

Administration of the GnRH-targeted immunocontraceptive vaccine ‘GonaCon™’ to the tammar wallaby, *Macropus eugenii*: side effects and welfare implications

Snappe, M.A.^{1,2,3}, Hinds, L.A.^{1,2}, Miller, L.A.⁴

¹Invasive Animals CRC, University of Canberra, Bruce, ACT, 2617, Australia, melissa.snappe@csiro.au

²CSIRO Ecosystem Sciences, GPO Box 1700, Canberra ACT 2601, Australia

³Research School of Biology, Australian National University, Acton, ACT, 0200, Australia

⁴USDA National Wildlife Research Centre, Fort Collins, Colorado, USA

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Fertility control is being investigated as an alternative, non-lethal method of managing overabundant wildlife where conventional lethal techniques are no longer considered acceptable based most often on concerns for animal welfare. Gonadotrophin releasing hormone (GnRH) targeted immunocontraception has been shown to disrupt reproductive function in numerous mammal species by preventing GnRH-stimulation of gonadotrophin release from the pituitary, which results subsequently in a loss of gonadal activity in both sexes. GonaCon™, a single shot, injectable GnRH vaccine developed by the USDA National Wildlife Research Centre, has achieved long-lasting infertility in males and females of a number of species. Despite this success, it is necessary to evaluate all of the potential effects treatment with this vaccine may have on both individuals and social structure within a targeted population to avoid detrimental impacts on animal welfare and failure of a management strategy due to unforeseen changes in population dynamics. The effects of GonaCon™ on reproduction and behaviour have been assessed over the last 5 years in both short- and long-term experiments in the male and female tammar wallaby, a model macropodid marsupial species. From these studies, we have shown that this method causes 100% infertility in males vaccinated as adults (>2 years duration) or juveniles (≥2 years) and in adult females (>4 years). During this time data has also been collated for behavioural changes, body condition, effects on lactation and the formation of vaccination site reactions in the injected muscle block.

Males treated with the GnRH-vaccine as juveniles demonstrated significantly reduced rates of sexual behaviour compared to Control males, whilst those treated as adults demonstrated a statistically comparable number of mating attempts but failed to produce a copulatory plug. When held with vaccinated animals, experimental control males showed a decreased rate of agonistic behaviour compared to that observed when they were grouped with other untreated males. Despite this overall decrease in agonistic interactions, control males showed significantly more agonistic behaviours than did vaccinated animals during dominance observations, and achieved a higher dominance rank. Control males also showed sexual-type behaviours towards vaccinated males during dominance observations at a comparable rate to that demonstrated by intact males towards non-receptive females. Body condition was also altered in immunised animals compared to controls, with immunised animals generally having a greater amounts of mesenteric and kidney fat at autopsy. Lactation was not affected by administration of GonaCon™ to females with pouch young. The majority of animals immunised with GonaCon™ develop one or more granulomas at the site of injection, although signs of disrupted muscle function or discomfort were not apparent. Despite the various changes observed in the male and female tammar following immunisation, GonaCon™ does not apparently impact negatively on their welfare. Further studies at a population level are required to determine the effects of modified behaviour on social structure and individual wellbeing.