Quanterix®

Fact Sheet

Simoa® Neurology 2-Plex A (Aβ40, Aβ42)

What is Amyloid Beta?

Amyloid beta (Aβ) is a peptide consisting of 36-43 amino acids that plays a pivotal role in the pathogenesis of Alzheimer's disease (AD). Specifically, the ratio of amyloid beta 42 to amyloid beta 40 (Aβ42/40) has garnered significant attention in the realm of AD research and diagnostics. Amyloid beta 42 (Aβ42) and amyloid beta 40 (Aβ40) are two major isoforms of Aβ, differing in their lengths and aggregation properties. Aβ42 is more prone to aggregate and form toxic oligomers and fibrils compared to Aβ40. Consequently, the Aβ42/40 ratio serves as a critical indicator of the pathological processes underlying AD.

Under normal physiological conditions, Aβ peptides are produced through the sequential cleavage of the amyloid precursor protein (APP) by β- and γ-secretases. However, in AD, dysregulation of this proteolytic process leads to an imbalance in Aβ42 and Aβ40 production, resulting in an increased Aβ42/40 ratio. Elevated Aβ42/40 ratios have been consistently observed in individuals with AD and are associated with the accumulation of amyloid plaques in the brain, a hallmark pathology of the disease. Moreover, alterations in the Aβ42/40 ratio often precede the onset of clinical symptoms, highlighting its potential utility as a predictive biomarker for AD.

Quantification of the Aβ42/40 ratio in cerebrospinal fluid (CSF) and plasma has emerged as a valuable tool for early diagnosis and monitoring of AD progression. Additionally, advancements in imaging techniques, such as positron emission tomography (PET), allow for the in vivo assessment of amyloid burden in the brain, further supporting the diagnostic relevance of the Aβ42/40 ratio. In conclusion, the Aβ42/40 ratio serves as a crucial biomarker in the study of AD, offering insights into the underlying molecular mechanisms and aiding in the development of diagnostic and therapeutic strategies for this devastating neurodegenerative disorder.

How to Measure Aβ40, Aβ42?

The Neurology 2-Plex A assay is an ultra-sensitive digital immunoassay for the quantitative determination of Aβ40 and Aβ42in human EDTA plasma and CSF.

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. Quanterix 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 AD. 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.

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What is the Simoa® Difference? continued

The Aβ42/40 ratio has emerged in recent years as valuable biomarker of AD pathology and neuronal injury, establishing itself as a promising tool for evaluating AD pathology. Its specificity to AD 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 the Aβ42/40 ratio levels in biofluids, enhancing its utility in early detection and differential diagnosis of AD. 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.