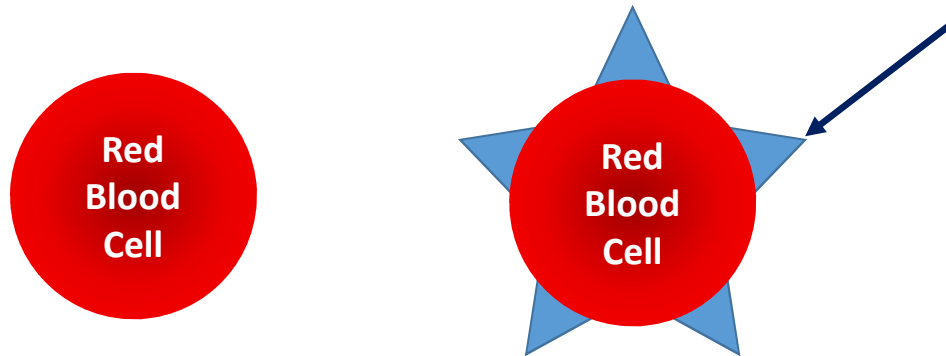


## POLYALLELIC INHERITANCE:

BLOOD TYPES ARE CONTROLLED BY THREE DIFFERENT ALLELES



*Think back to The Cell as a Factory*

### Antigen

A molecular 'flag' on the outside of the red blood cell

- Lets the immune system (white blood cells) know that the cell is part of the body

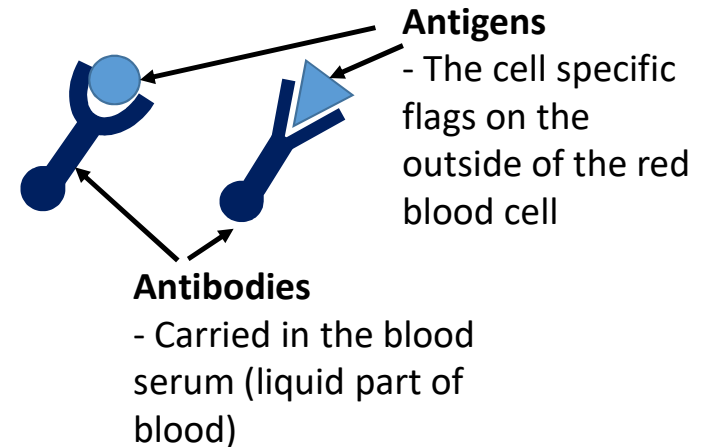
### Antibodies

- Huge protein that recognizes a specific molecule ('flag')
- Has a binding site a bit like an enzyme that recognizes one particular antigen and labels it/ the cell for destruction

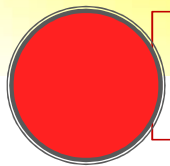
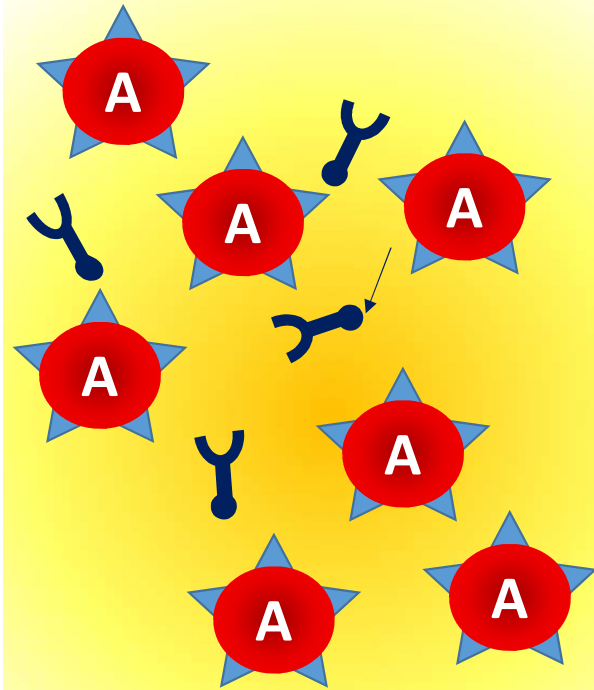
- Before a baby is born it gets rid of any antibodies that recognize the 'flags' on the Baby's blood cells



- Antibodies that will recognize foreign cells with different 'flags' are kept, just in case there's an invasion



