USQ AEC Standard Operating Procedure
Development of the Mata Hari Judas female

USQ AEC SOP ID: WL013

This Standard Operating Procedure (SOP) is applicable to all USQ Research Workers who care for and use Animals for Scientific Purposes. The procedure must only be performed by those persons who have been deemed competent and who believe they remain competent to do so. Access to supervision by suitably qualified staff whilst undertaking this procedure is encouraged, where required.

Species

- Red fox (*vulpes vulpes*)

Purpose

The purpose of this SOP is to provide information to people considering use of the Mata Hari Judas female technique for detecting and control on wildlife, principally vertebrate pest species, an understanding about what the Mata Hari Judas technique is, how it is used and the process of getting a female into prolonged oestrus.

The re fox, *Vulpes vulpes*, an introduced predator, is a major economic problem through predation of livestock, e.g. chickens, lambs and kids (estimates of deaths from foxes in sheep and goat flocks range up to more than 30% of their lambs and kids) (Gentle 2006, Saunders et al. 2010). Foxes are also a significant threat to biodiversity as a predator, particularly of native species in the critical weight range between 35 and 5,500g (e.g. native mice and rats, most of the marsupial carnivores and many of the marsupial herbivores) and are a competitor to native species, particularly quolls.

Foxes have been strongly implicated in the extinction of a growing number of Australian species and are a recognised threat to many vulnerable species (Gentle 2006, Saunders et al. 2010). Baiting, shooting and trapping are regularly used to control foxes, although these methods are typically used to reduce the impact of foxes rather than eradicate them and all limitations. Baiting and trapping have inherent problems with by-catch, and shooting has been shown to be most effective when fox numbers are high. None of the traditional control methods are considered 100% effective, and therefore, ongoing management of foxes is always necessary.

One technique used to successfully eradicate other vertebrates pests, as yet untested in foxes, is the Mata Hari Judas technique (Cruz *et al*. 2009). This is a technique where a female (in this case, vixens) of the target species hormonally induced into prolonged oestrus to attract animals of the same species. The Mata Hari Judas technique was first developed 15 years ago as part of the PhD project Dr Karl Campbell (Campbell 2007; Campbell *et al*. 2007) and the process of prolonging oestrus for the same purposes (detection for control of invasive species) has been demonstrated in cats (Murray *et al*. 2020) and dogs (N.Fraser, unpublished data as part of her PhD). All of these studies used Compudose-100 to induce prolonged oestrus.

Vixen will be dosed at 0.5mg/kg total oestradiol per vixen (and queen, bitch), rounded to the nearest ¼ implant – approximately 1 implant for a 30 -35kg animal. Each implant contains 21.4mg oestradiol. For an 8kg vixen, this would be a ¼ implant of Compudose-100. This dose rate is based on the vixen being similar in size to a large domestic cat, and we have previously induced prolonged oestrus in queens using this dose rate. For these species, the duration of the prolonged oestrus has been 128 days for goats, 27 days for queens and 57 days in bitches. For both queens and bitches, both entire and ovariohysterectomised females were attractive to males of the same species. Additionally, both males and females of the species have been attracted to the Mata Hari Judas (MHJ) female. If we can collect the 'smell' and vocalisations from a vixen in oestrus, to attract and therefore detect other foxes, then we overcome the welfare issues of using live animals.

Definitions

MHJ	Mata Hari Judas
HVWC	Hidden Vale Wildlife Centre

Linked SOPs

SOP ID number	SOP title
WL014	Use of the Vennel by a Mata Hari Judas female

Potential Hazard to Research Workers

USQ Risk Management Plan ID number	USQ Risk Management Plan title
RMP_2020_4960	Wildlife research and teaching fieldwork

Personal Protective Equipment required

- Disposable examination gloves – various sizes
- Eye protection
- Mask

Animal wellbeing considerations

Perceived stressors	Management strategy
Poor appetite, lack of offered food eaten	Feed good quality dried dog food and monitor feed and water intake and faecal output to determine if the diet is eaten and if any digestive problems occur (indications include diarrhea, vomiting). Change diet if necessary, repeat process.
Extreme escape behaviours	Increase amount of cover in holding pen,e.g. put more hollow logs, more 30cm PVC pipe into holding pen. If required, include sedative in food or waterer to reduce the animal's anxiety – monitor.
Time spent in Vennel	To alleviate the stress associated with the length of time the vixen is held within the Vennel, she will be supplied with *ad libitum* water, and food supplied automatically (and checked daily). She will be supplied with chew toys and other objects for enrichment (e.g. chewable kongs and balls), and the Vennel is designed to have multiple levels, a sandpit for digging (e.g. clamshell plastic sandpit with sand) and a sleeping nest box.

