**Antigen (Ag)**: is a macromolecule that induced to the formation of antibody (Ab), which reacts specifically with the Ag.

**The main characteristics of the Ag:**

1. High molecular weight > 10000 Dalton.

2. Foreignness.

3. Chemical complexity.



**Vaccine**: Any substance that is artificially introduced into the human or animal body produces an immune resulting in Ab.

 One of the determining factors in quality antibody development is quality antigen preparation; which focuses on the preparation of high-quality antigens for ensuring high-Quality antibody development.

**Types of antigens according to source:**

1) Bacterial antigens.

2) Protein antigens.

3) RBCs antigens.

* **Bacterial antigens**

They are different types of bacterial antigens are located on the surfaces of gram positive and/or negative bacteria and are responsible for inflammation processes.

**Types of bacterial antigens:**

The types of bacterial antigens extracted from different groups of bacterial cells are used:

A. Whole bacterial cells.

B. Appendixes (e.g. flagella, and cilia (fimbria)).

C. Toxin.

D. Cell membrane (CM) which **includes**:

 a. Lipopolysaccharides (LPS)

 b. Peptidoglycan (PGN).

 c. Exopolysaccharides (EPS).

 d. Capsule (Vi)

* **Protein antigens**

A protein antigen is a protein that can stimulate the production of antibodies by the immune system, and to which the immune system will react if is identified in the body.

**Types of protein antigens**

Numerous protein antigens have been identified, such as:

1. **Exogenous protein antigen**: a protein produced by another organism outside the body. A protein produced by a virus, for example, could be consumed. When the immune system recognizes it as foreign and stimulates the production of antibodies capable of latching onto and attacking the antigen
2. **Endogenous protein antigens**: are proteins that are made within the body. They are frequently observed in cell death. The body's cells can be programmed to produce these antigens, allowing the immune system to know when it's time to break down a cell and recycle its components. The immune system can also use this type of protein antigen to mark infected cells for destruction.
3. **Another type of protein antigen is an autoantigen**: which is a naturally occurring but sometimes harmless substance that the body begins to recognize as an antigen. Autoantigens play a role in autoimmune disease, in which the body begins to attack itself due to incorrect immune system programming.
* **Red blood cell antigens:**

Blood group antigens are either sugars or proteins that are attached to various components of the red blood cell membrane (e. g. the antigens of the ABO blood group are sugar, in constrict, the antigens of the Rh blood group are proteins). The antigens expressed on red blood cells determine a person's blood group.

The two major blood groups are ABO (blood types **A, B, AB**, and **O**) and Rh (with Rh **D-positive** or **Rh D-negative** blood types). Blood group antigens are used to serve a purpose; for example, one blood group antigen made red blood cells more resistant to parasite invasion.

**To ensure** immune compatibility, the blood to be donated must be typed and cross-matched with the patient's blood before transfusion.

**In pregnancy**, the risk of the mother's immune system attacking the foreign antigens present on her fetus' red blood cells and forming antibodies to cover fetal red blood cell antigens.

**Preparation of Red Blood Corpuscular (RBCs):**

**Purpose:** To prepared blood cell suspensions to be used for serologic testing.

**Principle**:A red cell suspension is a common reagent used for many serologic procedures.

\*\*The cells must be washed at least once in order to remove plasma, Red cell

suspensions provide the appropriate serum to cell ratio to allow for grading and

interpretation of tests results.

**red cell suspension is used for the following tube examination procedures:**

 •ABO and Rh typing.

 •Donor unit compatibility (crossmatch).

 •Direct Anti-globulin test.

 •Indirect Anti-globulin test

**Materials:**

1- Sample of blood

2- Saline

3- Test tubes 75x12 mm (khan tube)

**Method:**

1- Place 0.2 -0.5 ml of blood into the tube (2-3 drops).

2- Fill the tube ¾ full with 0.9% saline to re-suspend the cells.

3- Centrifuge at 200 G for 3 minutes until the RBC's are packed. (G=relative

centrifugal force)

4- Decant the supernatant.

5- Tap the tube to resuspend the RBC's in the residual fluid.

6- Repeat step 2-5 at least twice. The last wash should always have a clear supernatant with no signs of hemolysis.

7- To make 5% red cell suspension, add 5µl drop of RBC to 95µl of saline. Or 1 drop of RBC to 19 drop of saline.

8- To make a 3% suspension add 3µl drop of RBC to 97µl of saline, or add 1 volume packed RBC's to 32 volumes of saline.