Convenient and Rapid Quantification of Therapeutic Biological Drugs in Undiluted Bodily Fluids

Andrea Idili[1],

[1]Chemistry Department, University of Rome, Tor Vergata, Via della Ricerca Scientifica, 00133 Rome, Italy

Andrea.idili@uniroma2.it

Precision medicine - the ability to tailor treatment precisely to each individual patient - would be greatly advanced by the availability of technologies that enable rapid and convenient measurement of drugs and biomarkers at the point of care. Due to their low cost, ease of use and good analytical performance in complex clinical samples, electrochemical aptamer-based (EAB)[1] sensors appear to be a promising means to this end. Therefore, we present here the development of EAB sensors for the measurement of therapeutic monoclonal antibodies,[2] which are biological drugs used for the treatment of various diseases such as cancer or infectious diseases.[2] The sensors use a previously reported DNA aptamer capable of recognizing the selected monoclonal antibody. We incorporated these into the EAB platform by truncating them (causing them to undergo a binding-induced conformational change), modifying them with a redox-reporting methylene blue, and covalently attaching them to an interrogation electrode. We then adapted the system to a scaffold approach, using the aptamer as the recognition element attached to a redox-reporting methylene blue double-stranded DNA scaffold. The resulting sensors can measure the monoclonal antibody directly in biological fluids such as blood within minutes. The speed and convenience with which this is achieved suggests that the developed sensors could significantly improve the ease and frequency with which biological drugs can be monitored during the therapeutic treatment.

References

[1] Schoukroun-Barnes, L. R., Macazo, F. C., Gutierrez, B., Lottermoser, J., Liu, J., & White, R. J. Annual Review of Analytical Chemistry, 9 (2016), 163-181.

[2] Castelli, M. S., McGonigle, P., & Hornby, P. J. Pharmacology research & perspectives, 7(2019), e00535.