Volume 3, Issue 2, February 2025 ISSN (E): 2938-3765

ENZYME-LINKED IMMUNOSORBENT ASSAY

Nabiyeva F. S.
Senior Lecturer, Department of Clinical Laboratory Diagnostics,
Samarkand State Medical University

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

Utkirova M. U.
Cadet of the Department of Clinical Laboratory Diagnostics,
Samarkand State Medical University

Abstract
Enzyme-linked immunosorbent assay (ELISA) is an immunological assay widely used in basic science research, clinical application studies, and diagnostics. ELISA is a highly effective tool for the quantitative and qualitative determination of antigens and antibodies in biological samples. The use of this method in medical diagnostics and scientific research allows us to identify infectious diseases, establish autoimmune processes and monitor the effectiveness of therapy.

Keywords: Enzyme immunoassay, antigen, antibodies, diagnostics.

Introduction

ELISA was first used to measure immunoglobulin G (IgG) in rabbit serum. Shortly after, it was utilized to detect human choriogonadotropin (hCG), a hormone that is produced during pregnancy. Since then, ELISA has been used extensively in various screening tests, including the identification of antigenic components from the Human Immunodeficiency Virus (HIV) and Hepatitis B virus. Since its invention, ELISA has undergone various modifications with the goal to improve the sensitivity of analyte detection, leading to the invention of various types of ELISA, which include direct, indirect, sandwich, and competitive ELISA [17,19].

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 [1,15,18]. ELISA can be performed in various formats, including direct, indirect and competitive options, which allows for flexible adaptation to specific research objectives.

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 [2,6,9].

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

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 [11,14,16].

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 [3,4,13].

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 [5,7,12].

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 [8,10].

Conclusion

Thus, the role of enzyme immunoassay in medicine cannot be overestimated: it not only improves diagnostics, but also opens up new horizons for scientific research and medical practice. ELISA is becoming an indispensable tool not only in clinical practice, but also in scientific research. Its versatility and ability to adapt to new challenges make it an important element in the fight against infections and toxicological threats. In the future, its application in various fields of medicine is expected to further increase.

REFERENCES:

1. Hayrapetyan H. et al. Enzyme-linked immunosorbent assay: types and applications //ELISA: Methods and Protocols. – 2023. – С. 1-17.
2. Konstantinou G. N. Enzyme-linked immunosorbent assay (ELISA) //Food allergens: Methods and protocols. – 2017. – С. 79-94.
3. Анцилевич Л.М., Ягудина Л.А. Практическое применение иммуноферментного анализа в диагностике заболеваний // Практическая медицина. 3 (79). Июль 2014 г. 28 с.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

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.
6. Даминов Ф. А. Анализ результатов хирургического лечения больных узловыми образованиями щитовидной железы //research focus. – 2022. – Т. 1. – №. 2. – С. 120-124.
7. Даминов Ф. А. ЛАПАРОСКОПИЧЕСКИЙ АДГЕЗИОЛИЗ В ЛЕЧЕНИИ ОСТРОЙ СПАЧЕЧНОЙ КИШЕЧНОЙ НЕПРОХОДИМОСТИ //Research Focus. – 2022. – Т. 1. – №. 2. – С. 117-119.
8. Бердиярова Ш. Ш., Даминов Ф. А., Дўстмуродова Д. Х. ДИАГНОСТИКА И ЛЕЧЕНИЕ ГЕМАТОГЕННОГО ОСТЕОМИЕЛИТА //Research Focus International Scientific Journal. – 2023. – Т. 2. – №. 5. – С. 213-218.
9. Жаворонок С.В., Тапальский Д.В. Иммуноферментный анализ. Учебное пособие для студентов 2-5 курсов. Гомель, 2004.
10. Isomadinova L. K., Kudratova Z. E. Clinical and laboratory characteristics of vomiting in pregnant women in early pregnancy //Doctor's herald journal. – 2023. – Т. 2. - С. 52-56.
11. Кудратова З.Э., Кувандиков Г.Б. Цитомегаловирус инфекциясининг замонавий клиник-лаборатор характеристикаси // Биомедицина ва амалиет. 905-908, 2020.
12. Ибрагимов Б.Ф., Ибрагимова Н.С. Роль гомоцистеина в патогенезе синдрома поликистозных яичников у женщин International scientific review, Boston, USA. January 22-23, 2020.
13. Душанова Г.А., Набиева Ф.С., Садинова М.Ж., Нурматова Д.М. Анализ взаимосвязей параметров иммунного гомеостаза с состоянием системы ПОЛ-АОС // Вестник науки и образования, 2021. № 2 (105). Часть 2.
14. Набиева Ф.С., Ибрагимова Н.С., Умарова С.С. Инструментальные и лабораторные методы исследования для ранней диагностики эхинококкоза // Вестник науки и образования № 24 (78), часть 4, 2020.
15. Ибрагимова Н.С., Набиева Ф.С., Умарова С.С. Оценка значимости клинико-лабораторных и инструментальных методов исследования при диагностике эхинококкоза // International scientific review, Boston, USA. December 22-23, 2019.
16. 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. С. 88-90, 2020.
17. ШШ Бердиярова, НА Юсупова. Особенности иммунометаболических нарушений иммунологической реактивности при гематогенных остеомиелитах. Вестник науки и образования, 29-32.
18. Клинико-лабораторная диагностика внебольничных пневмоний у детей ШШ Бердиярова, НА Юсупова, ХИ Ширинов Вестник науки и образования, 80-83.
19. Исомадинова Л. К., Даминов Ф. А. Современная лабораторная диагностика хронического пиелонефрита у детей //Journal of new century innovations. – 2024. – Т. 49. – №. 2. – С. 112-116.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5