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Surface Plasmon Resonance Sensor for Detecting Cancer Biomarkers

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Introduction

A biomarker is a physiologically detectable marker that, in the best-case scenario, predicts a clinically significant outcome. Diagnostic biomarkers are more convenient and cost-effective than measuring the final clinical outcome directly. Cancer is one of the most prominent global health issues, as well as a major cause of morbidity and mortality worldwide. As a result, cancer biomarker assays that are reliable, consistent, precise, and validated are desperately needed. Biomarker-based tumour detection has a lot of potential for improving disease knowledge at the molecular level, as well as early detection and surveillance. In contrast to conventional approaches, surface plasmon resonance allows for the quick and less invasive screening of a variety of circulating indicators, such as circulating tumour DNA, microRNA, circulating tumour cells, lipids, and proteins.

With several advantages, the SPR technique is a particularly advantageous choice for biomarker identification at the point of care. As a result, it allows for the timely detection of tumour markers, which could be used to track cancer development and prevent malignant tumour relapse. The focus of this review is on advancements in SPR biosensing technologies for cancer detection [1].

Description

A biomarker is a biological discovery that predicts a clinically meaningful endpoint or interim result. Biomarkers can be used to detect, characterize, diagnose, and monitor diseases. To appreciate the significance of a biomarker, it is necessary to understand the pathophysiological relationship between a marker and a diagnostic and therapeutic endpoint. Cancer is a multi-step process that involves genetic and epigenetic changes that disrupt the cellular homeostasis between growth and death. Cancer is a major disease that kills millions of people worldwide each year. According to the International Agency for Research on Cancer, 18.1 million cancer cases and 9.6 million cancer deaths occur each year. Cancer is one of the most serious global health issues in developed countries, causing morbidity and mortality[2].

The study concluded that analysing biomolecules involved in the molecular pathogenesis of cancer could yield important clinical information, i.e., biomarkers, which are critical in determining whether cancer is suspected. Among these molecules are nucleic acids, carbohydrates, proteins, lipids, and metabolites. Biomarkers can be used for a variety of purposes, including determining an individual's risk of developing cancer, forecasting the likelihood that a specific medication will be effective for a specific patient, and tracking the progression to determine whether or not a therapy is effective. There is an urgent need for credible, robust, and validated cancer markers to reduce cancer mortality and morbidity. Biomarkers not only detect cancer but also classify it by stage and type. Rapid and accurate cancer detection can improve the efficacy of treatment therapies, ultimately leading to higher overall survival rates [3-5].

Conclusion

Clinical oncology is likely to enter a new era in which the molecular characteristics of the individual patient will increasingly dictate cancer detection, diagnosis, and treatment. The discovery and practical application of novel biomarkers will have a significant impact on cancer research. Biomarkers that can diagnose and predict cancer years before symptoms appear will revolutionise cancer diagnosis and treatment. Such markers do not require tumour tissue for detection and are secreted into the bloodstream by cancer cells, allowing for simple detection without even a minor surgical procedure. They may also be potential markers for population-based testing. SPR was chosen over conventional tools to detect cancer biomarkers due to several unique features, including real-time detection, label-free operation, rapid monitoring, non-destructive examination, simple miniaturization, and superior sensitivity. The principles of operation and applications of specific SPR, LSPR, and SPRi devices for the selective detection of various tumour markers were described. The tested biosensors had low limits of detection for cancer biomarkers in a variety of sources, including serum, buffers, cell lines, and patient-derived samples. Because therapeutic molecule interactions can be studied at low concentrations, SPR-based screening approaches appear to be one of the most promising tools for high-throughput screening of anti-cancer drugs and therapeutic antibodies in the drug discovery sector.

Acknowledgement

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Conflict of Interest

There are no conflicts of interest by author.

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