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Effect of gentle stroking and vocalization on behaviour, mucosal immunity and upper respiratory disease in anxious shelter cats

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ABSTRACT

Emotional, behavioural, and health benefits of gentle stroking and vocalizations, otherwise known as gentling, have been documented for several species, but little is known about the effect of gentling on cats in stressful situations. In this study, 139 cats rated as anxious upon admission to an animal shelter were allocated to either a Gentled or Control group. Cats were gentled four times daily for 10 min over a period of 10 days, with the aid of a tool for cats that were too aggressive to handle. The cats' mood, or persistent emotional state, was rated daily for 10 d as Anxious, Frustrated or Content. Gentled cats were less likely to have negatively valenced moods (Anxious or Frustrated) than Control cats (Incidence Rate Ratio [IRR] = 0.61 CI 0.42–0.88, $P = 0.007$). Total secretory immunoglobulin A (S-IgA) was quantified from faeces by enzyme-linked immunosorbent assay. Gentled cats had increased S-IgA (6.9 ± 0.7 $\log_e$ μg/g) compared to Control cats (5.9 ± 0.5 $\log_e$ μg/g) ($P < 0.0001$). Within the Gentled group of cats, S-IgA values were higher for cats that responded positively to gentling (7.03 ± 0.6, $\log_e$ μg/g), compared with those that responded negatively (6.14 ± 0.8, $\log_e$ μg/g). Combined conjunctival and oropharyngeal swab specimens were tested by quantitative real-time polymerase chain reaction (rPCR) for feline herpesvirus type 1 (FHV-1), feline calicivirus (FCV), *Mycoplasma felis*, *Chlamydophila felis*, and *Bordetella bronchiseptica*. There was a significant increase in shedding over time in Control cats (23%, 35%, 52% on days 1, 4 and 10, respectively), but not in gentled cats (32%, 26%, 30% on days 1, 4 and 10, respectively) ($P = 0.001$). Onset of upper respiratory disease was determined by veterinary staff based on clinical signs, in particular ocular and/or nasal discharge. Control cats were 2.4 (CI: 1.35–4.15) times more likely to develop upper respiratory disease over time than gentled cats ($P < 0.0001$). It is concluded that gentling anxious cats in animal shelters can induce positive affect (contentment), increase production of S-IgA, and reduce the incidence of upper respiratory disease.

1. Introduction

In humans, the relationship between negative life events and susceptibility to diseases, such as the common cold, is well established (Cohen et al., 1991; Evans and Edgerton, 1991; Pressman et al., 2005). In cats too, a stressful event, such as entering an animal shelter, can reactivate subclinical conditions (e.g. feline herpesvirus type 1) (Gaskell et al., 2007) and inhibit the production of mucosal antibodies, particularly secretory immunoglobulin A (S-IgA) (Gourkow et al., 2014), resulting in increased susceptibility to pathogens that cause Upper Respiratory

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Disease (URD) (Hannant, 2002). Hence, the management of emotional stress may be of clinical importance in managing respiratory disease (Griffin, 2012; Hurley, 2006; McMillan, 2002, 2005).

Physical contact between cats, such as allogrooming and allorubbing, facilitates social bonding (Crowell-Davis et al., 2004; van den Bos, 1998); and petting seems to serve a similar purpose in the cat/human relationship (Bernstein, 2007). In the home, interactions between cats and owners tend to be characterized by frequent physical contact, such as petting, lifting and holding. In addition, both cats and people seek this physical contact (Mertens, 1991). Physical contact with humans has been reported to increase emotional wellbeing in various domestic species. Laboratory cats show a preference for human interaction over toys (De Luca et al., 1992). Petting can reduce the heart rate in dogs (Kostarczyk and Fonberg, 1982) and horses (McBride et al., 2004); and reduce fear of humans in cows (Breuer et al., 2003), rabbits (Csatádi et al., 2005) and dogs (Coppola et al., 2005; Hennessy et al., 1998; Luescher and Tyson, 2009; Normando et al., 2009). Petting and therapeutic massage of cats are believed to reduce stress associated with chronic pain (Robertson et al., 2010), and five min of petting can reduce arterial blood pressure (Slingerland et al., 2008). Conversely, cessation of petting has been associated with an increase in the level of cortisol in laboratory cats accustomed to receiving petting during routine care (Carlstead et al., 1993).

