A novel microneedles biosensor based on lignin nanoparticles for real time monitoring of glucose

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Microneedle arrays for minimally invasive continuous sensing in the dermal interstitial fluid (ISF) have been demonstrated in both amperometric and potentiometric modes [1], however there are no publication where microneedle arrays have been modified with lignin nanoparticles [2].

Lignin, the most abundant polyphenol in nature, is the main byproduct in the pulp and paper manufacturing industry and biorefinery. Lignin nanoparticles (LNPs), easily produced by green methods, offer unique properties and have therefore gained interest for electrode modification [2].

In this work, we have developed a novel green LNPs modified microneedles electrode platform for pain free continuous monitoring of glucose in artificial interstitial fluid (ISF).

The gold surface of the microneedles has been modified with LNPs and electrochemically characterized. Functionalization with glucose oxidase enzyme and with an Osmium polymer as redox mediator allowed the continuous monitoring of glucose.

The performance of the LNPs/microneedle biosensor for glucose detection was assessed in artificial interstitial fluid and in human serum, both spiked with glucose. The results reveal that the new LNPs microneedles biosensor holds interesting promise for the development of biocompatible, wearable, real-time monitoring devices to be used in clinical care and sport medicine. The proposed LNPs microneedles platform can be applied also for the detection of other important bioanalytes (such as lactate, hormones, etc).

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