Heat production of muscle tissue of tegu lizards (*Salvator merianae*)

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In general, small ectothermic vertebrates are incapable of endogenously sustaining a body temperature substantially above ambient temperature. However, contrary to prevailing notions, some ectotherms can engage in facultative endothermy. For example, during the reproductive season, tegus lizards have an enhanced capacity to augment heat production and heat conservation [1]. In this case, an elevated body temperature is sustained mainly through enhanced metabolic rates in muscle tissue. Goal of the study was the identification of the heat contributions from different sources inside the muscle cells of tegus lizards.

Direct calorimetry is a valuable tool if anaerobic processes have to be studied. This is the case if heat contributions from reactions catalyzed by SERAC enzymes have to be analyzed. SERCA is an enzyme in the membrane of the sarcoplasmatic reticulum (SR), an organelle which plays an important role in the regulation of the Ca^{2+} concentration inside the muscle cell. SERCA acts as calcium pump when the Ca^{2+} concentration has to be decreased in the cytosol in order to force the relaxation of the muscle fibers. The ATP hydrolysis reaction is the driving force for the transport of Ca^{2+} from the cytosol into the SR against the concentration gradient. However, ATP hydrolysis can be uncoupled from the calcium ion transport and the evolved heat serves as contribution to the thermogenesis of the organism.

To determine the contribution of SERCA to the overall heat production, oxidative phosphorylation was blocked and the effect of the SERCA inhibitor thapsigargin was analyzed by measuring the heat production of small pieces of muscle tissue obtained from biopsy using a flow-through chip calorimeter. Results obtained at different states of animal's activity are compared.

Keywords: Endothermy, Tegus lizard, SERCA, chip calorimetry

[1] Seasonal reproductive endothermy in tegu lizards, G. J.; Leite, C. A. A.; Sanders, C. E.; Cadena, V.; Andrade, D. V.; Abe, A. S.; Milsom W. K.; Sci. Adv. 2016; 2 :e1500951.