Docket #: S23-075

Molecular Signature for Diagnosis of Chronic Fatigue, Long COVID, and Autoimmunity Conditions

Stanford researchers have identified that increased oxidative stress is a key molecular signature of fatigue-based conditions including Long COVID and myalgic encephalomyelitis or chronic fatigue syndrome (ME/CFS). They have also developed a precision medicine platform for identifying novel therapeutic leads that lower oxidative stress and selecting which patients may benefit most from these leads.

More than 65 million individuals worldwide are estimated to have Long COVID (LC), where patients often report fatigue and other symptoms resembling myalgic encephalomyelitis or chronic fatigue syndrome (ME/CFS). Currently, there are no treatments or reliable diagnostic markers for fatigue. To address this gap in knowledge, Stanford researchers analyzed blood samples from individuals with fatigue syndromes, including LC, ME-CFS, and lupus patients, to successfully identify a common molecular signature of elevated oxidative stress in cells. Diagnostic analysis for fatigue can then be performed with one or more of flow cytometry, RNA-seq analysis, mass spectrometry, and systems chemistry analysis.

Furthermore, the developed assays can identify specific drugs that can redress or lower oxidative stress in cells. Using this platform, Stanford researchers have successfully identified several FDA-approved drugs that can lower oxidative stress in cells.

Stage of Development
In vitro: Strong signal to noise ratio in assays

Applications

- Molecular diagnostic for ME-CFS and Long COVID

- Quantitative diagnostic for fatigue
- Identifying novel therapeutic leads for fatigue based conditions

Advantages

- First quantitative diagnostic for fatigue
- First identified treatment for Long COVID or ME-CFS
- Precision medicine approach
- Non-invasive

Publications

- V. Shankar, J. Wilhelmy, E.J. Curtis, B. Michael, L. Cervantes, V. Mallajosyula, R.W. Davis, M. Snyder, S. Younis, W.H. Robinson, S. Shankar, P.S. Mischel, H. Bonilla, & M.M. Davis (2025). Oxidative stress is a shared characteristic of ME/CFS and Long COVID. *Proc. Natl. Acad. Sci. U.S.A.* 122 (28) e2426564122, July 8, 2025.

Patents

- Published Application: WO2024254152

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