



Blood



I. Function

A. Transport

- nutrients
- oxygen/carbon dioxide
- waste

B. Maintaining Homeostasis

- hormones

C. Protection

- immune system

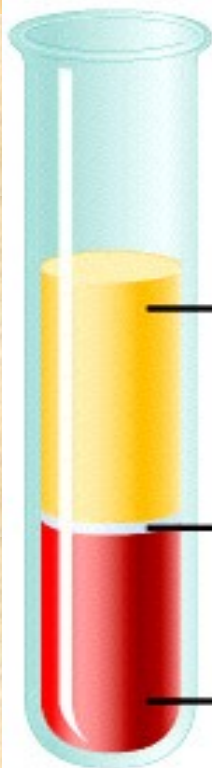
II. Composition of blood



A. Plasma



Centrifuged Blood Sample

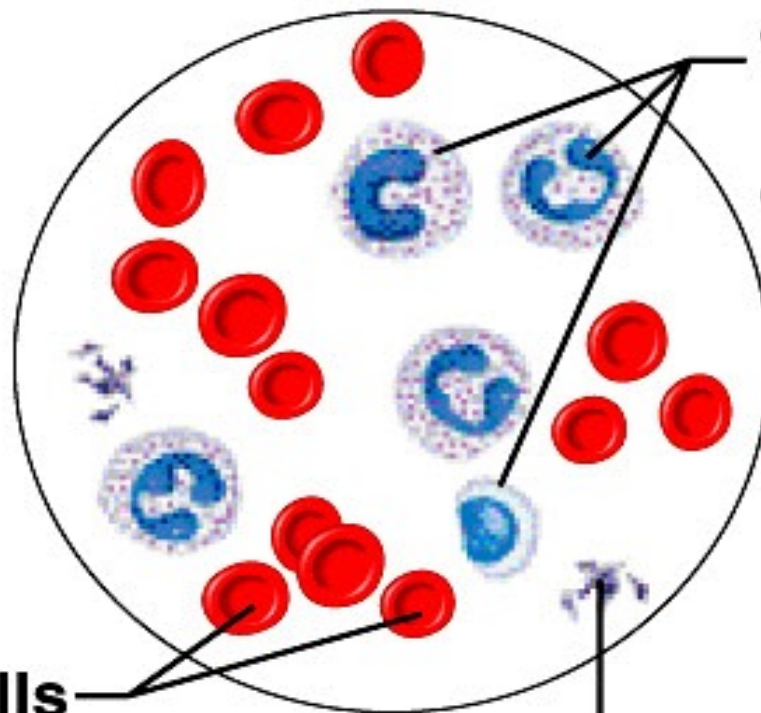


Liquid
(plasma)

“Buffy coat”
(white blood cells
and platelets)

Red blood cells

Peripheral Blood Smear



White
blood
cells

Red blood cells

Platelets



- 
- **91% water**
 - **9% suspended material**

Proteins:

