

Temperature and CO₂ during the Hatching Phase

II. Effects on Chicken Embryo Physiology

C. M. Maatjens*†, I. A. M. van Roovert-Reijrink*, I. van den Anker†, R. Molenaar‡, C. W. van der Pol*†, B. Kemp†, H. van den Brand†

HatchTech B.V., P.O. Box 256, 3900 AG Veenendaal, the Netherlands; †Adaptation Physiology Group, Wageningen University, P.O. Box 338, 6700 AH Wageningen, the Netherlands; ‡Turi Foods, Devon Meadows, Australia.

The objective of this study was to investigate the effect of eggshell temperature (EST) and carbon dioxide concentration during only the hatching phase on physiological characteristics of embryos and chicks.

Three groups of eggs were incubated at an EST of 37.8°C until d 19 of incubation (E19). From E19, embryos were incubated at a low (36.7°C), normal (37.8°C), or high (38.9°C) EST and at a low (0.2%) or high (1.0%) CO₂ concentration. For E19, internal pipping (IP), hatch, and 12 h after hatch, blood parameters were analysed, and hepatic glycogen was determined. At IP, hatch, and 12 h after hatch, interactions were found between EST and CO₂, but all these interactions were temporary and in most cases weak. High EST resulted in a lower hepatic glycogen concentration compared to low ($\Delta = 21.1$) and normal EST ($\Delta = 14.43$) at IP, and a lower hepatic glycogen concentration compared to low EST ($\Delta = 6.24$) at hatch. At hatch, high EST resulted in lower hematocrit value ($\Delta = 2.4$)

and higher potassium ($\Delta = 0.5$) compared to low EST. At 12 h after hatch, high EST resulted in a higher lactate concentration compared to low ($\Delta = 0.77$) and normal EST ($\Delta = 0.65$). And high EST resulted in higher potassium compared to low ($\Delta = 0.4$) and normal EST ($\Delta = 0.3$). An effect of CO₂ solely was only found at IP, at which high CO₂ resulted in a lower pH ($\Delta = 0.03$) and a lower hepatic glycogen concentration ($\Delta = 7.27$) compared to low CO₂. High EST during only the hatching phase affected embryo and chick physiology, indicated by the lower hepatic glycogen levels at IP and hatch. High CO₂ affected pH and hepatic glycogen at IP. Effects of CO₂ were only found at low EST, which emphasizes the large effect of EST during the hatching phase.