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Why Do We Need to Newest Techniques in Medical Microbiology?

Babak Vazirianzadeh [1*], Ali Zarei Mahmoudabadi [2]

[1] Department of Medical Entomology and Infectious and Tropical Diseases Research Centre, Ahvaz Jundishaur University of Medical Sciences, Ahvaz, IR Iran

[2] Department of Medical Mycology, School of Medicine, and Infectious and Tropical Diseases Research Centre, Jundishapur University of Medical Sciences, Ahvaz, IR Iran

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1. Introuduction

In this article we follow the history of Microbiology and the required techniques at each stage. Microbiology is a multidisciplinary science of microorganisms including: protozoans, algae, molds and microscopic fungi, bacteria, rickettsiae, mycoplasmae and viruses. The history of this science was referred to thousands years ago. That time the man was unaware of the existence of microorganisms, however used microbes widely to prepare fermented-milk and many other food products (1). The prefix of microbe is generally referred to object sufficiently small that a microscope is required for detecting. This visualization was first documented by Anton van Leeuwenhoek of bacteria by using finely ground lenses. He examined dental plaque, plant infusions, and food procedure with the aid of microscopes he had developed. It was happened in the 17th century (1, 2).

The next step was regarded to the works of Pasteur the creator of microbiology. He elucidated the role of microorganisms in fermentation and in the origin of animal and human diseases. His experiences were also involved in preventive vaccination method using injecting the subject with diluted cultures of pathogenic microorganisms. His works served as the scientific basis for the sterilization of surgical instruments and dressings, for canned goods manufacture, for the pasteurization of food products and controlling infectious diseases special viral diseases such as rabies (1866-1886) (1, 2). Parallel to Pasteur' works, he was R. Koch who proposed solid nutrient media to culture and isolate microorganisms such as *Bacillus anthracis* (1877), the *Tuberculosis bacillus* (1882) and *Vibrio cholerae* (1883).

Pasteur's ideas were developed further by S. N. Vinogradskii and his students in the terms of discovering chemoautotrophic microorganisms, cellulose-decomposing and methane-forming bacteria in Russia (1891 - 1912) (3, 4). The other contributors of microbiology were Beyerinck (1922), Kluyver (1936), van Kiel (1936) who studied the ecology, physiology, and biochemistry of various groups of microorganisms. Koch after Pasteur was the founder of Medical microbiology; however, their works were promoted by Behring (1894), Roux (1899), Kitasato (1889)

* *Corresponding author:* Babak Vazirianzadeh, Department of Medical Entomology and Infectious and Tropical Diseases Research Centre, Ahvaz Jundishaur University of Medical Sciences, Ahvaz, IR Iran. Tel: +98-9163095110, Fax:+98-6113738282, *E-mail:*babakvazir@yahoo.co.uk

and Metchnikoff (1908) in regards medical microbiology and immunology (2-4). Many individuals which are mentioned above have made significant contributions to the development of microbiology. Consequently, the content, scope, and problems of general microbiology have gradually changed and different branches of microbiology have derived, which were included Industrial microbiology, Agricultural microbiology, Geological microbiology and medical microbiology (4).

2. Medical Microbiology and New Techniques

Each of microbiology branches has had its individual requirements to be developed and applied. Medical microbiology is the study of the microorganisms that cause disease in man and the development of effective methods of controlling them (1, 2). Human error, poor laboratory techniques and misuse of equipment cause the majority of laboratory injuries and work-related infections (5). Therefore, to avoid the above mentioned inconvenience, it was needed applying safe techniques in medical microbiology regarding diagnose the diseases. However, safety was not the only requirement of a good technique in medical microbiology. The other requirements looked for the methods with more accuracy, when the culture and enzyme immunoassays methods had reached the limit of their sensitivity and specificity (6). The new method which uses genetic material with a range of molecular tools in the laboratory is molecular technology. It allows highly sensitive and specific, culture-independent detection of infectious agents in clinical specimens, which meets the requirements of a good technology in medical microbiology (6).

The polymerase chain reaction (PCR) which has been created by Dr. Kary Mullis in 1983 is in front of the molecular technology. It has provided new opportunities including more efficiently affect within a suitable time frame when the detection of pathogens is difficult to cultivate, or are slow growing or unculturable, regarding patient care in clinical laboratory (6). PCR application is included several steps to be achieved. There are a number of modifications and different processes during one completed round of PCR. These are particularly viewed in the step of amplification the genetic materials including DNA or RNA. However, the other steps such as designing the primers, extraction of organism DNA/RNA, purified DNA/RNA, reaction mix components and thermocycling (denaturation, annealing and primer extension) are involved with complicated techniques, chemicals and tolls. During the processes the thermal and buffering conditions should be optimal to achieve the accurate results. Consequently, there might be several modifications in each used tolls or techniques based on our basic aims to do a PCR. This pushes the original PCR application creating new methods such as: Quantitative PCR, Real Time PCR, Nested PCR, Multiplex PCR and Reverse transcription PCR with new and particular terms and conditions which opens new windows to make accurate clinical interpretation for specific medical cases (6).

Here, only PCR is considered as a new technique in medical microbiology. There are several molecular techniques other than PCR which are involved with molecular technology such as: Expression cloning, Gel electrophoresis, Macromolecule blotting and probing, southern blotting, Northern blotting, Western blots, Eastern blotting, arrays, Allele Specific Oligonucleotide and Antiquated technologies (7). The present variety techniques and tolls in molecular biology which have been applied in medical microbiology according to different protocols to distinguish the problems in clinical microbiology cases express this subject: the more techniques, the more accuracy in diagnosing the diseases. There is a very apparent example to make sense using the newest techniques in medical microbiology. About 11 years ago, 20,000 protein coding genes in our genome was expected by scientists and expected 100,000 on a par with the fruit fly. However, the number of sunburnt microorganisms which live in our nasal cavity, the oral cavity, the gastrointestinal tract, the skin, and the genitourinary tract and play vital roles in our function are counted the current discrepancy between the anticipated and the actual number of genes can be explained. It means the total number of genes is closer to the 100,000. This reveals that identifying these micro populations is crucial in human health and disease. The accurate identifying these micro populations needs to new molecules and modern tolls and technology (8).

However, these methods should be moved toward creating the most cost effective techniques in which the insurance companies accept to pay back the subsides to the patients.

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