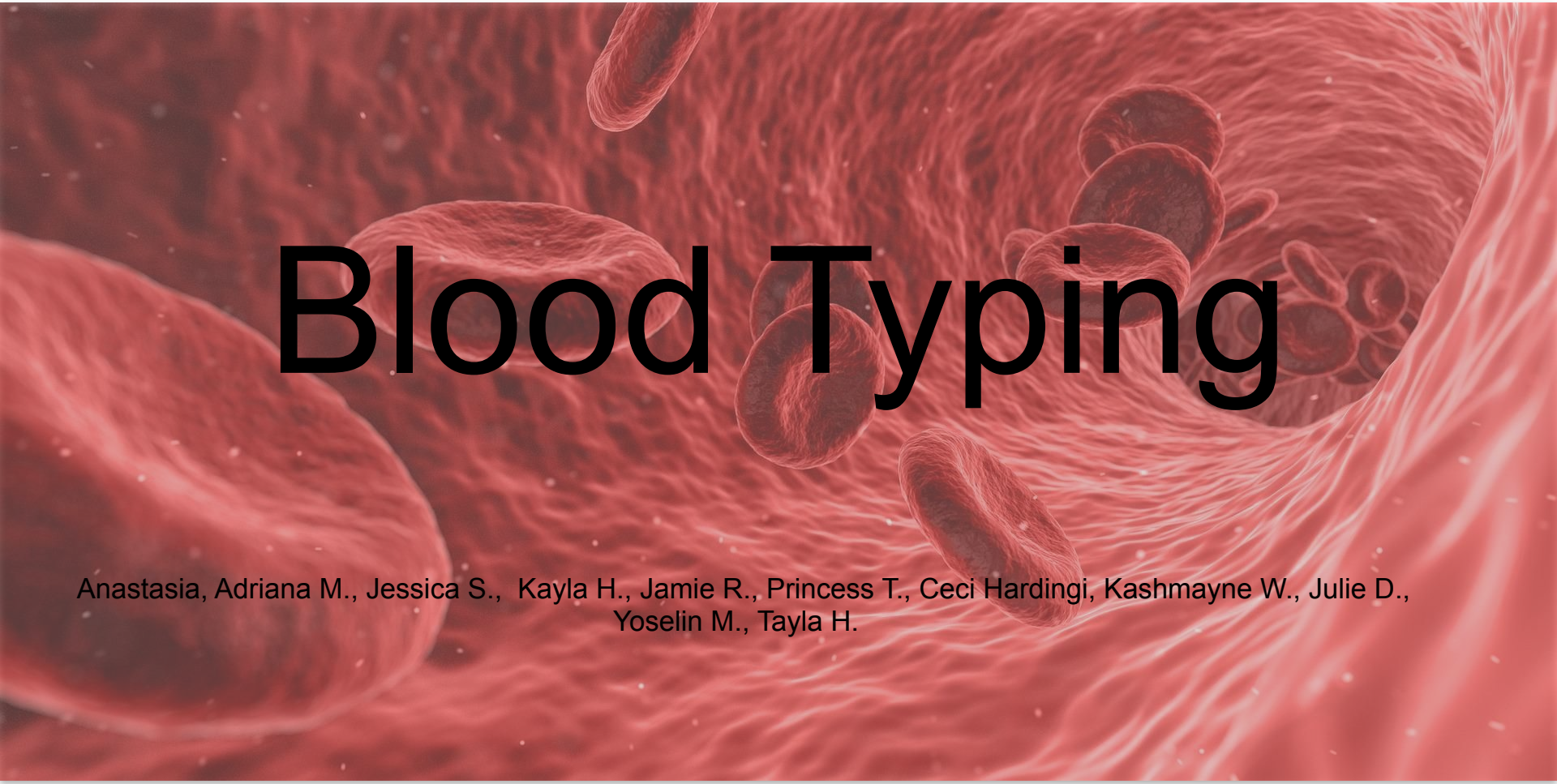

Blood Typing

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