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Evolving Blood Culture Techniques for the Separation of Blood Pathogens at Clinical Microbiology Laboratories

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Review Article

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ABSTRACT

Bloodstream infections (BSIs) are substantial cause of morbidity and mortality in patients. Around 20 million cases of severe sepsis rise each year globally. Firm and precise identification of the etiologic pathogen is vital to be able to initiate pathogen specific antibiotic therapy and reduce mortality rates, and for reducing length of hospital prices. These identification methods are applied on several emerging blood culture procedures. This review presented the currently available technologies and different approaches of predictable laboratory diagnostic steps for blood stream infection. Based on their ability these techniques can be physical, semi-automated or wholly automated. Making an allowance for the importance of blood cultures in diagnosis and organization of bloodstream infections, it is judicious and relevant to understand the principles, technical requirements and limitations of these technologies. At the present time, there are numerous evolving blood culture techniques for the diagnosis of blood stream infections and drug vulnerability testing. These systems depend on several detection principles and cultural environments to identify microbes.

INTRODUCTION

Bloodstream infections are significant source of morbidity and mortality in patients. Around 20 million cases of severe sepsis rise each year globally [1-4]. In the USA, septicaemia was constantly arisen in the top 10 sources of death, accounting for 35,587 deaths in 2009 alone. In an Australia hospital, death for patients presenting with septic tremor ranges from 23.1-27.6%. Blood culture systems that exploit the recovery of pathogens are imperative in the investigation of septicemic patients to confirm the timely delivery of suitable antimicrobials [5-8]. Blood culture is clearly the most significant diagnostic process for recognizing microorganisms tangled in bloodstream infections. Ideally, blood samples ought to be taken immediately previously to the start of empirical antimicrobial treatment. However, the blood culture is slow and inadequately sensitive when the patient has previously received antibiotics or in the presence of slow-growing or intracellular microorganisms [9-13]. The strains which display α and β-haemolysis have exotoxins that may show harmful effects within body as demonstrated by their breakdown of erythrocytes in blood agar medium [14-19].

Society and Journals

The purpose of Open access journals is to spread information and permit that information to be designed upon. It has substantial positive impact on everything from education to apply of medication to the

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flexibility of entrepreneurs to initiate. It provides access to everyone and so scholars universally can find and use research work with ease [20-23].

In order to promote consciousness among the people, physicians and research experts unite to form a society or an organization. The main intention of these societies is to counsel and promote awareness regarding separation of blood Pathogens at clinical microbiology laboratories. hellenic society for microbiology: The Society was established on 13th September 1932 under the name: "Hellenic Microbiological and Hygiene Union". After a connect modifications of its statute in 1936 and 1947 in the third modification on 18th July 1972 it performs as "Hellenic Microbiological Society. Taiwan Society of Microbiology established 1990 November sixth Republic of Taiwan [24-29]. It would be known as the Taiwan Society for Microbiology. This will be reached at home and abroad, trade of exploration experience, enhance microbiological measures, the advancement of scholarly innovative work for the reason. The venue will be situated at the seat of the capital of the Republic of China [30-36].

Open Access literature plays a key part in proving the information and current researches across the sphere [37-40]. Journal of Pharmaceutical Microbiology intends to bring out the most complete and reliable cause of information on the detections and existing developments in the mode of original articles, review articles, case reports, short communications, etc. in all ranges of the field of general Surgery and making them freely accessible through online without any restrictions or any other contributions to researchers globally [41-45]. Research & Reviews: Journal of Microbiology and Biotechnology is a peer reviewed, International quarterly journal that makes significant contributions in this field, encompassing vast areas of Microbiology and Biotechnology such as Microbial Ecology and Diversity, Molecular Biology and Microbial Cell Biology. Medical Mycology: Open Access This peer reviewed journal would like to establish as a reliable scientific information resource with the sole objective of fulfilling the global requirement of the academicians, researchers and scientists [46-49]. All relevant topics in the arena of medical mycology encompassing various novel compound extractions from fungal sources, use of different drugs such as ciclosporin, penicillin, statins, cephalosporin, ergometrine etc., novel application of fungal biochemical and microbiological tests for pharmaceutical purposes, studies in mycotoxicology are welcome [50-54].

Presentation at conferences, symposiums, workshops also produces a better acquaintance to health information and progressive technologies that are being created in the current generation [55-59]. 7th Euro Clinical Microbiology and Mycotoxins which is going to be held in February 27-28, 2017 Amsterdam, Netherlands in which renowned speakers like Silvia Gratz; Marie-Caroline Smith; Irene Grant are going to participate. 7th Euro Global Summit on Clinical Microbiology which is going to be held in February 27-28, 2017 Amsterdam, Netherlands in which renowned speakers like Ratana Lawung; Charlene Kahler and Segundo Mesa Castillo are going to participate. International Conference On Microbial Engineering which is going to be held in May 29-31, 2017 Beijing, China in which the congress is expecting audience such as experts from genetic engineering, Food technology, Biofuels, and experts from academics as well as industrial microbiology [56-63].

