Electrochemical device for the detection of Alzheimer's disease protein markers

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Alzheimer's disease (AD) is a neurodegenerative disorder that causes progressive cognitive impairment and memory loss in one out of every ten people over the age of 65. AD is not curable yet, and treatment may be ineffective if identified later in the disease's progression. Early detection is imperative to improving the efficiency of existing treatment, delaying or slowing symptoms, and thus providing the patient a better quality of life while navigating the disease. Electrochemical sensing is a promising approach for early detection of AD [1,2]. In this work, we present an electrochemical sensor design capable of detecting proteins, such as Tau and glial fibrillary acidic protein (GFAP), recently shown to exist in high concentrations in the blood of patients with AD [3]. To build biosensing electrodes, we use two types of bioreceptors, an antibody and a recombinant fusion protein (nanobody) developed for these protein markers. We evaluate how gold-based electrodes' performance in detecting the biomarkers depends on the bioreceptor type selected and suggest a sensing mechanism (Faradaic or potentiometric) and device type (electrode or transistor) that leverages the functionality of each surface.

References

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[2] S. Wustoni et al., Biosens. Bioelectron., 143 (2019) 111561
[3] A. Benedet et al., JAMA Neurol, 78,12 (2021) 1471