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Research Paper

A Review of Laboratory Diagnosis Of Chikungunya Fever

Microbiology

KEYWORDS : Chikungunya fever, diagnosis, method.

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ABSTRACT

Chikungunya, a mosquito-transmitted viral disease that produces variable symptoms, ranging from asymptomatic infection to life-threatening disease, is present in about 110 tropical and subtropical countries. As chikungunya is increasing in incidence, improved diagnosis, early detection of severe cases, and efficient medical management are of primary importance in all areas where chikungunya is endemic. Traditionally, chikungunya has been diagnosed by virus isolation or serological methods, but with recent advances in molecular techniques and in rapid detection technology, a range of novel diagnostic tests will soon be commercially available that will improve case management and aid disease control efforts.

Introduction

Chikungunya (in the Makonde language "that which bends up") virus (CHIKV) is an insect-borne virus, of the genus *Alphavirus*, that is transmitted to humans by virus-carrying *Aedes* mosquitoes [Lahariya C & Pradhan SK; 2006]. There have been recent breakouts of CHIKV associated with severe illness.

CHIKV infection causes an illness with symptoms similar to dengue fever, with an acute febrile phase of the illness lasting only two to five days, followed by a prolonged arthralgic disease that affects the joints of the extremities. The pain associated with CHIKV infection of the joints persists for weeks or months, or in some cases years [Powers AM & Logue CH; 2007 & Sourisseau M et al.; 2007].

Treatment of acute CHIKV is supportive, using either oral or intravenous rehydration for mild or moderate disease, and intravenous fluids and blood transfusion for more severe cases. Chikungunya has become a global problem since the Second World War and is endemic in more than 110 countries. Apart from eliminating the mosquitoes, work is ongoing on a vaccine, as well as medication targeted directly at the virus.

The acquired immune response to infection with CHIKV consists of the production of IgM and IgG antibodies primarily directed against the virus envelope proteins. The immune response varies depending on whether the individual has a primary or a secondary infection [Vorndam V & Kuno G; 1997]. In general, sero diagnosis of chikungunya is dependent on the stage of the infection.

Laboratory Diagnosis of Chikungunya

Chikungunya infections can be confirmed by the detection of the virus, viral RNA, or specific antibodies in patient samples. The type of testing performed is typically dictated by the timing and volume of samples available. Blood test is the only reliable way to identify chikungunya since the symptoms are similar to much more deadly dengue fever. Common laboratory tests for chikungunya include for instance RT-PCR and serological tests.

RT-PCR

Viral RNA can be easily detected by reverse transcriptase-polymerase chain reaction (RT-PCR) in serum specimens obtained from patients during the acute phase of infection. Chikungunya infections cause high levels of viraemia (up to 1x 10 E 6.8 plaque-forming units per ml), which typically last for 4-6 days after the onset illness. RT-PCR can therefore easily been done within the first 7 days on an acute-phase specimen to confirm chikungunya virus infection [WHO; 2008].

ELISA

Enzyme-linked immunosorbent assays (ELISA) detect both anti-CHIKV immunoglobulin (Ig) M and IgG antibodies from either acute or convalescent phase samples. Serological diagnosis requires a larger amount of blood than the other methods. ELISA results require 2-3 days and the test is quite specific with very little cross reactivity with related alphaviruses. Testing of samples from imported cases found that chikungunya-specific IgM antibodies develop rapidly within a few days after illness onset and persist for several months [WHO; 2008].

Immunofluorescenceassays

Immunofluorescence assays are sensitive and specific but lack the ability to qualify antibodies, are subjective, and require special equipment and training. However, these tests are commercially available and are an option for laboratories that routinely use this method for detection of other infectious agents [WHO; 2008].

PRNT

Plaque reduction neutralization tests (PRNT) are very useful because they are quite specific for alphaviruses and are the gold standard for confirmation of serologic test results. The major drawback to PRNT is that it requires the use of live virus [WHO; 2008].

Haemagglutination-inhibitiontests

Another way to diagnose the disease is by distinguishing the chikungunya strain by kinetic Haemagglutination-inhibition tests. Chikungunya is confirmed when symptoms such as fever and joint pain seen along with a fourfold Haemagglutination Inhibition antibody difference in paired serum samples. This turns positive within 5to 8 days of infection [WHO; 2008].

Conclusion

To improve case management, surveillance, outbreak investigations and to ensure the success of chikungunya vaccine trials, quality diagnostic tools are essential. However, current diagnostic tools available for chikungunya are not practical for point-of-care use or during the febrile phase of the disease. Many tools are commercially available but their performance and operational characteristics have not been widely evaluated. More novel diagnostic techniques need to be developed for patient management. IgM/IgG detection in a single test and ideally prognostic markers of disease severity would be paired with etiologic diagnosis. The recommended new tools, reference material collection and specimen banks discussed within this document address these needs.

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