Evaluation of an innovative approach for sensory enrichment in zoos: semiochemical stimulation for captive lions (Panthera leo)

M Martinez-Macipe*, C Lafont-Lecuelle‡, X Manteca†, P Pageat‡ and A Cozzi‡

1 Universitat Autònoma de Barcelona, School of Veterinary Science, Departament de Ciencia Animal i dels Aliments, Bellaterra, Barcelona 08193, Spain
2 IRSEA - Research Institute Semiochemistry and Applied Ethology, Quartier Salignan, Apt 84400, France

Abstract

Despite improvements in zoo housing and management conditions over the last years, zoo animals may still present undesirable behaviours, such as aggression, stereotypies, boredom and a general absence of natural behaviours. In order to improve animal welfare, researchers are constantly looking for tools to enrich the environment and increase sensory information. Semiochemicals carry important information and are already in use for domestic and wild species. The aim of the current study was to evaluate their impact on the behaviour of captive lions. The behaviour of 18 African lions (Panthera leo) living at Aqaulon Safari Park, Tarragona, Spain was recorded during four different experimental conditions: (i) no intervention (baseline); (ii) Cat Facial Pheromone F3 in gel-diffuser blocks; (iii) Cat Appeasing Pheromone (CAP) in gel-diffuser blocks; and (iv) placebo blocks. The schedule consisted of six days with exposure to each condition and three days without. It was repeated twice. The statistical analysis showed a number of differences: animals exhibited longer periods of ‘follow’ behaviour when exposed to F3 than control or placebo; and longer periods of ‘play’ behaviour during F3 than control, placebo or CAP, although there was also a significant difference between CAP and placebo vs control. The lions also ‘ran’ more during F3 than during all other conditions and ‘walked’ more during F3 than during control or CAP; walking time was also significantly higher during placebo and CAP vs control. These results suggest that semiochemicals affect the behaviour of lions in captivity and might be considered and studied more thoroughly as potential tools to improve welfare.

Keywords: animal welfare, behaviour, cat, lion, pheromones, zoo

Introduction

Even the best zoos remain captive environments and may be subject to captivity-related problems. Lions (Panthera leo), as social animals, need to be housed in groups with enough space to walk and ‘investigate’ (Hosey et al 2009).

Environmental enrichment is used as a tool to stimulate a wide variety of behaviours and improve the health and welfare of the animal, preventing and treating stereotypies and other abnormal behaviours. Enrichment comes in many shapes and forms: food-based enrichment, physical enrichment, social enrichment, cognitive enrichment, and sensory enrichment (Hosey et al 2009).

Scientists and zookeepers are just beginning to develop the use of semiochemicals as a form of enrichment (Wells 2009). Semiochemicals, a broader term for chemicals involved in animal communication (Wyatt 2003), are successfully used to reduce spraying behaviour in cats (Felis silvestris catus) (Mills & White 2000), fear in dogs (Canis familiaris) (Levine & Mills 2008), stress caused by intensive conditions in poultry (Gallus gallus) (Madec et al 2008a) and pigs (Sus scrofa domestica) (Guy et al 2009), and for various applications in zoo animals (Gaultier et al 2005a,b).

Pheromones are a subclass of semiochemicals used for communication between animals (Wyatt 2003, 2010). The message persists for a certain period of time (Eisenberg & Kleiman 1972) and can be received even after the sender has gone (Tomecek 2009). As a result of these properties, pheromonatherapy can be successfully used to deal with stressed animals, without any known side-effects (Mills & White 2000). Furthermore, pheromone-diffuser blocks are small and can be hidden in fences and, in general, galenic forms (ie a formulation aimed at preparing and compounding medicines to optimise their absorption) used in pheromonatherapy can be adapted for each enclosure. Benefits can be increased if pheromonatherapy is combined with an accurate assessment and improvement of housing conditions (Young 2003).

In felines, semiochemicals can help the animal to eliminate stress and promote relaxation with no side-effects, replacing aggressive interactions and impulses with more positive social ones (Gaultier et al 2005a). F3 is used in domestic cats to reduce stress and provide them with a familiar environment (Frank et al 1999). Very few studies have been published on the use of semiochemicals in wild cats. Spielman (2000) showed that Cat Facial Pheromone F3, a