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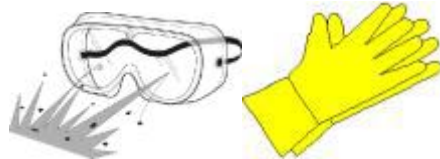
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Artificial Blood Typing Lab

Background: The blood that courses through our arteries, veins and capillaries is very antigen/antibody specific and must be safeguarded against infection or cross-contamination from different blood types. Our blood type is determined by the genetic inheritance we receive from our parents upon conception. The blood type itself is determined by multiple alleles. In this laboratory, you will understand a bit better what could possibly happen when blood is mixed with the wrong type of blood, possibly through a confusion or lab accident. You will observe a color change for any contamination where blood would clot and pose a threat to the recipient.

Essentially, there are four blood types: A, B, AB, and O. Each of these blood types will normally be coupled with a “positive” or “negative”, which indicates the Rh (Rhesus) factor associated with the blood.

Laboratory Safety Precautions: The following symbols represent the precautions that are required for this lab:



From the Franklin Institute.... (<http://www.fi.edu/biosci/blood/rh.html>)

“Scientists sometimes study Rhesus monkeys to learn more about the human anatomy because there are certain similarities between the two species. While studying Rhesus monkeys, a certain blood protein was discovered. This protein is also present in the blood of some people. Other people, however, do not have the protein. The presence of the protein, or lack of it, is referred to as the Rh (for Rhesus) factor. If your blood does contain the protein, your blood is said to be Rh positive (Rh+). If your blood does not contain the protein, your blood is said to be Rh negative (Rh-). This Rh factor is connected to your blood type. For example, your blood may be AB+ which means that you have type AB blood with a positive Rh factor. Or, you might have O- blood which means that you have type O blood with a negative Rh factor. It is particularly important for expectant mothers to know their blood's Rh factor. Occasionally, a baby will inherit an Rh positive blood type from its father while the mother has an Rh negative blood type. The baby's life could be in great danger if the mother's Rh negative blood attacks the baby's Rh positive blood. If this happens, an exchange transfusion may save the baby's life. The baby's blood can be exchanged for new blood that matches the mother's.”

And, from the American Red Cross Northern Ohio Blood Services Region... (<http://chapters.redcross.org/br/northernohio/INFO/bloodtype.html>)

- Almost 40% of the population has O+ blood
- Patients with Type O blood must receive Type O blood
- About half of all blood ordered by hospitals in our area is Type O
- Type O blood is the universal blood type and is the only blood type that can be transfused to patients with other blood types

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- Only about 7% of all people have Type O negative blood
- Type O negative blood is the preferred type for accident victims and babies needing exchange transfusions
- There is always a need for Type O donors because their blood may be transfused to a person of any blood type in an emergency.

If your blood type is . . .

| Type | You Can Give Blood To | You Can Receive Blood From |
|------|-----------------------|----------------------------|
| A+ | A+ AB+ | A+ A- O+ O- |
| O+ | O+ A+ B+ AB+ | O+ O- |
| B+ | B+ AB+ | B+ B- O+ O- |
| AB+ | AB+ | Everyone |
| A- | A+ A- AB+ AB- | A- O- |
| O- | Everyone | O- |
| B- | B+ B- AB+ AB- | B- O- |
| AB- | AB+ AB- | AB- A- B- O- |

Materials: The following materials are needed to complete this laboratory experience:

Glass microscope slides toothpicks
lab papers distilled water in wash bottles

Artificial blood as below

- Type A Artificial blood – (0.2M lead nitrate solution)
- Type B Artificial blood – (0.2M barium chloride solution)
- Type AB Artificial blood – (mix equal parts of $Pb(NO_3)_2$ and $BaCl_2$ solutions)
- Type O Artificial blood – distilled water
- Simulated anti-A serum – (0.2M sodium iodide solution)
- Simulated anti-B serum (0.2 silver nitrate solution)

Procedure: The following procedure is utilized to perform this experience:

Initial Set-Up

1. Place the four slides you are using on the attached contrast sheet. This will allow you to see the reactions on a “clean” background and make better observations.
2. On slide 1, place two drops of simulated type A blood on the right and two drops of simulated type A blood on the left.
3. On slide 2, place two drops of simulated type B blood on the right and two drops of simulated type B blood on the left.
4. On slide 3, place two drops of simulated type AB blood on the right and two drops of simulated type AB blood on the left.
5. On slide 4, place two drops of simulated type O blood on the right and two drops of simulated type O blood on the left.

