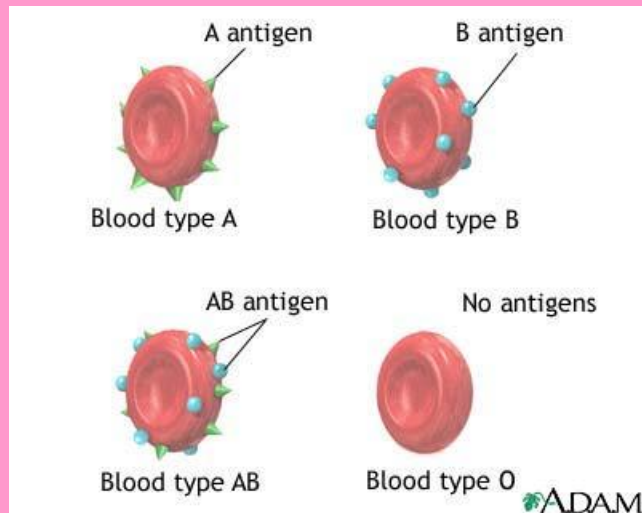
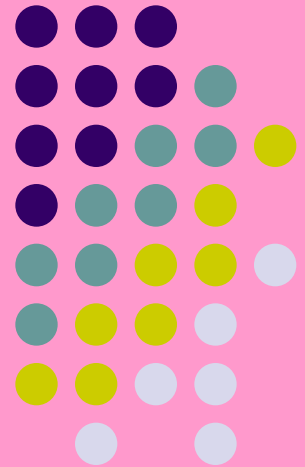


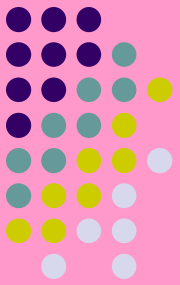
Blood Types and the Rh Factor



Chitraroff
MMHS

Anatomy & Physiology

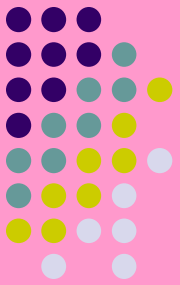




I. Genetics

A. Blood type is a genetically inherited trait
“codominance”

1. traits are made of two alleles (one from each parent)
2. Upon fertilization the two alleles join to determine blood type
3. Alleles can be dominant or recessive.
 - a. A dominant allele is always shown “expressed” no matter what allele it is paired with
 - b. A recessive allele is only expressed when it is paired with another recessive allele



Genetics of Blood

B. Genotype and Phenotype

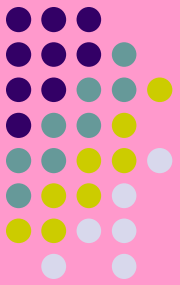
1. How alleles appear on the chromosome is the genotype

a. BB and Bb are both genotypes for brown eyes

b. bb is the genotype for blue eyes

2. How the alleles appear physically is the phenotype

a. different genotypes can have the same phenotype



ABO Blood Grouping

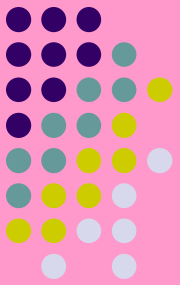
C. Genetics of A, B, O blood groups

1. Blood has codominant alleles

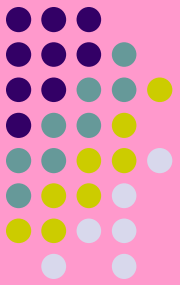
a. A and B are dominant

b. O is recessive

Genotype vs. Phenotype



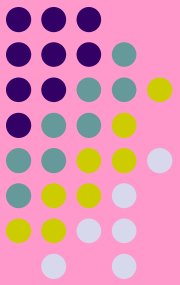
Blood Genotype	Blood Phenotype
$I^A I^A$ (AA), $I^A i$ (AO)	Type A
$I^B I^B$ (BB), $I^B i$ (BO)	Type B
$I^A I^B$ (AB)	Type AB
ii (OO)	Type O



II. ABO blood groups

A. Antigens and Antibodies

1. Agglutination is the clumping of red blood cells following a transfusion reaction
2. Antigens (agglutinogens)
 - a. surface molecules on RBC's
 - b. at least 50 different kinds (A, B, D most important)
 - c. type A blood has only antigen A
 - d. type B blood has only antigen B
 - e. type AB blood has both antigen A and B
 - f. type O blood has neither antigen