Albumin – most abundant ->water regulation

Globulins – transport steroid hormones

Fibrinogen – formation of clots

B. Formed elements

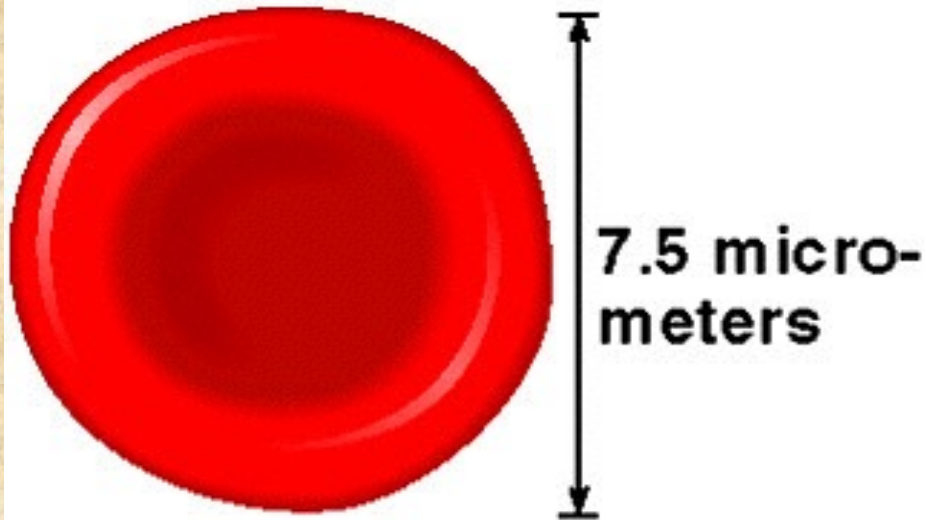
Derived from hemocytoblast stem cells

1. Erythrocytes (RBC)

- **transports gases**
- **1/3 volume hemoglobin**

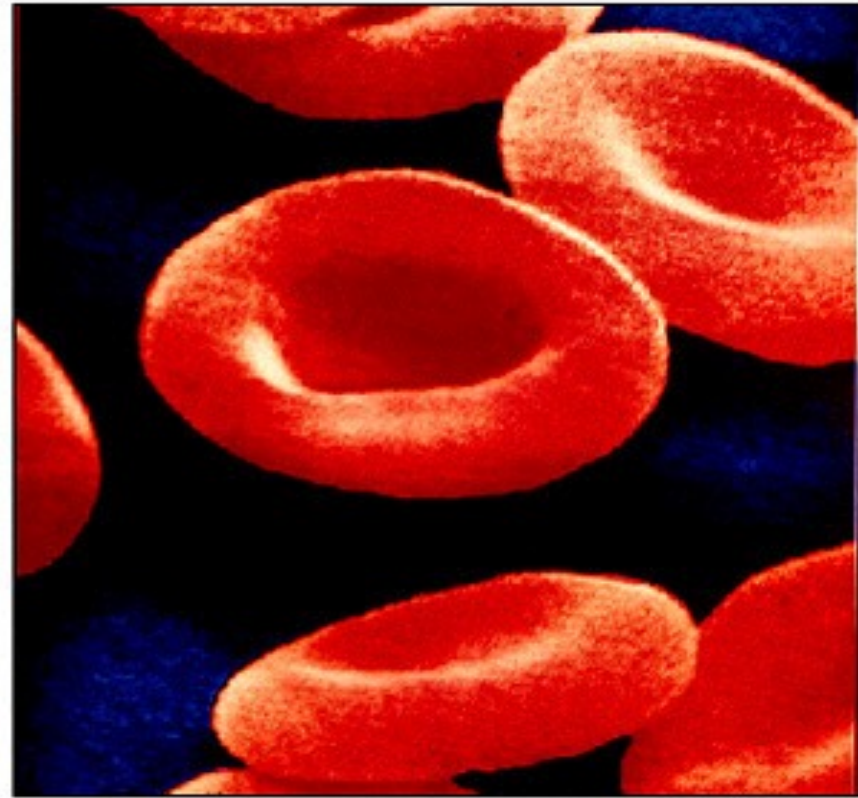
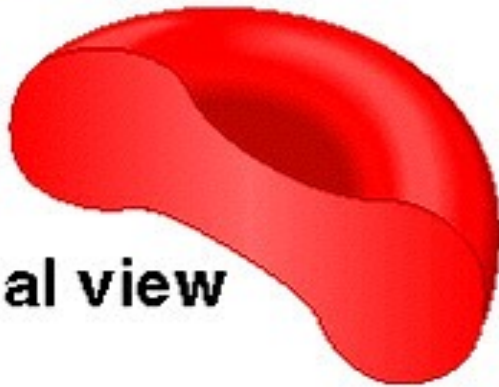


Top view



2.0 micro-
meters

Sectional view



A

B





- **Production:**

Erythropoietin from Kidney (liver)

