

CLINICAL SPECIFICATIONS

BRAIN DERIVED NEUROTROPHIC FACTOR

Function:

Brain derived neurotrophic factor (BDNF) is a member of the neurotrophin family. BDNF supports differentiation, maturation, and survival of neurons, and under acute conditions including glutamatergic stimulation, cerebral ischemia, hypoglycemia, and neurotoxicity is neuroprotective. Therefore BDNF plays a significant role in the development and maintenance of a healthy nervous system. BDNF plays a direct role in the early phase of synaptic plasticity by triggering the delivery of GluR1 subunits to the synapse.

Associated With:

Alzheimer's disease^{Reviewed in 1}
 Parkinson's disease^{Reviewed in 1}
 Autism^{Reviewed in 1,2}
 Huntington's disease^{Reviewed in 1}
 Bipolar disorder^{Reviewed in 1}
 Epilepsy²
 Pervasive development disorders²
 Childhood disintegrative disorder²

Known Cross-Reactions: A β ₄₂ peptide;³ Varicella-zoster virus IE62⁴

Clinical Significance:

BDNF has several important actions, including maturation and differentiation of neurons. In healthy subjects BDNF levels are higher in women than in men and levels decrease with age in both genders.⁵ This may explain why Alzheimer's disease (AD) is more common in the elderly. Recently Vojdani and Vojdani showed that anti-amyloid beta (A β ₄₂) peptide reacted strongly with BDNF; therefore, elevation of A β ₄₂ antibodies in the blood and their cross-reaction with BDNF may contribute to neuronal cell death and worsen the symptomatology of AD.³ It is possible that a breach in the blood-brain barrier may lead to cross-reactive antibodies destroying what is left of BDNF levels in the brain. Decrease in the expression of BDNF is seen in many neurological diseases as noted above, while overexpression of BDNF in the hippocampus was found to occur in spontaneous seizures, leading to temporal lobe epilepsy.^{reviewed in 1} It has been suggested that decreased serum BDNF levels may have a role in the pathophysiology of cognitive deficits noted in patients with type 2 diabetes mellitus.⁶ BDNF levels were significantly lower in patients with schizophrenia who had lower cognitive scores than controls, suggesting that BDNF may be involved in the pathophysiology of schizophrenia, and its associated cognitive impairment, especially immediate memory.⁷ Although the name implies that BDNF is solely in the brain, it is actually widely distributed throughout the body and is also sourced from the heart, lungs, gastrointestinal tract and liver; it is expressed in smooth muscles.^{reviewed in 1} Although physical exercise enhances brain BDNF levels, removal of BDNF-cross-reactive antibodies would make a good additional strategy for combatting neurodegeneration in AD.

References:

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3. Vojdani and Vojdani. Amyloid-beta 1-42 cross-reactive antibody prevalent in human sera may contribute to intraneuronal deposition of A-beta-P-42. Int J Alzheimers Dis, 2018; 2018:1672568.
4. Hama et al. Antibody to varicella-zoster virus immediate-early protein 62 augments allodynia in zoster via brain-derived neurotrophic factor. J Virol, 2010; 84(3):1616-1624.
5. Zhang et al. The immunohistochemical distribution of NGF, BDNF, NT-3, NT-4 in the brains of adult Rhesus monkeys. J Histochem Cytochem, 2007; 55:1-19.
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7. Zhang et al. Low BDNF is associated with cognitive impairment in chronic patients with schizophrenia. Psychopharmacology (Berl), 2012; 222:277-284.
8. Pan et al. Transport of brain-derived neurotrophic factor across the blood-brain barrier. Neuropharmacology, 1998; 37:1553-1561.