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Definition of ABO blood group antigens

They are glycoproteins attached to the RBC surface

Blood group antibodies are natural antibodies that are synthesized where

Peyer's patches

A and B antigens that are normally present in food are trapped by specialized epithelial cells called ?????? that overlie ??????.

M cells  
peyer's patches

M cells have close proximity to what other cells

B lymphocytes

Most common blood group

O

Blood group O natural Ab's

# Anti-A-IgM, anti-B-IgM  
# Most people have anti-AB-IgG antibodies.

Which blood type has Increased incidence of duodenal ulcers	Type O
Blood group A natural Ab's	Anti-B-IgM antibodies
Which blood type has Increased incidence of Gastric Carcinoma	Type A
Blood group B natural Ab's	Anti-A-IgM antibodies
Least common blood group	type AB
Blood group AB natural Ab's	No natural antibodies
Newborns Ab's at birth	# Do not have natural antibodies at birth # IgG antibodies are of maternal origin. bc they cross the placenta

<p>Elderly people and special considerations wrt transfusions</p>	<p>Frequently lose their natural antibodies</p> <p>may not have a hemolytic transfusion reaction if they are transfused with the wrong blood group</p>
<p>Paternity issues in newborns</p> <p># Blood group AB parents cannot have an</p> <p># Blood group O parents cannot have</p> <p># Blood group A and B parents can have O children if</p>	<p>-Type O child</p> <p>-AB, A, or B child</p> <p>-both have AO and BO phenotypes.</p>
<p>Determining the ABO group forward type</p> <p>what is indentified</p> <p>describe the process</p>	<p># Identifies the blood group antigen</p> <p>* Patient RBCs are added to test tubes that contain either anti-A or anti-B test serum.</p>
<p>Determining the ABO group Back type</p> <p>what is indentified</p> <p>describe the process</p>	<p># dentifies the natural antibodies</p> <p>* Patient serum is added to test tubes containing either A or B test RBCs.</p>
<p>Forward or back</p> <p># Example-blood group A serum</p> <p>* Patient anti-B-IgM antibodies agglutinate B test RBCs but not A test RBCs.</p>	<p>Back type</p>
<p>Forward or back</p> <p># Example-blood group A RBCs</p> <p>* Agglutination reaction with anti-A test serum but not with anti-B test serum</p>	<p>Forward type</p>

<p>Rh antigen system describe the gene locus/loci</p>	<p># t has three adjoining gene loci.</p> <ol style="list-style-type: none"> <li>1. Locus coding for D antigen (no d antigen)</li> <li>2. Locus coding for C and c antigen</li> <li>3. Locus coding for E and e antigen</li> </ol>
<p>Rh antigen system inheritance</p>	<p># Autosomal codominant inheritance</p> <ol style="list-style-type: none"> <li>1. One of the sets of three Rh antigens from each parent is transmitted to each child.</li> </ol>
<p>Possible Rh antigen profiles</p>	<p># DD, Dd, or dd # CC, Cc, or cc # EE, Ee, or ee</p>
<p>An individual who is Rh positive is ???? antigen positive.</p>	<p>D antigen</p>
<p>Approximately ???% of the population has D antigen.</p>	<p>85</p>
<p>Individuals lacking D antigen are considered ?????.</p>	<p>Rh negative</p>
<p>Rh phenotype of an individual how tested example</p>	<p># RBCs are reacted with test antisera against each of the Rh antigens.</p> <p># Example-Rh phenotype that is positive for C, c, D, and E antigens but negative for e antigen (phenotype is CcDE)</p>

<p>define Alloimmunization</p>	<p>Production of an antibody against a foreign antigen not present on an individual's RBCs</p>
<p>Production of an antibody against a foreign antigen not present on an individual's RBCs and what is the Ab called</p>	<p>Alloimmunization atypical antibodies.</p>
<p>Significance of atypical antibodies</p>	<p>May produce a hemolytic transfusion reaction (HTR)</p>
<p>??????antibodies are more likely to produce an HTR than ????? antibodies</p>	<p>IgG IgM</p>
<p>????? antibodies react best in warm temperatures, but ???????antibodies react best in cold temperatures.</p>	<p>IgG IgM</p>
<p>Transfusion requirements in an individual with atypical antibodies</p>	<p>Individual must receive blood that is negative for the foreign antigen.</p>
<p>Duffy (????) antigens</p>	<p>Fy</p>

Fy antigens aka

Duffy (Fy) antigens

Fy antigens are the binding site for

infestation of RBCs by Plasmodium vivax.

