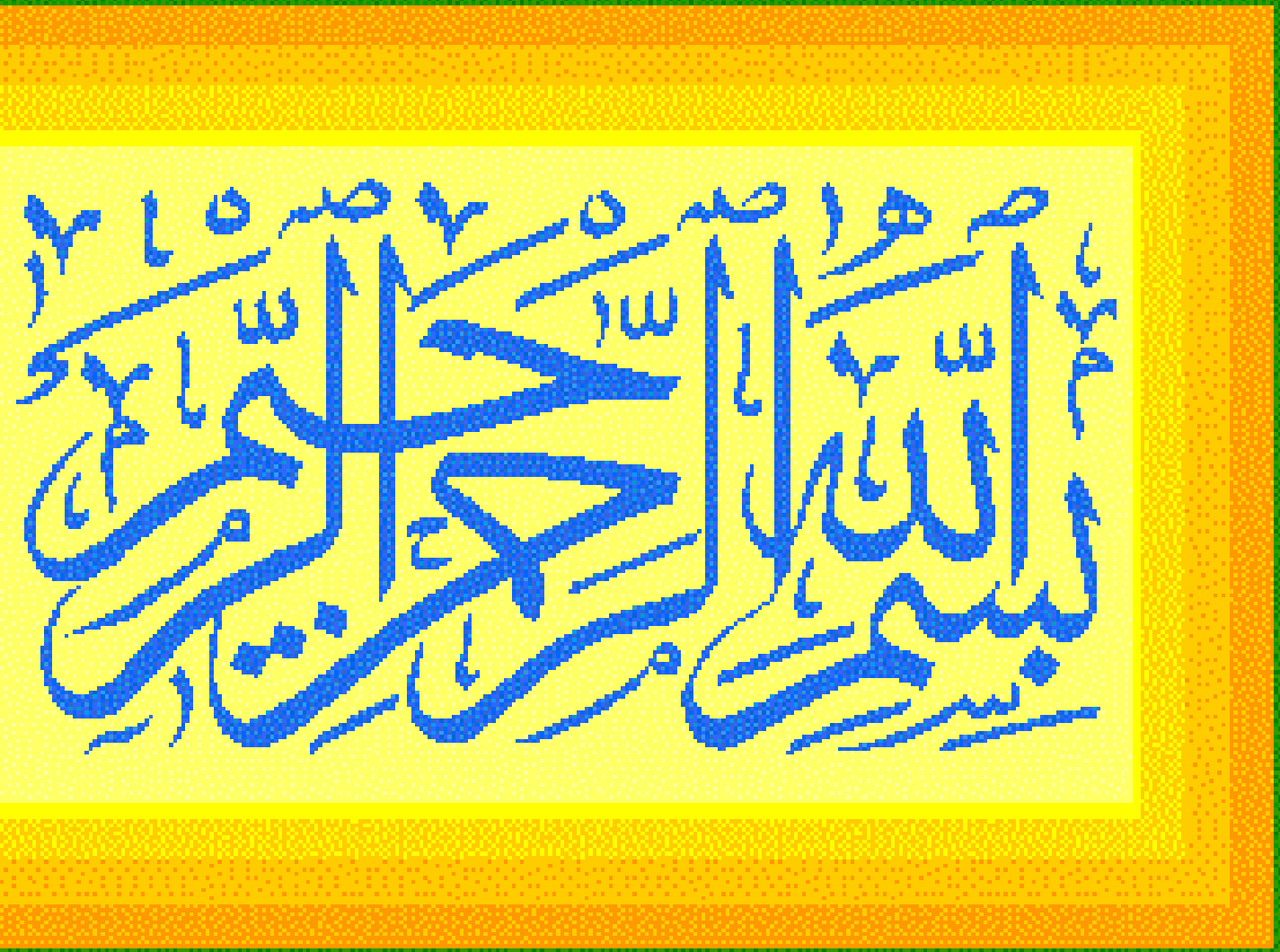
بسم الله الرحمن الرحيم

Blood Component Transfusions

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Blood Products

- Whole Blood
- Red Blood Cells
- Platelets
- Fresh Frozen Plasma
- Cryoprecipitate

- With the use of the triple-pack plastic collection units, PRP is separated from packed RBCs after centrifugation of whole blood at *2000g at 20"C for 2 minutes.*
- The PRP is then transferred to an adjoining bag.

