

CATECHOLAMINES AND CORTISOL IN THERMOREGULATION OF CHICKEN AND DUCK EMBRYOS INCUBATED UNDER LOWERED TEMPERATURE

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During the embryological development the neural and the hormonal regulatory system has to be developed to a stage, that they are able to adapt the organism from prenatal protected life to the completely different as well as changing environmental conditions. The prenatal mammal in the uterus is protected against various exogenic influences by the mother. In comparison to that the avian embryo has to react very early to stress factors with own regulatory systems. The sympatho-adrenal system plays a pivotal role in the adaptation of body to stress by providing an immediate response to any stressor. The main function of the Catecholamines (CA): noradrenaline-NA, adrenaline-A and dopamine-DA is to protect the embryo from deleterious hypoxic damages in the end of embryogenesis by improving the blood gas status and the redistribution of cardiac output in favour of heart, brain and chorioallantoic membrane. When respiration changes from the chorioallantoic circuit to the lungs, Corticosteroids stimulate the synthesis of surfactant and Cortisol (C) is responsible for glucose metabolism. Under the condition of stress, C permits a permissive effect to CA by an increasing sensitivity to the CA-receptors in circuit. All these functions of hormones support the possibility of thermoregulation. Our basic question was whether lower prenatal temperatures for certain periods of time had any influence on CA and C in plasma of the chick embryo in comparison with duck embryo. The present study aimed at the influence of two temperatures (37.5°C and 35.0°C) on the CA- and C-concentrations in plasma of chick and duck embryos. The incubation temperature was decreased (35.0°C) at day of incubation (D)14 for chicken embryos and at D23 for duck embryos. The control group was continuously incubated at 37.5°C. The day on which the incubation temperature was changed in the duck is determined in relation to the chicken embryo's age. D14 of the chicken and D23 of the duck are equivalent to 66% of their respective incubation time. CA were determined by HPLC, C with testkits (Sigma-Aldrich). The table shows the median of hormone concentrations (ng/ml) in chick and duck embryos from selected incubation days.

	Chicken						Duck					
	D18		D19		D20		D30		D31		D32	
T [°C]	37.5	35.0	37.5	35.0	37.5	35.0	37.5	35.0	37.5	35.0	37.5	35.0
DA	6.9	7.3	5.9	7.4	10.5	9.8	1.8	1.3	1.6	1.2	2.2	1.9
NA	13.3	13.6	21.9	8.2	38.5	15.6	17.6	9.3	26.6	9.6	11.9	33.6
A	1.8	0.5	5.9	0.5	11.2	0.9	4.7	0.9	4.1	1.6	3.2	5.4
C	3.1	2.7	4.3	5.6	5.4	4.6	5.8	5.2	7.9	7.0	7.4	8.5

In chick embryos we found an age dependent increase in hormone levels at 37.5°C and at 35.0°C from D18 to D20. In duck embryos an increase was found between D30 to D32 only at 35.0°C. The longer-term decrease of incubation temperature influenced the CA- and C-concentration in plasma. Considering the physiological function of these hormones in chicken and duck embryos- the influence on metabolism and circuit - thermoregulation can be assumed at 35.0°C in both.

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