

HANDHELD DEVICE FOR EARLY DETECTION OF MULTIPLE CANCER AND CARDIAC DISEASE BIOMARKERS

Abstract

Early detection of cancer and cardiovascular diseases (CVD) is very important to increase the survival rate of patients in critical conditions. Therefore, it is necessary to have a reliable detection tool for cardiac and cancer markers which could probe a combination of biomarkers towards a highly accurate diagnosis and provide a multi-parametric detection system.

Several methods are available but they still hold several limitations concerning portability, sensitivity

and cost effectiveness. In order to overcome these problems, point-of-care hand-held diagnostic device was developed.

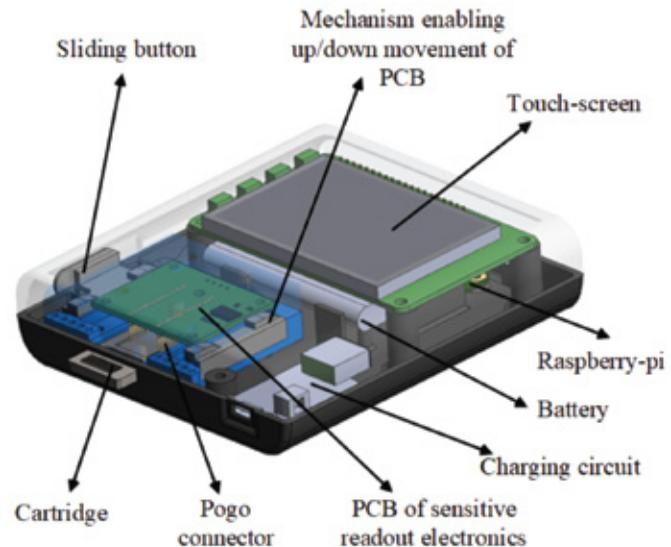
This technology is a hand-held point-of-care diagnostic device that incorporates a lab-on-a-chip module with interdigitated capacitive biosensors for label-free detection of multiple cancer and cardiovascular disease biomarkers.

Technology Overview

Interdigitated capacitive (IDC) sensors previously developed by our researchers for the detection of multiple CVD and cancer biomarkers, has been extended to a fast, low-cost hand-held point-of-care diagnostic device. For this purpose, a novel circular IDC-based biosensor in 2x6 capacitive arrays capable of detecting a panel of biomarkers in human serum is designed, fabricated and verified.

The developed prototype is comprised of a capacitive bio-detection chip, a sensitive capacitive readout electronics enclosed in a hand-held unit and a data analysis software calculating the quantity of biomarkers.

The device uses pre-activated ready-to-use cartridges, composed of capacitive biosensors, which can be stored 3 months under optimal conditions, and is capable of on-site diagnosis and can report the result in less than 30 minutes.



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Technology Features And Specifications

The hand-held unit is designed in a way that it enables the easy use of pre- activated cartridges and ensures a reliable connection with IDC sensor.

The hand-held unit also incorporates a small computer that the software runs on it and a touch-screen to control the operation of the device and to display the results on the screen.

The device has the essential features of fast, on-site, low cost and accurate diagnosis and prognosis of the cancer and cardiovascular diseases.

Potential Applications

Target biomarkers used for the verification of the point-of-care hand-held diagnostic device, that are indicative of CVD and cancer, are BNP (CVD), SAA (cancer), IL-6 (CVD and cancer), Fibrinogen (CVD and cancer), Troponin-I (CVD) and TNF- α , VEGF and HER2 (cancer). These biomarkers are tested with real blood samples. However, the developed device is not limited with the listed biomarkers.

Customer Benefits

A prototype point-of-care hand-held diagnostic device was developed to detect cancer and CVD target biomarkers. The device incorporates interdigitated capacitive sensors in a storable cartridge that can be inserted into the device. The device can detect multiple biomarkers simultaneously and display the results in less than 30 minutes. The cartridges can be pre-activated with the target antibodies and can be stored 3 months under optimum conditions.

The device does not compete with advanced, expensive laboratory tests in terms of accuracy. It is intended to be used in first level health facilities, areas that have limited access or no-access to advanced laboratory tests.

Market Trends & Opportunities

In 2017, a total of 1.7 million new cancer cases are estimated to be diagnosed in the US alone; during the same time period, close to 0.6 million patients are estimated to die due to cancer. Therefore, in addition to satisfying the unmet market need for advanced and efficient treatment interventions, early cancer diagnosis and screening form an important component of disease prevention and cure.

Due to the increasing prevalence of diabetes, cancer, and cardiac diseases, the global point of care diagnostics market has a large potential to drive the overall market growth.

The global point-of-care diagnostics market is projected to reach USD 38.13 Billion by 2022 from USD 23.71 Billion in 2017, at a CAGR of 10% during the forecast period.