INFLUENCE OF INCUBATION TEMPERATURE ON THERMOREGULATORIC EFFORT IN BIRD EMBRYOS

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During the early ontogeny epigenetic adaptation mechanisms occur to adapt the organism for the expected postnatal environmental conditions. These processes can be also induced by prenatally applied temperature changes. It is easily achieved in birds by changing the incubation temperature. Our investigations have shown, that in precocial birds endothermic reactions occur already during embryonic development. It is known, that birds incubated at a lower or higher temperature than normal are acclimated to cold or heat, but there is no knowledge of the influence of prenatal temperature experiences on the development of thermoregulatory mechanisms. The aim of this study is to investigate the effect of prenatal cold and warm load in comparison to a normal incubation temperature on thermoregulatory heat production (HP) in Muscovy duck embryos (*Cairina moschata*) and chicken embryos (*Gallus domesticus*). The experiments were carried out in chicken embryos between day 15 and day 24 of incubation and in embryos of the Muscovy duck between the 29th and the 37th day of incubation. The embryos were incubated until day 17 (chickens) or day 28 (ducks) at 37.5°C and later at 34.5°C (cold, first series) or at 38.5°C (warm, second series). In a third series the embryos were incubated during the whole time of embryonic development at 37.5°C (control). HP was determined by measuring oxygen consumption of each individual embryo. Simultaneously, the temperature of the allantoic fluid (Taf) was estimated. The results can be summarized as follows. Firstly, HP in cold and surprisingly also in warm incubated chicken embryos was higher than in the control group. For instance, at the day before hatching the HP of the cold incubated embryos was 3.21 ± 0.32 W/kg (n=6), of the warm incubated ones it was 2.69 ± 0.16 W/kg (n=10) and the control group had a HP of 2.1 ± 0.06 W/kg (n=6). The values of each group investigated was significantly different ($p<0.05$, student's t-test). Secondly, the day before hatching the warm incubated duck embryos show an overshooting reaction in their HP and their Taf when rewarming after a decrease of temperature (180 min, -3°C). That means, when comparing HP and Taf the time before cooling and when re-increasing ambient temperature, it is seen that these values reach higher levels when rewarming the embryo to sink nearly to the level before decreasing temperature after a couple of hours, forming a curve. This might be a sign of an increased thermoregulatory ability in the investigated avian species.

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