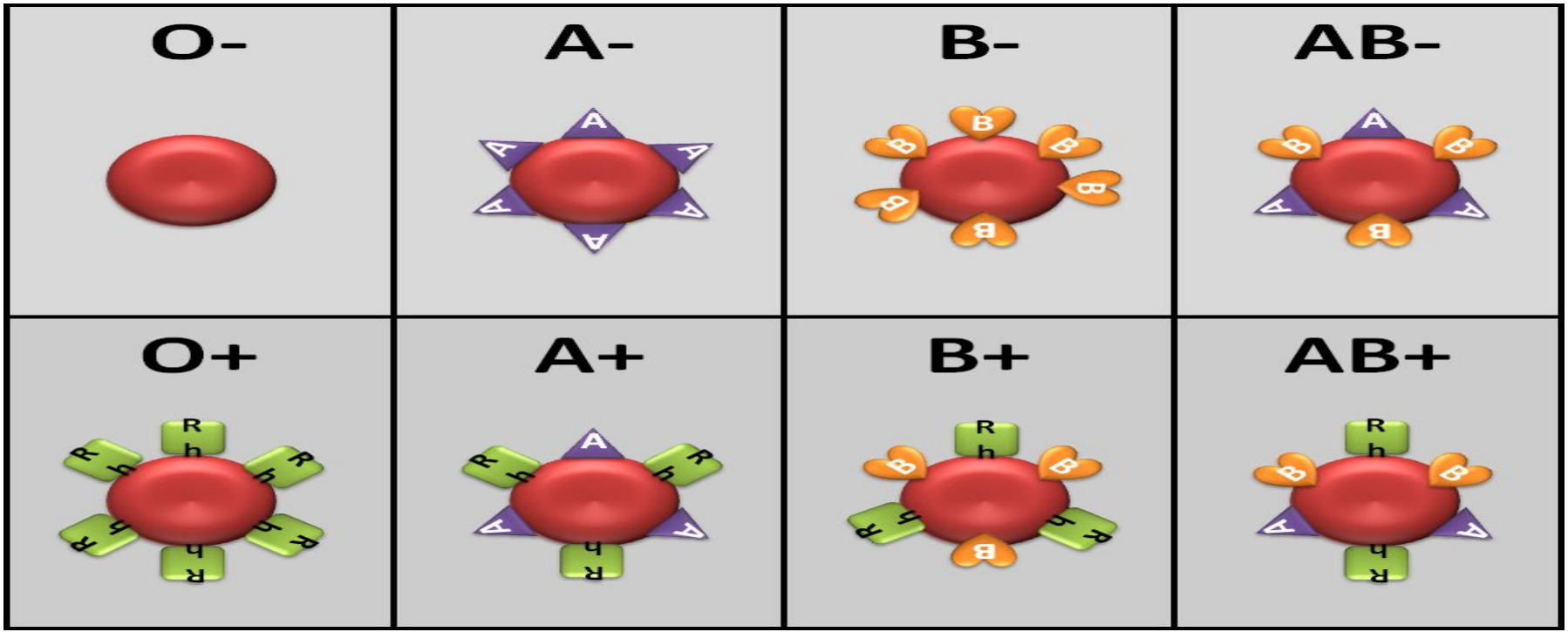
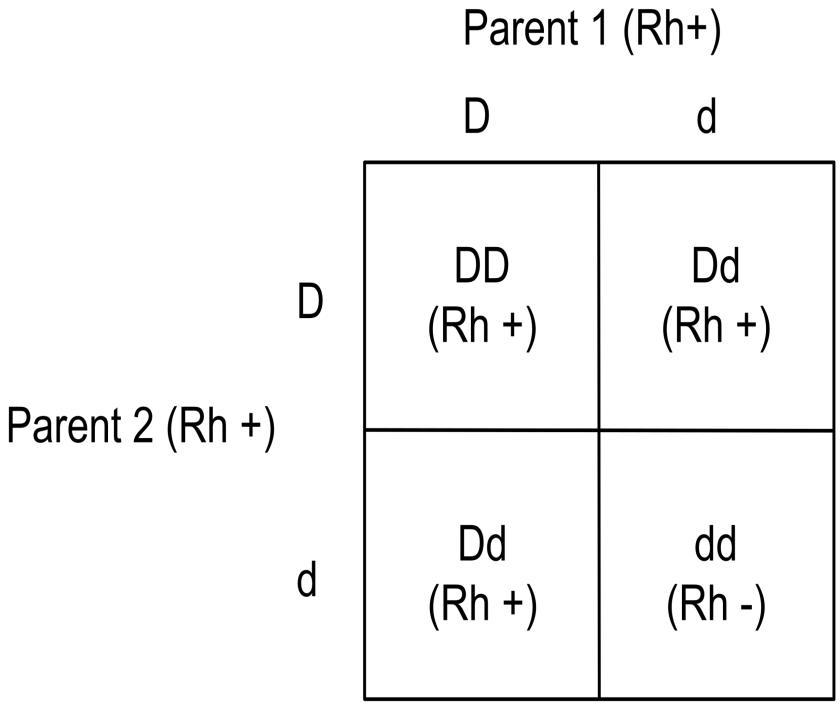
What Are The Different Blood Types?



