

## Induction to inhalation anaesthesia in agamid lizards with alfaxalone

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**ABSTRACT:** The aim of this study was to evaluate intravenous anaesthesia with alfaxalone for tracheal tube insertion in three species of agamid lizards. Alfaxalone, at a dose rate of 5 mg/kg, was administered intravenously to 80 inland bearded dragons (*Pogona vitticeps*), 10 Rankin's dragons (*Pogona henrylawsoni*) and 10 Chinese water dragons (*Physignathus cocincinus*) following 24 h of fasting. The righting reflex in inland bearded dragons, Rankin's dragons and Chinese water dragons was lost within 12–45 s ( $17.52 \pm 8.80$  s), 15–40 s ( $24.60 \pm 9.61$  s) and 12–40 s ( $21.70 \pm 9.53$  s), respectively. The mean tracheal tube insertion time for inland bearded dragons, Rankin's dragons and Chinese water dragons was  $23.61 \pm 10.91$  s,  $35.30 \pm 14.71$  s and  $32.00 \pm 14.32$  s, respectively. Intravenous use of alfaxalone proved to be a suitable method for safe tracheal tube insertion and induction to inhalation anaesthesia in agamid lizards.

**Keywords:** surgery; reptiles; reflexes; tracheal tube insertion; bearded dragon; Rankin's dragon; water dragon

Alfaxalone (3- $\alpha$ -hydroxy-5- $\alpha$ -pregnane-11,20-dione) is a drug that is used for anaesthesia and induction to inhalation anaesthesia in exotic animals including reptiles (Bertelsen and Sauer 2011; Knotek et al. 2011; Jones 2012; Kischinowski et al. 2013; Knotek et al. 2013a; Knotek et al. 2013b; Shepard et al. 2013; Knotek 2014). Studies have described a reliable induction of anaesthesia in reptiles within the first two minutes after intravenous administration of alfaxalone at a dose rate of 2–4 mg/kg (Carmel 2002; Simpson 2004). However, satisfactory anaesthesia for surgery was not achieved after administration of alfaxalone alone at a dose of 9 mg/kg in a study on Australian lizard species, although in most of them an endotracheal tube could be inserted (Scheelings et al. 2010).

The aim of the present study was to evaluate the clinical use of a low dose of alfaxalone as a short-acting anaesthetic agent for induction to inhalation anaesthesia in three commonly kept pet agamid

species, inland bearded dragons (*Pogona vitticeps*), Rankin's dragons (*Pogona henrylawsoni*) and Chinese water dragons (*Physignathus cocincinus*).

### MATERIAL AND METHODS

The study was performed with agamid lizards, which had been presented to the Avian and Exotic Animal Clinic for different surgical treatments (abscess removal, enterotomy, ovariectomy, salpingotomy, reposition of hemipenes, partial tail amputation, and orthopaedic surgery on limbs). The health of each of the patients was evaluated using standard clinical examination and by evaluating blood profiles including full haematology and plasma chemistry in adult animals. After fasting for 24 h the patients, 80 bearded dragons (mean body weight  $270 \pm 68$  g), 10 Rankin's dragons (mean body weight  $113 \pm 46$  g) and 10 Chinese water dragons

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(mean body weight  $334 \pm 75$  g), received a combination of meloxicam (1 mg/kg intramuscularly into the left front leg, Metacam 5 mg/ml, Boehringer Ingelheim, Germany) with (A) butorphanol (2 mg/kg intramuscularly to the right front leg, Torbugesic 10 mg/ml, Pfizer, Spain) 25–35 min before the alfaxalone administration or (B) tramadol (10 mg/kg intramuscularly into the right front leg, Tramal 50 mg/ml, Stada, Germany), 16–19 h before the alfaxalone administration.

