Rapid, non-invasive, and bi-functional biosensing of salivary oncology markers by chitosan sponge collection on 3D printed platform

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Saliva, containing physiological and pathological biomarkers, can be collected non-invasively and patient-friendly. Aimed for early diagnosis of diseases, salivary biosensors have been widely studied to develop efficient methods of saliva delivery and sensing. However, current tests has had limitations like having low specificity and requiring long time and labor. In this work, a sensor chip is 3D-printed using the biocompatible PLA filaments. Its design enables simple collection and detection. Nontoxic chitosan sponges with high absorbing capacity are used as saliva collectors. Sponges also have possibilities to be modified with additional biochemical groups to enhance functionality. While the sponges deliver saliva sample from the collecting zone, Polyethylene glycol (PEG) hydrogel patterned and gel-framed nanofibers or papers are placed on detection zone of the chip. For identification of biomarkers such as salivary glucose and creatinine levels, enzymatic reactions resulting in color changes would be applied. Furthermore, SERS (Surface-enhanced Raman scattering) techniques may be incorporated for successful measurements of salivary oncology markers.