

Effects of Temperature and CO₂ during the Hatching Phase on Embryo Physiology

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The hatching phase is characterized by physiological and metabolic processes, which can be influenced by eggshell temperature (EST) and CO₂ concentration. Eggs (n = 600) were incubated at EST 37.8°C until d 19 of incubation (E19). From E19, embryos were incubated at low (36.7°C), normal (37.8°C), or high (38.9°C) EST and at low (2,000 ppm) or high (10,000 ppm) CO₂ concentration.

At E19, internal pipping (IP), hatch, and 12 h after hatch, blood parameters and hepatic glycogen were analysed. The main effect of high EST was expressed in lower hepatic glycogen concentration compared to low ($\Delta = 21.1$ mg/mL) and normal EST ($\Delta = 14.43$ mg/mL) at IP ($P < 0.0001$), and a lower hepatic glycogen concentration compared to low EST ($\Delta = 6.24$ mg/mL) at hatch ($P = 0.02$). At high EST, embryos used more hepatic glycogen after E19 until hatch compared to normal or low EST resulting in less hepatic glycogen available during the

hatching process. At 12 h after hatch, high EST resulted in higher lactate concentration compared to low ($\Delta = 0.77$ mmol/L) and normal EST ($\Delta = 0.65$ mmol/L) ($P = 0.01$), which might be caused by the increased metabolic rate at high EST. Only at IP, an effect of CO₂ was found for pH ($P < 0.01$) and hepatic glycogen ($P = 0.02$). High EST during the hatching phase affected embryo and chick physiology, indicated by lower hepatic glycogen levels at IP and hatch, which emphasizes the important role of EST during the hatching phase.