Advanced uses of immunohistochemistry in histology and histopathology

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Immunohistochemistry [IHC] is an important application of monoclonal as well as polyclonal antibodies to determine the tissue distribution of an antigen [protein or lipid] by specific antigen/antibody reaction tagged with a visible label. Immunohistochemistry has an expanding role in diagnostic and research laboratories. This article highlights the various applications of IHC in health and diseases and gives more information in the Future directions of immunohistochemistry.

Key Words: *Immunohistochemistry, Histology, Histopathology, Diseases, Diagnosis*

Immunohistochemistry [IHC] is an integration of histological, immunological and biochemical techniques, which is used for the identification of specific tissue components [antigens] by means of a specific antigen/antibody reaction tagged with a visible label. IHC visualize the distribution and localization of specific cellular markers or components within a cell or tissue (1,2). IHC used to detect cell or tissue antigens that range from amino acids and proteins to infectious agents and specific cellular populations (3). Immunohistochemical staining has an important role in the histopathological diagnosis of many tumors (4,5) and diseases (6-10). In basic research, immunohistochemistry is also widely used to understand the distribution and localization of biomarkers and differentially expressed proteins in different parts of human and animal tissues (1,2).

APPLICATION OF IHC IN HISTOLOGICAL RESEARCH

In basic research, IHC has become a crucial technique and is widely used in many medical research laboratories. IHC used to understand the distribution and localization of biomarkers and differentially expressed proteins in different parts of human and animal tissues as ovary (11) uterus (12). IHC is also used in field of mesenchymal stem cells (13), embryonic stem cell (14,15) and Telocytes (16-18) research area. IHC can also be used to determine specific molecular markers in fundamental biological processes such as proliferation, development and apoptosis (19).

APPLICATION OF IHC IN HISTOPATHOLOGY

As IHC, can detect the earliest changes in transformed tissues and identifying cellular changes not normally visible with H&E, it can be used to help distinguish hyperplasia from neoplasia (2). IHC may act as a Prognostic markers in cancer, prediction of response to therapy and to detect infectious agent in tissues by use of specific antibodies against microbial DNA or RNA, e.g. in Cytomegalo virus, Hepatitis B virus, Hepatitis C virus (1).

IHC used in the Histopathology of the Respiratory System and lung (8,20,21) diagnosis, differential diagnosis and classification of soft-tissue tumors (4,5) diagnosis of prostate cancer (22) surgical pathology practice (9) in the Diagnosis of Bioterrorism Agents (7) in mammary pathology and breast cancer (23) Diagnosis of Cutaneous Leishmaniasis (10) and in oral pathology laboratory (24).

In brain trauma, immunohistochemical staining for beta amyloid precursor protein has been used as a method to detect axonal injury within as little as 2–3 h of head injury (6). This is useful in establishing timing of a traumatic insult in medico-legal settings (1). In muscle diseases IHC can assist in differentiating vascular dystrophy from non-dystrophicdisorders (1).

FUTURE DIRECTIONS OF IMMUNOHISTOCHEMISTRY

Genogenic immunohistochemistry will help in identification of the underlying molecular changes that can be used both for diagnosis and therapy (25). Using automated computerized image capture and analysis systems (9,26) will give more accurate results. Development of more specific antibodies from recombinant antibody fragments will give molecules with ultra-high affinity, high stability, and increased potency (9). The use of tissue microarrays [TMA] as a high-throughput technique enables economical evaluation in terms of sample utilization and reagent costs (9,26).

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