CYREX® Laboratories

## CLINICAL SPECIFICATIONS

# BETA NERVE GROWTH FACTOR

### Function:

Nerve growth factor (NGF) is a neurotrophic factor and neuropeptide. NGF is primarily involved in the regulation of growth, maintenance, proliferation, and survival of certain target neurons in the sympathetic and sensory nervous systems. NGF binds with tropomyosin receptor kinase A (TrkA) and low-affinity NGF receptor (LNGFR/p75NTR). These receptors are associated with neurodegenerative disorders. NGF circulates in the bloodstream to keep homeostasis throughout the body and contributes to cell growth and differentiation, particularly nerve cells.

### Associated With:

Alzheimer's disease[1,2]
Parkinson's disease[3]
Systemic Sclerosis[4]
Leprosy[5]
Allergic bronchial asthma[6]

**Known Cross-Reactions:** $A\beta_{42}$ peptide;[7] Neurotrophins[8]

### Clinical Significance:

Beta Nerve Growth Factor (βNGF) is the subunit responsible for NGF biological activities. Mice that display βNGF antibodies in adulthood show an age-dependent loss of cholinergic basil forebrain neurons.[reviewed in 1] NGF initiates nerve cell growth by binding to NGF receptors. Antibodies against βNGF have been shown to interfere with this binding and thus inhibit its ability to induce neurite outgrowth from sensory neurons.[9] Consequently, as neurodegeneration occurs, βNGF is unable to initiate repairs to the damaged neurons. Studies show that alterations of the NGF/TrkA signaling system correlate well, and even more robustly than the amyloid plaque formation, with cognitive deficits in mild cognitive impairment and in its progression toward Alzheimer's disease (AD).[reviewed in 2] Generally speaking in the neurotrophic family, NGF has been associated with Parkinson's disease (PD), and brain derived neurotrophic factor (BDNF) with AD.[3] Serum NGF decreases during the progression of PD; thus, measuring antibodies against βNGF may be a reliable means to identify the degree of dopaminergic neuron degeneration.[3] Due to cross-reactivity with amyloid beta peptide,[7] patients with circulating antibodies to βNGF may be at greater risk for AD and other neurological disorders when the blood-brain barrier is breached.

### References:


1. Counts and Mufson. The role of nerve growth factor receptors in cholinergic basal forebrain degeneration in prodromal Alzheimer disease. J Neuropathol Exp Neurol, 2005; 64(4):263-272.
2. Triaca and Calissano. Impairment of the nerve growth factor pathway driving amyloid accumulation in cholinergic neurons: the incipit of the Alzheimer's disease story? Neural Regen Res, 2016; 11(10):1553-1556.
3. Lorigados Pedre et al. Nerve growth factor levels in Parkinson disease and experimental parkinsonian rats. Brain Res, 2002; 952(1):122-127.
4. Matucci-Cerinic et al. Nerve growth factor and neuropeptides circulating levels in systemic sclerosis (scleroderma). Ann Rheum Dis, 2001; 60:487-494.
5. de Souza Aarao et al. Nerve growth factor and pathogenesis of leprosy: Review and update. Front Immunol, 2018; 9:939.
6. Nassenstein et al. The neurotrophins nerve growth factor, brain-derived neurotrophic factor, neurotrophin-3, and neurotrophin-4 are survival and activation factors for eosinophils in patients with allergic bronchial asthma. J Exp Med, 2003; 198(3):455-467.
7. 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.
8. Conner and Varon. Characterization of antibodies to nerve growth factor: assay-dependent variability in the cross-reactivity with other neurotrophins. J Neurosci Methods, 1996; 65(1):93-99.
9. Zimmerman et al. Monoclonal antibodies against b nerve growth factor and their effects on receptor binding and biological activity. Proc Natl Acad Sci USA, 1981; 78(7):4611-4615.






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