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Diagnostic Technology Landscape

Excerpt

“The MODS assay was developed as a faster, cheaper, and more sensitive test than other solid or liquid culture-based tests currently in use for TB diagnosis.(19;24;27) The basic principle is via microscopic examination of the liquid media (Middlebrook 7H9) using an inverted light microscope to identify MTBC within wells that exhibit bacterial growth. The test involves a 24-well plate, each well containing small volumes of liquid media that are used to identify MTBC growth and in addition resistance to rifampicin and isoniazid, i.e. 4 wells per specimen. In addition, *para*-Nitrobenzoic Acid (PNB), a compound that inhibits the growth of MTBC but not of non-tuberculosis mycobacteria (NTM), can be added to one (drug free) well to help discriminate between MTBC and NTM prior to microscopic examination.(28) TB-complex bacteria grow as a tangled or corded mass of cells while non-tuberculous mycobacteria do not.(29) *M. chelonae*, an NTM also has a chorded form, but has a relatively faster growth rate by which it can be differentiated from MTBC. The time to detection is typically under 2 weeks. The incorporation of anti-TB drugs into some of the wells at the outset enables DST with clinical specimens, unlike other current methods that rely on an initial culture followed by DST.

The use of MODS is recommended for use in areas that currently use solid-based media and have the basic facilities and trained staff to safely perform TB culture. In a recent study by Shah et al., MODS detection of MTBC took a median of 9 days as opposed to MGIT (16 days) and solid culture (29 days).(19) A further study demonstrated a median of 7 days to identify MDR strains as opposed to 70 days using the conventional solid media DST assays.(19) In a recent meta-analysis, the MODS assay had a sensitivity of 98% for rifampicin resistance and a specificity of 99.4%. The mean turnaround time was about 10 days.(30)

As a culture-based method, consideration must be given to specialist training and appropriate containment facilities are still needed to protect laboratory staff and to correctly perform the tests when using MODS. The manual reading of test results with a microscope limits the throughput. A further barrier to more widespread use of MODS has been the availability of the test media, test components, and suitable low-cost inverted microscopes with which to read the plates.

Hardy Diagnostics (USA) has released a CE-marked MODS kit which contains all of the necessary reagents and drugs for performing DST MODS. The test uses a plate that employs a tightly sealed silicon lid to reduce contamination and risk of spills—a concern with the original method that used a conventional polycarbonate plate and loose fitting lid. Further improvements to MODS include the development of a low-cost microscope (31) and an automated reader for high throughput analyses of cultures.(32) The standardization of a low-cost culture method and equipment may, consequently, help improve DST for MDR-TB in intermediate level laboratories.”

References:

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