

Immunohistochemistry (IHC)

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Abstract

Immunohistochemistry (IHC) is a vital technique used in pathology and research to identify and visualize specific proteins or antigens within tissue samples. This powerful method combines principles of immunology and histology, enabling researchers and clinicians to gain valuable insights into tissue biology. The process involves using specific antibodies labeled with detectable markers to bind to target proteins in tissue sections. IHC plays a significant role in disease diagnosis, biomarker discovery, and drug development, as it allows for accurate identification of biomarkers and protein expression patterns. This short note provides an overview of the principles, procedure, and significance of Immunohistochemistry in advancing our understanding of various diseases and biological processes.

Keywords: Tissue samples; Protein expression; Drug development; Secondary antibodies; Prognostic indicators

Introduction

Immunohistochemistry (IHC) is a powerful technique used in the field of pathology and research to visualize and identify specific proteins or antigens within tissues. By combining the principles of immunology and histology, IHC enables researchers and clinicians to gain valuable insights into the distribution, localization, and expression levels of target proteins, helping them unravel the complexities of tissue biology. This short article provides an overview of Immunohistochemistry [1] and its significance in advancing our understanding of various diseases and biological processes.

Principles of immunohistochemistry

IHC involves the use of specific antibodies that bind to target proteins in tissue samples. These antibodies are raised against the protein of interest and are labeled with a detectable marker, such as a fluorescent dye or an enzyme. When applied to tissue sections, these antibodies will specifically bind to the corresponding antigens within the tissue.

Method

The IHC procedure typically follows a series of steps

Tissue sample preparation: Tissue samples are collected and processed into thin sections using a microtome. These sections are then mounted onto glass slides for further analysis.

Antigen retrieval: In many cases, the target antigens may be masked or altered during tissue processing. Antigen retrieval methods are employed to unmask or expose the antigens, ensuring better antibody binding.

Blocking: To reduce non-specific binding, [2] the tissue sections are treated with blocking agents to prevent the antibodies from binding to irrelevant sites.

Primary antibody incubation: The tissue sections are incubated with the primary antibodies that specifically recognize the target proteins of interest. These antibodies form complexes with the antigens in the tissue.

Secondary antibody incubation: After washing away unbound primary antibodies, the tissue sections are exposed to secondary antibodies. These secondary antibodies are labeled with detectable markers and recognize the primary antibodies, amplifying the signal

for better visualization.

Visualization: The bound antibodies create a visible signal, either through a color change (in enzyme-based systems) or through fluorescence (in fluorescent-based systems), allowing the visualization of target proteins under a microscope.

Significance of Immunohistochemistry

Disease diagnosis: IHC plays a crucial role in diagnosing various diseases, such as cancer. It helps pathologists identify specific biomarkers that are indicative of particular tumor types, aiding in accurate diagnosis and personalized treatment [3].

Biomarker discovery: IHC is valuable in identifying potential biomarkers associated with diseases. These biomarkers can serve as targets for therapeutic intervention or prognostic indicators.

Research applications: In research, IHC is widely used to study protein expression patterns in different tissues, allowing scientists to investigate the roles of specific proteins in various physiological and pathological processes.

Drug development: Immunohistochemistry assists in evaluating the effectiveness of drug candidates by examining changes in protein expression and localization following treatment.

Result

Disease diagnosis: The result of IHC aids pathologists in accurately diagnosing diseases, particularly cancer. By identifying specific biomarkers associated with certain tumor types, IHC helps determine the nature and origin of the disease, leading to appropriate treatment strategies [4].

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Biomarker discovery: IHC is instrumental in identifying potential biomarkers relevant to various diseases. These biomarkers serve as indicators for disease progression and response to treatment, guiding clinicians in choosing personalized therapies.

Research applications: The result of IHC in research helps investigators study the expression patterns of proteins in different tissues. By understanding protein localization and distribution, researchers gain insights into the role of specific proteins in physiological and pathological processes [5].

Drug development: In drug development, IHC is used to assess the impact of drug candidates on protein expression and localization within tissues. This information is crucial in determining the efficacy of potential therapeutics.

The result of Immunohistochemistry provides valuable information about the presence, location, [6] and expression levels of specific proteins or antigens within tissue samples. Its applications in disease diagnosis, biomarker discovery, research, and drug development make it an indispensable tool in advancing our understanding of tissue biology and improving patient care.

Discussion

Disease diagnosis and prognosis: IHC plays a critical role in diagnosing various diseases, especially cancer. It helps pathologists identify specific protein markers associated with different tumor types. By analyzing the expression patterns of these biomarkers in tissue samples, clinicians can accurately diagnose the disease, determine its stage, and predict the patient's prognosis. This enables personalized treatment approaches tailored to the individual patient, resulting in better outcomes.

