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The Contractility of Isolated Rat Atrial Tissue during Hypoxia is Better Preserved in a High- or Zero-Glucose Environment than in a Normal Glucose Environment

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Aim: Hyperglycemia is known to be associated with an increase in mortality in myocardial infarction and intensive care patients despite the fact that glucose metabolism plays a central role in myocardial protection. We studied the effect of different glucose levels (22 Mm L^{-1}; 5.5 mM L^{-1}; and 0 mM L^{-1}) on the contractile reserve of isolated rat atrial myocardium during and after hypoxia.
Methods: We observed the contraction ofisolated rat atrium strips caused by electrical-field stimulation in a modified Krebs-Henseleit Buffer (KHB) organ bath oxygenated with 95% O_2 + 5% CO_2 at 37°C. We applied two periods of hypoxia and two periods of reoxygenation. Three glucose concentrations were used in the buffer to study the effect of glucose (high- n=6; normal- n=7; and zero-glucose n=6). The effect of isoproterenol 1 µM L^{-1} was tested during the second ischemic period.
Results: The main finding was that both a zero-glucose (27.8 ± 5.9 vs. 14.7 ± 3 % of baseline tension) and a high-glucose environment (38.5 ± 14 vs. 14.7 ± 3 % of baseline tension) had a positive effect in terms of better contractility than the normal-glucose buffer during both the first (p=0.00062) and the second ischemic period (31.2 ± 5.9 % zero-glucose vs 14.7 ± 4.2 normal-glucose vs. 35.3 ± 15.9% high-glucose p=0.0038).
Conclusion: Both zero-glucose and high-glucose environments resulted in a better contractile reserve in isolated rat atrial myocardium during hypoxia than in a normal one. The exact clinical relevance of this observation is, at present, unclear.