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Known Testing

6. Place one drop of Anti-A serum on the left side and one drop of anti-B serum on the right side of each slide. If necessary, use a clean toothpick to mix each slide (do NOT mix the two sides of the slide together – they must stay separate).
7. Record any observations in the Data portion of this lab.
8. Clean up your slides and put them on the paper towels to drain and dry.

Subject Testing

1. Repeat the process with the “blood” samples for the following people: Mr. Smith, Mr. Jones, Mrs. Green, and Mrs. Burns. Identify the blood type each of these people has and record it in the Data portion of this lab.
2. Clean up your slides and put them on the paper towels to drain and dry.

Data: The following data was collected during this laboratory experience:

Known Testing

| Slide Number | Clumping or Color change on left? | Clumping or Color change on right? | Simulated blood type? |
|--------------|-----------------------------------|------------------------------------|-----------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

Subject testing

| Slide Number | Clumping or Color change on left? | Clumping or Color change on right? | Simulated blood type? |
|--------------|-----------------------------------|------------------------------------|-----------------------|
| Mr. Smith | | | |
| Mr. Jones | | | |
| Mrs. Green | | | |
| Mrs. Burns | | | |

Conclusion: The following can be concluded after performing this laboratory experience:

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Analysis Questions: Answer the following questions in the space provided.

1. Which simulated blood types showed clumping or a color change when simulated anti-A serum was added? Why?

2. Which simulated blood types showed clumping or a color change when simulated anti-B serum was added? Why?

3. If clumping/color change occurs when both Anti-A and anti-B sera are added, what is the blood type?

4. If clumping/color change DOES NOT occur when both Anti-A and anti-B sera are added, what is the blood type?

5. What blood type must people have in order to receive a transfusion of blood type A safely? Why (what happens with regard to immunity)?

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6. What blood type must people have in order to receive a transfusion of blood type B safely? Why (what happens with regard to immunity)?

7. What blood type must people have in order to receive a transfusion of blood type AB safely? Why (what happens with regard to immunity)?

8. What blood type must people have in order to receive a transfusion of blood type O safely? Why (what happens with regard to immunity)?

9. What types of precautions must one take to reduce the risk of bio-contamination when using, handling, or transfusing REAL live blood products?

10. Why isn't blood typing accurate enough to tell, conclusively, if a person actually committed a crime? What other methods are more accurate and why?

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And finally from the American Red Cross... (<http://www.givelife2.org/sponsor/quickfacts.asp>)

50 Quick Facts

Facts about blood needs

1. Every two seconds someone in the U.S. needs blood
2. More than 38,000 blood donations are needed every day
3. One out of every 10 people admitted in a hospital needs blood
4. Total blood transfusions in a given year: 14 million (2001)
5. The average red blood cell transfusion is approximately 3 pints
6. The blood type most often requested by hospitals is Type O
7. The blood used in an emergency is already on the shelves before the event occurs
8. Sickle cell disease affects more than 80,000 people in the U.S., 98% of whom are African American. Sickle cell patients can require frequent blood transfusions throughout their lives
9. More than 1 million new people are diagnosed with cancer each year. Many of them will need blood, sometimes daily, during their chemotherapy treatment.
10. A single car accident victim can require as many as 100 units of blood. [See more facts on blood needs for various medical treatments](#)

Facts about eligibility

11. You must be at least 17 years old, weigh more than 110 pounds, and be in good general health to donate (note: eligibility requirements may vary in some states and blood centers)
12. A healthy donor may donate red blood cells every 56 days
13. A healthy donor may donate platelets as few as 3 days apart, but a maximum of 24 times a year

