QuantuMDx

Table 1. Summary of WHO recognised methods of TB diagnosis (adapted from MacGregor-Fairlie et al., 2020 and Pai *et al.*, 2016).

Method	Diagnostic	Principle	Use	Sensitivity	Specificity	TAT	Pros	Cons
Imaging	Chest X-ray	Imaging lungs	Active TB screening	73–79%	60–63%	Same day	Readily available in most healthcare settings Non-invasive Multiple applications	Low specificity & sensitivity High initial costs Radiation exposure
Microscopy	Sputum smear light microscopy	Direct visualisation of mycobacterium using light microscopy	Active TB diagnosis	60–69%	97–98%	Same day	Rapid Inexpensive/test Few reagents are required	Sputum can be difficult to obtain Requires training Reagents are toxic (e.g. phenol)
	Sputum smear fluorescence microscopy	Direct visualisation of mycobacterium using fluorescence microscopy	Active TB diagnosis	52-97%	94-100%	Same day	Rapid Inexpensive/test Increased sensitivity	Sputum can be difficult to obtain Requires training Reagents are toxic
Culture	Bacterial culture (solid media)	Bacterial culture	Active TB diagnosis Drug susceptibility	100%	100%	>28 days	Gold standard Drug sensitivity testing can take place in tandem Cheaper than molecular/immunological methods	Requires high containment laboratory Generation of results is time-consuming
	Bacterial culture (liquid media)	Bacterial culture	Active TB diagnosis Drug susceptibility	86–93%	100%	10-21 days	Faster than conventional culture High degree of specificity and sensitivity	More expensive than conventional culture Requires specialist training Requires high containment laboratory

Table 1 continued...

Method	Diagnostic	Principle	Use	Sensitivity	Specificity	TAT	Pros	Cons
Antigen	LAM lateral flow	Antigen detection (Lipo-arabinomannan)	Active TB diagnosis	13–93%	87–99%	Same day	Non-invasive urine sample Rapid detection Useful in immunocompromised/ paediatrics	Large variability in sensitivity Not recommended in immunocompetent individuals
Nucleic Acid Amplification Test (NAAT)	GeneXpert MTB/ RIF (Cepheid, USA)	Polymerase Chain Reaction	Active TB diagnosis Drug resistance	82–88%	96–98%	Same day	Can test for M. tb and rifampicin resistance + Rapid turnaround –	Variable sensitivity in HIV/Immunocompromised patients Low sensitivity in smear-negative patients Expensive
	TB LAMP	Loop-mediated isothermal amplification (LAMP)	Active TB diagnosis	86– 93%	91%– 96%	Same day	Sensitivity and specificity comparable to PCR testing Cheaper to run than PCR Visual readout Rapid detection –	Infrastructure required can be prohibitively expensive Cannot be used for LTBI Presents a significant contamination risk if run in a molecular biology laboratory
	Line probe assays	PCR amplification and reverse hybridization	Active TB diagnosis Drug resistance	96–98%	99%	1-2 days	Can detect resistance to isoniazid and/or rifampicin Rapid detection	Less sensitive and specific in smear-negative samples Reagents require cold storage

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Table 1 continued...

Method	Diagnostic	Principle	Use	Sensitivity	Specificity	TAT	Pros	Cons
Immune response	Tuberculin skin test (TST)	Stimulation of a hypersensitivity reaction mediated by T-cells	Latent TB diagnosis	48–78%	57–81%	5 days	Inexpensive Requires no handling of M. tuberculosis positive samples	Results take ~5 days to appear Requires repeated visits to healthcare professional Highly variable sensitivity and specificity
	IFN-γ release assays (IGRA)	Detection of IFN-γ produced by sensitized T cells when exposed to mycobacterial antigen	Latent TB diagnosis	61–86%	57–81%	1-2 days	Blood sample (which is easier to acquire than a sputum sample) Rapid detection	Less sensitive in HIV/Immunocompromised individuals (43–49%) Less sensitive in children (70–76%) Requires handling of blood samples Time sensitive Requires specialist training Relatively expensive

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