

Biochemical Comparison of Arginine Kinase Allozymes in *Drosophila*
Melanogaster
黃果蠅(*Drosophila melanogaster*)精氨酸激酶異構酶之生化特性比較

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Abstract

ARK(B) is a rare arginine kinase allozyme found in natural populations of *Drosophila melanogaster*. To test whether the rarity of this allozyme could be due to its biochemical impairment relative to the common allozyme, biochemical properties such as catalytic efficiency and conformational stability of the rare (ARK(B)) and the common (ARK(A)) allozymes were compared in this study. Both allozymes were purified by ammonium sulfate fractionation, DEAE-ion-exchange column, Blue-Sepharose, and S-300 gel filtration, to yield a single coomassie-blue band on SDS-polyacrylamide gels. ARK(A) has a higher V_{max} or V_{max}/K_m than ARK(B) at 18 or 29 degrees C, but there are no differences at 24 degrees C. In general, ARK(A) is catalytically more efficient than ARK(B). Heat treatment of the allozymes shows that ARK(B) has a lower specific activity than ARK(A), and its temperature of heat inactivation is also lower. Also, the rate of heat inactivation of ARK(B) is faster. Therefore, ARK(B) is more thermolabile than ARK(A). From comparisons of catalytic efficiency and thermal stability of the allozymes, we assume that ARK(B) is biochemically less efficient than ARK(A), and that might partially account for the rarity of Argk(B) in natural populations of *D. melanogaster*.

Key words : *Drosophila melanogaster*; Arginine kinase allozymes; Catalytic; Efficiency; Conformational stability

中文摘要

黃果蠅(*Drosophila melanogaster*)的自然族群中存在一種稀少的精氨酸激異構□t(arginine kinase allozyme)叫 ARK□，而其對偶基因分佈頻率的稀少性(rarity)可能由於其生化能力劣於另一種對偶基因分佈普遍的異構□t 叫 ARK□，因此自然選汰的壓力作用其上而無法擴散。為測驗此假設，本文比較了此二異構□t 的催化能力(catalytic efficiency)及結構的穩定度(conformational stability)等。此二種異構□t 均先被純化(protein purification)，然後才進行生化反應的試驗。酵素動力學(kinetics)的結果顯示在 18°C 及 29°C 時，ARK□有較高的 V_{max} 或 V_{max}/K_m ，但在 24°C 時則無顯著差異，然而綜合而言，此結果建議 ARK□的催化能力較 ARK□為強，另外，熱處理的實驗顯示 ARK□活性(specific activity)下降速率較快，且活性被完全抑制的溫度也較低，以及速率也快很多。此結果建議 ARK□對熱的穩定性較 ARK□為差。從對此二異構□t 在催化能力及熱的穩定度的比較，本文建議 ARK□的生化能力劣於 ARK□，而此建議可能部份解釋為什麼 Argk□在黃果蠅的自然族群中的分佈那麼少。

關鍵字：黃果蠅；異構酶；催化能力；結構的穩定度