3. Antibodies (agglutinins)

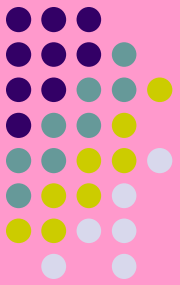
a. contained in plasma

b. attack “foreign” antigens on others RBC's

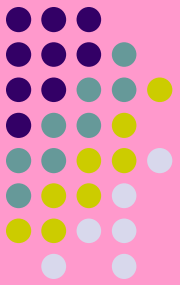
B. Type AB is considered to be the universal recipient

C. Type O is considered to be the universal donor

Agglutinogens vs Agglutinins



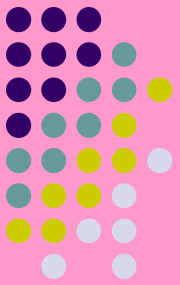
Blood Type	Agglutinogen	Agglutinin
Type A	A	B
Type B	B	A
Type AB	A, B	None
Type O	none	A, B



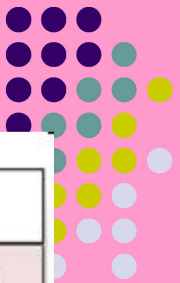
III. Rh Factor

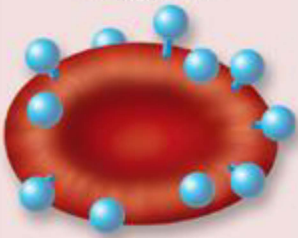
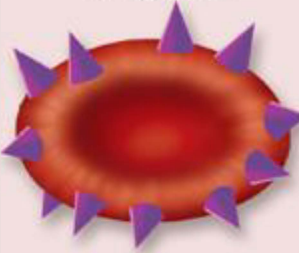
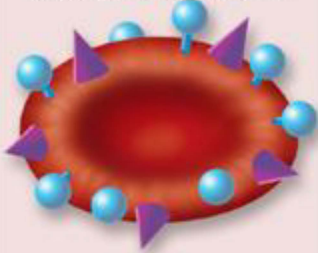
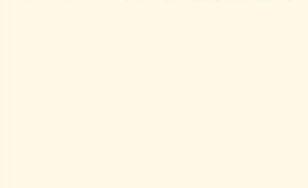
- A. Named after the rhesus monkey that was being studied
- B. If antigen D is present the person is Rh+; if antigen D isn't present then the person is Rh-
- C. Rh antibodies (anti-Rh) are not inherited; they only appear when stimulated
 - 1. Rh- person receives Rh+ blood: person will be safe the 1st time but the 2nd time anti -Rh will attack donor blood

RhoGam

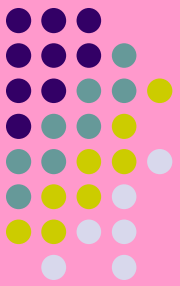


2. Rh- mom pregnant with Rh+ baby: at birth, blood can mix causing mom to make anti-Rh that will attack future babies (erythroblastosis fetalis); prevention= (Rh-) mom is injected several times with RhoGAM which binds to fetal cells protecting them from mom's antibodies.

