



TeachEngineering

ELISA and Point of Care Devices



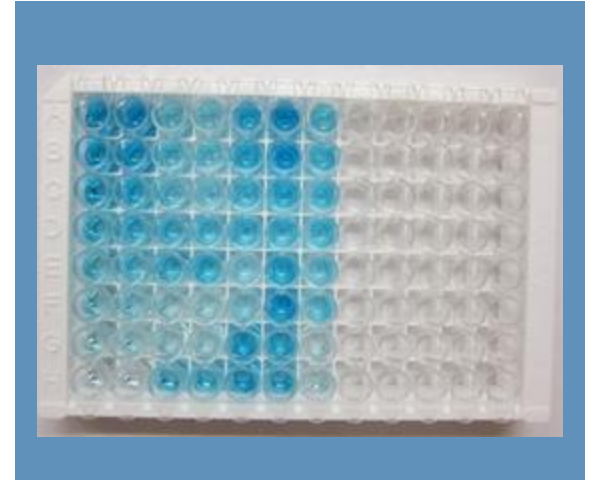
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ELISA: Enzyme-Linked Immunosorbent Assay

- A plate-based assay technique used to determine the presence and quantity of antigens or antibodies.
- The assay is typically done on a 96-well polystyrene plate.
- An enzyme-mediated reaction produces a color change that can be used to measure the amount of antigen present.
 - Antigens may be in a patient's blood plasma or other bodily fluids or tissues.



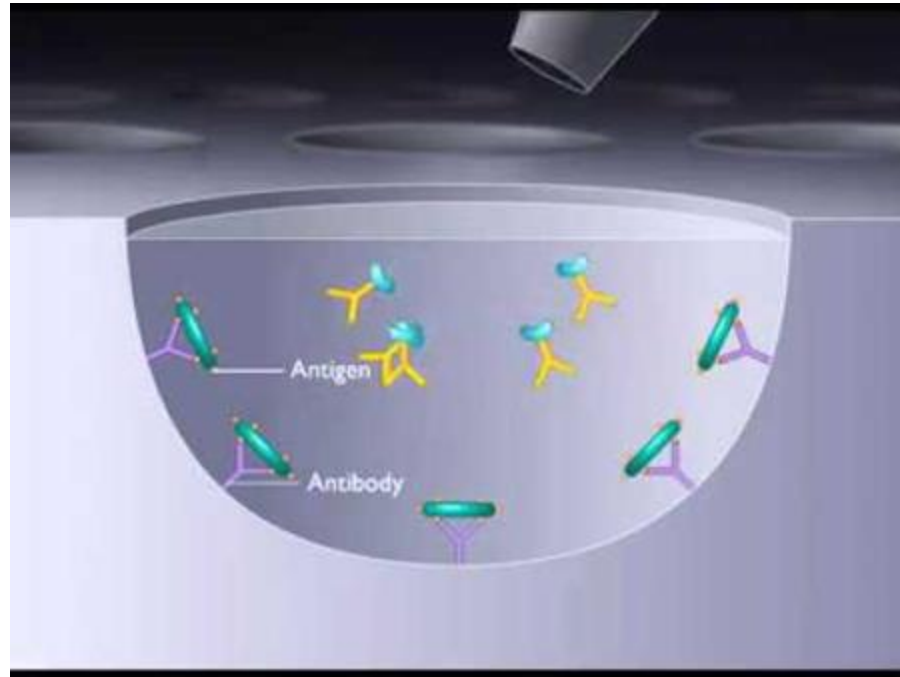
ELISA plate showing qualitative results. [WikiCommons](#)

ELISA Applications

An **ASSAY** is a test that verifies the quantity and activity of certain chemicals. The ELISA is particularly useful in clinical settings:

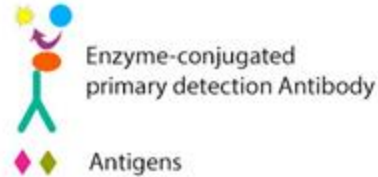
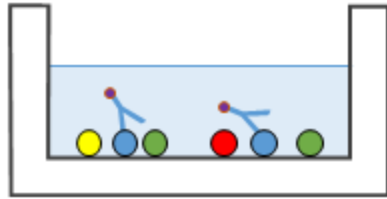
- It can be used to detect and measure any protein or antigen associated with infectious or autoimmune disease.
- ELISAs can be customized to identify different proteins:
 - Some identify antigens (e.g., spike proteins in a COVID test).
 - Some test for the presence of antibodies (e.g., HIV test).
 - Some test for the presence of hormones (e.g., hCG in a pregnancy test).
- They can be incorporated into simple near-patient devices, or point of care (POC) biosensors to develop fast clinical results.
 - This can save time and reduce costs.