Facts about the blood supply

14. The number of blood donations collected in the U.S. in a year: 15 million (2001)
15. The number of blood donors in the U.S. in a year: 8 million (2001)
16. The number of patients who receive blood in the U.S. in a year: 4.9 million (2001)
17. The volume of blood transfused to patients is increasing at the rate of 6% per year (2001)
18. The demand for blood transfusions is growing faster than donations
19. Approximately 60% of the U.S. population is eligible to give blood — only 5% do in a given year
20. Blood cannot be manufactured — it can only come from generous donors

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21. Shortages of all blood types usually occur during the summer and winter holidays

Facts about the blood donation process

22. Donating blood is a safe process. A sterile needle is used only once for each donor and then discarded
23. Blood donation is a simple four-step process: registration and medical history, mini-physical, donation, and refreshments
24. Every blood donor is given a mini-physical, checking the donor's temperature, blood pressure, pulse and hematocrit level (red blood cells count) to ensure it is safe for him or her to give blood
25. The actual blood donation typically takes less than 10-12 minutes. The entire process, from the time you arrive to the time you leave, takes about an hour
26. The average adult has about 10 to 12 pints of blood in his body. Roughly 1 pint is given during a donation
27. All donated blood is tested for HIV, Hepatitis B and C, syphilis and other infectious diseases, before it can be released to hospitals
28. Information you give to the American Red Cross during the donation process is strictly confidential. It may not be released without your permission except as directed by law

Facts about blood and its components

29. Whole blood can be processed into **red cells, platelets, plasma, and cryoprecipitate**. The total number of units of all of these components transfused in a year is 29 million (2001)
30. It is possible to donate specifically only platelets or plasma. This process is called apheresis
31. Most donated red blood cells must be used within 42 days of collection
32. Donated platelets must be used within 5 days of collection — new donations are constantly needed
33. Healthy bone marrow makes a constant supply of red cells, plasma and platelets. The body will replenish the elements given during a blood donation - some in a matter of hours, and others in a matter of weeks

Facts about donors

34. The #1 reason donors say they give blood is because they "want to help others"
35. Two most common reasons cited by people who don't give blood are: "Never thought about it" and "I don't like needles"
36. One donation can help save the lives of up to 3 people
37. If you began donating blood at age 17 and donated every 56 days until you reached 76, you would have donated 48 gallons of blood, potentially helping save over 1,000 lives!
38. Red Cross donors are 50% male, 50% female
39. The American Red Cross accepts blood donations only from voluntary donors

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40. Among Red Cross donors in a given year, 18% donate occasionally, 38% are first time donors, and 43% are repeat and loyal donors
41. People with O- type blood are universal donors. Their blood can be given to people of all blood types. Only 7% of people in the U.S. have O- blood type
42. Type O- blood is often used in emergencies before the patient's blood type is known, and with newborns who need blood.
43. 45% of people in the U.S. have type O (+/-) blood. This percentage is higher among Hispanics — 57%, and among African Americans — 51%
44. People with AB+ type blood are universal donors of plasma, the liquid portion of blood. AB+ plasma is often used in emergencies, for newborns and for patients requiring massive transfusions

Facts about the American Red Cross

45. The American Red Cross blood program started in 1940, under the leadership of Dr. Charles Drew
46. The American Red Cross supplies approximately 45% of the nation's blood supply
47. The Red Cross provides blood for patients in nearly 3,000 hospitals across the U.S.
48. The Red Cross makes blood available to any patient who needs it — patients are not required to find donors to replace the blood they use (a practice common in Europe and some U.S. blood banks) allowing the patient and their family to focus on recovery.
49. 80% of the blood donations given to the Red Cross are collected at mobile blood drives set up at community organizations, companies, high schools, colleges, places of worship or military installations. The remaining 20% are collected at fixed Red Cross donor centers
50. The American Red Cross works with over 50,000 sponsors each year to hold more than 120,000 blood drives, providing convenient locations for people to give blood

Bibliography of Images Used:

Eyewear Symbol: <http://www.utexas.edu/cons/safety/equipment/eyewear.html>

Gloves Symbol: <http://www.epa.gov/grtlakes/seahome/housewaste/images/glove2.gif>