The overall perceived level of risk to an animal undergoing this procedure is:

	High		Medium	X	Low

Substances to be administered

Substance	Dose	Route	Purpose
Crystalline oestradiol-12ß (Compudose-100 implant)	21.1mg Oestradiol per implant; vixens will be dosed at 0.5mg/kg liveweight	Inserted under the skin on the dorsal surface near scapulae	Used to induce and prolong oestrus in goats, pigs, cats and domestic dogs.
Lignocaine	Not to exceed 4mg/kg typically 10mg	Dermal infusion	Used to numb tissue in the area where the implant is inserted.

	(1ml) per animal		
Tiletamine hydrochloride and zolazepam hydrochloride (Zoletil)	10mg/kg	Intramuscular injection	Dissociative anesthetic agent, with good analgesi properties to skin (Travaini and Delibes 1994)

Equipment/ materials required

- Compudose-100 implant
- Lignocaine
- Zoletil
- Surgical equipment (syringes, needles – typically 21G needles and 1,5 or 10ml syringes)
- Scalpels
- Surgical drapes
- Staples
- Applicator to close wound
- Disposable examination gloves – various sizes
- Fur clippers
- Aseptic cleaning fluid
- Swabs
- Rubbish bags
- Monitoring sheets, including, anaesthetic form

Site specification or location requirements

Hidden Vale Wildlife Centre veterinary clinic

Duration of the procedure

- One hour

Procedure

To be undertaken by a veterinarian

1. Bring the vixen to the HVWC veterinary clinic and use of Zoletil to anaesthetise her. Female must appear healthy on visual examination and data recorded during the procedure using the Anaesthetic form and the Anaesthesia Monitoring Vixen form to record data from the vixen at least every 15 minutes.
2. A 5 x 5cm area on the dorsal surface near the scapula of the vixen should be clipped and aseptically prepared.
3. Lignocaine should be infused into the skin in the centre of the prepared area.
4. A scalpel blade will be used to make a stab incision, and the implant (1/4 of the normal size implant to achieve the correct dose of oestradiol for a vixen) will be placed within the stab incision.
5. Staples will be used to close the stab incision.
6. Additional sedation and/ or analgesia will be provided if deemed necessary by the veterinarian performing the procedure.
7. Return the vixen to the location required (e.g. fox pen or Vennel) and monitor fox as per the appropriate monitoring protocol until fully recovered (use Monitoring of vixen in fox pen in HVWC or monitoring vixen in Vennel).

Training, qualifications or competencies required

This SOP is to be undertaken by a veterinarian.

References

Campbell, K.J., Baxter, G.S., Murray, P.J., Coblentz, B.E., and Donlan, C.J. (2007). Development of a prolonged estrus effect for use in Judas goats. *Applied Animal Behaviour Science* 102, 12-23.

Campbell, K. J. (2007). Manipulation of the reproductive system of feral goats (*Capra hircus*) to increase the efficacy of Judas goats: field methods utilising tubal sterilisation, abortion, hormone implants and epididymectomy. PhD Thesis, School of Natural and Rural Systems Management. University of Queensland, Gatton.

Cruz, F., Carrion, V., Campbell, K. J., Lavoie, C., and Donlan, C. J. (2009). Bio-Economics of Large-Scale Eradication of Feral Goats from Santiago Island, Galápagos. *Journal of Wildlife Management*, 73, 191-200.

Gentle, M. (2006). Red fox. Pest status review. Queensland Natural Resources and Water.

Murray, PJ, Rogie, M, Fraser, N, Hoy, JM, Kempster, S (2020). Development of the Mata Hari Judas queen (*Felis catus*). *Animals* 2020, 10(10), 1843; https://doi.org/10.3390/ani10101843.

Saunders, G., Gentle, M., and Dickman, C. R. (2010). The impacts and management of foxes *Vulpes vulpes* in Australia. *Mammal Review* 40, 181–211.

Travaini A, Delibes M. (1994). Immobilisation of free-ranging red foxes (*Vulpes vulpes*) with tiletamine hydrochloride and zolazepam hydrochloride. *J. Wildl. Dis*. 30(4):589-91. doi: 10.7589/0090-3558-30.4.589. PMID: 7760497.

Licences and permits

- Scientific Purposes Permit

SOP approval and review history

Date	Version	Review pathway	Notes
29 April 2021	0.0	**15/04/2021** USQ AEC "Subject to Modifications." **29/04/2021** Reviewed and approved by the USQ AEC Executive.	approved for use under project 20REA009