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Modern Methods in Histopathology

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Abstract

The goal of this study was to evaluate both historical and contemporary literature reviews as well as case studies in order to inform how histological stains have changed in the modern period. The results of the literature research showed that histopathology and histotechnology in terms of stains utilised have improved. There has been an increasing demand for staining techniques that are accurate, effective, and simple. Many staining techniques have been supplanted by new immunostaining, molecular, non-culture, and other advanced staining techniques, but many others are still in use today. Because the necessary chemicals have been shown by science to be harmful, some staining techniques have been abandoned. The case studies showed that current histology uses a combination of many stain procedures to increase the staining process' efficacy. In order to increase their efficiency, better histology stains have been changed and mixed with other stains.

Keywords: Histological staining • Histology • Histopathology

Introduction

Most of the time, pathology concentrates on the morphological aspects of illness studies. To isolate and identify specific infectious disease agents, to provide a more precise illness diagnosis, to define the role of differential gene expression in disease aetiology, and to provide individualised medical approaches to therapy, molecular techniques are utilised in conjunction with pathology. Molecular methods are now required in all laboratories for clinical and anatomical pathology. Numerous molecular uses in anatomical pathology have proven to be valuable and beneficial. Molecular approaches can aid in the discovery of novel molecular targets for certain therapeutic strategies, help define disease more precisely, and uncover predictive and prognostic signals. Pathology and histology utilise *in situ* hybridization and fluorescent *in situ* hybridization (FISH) polymerase chain reaction as two of the most widely used molecular techniques (PCR) [1]. With the advent of personalised medicine, treatment plans now include a greater emphasis on the patient, the illness, and how to control prognosis and pharmaceutical response in conditions like cancer. One of the histological pillars of molecular assays is immunohistochemistry (IHC). IHC can limit tissue cell proteins and project molecular testing and treatment plans to more effectively manage the patient's malignancy. IHC is a useful tool for examining cellular markers that frequently characterise particular phenotypes and can offer vital diagnostic, prognostic, and predictive data for disease biology. IHC has been an ongoing effort to boost sensitivity for the detection of distinct antigenic targets, with the main objective of fusing tissue-based testing with proteomic data [2].

Description

Due to antibodies' application in the molecular analysis of tissue disease, IHC procedures in fixed tissue specimens have had to be modified and developed. IHC and *in situ* hybridization are routinely used for malignancies that have recently been diagnosed. Although the outcomes are mainly unknown, molecular technologies have occasionally been utilised to build multigene expression outlines. IHC and molecular tests can be used in conjunction to enhance cancer diagnosis testing in areas including breast, prostate, head and neck, colon, and other malignancies [3].

IHC was a pioneer in the development of several techniques, including GIST, Her2, CISH/FISH, and microsatellite instability (MSI). Thanks to new and improved monoclonal antibodies, the use of IHC on various cancers has undoubtedly anticipated new molecular diagnostic applications. In histotechnology, IHC has opened the door for molecular diagnostics. In order to separate individual cells or cell populations from preserved or frozen tissue slices for use in other experiments, such as genetic research, LCM was developed. One of the special benefits of micro dissection is the production of cellular populations that can be verified morphologically. One histological application of micro dissection is the molecular testing for "tissue floaters" to isolate particles of a potential floater from the rest of the tissue sample. Another application is the measurement of uncommon individual neoplastic cells, such as the separation of Reed-Sternberg cells from neighbouring lymphoid infiltrates. A technique called *in situ* hybridization can be used to find particular DNA/RNA sequences in tissues. Instead of using antibodies, probes are used to find DNA or RNA sequences [4]. Hybridization is the term for the chemical reaction between the probe and the DNA/RNA that needs to be identified. When done on tissue slices or cells to find the potential location of the DNA/RNA, this is known as "*in situ*." This is a novel approach to identify specific mRNA species in single cells in tissue slices. It might disclose details about physiologic systems and illnesses [5].

Conclusion

In forensics, the process of "DNA fingerprinting" is routinely used to identify DNA. A reference sample is obtained, which is a DNA sample of the subject. The sample that is typically advised since it reduces the potential of contamination is a buccal smear. You can also use saliva, blood, sperm, and other biological fluids. A DNA profile of this sample can be created and analysed to see whether there is a genetic match. To determine whether a patient's tissue was inadvertently switched or mixed up in the histology laboratory during tissue processing, DNA fingerprinting is routinely utilised.

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Conflict of Interest

None.

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