Despite the documented benefits, in some cats even gentle petting may induce aggression (Rodan, 2010). This is marked by tail twitching, increased muscle tension, leaning away, flattened ears, horizontal retraction of the lips, and hissing (Hunthausen, 2006). It has been suggested that the epidermal units (Merkel cells, Ruffian endings and vibrissae) of cats discharge rapidly, making them highly sensitive to touch, particularly when under stress (Rodan, 2010). In addition, approximately 20% of cats are thought to be genetically predisposed towards defensive behaviour to humans, which is not affected by prolonged socialization (Adamec et al., 1983; McCune, 1995; Reisner et al., 1994). Thus, tactile enrichment, such as petting, gentling or massage, can be expected to fail in some cats; particularly those with a timid temperament or when poorly socialized to humans. However, petting in the temporal region (between the eyes and ears) rather than in the caudal region (Soennichsen and Chamove, 2002), and delivery using short strokes with circular movements (Tellington-Jones, 2003), may reduce such negative responses.

In various species, gentle stroking has successfully reduced the immunosuppressive effects of various husbandry practices. For example, under artificial rearing conditions, lambs usually experience a decrease in secretory immunoglobulin G, compared with ewe-reared lambs, which is prevented by providing gentling (Caroprese et al., 2010). Another immunoglobulin, S-IgA is the most abundant mucosal antibody and is necessary for protection against pathogens that can be inhaled or ingested (Stokes and Waly, 2006). The importance of mucosal immunity is well documented in cats, and stimulation of S-IgA is the main goal in the development of effective intranasal vaccines to protect cats against URD pathogens (Edinboro et al., 1999; Foss and Murtaugh, 2000). Emerging attitudes in veterinary medicine emphasize the importance of addressing negative emotional states in animals, as they may compromise health (Griffin, 2012; McMillan, 2005). The hypothesis examined in this study was that suitable gentling of cats in a shelter would reduce anxiety and increase S-IgA, with a concomitant reduction in URD. Epidemiological aspects of this study have been reported separately (Gourkow et al., 2013).

2. Material and methods

This study was approved by the University of Queensland Animal Ethics Committee (CAWE/231/10).

2.1. The shelter and experimental ward

The study took place at the Vancouver Branch of the British Columbia Society for the Prevention of Cruelty to Animals (BC SPCA, Vancouver, Canada). The shelter had six separate housing areas, with a maximum capacity to house 120 cats. The facility also included an isolation area for sick cats and an on-site veterinary hospital. A small room adjacent to the reception area was used for examination and vaccination of incoming cats.

A housing unit located on the second floor of the shelter was used as the experimental ward. This room was maintained at a constant temperature of $20 \pm 2\,°C$, and was naturally lit with the provision of artificial light for 4 h each day. Visitors were discouraged from entering the experimental ward; however, approximately 24 people over the course of the study were provided entry to look for their stray cats. Apart from this, the only people entering the ward were shelter staff and two research staff. In common with most shelter environments, some sounds of dogs barking, and people walking and talking nearby, were audible to the human ear. The experimental ward included a food preparation area out of sight of the cats. Feed was provided twice daily at 0700 and 1700 h and comprised 70 g of age-appropriate pellets and approximately 30 g of wet food (Science Diet, Hill's Pet Nutrition, Inc. ®/™ Topeka, KS, U.S.A.). Fresh water was provided ad libitum. Feeding was undertaken by the experimenter, shelter staff or volunteers.

The cat housing in the experimental ward consisted of 20 stainless steel cages (76 cm × 76 cm × 71 cm). Each was furnished with litter boxes and non-absorbent cat litter (Veterinary Concepts, Wisconsin, U.S.A.), a stainless steel food and water bowl, and a towel for bedding. Each cage was fitted with an infrared camera (Sony CCD25M crystal-View Super Hi-Res ICR IR Camera SLED w/9-22 mm Vari-focal Lens, Microtech Advanced Technologies Ltd., Vancouver, Canada) mounted at cage height on a rod suspended from the ceiling at 1 m from the cage door. Footage was available for viewing real-time in an adjacent room, and was stored for subsequent analysis.

2.2. Biosecurity

Shelter staff cleaned cages daily by removing all waste, changing bedding, and wiping walls with a clean cloth