Journal of Clinical Microbiology and Antimicrobials

OPEN ACCESS Freely available online

Short Communication

Innovations in Diagnostic Tools for Early Detection of Anaplasmosis

Rosan Yazir*

Department of Microbiology, California State University, Fresno, USA

DESCRIPTION

Anaplasmosis is a tick-borne disease caused by the bacterium *Anaplasma phagocytophilum*, which primarily infects white blood cells, leading to fever, fatigue, and other systemic symptoms. The disease is transmitted by tick species such as *Ixodes scapularis* (black-legged tick) and it is a growing concern in areas where tick populations are expanding. Early detection of anaplasmosis is important to prevent severe complications and initiate timely treatment. Traditionally, diagnosis has been challenging due to the nonspecific symptoms and the difficulties in detecting the bacterium during the early stages of infection. However, recent innovations in diagnostic tools have provided more efficient and accurate means of identifying anaplasmosis at its onset. This study discusses about the advancements in diagnostic methods and their impact on the early detection of anaplasmosis.

Challenges in diagnosing anaplasmosis

The diagnosis of anaplasmosis can be challenging because the clinical symptoms overlap with many other common illnesses, such as viral infections, Lyme disease and other tick-borne illnesses. Symptoms such as fever, chills, headache, muscle aches and fatigue are often seen in the early stages of the disease. This makes it difficult for clinicians to distinguish anaplasmosis from other conditions without laboratory confirmation [1]. Additionally, because *Anaplasma phagocytophilum* infects white blood cells, it can be present in low numbers in the bloodstream, especially in the early stages of infection. Traditional diagnostic methods like microscopy of blood smears often fail to detect the pathogen when its concentration is low [2]. This necessitates the use of more advanced diagnostic tools to enhance the sensitivity and accuracy of early detection. The early detection of anaplasmosis is important for preventing complications and initiating timely treatment. Traditional diagnostic methods have limitations in sensitivity, especially in the early stages of infection. However, innovations such as PCR testing, serological assays, next-generation sequencing, immunohistochemistry and point-of-care diagnostics have significantly improved the ability to diagnose the disease at its onset [3]. These advancements in diagnostic tools are enabling faster, more accurate identification of *Anaplasma phagocytophilum* and helping to guide appropriate treatment strategies. As these technologies continue to evolve, people can expect even more efficient and accessible diagnostic solutions for anaplasmosis, which will ultimately improve patient outcomes and reduce the burden of this tick-borne disease [4]. Early diagnosis and appropriate intervention are key to managing anaplasmosis, and continued innovation in diagnostic techniques will play a central role in combating the spread of this infectious disease [5].

Innovations in diagnostic tools

Recent advances in diagnostic tools for early detection of anaplasmosis have significantly improved the ability to identify the disease at its onset. These innovations involve molecular techniques, serological tests, and more sensitive imaging technologies [6]. Polymerase Chain Reaction (PCR) testing is one of the most significant innovations in the early detection of anaplasmosis. PCR allows for the amplification of specific DNA sequences of *Anaplasma phagocytophilum*, making it possible to detect the pathogen even in low concentrations in blood samples. PCR-based tests are highly sensitive and can detect *Anaplasma* DNA at early stages of infection, even before the body has developed detectable levels of antibodies. This makes PCR an ideal tool for diagnosing anaplasmosis in the acute phase [7]. The use of PCR allows clinicians to target specific genetic markers unique to *Anaplasma phagocytophilum*, reducing the risk of false positives and providing accurate identification of the pathogen. Advances in real-time PCR technologies allow for faster results, reducing the time required for diagnosis and enabling prompt treatment decisions [8]. This technology also permits quantitative analysis, which can provide insights into the severity of infection. While PCR detects the pathogen directly, serological tests identify the body's immune response to the infection, namely the presence of antibodies produced in response to *Anaplasma* infection. These tests are valuable for diagnosing anaplasmosis when the infection has progressed to the point where the immune system has generated antibodies but the pathogen is no longer present in the blood at detectable levels [9]. . ELISA (Enzyme-Linked Immunosorbent Assay) tests are widely used to detect specific antibodies against *Anaplasma phagocytophilum*. These tests are relatively easy to perform and are used to confirm the diagnosis in patients who have been

