

研究论文

### SDS抑制乙酰胆碱酯酶反应的热动力学研究

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**摘要** 在37 °C, pH=7.4的Tris-HCl缓冲体系中, 利用热焓放大技术和热动力学初始速率法研究了近生理条件下的乙酰胆碱酯酶(AchE)催化溴化乙酰胆碱水解反应及十二烷基硫酸钠(SDS)对反应的抑制动力学.

通过测量实验条件下反应体系的总反应焓及相同条件下的Tris碱的质子化焓, 确定了酶反应的摩尔反应焓 $\Delta H_{m,1}$ 为0.63 kJ·mol<sup>-1</sup>, 米氏常数 $K_m$ 和底物抑制常数 $K_S$ 分别为0.85~0.94 mmol·L<sup>-1</sup>和0.74~0.83 mmol·L<sup>-1</sup>.

SDS能够显著地降低反应速率, 但对酶反应的生化常数的影响较小, SDS对AchE的抑制表现为不可逆抑制.

在一定浓度的SDS溶液中, AchE的失活符合一级反应动力学规律,

表现一级失活速率常数与作用时间及SDS浓度的四次方呈线性关系, 失活常数为 $(2.47\sim 2.69)\times 10^{13} \text{ mol}^{-4}\cdot\text{L}^4\cdot\text{min}^{-1}$ .

**关键词** [热动力学](#) [乙酰胆碱酯酶](#) [溴化乙酰胆碱](#) [十二烷基硫酸钠](#) [不可逆抑制](#)

分类号

### Thermokinetic Studies on the Inhibition of Acetylcholinesterase Reaction by SDS

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**Abstract** At 37 °C and in Tris-HCl buffer (pH=7.4), enthalpy magnification technique and thermokinetic initial rate method were employed to study the hydrolysis reaction of acetylcholine bromide catalyzed by acetylcholinesterase (AchE) and the inhibition of the reaction by sodium dodecyl sulfate (SDS) under near physiological conditions. Molar enthalpy ( $\Delta H_{m,1}$ ) of the enzymatic reaction was determined to be 0.63 kJ·mol<sup>-1</sup> by deducting enthalpy of protonization of Tris base from total enthalpy of reaction system. Michaelis constant ( $K_m$ ) and substrate inhibition constant ( $K_S$ ) were also determined to be 0.85~0.94 mmol·L<sup>-1</sup> and 0.74~0.83 mmol·L<sup>-1</sup>, respectively. SDS could remarkably decrease the rate of enzyme reaction but has less influence on biochemical constants of the enzyme. In SDS solution, inactivation rate of AchE follows first order reaction kinetics, the apparent first order inactivation constant is linear to action time and the fourth power of SDS concentration, and inactivation constant was calculated to be  $(2.47\sim 2.69)\times 10^{13} \text{ mol}^{-4}\cdot\text{L}^4\cdot\text{min}^{-1}$ .

**Key words** [thermokinetics](#) [acetylcholinesterase](#) [acetylcholine bromide](#) [sodium dodecyl sulfate](#) [irreversible inhibition](#)

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