Too hungry to learn? Hungry broiler breeders fail to learn a Y-maze food quantity discrimination task

LA Buckley*†‡, LM McMillan‡, V Sandilands‡, BJ Tolkamp‡, PM Hocking§ and RB D’Eath‡

† Animals Department, Harper Adams University College, Newport, Shropshire TF10 8NB, UK
‡ Scottish Agricultural College, West Mains Road, Edinburgh EH9 3JG, UK
§ The Roslin Institute and Royal (Dick) School of Veterinary Studies, Roslin BioCentre, Midlothian EH25 9PS, UK
* Contact for correspondence and requests for reprints: lbuckley@harper-adams.ac.uk

Abstract

Choice tests may aid determining whether qualitative dietary restriction improves the welfare of feed-restricted broiler breeder chickens (Gallus gallus domesticus). However, hunger-stress may reduce competency to choose by impairing learning. The effect of chronic feed restriction on the ability of broiler breeders to learn a hunger-relevant discrimination task was investigated using a Y-maze paradigm. The task was to associate black and white arms with large and small quantities of feed. Birds were reared to three growth curves by means of severe (n = 12), moderate (n = 12) or very mild feed restriction (n = 12). Learning the task and selecting the larger food option allowed birds to increase their feed intake. Time taken to traverse the Y-maze was also measured. Birds from all treatment groups traversed the Y-maze more quickly over time, indicating that they had learnt that running down the Y-maze arms was associated with a rewarding outcome (food). However, feed restriction significantly reduced their ability to associate the black and white cues with differences in food quantity. Consequently, average pay-offs in terms of daily feed increments disproportionately accrued to the less feed-restricted treatment groups. It is concluded that feed restriction affected the performance of broiler breeders in this task, perhaps by narrowing their attention such that they ignore potentially hunger-relevant contextual cues. However, low overall group success rates demonstrate that this task was difficult to learn even for less severely feed-restricted birds. Therefore, Y-maze choice tests may not be the most appropriate method for determining hungry broiler breeder dietary preferences.

Keywords: animal welfare, broiler breeders, choice test, feed restriction, learning, stress

Introduction

Hunger is the most pressing welfare issue facing the modern-day broiler breeder. Selective breeding for large appetites facilitates rapid growth in birds destined for consumption but also results in parent stock that must be feed restricted to ensure optimal growth rates. Ad libitum feeding regimes are associated with obesity and co-morbid conditions, such as ascites syndrome (Baghbanzadeh & Ducuyere 2008), increased lameness (Kestin et al 2001) and reproductive failure (Robinson & Wilson 1996). Thus, it is necessary to feed restrict broiler breeders to 25–50% of ad libitum intake (Savory & Maros 1993). However, this results in a bird that experiences chronic hunger for most of its life. By six weeks of age, broiler breeders consume their daily ration within 5–7 min (Savory & Maros 1993), show various behavioural and physiological indicators of stress (Hocking et al 1993, 1996; de Jong et al 2002, 2003) and are prepared to work for additional feed even when reared on double the recommended ration of feed (Savory et al 1993).

A popular scientific approach has been to try to improve satiety by modifying the quality of the feed ration. Low- or non-nutritive fillers, such as ground oat hulls and/or appetite suppressants (eg Zuidhof et al 1995; Savory et al 1996; Rozenboim et al 1999; Vermooten et al 1999; Savory & Lariviere 2000; Nielsen et al 2003; Hocking et al 2004; Hocking 2006; Sandilands et al 2006) are added to the ration to try and increase satiety without increasing energy intake. However, the evidence that this improves welfare in broiler breeders is unclear and variable (see: Savory et al 1996; Savory & Lariviere 2000; Nielsen et al 2003; de Jong et al 2005; Sandilands et al 2005; Hocking 2006; Sandilands et al 2006). Therefore, there is a need for additional methods. D’Eath et al (2009) suggested that choice tests could be a valuable additional tool to enable us to identify whether broiler breeders prefer traditional, quantitative or qualitative dietary restriction. Buckley et al (2010) used a T-maze closed economy choice test task to determine hungry broiler breeder preferences for quantitative or qualitative dietary restriction. They found that whilst birds easily learnt a food versus no food discrimination task, irre-