Poster Abstract

Real-time Monitoring of Bacterial Pathogens Using Functionalised Electrochemical Sensors

Introduction

Bacterial wound infection is one of the major components of chronic wounds, leading to sepsis in severe cases. Clinical diagnosis of wound infections relies on conventional methods, including culture assays and imaging techniques, which require long analysis time and are difficult for routine use[1]. Consequently, regardless of the status of infection, uncontrolled levels of antibiotics are applied, leading to antimicrobial resistance. Herein, we propose developing a rapid monitoring system that provides real-time observation of data corresponding to the presence and growth of bacterial pathogens in the wound environment.

Methods

In-vitro measurements were conducted using *Staphylococcus aureus* cultures, one of the most common wound pathogens. Electrochemical impedance spectroscopy was performed routinely on screen-printed electrodes to record real-time measurements over 24 hours. Electrodes were further functionalised with gelatine polymer that acts as a bioreceptor for capturing pathogenic bacteria through the interaction between gelatine and gelatinase secreted by the pathogens[2]. To increase surface-area-to-volume ratio and mechanical stability, gelatine nanofibers were printed on the electrodes using electrohydrodynamic jet 3D-printing[3].

Preliminary results & future approaches

Impedance readings of unfunctionalized carbon electrodes were taken continuously for 24 hours. As a proof-of-concept, gelatine degradation by *S. aureus* cultures was illustrated using gelatine hydrogels. Currently, printed gelatine nanofibers are being characterised with an emphasis on refining their composition. Additionally, the effect of gelatine degradation on impedance levels is investigated. Future work includes analysing the sensor sensitivity in complex wound environments using polymicrobial cultures. In conclusion, our research holds promise for addressing current challenges in wound care management.

References

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