

Calcium and gadolinium ions stimulate the GTPase activity of purified chicken brain tubulin through a conformational change

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Ca²⁺ and Gd³⁺ stimulated the GTPase activity of chicken brain tubulin 13- and 26-fold, respectively. Mg²⁺, Tb³⁺, and Na⁺ had no effect. This GTPase activity showed a saturation behavior with Ca²⁺ and Gd³⁺ with a maximal activity of 0.26 ± 0.026 and 1.15 ± 0.78 nmol min⁻¹ per mg of tubulin and semisaturation constants, expressed as the concentration of the cation needed for 50% of saturation, of 0.32 ± 0.18 and 0.011 ± 0.007 mM, respectively. In the presence of Ca²⁺, the GTPase activity was proportional to tubulin concentration in the range 0.9-31.8 μ M. The semisaturation constants for the inhibition of tubulin polymerization and for the depolymerization of microtubules by Ca²⁺ were 0.71 ± 0.1 and 0.049 ± 0.043 mM, respectively. The similarity of the Ca²⁺ semisaturation constants for inhibition of tubulin assembly and stimulation of the GTPase activity suggests that these processes are correlated. These results support the hypothesis that the GTPase activity is related to but not direct