????? antigens are the binding site for infestation of RBCs by Plasmodium vivax.

Fy

Majority of black Americans lack the  
????? antigen.

Fy antigen.

and implications

\* Offers protection against contracting P. vivax malaria

????? may develop against I or i antigen.

IgM antibodies (cold agglutinins)

antigens and Increased risk for developing a cold autoimmune hemolytic anemia

IgM antibodies (cold agglutinins) may develop against I or i antigen.

# Anti-i hemolytic anemia may occur in infectious mononucleosis.

# Anti-I hemolytic anemia may occur in Mycoplasma pneumoniae infections.

<p>The most common infectious agent transmitted by blood transfusion is</p>	<p>cytomegalovirus (CMV)</p>
<p>The most common infectious agent transmitted by blood transfusion is cytomegalovirus (CMV), which is present ????????</p>	<p>in donor lymphocytes.</p>
<p>Autologous transfusion</p>	<p>Process of collection, storage, and reinfusion of the individual's own blood</p>
<p>Safest form of transfusion</p>	<p>Autologous transfusion</p>
<p>Tests performed on donor blood</p>	<ul style="list-style-type: none"> <li># Group (ABO) and type (Rh)</li> <li># Antibody screen (indirect Coombs' test)</li> <li>* Detects atypical antibodies (e.g., anti-D, anti-Kell)</li> <li># Screening tests for infectious disease</li> <li>* Examples-syphilis, hepatitis B and C, HIV-1 and 2, HTLV-1</li> </ul>
<p>Before blood is transfused into newborns or patients with T-cell deficiencies, it must be ???????  and Why</p>	<p>irradiated to kill donor lymphocytes.  prevents graft-versus-host reaction (see Chapter 3) or a CMV infection.</p>

<p>Components of a standard crossmatch</p>	<p># ABO group and Rh type  # Antibody screen for atypical antibodies  # Direct Coombs' test to identify atypical IgG antibodies on patient RBCs  # Major crossmatch</p>
<p>Patient crossmatch wrt guarantee</p>	<p>a compatible crossmatch does not guarantee that the recipient will not develop atypical antibodies, a transfusion reaction, or an infection.</p>
<p>Purpose of a major crossmatch</p>	<p>Detect atypical antibodies that are directed against foreign antigens on donor RBCs</p>
<p>Major crossmatch process</p>	<p># Patient serum is mixed with a sample of RBCs from a donor unit.</p> <ol style="list-style-type: none"> <li>1. Each unit of donor blood must have a separate crossmatch.</li> <li>2. Lack of RBC agglutination or hemolysis indicates a compatible crossmatch.</li> </ol>
<p>Use of blood group O packed RBCs for transfusion</p>	<p>Can be transfused into any patient, regardless of the blood group</p>
<p>Blood group ?????? individuals are considered universal donors.</p>	<p>O</p>

<p>Blood group O individuals can receive ????? blood.</p>	<p>O</p>
<p>in typw O patients ??????will hemolyze transfused A, B, or AB RBCs.</p>	<p>Anti-A-IgM and anti-B-IgM</p>
<p>Blood group AB individuals can receive ?????? blood.</p>	<p>Any group</p>
<p>Blood group ?????? individuals are considered universal recipients</p>	<p>AB</p>
<p>Packed RBCs purpose</p>	<p>increase O2 transport to tissue</p>
<p>Each unit of packed RBCs should raise the Hb ?????and the Hct ?????; lack of an increment implies ??????</p>	<p>1 g/dL 3%; a hemolytic transfusion reaction or blood loss in the patient</p>
<p>is the most common contaminant of stored blood</p>	<p>Yersinia enterocolitica, a pathogen that thrives on iron</p>

