

CLINICAL SPECIFICATIONS

TAU PROTEIN

Function:

Tau protein is a microtubule-associated protein found in the neurons of the central nervous system. It binds to tubulin, which facilitates tubulin's ability to assemble into microtubules. This action provides stability and flexibility for distal portions of axons. It also plays a role to ensure neurons are naturally free of Amyloid-Beta clumps and other forms of toxic proteins. To a lesser extent Tau Protein is found in oligodendrocytes.

Associated With:

Alzheimer's disease mild cognitive impairment^{1,2}
 Dementia due to Alzheimer's disease²
 Alzheimer's disease³
 Multiple sclerosis⁴
 Traumatic brain injury ^{reviewed in 5}

Known Cross-Reactions: A β ₄₂ peptide⁶

Clinical Significance:

Tauopathies such as Alzheimer's disease (AD) are age-related neurodegenerative disorders that are characterized by the presence of abnormally phosphorylated tau aggregates.² In the pathology of AD, the formation of amyloid-beta (A β ₄₂) plaques is thought to be the initial event, with the recruitment of tau protein as a second important player that can spur the pathology further.⁷ Tau protein alters intracellular traffic due to its tight binding to microtubules. When Tau Protein loses its ability to bind structures, intracellular transport is disrupted. Inhibition of transport can slow down exocytosis and affect the distribution of mitochondria, which become clustered near the microtubule organizing center.⁸ In AD, Tau Protein has lost its capability to bind to microtubules and therefore is ineffective in keeping the cytoskeleton well organized in the axonal process.⁸ Serum antibodies were shown to be elevated in patients with mild cognitive impairment (MCI) associated with AD and in patients with dementia due to AD, but not in patients with MCI not due to AD.² Within hours after traumatic brain injury (TBI), tau is produced, and in animal models produces brain atrophy.⁹ Studies on tau neurogenesis in TBI link TBI to chronic traumatic encephalopathy (CTE).^{reviewed in 5} Using A β ₄₂ peptide antibody, Vojdani and Vojdani showed strong reactivity between this antibody and Tau Protein.⁶ Therefore, due to cross-reactivity with amyloid beta peptide,⁶ patients with circulating antibodies to tau protein may be at greater risk for AD and other neurological disorders when the blood-brain barrier is breached.

References:

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