What Does Positive and Negative Mean?

- Rh (rhesus) factor is the determination of positive and negative
- If a person is positive, then they have the Rh protein factor on the surface of their red blood cells.
- Positive is the most common in blood typing.
- Negative means this protein is absent from the red blood cells but that does not mean your blood is “weaker”.
- Rh is also split in A,B,C,and D but whether or not + or - is only based on Rh(D).



How Did You Get Your Blood Type?

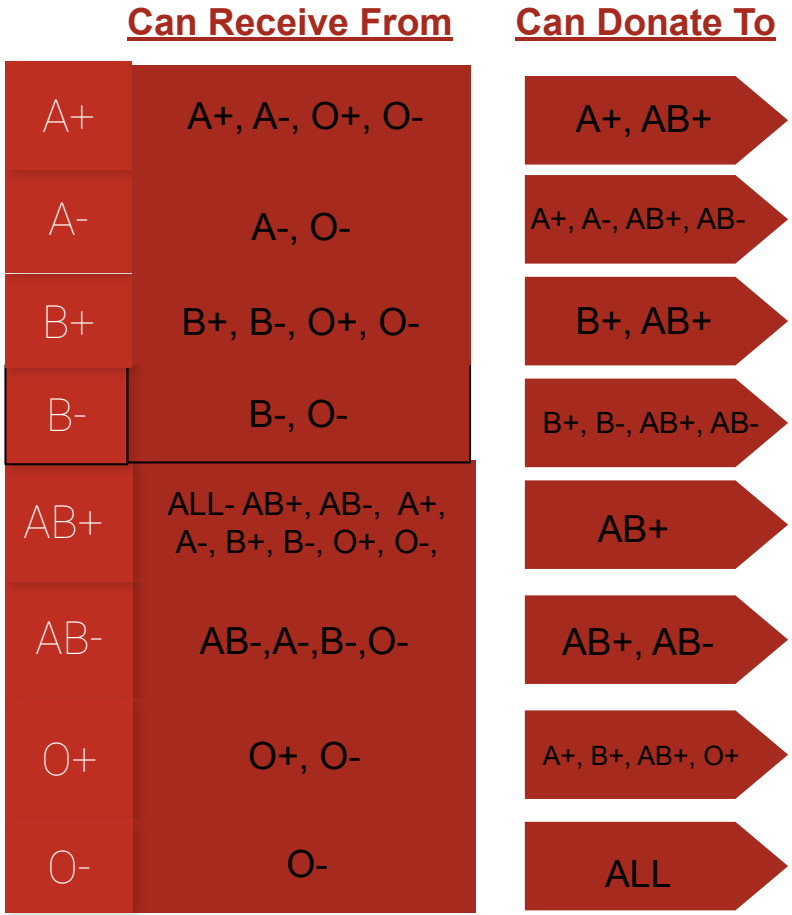
Everyone has an ABO blood type! Just like your hair and eye colour, our blood type is given to us from our parents!

-Each parent gives 1 of 2 ABO genes to their child ie. YOU!

