Colorimetric point-of-care devices for rapid detection of salivary biomarkers and drugs

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Point-of-care testing (POCT) is drawing increasing attention in the diagnostics market, representing a valuable tool for the early detection and quantification of key biomarkers related to specific pathologies and to increase the chance of successful treatment.[1] The integration of noble metal nanoparticles, like gold (AuNPs), in POC devices strongly increases the stability and sensitivity of the test, enabling the detection of analytes also in non-invasive fluids where their concentrations are typically very low. Moreover, the remarkable plasmonic properties of AuNPs and their simple manipulation allow for a naked-eye readout that is cost-effective and flexible.[2] In particular, exploiting a target-induced morphological change of multibranched AuNPs, we developed a novel strategy aimed at detecting glucose in saliva.[3] The rapid color change associated with the particle shape variation and the successful technological transfer on a solid substrate enabled the realization of a dipstick prototype for the early and non-invasive home testing of hyperglycemia. Extending the same strategy to several targets, we realized a low-cost monolithic paper-based device for the simultaneous detection of three salivary biomarkers (cholesterol, glucose, and lactate), showing excellent selectivity and multiplexing ability.[4] Moreover, taking advantage of the POC technology, we realized two innovative devices for the assessment of anticancer drug contaminations both in occupational environments and in urine samples of healthcare workers, aimed at reducing the risk of the exposure.[5] We developed two lateral-flow assays based on the pharmacological action mechanism of the drugs for the recognition step, avoiding the use of costly antibodies. Particularly, we exploited the intercalation in the dsDNA probe and the competition with folic acid for the detection of doxorubicin and methotrexate, respectively.[6] The highly sensitive strategies were successfully adapted to a real urine sample, without resorting to complex pre-treatment procedures.

References

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Figures

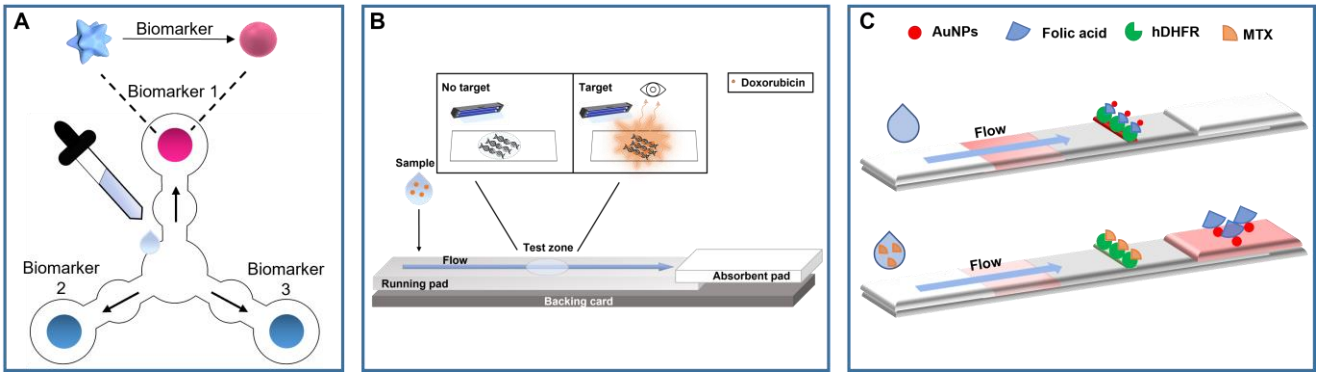

Figure 1: Schematic illustrations of the multiplexed paper-based device for the simultaneous detection of three salivary biomarkers (A), doxorubicin POC device (B), and methotrexate (MTX) lateral flow device.