BLOOD

rvsd: 23Feb2016
Martini's 5th: 624-650, Martini's 6th: p 651-666, 7th: 640-667, 8th: 650-679, 10th: 652-683

1628: William Harvey demonstrated continuous **circulation** using valves in brachial veins.
(Showed by expressing blood distally, then releasing to fill veins towards the heart.)

COMPOSITION OF BLOOD:

Blood, when centrifuged (as with hematocrit) separates (p 654) into

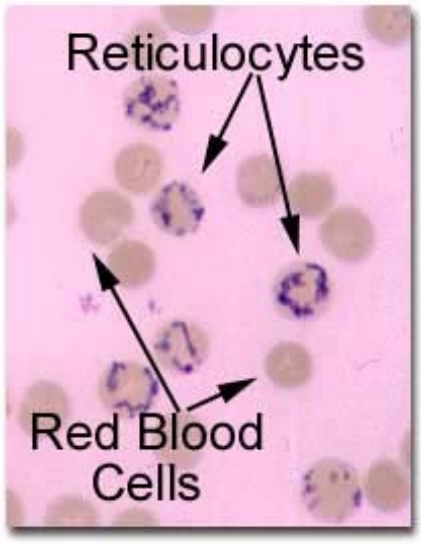
plasma (55%)	Liquid portion of blood, contains 9% protein
formed elements (45%)	Erythrocytes,
"**Buffy coat"**	Leukocytes (5 kinds) & platelets

Clotting: forms (analogous to coagulation of milk in cheese formation):

serum ("whey")	lacks clotting factors
clot	consists of RBC entrapped in insoluble fibrin fibers

PLASMA: Contains clotting factors, contains **Four types of proteins (but *not* fibrinogen):**

protein	% total	function
albumin	54%	maintains osmotic pressure (albumin leaks out with severe burns: blood vol drops, shock results)
globulin	38%	14% α, 13% β, 11% γ. (electrophoresis)
fibrinogen	7%	precursor to fibrin , lacking in serum
prothrombin	1%	precursor to thrombin which activates fibrinogen , serum lacks



ERYTHROCYTES: (p 658) biconcave disc. incrs by emotional, physical in spleen and liver
Shape increases surface area of RBC to 3200 sq meters, 1500x area of body
7 micrometer diameter, increases as pH drops: therefore larger in veins

Males:	5,400,000 / cmm;	15 g Hb
Females	4,700,000 / cmm;	13-14 g H

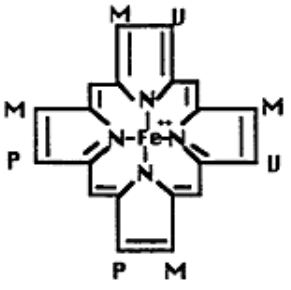
Life span of 80-120 days

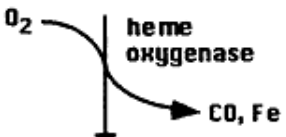
HEMOGLOBIN: (p 659) each RBC about 280 mil mol.

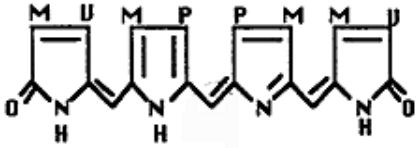
Adult:	two alpha (α)	(141 AA)
	two beta (β)	(146 AA)
Fetus:	two α chains	
	two γ chains	

Reticuloendothelial system (RES) phagocytic **macrophages** removes *effete* (inelastic) RBCs
Occurs in spleen esp, also connective tissue, liver and bone marrow

Heme catabolism: Draw porphyrin, snipped to release Fe^{++} (see right)
p 662 Fe^{++} is salvaged and may be stored in liver as ferritin, or in bone marrow
Waste: protoporphyrin converted to **bilirubin**, giving bile its golden-yellow color







HEMATOPOIESIS: (p 663)
all blood cells formed from pleuripotent stem cells: hemocytoblasts in several sites:

1)	earliest embryo	mesenchyme of yolk sac
2)	late embryo	liver
3)	fetus	then spleen
4)	adults	red marrow, esp of ribs, skull, vertebrae, pelvis.

REGULATION: ERYTHROPOIESIS, proliferation of stem cell progeny, stimulated by
erythropoietin (EPN), activated in blood by **renal erythropoietic factor** (REF)
REF cleaves a plasma protein to yield EPN.
EPN increased by hypoxia.
antiEPN abolishes synthesis of RBC

ANEMIAS:

aplastic anemia:	esp due to radiation etc.
pernicious anemia:	B_1 lack, may be due to lack of intrinsic factor
hemolytic anemia:	sickle cell anemia (p 660)
thalassemia:	decreased synth of one or more globulin chains, Hb precipt~ cells destroyed
	alpha thalassemia = reduced alpha chains
	beta = reduced B chains