-A and B genes are dominant and the O gene is recessive. A parent that has O blood with 2 O genes and a parent with A blood with 2 A genes will produce a child with type A blood; 1 A gene and 1 O gene.

-Since everyone inherits ABO genes, everyone also inherits one Rh factor gene from each parent. The Rh-positive gene is the dominant gene when paired with an Rh-negative gene.

What Types Can Match and Why?



Blood type is determined by antigens. Blood type A has the A antigen, type B has the B antigen, type AB has both A and B antigens, and type O has neither. **To receive blood, the donor cannot have an antigen that the recipient does not have.**

The Rh factor determines whether a blood type is positive or negative. Positive blood types do have the Rh factor, while negative blood types do not. **A person without the Rh factor (negative) cannot receive blood from a person with the Rh factor (positive)**. This is why negative blood types cannot receive blood from positive blood types, but positive blood types can receive negative.

Discovery of Blood Typing

- The Different blood types were discovered by Austrian scientist Karl Landsteiner (1868-1943) in 1900.
- While in the lab, he noticed that blood sometimes clumps together when mixed with other peoples' or animal's blood.
- He took a serum from one person and mixed it with another person's red blood cells to see if they will clump together.
- He found when they clump, they are rejecting the serum, and when there is no reaction, the blood type matched.
- He learned that there are three main blood types: A,B,O
    - His assistant had found the AB blood type
- He won the Nobel Prize for medicine for it in 1930.

Reasons for Blood Typing

- If you are ever in need of a blood transfusion it is important to know your blood type.
- Different blood types can also increase the likelihood for different disorders later in life. People with A, B, or AB blood types are more likely to develop coronary heart disease and dangerous blood clots.
- Those with AB blood are more likely to develop memory problems later in life.
- When the wrong blood is introduced to a body, the body will have an “ABO incompatibility reaction”
    - This means that your immune system will attack and kill all the new blood cells
    - Symptoms include: anxiety, shock, fever, chills, pain, and the face becoming flushed or yellow.

Punnett Squares

- Punnett squares are diagrams that are used to find genotypes when crossing two organisms.
    - **Gen**otypes are the **gen**es an organism carries
    - **Ph**enotype is the **ph**ysical characteristics of an organism with a specific genotype
- For blood typing the following genotypes can be used:
    - $\mathbf{I^AI^A}$ **or** $\mathbf{I^Ai}$ is blood type A
    - $\mathbf{I^BI^B}$ **or** $\mathbf{I^Bi}$ is blood type B
    - **ii** is blood type O
    - $\mathbf{I^AI^B}$ is blood type AB
- Recessive vs Dominant
    - Recessive genes are masked by dominant genes when they show up together in a genotype (I^Ai)
        - These genes are only expressed when you get two of the recessive alleles together
        - If you have a dominant allele and a recessive allele you are a carrier for the recessive gene
    - Dominant genes are the genes that are expressed in your phenotype. This is the gene that is noticeable in a carrier genotype.

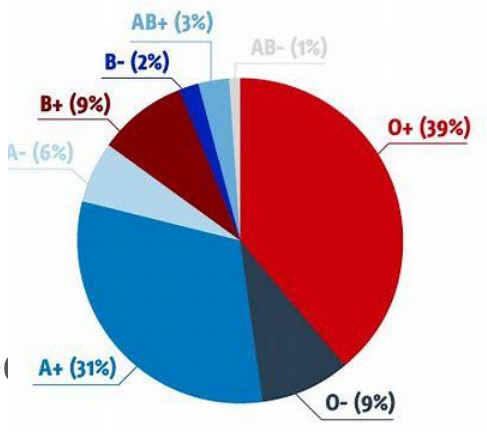
Punnett Squares (cont.)

- Genotypes can also be heterozygous or homozygous
  - Heterozygous means that there is a dominant allele and a recessive allele in the genotype
    - I^Ai or I^Bi
  - Homozygous means that there are only dominant alleles or recessive alleles in the genotype
    - I^AI^A, I^BI^B, or ii
- Type AB blood is an example of codominance
- Here is what a punnett square looks like before it is filled out:

The Rare AB Blood Type

How do you become AB if both A type and B type are dominant?

