Nucleic acid testing applications in molecular diagnostics.

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Abstract

In order to create diagnostic applications for the cutting-edge method polymerase chain reaction, Roche and Cetus engaged into an agreement in 1989. Genes and pathogen genomes have been utilised to diagnosis disease since a new field of molecular diagnostics emerged. Automated laboratory platforms were developed to expedite the procedure and enable accurate and precise processing of patient blood samples. The use of nucleic acids in molecular diagnostics and its application to significant human diseases will be discussed in this chapter. Examples of nucleic acid markers that have had a significant clinical influence on healthcare are reviewed.

Keywords: Nucleic acid testing, Molecular diagnostics, Nucleic acid amplification, Molecular diagnostics.

Introduction

NAT and NAAT are common abbreviations for nucleic acid amplification and nucleic acid testing diagnosis. It is a process that involves enlarging genetic material, such as DNA or RNA, and identifying it for diagnosis. RNA or DNA makes up the genetic material of all living things, however genome sequences vary. NAT is a perfect method for diagnosing infectious infections, cancer, genetic abnormalities, and mitochondrial disorders because of this genetic variety. Numerous viral and chronic diseases could be treated with a molecular diagnostic tool. Nearly all NAT for infectious diseases is carried out in centralised laboratories with state-of-the-art equipment and qualified workers. However, POC is defined as near-patient testing performed at a clinic, hospital, doctor's office, or patient's home (point of care). There is a unique complement of DNA or RNA in every microorganism. Numerous viral pathogens can be identified with the help of the optimal molecular fingerprint, which is a sequence of nucleic acids. The amount of microbial double-stranded DNA in clinical samples is examined using RT-PCR and PCR. Other single-stranded detection techniques need higher concentrations, or they are difficult or cumbersome to use. The cost of molecular diagnostics may be higher than that of other laboratory methods. Only those molecular diagnostics that locate infections in human serum using shed surface proteins or antibodies. However, based molecular testing has a number of benefits over more conventional techniques due to its speed, sensitivity, and specificity [1-3]. The ability to detect infections has significantly improved since nucleic acid testing was implemented in clinical laboratories. With the right tests on hand, a chronic viral infection can be treated. These tests can tell the doctor whether the patient is responding, building resistance, or getting better. Nucleic acid testing for blood-borne infections significantly increased the safety of the blood supply on a global scale. The hereditary risks of pregnancy and the inherited illnesses that a developing foetus or a newborn may be treated can be explained to expectant parents. Finally, today's cancer patients can benefit from a much more customised approach to therapy, which maximises effectiveness and efficiency while lowering costs for both the patient and the healthcare system [4,5].

The revelation of infections has significantly improved since NAT was used in clinical laboratories. With the right tests at hand, a viral infection can be treated if the patient is responding or gaining resistance. There has been an increase in the use of commercial molecular tests during the past ten years. In 2013, five top healthcare businesses sold more than 70% of the tests used in molecular diagnostics. Nevertheless, the number of businesses creating molecular testing has significantly increased recently. Approximately 300 firms actively contribute to the development of molecular diagnostics in the healthcare sector. These businesses emphasise the value and significance of nucleic acid testing.

Conclusion

It is probable that NAT will eventually enter markets in emerging and developing nations. It is not unexpected that molecular testing is widely used in global healthcare and is accessible. Manufacturing nucleic acid testing and adapting technologies and platforms, particularly in environments with constrained resources, are difficult. Time to test findings and assay equipment complexity may both decrease in molecular testing in the future. Additionally, molecular testing will decrease the quantity and level of staff competence needed to carry out such assays.

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