

# ANESTHESIA AND SURGERY PROTOCOLS FOR INTRAABDOMINAL TRANSMITTER PLACEMENT IN FOUR SPECIES OF WILD ARMADILLO

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## RESUMO

Armadillos belong to the Cingulata order and the family Dasypodidae, with nine genera and 20 species that range from the tiny pink-fairy armadillo (90 g) (*Chlamyphorus truncatus*) to the giant armadillo (60 kg) (*Priodontes maximus*). Implantable transmitters can be a solution to monitor animals for which the anatomy hinders the attachment of external tracking devices. Nevertheless, few studies using implantable transmitters have been performed with armadillos. Hence, one of the requirements for the use of intra-abdominal transmitters is the identification of safe and effective anesthetic protocols to perform implantable transmitter surgery, especially in the field. The anatomy and physiology of armadillos make anesthetic procedures and the placement of telemetry devices challenging. From June 2011 to November 2019, a total of 73 free-living armadillos were captured and anesthetized in the Pantanal, Brazil. 33 Giant (*Priodontes maximus*), 26 six-banded (*Euphractus sexcinctus*), 12 southern naked-tailed (*Cabassous unicinctus*), and 2 nine-banded (*Dasypus novemcinctus*) armadillos were divided into two groups. In group 1, 30 armadillos were anesthetized for collection of biological samples, body measurements, and placement of a microchip tag. Anesthetic combination BDM was applied: butorphanol tartrate, detomidine hydrochloride, and midazolam hydrochloride, each at 0.1 mg/kg. In group 2, 43 armadillos received ketamine hydrochloride at 10 mg/kg 20 min after BDM injection and intra-abdominal radio transmitters were surgically implanted. The transmitter was inserted freely into the abdominal cavity. Vital signs were monitored during anesthesia every 10 min and varied within species and between groups. Rectal temperature varied from  $33.1 \pm 1.36$  to  $35.34 \pm 1.218^\circ\text{C}$ , heart rate (beats/min) from  $19 \pm 2.14$  to  $84.71 \pm 9.25$ , respiratory rate (breaths/min) from  $11 \pm 4.16$  to  $31 \pm 2.82$ , and oxygen saturation values (SPO2%) from  $84.17\% \pm 2.39$  to  $98\% \pm 1.20$ . Both groups received the antagonist combination NYF: naloxone hydrochloride (0.02 mg/kg), yohimbine hydrochloride (0.125 mg/kg), and flumazenil (0.01 mg/kg). Recovery varied according to intravenous or intramuscular injection from  $2 \pm 4$  to  $8.08 \pm 2.93$  min respectively. BDM protocol was considered satisfactory and provided enough time to complete the procedures ( $60 \pm 85$  to  $133.20 \pm 9.12$  min) according to the species and group. Ketamine added to the BDM provided enough time and a surgical plane of anesthesia ( $97 \pm 22$  to  $137 \pm 39.5$  min). The anesthetic protocols can be used for short and noninvasive procedures and/or to implant intraabdominal transmitters. Both can be a low-cost alternative especially in countries where other anesthetic agents are expensive, restricted, or not available. The advantage of antagonizing the BDM anesthetics combination is that it significantly reduces the undesirable effects of long recoveries. The low adverse effects and high safety margin provided by both protocols avoid the chances of emergency situations, which are especially delicate in field conditions. The intra-abdominal implant did not appear to have a negative impact on the armadillos studied. Despite the complexities of using implantable transmitters, including technological limitations, high costs, and the conditions of surgical procedures in the field, this type of device is currently the most efficient and recommended method for long-term monitoring of wild armadillos.

**PALAVRAS-CHAVE:** Chemical immobilization, Free-living, Implant, Telemetry, Xenarthra.

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