Biomarker discovery: One of the most significant contributions of IHC is its ability to identify novel biomarkers. These biomarkers can be indicators of disease presence, progression, [7] or response to treatment. IHC facilitates the discovery of potential targets for new therapies and helps researchers select the most appropriate biomarkers to develop diagnostic tests for early disease detection.

Research applications: IHC allows scientists to study the distribution and localization of specific proteins within tissues. This information is crucial in understanding the underlying molecular mechanisms of various biological processes and disease pathways. Researchers can investigate how proteins interact, their involvement in signaling pathways, and their role in tissue development and regeneration.

Drug development and personalized medicine: IHC has revolutionized drug development by providing insights into the effects of drug candidates on target proteins. Researchers can assess changes in protein expression and distribution in response to treatment, [8] aiding in the identification of potential therapeutic agents. Furthermore, IHC's role in identifying patient-specific biomarkers enables the development of personalized medicine, where treatment strategies can be tailored to an individual's unique molecular profile.

Clinical trials and companion diagnostics: IHC is used to evaluate the effectiveness of experimental drugs and monitor treatment response. It helps identify patient subgroups that may benefit more

from a particular therapy, guiding trial design and patient selection [9]. Moreover, IHC is crucial in developing companion diagnostics, which are tests that identify patients most likely to respond to a specific treatment, increasing treatment efficacy and reducing unnecessary side effects.

Limitations and challenges: While IHC is a powerful technique, it does have limitations. Factors such as tissue quality, antigen retrieval methods, and antibody specificity can affect the accuracy and reproducibility of results [10]. Researchers must carefully validate their antibodies and optimize staining protocols to ensure reliable outcomes.

Conclusion

Immunohistochemistry is a versatile and indispensable tool in modern medicine and research. Its ability to visualize specific proteins within tissues has revolutionized disease diagnosis, biomarker discovery, and drug development. As technology advances and our understanding of tissue biology deepens, IHC will continue to play a crucial role in improving patient care and advancing scientific knowledge. Researchers and clinicians must stay vigilant in addressing its challenges to harness its full potential for medical advancements.

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Conflict of Interest

None

References

- Torres AG (2004) Current aspects of Shigella pathogenesis. *Rev Latinoam Microbiol* 46: 89-97.
- Bhattacharya D, Bhattacharya H, Thamizhmani R, Sayi DS, Reesu R, et al. (2014) Shigellosis in Bay of Bengal Islands, India: Clinical and seasonal patterns, surveillance of antibiotic susceptibility patterns, and molecular characterization of multidrug-resistant Shigella strains isolated during a 6-year period from 2006 to 2011. *Eur J Clin Microbiol Infect Dis*; 33: 157-170.
- Von-Seidlein L, Kim DR, Ali M, Lee HH, Wang X, Thiem VD, et al. (2006) A multicentre study of Shigella diarrhoea in six Asian countries: Disease burden, clinical manifestations, and microbiology. *PLoS Med* 3: e353.
- Germani Y, Sansonetti PJ (2006) The genus Shigella. *The prokaryotes In: Proteobacteria: Gamma Subclass Berlin*: Springer 6: 99-122.
- Jomezadeh N, Babamoradi S, Kalantar E, Javaherizadeh H (2014) Isolation and antibiotic susceptibility of Shigella species from stool samples among hospitalized children in Abadan, Iran. *Gastroenterol Hepatol Bed Bench* 7: 218.
- Sangeetha A, Parija SC, Mandal J, Krishnamurthy S (2014) Clinical and microbiological profiles of shigellosis in children. *J Health Popul Nutr* 32: 580.
- Nikfar R, Shamsizadeh A, Darbor M, Khaghani S, Moghaddam M (2017) A Study of prevalence of Shigella species and antimicrobial resistance patterns in paediatric medical center, Ahvaz, Iran. *Iran J Microbiol* 9: 277.
- Kacmaz B, Unaldi O, Sultan N, Durmaz R (2014) Drug resistance profiles and clonality of sporadic Shigella sonnei isolates in Ankara, Turkey. *Braz J Microbiol* 45: 845-849.
- Zamanlou S, Ahangarzadeh Rezaee M, Aghazadeh M, Ghotaslou R, et al. (2018) Characterization of integrons, extended-spectrum β -lactamases, AmpC cephalosporinase, quinolone resistance, and molecular typing of Shigella spp. *Infect Dis* 50: 616-624.
- Varghese S, Aggarwal A (2011) Extended spectrum beta-lactamase production in Shigella isolates-A matter of concern. *Indian J Med Microbiol* 29: 76.