

Recent advances in non-surgical contraception as a humane method for controlling feral cat populations

Discusses three non-surgical methods of contraception that are more humane, less costly, less technical, and less invasive than those currently in use in the field.

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Introduction

Feral cat populations exist worldwide and raise concerns about public health, impacts on wildlife, and welfare of the cats themselves (Levy *et al.*, 2011). Feral cats have a high mortality rate and short life expectancy (<5 years) with causes of death ranging from starvation, disease, poisoning, car accidents and attack from other animals (Clarke & Pacin, 2002; Robertson, 2008). Sterilisation is an effective method of reducing population size and aggression in these colonies. Surgical sterilisation, including trap, neuter and return (TNR) programs, can be both costly and labour-intensive, involving surgery and anaesthesia with the potential for complications and post-operative pain. A more humane approach to population control is non-surgical contraception (Robertson, 2008), which also eliminates the need for anaesthesia, sterile conditions, and recovery care (Jana & Samanta, 2011). This review will discuss recent advances of gonadotropin-releasing hormone (GnRH) agonists, immunocontraception and chemical castration as a means of non-surgical contraception for managing feral cats.

Discussion

An ideal non-surgical fertility control for feral cats would induce permanent or multi-year sterilisation with a single treatment, with predictable effects on behaviour and reproduction (Levy *et al.*, 2011; Jana & Samanta, 2011). A permanent sterilisation technique would be best, since feral cats may become wary of people once caught and are unlikely to be trapped again. However, a multi-year fertility treatment could be successful for use in feral cats with a short lifespan (Levy *et al.*, 2011). In addition, a treatment that can be used on both sexes should be considered, since it may be difficult to sex cats in a field situation.

GnRH agonist implants: GnRH regulates the release of both luteinising-hormone (LH) and follicular-stimulating hormone (FSH) from the anterior pituitary gland. In males, LH regulates testosterone synthesis, whereas FSH initiates and maintains spermatogenesis. In females, both LH and FSH are needed for ovulation (Kutzler & Wood, 2006). Since GnRH controls fertility and behaviour responses in both sexes, it is an ideal method of non-surgical contraception (Levy *et al.*, 2011).

GnRH-agonist implants are used for fertility control by downregulating GnRH receptors, resulting in functional loss of ovarian and testicular activity (Toydemir *et al.*, 2012). In a study with mixed-breed queens (n=28), estrous behaviour and estradiol concentrations were suppressed in all cats for a period of 18.5 months after administration of subcutaneous GnRH-agonist (9.5mg deslorelin) implants. In a second study, the efficacy of GnRH-agonist implants (4.7mg deslorelin, Suprelorin®) was tested in tomcats (n=10). The implants were injected subcutaneously in the neck without sedation or anaesthesia. Testosterone concentrations in all but one cat were detected below basal levels, and all toms showed complete loss of sexual behaviour. However, the study was inconclusive in determining the length of time a tom was infertile beyond 36 weeks (Goericke-Pesch *et al.*, 2011). In both studies, the implants were well tolerated with no evidence of inflammation or infection following the procedure (Toydemir *et al.*, 2012; Goericke-Pesch *et al.*, 2011). In the queens, the implants left small holes, which closed within a few hours (Toydemir *et al.*, 2012).

Both studies clearly demonstrate the use of GnRH-agonist implants as a safe and effective method of contraception. However, a longer study is needed to assess the maximum duration

of effectiveness in male and female cats.

GnRH Immunocontraception: Immunocontraception uses the body's immune system to block fertility (Purswell & Kolster, 2006). Immunisation against GnRH produces antibodies that inhibit normal hormonal secretion required for gamete production and gonadal regulation (Talwar, 1985; Levy *et al.*, 2004). Immunocontraception has been used successfully in many wildlife species (Robertson, 2008), and recent studies have been aimed towards use in cats and dogs (Kutzler & Wood, 2006). An advantage of using these vaccines in feral cats, as seen with GnRH implants, is that they can be administered without sedation to cats confined in a trap (Levy *et al.*, 2011).

In a recent study, female cats (n=24) received a single injection of GnRH-KLH immunocontraceptive (GonaCon™) intramuscularly. The duration of contraception varied from 5 months to 5 years. Half of the cats maintained contraception for 3 years and a quarter for more than 5 years. No inflammation or pain was observed at the vaccination site. However, 5 of the cats developed non-painful, granulomatous injection-site reactions, presumably due to use of an adjuvant (Levy *et al.*, 2011). Since GnRH is not normally immunogenic, an adjuvant is needed to stimulate the immune system response (Kutzler & Wood, 2006). Cats may be at risk for developing life-threatening sarcomas at injection sites. Therefore, consideration should be given to producing a vaccine with little risk of injection-site reactions (Levy *et al.*, 2011).

Chemical sterilisation causes infertility of males by injecting compounds into the testis, epididymis or vas deferens to induce azoospermia (Kutzler & Wood, 2006). The procedure is inexpensive, not technically demanding and suitable for large-scale sterilisation (Jana & Samanta, 2011). However, a general anaesthetic is necessary (Kutzler & Wood, 2006). In a recent study, male cats (n=30) received a single bilateral intra-testicular injection of sterile calcium chloride dihydrate in saline solution per testis. Following the procedure, mild signs of discomfort were observed for up to 5 minutes, possibly due to excess fluid pressure. Testicular swelling was evident in treated animals 24 hours after the procedure and gradually decreased after 4 weeks.

The results of this study showed intra-testicular calcium chloride injections to be a permanent androgen-eliminating sterilisation method by causing necrosis, degeneration and possibly free-radical damage of testicular parenchyma. When general anaesthetic is possible in the field, chemical castration can offer an affordable, permanent method to non-surgical sterilisation (Jana & Samanta, 2011).

Conclusions

When compared to surgical methods of contraception, all three methods discussed here were less costly, technical, and invasive. These studies show that non-surgical methods offer a more humane approach to contraception by minimising handling and healing time. Multi-year treatments, such as GnRH-agonists and immunocontraception, may be useful for feral cats with a short lifespan. However, further research on permanent contraception methods that can be administered to either sex in a single treatment without sedation would be beneficial.

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