Red bone marrow

Iron required

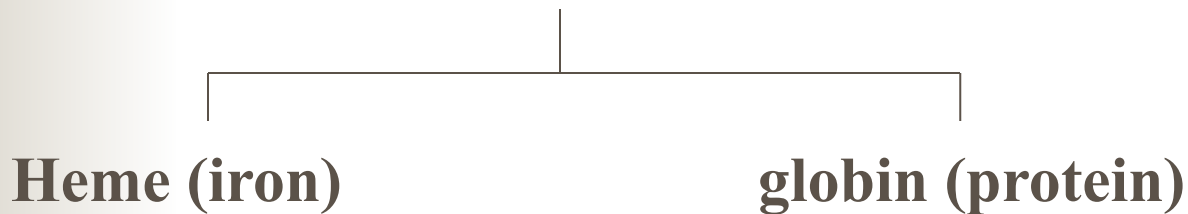
- **RBC cycle** 

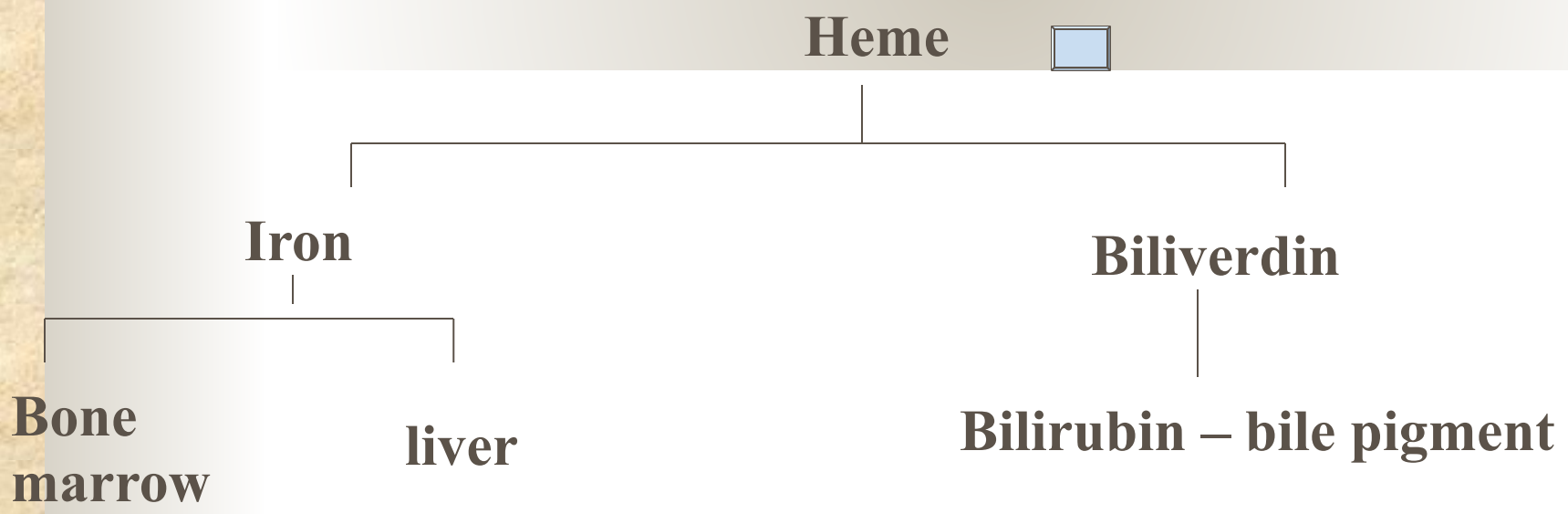
120 days

Damaged RBC – liver and spleen

Macrophages

- **Hemoglobin breakdown**





2. Leukocytes (WBC)

no hemoglobin/has nucleus

immune response

hormones: interleukins and colony-stimulating (CSF)





d. Monocytes

- agranulocyte
- largest WBC
- after 3 days -> macrophages
- phagocytes with lysosomes
- ingests larger objects than Neutrophils

e. **Lymphocytes**

- agranulocyte
- cells of the immune system
- **B cells (antibodies) / T cells immune response**





3. Platelets (Thrombocytes)

- fragments of megakaryocytes
- hormone: thrombopoietin
- **blood clotting/ mend blood vessels**

C. Hemostasis

1. Platelet plug

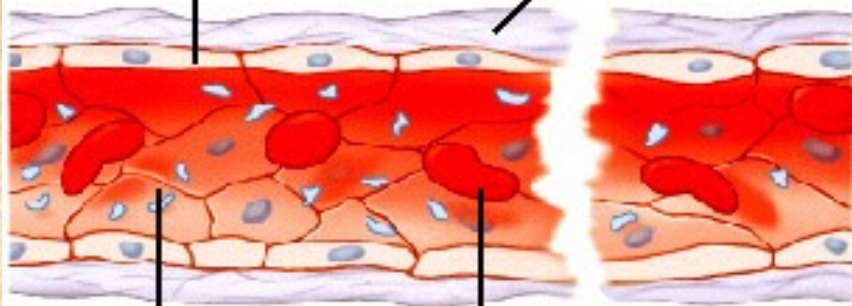
- platelets bind to damaged vessel wall
- release chemical for more platelets
- platelets release serotonin (constriction)

