THE EARLY DEVELOPMENT OF NEURONAL HYPOTHALAMIC THERMOSENSITIVITY IS INFLUENCED BY EPIGENETIC TEMPERATURE ADAPTATION

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During embryonic development, changes in environmental conditions induce alterations in postnatal development of control systems like the thermoregulatory system. Birds incubated at lower or higher temperatures than usual were postnatal cold or warm adapted. In our own experiments in ducklings, for instance, heat production was higher (56%) in cold-incubated birds (34.5°C) than in normally incubated ones under cold load (10°C) on the first day after hatching. Besides this, cold-incubated ducklings preferre lower ambient temperatures during the first 10 days post-hatching than birds incubated at the usual 37.5°C. Obviously, these alterations are the result of epigenetic adaptation processes. It is to assume, that in the brain epigenetic adaptation processes results in a changed neuronal activity. In relation to that, in our experiments we investigated the prenatal influence of different incubation temperatures on the development of central neural thermoregulatory mechanisms in ducklings. Experiments were carried out in 1-, 5- and 10-d-old Muscovy ducklings (*Cairina moschata*) incubated at 35°C, 37.5°C (control) and 38.5°C during the last week of incubation. At the day of the experiments the birds were decapitated and the brain removed. 400 µm thick brain slices including the preoptic area of the anterior hypothalamus (PO/AH) were prepared. Using the method of extracellular recordings, neuronal thermosensitivity of PO/AH neurons after sinusoidal temperature changes (40°C ± 3°C) was investigated. The proportion of cold- (C) and warm-sensitive (W) and temperature-insensitive PO/AH neurons was determined in all age groups, investigated. The results show, that changes in incubation temperature induced a clear alteration of neuronal hypothalamic thermosensitivity during the first 10 days post-hatching, but this alteration was independent (proximate nonadaptive) of the direction of changes in incubation temperature between day 1 and 5. In 1- and 5-d-old ducklings the proximate nonadaptive change in neuronal hypothalamic thermosensitivity after different prenatal temperature load might be typical for this early stage of ontogeny. Proximate nonadaptive alterations to various exogenous factors were also found in many body functions (e.g. blood flow of the allantoic membrane, heart rate) during early development in birds as well as in mammals. On the 10th day post-hatching prenatal temperature experiences induced an incubation temperature dependent alteration of the thermosensitivity of PO/AH neurons (proximate adaptive). In 10-d-old birds cold load elevated hypothalamic warm-sensitivity through an increased proportion of W-neurons and a reduced proportion of C-neurons. Prenatal warm load induced an opposite effect. We conclude, that in differently incubated birds the observed alteration in the activity of PO/AH neurons which results in changes in neuronal thermosensitivity of the thermoregulatory center is caused by epigenetic adaptation processes.

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