

肥大心におけるサルコレンマ $\text{Na}^+ - \text{Ca}^{2+}$ 交換, および ATP 依存性 Ca^{2+} -binding 活性の変化

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Alterations in sarcolemmal $\text{Na}^+ - \text{Ca}^{2+}$ exchange and ATP-dependent Ca^{2+} -binding in hypertrophied heart

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ABSTRACT In order to examine changes in Ca^{2+} transport in heart sarcolemma, cardiac hypertrophy was induced in rabbits by stenosis of the abdominal aorta and hearts were removed 18-20 weeks later; sham-operated normal rabbits were used as control. Sarcolemmal vesicles were isolated from the left ventricular tissue by a sucrose density gradient method and the membrane composition as well as activities of certain marker enzymes were monitored to determine the purity of control and experimental fractions; $\text{Na}^+ - \text{Ca}^{2+}$ exchange and Ca^{2+} -pump activities were assessed by the Millipore filtration technique. No changes in Ca^{2+} -influx were observed in Na^+ -loaded vesicles from the hypertrophied hearts when studied in the presence of different concentrations of calcium as well as at different times of incubation. In contrast, Na^+ -induced Ca^{2+} -efflux from Ca^{2+} -loaded vesicles was enhanced in the hypertrophied heart at different times of incubation and at different concentrations of sodium. ATP-dependent Ca^{2+} -binding activity of sarcolemma from hypertrophied heart, when measured at different times of incubation and at several concentrations of calcium, was more than the control. Minimal but an equal amount of cross contamination was seen in both control and experimental preparations; however, phosphatidylcholine, phosphatidylethanolamine and phosphatidic acid contents were increased in sarcolemma from hypertrophied hearts. These results suggest that the sarcolemmal Ca^{2+} -transport systems may become adapted during the development of hypertrophy for augmenting Ca^{2+} -efflux from the hypertrophied myocardial cell and this may prevent the occurrence of intracellular Ca^{2+} overload in a stable form of cardiac hypertrophy.

抄録 腹部大動脈結紮により肥大心を起こした家兎心筋のサルコレンマのカルシウム輸送機序を検討した。単離したサルコレンマでは Na^+ -誘発 Ca^{2+} -efflux の促進と, ATP 依存性 Ca^{2+} -binding の増加が観察された。以上の結果から肥大心はその病態に対処したカルシウム輸送能を示し, 細胞内カルシウム過負荷を抑制するように働いていることを示した。

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