2. Blood clot

- damaged vessel releases Thromboplastin

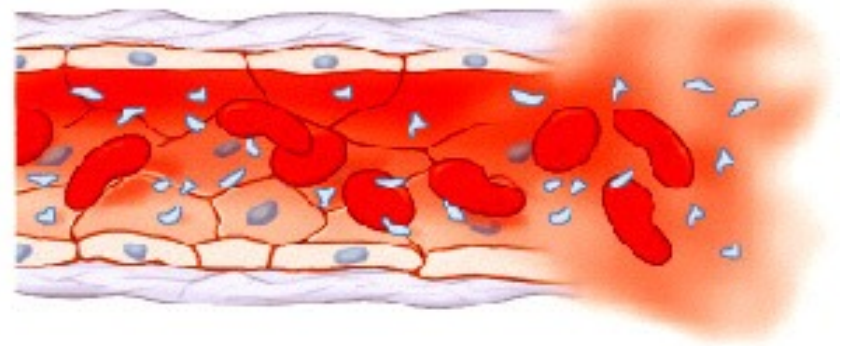


Endothelial lining **Collagen fiber**

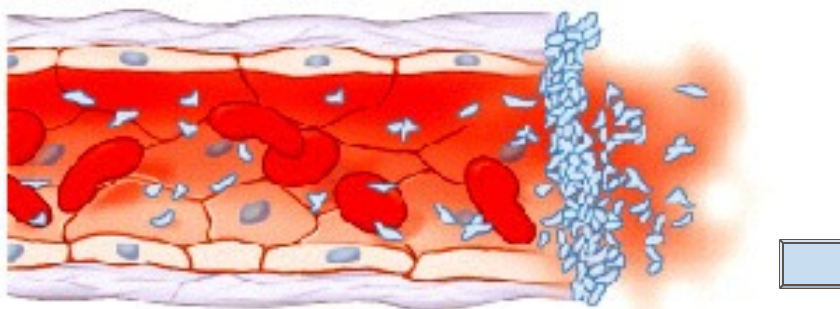


Platelet **Erythrocyte**

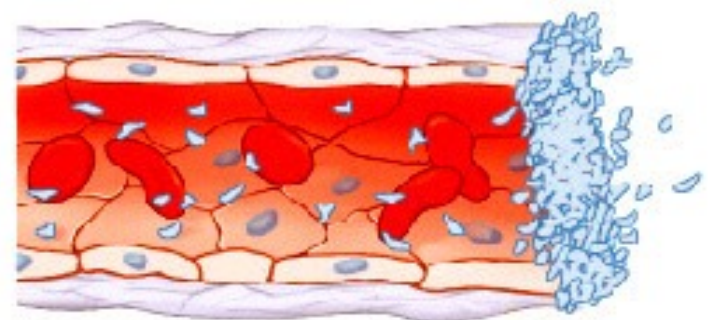
1 Break in vessel wall



