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

ESSAY
Submitted for Partial Fulfillment of
The Master Degree in
Clinical and Chemical Pathology

By
Heba Abu Bakr Tawfik
M.B, B.Ch

Supervised by

Professor / Mona Ahmed Wahba
Professor of Clinical and Chemical Pathology
Faculty of Medicine, Ain Shams University

Professor / Amany Ahmed Osman
Professor of Clinical and Chemical Pathology
Faculty of Medicine, Ain Shams University

Professor/Soha Raouf Youssef
Professor of Clinical and Chemical Pathology
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
2011

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.

Acknowledgment

My deepest gratitude and thanks to god the most merciful for giving me the strength to complete this work.

I wish to express my sincere thanks and gratitude to **prof. Dr. Mona Wahba** for her great care , continuous guidance and support and for giving me the chance to work in the field that I like the most.

I would also like to express my gratitude to **Prof. Dr. Amany Osman** for her valuable advice , guidance and meticulous supervision during every step of this work.

I would like also like to thank **Prof. Dr. Soha Raouf** for her help and her valuable advice and work .

My deepest thanks to My Father and My Mother and all My Family for their great support and help.

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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

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

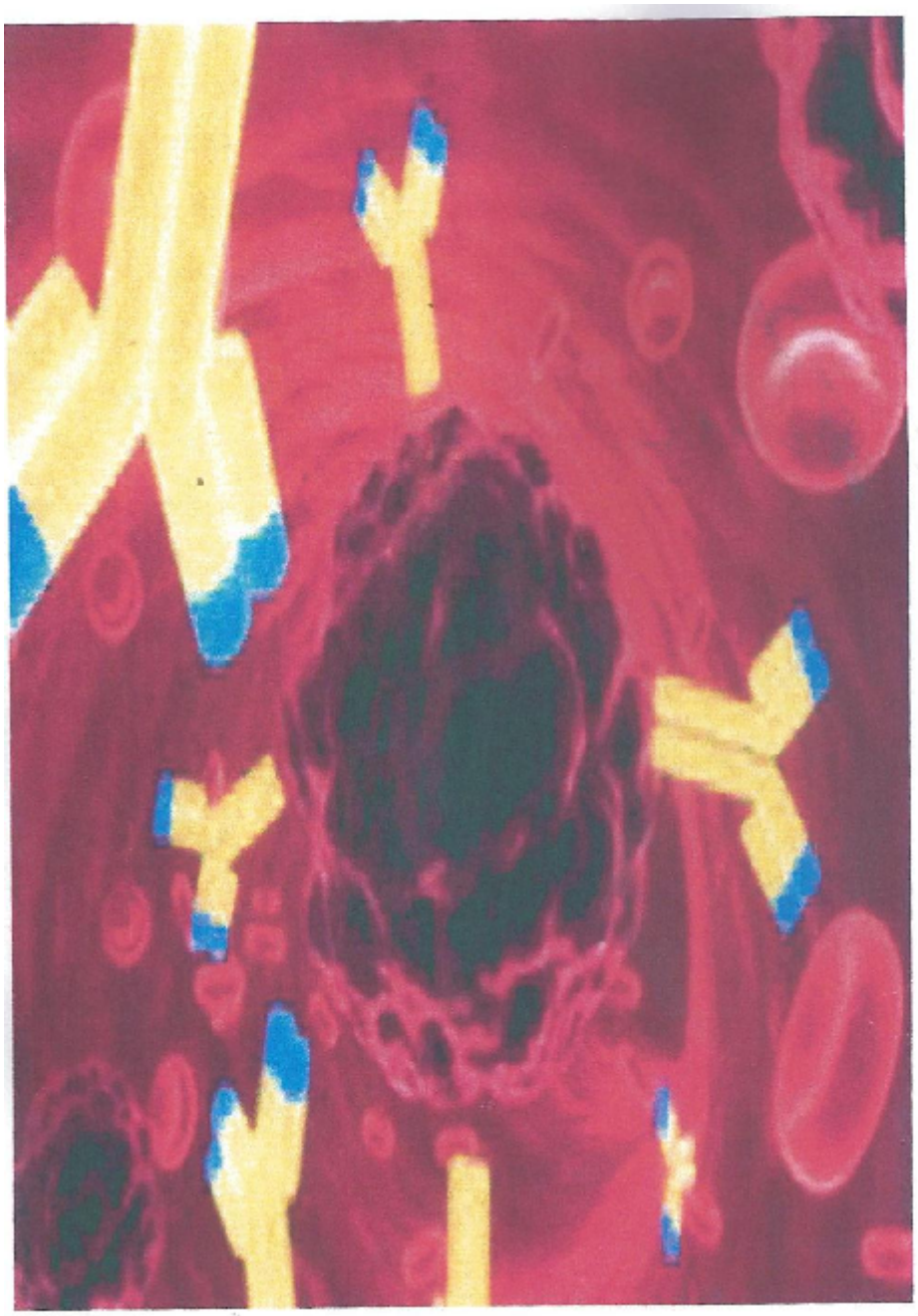

FIGURE (1) RED BLOOD CELL ANTIGENS

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