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Commentary

Impotence of Molecular Diagnostics in the Diagnosis of Infectious Diseases

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DESCRIPTION

Molecular techniques now play a significant role in the diagnosis of common infections observed in ambulatory practice and are no longer restricted to specialized centers. PCR has emerged as the standard technique, particularly for the detection of pathogens that are challenging to cultivate, like viruses. Although it has taken the role of conventional procedures in some situations, PCR is not always appropriate and has its limitations [1]. To be able to prescribe molecular approaches logically, one must understand when to utilize them as well as what their advantages and disadvantages are. The characteristics of molecular tests and their primary uses in outpatient care are reviewed in this article.

The main methods used in the laboratory diagnosis of infectious disorders include the direct detection of the microbe by microscopy or by characterization of its molecular structures (proteins or nucleic acids), as well as the evaluation of humoral immune response [2,3]. Even though antibodies and antigens are molecular structures, the goal of molecular diagnostics is to find and examine an organism's DNA. The earliest DNA analysis techniques date back to the 1970s, but Polymerase Chain Reaction (PCR) technology didn't emerge until the middle of the 1980s. Immediately after, the ability to amplify DNA and RNA (Ribonucleic Acid) was used for the detection of pathogens, and thirty years later, PCR was regarded as a key technique of the microbiology laboratory [4].

Similar to antigen detection, molecular approaches enable illness diagnosis during the acute stage, before the formation of antibodies [5]. To find out whether there are antibodies in the serum, however, a few days or perhaps a few weeks are needed. A positive PCR in the acute phase typically shows an infection, although a negative serology must be repeated within an appropriate window of time to show seroconversion.

Medical microbiology has been transformed by molecular approaches, particularly for the diagnosis of viral illnesses, by enabling the detection of organisms that are difficult or impossible to cultivate. Indeed, virus cultivation can take many weeks and calls for immortalized human or animal cell lines. It is becoming less and less common and has mostly been superseded by PCR, which has also substituted serology for numerous reasons, including shingles, varicella zoster infection, and acute herpes. Unlike viruses, bacteria and fungal cultures have not been displaced by molecular methods. However, the development of particular PCRs has also improved and made it easier to detect some slow-growing bacteria (such as Chlamydia and mycobacteria) that require highly specialized culture conditions. For several parasitic illnesses, such as toxoplasmosis, leishmaniasis, amebiasis, or malaria, PCR detection is available. Traditional approaches (such as microscopy or serology) are still frequently utilized to study these disorders.

Modern molecular techniques can offer quantitative indications in addition to simple detection, for instance to track changes in HIV viral load or hepatitis C during therapy and identify the emergence of resistant strains. The diagnosis of latent virus reactivations, such as polyomavirus BK or CMV (cytomegalovirus), in immunocompromised patients can also benefit from this measurement [6].

Although PCR was invented before DNA sequencing, it is the foundation of all current techniques. Ribosomal DNA sequencing is used most frequently in microbiology for the detection and identification of bacteria. Identification is made possible even when the bacterium is not or more because to the sequence of this gene being distinctive to a species or a family. Another use of sequencing is to find mutations brought on by drug resistance; this is done, for instance, to characterize HIV.

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