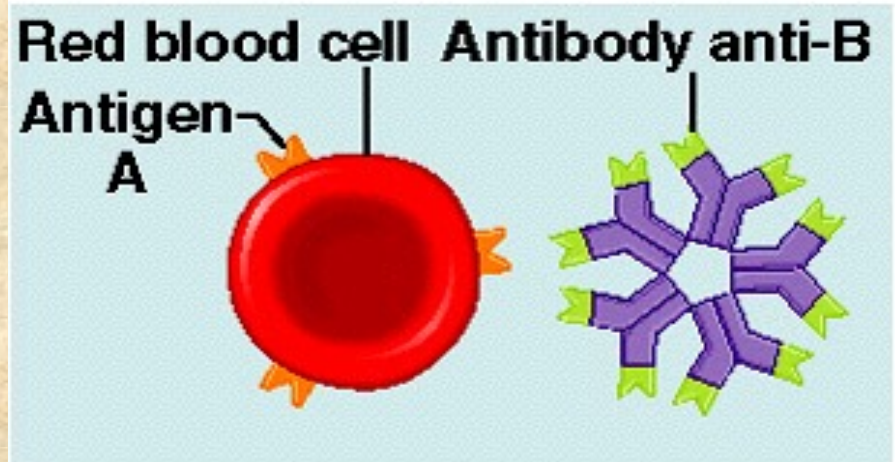
2 Blood escaping through break



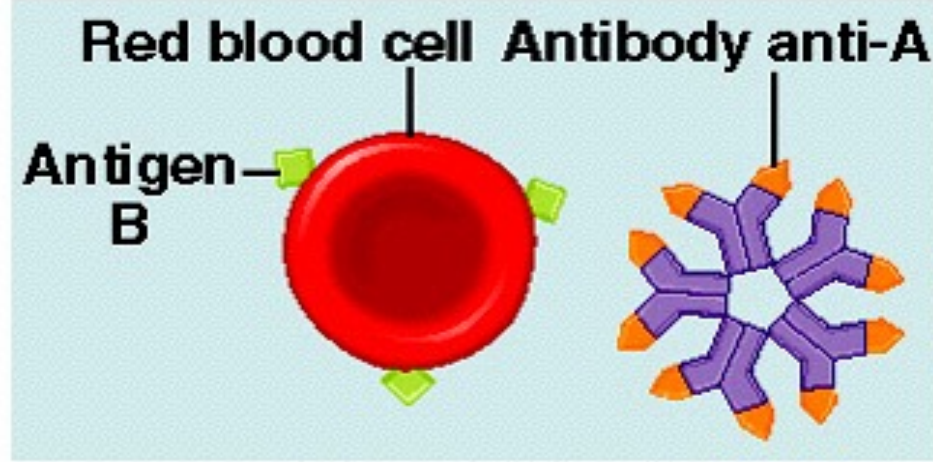
3 Platelets adhere to each other, to end of broken vessel, and to exposed collagen



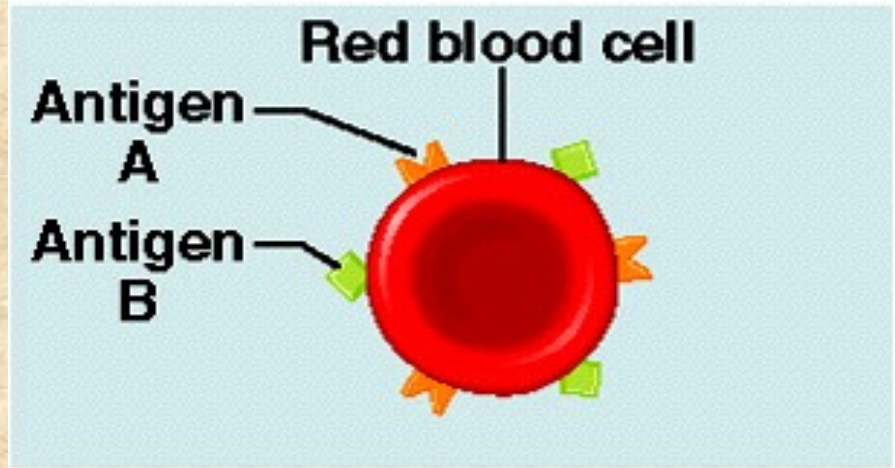
4 Platelet plug helps control blood loss



