

BIOS255 - Week 1 Case Study: Blood Typing

Key Terminology:

Before we proceed let's go over some definitions.

Antigens: Molecules or markers on the surface of red blood cells that can trigger an immune response. For example, A and B antigens in the ABO system, and Rh antigen in the Rh system.

Antibodies: Proteins in the blood plasma that target and neutralize foreign antigens. For example, someone with type A blood has anti-B antibodies, which would react with B antigens.

Agglutination: This is a clumping reaction that occurs when an antibody binds to its corresponding antigen. In blood typing, if anti-A antibodies are added to a person with type A blood, agglutination will occur (clumping), indicating the presence of A antigens. This reaction is important because if incompatible blood types are mixed, agglutination can occur, which can be dangerous.

ABO Blood Group System

The ABO blood group system is based on the presence or absence of specific antigens found on the surface of red blood cells. Antigens are proteins or molecules that trigger an immune response. In the case of blood groups, the two primary antigens are A and B.

- Type A blood: Has A antigens on the surface of red blood cells and anti-B antibodies in the plasma.
- Type B blood: Has B antigens on the surface of red blood cells and anti-A antibodies in the plasma.
- Type AB blood: Has both A and B antigens on the surface of red blood cells and no anti-A or anti-B antibodies in the plasma (universal plasma recipient).
- Type O blood: Has no A or B antigens on the surface of red blood cells, but has both anti-A and anti-B antibodies in the plasma (universal donor).

Rh Blood Group System

In addition to the ABO system, the Rh system is another important classification for blood type. This system is based on the presence or absence of the Rh antigen (also known as the Rh factor or D antigen) on red blood cells. It is important to note that, unlike the ABO blood grouping, Anti-Rh antibodies are not produced initially by individuals who are Rh-negative (i.e., lacking the Rh antigen on their red blood cells). But after initial exposure to Rh-Positive blood they will develop antibodies within 7-14 days.

- Rh-positive (Rh+): If the Rh antigen is present on the red blood cells, the blood type is Rh-positive (e.g., A+, B+, etc.).
- Rh-negative (Rh-): If the Rh antigen is absent, the blood type is Rh-negative (e.g., A-, B-, etc.).

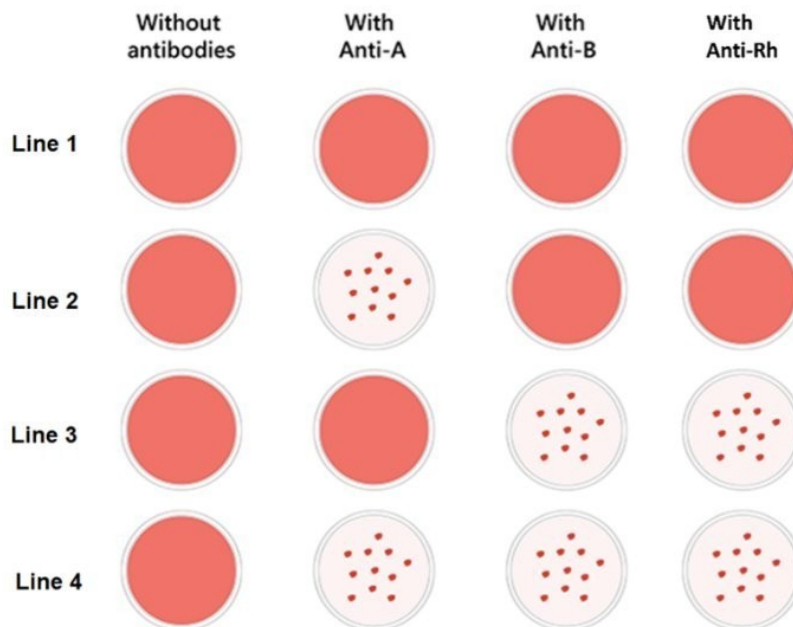
Blood Typing Test

The blood typing test is used to determine an individual's ABO and Rh blood group. In this test, a sample of blood is mixed with antibodies that specifically react with A, B, or Rh antigens. Based on how the blood sample reacts, the blood type can be identified. Here's how it works:

- Anti-A antibodies are mixed with the blood sample to check for A antigens.
- Anti-B antibodies are mixed with the blood sample to check for B antigens.
- Anti-Rh antibodies are mixed with the blood sample to check for the Rh antigen.

Example:

In the following image let's use Line 3 as an example.



Line 3:

Without Antibodies (Control): No agglutination

With Anti-A Antibodies: No agglutination