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Microfluidic Approach for Measurements of pH, O₂, and CO₂ in Saliva

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Abstract:

In this paper, we propose a microfluidic approach for measuring pH, dissolved oxygen (O₂), and carbon dioxide (CO₂) in human saliva. The proposed innovative method combines the advantages of a microfluidic approach, i.e., small amounts of samples and reagents and precise control of the experimental conditions, with rapid measurements of significant parameters of saliva. The novel design of a microfluidic chip with integrated commercially available PreSens sensors was used for examining the effect of Chlorhexidine on artificial saliva (AS), stimulated saliva (SS), and non-stimulated saliva (NSS). The measurement results showed that for persons with an initially low saliva pH, the use of Chlorhexidine increased the pH, and afterward, the pH value returned to the initial value or higher. However, measurements of volunteers with initial pH close to neutral showed that Chlorhexidine reduced the pH value, increasing the risk of erosion and demineralization. In conclusion, the proposed methodology showed potential for precise measurements of pH in saliva samples; however, further research is required to examine the influence of the sample collection method on the amounts of O₂ and CO₂ in saliva.

Keywords: saliva, microfluidics, sensors, pH, oxygen, carbon dioxide