- A child becomes AB if one parent is A type and the other is B type, this means that the A and B become **codominant**
- **Codominant** means that both alleles of a gene are expressed.
- The only other way is if one parent is already AB type
- Only about 4% of the world's population has AB type blood.



How A Blood Typing Test Is Performed

There are two steps that can be used to determine an individual's blood type.

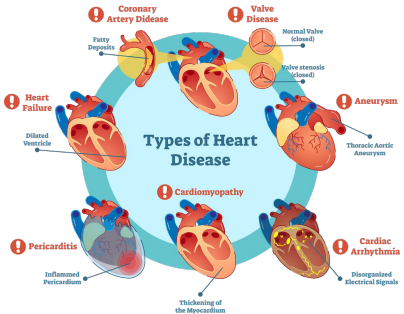
1. In order to do an ABO blood typing test, it is first necessary to obtain the blood sample to be tested. After that, antibodies against Type A and Type B blood are then mixed with the blood sample obtained. This step is critical as it is the sole determinant in this process. As such, if the blood cells stick together, this is indicative that the blood sample tested reacts with one of the antibodies.
2. Back typing is also an important step in determining one's blood type. In this step, the serum of your blood is mixed with Type A and Type B. If an individual has anti-A antibodies then that indicates blood Type B. If the individual has anti-B antibodies that indicate blood Type A. However, a person with blood Type O will have both the antibodies previously mentioned.

Diseases Associated With The Different Blood Types

Blood Type A,B, AB

The Blood Types A, B, AB are more likely to have:

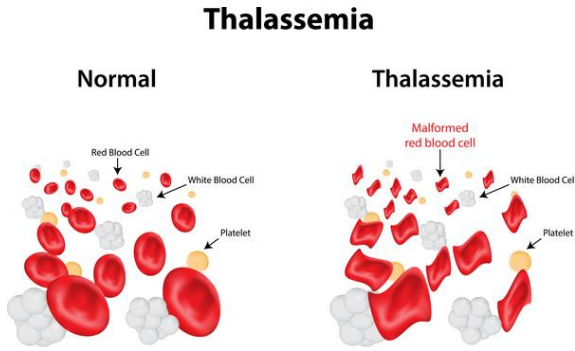
- Type 2 Diabetes
- Cardiovascular Disease
- Rheumatic Disease
- Blood clots (Venous Thromboembolism)
- Von Willebrand Disease
- Gastric Cancer



Blood Type O

The Blood Type O are more likely to have:

- resistance to malaria
- Peptic ulcers
- Cervix Cancer



Blood Bank Case Study: “What’s Your Type?”

Occasionally there can be controversy regarding a person’s blood type with the Rh factor. In this case study a 31y old female, who wants children, was told she had 3 different blood types over the course of 15 years. What is her true blood type and if she was in need of a transfusion, what type should she receive?

	Patient?	Donor?	Anti-A	Anti-B	Anti-D	Weak D	A1 Cells	B Cells	Interpretation
Old	√		0	0	0	3+	4+	4+	O Du
MyChart	√		0	0	0	NT	4+	4+	O neg
ARC		√	0	0	0	3+	4+	3+	O Pos

Based on historical tests, she is a weak D which can be classified as O pos weak D, or O neg weak D, depending on the lab. This means she is Rh positive and should be able to receive Rh positive blood. However, depending on lab policy’s she should most-likely receive Rh negative blood to avoid anti-D and other complications.

Donating Blood Fun Facts

- One pint of blood can save up to three lives!
- Every Two seconds someone in the United States needs a blood transfusion.
- Any healthy adults who are at least 17 years old weighing at least 110 pounds may donate about a pint of blood.
- Some high schools host blood drives for students to donate and would earn a red cord at graduation if an individual donated twice (once per school year)
- Type O negative can be donated to anyone which is known as the universal blood type.
- Due to the pandemic, there is a shortage on a numerous of things including blood; the American Red Cross are encouraging those who are eligible to donate.