

COMPARISON OF DAY FIVE ACCLIMATION AND FASTING TECHNIQUES TO REDUCE BROILER HEAT DISTRESS MORTALITY

K. McDonald¹, T. Belay¹, F. Deyhim² and R.G. Teeter³

Story in Brief

A study utilizing 780 male broilers was conducted to test the 24 hour day five posthatching acclimation procedure. Two-hundred-sixty broilers were exposed to 95 - 100°F for 24 hours on day five posthatching. In addition, 520 control birds were maintained at an initial brooding temperature of 85°F. Of the 520 control birds, 260 birds were fasted 6 hours prior to the heat distress period. After the acclimation period both groups were brooded together. On day 45 posthatching, a 95°F (40% relative humidity) heat distress was imposed on all birds. The control and acclimated birds had a 87.5% and 87.9% survivability while the fasted birds had a 98% survivability. In this study the 24-hour day five acclimation procedure failed to impact broiler heat tolerance.

(Key Words: Acclimation, Heat Distress, Broilers, Fasting, Mortality.)

Introduction

Removing feed from broilers that are susceptible to and likely to encounter heat distress has also been demonstrated to reduce heat distress induced prostration (Teeter et al., 1987). Likewise, acclimating broilers to heat distress has also been shown to reduce heat distress prostration. The heat distress acclimation process may be defined as the physiological adaptations made by the bird to maintain homeostasis during high temperature distress. Acclimation as it relates to heat distress has been studied since the early 1950's when Hutchinson and Sykes (1953) reported that birds acclimated for 24 days at 100.4°F exhibited increased heat tolerance when placed under heat distress. More recently, Reece et al. (1972) and May et al. (1986) demonstrated that prior extended exposure to elevated ambient temperatures increased bird survivability during subsequent exposure to acute heat challenges.

The precise physiological processes involved and the specific time frame required to produce a beneficial acclimation effect are not understood. Arjona et

¹Graduate Assistant ²Poultry Research Coordinator ³Professor

al. (1988) suggested that as little as a 24-h acclimation period at five days posthatching would increase broiler heat distress tolerance later in life. More specifically, Arjona acclimated day five posthatching chicks at 95.0 to 100.0°F for 24 h. The birds were then brooded at normal temperatures until days 44 and 45 posthatching at which time they were exposed to acute heat distress (95.0 to 100.0°F) for 8 h daily over a 2-day period. The results of this experiment indicated that acclimated birds had increased survivability over non-acclimated birds (99 and 88%, respectively). If these results are repeatable, then even short term broiler acclimation to heat distress can have a profound and long lasting impact on bird resistance to heat distress. The objective of the study reported herein was to evaluate and compare the day five posthatching acclimation procedure with the well established fasting technique.

Materials and Methods

Seven-hundred-eighty, day old, Cobb x Cobb commercial broiler chicks were placed in grower batteries and fed a typical corn-soybean meal starter ration. The chicks were housed in an environmental chamber with the brooding temperature initiated at 85°F and lowered 3.3°F per week to 75°F at 3 weeks posthatching. Birds were allowed to consume feed and water ad libitum. The three treatment groups consisted of: 1) non-acclimated controls; 2) birds acclimated for 24 h at five days posthatching; and 3) non-acclimated birds fasted for 6 h prior to acute heat distress initiation.

The acclimation period was initiated on day five posthatching. Initial temperature of 85°F was raised to between 95 and 100°F over a 4-h period. The 95 to 100°F temperature was maintained at 95 to 100°F for 24 h after which the birds were returned to the initial brooding temperature of 85°F (over a 2-h period).

The heat distress period was initiated on day 45 posthatching. The chamber temperature was elevated from 75°F to 95.0°F (at 40% relative humidity) over a 6-h period. Birds were maintained at 95.0°F for 1 h followed by a slow reduction to 75.0°F over the next 4 h. The temperature was reduced after 1 h at 95.0°F as the birds were exhibiting extreme heat distress symptoms. This protocol was repeated on days 46 and 47.

Results and Discussion

The treatments evaluated in this study did not impact live weight gain and body weight of the three treatment groups were similar during the acute heat distress period (Table 1). However, bird survival was significantly impacted by treatment. The acute heat distress period resulted in an average of 87.7%

Table 1. The effects of five day posthatching acclimation and fasting procedures on body weight, feed consumption and survivability.

	Treatment		
	1	2	3
Bird weight, lb	3.04	3.06	3.03
Feed consumption, lb	3.86 ^{ac}	4.19 ^a	3.30 ^{bc}
Survivability, %	87.5 ^a	87.9 ^a	98.0 ^b

^{a,b,c} Means in the same row with different superscripts differ ($P < .05$).

survivability for the control and day five acclimated birds. The day five acclimation procedure failed to influence bird survivability. Which is in agreement with several unpublished studies (J.W. Deaton and M.O. Smith, personal communication). However, the 6-h fasting procedure prior to heat distress exposure was effective and dramatically increased survival to 98.0%. Therefore, we conclude that the 24-h acclimation of day five posthatching chicks is ineffective in preparing broilers to cope with heat distress later in life.

Literature Cited

- Arjona, A.A. et al. 1988. Effect of heat stress early in life on mortality of broilers exposed to high environmental temperature just prior to marketing. *Poult. Sci.* 67:226.
- Hutchinson, J.C.D. and A.H. Sykes. 1953. Physiological acclimation of fowls to hot humid environment. *J. Agric. Sci.* 43:294.
- Reece, F.N. et al. 1972. Effects of high temperature and humidity on heat prostration of broiler chickens. *Poult. Sci.* 51:2021.
- May, J.D. et al. 1986. Effect of acclimation and heat stress on thyroid hormone concentration. *Poult. Sci.* 65:1211.
- Teeter, R.G. et al. 1987. Effects of feed intake and fasting duration upon body temperature and survival of thermostressed broilers. *Nutrition Rep. Int.* 35:531.