Emerging Blood Culture Techniques

Nowadays, there are various emerging blood culture techniques for the diagnosis of blood stream infections and drug susceptibility testing [64-70]. These involve starting from manual methods, semi-automated and more sophisticated fully automated methods. Among these are API, BBL systems, BACTEC systems, VITEK systems, BacT/Alert, BacT/ Alert 3D, Versa TREK system, etc. These systems rely on a variety of detection principles and cultural environments to detect microorganisms [71-76]. Many systems and their respective media have been compared, each system having its own limitations and advantages. Fully automated continuous monitoring systems are simple to use in comparison with manual and semi-automated systems [77-83].

Biochemical Identification Methods

The API identification systems consist of series of micro cupules on a plastic strip that contain dehydrated substrates for the demonstration of enzymatic activity or the fermentation of carbohydrates [84-89]. Depending on type of the organism and the API strip utilized, it may or may not require microbial growth. API systems are manual and do not incorporate antimicrobial susceptibility testing. The biochemical identification system tests are based on the biological activities of bacteria in using different substrates and release a certain product [90-95]. The most commonly known biochemical tests are the BBL Crystal identification system, API identification systems and BBL Phoenix identification and Susceptibility System.

BBL crystal identification system

BBL Crystal system is a miniaturized bacterial identification method employing modified conventional and chromogenic substrates [96-99]. There are two products currently available: the Rapid Stool/Enteric ID Kit (RS/E kit) and the Enteric/Nonfermenter ID Kit (E/NF kit). Each is based on modified conventional and chromogenic

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substrates contained within a novel plate. Each kit comprises thirty tests, a plastic base containing reaction wells to which, following inoculation, is clipped a lid with dehydrated substrates on the tips of plastic prongs [100-102].

BBL crystal enteric/non-fermenter system

The BBL Crystal Enteric/ Nonfermenter System was used to test 25 archived isolates of Yersinia pestis to obtain a unique biochemical profile code for Y. pestis . Twenty-five isolates of Y. pestis from the archived collection at the Centers for Disease Control and Prevention were chosen to represent geographical and host diversity. The biochemical diversity of these isolates was determined with the API 20E system.

BBL crystal anaerobe (ANR)

BBL crystal anaerobe identification system is a miniaturized 4 hrs identification method employing modified conventional, fluorogenic, and chromogenic substrates to identify anaerobic bacteria from clinical specimens without the need for anaerobic incubation. The BBL Crystal ANR ID kit consists of 20 panel lids, 20 bases and 20 tubes of inoculum fluid. Many of the tests used in this system are modifications of classical methods and include tests for fermentation, oxidation, and degradation or hydrolysis of various substrates. In addition, this system uses chromogenic and fluorochrome-linked substrates to detect preformed metabolic enzymes. The system correctly identified all tested strains of Campylobacter, Desulfomonas, Leptotrichia, Mobiluncus, Peptostreptococcus, Porphyromonas [103-106] .

BBL crystal neisseria/haemophilus

The BBL crystal neisseria/ haemophilus (N/H) identification system is a miniaturized 4 hrs identification method employing modified conventional, fluorogenic, and chromogenic substrates. It is important for the identification of Neisseria, Haemophilus, Moraxella, Gardnerella vaginalis, as well as other fastidious bacteria

CONCLUSION

Blood culture systems and practices that maximize the recovery of pathogens are imperative in the investigation of septicemic patients to ensure the timely delivery of appropriate antimicrobials. The detection and identification of bacteria from the blood of patients is one of the most important roles of the clinical microbiology laboratory. The automated methods like BACTEC and VITAK 2 generally give better result, reduced error and minimum turnaround time. They provide rapid result and help in the reduction of disease mortality, morbidity and reduction of drug resistance bacterial strain development. In our country Ethiopia, these automated machines rarely found. The BACTEC system, MGIT and API are found in EPHI and in some regional and specialized private laboratories.

Generally, from our article review on emerging blood culture techniques, these techniques are rarely known and used. We thereby would like to recommend some points to laboratory professionals, the concerned bodies and other stakeholders to apply and practice these sophisticated technologies in our country to improve the laboratory service in identifying and testing susceptibility to drugs for various microorganisms. The government also should allocate appropriate budget to laboratory service provider institutions for machines, reagents and maintenance equally with other sectors to function properly. The short turnaround times of these techniques are very important for prompt, appropriate treatment of bloodstream infections. Therefore, investing on these techniques is unquestionable for better vision and to build healthy community. Finally, it is better we professionals focus both in theoretical and practical areas of these emerging blood culture techniques as well as teaching schools.[107-109].

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