Direct and Indirect ELISA Process and Results



[Video Link](#)

Direct ELISA Model



Images: [wiki commons](#)

Blood serum preparation (which may or may not contain the antibodies in question) is added to each of the wells.

1. If the antigen (1) of interest is present, it binds to the plate's well.
2. Antibodies (2) conjugated with an enzyme (E) are added.
3. Then a substrate (3) is added.
4. The enzyme catalyzes the reaction that changes the substrate. The product produces a signal that is recorded as a change in color.

Sandwich ELISA Model

Sandwich ELISA

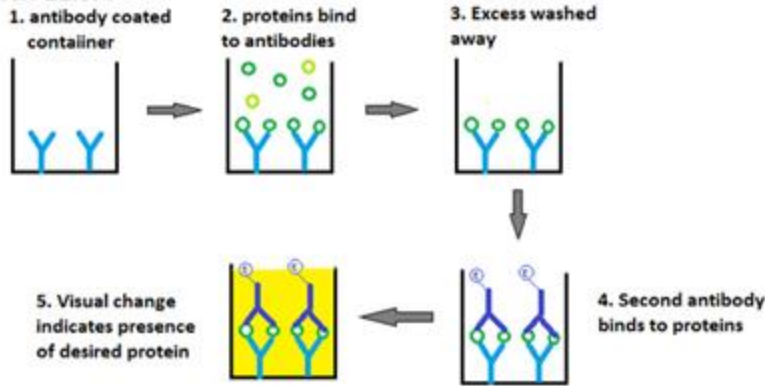
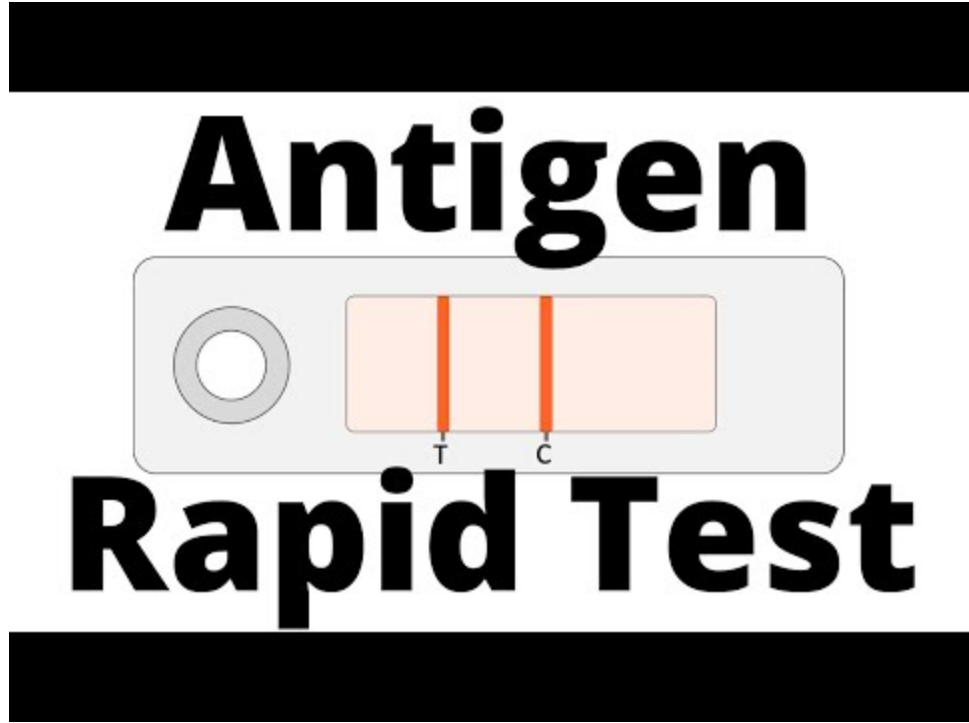


Image: [Wiki commons](#)

Note: There are variations of the sandwich ELISA—the assay type is dependent on the platform used. The principle is the same for all: The antigen is “sandwiched” between a capture antibody and a detection antibody.

1. A primary or capture antibody is bound and immobilized on the plate.
2. Blood serum (which may or may not have the antigen in question) is prepared and added to each of the wells. ***If present***, the antigen of interest binds to antibodies.
3. Plates are washed to remove excess reagents (this is done between all other steps as well).
4. Secondary/capture antibodies are conjugated with an enzyme and added.
5. A substrate is added. It binds to the enzyme/antibody complex, and the reaction produces changes in color.

COVID tests incorporate the ELISA on a **lateral flow column**:



[video link](#)

Pregnancy tests also incorporate the ELISA on a lateral column:

