

## The Influence of Level and Duration of Acute Hypoxia on the Heart Rate Response at the Second Part of Chick Embryogenesis

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The effects of acute hypoxia on cardiovascular function during the chick embryogenesis have been intensely studied. The results showed that the response to acute hypoxia in chick embryogenesis includes hypotensive bradycardia and redistribution of cardiac output from the ancillary blood vessels toward vital organs, such as the brain, heart, and adrenal glands. In our earlier studies, a biphasic hypoxic response of the heart rate (HR) under mild hypoxia (10%O<sub>2</sub>) was described on incubation day 10 (D10) and D14 was described. The goal of this study was to analyze the time course of the changes in HR during exposure of D10, D12, D14, D16 chick embryos to mild and severe acute hypoxia (10% or 5%O<sub>2</sub>) for 20 and 40 min. A digital video camera was used to perform video recording, and HR was measured as a pulse rate in a major vessel.

In control, the HR increased from 250 to 264 bpm between D10 bpm and D14, and then did not change till D16. In spite of the variability of the time course of the changes in HR during exposure to hypoxia, we can note that the mild and severe hypoxia causes the inhibitory effect on HR in all ages studied and the strength of this effect decreases with age while at the same time it rose with the increasing degree of hypoxia. Thus, for example, the mild hypoxia reduced HR by 12% on D12 and by 5% on D16 while severe hypoxia reduced HR by 35% on D10 and 20% on D16. After the hypoxic mixture was replaced with atmospheric air, HR returned to baseline level with the short overshoot. Both mild and severe hypoxia for 20 min caused a biphasic response with the HR initially dropping and then partly recovering against a background of continuing hypoxia at all ages studied.

The results of prolonged 5%O<sub>2</sub> exposure (40 min) on D14-15 showed a distinct pattern of the HR response to hypoxia: the HR decreased by 3 min of hypoxia and then partly recovered by 10 min and stabilized till about 20 min of hypoxia after that HR gradually decreased by the end of hypoxia. This indicates the existence of the regulatory mechanisms of the HR of chick embryo at this age, which allow it to maintain the stable HR till 20 min of the severe hypoxia.

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**Keywords:** acute hypoxia; heart rate; chick embryogenesis

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## Effects of Temperature Training before Hatching on Locomotion and Fear Behaviour of Broiler Chickens

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Previous investigations show that short-term temperature training during the last days of embryonic development has long-lasting impact on development and post-hatching performance, marked by an increased hatchability, a better feed conversion and increased body weight in comparison to conventional incubated chickens, especially in males. Aim of the present investigation was to consider if short-term temperature training before hatching also influence welfare aspects like locomotory activity and fear related to the improved robustness in comparison to conventional incubation. The investigations were carried out in ROSS 308 broiler chickens within a collaborative research project about temperature training before hatching, which is running together with Pas Reform Hatchery Technologies and the Friedrich-Löffler Institute, Federal Research Institute for Animal Health. One group was short-term temperature experienced with + 1°C over standard for 2 hrs daily during the last three days before hatching. The control group was incubated under conventional conditions. In two practical trials we established the approach to perform the behavioural observations during the rearing period of 35 days. For behavioural analysis selected groups of chickens were observed by video over the whole rearing period. On two defined periods in the morning and afternoon the locomotory activity was analysed daily by scan sampling. One day before the end of the rearing period fear behaviour was tested using the Novel-Object-Test. A defined period after placing a novel object in the pen was analyzed to score fear behaviour (fearful, neutral, approaching) of the chickens. Results of the behavioural observations show that the locomotory activity of the chickens generally decreases over life span. No difference was found in locomotory activity between short-term temperature trained and conventional incubated chickens. But it is remarkable, that the short-term temperature trained chickens show the same locomotory activity like the conventional incubated ones, although they have a significantly higher body weight. The Novel-Object-Test indicates a slight decreased fear level in favour of short-term temperature trained chickens. Further experiments and analyses are required in order to determine the possible influence of short-term temperature training on welfare aspects in chickens.

**Keywords:** short-term temperature training, locomotion, fear, welfare, broiler

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