



Multiplex PCR For Bacterial Meningitis

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Introduction

Bacterial meningitis is a serious infectious disease that can cause considerable morbidity and mortality in both children and adults. Although its incidence has diminished due to the development and widespread use of polysaccharide and conjugate vaccines in recent years, 1.2 million cases of bacterial meningitis and 135 000 deaths are still estimated to occur annually worldwide. The incidence and mortality rates of bacterial meningitis vary according to the geographical region, the specific pathogen and the age group. The estimated annual incidence in South Africa is 4 per 100 000 people, with the highest incidence in children less than 1 year of age (40 per 100 000). Since permanent neurological sequelae are observed in up to 50% of the survivors, rapid diagnosis and prompt treatment is essential. Excluding the neonatal period, *Streptococcus pneumoniae* and *Neisseria meningitidis* are the most frequently observed agents causing bacterial meningitis. In the neonatal period the most common causative organisms are group B streptococci (*S. agalactiae*) and *Escherichia coli*. *Listeria monocytogenes* is more often detected in neonates, immunocompromised patients and adults older than 50 years of age.

The diagnosis of bacterial meningitis is based on blood and CSF cultures and the cell count, biochemical and microscopic analysis of CSF samples; but empirical antibiotic treatment should be initiated immediately based on the clinical findings. Ideally the blood and CSF samples should be collected before the administration of the first dose of antibiotics, but if the facilities are not readily available for collection of these samples, the administration of the first dose of antibiotics should not be delayed. For effective, targeted treatment of bacterial meningitis, the microorganisms and their antibiotic susceptibility patterns should be rapidly identified.

While CSF culture is the gold standard for the diagnosis of bacterial meningitis, the low bacterial growth rates, particularly in patients who have received antibiotic treatment prior to the lumbar puncture, have necessitated the development of new test methods. Nucleic acid amplification tests such as PCR can detect small amounts of pathogen DNA regardless of the viability of the responsible microorganism. Unfortunately antibiotic susceptibility can currently only be determined from cultured microorganisms.

The identification of the causative pathogen in the CSF and the early initiation of appropriate treatment is the most critical stage in the management of bacterial meningitis. Even short delays in the diagnosis and treatment increase the rate of sequelae and mortality. Delays in the diagnosis can be avoided through the routine use of PCR-based molecular methods for patients with suspected bacterial meningitis.

Testing offered by Lancet Laboratories

Lancet Laboratories offers routine microscopy, chemistry, cell counts and culturing for both bacteria and yeasts in CSF. A viral meningitis PCR panel which include the viruses commonly associated with meningitis (Herpes simplex virus types 1 and 2, varicella-zoster virus, enterovirus, and mumps virus) is also available on request.

Lancet Laboratories now also offers a multiplex PCR panel for a very sensitive method to diagnose bacterial meningitis (see Table 1).

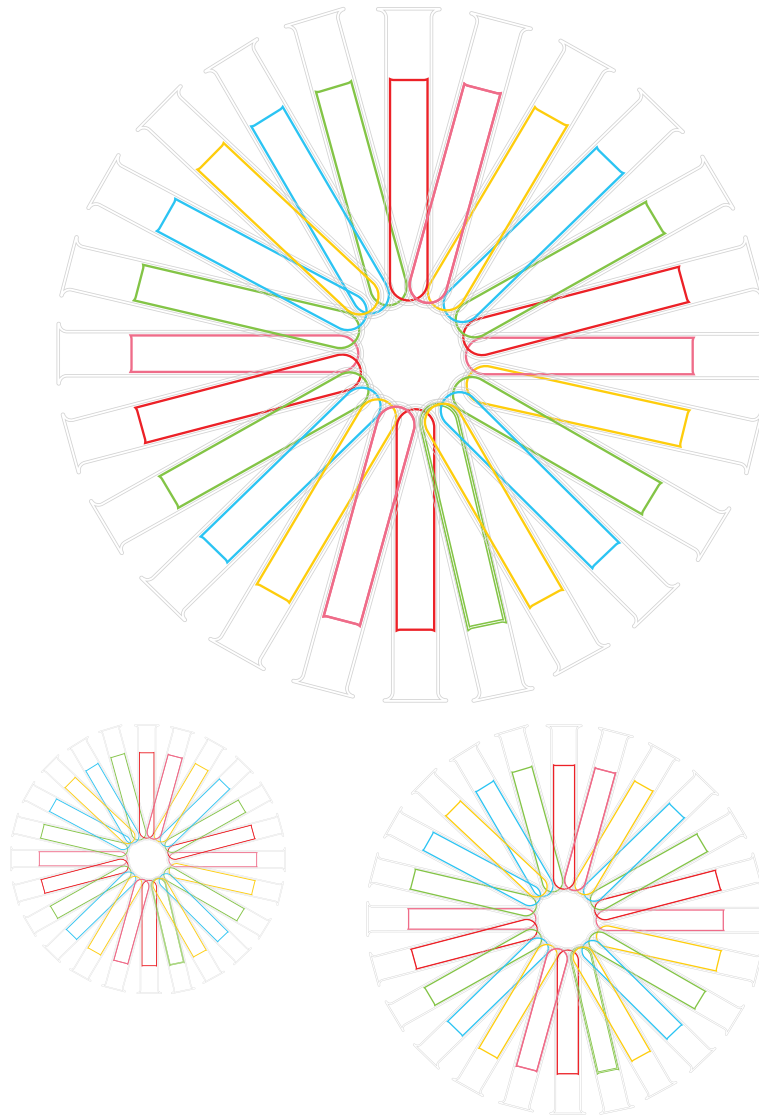
Table 1: Organisms included in the bacterial meningitis PCR panel

Bacterial Meningitis Panel	
<i>Haemophilus influenzae</i>	<i>Escherichia coli</i>
<i>Streptococcus pneumoniae</i>	Group B streptococcus (<i>S. agalactiae</i>)
<i>Neisseria meningitidis</i>	<i>Listeria monocytogenes</i>

These panels can be requested separately or together as part of the routine CSF analysis or as an add-on test after chemistry and cell count results are available. A minimum of 150 µL of CSF is required for the PCR panels.

References

1. World Health Organisation. Laboratory Methods for the Diagnosis of Meningitis caused by *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenzae* (2nd Edition; 2011). Available at: <https://www.cdc.gov/meningitis/lab-manual/full-manual.pdf>
2. Başpınar EÖ, et al. Comparison of culture and PCR methods in the diagnosis of bacterial meningitis. *Braz J Microbiol* 2017; 48(2): 232 - 236.
3. Boyles TH, et al. Guidelines for the management of acute meningitis in children and adults in South Africa. *South Afr J Epidemiol Infect* 2013; 28(1): 5 - 15.



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