from the recorded time history. One cycle is defined as between two local maximums. The movement frequency was calculated as the number of movement cycles within a quintile (20% of the total practice time) divided by the duration of the quintile. Frequencies of the chest and abdominal movements were calculated in the same fashion only the time history data were collected using customer made plethysmographic device at the chest and the abdomen. Output parameters were statistically examined with two-factor (Group X Time) ANOVA analysis of variance with subjects in each group as repeated measures. Post Hoc analyses, trend analysis and pair comparison, were also performed when needed. Significance level was set at .05. Result: group 2 showed lowest chest movement rate at 8 per minute but group 1 and 3 averaged at 15 and 13. There was not group difference observed but overall abdominal movement rate increased up to 3 additional cycles at the fourth comparing to the first quintile. The abdomen was moving at twice of the rate of the chest across all the groups and all quintiles. Knee joint movement was used to represent the movement rhythm during Tai Chi practice in this study. Knee movement rate followed a cubic trend with the highest point at the fourth quintile, which is about 3 cycles more than the first quintile. Furthermore, knee joint movement rate was positively correlated with heart rate, chest and abdominal movement rates, although no correlation was observed among the later three. It is important to note that heart rate increased from first to fifth quintile in a linear fashion, but this linear trend was not observed in the two breathing related parameters and the movement rhythm.

不同长度 β_2 整合素$_M$ 亚基与 ICAM-1 的亲和性比较

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整合素作为细胞表面糖蛋白受体,介导细胞-细胞、细胞-胞外基质以及细胞-病原体间粘附和信息传递,在免疫应答、凝血反应、炎症反应、肿瘤转移和创伤愈合等许多病理生理过程中起重要作用。整合素是由 α、β 两个亚基非共价结合而成的异源二聚体,其结构类似于两条近平行的腿部支撑着一个球形的头部。研究表明,β_2 整合素$_M$ 亚基头部的. domain 为与配体直接作用的结构域,并可通过"open" 或"close"的构象变化改变其与配体相互作用的亲和性[1];然而该亚基中没有与配体直接相互作用的其它结构域(如 Propeller、Thigh、Calf-1、Calf-2 等)的结构-功能关系目前尚不清楚。本文以 β_2 整合素成员 Mac-1 的$_M$ 亚基为研究对象,运用分子生物学实验手段构建了系列由固定 open 构象的 I domain 和不同长度的腿部结构域组成的重构$_M$ 亚基。其基本策略是通过将特定位点的氨基酸突变为半胱氨酸并添加二硫键(如 Q163C/Q309C, D294C/Q311C)将 I domain 锁定在 open 构象[2],保证其与配体结合的高亲和性;然后依次添加 Propeller、Thigh、Calf-1、Calf-2 等结构域构建不同的重构亚基。采用细胞 ELISA 方法和微管吸吮技术等研究重构蛋白与 ICAM-1 配体相互作用的反应动力学,考察腿部各结构域对整合素与其配体相互作用的影响,以加深对整合素 亚基腿部各结构域功能的认识。同时,基于已有$_M$ 亚基及 ICAM-1 的三维结构,运用同源模建、分子对接、分子动力学模拟等分子模拟手段,构建含不同结构域的$_M$ 模拟体系、预测不同长度的$_M$ 与 ICAM-1 D3 相互作用的结构特征。模拟预测与实验结果相比较,为认识不同结构域功能提供微观结构信息,深入理解其结构-功能关系。(本文得到国家自然科学基金项目(30730032/10702075)、科技部"蛋白质科学"国家重大研究计划(2006CB910303)、科技部 863 项目(2007AA02Z306)和中国科学院知识创新工程项目(KJCX2-YW-L08)的支持。E-mail: mlong@ imech. ac. cn; Tel: (010)82544131)

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