An initial investigation into the effects of isolation and enrichment on the welfare of laboratory pigs housed in the PigTurn® system, assessed using tear staining, behaviour, physiology and haematology

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Abstract

In some parts of the world, the laboratory pig (Sus scrofa) is often housed in individual, sterile housing which may impose stress. Our objectives were to determine the effects of isolation and enrichment on pigs housed within the PigTurn® — a novel penning system with automated blood sampling — and to investigate tear staining as a novel welfare indicator. Twenty Yorkshire × Landrace weaner pigs were randomly assigned to one of four treatments in a 2 × 2 factorial combination of enrichment (non-enriched [NE] or enriched [E]) and isolation (visually isolated [I] or able to see another pig [NI]). Pigs were catheterised and placed into the PigTurns® 48 h post recovery. Blood was collected automatically twice daily to determine white blood cell (WBC) differential counts and assayed for cortisol. Photographs of the eyes were taken daily and tear staining was quantified using a 0–5 scoring scale and Image-J software to measure stain area and perimeter. Behaviour was video recorded and scan sampled to determine time budgets. Data were analysed as an REML using the MIXED procedure of SAS. Enrichment tended to increase proportion of time standing and lying laterally and decrease plasma cortisol, tear-stain area and perimeter. There was a significant isolation by enrichment interaction. Enrichment given to pigs housed in isolation had no effect on plasma cortisol, but greatly reduced it in non-isolated pigs. Tear-staining area and perimeter were highest in the NE-I treatment compared to the other three treatments. Eosinophil count was highest in the E-NI treatment and lowest in the NE-I treatment. The results suggest that in the absence of enrichment, being able to see another animal but not interact may be frustrating. The combination of no enrichment and isolation maximally impacted tear staining and eosinophil numbers. However, appropriate enrichment coupled with proximity of another pig would appear to improve welfare.

Keywords: animal welfare, cortisol, enrichment, isolation, pigs, tear staining

Introduction

Refinement is the attempt to enhance animal welfare by reducing the amount of stress inflicted on those animals housed in our care (Russell & Burch 1959) and control peripheral variables which have the potential to reduce research data validity (Reinhardt & Reinhardt 2002). To refine the husbandry and use of laboratory animals, less invasive and validated methods for acquiring data and measuring stress must be developed and a perceived sense of control given to the animal through the use of environmental enrichment. Laboratory animals are routinely subjected to procedures that have been demonstrated to induce stress (Balcombe et al 2004). Blood collection is one of the most common procedures conducted on laboratory animals. Stress during blood collection is induced by pain of the procedure and by handling and restraint of the animal during the procedure. Effects are seen in significant changes in corticosterone and cortisol (Armario et al 1986; DeBoer et al 1990) and immunoglobulin concentrations (Moynihan et al 1989, 1990), lymphocyte counts (Moynihan et al 1990), heart rate (Line et al 1989; Sharp et al 2003), prolactin secretion (Seggie & Brown 1975), blood pressure (Sharp et al 2001, 2002) and active behaviours (Sharp et al 2003). These findings have implications for not only the welfare of the experimental animals, but also the validity of the research performed on them. Therefore, to obtain accurate physiological measures on research animals it is imperative to reduce restraint, handling, and human interaction as much as possible. Automated blood-sampling machines have been designed to do precisely this in a number of different species, including rodents, primates, dogs (Canis familiaris), and pigs (Sus scrofa). Automated blood-sampling machines avoid the repeated stressors that occur during manual blood sampling by allowing continuous automated access to the circulatory system. This process involves surgically implanting a catheter into a major blood vessel through which direct blood collection can occur via a series of pumps. Although the surgical implantation is invasive, proper surgical techniques as well as pre- and