Alfaxalone (Alfaxan® 10 mg/ml; Vetoquinol, France) was administered over a period of seconds to the ventral coccygeal vein (*vena coccygea ventralis*) using an insulin syringe-needle set to deliver a bolus dose of 5 mg/kg. The patients were placed on an electric heating pad (Bosch PFP 1031; Bosch, Czech Republic) kept at 37.5 °C. Loss of the righting reflex and loss of glottal control enabling the insertion of the endotracheal tube were continuously recorded. The time from the injection of alfaxalone to loss of the righting reflex was recorded as induction time. The time from the injection of alfaxalone to the loss of biting reflex and glottal control was recorded as tracheal tube insertion time (Bennett 1991; Bennett 1996).

Depending on the size of the lizard, a plastic intravenous catheter (either 14 G, 16 G or 18 G, Vasofix, B Braun, Germany), serving as a tracheal tube was inserted for the isoflurane inhalation anaesthesia (5% isoflurane, Nicholas Piramal, Piramal Healthcare, UK, combined with oxygen 0.2–0.4 l/min; non-rebreathing circuit with intermittent positive pressure ventilation maintained by a small animal ventilator SAV03, Vetronic Services, UK).

Statistical analyses of measured indicators (maximum, minimum, mean, standard deviation) were performed using the statistical software of the Excel program (Office-XP, Microsoft, USA).

## RESULTS

The results of the study are presented in Table 1. After the intravenous administration of alfaxalone, the righting reflex was lost in inland bearded dragons and Rankin's dragons within 12–45 s ( $17.52 \pm 8.80$  s) and 15–40 s ( $24.60 \pm 9.61$  s), respectively. In Chinese water dragons the righting reflex was lost within 12–40 s ( $21.70 \pm 9.53$  s). An endotracheal tube could be inserted in inland bearded dragons, Rankin's dragons and Chinese water dragons within 14–60 s ( $23.61 \pm 10.91$  s), 20–60 s ( $35.30 \pm 14.71$  s), and 15–60 s ( $32.00 \pm 14.32$  s), respectively.

## DISCUSSION

In reptiles, smooth induction of anaesthesia can be achieved with alfaxalone (Bertelsen and Sauer 2011; Jones 2012; Kischinowsky et al. 2013; Knotek 2014). In loggerhead sea turtles endotracheal intubation is easy to perform following intravenous administration of alfaxalone at low doses of 3–5 mg/kg (Phillips et al. 2016). A comparison of the pharmacodynamics of alfaxalone after single-dose intramuscular administration at two different doses and two different ambient temperatures in chelonians was recently reported (Shepard et al. 2013). Practical use of short-term intravenous anaesthesia with alfaxalone in lizards, green iguanas (*Iguana iguana*) and veiled chameleons (*Chamaeleo calyptratus*), has been published (Knotek et al. 2011, Knotek et al. 2013a; Knotek et al. 2013b). The results of the present study are similar to those published for alfaxalone in iguanas and chameleons. In veiled chameleons, the righting reflex was usually lost within one minute and the endotracheal tube could be inserted within 1–2 min (Knotek et al. 2011). In green iguanas, the time from the alfax-

Table 1. Alfaxalone anaesthesia (5 mg/kg *i.v.*) in 80 inland bearded dragons ( $270 \pm 68$  g body weight), 10 Rankin's dragons ( $113 \pm 46$  g body weight) and 10 Chinese water dragons ( $334 \pm 75$  g body weight)

Value	80 inland bearded dragons		10 Rankin's dragons		10 Chinese water dragons	
	induction time (s)	tracheal tube insertion time (s)	induction time (s)	tracheal tube insertion time (s)	induction time (s)	tracheal tube insertion time (s)
Minimum	12	14	15	20	12	15
Maximum	45	60	40	60	40	60
Mean	17.52	23.61	24.60	35.30	21.70	32.00
SD	8.80	10.91	9.61	14.71	9.53	14.32

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alone administration to the loss of toe-pinch reflex was  $2.20 \pm 1.47$  min (Knotek et al. 2013b). In the present study the righting reflex was lost within 45 s and the endotracheal tube could be inserted within 1 min after intravenous administration of alfaxalone in three agamid species.

In conclusion, intravenous use of alfaxalone proved to be a suitable method for safe tracheal tube insertion and induction to inhalation anaesthesia in agamid lizards.

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