خون و فراورده های خونی

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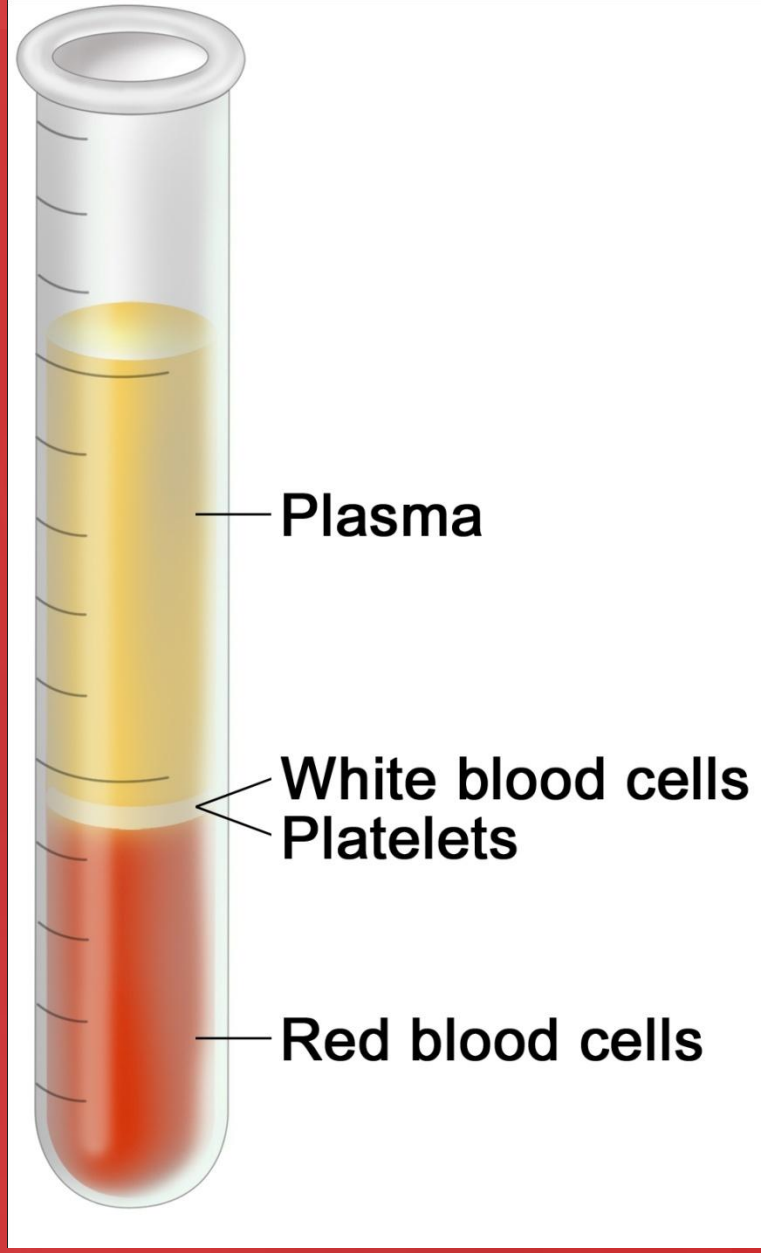
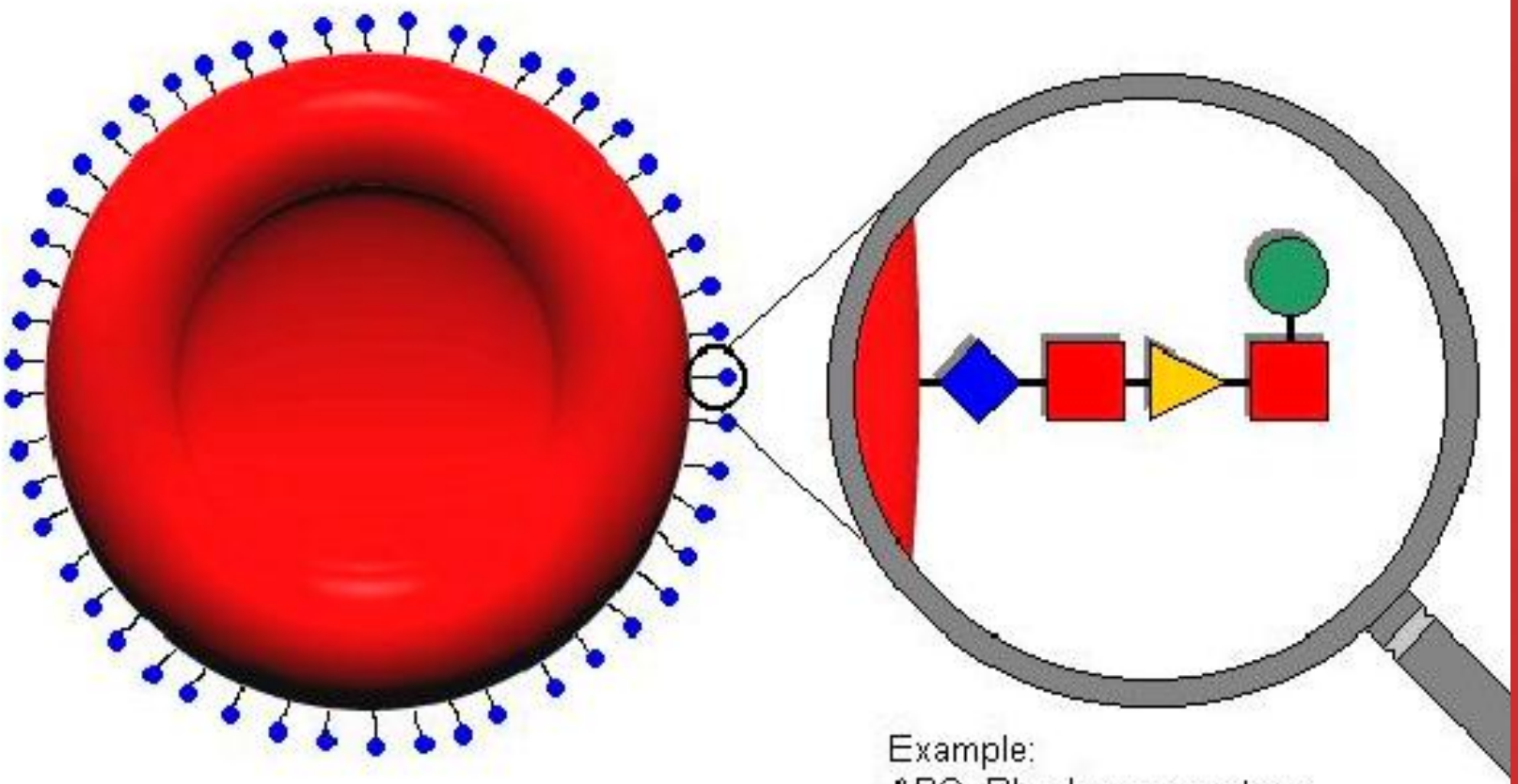
Components of Blood



