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Review Article

The Contribution of Rapid Diagnostic Tests in Infectious Diseases: Towards Early and Accessible Diagnosis

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Abstract: According to the WHO, rapid diagnostic tests are reliable, simple, economical, and easy to interpret. They remain stable even under extreme conditions, require little or no pre-treatment, and require a small volume of biological samples. Their evaluation focuses on the classic characteristics of any biological test: accuracy, reproducibility, diagnostic values, clinical utility, applicability, and cost. These tests offer the advantage of providing rapid results, facilitating early microbiological diagnosis and appropriate patient management. However, their sensitivity is often lower than that of reference methods, which is one of their main limitations.

Keywords: Application, Infectious Diseases, Sensitivity, Specificity, RDT.

INTRODUCTION

For several years, RDTs have established themselves as essential tools in the fight against infectious diseases, thanks to their ability to provide rapid, simple, and inexpensive diagnosis. The World Health Organization (WHO) has defined the "ASSURED" criteria that a good rapid test must meet: Affordable, Sensitive, Specific, User-friendly, Rapid, and Robust, without equipment and deliverable to the greatest number of people [1]. Recent pandemics, particularly COVID-19, have reinforced the importance of RDTs for large-scale, rapid, and accessible diagnosis [4].

Principles and performance of RDTs

Most RDTs are based on immunochromatography [2]. Their principle is based on antigen-antibody interaction revealed by a visible colored band. They enable the detection of bacterial, viral, parasitic, or fungal infections without sophisticated equipment. The performance of RDTs is measured by their sensitivity (probability of detecting a true positive) and specificity (probability of excluding a false positive) [3]. The prevalence of the disease in the population also influences the predictive value of the tests. The Fagan nomogram can be used to help interpret the results according to the pre-test probability [3].

Applications of RDTs in Infectious Diseases

In Parasitology:

Malaria is the parasitic disease for which RDTs are most widely used. The HRP2 antigen detection test is the most commonly used, with sensitivities reaching 98% in some contexts [4]. However, deletions of the HRP2 gene have been reported, limiting their effectiveness [7]. Lymphatic filariasis [8], visceral leishmaniasis [8], and Chagas disease [9], also benefit from RDTs, which enable community screening campaigns.

In Medical Mycology:

Rapid diagnosis of cryptococcosis using CrAg LFA (IMMY) has transformed the management of HIV patients [3]. The introduction of these tests has significantly reduced mortality [10]. Invasive aspergillosis now benefits from RDTs that detect galactomannan in serum or bronchoalveolar lavage [5]. Candidiasis can be rapidly diagnosed using validated immunochromatographic tests.

In Virology:

Acute respiratory infections, particularly influenza [6], and RSV infections [11], benefit greatly from RDTs. - In gastroenterology, RDTs for rotavirus, norovirus, or adenovirus [12], enable rapid diagnosis in pediatrics. - Arboviruses such as dengue rely on RDTs targeting the NS1 antigen or specific IgM/IgG [2-13].

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In Bacteriology:

RDTs can detect antigens from Streptococcus pneumoniae [14], Legionella pneumophila [15], and Shigella and Vibrio cholerae [16]. They enable early guidance on antibiotic therapy and help avoid inappropriate treatments [17].

Limitations and Prospects

The performance of RDTs can be affected by factors such as antigenic variability of pathogens or environmental conditions [18]. The development of molecular RDTs (GeneXpert®, Abbott ID NOW®) now allows direct detection of nucleic acids in a matter of minutes [19]. Future innovations include multiplex tests and digital biosensors [20].

CONCLUSION

Point-of-care tests play a key role in the rapid detection of infections, improving patient care and epidemic management. Their development must be accompanied by rigorous evaluation to ensure their effective integration into public health strategies.

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