- The PRP is then centrifuged at *5000g at 20"C for 2 minutes.*
- All of the platelet-poor plasma (PPP) is transferred to an adjoining bag to be used for the production of fresh frozen plasma or other blood components such as cryoprecipitate or albumin. When optimal centrifugation techniques are used, approximately 85 percent
- of the platelets (5.0 to 7.0 x 1010 platelets) are
- removed from a unit of whole blood.

WHOLE BLOOD

- Whole donor blood.
- One unit = 450 ml blood + 63 ml anticoagulant preservative solution - CPDA (citrate, phosphate, dextrose and adenine)
- Hemoglobin content is about 12 gm %.
- Stored for 35 days at temperature 2 – 6°C in blood bank refrigerator.

WHOLE BLOOD

Indications:

- Acute blood loss causes hypovolemia
- Exchange transfusion.

WHOLE BLOOD

Hazards:

- Donated blood is normally screened for hepatitis B surface antigen, antibodies to hepatitis C & HIV to prevent the risk of transmitting these infections.
- Some blood is screened for cytomegalovirus antibodies in order to supply CMV negative blood for immunocompromised patient.
- Allergic reaction.
- Febrile reactions.

WHOLE BLOOD

Cautions:

- Must be ABO & Rh compatible.
- Do not mix with drugs.
- Be aware of circulatory overload.

Infusion:

- Fast as patient can tolerate for massive loss.
- Over 1 to 2 hours for less urgent cases.

Packed red blood cells (PRBCs)

- Red blood cells are plasma reduced blood.
- One unit contains about 300 ml.
- Hemoglobin content is about 20 gm %.
- Stored for 35 days at temperature 2 – 6 C in blood bank refrigerator.

Guidelines for PRBCs transfusion

Age < 4 months of life:

- Hb < 13 gm% for severe cardiac / pulmonary disease.
- Hb < 10 gm% for moderate pulmonary disease and major surgery.
- Hb < 8 gm% for symptomatic anemia.

☺ Age > 4 months of life:

- Hb < 13 gm% for severe cardiac / pulmonary disease.
- Hb < 8 gm% for symptomatic anemia and marrow failure and surgery.

Packed red blood cells (PRBCs)

Hazards:

- ☺ As whole blood.

Cautions:

- ☺ As whole blood.

Packed red blood cells (PRBCs)

Infusion:

- Fast as patient can tolerate for massive loss.
- Over 1 to 2 hours for less urgent cases.
- Thick fluid, difficult to transfuse. To improve transfusion flow, add 50 ml normal saline using a Y- shape stopcock.

Dose:

- The usual dose is 10–15 ml/Kg

- IRRADIATION OF RBCs
- Transfusion-associated GVHD is a rare complication after the transfusion of cellular products.
- *premature neonates*;
- *congenital immunodeficiency*;
- *immunosuppressed oncology patients*
- In addition, normal recipients who are
- heterozygous for HLA antigens do not reject lymphocytes transfused from a donor who is homozygous for one of the recipient's haplotypes.

- CHOICE OF BLOOD FOR THE NEONATE
- Cellular components should be selected from *CMV antibody-negative* donors for neonate recipients weighing less than 1200 g at birth.
- Alternatively, leukocyte-reduced blood can also be used to prevent CMV infection.
- Cellular blood components should be irradiated to prevent GVHD.

- BLOOD STORAGE
- During storage, RBC metabolism continues and someRBC membrane leakage occurs. This results in changes such as
- D*ecreasing plasma dextrose*
- *Increasing plasma potassium*. These changes are acceptable for most transfusions,but in some situations the increased potassium in solution may cause problems. In these cases, fresh blood
- (less than 1 week old) may be beneficial.

