BLOOD GROUP ANTIBODIES AND THEIR CLINICAL SIGNIFICANCE IN TRANSFUSION MEDICINE

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بسم الله الرحمن الرحيم

"وما أوتيتم من العلم الا قليلا"

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Abstract

Abs to red Cell Ags Which are approximately 302 Ags , Can Cause HTRs and HDFN. The most important Abs are those of the ABO, RH, Kell , Kidd , Duffy and Ss blood group systems . Extended red cell Phenotyping of chronic patients and screening & identification of red cell Abs Shoud be done befor transfusion . Tubes , microplates , CAT and DNA techniques can be used for this purpose . Clinical bioassays can be Used as a functional assessment for the significance of red cell Abs .

Key Words : Abs – Ags – HTRs – HDFN
CAT – DNA

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List of Abbreviations

Ab	Antibody
ADCC	Antibody-dependent cellular cytotoxicity
Ag	Antigen
AHG	Anti human globulin
AIHA	Auto-immune hemolytic anemia
CAT	Column agglutination technology
CD	Clusters of differentiation
CLL	Chronic lymphocytic leukaemia
CLT	Chemiluminescence Test
CMV	Cytomegalovirus
DAF	Decay-accelerating factor
DAT	Direct antiglobulin test
DHTRs	Delayed hemolytic transfusion reactions
DIC	Disseminated intravascular coagulation
DL	Donath-Landsteiner
DNA	Deoxyribose nucleic acid
ELISA	Enzyme linked immunosorbent assay
gp	glycoprotein
GVHD	Graft versus host disease
HDFN	Hemolytic disease of fetus and newborn

HLA	Human Leukocyte Antigen
IAT	Indirect antiglobulin test
Ig	Immunoglobulin
IHTRs	Immediate hemolytic transfusion reactions
ISBT	International society of blood transfusion
IVIG	Intravenous immunoglobulin
LISS	Low ionic strength saline
MAIEA	Monoclonal antibody- specific immobilization of erythrocyte antigens assay
MMA	Monocyte monolayer assay
NAT	Nucleic acid testing
PCH	Paroxysmal cold haemoglobinuria
PCR	Polymerase chain reaction
PEG	Polyethylene glycol
RBCs	Red blood cells
RFLP	Restricted fragment length polymorphism
Rh	Rhesus
SLE	Systemic lupus erythematosus
SNP	Single- nucleotide polymorphism
SPH	Solid phase
ZZAP	ZZ-activated papain

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Introduction

Blood group serology includes the study of antigenic molecules present on the various cellular and soluble components of whole blood, together with the study of antibodies and lectins that recognize them and their interactions. However, in practice, the term blood group serology is restricted to red cell surface antigens and their interactions with specific antibodies. In this narrower sense, the complexities of HLA, granulocyte, platelet and plasma protein determinants do not normally fall within the blood group serologist's realm, even though all are likewise genetically polymorphic and play a role in blood transfusion ***(Contreras and Daniels, 2005).***

The narrower definition of blood group serology encompasses the following: ***(Janeway et al., 2001).***

I. The determination of the phenotype of red cells with antibodies and reagents of known specificity.

II. The search for and identification of antibodies with red cells of known phenotype.

III. Compatibility testing of patients' sera against cell samples from donor units of the same ABO and RhD groups.

The discovery of almost universally present naturally occurring antibodies in blood plasma led to the discovery of the ABO blood group system which remains, more than 100 years later, the most important and clinically significant of all blood groups. Blood group antibodies play an important role in transfusion medicine; both in relation to the practice of blood transfusion and in pregnancy ***(Stefanova, 2005).***

Clinically significant antibodies are capable of causing adverse events following transfusion, ranging from mild to severe, and of causing hemolytic disease of the fetus and newborn following placental transfer from mother to fetus. Assessing the clinical significance of antibodies relies heavily on mode of reactivity and historical data relating to specificity; functional assays are sometimes employed ***(Poole and Daniels, 2007).***

The principals of methodology for blood typing and antibody identification have changed little over the years, relying mainly on serological methods involving red cell agglutination. The recent advent of blood typing using DNA technology, although still in relative infancy, will surely eventually supersede serology. However, deciding on the clinical significance of an antibody when compatible blood is not immediately available is likely to remain as one of the most common dilemmas facing transfusion practitioners ***(Poole and Daniels, 2007).***

Aim of the work

The aim of this essay is to elucidate the role of blood group antibodies in transfusion medicine, both in relation to the practice of blood transfusion and in pregnancy.

BLOOD GROUP ANTIGENS AND ANTIBODIES

I. 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, 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 **(Table 1)**. 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 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 (***Ness et al., 1990)***.

II. 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 categorized into 29 systems, five collections, and two series ***(Contreras and Daniels, 2005).***

Each blood group antigen is given an identification number consisting of six digits. The first three numbers represent the system to which the antigen has been assigned. The second three digits identify the antigen in the order it was discovered. For example, the ABO system is number 001, and the A antigen is the first antigen in that system; thus, it has the ISBT number 001001 or ABO001 ***(Dean, 2005)***.