Blood Group

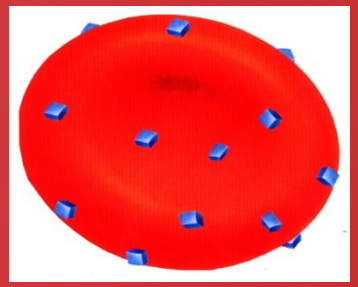


Blood Group

- Blood group

  Determined by the presence of different proteins on the red cell membrane.

  - A antigen- group A
  - B antigen- group B
  - A and B antigen- group AB
  - None – group O



Group A

Group B

Group AB

Group O

Rh Blood Group System

- Rh Blood Group System
  - One of the 23 known blood group systems.
  - Consist of 45 different antigens.
  - Clinical significant antigens: D、C、c、E、e. D antigen is the most important.

D antigen

RhD positive

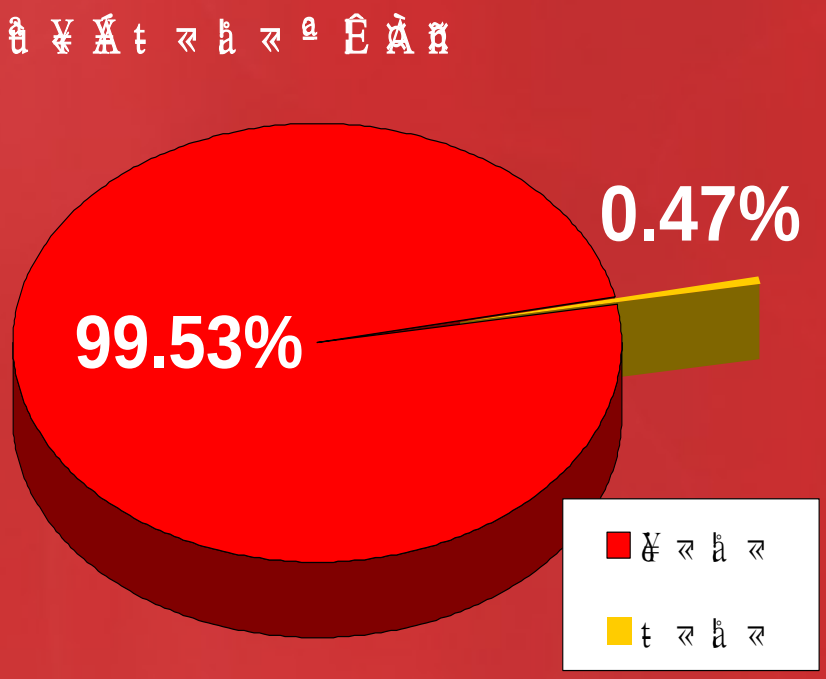
No D antigen

RhD negative

RhD negative

Variations of % RhD negative between populations:

- Caucasians: 15%
- Asian: 0.3 to 0.5%



Rh blood group of Macao population

Blood replacement products: recommended uses and effects

Product (mL)	Contents	Uses and effects
Whole blood (1 unit = 500 mL)	All components	Rarely required. Consider when massive bleeding requires transfusion of >5 to 7 units of packed red cells
Red cells + additive solution (1 unit = 350 mL)	Red cells	One unit increases hematocrit by 3 percentage points and hemoglobin by 1 g/dL
Frozen plasma (1 unit = 200-300 mL)	All clotting factors, but no platelets	Best used to correct deficiencies of multiple coagulation factors (eg, DIC, liver disease, warfarin overdosage). One unit FFP increases fibrinogen by 7 to 10 mg/dL. Usual dose is 10 to 15 mL/kg.
Cryoprecipitate (1 unit = 10 to 20 mL)	Fibrinogen, factors VIII, XIII, VWF	Typical dose consists of two bags of prepooled cryoprecipitate (total of 10 units), which will raise plasma fibrinogen by 70 mg/dL in a 70 kg recipient
Whole blood-derived and apheresis-derived platelets (1 unit = 50 mL)	Platelets	Six units of whole blood-derived or one unit of apheresis-derived platelets will raise the platelet count by approximately 30,000/microL in an adult with a BSA of 2.0 square meters

Frozen blood products (plasma, cryoprecipitate) take 35 to 45 minutes to thaw. It may take the same amount of time to perform an uncomplicated crossmatch.

DIC: disseminated intravascular coagulation; FFP: fresh frozen plasma; VWF: von Willebrand Factor; kg: kilograms; BSA: body surface area.

Whole blood or RBC

Indications for red cell transfusion in the adult

- A patient with chronic anemia should be replaced with red cell preparations containing minimal plasma, since volume replacement is not required.

