Quanterix®

Fact Sheet

Simoa® p-Tau 217

What is p-Tau 217?

Phosphorylated Tau 217 (p-Tau 217) is proving to be a crucial biomarker for Alzheimer's disease and other neurodegenerative disorders. Tau proteins play a pivotal role in maintaining the stability of neuronal microtubules, which are essential for normal brain function. In Alzheimer's disease, tau proteins can become hyperphosphorylated, leading to the formation of neurofibrillary tangles, a hallmark of the disease. This abnormal phosphorylation is associated with neuronal damage, cognitive decline, and cell death.

Research indicates that p-Tau 217 levels in cerebrospinal fluid (CSF) and blood are significantly elevated in patients with Alzheimer's, even in the early stages. This positions it as a valuable potential biomarker for early diagnosis and monitoring disease progression. Furthermore, studies have shown that p-Tau 217 can help differentiate Alzheimer's disease from other forms of dementia, such as Lewy body dementia and frontotemporal dementia.

Testing for p-Tau 217 in blood and CSF is becoming more common in clinical settings, aiding in the detection and management of Alzheimer's disease. As research into biomarkers advances, p-Tau 217 stands out for its specificity and potential role in tracking the progression of neurodegenerative diseases.

For researchers exploring biomarkers for Alzheimer's disease or interested in early diagnosis, understanding p-Tau 217 is crucial. It offers insights into disease mechanisms and provides a reliable measure for clinical research and therapeutic development. By focusing on p-Tau 217, scientists and clinicians are making strides toward earlier more accurate diagnosis and effective treatments for Alzheimer's disease and other neurodegenerative conditions.

How to Measure p-Tau 217?

The Simoa® p-Tau 217 assay is an ultra-sensitive digital immunoassay for the quantitative determination of p-Tau 217 in human EDTA plasma and CSF. Quanterix also offers Simoa® p-Tau 217 testing as a service with a laboratory developed test (LucentAD) that has been per CLIA and CLSI guidelines. This test is not currently cleared by the U.S. FDA as an in vitro diagnostic. Quanterix's state-of-the-art facility includes a CLIA-licensed lab and supports over 400 customers globally.

What is the Simoa® Difference?

Simoa® is a powerful digital immunoassay technology that is up to 1000 times more sensitive than standard sandwich-based immunoassay techniques. Traditional ELISA measurements are limited to pg/ml levels of detection. Simoa® can achieve sensitivity as low as femtogram (fg/ml) levels, delivering the gold standard for early, ultra-sensitive detection and quantification of proteins far below the typical lower limit of quantification (LLOQ). Simoa® is based upon the isolation of individual immunocomplexes on paramagnetic beads using standard ELISA reagents. The main difference between Simoa® and conventional immunoassays lies in the ability to trap single molecules in femtoliter-sized wells, allowing for a "digital" readout of each individual bead to determine if it is bound to the target analyte or not.

Neurological disorders continue to be among the most challenging to diagnose early and treat. Unlike 'visible' illnesses, neuronal injury and neurodegeneration can be overlooked or mistaken for other conditions. The subtlety of symptoms and the subjective nature of today's assessments also make it difficult to identify these diseases early. Currently, no definitive tests exist for the early detection of neurodegenerative diseases such as Alzheimer's disease. Clinicians can only conclusively diagnose them once symptoms start to present. As a result, many patients may wait years for a diagnosis or a clear treatment pathway.

p-Tau 217 has emerged in recent years as valuable biomarker of Alzheimer's disease pathology and neuronal injury, establishing itself as a promising tool for evaluating Alzheimer's disease pathology. Its specificity to Alzheimer's disease pathology distinguishes it from other biomarkers and underscores its importance in clinical research and practice. Furthermore, advancements in assay technologies, such as Simoa® technology, have facilitated the accurate and ultra-sensitive quantification of p-Tau 217 levels in biofluids, enhancing its utility in early detection and differential diagnosis of Alzheimer's disease. Thousands of studies have validated the use of Simoa® immunoassays to detect and measure biomarkers that hold promise as tools for early detection and prognosis for a range of neurodegenerative conditions.

p-Tau 217 in Action

Diagnostic Accuracy of a Plasma Phosphorylated Tau 217 Immunoassay for Alzheimer Disease Pathology

Simoa® ALZpath p-Tau 217 test, a new commercially available immunoassay for plasma p-Tau 217 has shown high accuracy in detecting Alzheimer's disease (AD) pathology across three observational cohorts. The assay was comparable to CSF biomarkers in identifying both amyloid and tau pathology, with area under the curve (AUC) values between 0.92 and 0.97. The test also demonstrated reproducible results in detecting longitudinal changes, particularly in individuals with amyloid positivity, suggesting its potential utility in both clinical and research settings.

