

## Response

We whole-heartedly agree that CSF parameters, including CSF lactate, can be useful adjunctive markers in helping distinguish bacterial from viral (or aseptic) meningitis.

As mentioned in our article, using a combination of routine clinical and CSF laboratory parameters (eg CSF glucose, protein and leucocyte count), has shown high accuracy in distinguishing bacterial from viral meningitis in adults and children.<sup>1,2</sup>

We agree that using CSF lactate, on its own (as the correspondents suggest), or in combination with other routine clinical parameters, can further assist clinicians in distinguishing bacterial from viral meningitis.

Reliance on single biomarkers can lead to inaccurate diagnosis. For example, CSF lactate has poor sensitivity (0.49) in identifying bacterial from viral meningitis among patients exposed to antibiotics, as shown in the article by Sakushima *et al* which you have referenced.<sup>3</sup> Similarly, CSF lactate can be raised in patients with malignancy, severe hypoxia, or other brain abnormalities, including raised intracranial pressure, hydrocephalus or mitochondrial disorders.<sup>4–6</sup>

To our knowledge, there are limited studies on using CSF lactate in combination with other markers, but recent results suggest inclusion of CSF lactate can improve accuracy of the Bacterial Meningitis Score.<sup>7</sup>

In summary, we support the measurement and judicious interpretation of CSF lactate. We also encourage further studies examining the diagnostic accuracy of CSF lactate in combination with other parameters to help distinguish bacterial from viral meningitis. ■

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