Improving leg health in broiler chickens: a systematic review of the effect of environmental enrichment

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Abstract

Leg problems are highly prevalent in modern broiler production and provision of environmental enrichment could be a strategy to improve leg health. Different types of environmental enrichment have undergone evaluation. Our objective was to conduct a systematic review of the effect of environmental enrichment on leg health in broiler chickens. The evaluation of leg health included measures of the entire leg and foot, and behavioural, pathological and physical measures. Six types of environmental enrichment were selected for inclusion: light programme, intensity of light, stocking density, perches, straw bales and separation of resources. For each type, a systematic literature search was performed. The review included 62 studies; 56 randomised trials and six cross-sectional studies. An assessment of the methodological quality of all 56 randomised trials was performed with some reporting deficits regarding occurrence of blinding, randomisation and reliability of measures. Provision of perches and increased intensity of light only displayed limited effectiveness in improving leg health and both mainly affected contact dermatitis. In contrast, there was evidence that a lowered stocking density and a dark/light schedule could improve leg health. Few studies have been carried out on the effect of straw bales and separation of resources. The few studies done have, however, shown that both types of enrichment can be effective in improving leg health. In conclusion, identifying and providing the optimal types of enrichment for broilers will reduce leg problems and increase mobility, thereby improving the welfare of the birds.

Keywords: animal welfare, broiler chicken, environmental enrichment, leg health, light, stocking density

Introduction

The demand for poultry meat worldwide is large, with the production rate rising by approximately three percent per year over the past decade (Food and Agriculture Organization of the United Nations 2015). To meet this high demand, modern broiler production has become more efficient by increasing growth rate and optimising feed conversion in chickens (Gallus gallus domesticus) (Robins & Phillips 2011). However, modern production presents several welfare issues with leg health one of the most prominent (Bessei 2006; Knowles et al 2008; Bassler et al 2013). Here, the leg is defined as the entire lower limb, including the upper leg, the knee, the lower leg, the hock and the foot. Factors affecting leg health in broilers have been addressed in a number of narrative reviews (Bradshaw et al 2002; Bessei 2006; Oviedo-Rondón et al 2006; Waldenstedt 2006); however, as yet, no systematic reviews are available.

Environmental enrichment

Factors affecting broiler leg health can be roughly divided into two main categories: those directly related to the chicken, such as growth rate and nutrition, and those related to the external production environment, such as light conditions, perches and stocking density. While previous narrative reviews have focused mainly on nutritional factors (Oviedo-Rondón et al 2006; Waldenstedt 2006), the current review focuses on environmental enrichment. Here, we define the effect of environmental enrichment as “an improvement in the biological functioning of captive animals resulting from modifications to their environment” (Newberry 1995) with the improvement in biological functioning being an improvement in leg health. The causality behind the effect of environmental enrichment on leg health is likely multifactorial and not fully understood. One suggested mechanism behind the effect is that enrichment can increase activity levels. Studies where birds were more active also found positive effects on lameness (Reiter & Bessei 2009; Blatchford et al 2012) and foot-pad dermatitis (O’hara et al 2015). Another mechanism specifically relevant for contact dermatitis, is that enrichment types, such as perches and lowered stocking density, can result in reduced contact with the litter and improved litter quality which, in turn, can reduce contact dermatitis. Our objective is to conduct a systematic review to assess the effect of environmental enrichment on leg health in broilers.