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Effects of Short-Term Temperature Manipulations During Storage on Embryonic Development and Hatchability of Hatching Eggs

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Abstract

In the poultry industry, long-term storage of hatching eggs is a common practice due to market demands, logistical planning, and breeding company operations. However, prolonged storage of eggs beyond seven days has been associated with increased cellular apoptosis in the blastoderm, deterioration of albumen quality (including changes in Haugh unit and pH), extended incubation duration, and substantial reductions in chick quality and hatchability. To mitigate these adverse effects, the Short Periods of Incubation During Egg Storage (SPIDES) technique has been developed and has gained strategic importance in recent years. The objective of this review is to examine the cellular and physiological mechanisms underlying SPIDES application during extended egg storage and to evaluate its industrial outcomes in commercial hatcheries based on current scientific literature. According to the reviewed literature, SPIDES stimulates the regeneration of blastoderm cells damaged during the storage period, promotes cellular homeostasis through increased expression of heat shock proteins, particularly HSP70, and limits the liquefaction of albumen. Furthermore, it enables the embryo to progress to more advanced blastoderm developmental stages (gastrulation stages), which are known to exhibit greater cellular resistance to storage-induced stress. From an industrial perspective, SPIDES has been shown to increase hatchability by approximately 3–7% in eggs stored for 7–14 days or longer, reduce early chick mortality, improve chick quality parameters such as navel score and body weight uniformity, and provide a more synchronized hatch by narrowing the hatch window. The available evidence indicates that SPIDES applications represent a sustainable, cost-effective, and efficient strategy for maintaining embryonic viability, maximizing hatchery performance, and supporting early growth performance during the first week of life. However, the success of this method depends on the precise management of gradual heating and cooling profiles that prevent shell sweating and contamination risks, while also ensuring that critical temperature and exposure-time thresholds are not exceeded, thereby avoiding early embryonic mortality. Optimizing and integrating this technique into commercial hatchery operations according to factors such as breeder age, genotype, eggshell quality, and storage duration is of critical importance for enhancing industrial efficiency, sustainability, and global competitiveness within the poultry sector.

Keywords: *Temperature Manipulation, Hatching Eggs, Storage, Embryonic Development, Hatchability.*