Correspondence to: Rosan Yazir, Department of Microbiology, California State University, Fresno, USA, E-mail: rosanazir@csu.org

Received: 23-Aug-2024, Manuscript No. JCMA-24-35601; **Editor assigned:** 26-Aug-2024, PreQC No. JCMA-24-35601 (PQ); **Reviewed:** 09-Sep-2024, QC No. JCMA-24-35601; **Revised:** 16-Sep-2024, Manuscript No. JCMA-24-35601 (R); **Published:** 24-Sep-2024, DOI: 10.35248/ JCMA. 24.8.199

Citation: Yazir R (2024). Innovations in Diagnostic Tools for Early Detection of Anaplasmosis. J Clin Microbiol Antimicrob. 8:199.

symptomatic for a longer period. Serological assays typically measure IgM (acute phase) and IgG (later phase) antibodies [10]. A positive IgM test indicates an early infection, while an IgG-positive result suggests past exposure. The timing of testing is important to accurately interpret serological results. One limitation of serological testing is that it may not be useful in the early stages of infection, as antibodies take time to develop. However, when used in conjunction with PCR, serological tests can help confirm the diagnosis and monitor disease progression. Point-of-Care (POC) diagnostics are gaining popularity for their ability to provide rapid, on-site testing. Several POC tests for anaplasmosis are in development or use, with the goal of providing faster results, especially in areas where access to laboratories is limited. Lateral flow tests, such as rapid antigen or antibody tests, are simple to use and can deliver results within 15–30 min. These tests are particularly useful for initial screening in resource-limited settings or during field investigations. Miniaturized PCR devices are also being developed for use in remote or rural areas, allowing for quick molecular testing without the need for a full laboratory setup

REFERENCES

1. Aubry P, Geale DW. A review of bovine anaplasmosis. Transbound Emerg Dis. 2011;58(1):1-30.
2. Liu LH, Wang NY, Wu AY, Lin CC, Lee CM, Liu CP. *Citrobacter freundii* bacteremia: Risk factors of mortality and prevalence of resistance genes. J Microbiol Immunol Infect. 2018; 51(4):565-572.
3. Oliver L, Lavoute C, Giorgi R, Salaun E, Hubert S, Casalta JP, et al. Infective endocarditis in octogenarians. Heart. 2017;103(20): 1602-1609.
4. Armbruster CE, Mobley HL, Pearson MM. Pathogenesis of *Proteus mirabilis* infection. EcoSal Plus. 2018; 8(1).
5. Davis JA, Jackson CR, Fedorka-Cray PJ, Barrett JB, Brousse JH, Gustafson J, et al. Carriage of methicillin-resistant *Staphylococci* by healthy companion animals in the US. Lett Appl Microbiol. 2014; 59(1):1-8.
6. Tome AM, Filipe A. Quinolones. Drug Saf. 2011; 34(6):465-488.
7. Bowen WH, Burne RA, Wu H, Koo H. Oral biofilms: Pathogens, matrix, and polymicrobial interactions in microenvironments. Trends Microbiol. 2018 ; 26(3): 229-42.
8. Bauer AW. Antibiotic susceptibility testing by a standardized single disc method. Am J clin pathol. 1966; 45:149-158.
9. Duron O, Koual R, Musset L, Buysse M, Lambert Y, Jaulhac B, et al. Novel chronic anaplasmosis in splenectomized patient, amazon rainforest. Emerg Infect Dis. 2022;28(8):1673.
10. Hoar BR, Nieto NC, Rhodes DM, Foley JE. Evaluation of sequential coinfection with *Anaplasma phagocytophilum* and *Anaplasma marginale* in cattle. Am J Vet Res. 2008;69(9):1171-1178.