



ALPHA + BETA TUBULIN

FUNCTION:

Tubulin is a building block protein and a major component of a cell's internal cytoskeleton, called microtubules. These structures play key roles in many cellular functions including, interaction with guanine, lateral contacts, interaction with beta and gamma phosphates of nucleotides, interaction with gamma phosphate, longitudinal contacts, backbone interactions with α and β phosphates, hydrophobic contact of conserved residues, nucleotide contacts, MAP-binding domain and acetylation site.

ANTIBODIES APPEAR:

Alcoholic liver disease¹
 Demyelinating disease¹
 Graves' disease^{1,5}
 Hashimoto's thyroiditis^{1,5}
 Infectious agent exposure^{1,7}
 PANDAS/ANDAS/OCD⁷
 Rheumatoid arthritis¹
 Recent onset diabetes type 1⁶
 Toxin exposure⁷

CLINICAL SIGNIFICANCE:

Tubulin's basic function as a component of microtubules explains its appearance in a variety of unrelated disorders, which can affect organ tissues, as well as, neuronal structures.^{3,4} Quantitative increases in anti-tubulin antibodies are thought to be due to autoimmune reactions to the patient's own tubulin, or to the polyclonal activation of B cells associated with diseases and disorders listed above.¹ A surprising similarity between the structures of tubulin and bacterial protein FtsZ (filamenting temperature-sensitive mutant Z) has spawned a variety of studies linking infectious agent exposure with tubulin antibodies.⁴ Elevated anti-tubulin antibody levels were found in sera from patients who presented with a number of infections, including leishmaniasis, African trypanosomiasis, onchocerciasis, schistosomiasis and leprosy.¹ Tubulin may be altered during the course of an infection, thus rendering it immunogenic. Infectious agents due to antigenic similarity may illicit a cross-reaction autoimmune response. Tubulin cross-reacts with Streptococcal protein, which can lead to autoimmunity and the neurological dysfunction associated with PANDAS/ANDAS/OCD.⁷ Tubulin is also a neuronal target of autoantibodies in Sydenham's Chorea, in which these autoantibodies alter the blood-brain barrier, thus increasing permeability of the blood-brain barrier.³ This event results in cell signaling, dopamine release, and movement and neuropsychiatric abnormalities. Antibodies against nerve cell Tubulin have been demonstrated in patients with toxic chemical exposure, including mercury and other heavy metals. Anti-tubulin antibodies are also detected in a high ratio of patients with recent onset type 1 diabetes, but decrease or disappear during the course of the disease.⁶ Anti-tubulin antibody was detected in 56% of patients with Hashimoto's thyroiditis and in 41% of patients with Graves' disease.⁵

KNOWN CROSS-REACTIONS:

Streptococcal Protein⁷

References:

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4. Pennisi E. Structure of key cytoskeletal protein tubulin revealed. *Science*, 1998; 279:176-177.
5. Rousset B et al. Anti-tubulin antibodies in autoimmune thyroid disorders. *Clin Exp Immunol*, 1983; 52:325-332.
6. Rousset B et al. Anti-tubulin antibodies in recent onset Type 1 (insulin-dependent) diabetes mellitus: comparison with islet cell antibodies. *Diabetologia*, 1984; 27(4):427-432.
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