**Opinion**
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# Biosensor Technology for Melanoma Biomarker Detection

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## Introduction

Cancer is the world's second most common cancer, with a growing fatality rate in recent years. Because of the limits of cancer diagnosis and therapy, the patient's survival rate is unpredictable. Early cancer detection is critical for successful therapy. A biomarker-based cancer diagnosis might dramatically enhance early detection and therapy. Biosensors are important in the identification of biomarkers because they are simple to use, portable, and can do real-time analysis. This review discusses several biosensors for detecting nucleic acid and protein-based cancer biomarkers for cancer detection. It focuses on various ways for using electrochemical, optical, and mass-based transduction systems in cancer biomarker detection. It also emphasises the analytical capabilities of different [1].

## About the Study

Cancer is the largest cause of mortality worldwide, with over 200 forms of cancer diagnosed and over 1500 fatalities happening each day. Despite recent technical advancements, cancer patients' survival rates remain low due to late detection. Cancer stage and dismal prognosis Conventional approaches, such as ultrasonography, Magnetic resonance imaging and biopsy are ineffective for detecting early stage cancer because. These approaches are dependent on the tumor's phenotypic features. Cancer is a multi-stage illness with a complicated beginning and course. A variety of genetic or epigenetic changes disrupts cellular signalling and cause tumorigenic change and cancer.

Biomarkers are substances that experience significant changes after cancer treatment. Biomarkers might be nucleic acids, proteins, metabolites, isoenzymes, or hormones and are classed as diagnostic, prognostic, or predictive. Diagnostic biomarkers are associated with illness identification, whereas prognostic biomarkers provide information regarding the course of disease recurrence. Predictive biomarkers, on the other hand, evaluate the response to therapy. The presence, absence, or change in the amount of particular biomarkers in a cell is often. Cancer-specific discovery and detection of these biomarkers might aid in early diagnosis and disease progression monitoring. Traditional enzyme-linked immunosorbent assay or polymerase chain reaction-based approaches for biomarker identification have technological constraints such as sluggish detection and high energy consumption [2].

Because they are also manual, these approaches are ineffective for continuous patient monitoring throughout therapy. Furthermore, all malignancies are complex, with several actions in the cell involving more than one molecule. As a result, the simultaneous detection of many biomarkers is critical for accurate diagnosis and prognosis. The goal of clinical cancer diagnosis is to provide analytical procedures that are expressly capable of detecting biomarkers in a sensitive and parallel manner, allowing for point-of-care testing. Cancer biosensors have recently gained popularity because to their excellent analytical performance and real-time measurement. Because of their reduced minimum detection limits, they may identify extremely low quantities of biomarkers in physiological samples, which can aid in the early identification of cancer.

Because of their reduced minimum detection limits, they may identify extremely low quantities of biomarkers in physiological samples, which can aid in the early identification of cancer. Furthermore, they permit the reuse of biorecognition molecules and eliminate the time lag between sample preparation and analysis. Furthermore, biosensors have a great potential for detecting numerous biomarkers at the same time. We discussed the established molecular alterations and related biomarkers in cancer in this review [3]. The most recent biosensor design and manufacturing technologies for detecting these cancer indicators are discussed. In comparison to previous papers, this study focuses on the analytical performance of these biosensors in terms of sensitivity, stability, linear detection range, and detection limit produced using different fabrication processes.

Cancer biosensors use antibodies, complementary nucleic acid probes, or other particular biorecognition molecules fixed on a transducer surface, depending on the target. The transducer turns the biological reaction caused by biorecognition molecules interacting with the biomarker into a quantifiable signal. Cancer biosensors primarily make use of electrochemical, optical, and mass-based transducers, the kind of which is determined by the type of biological response. The interaction of biorecognition molecules and the biomarker is converted into a quantifiable electrochemical signal using electrochemical transducers. An electrochemical probe is sometimes used to boost the signal. To identify the target, optical transducers use light absorption, fluorescence, luminescence, total internal reflection, surface plasmon resonance, and other optical phenomena [4]. Optical biosensors are particularly appealing since they can detect numerous targets simultaneously.

Optical fibres and waveguide devices are utilised in these optical biosensors to increase detection sensitivity by improving the interaction between the guided light and the sensor surface. Mass-based transducers, on the other hand, detect changes in mass to determine the biomarker. They are made up of a piezoelectric crystal that oscillates at a specific frequency when an electric field is applied to it. The frequency of oscillation of the crystal is influenced by the mass of the crystal and the applied electrical frequency. When the biorecognition molecule immobilised on a piezoelectric crystal attaches the target, the oscillation frequency of the crystal changes owing to the change in mass, which is measured to determine the concentration of the biomarker. Quartz crystals, recognised for their great sensitivity, are often utilised piezoelectric crystals.

Cancer biosensors offer various advantages, but they also have a few drawbacks. The lack of biocompatibility of the immobilisation matrices utilised to build most cancer biosensors results in decreased stability. Furthermore, weak biological signals generated by biorecognition molecules-biomarker interactions may result in lower detection sensitivity. Nanomaterials have been widely used in the creation of cancer biosensors in order to increase their analytical performance in recent years. Nanomaterials, with their exceptional optical, thermal, electrical, and catalytic capabilities, perform a variety of functions in biosensors. Their great biocompatibility and capacity to collect a large number of biomolecules provide the biosensors with exceptional stability and sensitivity. They also have dimensional similarities with biomolecules and may thus be easily conjugated to them [5].

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## Conclusion

Nanoparticles, among other nanomaterials, are widely employed in cancer biosensors because to their increased surface area tunable optical and electrical characteristics due to size and form The application of The use of semiconductor quantum dots in cancer diagnostics is also growing. Their unique optical features, such as Because of their broad excitation and narrow emission spectra, they may be used in high throughput applications. detection through multiplexing Carbon nanotubes, also known as are classified into two types: single-walled carbon nanotubes and multi-walled carbon nanotubes. Nanotubes are also commonly used in cancer biosensors. CNTs have outstanding characteristics due to their unique structure. Their superiority They are useful for biosensing due to their large surface area, high conductivity, and chemical durability applications. Other nanomaterials include For the same purpose, nanocantilevers, nanowires, and composite nanomaterials have been employed. cancer biomarker detection Various tactics have been employed.

## References

1. Zhang, Diming, and Qingjun Liu. "Biosensors and bioelectronics on smartphone for portable biochemical detection." *Biosens Bioelectron* 75 (2016): 273-284.
2. Li, Shuang, Daizong Ji, Gang Xu, and Jinglong Liu, et al. "Biosensors and Bioelectronics on Smartphone." *Handbook of Cell Biosens* (2022): 627-655.
3. Zhang, Diming and Qingjun Liu. "Biosensors and bioelectronics on smartphone for portable biochemical detection." *Biosens Bioelectron* 75 (2016): 273-284.
4. Su, Kaiqi, Xianxin Qiu, Jiaru Fang, and Quchao Zou, et al. "An improved efficient biochemical detection method to marine toxins with a smartphone-based portable system-Bionic e-Eye." *Sens Actuators B Chem* 238 (2017): 1165-1172.
5. Lu, Yanli, Zhenghan Shi and Qingjun Liu. "Smartphone-based biosensors for portable food evaluation." *Curr Opin Food Sci* 28 (2019): 74-81.

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