- Whole blood should be considered only when dealing with an adult who has bled acutely and massively and then only after the patient has received approximately five to seven units of red cells plus crystalloids.

Plasma Component

Composition and use of standard plasma components in adults

Component	Composition	Indications and dose*
FFP, thawed plasma, and 24 hour frozen plasma (FP 24) (one unit)	All soluble plasma proteins from one unit of whole blood	Correction of bleeding due to excess warfarin, vitamin K deficiency, or deficiency of multiple coagulation factors (eg, DIC, liver disease, dilutional coagulopathy) Initial dose: 15 mL/kg
		Massive transfusion protocols
		For infusion or plasma exchange in TTP-HUS
Cryo-precipitate (cryo, one unit)	One unit of cryo (volume: 10-20 mL) contains the cold insoluble protein from one unit of FFP; Pasteurized; contains vWF, factors VIII, XIII, fibrinogen, fibrinonectin. Some blood suppliers now provide pre-pooled cryo (one bag) comprised of 5 (or more) units of cryo in a volume rangling from 120 to 160 mL each/ Typically, two bags of pre-pooled cryo (ie, cryo from 10 units of FFP) are issued for therapeutic replacement of fibrinogen.	Source of fibrinogen (200 mg/unit)
		For bleeding in vWD: 1 unit/10 kg q 6-12 hr
		Factor XIII deficiency: 1 unit/10 kg usually once
		Factor VIII deficiency: 100 Int. units/unit. This use is outmoded; recombinant factor VIII should be used
Cryo-poor plasma (one unit)	240 mL of FFP that is depleted of cold insoluble proteins	Suitable for bleeding due to coumadin overdose, vitamin K deficiency.
		For infusion or plasma exchange in TTP-HUS

FFP: fresh frozen plasma; S/D FFP: solvent-detergent-treated FFP; DIC: disseminated intravascular coagulation; vWD: von Willebrand disease; TTP-HUS: thrombotic thrombocytopenic purpura-hemolytic uremic syndrome; vWF: von Willebrand factor.
* See text and appropriate topic reviews for details concerning each of the indications listed below.

FRESH FROZEN PLASMA

Fresh frozen plasma (FFP) is prepared from single units of whole blood or from plasma collected by apheresis techniques. It is frozen at -18 to -30°C within eight hours (FFP) of collection and, when appropriately stored, is usable for one year from the date of collection. Standard FFP units derived from a single unit of whole blood have a volume of about 250 mL; "jumbo" units prepared by apheresis may be as large as 800 mL.

Fresh frozen plasma — Fresh frozen plasma (FFP) and FP-24 refer to plasma that is separated and frozen at -18 Cº within eight hours or 24 hours, respectively, of collection of whole blood and can then be stored for one year.

FFP and FP-24 contain all the requisite plasma coagulation factors in amounts only slightly reduced (such as factor VIII) from that of fresh plasma. However, none of them is in concentrated form, and FFP should not be used as a source of specific clotting factors that can be obtained in safer and purer form

Dose and indications

As a general rule, hemostasis can be achieved when the activity of coagulation factors is at least 25 to 30 percent of normal, in the absence of an inhibitor such as heparin, and when the level of fibrinogen is at least 75 to 100 mg/dL. Since the plasma volume in adults is approximately 40 mL/kg, this requires a dose of FFP of approximately 10 to 15 mL/kg. This dose represents approximately three to five units of FFP for most adult patients, representing a significant volume challenge .

elevated INR

Given that the INR of FFP/FP24 units can be as high as 1.3 . transfusion of FFP/FP24 will have little effect on minimally elevated INRs. Existing guidelines suggest that FFP be considered for this purpose only when the patient's INR is ≥1.6. However, the ability of FFP to fully or even partially correct an INR ≤1.85, as well as the ability of such testing to predict clinical bleeding, have been called into question.

Thus, available studies do not support the efficacy of FFP in treating bleeding or as prophylaxis for invasive procedures in patients with a mild coagulopathy (ie, INR <2.0) .