<p>Platelets purpose</p>	<p>stop medically significant bleeding related to thrombocytopenia or qualitative platelet defects (e.g., aspirinView drug information)</p>
<p>Platelets have which antigens</p>	<p>HLA antigens and ABO antigens on their surface;  however, they lack Rh antigens</p>
<p>Each unit of platelets should raise the platelet count</p>	<p>by 5000-10,000 cells/<math>\mu</math>L</p>
<p>Fresh frozen plasma purpose</p>	<p>treatment of multiple coagulation deficiencies (e.g., DIC; cirrhosis) or treatment of warfarin over-anticoagulation if bleeding is life-threatening</p>
<p>Cryoprecipitate purpose</p>	<p>treatment of coagulation factor deficiencies involving fibrinogen and factor VIII (e.g., DIC)</p>
<p>Cryoprecipitate contains</p>	<p>contains fibrinogen, factor VIII, and factor XIII</p>
<p>??????is used instead of cryoprecipitate in treating mild hemophilia A and von Willebrand disease</p>	<p>Desmopressin acetate</p>

Desmopressin acetate  
purpose

used instead of cryoprecipitate in  
treating mild hemophilia A and von  
Willebrand disease

IgA deficient individuals must receive  
blood or blood products that

lack IgA.

Women commonly have these  
reactions owing to pregnancy, when  
there is an increased risk for exposure  
to fetal blood during delivery or after a  
spontaneous abortion.

Anti-HLA antibodies

Anti-HLA antibodies develop when

individuals are exposed to foreign  
HLA antigens (e.g., previous blood  
transfusion or organ transplant)

an extravascular hemolytic anemia.  
This reaction may occur within hours  
to 3 to 10 days after the transfusion.

the pretransfusion antibody screen is  
negative but  
memory B cells are present and  
reexposure to the foreign antigen  
causes them to produce antibodies,

Most common transfusion reaction

Allergic reactions

transfusion Allergic reactions  
mediator

Type I IgE-mediated hypersensitivity  
reaction against proteins in the donor  
blood

<p>transfusion Allergic reactions clinical findings</p>	<p># Urticaria with pruritus # Fever, tachycardia, wheezing # Potential for anaphylactic shock</p>
<p>transfusion Allergic reactions Tx</p>	<p># Mild cases are treated with antihistamines.</p>
<p>Transfusion reactions # Febrile reaction  1. Pathogenesis</p>	<p># Recipient has anti-human leukocyte antigen (HLA) antibodies directed against foreign HLA antigens on donor leukocytes.  * There are no HLA antigens on RBCs.</p>
<p>Transfusion reactions Type II hypersensitivity reaction</p>	<p>Febrile reaction</p>
<p>Transfusion reactions Febrile reaction what type of Hypersensitivity reaction is it</p>	<p>Type II hypersensitivity reaction</p>
<p>Transfusion reactions Febrile reaction Clinical findings</p>	<p># Clinical findings  1. Fever, chills, headache, and flushing</p>
<p>Transfusion reactions Febrile reaction Tx</p>	<p>Treated with antipyretics</p>

<p>Acute hemolytic transfusion reaction (HTR) clinical findings</p>	<p># Fever, back pain, hypotension # Disseminated intravascular coagulation, oliguria (renal failure)</p>
<p>-Transfusion reactions --Acute hemolytic transfusion reaction (HTR) -----where in vasculature is it</p>	<p>May be intravascular or extravascular hemolytic reactions</p>
<p>Transfusion reactions Acute hemolytic transfusion reaction (HTR) intravascular Rxn due to what? which type of hypersensitivity reaction?</p>	<p># ABO blood group incompatibility # Example-group B patient receives group A donor blood.  * Anti A-IgM attaches to A positive donor RBCs producing intravascular hemolysis.  # Type II hypersensitivity reaction</p>
<p>Transfusion reactions Acute hemolytic transfusion reaction (HTR) Extraavascular Rxn due to what? which type of hypersensitivity reaction?</p>	<p># n atypical antibody reacts with a foreign antigen on donor RBCs.  * Macrophage phagocytosis and destruction of donor RBCs coated by the atypical antibody  Type II hypersensitivity reaction</p>
<p>Transfusion reactions Acute hemolytic transfusion reaction (HTR) extravascular what commonly occurs</p>	<p># Jaundice commonly occurs.  * Unconjugated bilirubin is the end product of macrophage degradation of Hb.</p>

