EXPRESSION OF AN AVIAN UNCOUPLING PROTEIN IN GROWING MUSCOVY DUCKLINGS

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In mammals, it is known that body temperature and energy balance are regulated by modulation of the proton electrochemical gradient across the inner mitochondrial membrane through an uncoupling protein (UCP), which promotes the dissipation of oxidation energy in brown adipose tissue. Since then, UCP homologues have been characterised in other tissues and a number of animal and plant species suggesting larger physiological roles of these mitochondrial proteins than previously anticipated. Very recently, we have identified a complementary DNA from chicken (*Gallus gallus*) that encodes an avian UCP (avUCP; Raimbault et al., 2001). The predicted amino-acid sequence of avUCP, deduced from the nucleotide sequence is 55, 70, 70 and 46% identical to mammalian UCP1, UCP2, UCP3, and plant UCP, respectively. AvUCP may be involved in facultative thermogenesis because it is up regulated in avian models of cold-induced regulatory nonshivering thermogenesis (cold-acclimated ducklings) and diet-induced thermogenesis (inefficient line of chickens). We analysed the expression of avUCP in growing male Muscovy ducklings (*Cairina moschata* L.) reared at either thermoneutrality (25°C) or in the cold (4°C) from 1 wk of age. Ducklings were obtained from a commercial stockbreeder (Ets Grimaud, France). They were fed ad libitum with a commercial mash and had free access to water. Tissues were obtained after birds were killed by decapitation and stored at -80°C until analysis. Tissue total RNA was extracted with standard method. Analysis of avUCP messenger RNA in duckling tissues using RT-PCR and Northern blots, revealed a 1.8 kilobase transcript uniquely present in skeletal muscle. The pattern of expression of avUCP is similar to that of the mammalian UCP3, which is predominantly expressed in skeletal muscles. It however differs from that of the ubiquitous UCP2. Relative abundance of avUCP mRNA differed between skeletal muscles and depended on fibre typing. Relative abundance changed with age between hatching and 5 weeks of age and was affected by chronic cold exposure. These results therefore indicate that avUCP expression is modulated by age, ambient temperature and may possibly be involved in the modulation of oxidative metabolism, thermogenesis and energy balance in birds. By analogy with results in other species, the precise role of avUCP may not be exclusively in thermogenesis and further studies are required to clarify this important issue in avian energetics.

Raimbault, S., Dridi, S., Denjean, F., Lachuer, J., Couplan, E., Bouillaud, F., Bordas, A., Duchamp, C., Taouis, M. and Ricquier, D., 2001. Expression of an avian uncoupling protein putatively involved in facultative thermogenesis. Biochem. J. 353, 441-444.

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