



# The 4<sup>th</sup> Workshop on Fundamental Physiology and Perinatal Development in Poultry

## PROGRAM & ABSTRACTS

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## **Short-term cold influence stimulates neuronal NO-synthase activity in the anterior hypothalamus of Muscovy duck embryos**

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NO is prominently involved in the regulation of various physiological functions like the regulation of body temperature, metabolism and body weight. In the brain it acts as a messenger molecule in differentiation, synaptic plasticity and neurotoxicity. NO is produced by activation of nitric oxide synthase (NOS). The marker for NOS-positive neurons is nicotinamide adenine dinucleotide phosphate-diaphorase (NADPH-d). The aim of the study was to investigate the influence of short-term temperature stimulation on neuronal NOS activity of the anterior hypothalamus in Muscovy duck embryos during second half of incubation.

Experiments were carried out under normal incubation temperature (37.5°C) in Muscovy duck embryos on E20, E23, E28 and E33. Three experimental series were performed; without acute temperature stimulation (control), with 3 h warm (39°C) or cold stimulation (34°C) on the respective experimental day. In the temperature-stimulated groups the brains were immediately extracted after the 3 h of temperature influence. Activation of neuronal NOS was investigated in all experimental groups using histochemistry for identification of the NADPH-d. For analysis, NADPH-d positive neurons were counted in a defined area of the anterior hypothalamus. In the control and warm stimulated group NADPH-d positive neurons could be first detected on E23. Acute cold load induced NOS activation during an earlier embryonic age. In the cold stimulated group NADPH-d positive hypothalamic neurons were found already on E20. Also in the other age groups investigated, the activation of hypothalamic neuronal NOS was significantly increased after cold stimulation. In birds the development of body functions starts early during embryogenesis. Environmental stimulation could improve this process ('training effect', Nichelmann and Tzschentke, 2002, *Comp. Biochem. Physiol. A* 131:751-763). Both, the activation of neuronal NOS on an earlier stage of development and the significant increase in activation of NOS exclusively after cold load in all other age groups investigated leads to the hypothesis, that probably in bird embryos NO acts as a modulator of the neuronal cold and energy uptake pathway in the anterior hypothalamus.

**Keywords:** Muscovy duck, NO-synthase, prenatal ontogenesis, hypothalamus

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