>ADCC</b>	Antibody-dependent cellular cytotoxicity
<b>Ag</b>	Antigen
<b>AHG</b>	Anti human globulin
<b>AIHA</b>	Auto-immune hemolytic anemia
<b>CAT</b>	Column agglutination technology
<b>CD</b>	Clusters of differentiation
<b>CLL</b>	Chronic lymphocytic leukaemia
<b>CLT</b>	Chemiluminescence Test
<b>CMV</b>	Cytomegalovirus
<b>DAF</b>	Decay-accelerating factor
<b>DAT</b>	Direct antiglobulin test
<b>DHTRs</b>	Delayed hemolytic transfusion reactions
<b>DIC</b>	Disseminated intravascular coagulation
<b>DL</b>	Donath-Landsteiner
<b>DNA</b>	Deoxyribose nucleic acid

<b>ELISA</b>	Enzyme linked immunosorbent assay
<b>gp</b>	glycoprotein
<b>GVHD</b>	Graft versus host disease
<b>HDFN</b>	Hemolytic disease of fetus and newborn
<b>HLA</b>	Human Leukocyte Antigen
<b>IAT</b>	Indirect antiglobulin test
<b>Ig</b>	Immunoglobulin
<b>IHTRs</b>	Immediate hemolytic transfusion reactions
<b>ISBT</b>	International society of blood transfusion
<b>IVIG</b>	Intravenous immunoglobulin
<b>LISS</b>	Low ionic strength saline
<b>MAIEA</b>	Monoclonal antibody- specific immobilization of erythrocyte antigens assay
<b>MMA</b>	Monocyte monolayer assay
<b>NAT</b>	Nucleic acid testing
<b>PCH</b>	Paroxysmal cold haemoglobinuria
<b>PCR</b>	Polymerase chain reaction
<b>PEG</b>	Polyethylene glycol

<b>RBCs</b>	Red blood cells
<b>RFLP</b>	Restricted fragment length polymorphism
<b>Rh</b>	Rhesus
<b>SLE</b>	Systemic lupus erythematosus
<b>SNP</b>	Single- nucleotide polymorphism
<b>SPH</b>	Solid phase
<b>ZZAP</b>	ZZ-activated papain