<p>Acute hemolytic transfusion reaction (HTR) lab findings</p>	<p># Positive direct Coombs' test</p> <p>* IgG antibody and/or C3b is coating donor RBCs.</p> <p># Positive indirect Coombs' test</p> <p>* Atypical antibody is present in serum.</p> <p># No significant increase in Hb over pretransfusion levels.</p> <p># Hemoglobinuria (sign of intravascular hemolysis)</p> <p># Jaundice (sign of extravascular hemolysis)</p>
<p>Hemolytic disease of the newborn (HDN) mech and results</p>	<p>HDN results from the transplacental passage of maternal IgG antibodies (e.g., anti-D antibodies, anti-AB antibodies in O mothers)</p> <p>resulting in an extravascular hemolytic anemia in the fetus.</p>
<p>ABO Hemolytic disease of the newborn (HDN) how common</p>	<p># Most common HDN</p> <p>* Present in 20% to 25% of all pregnancies</p>
<p>ABO Hemolytic disease of the newborn (HDN) pathogenesis</p>	<p># Pathogenesis</p> <ol style="list-style-type: none"> <li>1. Blood group O individuals have anti-AB-IgG antibodies.</li> <li>1. IgG antibodies cross the placenta and attach to fetal A or B RBCs.</li> <li>2. Fetal splenic macrophages phagocytose RBCs, causing anemia.</li> <li>3. Unconjugated bilirubin from extravascular hemolysis is disposed of in the mother's liver.</li> </ol>

<p>ABO Hemolytic disease of the newborn (HDN) who is effected</p>	<p>Mothers are blood group O and the fetus is either blood group A or B</p> <p>May affect the firstborn or any future pregnancy if ABO incompatibility exists</p>
<p>ABO Hemolytic disease of the newborn (HDN) clinical findings</p>	<p>Jaundice develops within the first 24 hours after birth.</p> <p>Mild normocytic anemia or no anemia at all</p>
<p>ABO Hemolytic disease of the newborn (HDN) Risk for kernicterus</p>	<p>is very small</p>
<p>ABO Hemolytic disease of the newborn (HDN) wrt transfusion</p>	<p>Exchange transfusions are rarely indicated.</p>
<p>ABO Hemolytic disease of the newborn (HDN) lab findings</p>	<p># Positive direct Coombs' test on fetal cord blood RBCs</p> <p>* Due to anti-AB-IgG antibodies coating fetal A or B RBCs</p> <p># Spherocytes are present in the cord blood peripheral smear.</p> <p>* Due to macrophage removal of a portion of the RBC membrane</p>
<p>most common cause of jaundice in 24 hours after birth</p>	<p>ABO HDN</p>

Rh HDN  
wrt quantity of blood

the amount of fetal blood is quantified so that the appropriate amount of anti-D globulin is given to the mother.

Rh HDN what does Anti-D do

Anti-D globulin masks the antigenic sites on the fetal RBCs or destroys the fetal RBCs so that the mother does not host an antibody response against the D antigen.

when is there no indication for giving the Anti-D globulin either during or after delivery,

the patient develops anti-D antibodies, because its main purpose is to prevent sensitization.

Kernicterus refers to

deposition of free (not bound to albumin) lipid-soluble unconjugated bilirubin in the basal ganglia owing to an incompletely formed blood-brain barrier.

what non drug protects the mother from developing Rh sensitization.

ABO incompatibility  
----any A positive fetal RBCs entering her circulation will be destroyed by maternal anti-A-IgM antibodies, thereby preventing sensitization.

??????? is absent during the last trimester.

