

ATP SYNTHESIS AND HEAT PRODUCTION BY BROWN ADIPOSE TISSUE MITOCHONDRIA

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Brown adipose tissue (BAT) is capable of rapidly converting fat stores to heat and has been used as a model system for the understanding of nonshivering heat production and mechanisms of energy wasting to control obesity (1-12). The signal that activates the rate of heat production in BAT cells is the rise of the cytosolic Ca^{2+} concentration to the range of 0.2 - 0.7 μM (13, 14). In a recent report (15) we found that BAT mitochondria have a Ca^{2+} -ATPase bound to the inner membrane (de Meis, L., Arruda, A., Costa, R. and Benchimol, M. (2006) J.Biol.Chem. 276, 25078-25087). These mitochondria produce a large amount of heat during respiration and the rate of heat production is enhanced by Ca^{2+} and ATP. Liver mitochondria produce a small amount of heat and different from BAT, heat production is inhibited by Ca^{2+} . We now show that the rate of heat production in BAT mitochondria is enhanced during ATP synthesis and that both heat and ATP can be produced in the absence of an electrochemical H^+ gradient.