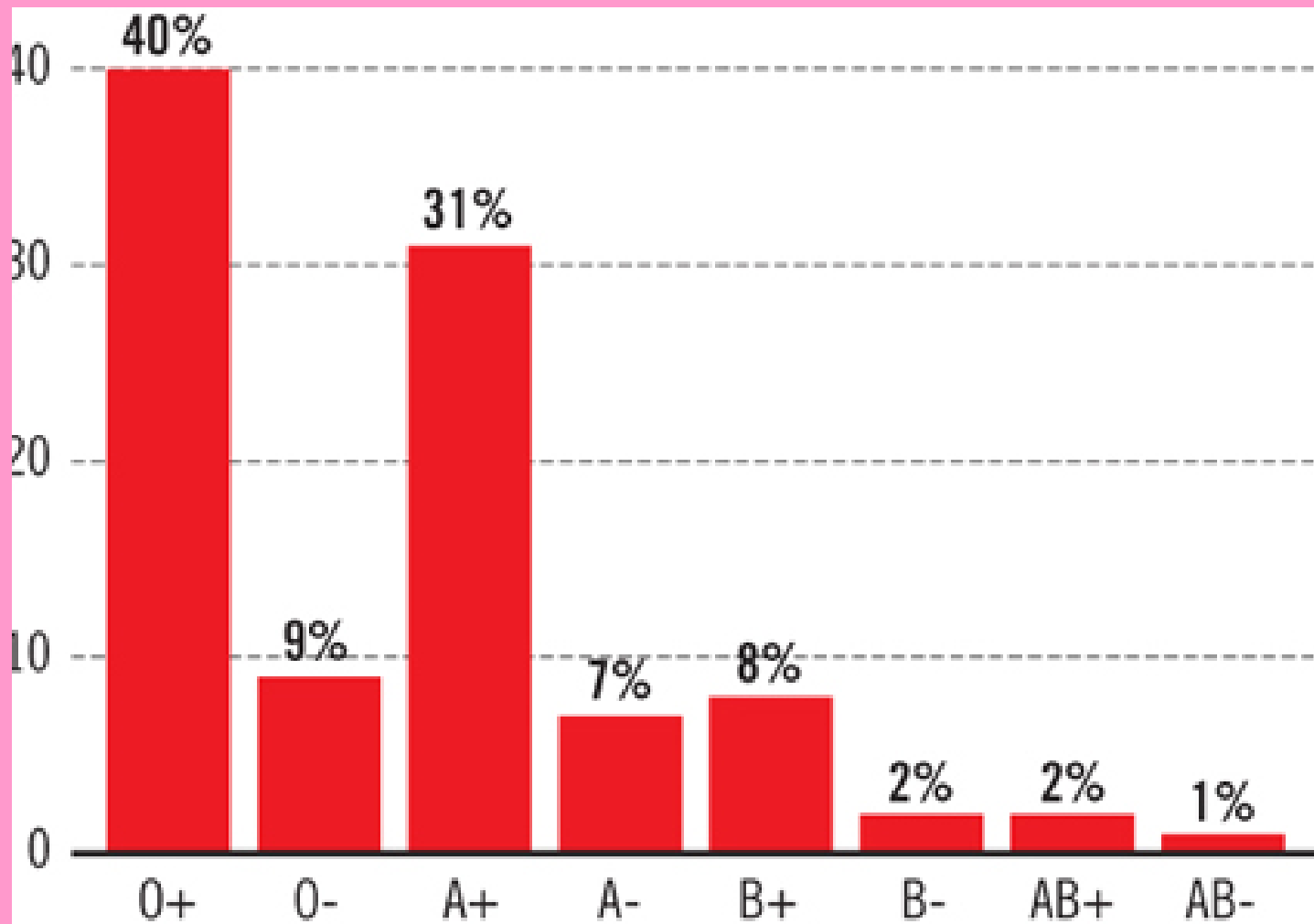


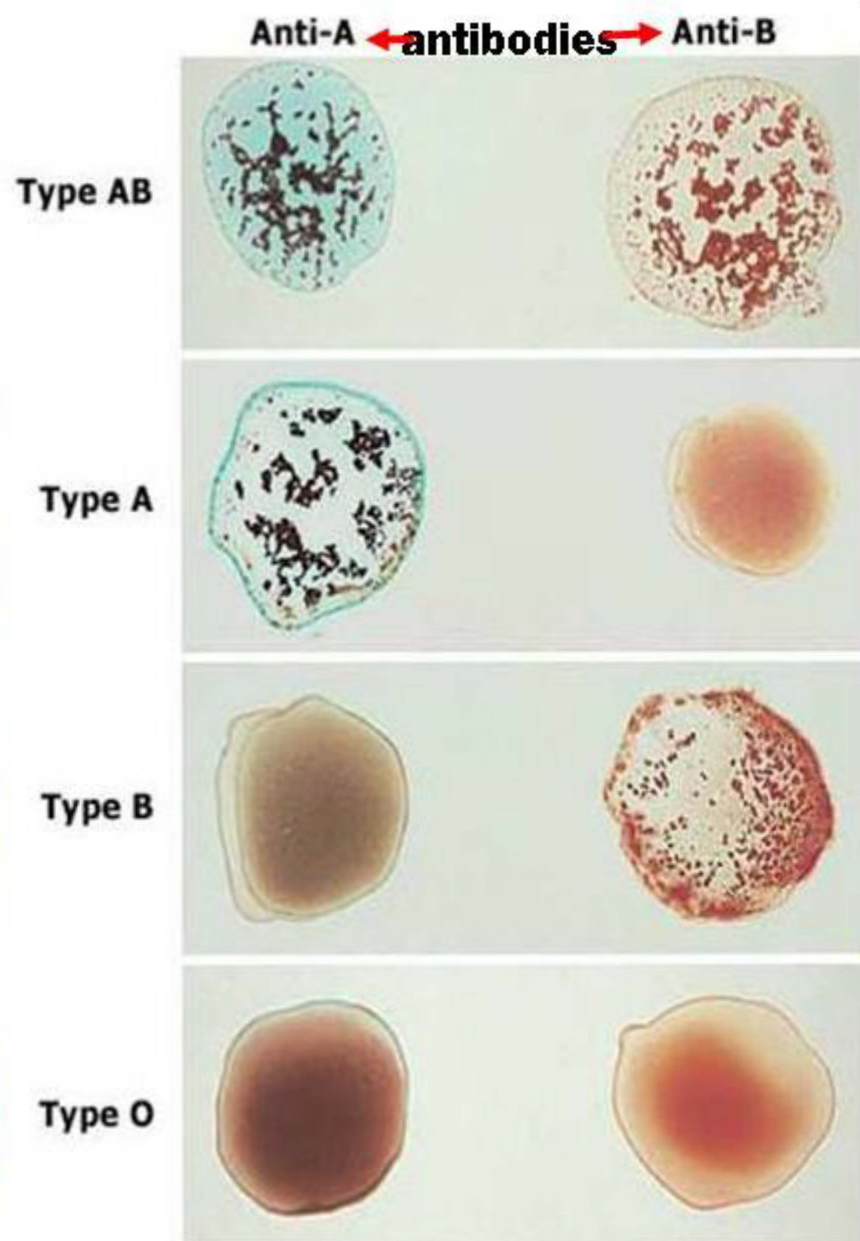
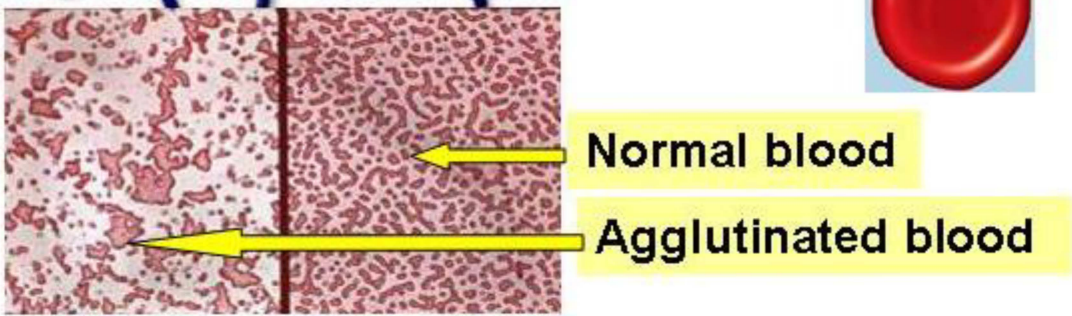
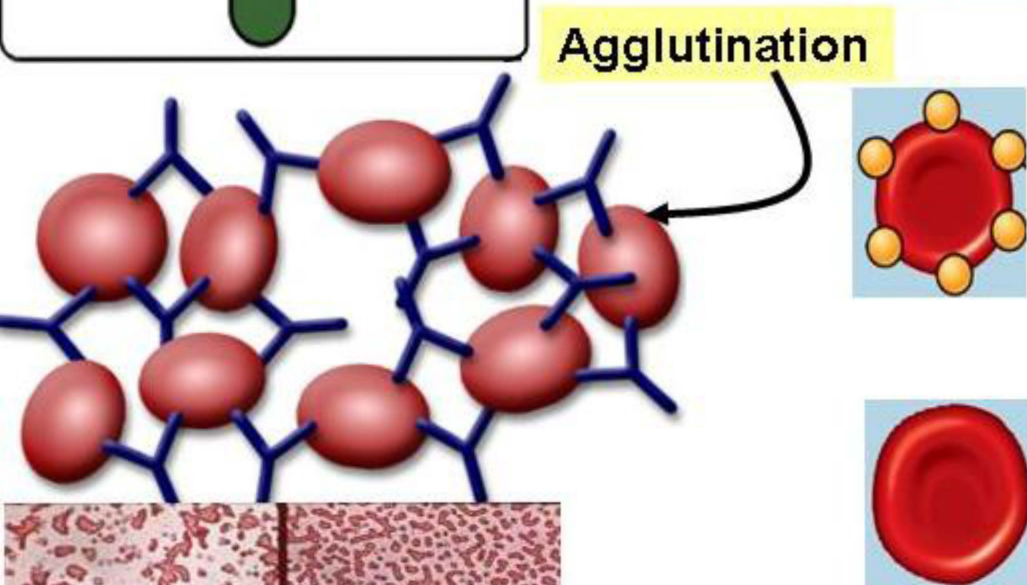
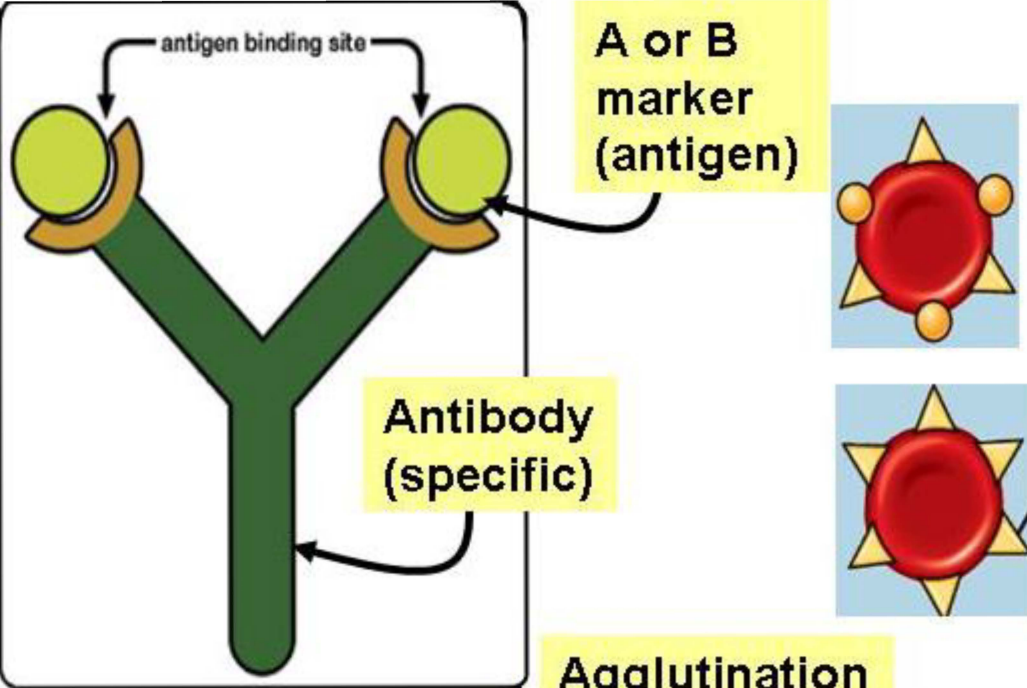
ABO Blood Types				
Erythrocytes	Antigen A 	Antigen B 	Antigens A and B 	Neither antigen A nor B 
Plasma	Anti-B antibodies 	Anti-A antibodies 	Neither anti-A nor anti-B antibodies 	Both anti-A and anti-B antibodies 
Blood type	Type A Erythrocytes with type A surface antigens and plasma with anti-B antibodies	Type B Erythrocytes with type B surface antigens and plasma with anti-A antibodies	Type AB Erythrocytes with both type A and type B surface antigens, and plasma with neither anti-A nor anti-B antibodies	Type O Erythrocytes with neither type A nor type B surface antigens, but plasma with both anti-A and anti-B antibodies

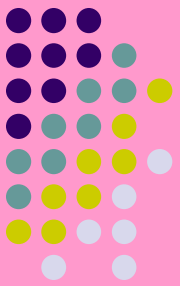
(a)



Blood Type Distribution







Genetic Cross of Blood Types

		Father's Blood Type				
		A	B	AB	O	
Mother's Blood Type	A	A or O	A, B, AB, or O	A, B, or AB	A or O	Child's Blood Type
	B	A, B, AB, or O	B or O	A, B, or AB	B or O	
	AB	A, B, or AB	A, B, or AB	A, B, or AB	A or B	
	O	A or O	B or O	A or B	O	