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ADDITIVELY MANUFACTURED ELECTROCHEMICAL GENOSENSOR FOR THE DETECTION OF HUMAN MONKEYPOX VIRUS

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Still affected by the recent SARS-CoV-2 virus pandemic, humankind had to deal with the reemergence of the monkeypox virus (MKPV)[1]. It is a zoonotic viral infection caused by MKPV which causes skin lesions, fever, and headache among other symptoms[1,2]. Although it has a low potential of becoming a pandemic, as the transmission of MKPV occurs mainly by direct contact with lesions or biological fluids of infected people or animals, the re-emergence of this virus raised concerns due to the increasing number of cases[2]. Therefore, the present work aims to develop of a 3D-printed electrochemical portable biodevice for the detection of MKPV target DNA. The electrochemical device consists a genosensor specifically designed for the detection a target DNA of MKPV. The capture DNA sequence used to produce the genosensor was amino C6 – AGACAACATAGATTACGGCTT and the target DNA sequence was AAGCCGTAATCTATGTTGTCT. The electrode was manufactured using lab-made ultra-flexible conductive filaments composed of carbon black, recycled PLA from coffee pods, and castor oil as a plasticizer. The sensors created through 3D printing technology exhibited good reproducibility and repeatability of analytical responses. Furthermore, the genosensor demonstrated excellent MKPV detection capabilities, with a linear range from 0.1 to 20.0 µmol L^{-1} for the DNA target, and achieved limits of detection of 29.0 nmol L^{-1}. Interference tests conducted with the biosensor demonstrated their selectivity for MKPV in the presence of cDNA from the SARS-CoV-2 virus and DNA from the Influenza virus. Moreover, analyses of fortified human serum samples showed recoveries close to 100%, confirming the absence of matrix effects for MKPV analysis. Therefore, the 3D-printed device represents a viable and highly promising alternative for on-site, portable, and rapid point-of-care MKPV monitoring.

1Stefano, J.S. et al., Human monkeypox virus: Detection methods and perspectives for diagnostics. TrAC Trends in Analytical Chemistry, 2023.
2Halvaei, P.; Zandi, S.; Zandi, M. Biosensor as a Novel Alternative Approach for Early Diagnosis of Monkeypox Virus. International Journal of Surgery, 2023.

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