Cryoprecipitate

When FFP is thawed at 4ºC, a precipitate remains, which can be separated by centrifugation; this material is termed cryoprecipitate (cryo). It is a concentrated preparation that contains virtually all of the factor VIII, fibrinogen, fibronectin, factor XIII, and von Willebrand factor (vWF) in fresh frozen plasma, reduced from an initial volume of 250 mL to a final volume of 10 to 20 mL. The remaining material can be refrozen and used as cryo-poor FFP.

Cryoprecipitate

Cryo contains about 200 mg of fibrinogen and 100 units of Factor VIII (80 to 110 IU) per unit and carries the same infectious risk as a unit of FFP. Cryo is used in the treatment of congenital and acquired deficiencies of fibrinogen and Factor XIII. As examples:

Ten units of cryo (obtained from 10 units of plasma) contain about 2 g of fibrinogen and will raise the fibrinogen level about 70 mg/dL in a 70 kg recipient.

Screening measures to protect the donor

- Medical history interview
- Weight requirement
- Traveling
- Recent vaccinations
- Bacterial Infection
- Medications

- Donors who have taken **isotretinoin** and **finasteride** are asked to wait one month after the last dose before donating blood;
- donors who have taken **dutasteride** are asked to wait six months; and
- donors who have taken **acitretin** are asked to wait three years.
- Individuals who have taken **etretinate** are permanently disqualified from donating blood.

most donors are also temporarily deferred if they are taking **warfarn**, heparin, or another anticoagulant. This is because of the effects of these medications on the therapeutic efficacy of plasma components as well as the potential for impaired hemostasis in the donor following the collection procedure.

Aspirin AND Clopidogrel ?

Screening for infections

- HBV
- HCV
- HIV

Risk of infection from a transfusion

- 1 in 200,000 to 1 in 360,000 for hepatitis B
- 1 in 1 million to 1 in 2 million for hepatitis C
- 1 in 1.5 million to 1 in 2 million for human immunodeficiency virus (HIV)

Despite these procedures, HIV transmission may still occur for four theoretical reasons:

- Donations may be collected during the window period of infection, defined as the interval of time shortly after HIV infection, when the donor is infectious but has not yet developed positive HIV laboratory tests
- The possible existence of a long term HIV chronic carrier state in which the individual never develops (or loses) HIV antibody
- Infection with variant strains of HIV that may escape detection by current serologic assays
- Testing or clerical errors.

Beta thalassemia

- Beta thalassemia intermedia
- Beta thalassemia major

Iron chelation therapy

- — Iron overload is inevitable in patients requiring life-long transfusion support. Each unit of transfused red cells introduces 200 to 250 mg of elemental iron into the body. Since iron cannot be actively excreted, and is utilized poorly in patients with ineffective erythropoiesis associated with beta thalassemia major, the excess iron is deposited in other viscera, usually the liver, heart, and endocrine organs. When iron stores overwhelm the ability of reticuloendothelial cells to sequester them, parenchymal iron overload develops, leading to end-organ dysfunction (especially heart, liver, and endocrine organs) and death

Iron chelation therapy

- Deferoxamine (DFO, Desferal)
- Deferasirox (Exjade)

Hemophilia

- Factor VIII deficiency (hemophilia A)
- Factor IX deficiency (hemophilia B, Christmas disease)
  - Clotting factor concentrates are given to prevent bleeding and to limit existing hemorrhage


Thanks

Red cell concentrates — Red cell concentrates are largely used for the treatment of blood loss or anemia.

In many blood centers, up to 100 percent of red cells are subjected to filtration to reduce leukocytes prior to storage, such that, nationwide, approximately 75 percent of red cells are leukoreduced prior to transfusion. These leukocyte-reduced (LR) red cells are used to mitigate febrile nonhemolytic transfusion reactions, HLA sensitization and platelet immune refractoriness, cytomegalovirus transmission, and other unwanted results of transfusing unnecessary leukocytes and cytokines.