E CONF SERIES

Scientific Conference on Multidisciplinary Studies
Hosted online from Bursa, Turkey
Website: econfseries.com 11th November, 2025

THE ROLE OF ENZYME-LINKED IMMUNOSORBENT ASSAY IN DISEASE DETECTION AND MONITORING

Yakubova D. M.
Assistant of the Department of Clinical Laboratory Diagnostics,
Samarkand State Medical University

Ibragimov M. X.
Cadet of the Department of Clinical Laboratory Diagnostics,
Samarkand State Medical University

Abstract
Enzyme-linked immunosorbent assay (ELISA) is a sensitive and specific method for detecting antigens and antibodies in biological samples. It enables early diagnosis of infectious diseases, monitoring of immune responses, evaluation of tumor markers, and rapid identification of toxic substances. ELISA can be applied in direct, indirect, and competitive formats, and modern technological enhancements such as automation and magnetic particle-based assays improve its efficiency and reliability. Despite certain limitations related to reagent quality and sample preparation, ELISA remains a versatile and indispensable tool in clinical diagnostics and biomedical research.

Keywords: ELISA, antigen, antibody, diagnostics, immunological monitoring, biomedical research.

The basic principle of ELISA is the specific binding of an antigen to a corresponding antibody to which an enzyme is attached. When a substrate is added to the enzymatic reaction, a colored product is formed, the intensity of which is directly proportional to the amount of the target component in the sample. The method is characterized by high sensitivity and specificity, which makes it indispensable in laboratory practice. ELISA can be performed in various formats, including direct, indirect and competitive options, which allows for flexible adaptation to specific research objectives [2,5].

In recent years, there has been active development of ELISA using modern technologies such as magnetic particles and process automation, which significantly increases its efficiency and reduces the risk of errors during analysis. One of the key advantages of ELISA is its ability to detect infectious diseases at early stages, which facilitates timely initiation of treatment and reduces the risk of complications. For example, in the case of the human immunodeficiency virus (HIV), the use of ELISA makes it possible to detect antibodies formed in response to the infection, even several weeks after infection. This is critical for epidemic control and development of preventive measures [1].

In addition, enzyme immunoassay is widely used in oncology to determine tumor markers, which facilitates early diagnosis of cancer and monitoring of therapy. In the field of endocrinology, where ELISA allows us to identify hormonal imbalances, which in turn has a significant impact on the quality of life of patients. ELISA is also used in toxicology to detect the presence of toxic substances and poisons in biological samples. This is especially important in cases of poisoning, when a quick and accurate diagnosis can save the patient's life. ELISA allows doctors not only to establish the fact of poisoning, but also to determine the degree of impact of the substance on the body, which helps to choose the correct treatment tactics [3,4].

In recent years, there has been growing interest in the use of ELISA to assess the immune response to vaccines. This approach allows us to study how the immune system responds to the introduction of antigens, which is especially relevant in the context of pandemics and outbreaks of infectious diseases. Using ELISA, it is possible to compare different vaccines and identify the most effective ones. In addition, enzyme immunoassay technologies continue to evolve, opening up new possibilities for practical application. Innovative methods such as multimodal ELISA and nanoinfinite technologies promise to improve the sensitivity and specificity of tests, which in turn leads to more accurate diagnosis and effective treatment of diseases.

Despite all the advantages, there are some limitations of the method. For example, ELISA results may depend on the quality of the reagents, the samples prepared,

and the technologies used during the analysis. Therefore, it is important to follow all standards and protocols to ensure the reliability of the data obtained [1,5].

Conclusion

ELISA is a cornerstone of modern diagnostics and biomedical research due to its high sensitivity, specificity, and adaptability. It facilitates early detection of diseases, monitoring of therapy, and assessment of immune responses, while advances in automation and novel assay technologies continue to expand its applications. By providing reliable and reproducible results, ELISA remains essential for clinical practice and scientific investigation, with significant potential for broader use in diverse medical and research contexts.

REFERENCES

1. Umarova S.S., Nabiyeva F.S., Ibragimova N.S. Early diagnostics of echinococcosis in children // European research: innovation in science, education and technology. London, United Kingdom. January 9-10. C. 88-90, 2020.
2. Анцилевич Л.М., Ягудина Л.А. Практическое применение иммуноферментного анализа в диагностике заболеваний // Практическая медицина. 3 (79). Июль 2014 г. 28 с.
3. Набиева Ф.С., Душанова Г.А., Бобокулов О.О. Значение иммуноферментного анализа в диагностике инфекционных заболеваний //Вестник науки и образования. – 2021. – №. 4-1 (107). – С. 54-56.
4. Сейсенбаева М.С., Кошеметов Ж.К., Сандыбаев Н.Т., Нурабаев С.Ш., Матвеева В.М., Богданова М.И., Сугирбаева Г.Д. Приготовление диагностических препаратов для иммуноферментного анализа с целью выявления антигена возбудителя пастереллеза // Актуальные вопросы ветеринарной биологии № 1(21), 2014. 33 с.
5. Сухоедова А.В., Меньшиков В.В. Технология использования антигенов в производстве тест-систем для иммуноферментного анализа // Успехи в химии и химической технологии. Том XXX, 2016. № 2. 75 с.