RESEARCH PAPER

Preliminary comparison of four anaesthetic techniques in badgers (*Meles meles*)

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Abstract

Objective To investigate the use of four ketamine-based anaesthetic combinations in wild badgers.

Study design Prospective, randomized, clinical trial.

Animals Twenty-four adult badgers.

Materials and methods Animals were divided into four groups of six and were anaesthetized using either intramuscular (IM) ketamine alone (20 mg kg^{-1}), ketamine (15 mg kg^{-1} IM) and midazolam (0.4 mg kg^{-1} IM), ketamine (10 mg kg^{-1} IM) and midazolam (1 mg kg^{-1} IM) or ketamine (5 mg kg^{-1} IM) and medetomidine (80 μg kg^{-1} IM) antagonized with atipamezole (0.8 mg kg^{-1}; IM). Features of each technique, i.e. quality of induction, maintenance and recovery, and the need for additional doses, were assessed using a simple descriptive scale. Physiological variables, i.e. rectal temperature, respiratory rate, heart rate and blood pressure, were also recorded.

Results Combinations of ketamine and midazolam did not produce adequate anaesthesia. The combination of medetomidine and ketamine had few advantages over ketamine alone.

Conclusions and clinical relevance These data will contribute to a wider study attempting to refine anaesthetic techniques in badgers.

Keywords anaesthesia, badgers, ketamine, medetomidine, midazolam.

Introduction

Chemical immobilization of badgers may be needed in veterinary practice to manage road accident victims, and in wildlife research, to facilitate ecological or epidemiological studies. Anaesthesia of wild species carries risks because the health status of the animal cannot be determined beforehand, the stress of trapping and handling is high and because it is difficult to determine the mass of the animal before immobilization. The latter is of particular concern with badgers as they often have damp, muddy coats and the trap may contain an unknown quantity of mud. Recovery from anaesthesia must also be rapid so that the animal can be returned to its home environment in such a state that it can resume normal activities, e.g. feeding young or defending territory.

Anaesthetic techniques must have features that meet the demands of both animal welfare and operator safety. From the animal's perspective, techniques must be safe, have minimal effect on physiological function, have rapid, smooth inductions and recoveries, and have minimal long-term effects. Operators require a technique that is safe and easy to administer, produces predictable effects, and induces a level of anaesthesia that enables the necessary procedures to take place.

There are anecdotal concerns regarding the use of ketamine alone for anaesthetizing badgers, i.e. reports of excessive sneezing and muscle rigidity during maintenance, and sneezing and excitability during recovery. A secondary goal of the current study was to quantify the side effects of ketamine and examine alternative anaesthetic techniques involving or excluding this drug.

The aims of this preliminary study were to evaluate three anaesthetic techniques by comparing them with ketamine alone. Physiological variables and the quality of anaesthesia were also compared.

Materials and methods

Twenty-four adult badgers, undergoing sampling procedures as part of a scientific study into population dynamics (Macdonald & Newman 2001) were anaesthetized; cubs were excluded from the analysis. Mean body mass was 9.3 kg (range 5.5–12.5 kg) and median body condition score (MAFF 1998; Ullman-Cullere & Foltz 1999) was 3. Ambient temperature ranged from 11 to 17 °C. Treatment groups were not adjusted for sex but were matched for mean body mass. The study took place between 12 August and 6 September 1999. Anaesthesia was provided under the Animals (Scientific Procedures) Act 1986 (Licence number 30/1826) and Badgers trapped with authority from English Nature under the Protection of Badgers Act 1992 (Licence number 20011412).

The badgers were randomly allocated into one of four groups of six:

1 Ketamine (Ketaset Injection; Fort Dodge Animal Health, Southampton, Hampshire, UK) at 20 mg kg^{-1} intramuscularly (IM);

2 Ketamine at 15 mg kg^{-1} and midazolam (Hypnovel; Roche, Welwyn Garden City, Hertfordshire, UK) at 0.4 mg kg^{-1} IM;

3 Ketamine at 10 mg kg^{-1} and midazolam at 1.0 mg kg^{-1} IM;

4 Ketamine at 10 mg kg^{-1} and medetomidine (Domitor; Pfizer Limited, Sandwich, Kent, UK) at 0.08 mg kg^{-1} IM; later antagonized with atipamezole (Antisedan; Pfizer Limited) at 0.8 μg kg^{-1} IM on completion of the procedures.

Badgers were trapped overnight and collected between 06.00 and 08.00 hours. They were held within a central, covered point for a maximum period of 3 hours before anaesthesia. The holding area was kept quiet and badgers were left undisturbed in their covered traps until required, and were weighed whilst still in their traps. Because the weather conditions were dry, weights obtained within the traps corresponded well with the weights of the anaesthetized badgers. The anaesthetic mixture was given by the IM route, into either the gluteal or biceps femoris muscles. Where more than one agent was used, they were mixed in one syringe and given as a single dose. All injections were performed by the same experienced operator to avoid variation. Badgers invariably sat still in their traps for injections and could be approached from all directions thus negating the need for crush bars. Induction time was taken from the time of injection to the time when the animals did not react to the paw pinch test (absence of pedal reflex). A person unaware of the treatment group assessed the quality of induction, maintenance and recovery. Induction was assessed using the simple descriptive scale shown in Table 1(a). Once anaesthetized, the badgers were placed on a workbench where the various measurements were performed and samples taken. The maintenance period was arbitrarily taken to be the time at which the pedal reflex was abolished to the completion of the final measurement. During the maintenance period, respiratory and heart rate, rectal temperature and blood pressure (diastolic and systolic) were recorded every 5 minutes. Respiratory rate was measured by direct observation and heart rate was measured using a stethoscope. Rectal temperature was taken using clinical mercury in glass thermometer. Blood pressure was measured non-invasively using an automated oscillotonometer designed and constructed for used in dogs and cats (Studley Data Systems, Oxford, UK). Measurements were taken every 5 minutes, with the first measurement taken immediately on completion of induction. The quality of maintenance of anaesthesia was assessed using the simple descriptive scale shown in Table 1(b). The time for recovery was arbitrarily taken from the time of completion of the final procedure to the time the animal lifted its head. The quality of recovery was assessed using the simple descriptive scale shown in Table 1(c). Some animals required further doses of anaesthetic, i.e. half the dose given for induction, to maintain anaesthesia.

Statistical analyses were carried out using the SAS system (SAS Institute Inc. 1996). Categorical data (quality of induction, maintenance and recovery, and the requirement for repeat doses) were analysed using contingency tables with chi-square tests (or Fisher's exact test where expected