

# 金属离子对GTP结合蛋白 Cdc42Hs的内源性 GTP酶活性的影响

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不同的金属离子会对GTP结合蛋白Cdc42Hs的内源性GTP水解酶活性产生不同的影响。相对于生理条件下的辅基 $Mg^{2+}$ 而言, $Mn^{2+}$ 对Cdc42Hs酶活力有所激活,表现在饱和浓度时,实验曲线指数项的表观速率常数 $k_{obs}$ 有2倍左右的提高,而其稳态反应速度要低于 $Mg^{2+}$ 。 $Mg^{2+}$ 和 $Mn^{2+}$ 的实验曲线在本质上没有什么差别,都是一个指数项和一个一次项的叠加,说明 $Mn^{2+}$ 和 $Mg^{2+}$ 以相似的机制结合于Cdc42Hs。在 $Ca^{2+}$ 存在时,实验曲线无明显的指数项出现, $Ca^{2+}$ 的存在仅使稳态反应速度有所降低,说明 $Ca^{2+}$ 以不同于 $Mg^{2+}$ 和 $Mn^{2+}$ 的机理与Cdc42Hs结合。随着 $Mg^{2+}$ 和 $Mn^{2+}$ 离子浓度的增大,指数项的表观速率常数 $k_{obs}$ 逐步升高,稳态反应速度 $v_s$ 逐渐降低。进一步的动力学模型分析得到了这一反应的微观动力学常数和 $Mg^{2+}$ 、 $Mn^{2+}$ 与蛋白的结合常数。

## EFFECTS OF METAL IONS ON THE INTRINSIC GTP-HYDROLYSIS ACTIVITIES OF SMALL GTPase Cdc42Hs

Different metal ions have different effects on the intrinsic GTP-hydrolysis activity of Cdc42Hs. Compared with  $Mg^{2+}$ , the physiological cofactor,  $Mn^{2+}$  has a slight activation effect on GTP-hydrolysis activity. The  $k_{obs}$  of the exponential phase of the experiment curve of  $Mn^{2+}$  is two-times higher than that of  $Mg^{2+}$  under saturated condition. And the velocity of the steady state is lower than that of  $Mg^{2+}$ . Essentially, there is no difference between the experiment curves of  $Mn^{2+}$  and  $Mg^{2+}$ . Both of them have an exponential phase and linear phase, which indicate that  $Mn^{2+}$  and  $Mg^{2+}$  adopt the same mechanism in binding to Cdc42Hs. In the case of  $Ca^{2+}$ , there is no detectable exponential phase in the experiment curve. The presence of  $Ca^{2+}$  only slows down the velocity of the steady state. This indicates that the binding mechanism of  $Ca^{2+}$  to Cdc42Hs is different from that of  $Mn^{2+}$  and  $Mg^{2+}$ . With the increasing of  $Mn^{2+}$  and  $Mg^{2+}$  concentration, the  $k_{obs}$  of the exponential phase increase, and the velocity of the steady state decrease. A detail kinetic analysis deduces the microscopic kinetic constants of the hydrolysis reaction and the disassociate constants of the metal ions with the protein.

### 关键词

金属离子(Metal ions); GTP结合蛋白(GTP-binding protein); Cdc42Hs; GTP水解酶活性(GTP-hydrolysis activity); 结合常数(Disassociate constants)