CRISPR-powered electrochemical nucleic acid testing

Can Dincer[1]

[1] University of Freiburg, FIT & IMTEK – Laboratory for Sensors, Georges-Köhler-Allee 105, Freiburg, Germany

dincer@imtek.de

Nucleic acid testing is decisive for the diagnosis of many diseases as well as for the monitoring of their treatment. In recent years, short non-coding RNAs, like microRNAs (miRNAs), have become more and more important as biomarkers in clinical diagnostics. The presence or dysregulation of specific miRNAs in human body fluids can be associated to various diseases, including Alzheimer or various types of cancer [1]. Besides its wide application in gene editing, CRISPR technology features a powerful tool for the highly sensitive and selective quantification of nucleic acids [2,3]. In this talk, the first CRISPR/Cas13a powered electrochemical microfluidic biosensor (CRISPR-Biosensor) for the on-site RNA detection will be presented [4]. The applicability of the CRISPR-Biosensor is successfully demonstrated by gauging two different miRNAs miR-19b and miR-20a, from very low sample volumes. Without any target amplification, CRISPR-Biosensor offers a low-cost, easily scalable and multiplexed approach for nucleic acid-based diagnostics.

References

1 Correia, C.N. *et al.* (2017) Circulating microRNAs as potential biomarkers of infectious disease. *Front. Immunol.* 8, 1–17

2 Gootenberg, J.S. *et al.* (2017) Nucleic acid detection with CRISPR-Cas13a/C2c2. *Science* 356, 438–442

3 Bruch, R. *et al.* (2019) Unamplified gene sensing via Cas9 on graphene. *Nat. Biomed. Eng.* 3, 419–420

4 Bruch, R. *et al.* (2019) CRISPR/Cas13a-Powered Electrochemical Microfluidic Biosensor for Nucleic Acid Amplification-Free miRNA Diagnostics. *Adv. Mater.* 31, 1905311

Figures

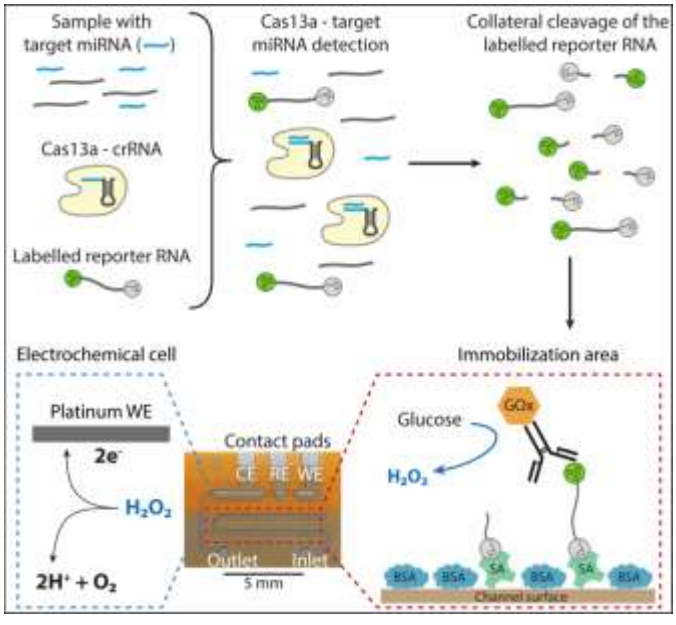

Figure 1. The working principle of the electrochemical CRISPR-Biosensor [4].