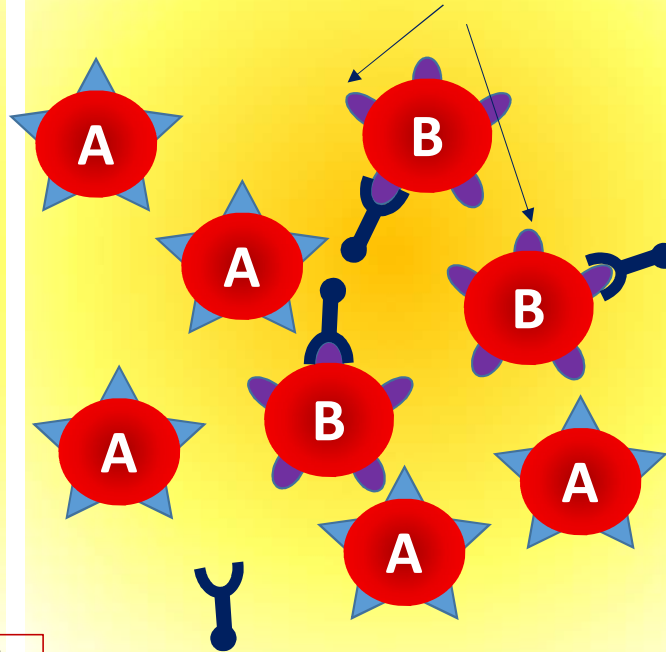
## HOW ANTIBODIES WORK: PERSON WITH TYPE A BLOOD CELLS



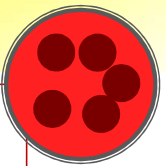
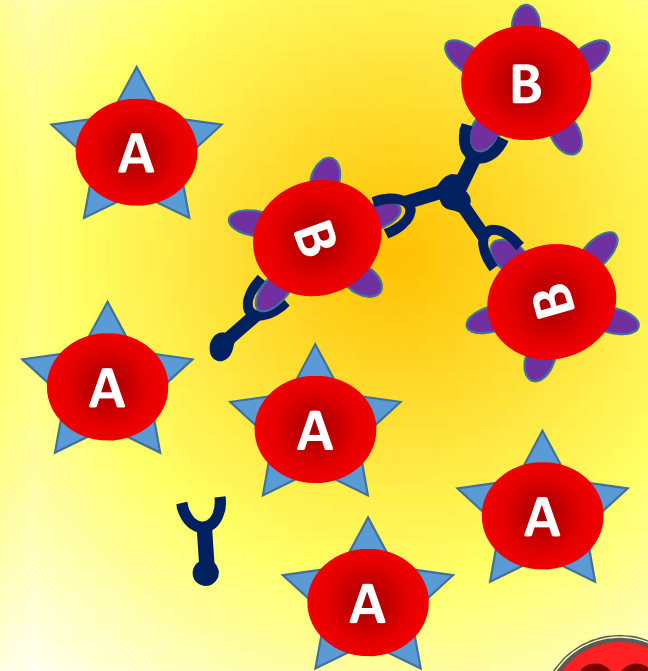
Blood looks like this in a test tube  
Red blood cells all spread out evenly  
throughout the blood serum

**1A.** Look for an on-line demonstration of blood clotting in the ABO Blood test  
Post the link to your video to canvas and say why you think it's the best one  
You will then have access to the the response to this question by others

Invading Type B red blood cells (from  
someone else)  
-foreign 'flag' recognized by persons  
invader detection antibodies



Invading Type B red blood cells  
stuck together by anti- Type B antibodies  
- neutralized/ destroyed by immune cells



Blood looks like this in a test tube  
Clumps of aggregated Type B cells  
**1B:** What do you think would happen to  
this person?

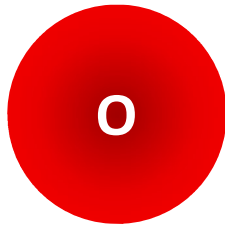
## The Genetics behind Blood Types: *-governed by the ABO gene*

Alleles of the ABO gene locus in the general population = 3 (= more than two (multiple) alleles)

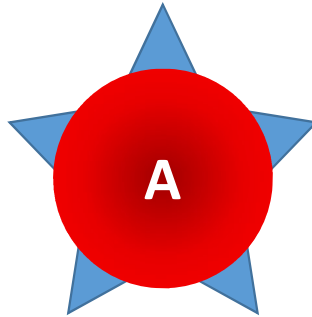
$i$  – no antigens made (recessive),  $I^A$  – Type A antigens made;  $I^B$  – Type B antigen's made

$I^A$  and  $I^B$  are codominant to each other and both are dominant over  $i$  (recessive).