# I-BLOOD GROUP ANTIGENS AND ANTIBODIES

## Introduction

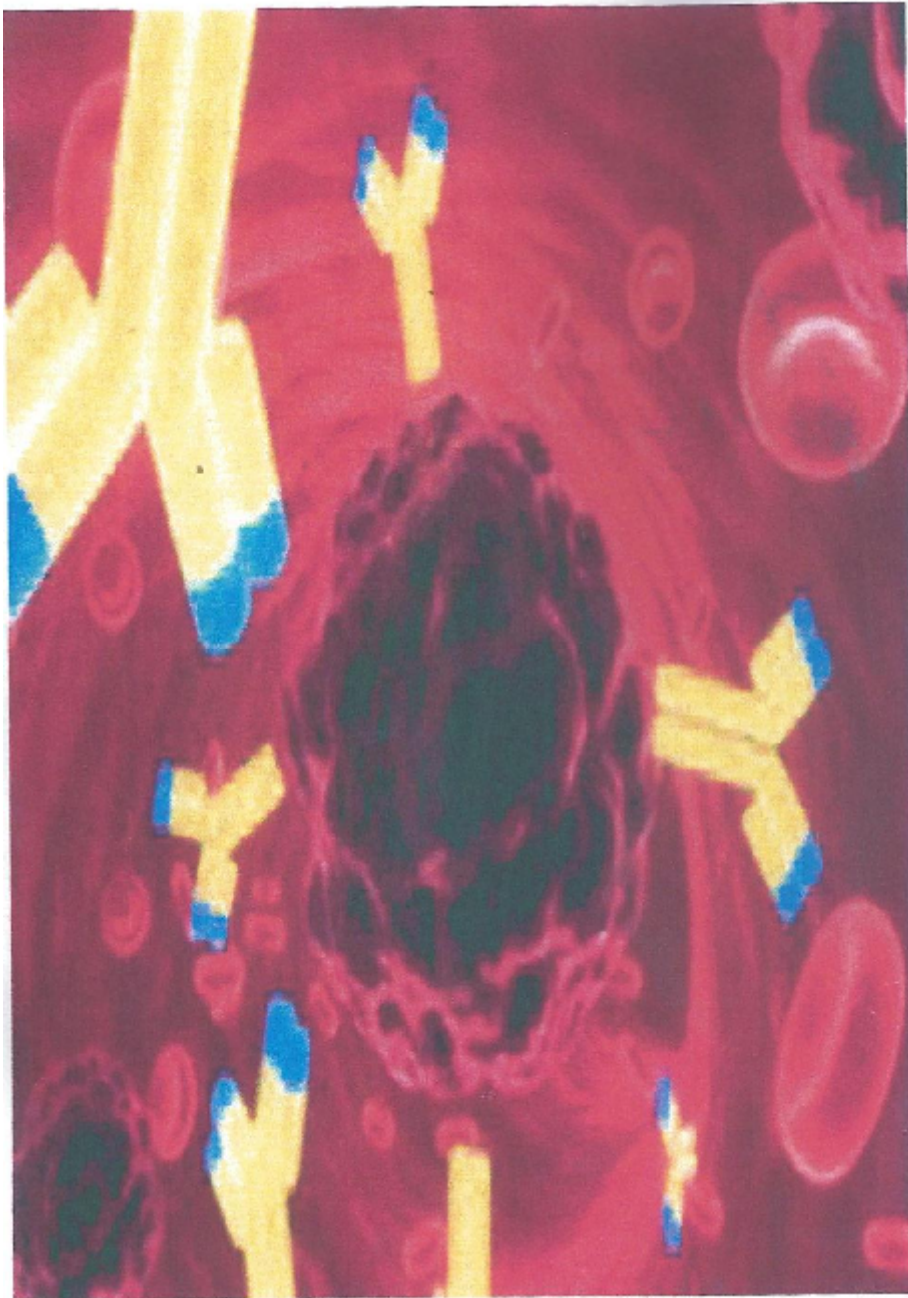
The observation by Landsteiner in 1900 that red cells of some individuals could be agglutinated by the serum of others led to the discovery of the ABO blood group system. Following the identification of the A and B blood group antigens, blood group serology blossomed throughout the 20th century, such that in humans approximately 302 blood group antigens were identified(**Figure 1**), most of which belong to 1 of 29 genetically discrete blood group systems (*Contreras and Daniels, 2005*).

The genes representing the 29 systems have been located on specific chromosomes . All are autosomal except XG and XK, which are X- borne and MIC2, which is on both the X and Y chromosomes. All the genes have been cloned, with the exception of P1 (*Webert et al., 2004*).

Blood group antigens may be proteins, glycoproteins or glycolipids. Most red cell antigens are synthesized by the red cells, however, some antigens such as those of Lewis, are

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**FIGURE (1) RED BLOOD CELL ANTIGENS**



adsorbed onto the red cell membrane from the plasma. Some red cell antigens are specific to the red cells, however others are found on other cells throughout the body (*Lewis et al., 1990*).

Antibodies to many of these antigens have the potential to be clinically significant; that is, they can facilitate accelerated destruction of red cells carrying the corresponding antigen. It has been recognized that knowledge and understanding of blood groups are essential for transfusion therapy. This is because individuals who lack antigens on their red blood cells can be alloimmunized, if they are exposed to blood expressing the antigen. This might occur with transfusion of blood products or during pregnancy. Antibodies that react with red blood cell antigens can cause problems such as delayed and immediate hemolytic transfusion reactions (HTRs) and hemolytic disease of the newborn (*Menitove, 1997*).

## **A-International Society of Blood Transfusion (ISBT) Terminology:**

The ISBT working party on terminology for red cell surface antigens was established in 1980 with the goal of creating a uniform nomenclature. Blood group antigens are now

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