

Heat Production by the Ca²⁺-ATPase Derived from Rabbits and Rats: Effect of Temperature.

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The sarcoplasmic reticulum Ca²⁺-ATPase (SERCA) pumps Ca²⁺ from the cytosol to the SR lumen using the energy derived from ATP hydrolysis. In addition, SERCA 1 is also able to hydrolyze ATP without pumping Ca²⁺, producing more heat per mol of ATP cleaved than that released during the coupled ATPase activity. These kinetic parameters were always measured at 35°C. Since the body temperature of rabbits and rats is greater than 35°C (approximately 39°C and 37°C respectively), in this work we verified the thermogenic activity of the Ca²⁺-ATPase derived from the white muscle of both animals in different temperatures. The elevation in temperature from 35°C to 42°C was accompanied by small increase in the rate of Ca²⁺ uptake. Both ATP hydrolysis and heat production increased, but this augmentation was greater in the rate of heat release. As a result, the amount of heat released per mol of ATP cleaved (ΔH^{cal}) increased with temperature from a range of -18 to -20 kcal/mol at 35°C to -32 to -34 kcal/mol at 42°C. These results show that SERCA is able to modulate the part of energy that is used for transport and the part that is converted into heat depending on the temperature of the assay medium.

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