



Abstract

Contactless Heating Technology for Lab-on-Chip Microfluidic-Based Nucleic Acid Amplification Testing System [†]

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Abstract: The miniaturisation of manual systems is reported in this paper. The whole system was based on microfluidic cartridge heated up by a unique contactless system. The presented device utilised fully passive cartridge with required reagents.

Keywords: POCT; lab-on-chip; microfluidics



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1. Introduction

Until today, various point-of-care systems (POCTs) for genetic testing have been introduced to the market, with some of them based on a microfluidic approach. Unfortunately, mainly due to the use of laboratory-grade PCR techniques, these systems do not meet several of the WHO's ASSURED criteria for a POCT, which has limited their adoption [1–3]. A technical issue to be solved with such systems is providing a method for detecting nucleic acids (NAs) in a sample which will allow for the rapid detection of NAs, with the system being mobile, exhibiting low energy consumption and being inexpensive to manufacture while allowing for the storage of the cartridges at a room temperature. In order to allow for the widespread adoption of decentralised genetic-based testing while also reducing technical drawbacks of the current systems, we have developed simplified nucleic acid amplification technology (SNAAT®). It is a microfluidic-based NA isothermal amplification system driven by contactless optical heating and temperature detection coupled with fluorescence detection of amplified genetic material on an electrically passive microfluidic cartridge.

2. Materials and Methods

The system consists of 2 components: the analyser and microfluidic cartridge, which are presented in Figure 1. The basis of the heating system is the electromagnetic radiation to thermal conversion happening directly on defined and insulated areas of the cartridge made by injection moulding from cyclic olefin copolymer (COC). Each card contains both liquid and freeze-dried reagents needed in the sample processing from the extraction of NA to the amplification of genetic material in 6 spatially separated chambers on 3 thermally independent areas that enable multiplexing. Additionally, a plurality of valves and pump mechanism for fluid movement is present on the cartridge. The analyser operating the card is a handheld device that, beyond the display, actuators and other control elements, contains the heating and detection elements that utilise 2 heating units with 24 UV LEDs (400 nm) in total, with a temperature detector for each of the heating zones, as well as 6 fluorescence detectors coupled with optical filters. In that way, we can achieve precise

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Microbiological Examination Methods of Food and Water Neusely da Silva, Marta Hirotomi Taniwaki, Valéria Christina Junqueira, Neliane Silveira, Maristela da Silva do Nascimento, Renato Abeilar Romeiro Gomes, 2012-12-18 Microbiological Examination Methods of Food and Water is an illustrated laboratory manual that provides an overview of current standard microbiological culture methods for the examination of food and water adhered to by renowned international organizations such as ISO AOAC APHA FDA and FSIS USDA It includes methods for the enumeration of indicator microorganisms of general contamination indicators of hygiene and sanitary conditions sporeforming spoilage fungi and pathogenic bacteria Every chapter begins with a comprehensive in depth and updated bibliographic reference on the microorganism s dealt with in that particular section of the book The latest facts on the taxonomic position of each group genus or species are given as well as clear guidelines on how to deal with changes in nomenclature on the internet All chapters provide schematic comparisons between the methods presented highlighting the main differences and similarities This allows the user to choose the method that best meets his her needs Moreover each chapter lists validated alternative quick methods which though not described in the book may and can be used for the analysis of the microorganism s dealt with in that particular chapter The didactic setup and the visualization of procedures in step by step schemes allow the user to quickly perceive and execute the procedure intended This compendium will serve as an up to date practical companion for laboratory professionals technicians and research scientists instructors teachers and food and water analysts Alimentary engineering chemistry biotechnology and biology under graduate students specializing in food sciences will also find the book beneficial It is furthermore suited for use as a practical laboratory manual for graduate courses in Food Engineering and Food Microbiology

The British National Bibliography Arthur James Wells, 2005

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