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Development of an electrochemical multiSEnsor platform for the simultaneous detection of emerging bREast caNcer biomArkers in a blood droplet

HORIZON 2020 Development of an electrochemical multiSEnsor platform for the simultaneous detection of emerging bREast caNcer biomArkers in a blood droplet

# Berichterstattung

Projektinformationen

SERENA

ID Finanzhilfevereinbarung: 101029884

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Projekt abgeschlossen

**EK-Unterschriftsdatum** 30 März 2021

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Periodic Reporting for period 1 - SERENA (Development of an electrochemical multiSEnsor platform for the simultaneous detection of emerging bREast caNcer biomArkers in a blood droplet)

Berichtszeitraum: 2022-02-01 bis 2024-01-31

# Zusammenfassung vom Kontext und den Gesamtzielen des Projekts

Problem/Issue Addressed:

The project aims to address the unmet needs in the field of cancer diagnosis. The focus is on breast cancer, which remains one of the leading causes of cancer-related mortality in women worldwide. Despite significant advances in treatment, early diagnosis, assessment of prognosis and prediction of treatment response remain crucial.

Importance for Society:

Early detection of cancer significantly improves patient outcomes. Liquid biopsy, a less invasive alternative to tissue biopsy, is a promising approach for early diagnosis, prognosis assessment and therapy monitoring. The development of reliable, rapid, and cost-effective diagnostic tools is crucial for improving cancer management and reducing mortality rates. Overall Objectives:

The overall objective of the project is to develop a novel electrochemical nanostructured multisensor platform for the rapid, cost-effective and reliable detection of novel breast cancer biomarkers, including non-coding RNAs (ncRNAs) and autoantibodies (AAbs), in whole blood. This platform aims to facilitate early cancer diagnosis, prognosis assessment and patient follow-up.

The fellowship provided me with a broad range of expertise, that significantly improved my career prospects. With my improved scientific skills and proposal writing ability, I aim to secure higher academic positions and apply for grants such as the ERC Starting Grant to eventually become independent as a Principal Investigator.

## Arbeit, die ab Beginn des Projekts bis zum Ende des durch den Bericht erfassten Berichtszeitraums geleistet wurde, und die wichtigsten bis dahin erzielten Ergebnisse

The developed electrochemical platform offers a novel approach to breast cancer biomarker detection, addressing limitations of current methods.

Advantages of the platform include rapid analysis, cost-effectiveness, and sensitivity in detecting biomarkers in whole blood samples.

Results have been disseminated through publications in scientific journals, presentations at conferences, and involvement in scientific communities.

Exploitation of the results includes potential patent of the developed technology for clinical use in breast cancer diagnostics.

Collaborations and networking activities have paved the way for further advancements and potential funding opportunities in related research areas.

In conclusion, the work performed during the reporting period has significantly advanced the development of the electrochemical multisensor platform, bringing the project closer to its goal of revolutionizing breast cancer diagnostics with a robust, sensitive, and cost-effective tool for early detection and personalized medicine.

Fortschritte, die über den aktuellen Stand der Technik hinausgehen und voraussichtliche potenzielle Auswirkungen (einschließlich der bis dato erzielten sozioökonomischen Auswirkungen und weiter gefassten gesellschaftlichen Auswirkungen des Projekts)

The project proposes several innovative approaches to cancer diagnostics, moving beyond the current state of the art.

1) Multisensor Platform: Developing a multisensor platform capable of detecting multiple biomarkers simultaneously in whole blood is innovative. This platform aims to address the limitations of existing techniques by offering rapid, cost-effective, and sensitive detection, facilitating early cancer diagnosis and treatment monitoring.

2) Green Technologies: Leveraging green technologies for sensor fabrication, enhances sustainability and cost-effectiveness while maintaining high performance. These approaches contribute to environmentally friendly device manufacturing.

Expected Results until the End of the Project.

By the end of the project, the researcher anticipates achieving the following results:

Identification and Design of Probes: Successful development and optimization of probes targeting specific cancer biomarkers, ensuring high specificity and sensitivity.

Optimized Electrochemical Platform: Characterization and optimization of the electrochemical platform, including the integration of probes and synthetic nanomaterials, to enhance sensor performance.

Multisensor Assembly and Testing: Integration of probes into the multisensor platform, followed by comprehensive testing using standard and whole blood samples to validate its efficacy and reliability for cancer biomarker detection.

Validation of the Method: Validation of the developed method for cancer biomarker detection, demonstrating its clinical utility and potential for translation into practical diagnostic devices. Potential Impacts:

The project's outcomes hold significant socio-economic and wider societal implications:

1) Improved Cancer Diagnosis and Management: The development of a rapid, low-cost, and reliable diagnostic platform can revolutionize cancer diagnosis, enabling early detection, personalized treatment, and improved patient outcomes. This can lead to reduced healthcare costs and better resource allocation.

2) Enhanced Accessibility to Diagnostics: The portable nature of the proposed device and its compatibility with whole blood samples make it suitable for Point-of-Care (PoC) settings, increasing accessibility to cancer diagnostics, particularly in resource-limited settings and underserved communities.

3) Empowerment of Women's Health: Given the focus on breast cancer diagnosis, the project has a direct impact on women's health. Early detection facilitated by the developed platform can empower women by enabling proactive management of their health and reducing the burden of late-stage cancer diagnoses.

4) Environmental Sustainability: The utilization of green technologies in sensor fabrication aligns with

sustainability goals, reducing environmental impact and promoting eco-friendly manufacturing practices in the biomedical field.



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