## Post-neurosurgical meningitis diagnosis

see also Meningitis diagnosis.

Post-neurosurgical meningitis (PNM) often leads to serious consequences; unfortunately, the commonly used clinical diagnostic methods of PNM are time-consuming or have low specificity.

The diagnosis of PNM is difficult because, unlike community-acquired meningitis, symptoms are less specific; patients are ill at baseline and many neurosurgical conditions mimic meningitis and cause cerebrospinal fluid (CSF) abnormalities. Pivotal CSF findings for diagnosis of PNM are the CSF glucose, CSF lactate and Gram stain. CSF leucocyte counts are not specific in PNM. Current diagnostic capabilities leave a non-negligible category of patients with microbiologically negative, uncertain diagnosis of PNM <sup>1</sup>.

To realize the accurate and convenient diagnosis of PNM, Xie et al. proposed a comprehensive strategy for cerebrospinal fluid analysis based on a machine-learning-aided Cross-Reactive Chemical Sensor Array. The sensor array involves three Eu3+-doped metal-organic frameworks (MOFs), which can generate specific fluorescence responding patterns after reacting with potential targets in CSF. Then, the responding pattern is used as learning data to train the machine learning algorithms. The discrimination confidence for artificial CSF containing different components of molecules, proteins, and cells is from 81.3 to 100%. Furthermore, the machine-learning-aided sensing array was applied in the analysis of CSF samples from post-neurosurgical patients. Only 25  $\mu$ L of CSF samples was needed, and the samples could be robustly classified into "normal," "mild," or "severe" groups within 40 min. It is believed that the combination of machine learning algorithms with robust data processing capability and a lanthanide luminescent sensor array will provide a reliable alternative for more comprehensive, convenient, and rapid diagnosis of PNM <sup>2</sup>.

1)

Hussein K, Bitterman R, Shofty B, Paul M, Neuberger A. Management of post-neurosurgical meningitis: narrative review. Clin Microbiol Infect. 2017 Sep;23(9):621-628. doi: 10.1016/j.cmi.2017.05.013. Epub 2017 May 18. PMID: 28529027.

Xie R, Song X, Chen H, Lin P, Guo S, Zhuang Z, Chen Y, Zhao W, Zhao P, Long H, Tao J. Intelligent Clinical Lab for the Diagnosis of Post-Neurosurgical Meningitis Based on Machine-Learning-Aided Cerebrospinal Fluid Analysis. Anal Chem. 2022 Nov 7. doi: 10.1021/acs.analchem.2c03154. Epub ahead of print. PMID: 36341721.

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