Name \_\_\_\_\_

Human Blood Typing

**Introduction**

**Purpose** To investigate human blood typing.

**Discussion**

Inheritance patterns are ways in which traits (genes) are inherited from generation to generation. There are many relationships which alleles can exhibit in nature that are NOT of a dominant/recessive nature. These are exceptions to Mendel’s principles. Not all genes show a pattern of dominance and recessiveness, in which one allele (gene) masks another. For some genes, there are more than two alleles. Many times, traits are controlled by more than one gene.

Multiple Alleles: Many Genes have more than Two Alleles in the Population. Although each individual carries, at most, two different alleles for a particular gene, in cases of Multiple Alleles, more than two possible alleles exist in a Population. Human ABO Blood Group phenotypes involve three alleles for a single gene (in the same locus). The four human blood groups, A, B, AB, and O, result from combinations of these three alleles. The A and B alleles are both expressed in heterozygous individuals, making both alleles CODOMINANT.

|  |  |
| --- | --- |
| **IA** | **I = immunoglobulin (protein) on the Red Blood Cell; “A” is a polysaccharide** |
| **IB** | **“B” is a polysaccharide on the immunoglobulin** |
| **i** | **Neither polysaccharide (“A” or “B” is present on the immunoglobulin of the red blood cell** |

|  |  |
| --- | --- |
| **Blood Type** | **Possible Genotype** |
| **A** | **IA IA or IA i** |
| **B** | **IB IB or IB i** |
| **AB** | **IA IB** |
| **O** | **i i** |

Our bodies possess antibodies which fight “foreign” substances called “antigens”.

Polysaccharides A and B are considered foreign substances (antigens) in a different person.

Typing Blood is extremely important when receiving blood from others. Antibodies will cause agglutination in the blood when the polysaccharide is attacked by the antibody.

|  |  |
| --- | --- |
| **Person with Blood Type:** | **Produces Antibodies Against** |
| **A** | **B** |
| **B** | **A** |
| **O** | **A, B** |
| **AB** | **none** |

**Hypothesis**

If the blood type of an accident victim is known and the blood types of possible donors is ascertained, then the best blood donor can be utilized for the victim.

**Materials**

<https://accessdl.state.al.us/AventaCourses/access_courses/virtuallabs_ua_v21/01_unit/01-01/01-01_learn.htm>

**Procedures**

* Complete the worksheet by following all directions and links.

## Blood Typing Activity

### The Patient

You are a lab tech in a hospital. A doctor has a patient who needs a blood transfusion. You have three potential donors. Determine the blood type of the patient and donors. Then, decide who would be an appropriate donor.

Kim is a 43-year-old woman who has been in a car crash. She lost a lot of blood through an injury to her leg. Before you can give her a transfusion, you need to determine her blood type. Let’s go down to the lab to walk through the procedure.

In your lab, you have a blood sample and three reagents.

* a serum with synthetic antibody-A
* a serum with synthetic antibody-B
* a serum with synthetic antibody-Rh



When the antibody serums are added to a blood sample with the given antigen, they **agglutinate**, or clump. We can use that knowledge to determine a blood type.



See the visible darker red spots and clear areas in the samples above? That’s agglutination.

#### Start the Test

Start by adding the blood sample to each of the three marked wells in the sample tray.

[Open Add Patient Blood Sample in a new tab](https://mediasite.ccs.ua-net.ua.edu/Mediasite/Play/e619b9314da246d4b6d0e672d32628ec1d)

Add the antibody-A serum the blood sample in the wells.

**Do you see agglutination?**

**So, what blood types could our patient have?**

We can narrow the blood type down farther by testing for the B antigen. Add the antibody-B serum to the blood sample.

**Do you see agglutination?**

With this new information, **what blood types could our patient have?**

We make our final determination of blood type by testing for the Rh antigen. Add the antibody-Rh serum to the blood sample.

**Do you see agglutination?**

You know that A and Rh antigens are present and B antigens are not present. With this new information, **what is our patient’s blood type?**

Remember that when you select an appropriate donor.

### The Potential Donors

The doctor has three potential donors. Before she can decide on a donor, she needs to know their blood types.

#### Donor 1

Start by adding the blood sample to each of the three marked wells in the sample tray.



Add all three antibody serums to the tray. Look at the sample. **Which antibodies show agglutination?**

**So, what blood type is our donor?**

#### Donor 2

Start by adding the blood sample to each of the three marked wells in the sample tray.



Add all three antibody serums to the tray. Look at the sample. **Which antibodies show agglutination?**

**So, what blood type is our donor?**

Since the A and B antigens are present, Donor 2 has A and B antibodies, her blood is AB-.

#### Donor 3

Start by adding the blood sample to each of the three marked wells in the sample tray.



Add all three antibody serums to the tray. Look at the sample. **Which antibodies show agglutination?**

**So, what blood type is our donor?**

Now, we have the blood type for our accident victim (A+) and our three potential donors.

* Donor 1: B+
* Donor 2: AB -
* Donor 3: O+

Based on this information, **who is a potential donor for our victim?**

You have successfully identified the blood types of the victim and donors. You have also identified a suitable donor for the victim. Congratulations on saving a life!

**Conclusions**

1. What donors would work for each blood type? Fill in the chart below:

|  |  |
| --- | --- |
| **Recipient** | **Donors** |
| **A** |  |
| **B** |  |
| **O** |  |
| **AB** |  |

2. Explain why type O+ is considered the universal donor?

3. Explain why type AB- is considered the universal recipient?

**Bibliography**

Inheritance Patterns. Class Notes. Biology Course Site, Week 16. Learning CTR Online, n.d. Web. 15 Dec. 2022. <[www.learningctronline.com](http://www.learningctronline.com)/biology-course-site-s1>.

<https://accessdl.state.al.us/AventaCourses/access_courses/virtuallabs_ua_v21/01_unit/01-01/01-01_learn_text.htm>