Development of an on-site measurement system for salivary stress-related substances based on microchip capillary electrophoresis technology

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Chemical and biochemical manipulations carried out in integrated microfluidic devices or microchips have attracted considerable interest in analytical chemistry and separation science. The microchip technologies have great potential for future applications in many fields including biochemistry, clinical medicine, healthcare, environmental science and food analysis. Performing capillary electrophoresis (CE) on microchips is a promising technique for on-site determination of biogenic substances, and has a few advantages over conventional immunoassay methods: reduced sample size, shortening analysis times, high separation efficiency, reduced cost, disposability of the microchips and downsizing of analytical system.

Psychological stress is of major importance to all age groups in recent years, and may lead to mental disorder and various diseases. An objective and quantitative method for measuring salivary biomarkers of stress is highly desired because saliva collection is easy, stress free and noninvasive. Based on the microchip technologies and advanced CE separation techniques, we have developed a rapid and easy-to-use analytical tool for the measurement of secretory immunoglobulin A (sIgA) and cortisol, which can contribute to disease prevention and overall good health. At this stage of our research, these stress-related substances in human saliva have been successfully analyzed by microchip-based CE immunoassay method. In the future, microchip technologies will enable total automation and integration of sample preparation. This research has widespread future potential for monitoring multiple stress-related markers within minutes from a trace of saliva.