

## INTISARI

### **KAJIAN BIOSENSOR ANTIBODI *SURVIVAL MOTOR NEURON* BERBASIS *QUARTZ CRYSTAL MICROBALANCE* DENGAN LAPISAN AKTIF *POLYVINYL ACETATE***

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*Spinal Muscular Atrophy* (SMA), merupakan penyakit neuromuskular yang diturunkan secara autosomal resesif akibat degenerasi sel saraf motor neuron pada kornu anterior medulla spinalis yang ditandai dengan kelemahan otot progresif. SMA disebabkan oleh kehilangan *homozygous* gen *Survival Motor Neuron 1* (SMN1) pada lebih dari 95% kasus. Beberapa metode deteksi SMN1 seperti *enzyme-linked immunosorbent assay* (ELISA), *Western Blot*, dan *fiber-optic surface plasmon resonance* (SPR) masih membutuhkan waktu preparasi yang cukup lama, membutuhkan biaya yang cukup besar, belum bersifat *real-time* dan *portable*. Deteksi SMN1 merupakan tantangan besar di bidang medis karena merupakan gen utama yang berperan dalam produksi protein *Survival Motor Neuron*. Salah satu sensor yang mampu mendeteksi protein SMN adalah *Quartz Crystal Microbalance* (QCM).

Penelitian ini difokuskan pada pengembangan sistem instrumentasi dan optimasi sensor *Quartz Crystal Microbalance* (QCM) dengan bantuan mikrokontroler ARDUINO UNO dan *software* Grbl 3.6.1. sensor *Quartz Crystal Microbalance* (QCM) dikembangkan dengan menggunakan *polyvinyl acetate* (PVAc) sebagai lapisan aktif yang dilapiskan pada permukaan QCM dengan metode *spin-coating*. Hasil respon menunjukkan optimasi dan kalibrasi sistem QCM yang dikembangkan mampu untuk membedakan *phosphate buffered saline* (PBS) murni dan PBS dengan campuran antibodi SMN. Oleh karena itu, metode dan proses deteksi antibodi SMN menggunakan QCM dan PVAc sebagai lapisan aktif memiliki potensi yang menjanjikan untuk deteksi protein SMN di masa yang akan datang.

**Kata kunci:** *Spinal Muscular Atrophy, Survival Motor Neuron, Quartz Crystal Microbalance, spin-coating.*

## ABSTRACT

### ***STUDY OF SURVIVAL MOTOR NEURON ANTIBODY BIOSENSOR BASED ON QUARTZ CRYSTAL MICROBALANCE SENSOR WITH POLYVINYL ACETATE ACTIVE LAYER***

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Spinal Muscular Atrophy (SMA), is a neuromuscular disease inherited in an autosomal recessive manner due to degeneration of motor neurons in the anterior horn of the spinal cord which is characterized by progressive muscle weakness. SMA is caused by a loss of the homozygous Survival Motor Neuron 1 (SMN1) gene in more than 95% of cases. Several detection methods for SMN1, such as enzyme-linked immunosorbent assay (ELISA), Western Blot, and fiber-optic surface plasmon resonance (SPR), still require a long preparation time, quite costly, not real-time and portable. Detection of SMN1 is a major challenge in the medical field because it is the main gene that plays a role in the production of the Survival Motor Neuron protein. One of the sensors capable of detecting SMN protein is Quartz Crystal Microbalance (QCM).

This research is focused on developing the instrumentation system and optimization of the Quartz Crystal Microbalance (QCM) sensor with the help of ARDUINO UNO microcontroller and Grbl 3.6.1 software. The Quartz Crystal Microbalance (QCM) sensor was developed using polyvinyl acetate (PVAc) as an active layer overlaid on the QCM surface with spin-coating method. The response results showed that the optimization and calibration of the QCM system developed were able to distinguish pure phosphate buffered saline (PBS) and PBS with a mixture of SMN antibodies. Therefore, the method and process of detection of SMN antibodies with QCM and PVAc as active layer has promising potential for detection of SMN proteins in the future.

**Keywords:** *Spinal Muscular Atrophy, Survival Motor Neuron, Quartz Crystal Microbalance, spin-coating.*