ISSN: 2157-7439
Journal of Nanomedicine & Nanotechnology

OPEN ACCESS Freely available online

Editorial

A Micro/Nano fluidic Chip Platform for High-Throughput Bacterial Detection

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INTRODUCTION

Post-neurosurgical meningitis (PNM) is one of the most serious hospital-acquired infections in the world, and a large number of pathogens, particularly those with multi-resistance genes, are linked to it. Existing methods for detecting bacteria and measuring their antibiotic response are insensitive and unstable, and laboratory-based detection methods are inconvenient, taking at least 24 hours to complete. Rapid identification of bacteria and determination of antibiotic susceptibility are critical in combating the emergence of multi-resistant bacterial strains.

This study evaluated a novel, fast and simple-to-use micro/Nano fluidic chip platform (MNCP) for diagnosing bacterial infections in neurosurgery [1]. Within 1 hour, this platform can identify 10 genus or species targets and 13 genetic resistance determinants. This platform, which is very simple to use, can identify 10 genus or species targets and 13 genetic resistance determinants in 1 hour [2].

The MNCP was used to identify bacteria and genetic resistance determinants in 108 bacterium-containing cerebrospinal fluid (CSF) cultures. The results were compared to those obtained using traditional methods of identification and antimicrobial susceptibility testing [3].

The concordance rate between the MNCP and the conventional identification method was 94.44 percent for the 108 CSF cultures; six species achieved 100 percent consistency. The sensitivity and specificity of the MNCP tests for the production of carbapenemase- and extended-spectrum beta-lactamase (ESBL)-related antibiotic resistance genes were both high and could fully meet the requirements of clinical diagnosis [4].

Post-neurosurgical meningitis (PNM) is one of the most serious hospital-acquired infections (HAI) in the world with long hospital stays, long-term disability, and unnecessary deaths, as well as high costs for patients and their families. Meningitis caused by bacteria, particularly when acquired in the hospital, can increase crude mortality rates by up to 30% when compared to match case controls. As a result, the most important intervention in the effective treatment of PNM is prompt and accurate antibiotic therapy [5].

Traditional PNM diagnostic processes typically begin with bacterial enrichment, followed by the transfer of a small amount of bacterial culture into a solid medium to obtain a single colony. Traditional PNM diagnostic processes typically begin with bacterial enrichment, followed by the transfer of a small amount of bacterial culture into a solid medium to obtain a single colony [6].

A number of colonies are chosen for identification by biochemical reaction or matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI- TOF MS) approximately 16–24 h later. The entire procedure takes a long time (48–72 hours), which may impede the timely diagnosis and treatment of critically ill patients [7]. If a quick and easy molecular detection method could be developed. In clinical laboratories, several new approaches to rapid identification of bacteria from culture broth, such as PCR and next-generation sequencing, have been used (NGS). However, each approach has its own set of flaws: PCR has fewer testing targets and cannot identify multiple pathogens and drug resistance genes, which may occur in bacterial meningitis. NGS, on the other hand, has high throughput but is an expensive, complex, and time-consuming operation that is not suitable for routine clinical use [8].

As a result, a simple, rapid, and high-throughput method for identifying pathogens and antibiotic resistance genes is desperately needed in the clinical microbiology laboratory.

The recent advancement of microfluidic chip technology has enabled the rapid detection of pathogens, as well as demonstrated. As a result, a simple, rapid, and high-throughput method for identifying pathogens and antibiotic resistance genes is desperately needed in the clinical microbiology laboratory [9].

The recent advancement of microfluidic chip technology has enabled the rapid detection of pathogens while also demonstrating high sensitivity and specificity there are currently few reports describing the use of microfluidic chip technology in the clinical diagnosis of PNM. Based on a spin-disk microfluidic chip, the

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Received: 3-Mar-2022, Manuscript No: jnmnt-22-15818, **Editor assigned:** 6-Mar-2022, PreQC No: jnmnt-22-15818 (PQ), **Reviewed:** 11-Mar-2022, QC No: jnmnt-22-15818, **Revised:** 17-Mar-2022, Manuscript No: jnmnt-22-15818 (R), **Published:** 25-Mar-2022, DOI: 10.35248/2157-7439.22.13.607.

Citation: Bisnow S (2022) A Micro/Nano fluidic Chip Platform for High-Throughput Bacterial Detection. J Nanomed Nanotech. 13: 607.

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authors' group created an easy-to-use multiplex loop-mediated isothermal amplification (LAMP) chip for the high-throughput detection of bacteria that cause PNM, as well as their antibiotic resistance genes [10].

Acknowledgement

None

Conflict of Interest

None

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