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Note on Enzyme Linked Immuno Sorbent Assay and the Steps Involved

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Description

Enzyme-Linked Immuno Sorbent Assay (ELISA) is a commonly used laboratory technique that enables the detection and quantification of specific proteins, antibodies, or antigens in a biological sample. It utilizes the principles of immunology and enzymology to provide sensitive and specific results. The basic principle of ELISA involves the immobilization of a target molecule (e.g., antigen or antibody) onto a solid surface, such as a micro plate. The immobilized molecule acts as a capture agent to bind the corresponding molecule of interest in the sample. This can be accomplished through various methods, such as direct ELISA, indirect ELISA, sandwich ELISA, or competitive ELISA, depending on the specific assay design. The direct ELISA was developed simultaneously by two distinct research teams led by scientists Eva Engvall, Peter Perlman and Van Weemen, Schuurs. The ELISA was created by the alteration of the Radio Immuno Assay (RIA). Instead of using radioactive iodine 125, enzymes were used to conjugate tagged antigen and antibody [1].

The levels of IgG in rabbit serum were the first use of the new method. Using horseradish peroxidase, researchers were able to quantify human chorionic gonadotropin in urine within the same year. Since then, the ELISA method has been used for a wide range of applications and has become a common diagnostic and research method in laboratories all over the world. The principal ELISA technique included chromogenic journalist particles and substrates in producing discernible variety change that screens the presence of antigen [2]. Fluorogenic, quantitative PCR and electro-chem luminescent reporters for the generation of signals have all been developed as a result of further development in the ELISA method. However, non-enzymatic reporters based on the ELISA principle are used in some of these methods instead of enzyme-linked substrates. An ultrasensitive enzyme-based ELISA that manipulates nanoparticles as chromogenic reporters was the most recent innovation in 2012. This procedure can create a variety signal noticeable by unaided eye, with blue tone for positive outcomes and red tone for adverse outcomes. However, this method is qualitative and can only identify the concentration of an analyte rather than its presence or absence [3]. The uses of ELISA are mentioned below.

Coating: The solid surface of the micro plate is coated with the target molecule, which may be an antigen or antibody. The surface is then blocked to prevent nonspecific binding.

Sample application: The biological sample containing the molecule of interest is added to the micro plate and allowed to incubate. If the molecule is present in the sample, it will bind to the immobilized capture molecule.

Detection: A secondary antibody, which is specific to the captured molecule, is added. This secondary antibody is typically labelled with an enzyme, such as Horseradish Peroxidase (HRP) or Alkaline Phosphatase (AP).

A substrate specific to the enzyme label is added. The enzyme catalyses a reaction with the substrate, resulting in the production of a detectable signal, usually a colour change. The intensity of the generated signal is measured using a spectrophotometer or a specialized ELISA reader. The signal is directly proportional to the amount of target molecule present in the sample. ELISA offers several advantages, including its high sensitivity, specificity and ability to analyse multiple samples simultaneously. It has a wide range of applications in various fields, including clinical diagnostics, biomedical research, food safety testing and environmental monitoring. There have been numerous experiments conducted using ELISA in various fields, including immunology, molecular biology and medical diagnostics.

Disease diagnosis: ELISA has been extensively used in the diagnosis of infectious diseases, such as HIV/AIDS, hepatitis and Lyme disease. In these experiments, blood samples from patients are tested for the presence of specific antibodies or antigens associated with the particular disease. The results obtained from ELISA can help in confirming the presence of the disease and monitoring its progression.

Allergen detection: ELISA is employed to identify allergens in food products or environmental samples. Researchers can use ELISA to detect and quantify specific allergenic proteins, such as peanuts, tree nuts, or gluten, in food samples. This information is crucial for food labelling and ensuring the safety of individuals with food allergies.

Drug development: ELISA plays a crucial role in drug development and monitoring the effectiveness of therapeutic treatments. For example, in the development of monoclonal antibodies, ELISA is used to screen and select clones that produce the desired antibodies. Additionally, ELISA can be used to determine drug levels in patient samples, assess immune responses to the drug and evaluate its pharmacokinetics.

Immune response studies: ELISA can be utilized to investigate immune responses in various research areas. Scientists can measure the concentration of specific antibodies, cytokines, or other immune markers in serum or tissue samples. These experiments help in understanding the immune response to infections, vaccines, or autoimmune disorders.

Environmental monitoring: ELISA is employed in environmental studies to detect and quantify pollutants, toxins, or environmental contaminants. For instance, ELISA can be used to measure the levels of pesticides, heavy metals, or hormones in soil, water, or biological samples, providing crucial information for environmental assessment and risk management. These are just a few examples of the wide range of experiments that have utilized ELISA. The versatility and sensitivity of this technique make it a valuable tool in many fields of research and diagnostics, ELISA is a versatile and widely used technique that plays a crucial role in the detection and quantification of specific molecules, contributing to advancements in various scientific and medical disciplines [4,5].

Catalyst Connected Immuno Sorbent Measure (ELISA) is a usually utilized lab method that empowers the location and evaluation of explicit proteins, antibodies, or antigens in a natural example. It provides specific and sensitive results by utilizing enzymology and immunology principles. The immobilization of a target molecule (such as an antibody or antigen) onto a solid surface, such as a micro plate, is the fundamental principle of ELISA.

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Conflict of Interest

The author shows no conflict of interest towards this article.

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