- The traditional use of relatively fresh RBCs «7 days of storage)
- has been halted in many centers in favor of *diminishing donor*
- *exposure by using a single unit of RBCs* to obtain aliquots for
- transfusing each infant throughout its permitted duration of
- storage (currently 42 days). Neonatologists who insist on transfusing only fresh RBCs generally are fearful of the rise in the
- plasma potassium (*K+)* level that occurs in RBC units during
- extended storage. However,the safety of stored RBCs may not apply *to large-volume(>25 mL/kg)* transfusions infused rapidly, in which greater doses of K+may be harmful.

Fresh frozen plasma (FFP)

- Whole blood is separated into PRBCs and platelet rich plasma. The latter is centrifuged again to provide a unit of plasma and a unit of platelets.
- One unit = 200 – 250 ml is separated from one whole blood donation within 6 hours of collection and frozen to –18 to –25 C.
- May be stored for up to one year at –25 C.
- Contain normal level of stable clotting factors, albumin and immunoglobulins, but about 70 % of factor 8 level.

Fresh frozen plasma (FFP)

Cautions:

- Must be ABO compatible.
- Does not need cross matching.
- Thaw it in 30 – 37 C water and use within 6 hours. High temperature will destroy clotting factors and vitamins.

Infusion:

- Approximately 0.5 ml/Kg/minute (Use 170 mic.m filter)

Fresh frozen plasma (FFP)

Dose:

- 10 – 15 ml/Kg.

- Guidelines for pediatric FFP transfusion:
  - Severe clotting factors deficiency and bleeding.
  - Severe clotting factors deficiency and invasive procedure.
  - Emergency reversal of warfarin effects.
  - Dilutional coagulopathy and bleeding
  - Replacement of anticoagulant proteins (AT III, protein C & S).

Fresh frozen plasma (FFP)

Hazards:

- ☺ As whole blood and PRBCs.

- The indications for FFP in neonates include: (1) reconstitution of red blood cell (RBC) concentrates
- to simulate whole blood for use in massive transfusions
- (*exchange transfusion* or cardiovascular surgery); (2) hemorrhage secondary to *vitamin K deficiency*; (3) *disseminated intravascular coagulation* with bleeding
  (4) bleeding in *congenital coagulation factor deficiency* when more specific treatment is either unavailable or inappropriate.

Platelets (plt.)

- Prepared from whole blood as for plasma.
- One unit contains approximately 5.5 x 1010 platelets in 50 – 75 ml of plasma.
- May be stored for 5 days at 20 – 24°C

Hazards:

- As for FFP.

Criteria for Transfusion

- If no evidence of platelet dysfunction exists, patients usually do not experience active bleeding if the platelet count is greater than 10,000/mm3
- and have minimal risk for spontaneous life-threatening hemorrhage until the count is less than or equal to 5000/mm3

- In the thrombocytopenic surgical patient with normal platelet function, both *major and minor surgeries* have been performed safely with platelet counts ranging from 30,000 to 60,000/mm3

- the eye or central nervous system,
  platelet counts should be maintained at more than or equal to 100,000/mm3.

Platelets (plt.)

Cautions:

☺ Must not be refrigerated before use.

☺ Must be ABO compatible.

Platelets have both the ABO and HLA antigens. ABO compatibility is ideal but not required. (incompatibility will shorten the life span of the platelet)

☺ Administer through a leukocyte reduction *filter* specifically designed for platelets transfusion.

☺ The unit may contain immunocompetent WBCs, and therefore *irradiation* of the blood product may be considered in specific patient populations e.g., immunocompromised patients.

Platelets

single donor units

Platelets (plt.)

Infusion:

- One unit over 10 min. (use 170 µm filter)

Dose:

one unit of random-donor platelets (5.0 to 7.0 x 1010platelets) per10 kg of body weight should increase the platelet count by 40,000 to 50,000/mm3 within 1 hour after the infusion.

In the average-sized adolescent or adult, 6 units of platelet concentrate, or 1 single-donor apheresis unit (3 to 5 xlOll), will increase the platelet count by 50,000/mm3

Guidelines for pediatric platelet transfusion

:

Age < 4 months:

- Platelets < 100,000/mm^3 and bleeding.
- Platelets < 50,000/mm^3 and invasive procedure.
- Platelets < 20,000/mm^3 and clinically stable.
- Platelets < 100,000/mm^3 and clinically unstable.

Age > 4 months:

- Platelets < 50,000/mm^3 and bleeding.
- Platelets < 50,000/mm^3 and invasive procedure.
- Platelets < 20,000/mm^3 and marrow failure with additional hemorrhagic risk factor.

- To determine the effectiveness of platelet transfusion, a platelet count should be obtained before infusion, at 1 hour, and at 24 hours after infusion.

- Platelet recovery and survival may be affected by variability
  in platelet units or the patient's clinical situation.
  Variability in platelet components may result from
  Donor platelet count,
- *Techniques used to harvest the platelets*,
- *Storage conditions*,
- *Method of blood product administration*.
- If platelets are given too slowly,
  there is decreased yield because of platelet adherence.

$$CCI = \frac{(\text{Post-transfusion count} - \text{Pretransfusion count}\ (\text{BSA m}^2)}{\text{Number of platelets given}\ (\times 10^{11})}$$

- It is important to minimize repeated transfusion of **group 0** PLTs to group A or
- B recipients because passive anti-A or anti-B in group 0 plasma can lead to hemolysis.

Cryoprecipitate (cryo)

- Cryoprecipitate is the cold, insoluble, white precipitate that forms when a unit of FFP is thawed to 1 – 6°C.

- One unit of cryoprecipitate is the amount removed from one unit of FFP and generally consists of 10 – 20 ml.

- May be refrozen at - 18°C. At this temperature it is stable for 12 months.

Cryoprecipitate (cryo)

Cryoprecipitate contains significant amounts of:

- Factor VIII 100 – 200 Units.
- Fibrinogen 150 – 250 mg.
- Factor XIII 20 – 30 % of original unit of FFP.
- Fibronectin 15 – 30 mg.

Cryoprecipitate (cryo)

Indications:

- Hemophilia A, Von Willebrand disease, hypofibrinogenemia and Factor XIII deficiency.

- With the availability of coagulation factors concentrate, cryo is most commonly used as replacement therapy for patients with acquired bleeding disorders and low fibrinogen levels (< 100 mg%).

Cryoprecipitate (cryo)

Hazards:

- Infection risk.

Cautions:

- ABO compatibility is not essential. However if possible use ABO compatible product.

- Prior to its administration, cryoprecipitate is thawed and then should be administered within 4 hours.

Cryoprecipitate (cryo)

Infusion:

☺ Approximately 10 ml/minute. Use standard blood administration set.

Dose:

☺ One unit of cryoprecipitate / 10 Kg body weight will increase the fibrinogen level by 50 mg%.

☺ Repeat dose of cryoprecipitate is accomplished by periodic measurements of PT, PTT & fibrinogen.

BLOOD FILTERS

☺ Prior to administration blood products should be passed through a standard 170 µm filter to remove small clots and aggregates of cells that may develop during processing & storage.

☺ Additional microaggregates of platelets,WBC, and fibrin that can pass through standard 170 µm filters may also form and are suggested to be one of the factors responsible for developing ARDS following massive transfusion.

BLOOD FILTERS

- Microaggregates filters (20-40 μm) have been suggested as means of removing these aggregates and preventing respiratory compromise.

- Filters are also available to remove the majority of leukocytes (99.9%) from the blood product.

WHOLE BLOOD ABO AND RH COMPATIBILITY

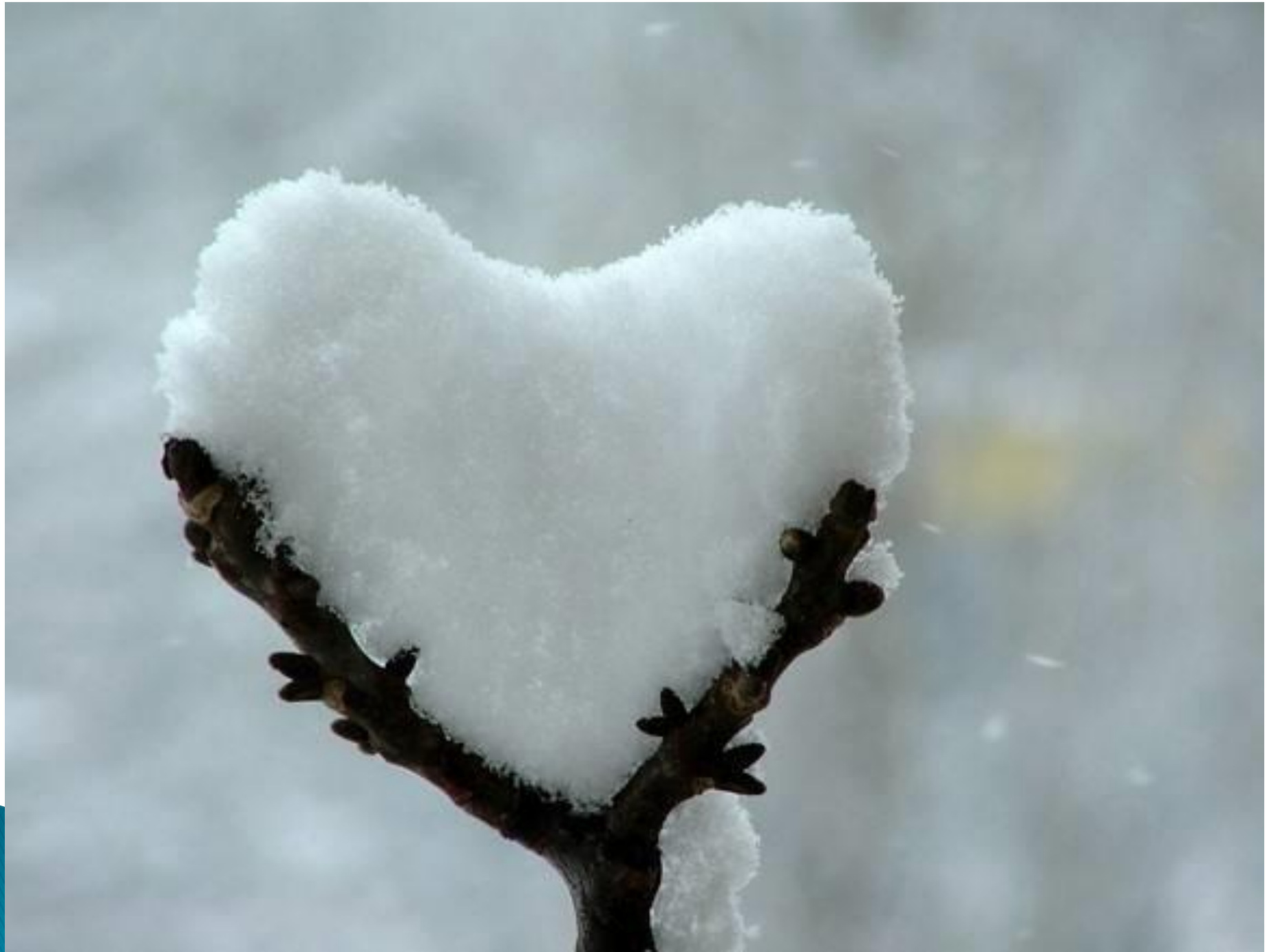
	DONOR					
RECIPIENT	A	B	O	AB	Rh Positive	Rh Negative
A	•					
B		•				
O			•			
AB				•		
Rh Positive					•	•
Rh Negative						•

PACKED RBC ABO AND RH COMPATIBILITY

	DONOR					
RECIPIENT	A	B	O	AB	Rh Positive	Rh Negative
A	•		•			
B		•	•			
O			•			
AB	•	•	•	•		
Rh Positive					•	•
Rh Negative						•

PLASMA ABO AND RH COMPATIBILITY

	DONOR					
RECIPIENT	A	B	O	AB	Rh Positive	Rh Negative
A	•			•		
B		•		•		
O	•	•	•	•		
AB				•		
Rh Positive					•	•
Rh Negative					•	•



Thank You