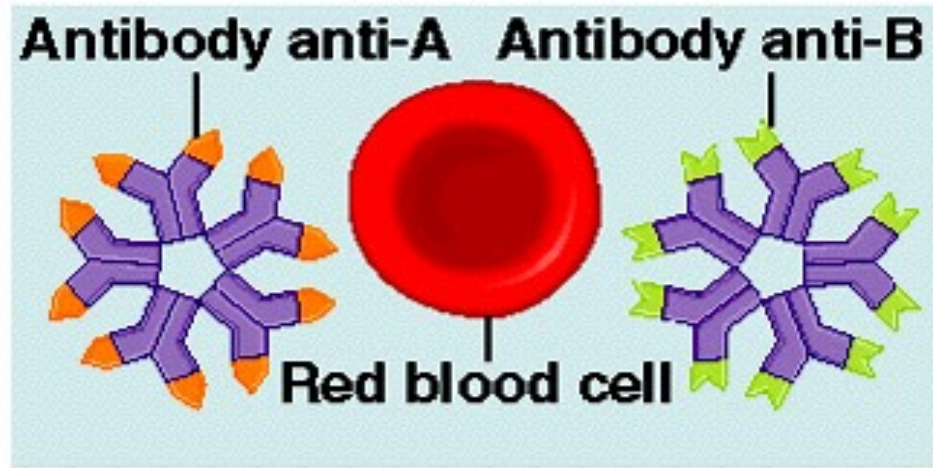
Type A blood



Type B blood



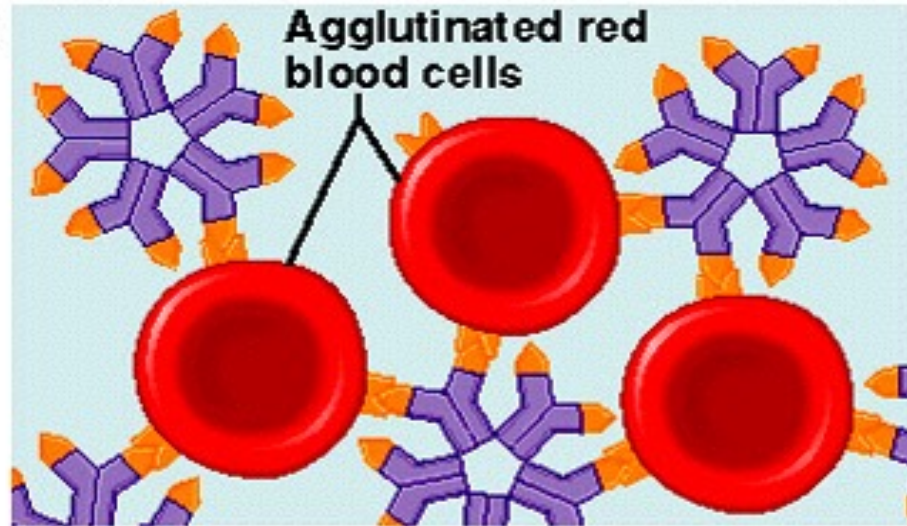
Type AB blood



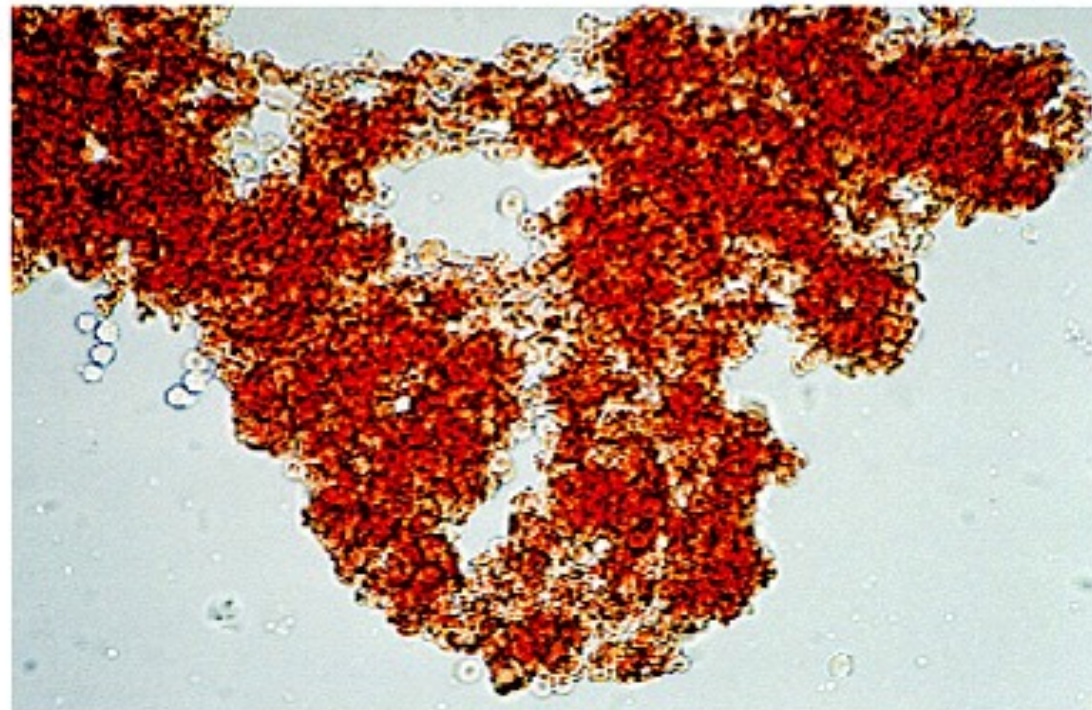
Type O blood

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B



D





B. Rh blood type

1. Antigenes on RBC

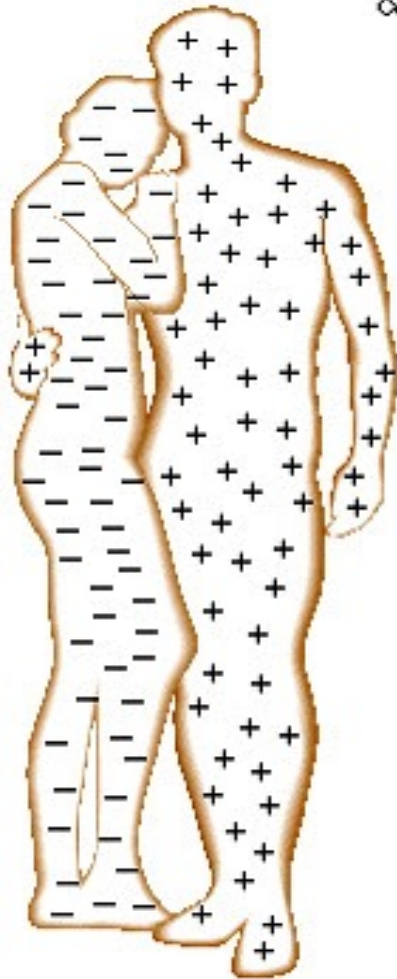
- Rh positive – has antigenes
- Rh negative – no antigenes

2. Antibodies against Rh

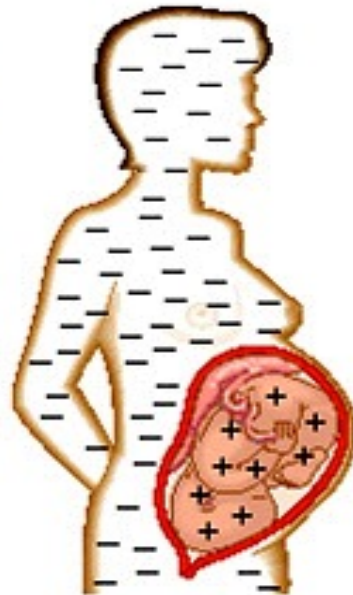
- Rh negative individual – antibodies after Rh+ encounter

3. Pregnancy

- Rh neg w/Rh+ fetus
- blood from fetus -> into mother's blood
- 2nd pregnancy w/Rh+ fetus -> antibodies attack



Rh-negative woman and Rh-positive man conceive a child



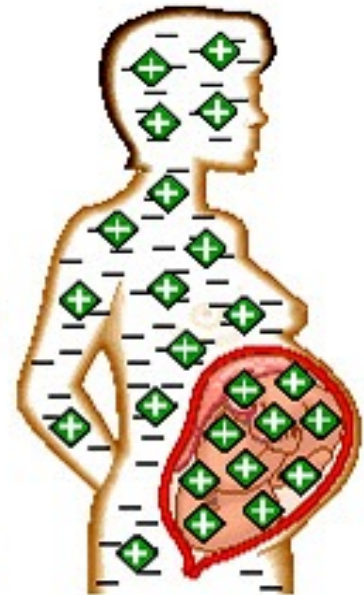
Rh-negative woman with Rh-positive fetus



Cells from Rh-positive fetus enter woman's bloodstream



Woman becomes sensitized—antibodies (⬠) form to fight Rh-positive blood cells



In the next Rh-positive pregnancy, maternal antibodies attack fetal red blood cells