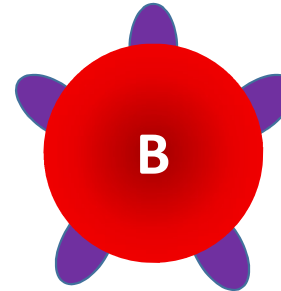
No Antigens



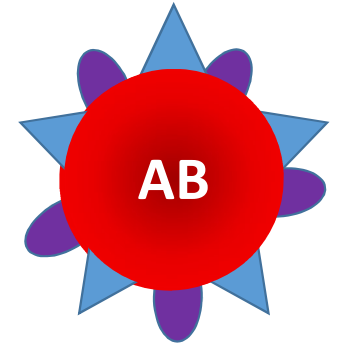
Type A Antigens



Type B Antigens



Type A and Type B  
Antigens

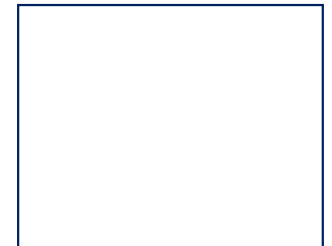
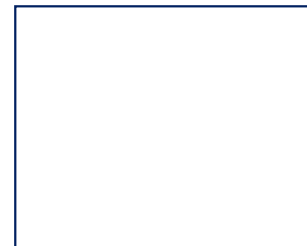
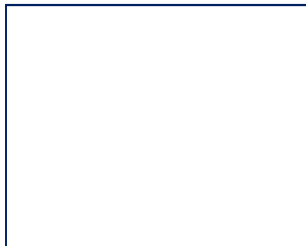


### 2. Possible Genotypes:

*remember an individual person can only have two alleles maximum for a given gene locus*

### 3. Antibodies present in the person's blood:

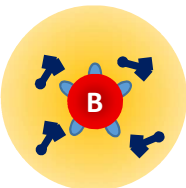
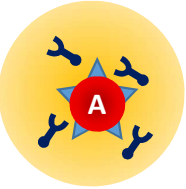
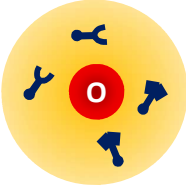
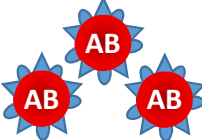
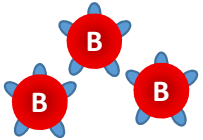
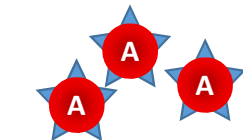
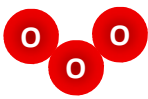
*Draw in the shapes of the antibodies present in the person's blood*



BLOOD TRANSFUSIONS can be dangerous if the two blood types aren't compatible

ABO Blood Type Compatibility *Universal donor*

DONOR'S BLOOD CELLS




*Universal acceptor*

**Rhesus Blood Types:**  
Governed by the alleles of the Rhesus (Rh) gene.  
*The defective allele (Rh<sup>-</sup>) is recessive*

*Rhesus positive: Rh<sup>+</sup>Rh<sup>+</sup> or Rh<sup>+</sup>Rh<sup>-</sup>*

*Rhesus negative: Rh<sup>-</sup>Rh<sup>-</sup>*

*The most common Blood type in the U.S. is*

*Phenotype: **O Positive***  
*Genotype: **ii, Rh<sup>+</sup>Rh<sup>+</sup> or ii, Rh<sup>+</sup>Rh<sup>-</sup>***

**4. The rarest Blood type in the U.S. is**  
**Phenotype: **AB negative****  
**Genotype: \_\_\_\_\_**

**5. Do some Research:**  
*What are the relative proportions of each of the ABO blood types ...*

*(i) in the US?*  
A      B      AB      O  
\_\_\_\_

*(ii) in the World?*  
A      B      AB      O  
\_\_\_\_

*(ii) in your home/ancestral country?*  
A      B      AB      O  
\_\_\_\_

Dr. Bradley's Drawing Page