Ashton NJ, Brum WS, Di Molfetta G, et al. Diagnostic Accuracy of a Plasma Phosphorylated Tau 217 Immunoassay for Alzheimer Disease Pathology. *JAMA Neurol*. 2024;81(3):255-263. doi:10.1001/jamaneurol.2023.5319

Alzheimer's Disease biological PET staging using plasma p217+tau

Plasma p-Tau 217 can differentiate between various stages of AD neuropathology at a group level, demonstrating robust accuracy in identifying Advanced, Intermediate/Advanced, or all A+ stages. Further analysis showed that p-Tau 217 had high accuracy in group-level discrimination across stages with AUC values of 0.91-0.93. Additionally, at an individual level, results indicated that p-Tau 217 can effectively predict if cognitively impaired individuals are in a combined Intermediate/Advanced stage, supporting its potential use in guiding treatment decisions and clinical trial selection.

Feizpour A, Doré V, Krishnadas N, et al. Alzheimer's Disease biological PET staging using plasma p217+tau. *medRxiv*. Preprint posted online January 13, 2024. doi:10.1101/2024.01.11.24301180

Plasma p-tau217, p-tau181, and NfL as early indicators of dementia risk in a community cohort: The Shanghai Aging Study

The study explored the potential of transitioning Alzheimer's disease molecular phenotyping from cerebrospinal fluid to plasma samples across various stages of AD. Core biomarkers like Aβ42/40, p-Tau 181, and t-Tau showed correlation between CSF and plasma. GFAP, NF-L, and p-Tau 181 were identified as significant markers for disease progression in both CSF and plasma. These results suggest the potential for using a standardized panel of plasma markers to aid in early AD diagnosis and disease monitoring.

Xiao Z, Wu W, Ma X, et al. Plasma p-tau217, p-tau181, and NfL as early indicators of dementia risk in a community cohort: The Shanghai Aging Study. *Alzheimers Dement (Amst)*. 2023;15(4):e12514. Published 2023 Dec 22. doi:10.1002/dad2.12514

Plasma pTau-217 and N-terminal tau (NTA) enhance sensitivity to identify tau PET positivity in amyloid-β positive individuals

In a cross-sectional study of 234 participants across the AD continuum, researchers assessed plasma biomarkers to predict tau PET-positivity in amyloid-beta positive (Aβ+) individuals. Among various plasma biomarkers, p-Tau 217 and NTA-tau exhibited the highest association with tau PET-positivity, with areas under the curve (AUC) of 0.89 and 0.88, respectively. The combination of p-Tau 217 and NTA-tau demonstrated the strongest concordance with tau PET for classifying tau positivity, suggesting a valuable method for patient stratification and prognosis in clinical trials and practice.

Woo MS, Tissot C, Lantero-Rodriguez J, et al. Plasma pTau-217 and N-terminal tau (NTA) enhance sensitivity to identify tau PET positivity in amyloid-β positive individuals. *Alzheimers Dement*. 2024;20(2):1166-1174. doi:10.1002/alz.13528

p-Tau 217 In The News

Breakthrough Blood Test for Alzheimer's Disease Detection with Simoa® Technology

A recent study published in JAMA Neurology highlights the impressive diagnostic accuracy of the plasma Simoa® ALZpath p-Tau 217 immunoassay for detecting Alzheimer's disease (AD) pathology. Conducted by Dr. Nicholas Ashton at the University of Gothenburg, this study found that the Simoa® ALZpath p-Tau 217 test accurately identified biological AD, with results comparable to those obtained through cerebrospinal fluid (CSF) biomarkers. The assay's reproducible cut-offs across different cohorts suggest that it offers reliable performance for clinicians and researchers.

The Simoa® ALZpath p-Tau 217 immunoassay not only provides robust detection of Alzheimer's pathology but also has the unique capability to monitor longitudinal changes. This feature allows the test to identify preclinical signs of Alzheimer's, making it a critical tool for early diagnosis and potentially improved treatment outcomes. The use of Simoa® technology in this blood-based test is a significant step toward making Alzheimer's detection more accessible, enabling earlier intervention and better patient management.

This breakthrough in Alzheimer's detection underscores the importance of innovative, reliable, and less invasive testing methods in the ongoing battle against this progressive disease.

For more information visit: https://www.quanterix.com/news/diagnostic-accuracy-of-a-plasma-phosphorylated-tau-217-immunoassay-for-alzheimers-disease-pathology/