
Lab-on-Capillary: A Rapid, Simple and Quantitative Genetic Analysis Platform Integrating Nucleic Acid Extraction, Amplification and Detection

Xiaoming Zhou*¹

¹South China Normal University (SCNU) – MOE Key Laboratory of Laser Life Science Institute of Laser Life Science, College of Biophotonics, South China Normal University, Guangzhou 510631, China, China

Abstract

In this work, we describe for the first time a genetic diagnosis platform employing a poly diallyldimethylammonium chloride- (PDDA) modified capillary and a liquid-based thermalization system for rapid, simple and quantitative DNA analysis with minimal user interaction. Positively charged PDDA is modified on the inner surface of the silicon dioxide capillary by using an electrostatic self-assembly approach that allows the negatively charged DNA to be separated from the lysate in less than 20 seconds. The capillary loaded with PCR mix is incorporated in the thermalization system, which can achieve on-site real-time PCR. This system is based on the circulation of pre-heated liquids in the chamber, allowing for high-speed thermalization of the capillary and fast amplification. Multiple targets can be simultaneously analysed with multiplex spatial melting. The current method can achieve DNA extraction, amplification, and detection within 40 min.

Keywords: Capillary, Nucleic Acid Extraction, Nucleic Acid Amplification, Genetic Analysis

*Speaker