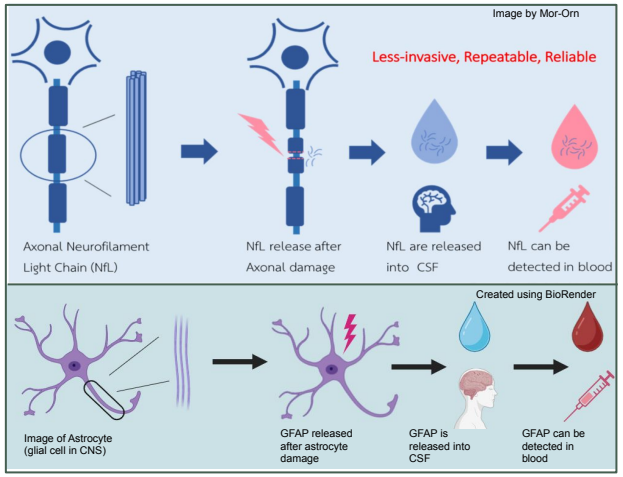
Correlation Between Serum Neurofilament Light Chain and Glial Fibrillary Acidic Protein with 2-year Disease Outcome in Anti-NMDA Receptor Encephalitis

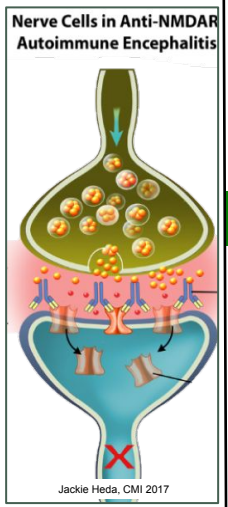
Jamie Wayne[1], Albert To[1], Oranuch Chuapakdee[2], Abhinbhen Saraya[2], Vivek Nerurkar[1]

[1]Minority Health Research Training (MHRT) Program, Department of Tropical Medicine, Medical Microbiology and Pharmacology, University of Hawaii at Mānoa; [2]Thai Red Cross - Emerging Infectious Diseases (TRC-EID) Health Science Center, King Chulalongkorn Memorial Center

INTRODUCTION

Anti-NMDAr Encephalitis occurs when autoantibodies target NMDA receptors (NMDAr), causing brain inflammation and neurological damage. It is a rare autoimmune disease that affects approximately 1.5 per million people worldwide each year (Song et al. 2024). Prognosis involves clinical evaluation and laboratory testing, such as cerebrospinal fluid (CSF) analysis.





OBJECTIVE

The objective is to investigate serum Neurofilament Light chain (NfL) & Glial Fibrillary Acidic Protein (GFAP) and correlate these levels with disease outcome with anti-NMDA receptor encephalitis (anti-NMDARE) over a 2 year period.

SIMOA (Single Molecular Assay)

Introduced in 2013, SIMOA technology is a new technology that can measure multiple analytes (NfL and GFAP) simultaneously. It can detect proteins at sub femtomolar concentrations requiring less sample volumes than other protein detection methods. Additionally, its digital readout allows for precise quantification by counting individual molecules.

SIMOA (Single Molecular Assay)

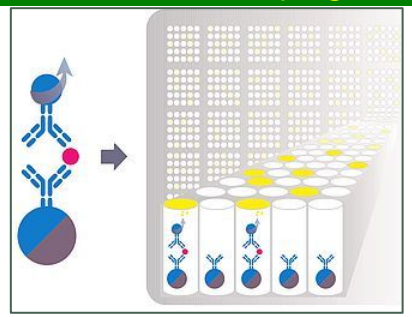


Image of how SIMOA technology works by Chimera Biotech

Image of SIMOA SRX Analyzer

MATERIALS AND METHODS

AIE Patients are admitted to King Chulalongkorn Memorial Hospital → Patients undergo neurocognitive exams → 5 mL of Blood is collected for NfL and GFAP → Serum biomarkers are measured using Simoa SRX Analyzer → Patient follow-up at 0, 12, and 24 months → Data analysis of biomarker levels & patient outcome

RESULTS

jwayne@hawaii.edu

Sample Size of the study so far consisted of 22 Thai patients, 91% females, with an age range between 9-36 years.

Result Summary: When people are diagnosed with anti-NMDAr Encephalitis, their levels of neurodegenerative biomarkers are the highest. As patients get treated, the amount of NfL and GFAP decrease

RESULTS

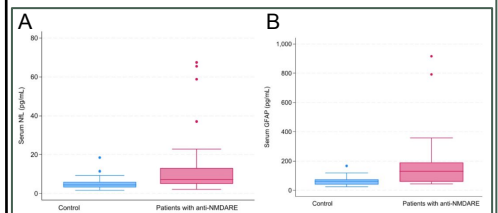


Figure 1. Serum levels of (A) NfL and (B) GFAP between healthy control and patients with Anti-NMDAr Encephalitis

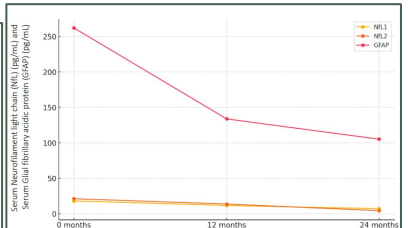


Figure 2. Serum levels of NfL and GFAP in patients with Anti-NMDAr Encephalitis over a 24-month period

CONCLUSIONS

We can use non-invasive blood samples to measure trace amounts of NfL and GFAP, instead of conducting lumbar punctures to obtain CSF as a prognostic tool. Trained physicians perform lumbar punctures, which takes time to perform and is costly. Along with patient symptoms, MRI, and EEGs, serum biomarker levels can be used as diagnostic and/or prognostic tools. Currently, the test is too expensive for routine use, but with more research and increased use, it may become more affordable.

FUTURE DIRECTIONS

Future research should expand the sample size and include multiple follow-up periods within a single year, extending data collection beyond two years. A broader range of neuronal biomarkers should be investigated. Currently, the high cost of SIMOA technology limits its routine use, but increased utilization and further research are expected to reduce costs and improve accessibility.

ACKNOWLEDGEMENTS

I would like to express my gratitude to my mentors, Dr. Abhinbhen Saraya, Dr. Oranuch Chuapakdee, and Dr. Albert To, for their invaluable guidance and support. Special thanks to the Minority Health Research Training (MHRT) Program, Dr. Vivek R. Nerurkar, Dr. Angela Sy, Renn Silve Salomon and Aira Mae Corpuz, for their assistance and encouragement. This research was made possible by funding from the NIH grant MHRT - T37MD008636-09 and the Ratchadepisek Grant.