\* Increases the risk for a fetomaternal bleed

Cytotrophoblast

Rh HDN  
when is mom exposed to fetal blood

Occurs during the last trimester or during childbirth itself

<p>Rh HDN pathogenesis of sensitization</p>	<p># Mother is Rh (D antigen) negative and the fetus is Rh positive. # Mother is exposed to fetal Rh positive blood (fetomaternal bleed).</p> <p># Mother develops anti-D-IgG antibodies when exposed to fetal Rh positive cells.</p>
<p>Rh HDN pathogenesis of later babies</p>	<p># Anti-D-IgG antibodies cross the placenta and attach to fetal Rh positive RBCs. # Fetal splenic macrophages phagocytose RBCs, causing severe anemia.</p>
<p>Rh HDN results of Fetal splenic macrophages phagocytose RBCs, causing severe anemia.</p>	<p>extravascular hemolytic anemia in the fetus.</p> <p># Fetus may develop high-output cardiac failure leading to hydrops fetalis and death. # Hydrops fetalis is a combined left- and right-sided heart failure with ascites and edema.</p>
<p>Rh HDN hematopoiesis</p>	<p>Extramedullary hematopoiesis is present in the liver and spleen.</p>
<p>Rh HDN who deals with the unconjugated bilirubin</p>	<p>Unconjugated bilirubin is conjugated in the mother's liver.</p>
<p>Rh HDN Prevention of Rh HDN in Rh negative mothers who don't make anti-D</p>	<p>Receive anti-D globulin (Rh immune globulin) during the 28th week of pregnancy</p>

Anti-D globulin ?????? cross the placenta	does not
Anti-D globulin protects the mother from	sensitization to fetal Rh positive cells
Anti-D globulin lasts ?????? in the mother's blood.	~3 months
Additional anti-D globulin is given to the mother after delivery if the baby is?	Rh positive.
Rh HDN clinical findings	Jaundice develops shortly after birth.
Degree of anemia is more severe than with ABO HDN.	Rh HDN
Rh HDN wrt kernicterus	Increased risk for kernicterus * The free, unbound lipid soluble unconjugated bilirubin poses the greatest risk for bilirubin entry into the brain

<p>Level of unconjugated bilirubin is much higher than with ABO HDN.</p>	<p>Rh HDN</p>
<p>Rh HDN vs ABO HDN  WRT Anemia WRT jaundice</p>	<p>Degree of anemia is more severe than with ABO HDN.  Level of unconjugated bilirubin is much higher than with ABO HDN.</p>
<p>Rh HDN lab tests</p>	<p># Positive direct and indirect Coombs' tests on fetal cord blood # Spherocytes are not present in cord blood.  * Macrophages phagocytose the entire RBC.</p>
<p>Rh HDN wrt transfusion</p>	<p># Exchange transfusions are required.  1. Newborn's blood is removed and replaced with fresh blood. 2. Transfusion corrects anemia and removes antibodies and unconjugated bilirubin.</p>
<p>Which HDN is this Spherocytes are not present in cord blood.</p>	<p>Rh HDN</p>
<p>Which HDN is this Positive direct and indirect Coombs' tests on fetal cord blood</p>	<p>Rh HDN</p>

<p>Which HDN is this Exchange transfusions are required.</p>	<p>Rh HDN</p>
<p>Which HDN is this Most common HDN</p>	<p>ABO HDN</p>
<p>Which HDN is this Risk for kernicterus is very small</p>	<p>ABO HDN</p>
<p>Which HDN is this Mild normocytic anemia or no anemia at all</p>	<p>ABO HDN</p>
<p>Which HDN is this Exchange transfusions are rarely indicated.</p>	<p>ABO HDN</p>
<p>Which HDN is this Spherocytes are present in the cord blood peripheral smear.</p>	<p>ABO HDN</p>
<p>Newborn Use of blue fluorescent light</p>	<p># Used as a treatment of jaundice in the newborn # Unconjugated bilirubin in the skin absorbs light energy from blue fluorescent light.</p>

Newborn  
Use of blue fluorescent light  
describe the reaction

# Photoisomerization converts unconjugated bilirubin to a nontoxic water-soluble dipyrrole (called lumirubin).

\* Lumirubin is excreted in bile or urine.

What is Lumirubin  
and how is it excreted

# Photoisomerization converts unconjugated bilirubin to a nontoxic water-soluble dipyrrole (called lumirubin).

\* Lumirubin is excreted in bile or urine.