ACS SENSORS

pubs.acs.org/acssensors Article

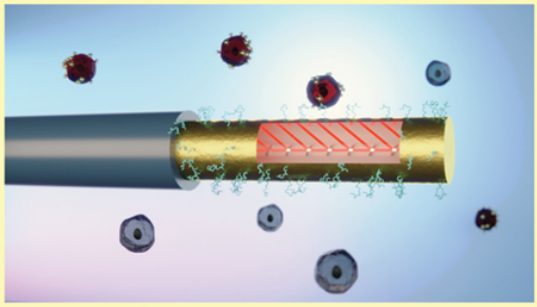
Rapid Detection of Circulating Breast Cancer Cells Using a Multiresonant Optical Fiber Aptasensor with Plasmonic Amplification

Médéric Loyez,* Eman M. Hassan, Maxime Lobry, Fu Liu, Christophe Caucheteur, Ruddy Wattiez, Maria C. DeRosa, William G. Willmore, and Jacques Albert

Cite This: *ACS Sens.* 2020, 5, 454−463 Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: The detection of circulating tumor cells (CTCs), which are responsible for metastasis in several forms of cancer, represents an important goal in oncological diagnosis and treatment. These cells remain extremely challenging to detect, despite numerous previous studies, due to their low concentration (1−10 cells/mL of blood). In this work, an all-fiber plasmonic aptasensor featuring multiple narrowband resonances in the near-infrared wavelength range was developed to detect metastatic breast cancer cells. To this aim, specific aptamers against mammaglobin-A were selected and immobilized as receptors on the sensor surface. In vitro assays confirm that the label-free and real-time detection of cancer cells [limit of detection (LOD) of 49 cells/mL] occurs within 5 min, while the additional use of functionalized gold nanoparticles allows a 2-fold amplification of the biosensor response. Differential measurements on selected optical resonances were used to process the sensor response, and results were confirmed by microscopy. The detection of only 10 cancer cells/mL was achieved with relevant specificity against control cells and with quick response time.



KEYWORDS: *surface plasmon resonance, aptamer, mammaglobin, biomarker, breast cancer cells, biosensing*