SHORT COMMUNICATIONS

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Effect of Acepromazine and Haloperidol in Male Iberian Ibex (*Capra pyrenaica*) Captured by Box-Trap

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ABSTRACT: Short-acting neuroleptic drugs are used to prevent adverse effects of stress in wildlife. We compared the effect of acepromazine and haloperidol in Iberian ibex (*Capra pyrenaica*) captured with box-traps. We captured 23 male Iberian ibex at the National Game Reserve of Ports de Tortosa i Beseit, northeastern Spain, March 2003–June 2005. Seven animals received 0.1 mg/kg of acepromazine maleate, eight received 0.33 mg/kg of haloperidol and eight animals acted as controls. Clinical, hematologic, and serum biochemical parameters were analyzed. Both treatments decreased rectal temperature, white blood cells, lymphocytes, and concentrations of creatinine, creatine kinase, and lactate dehydrogenase. Acepromazine also decreased red blood cells, packed cell volume, hemoglobin concentration, neutrophils, and concentrations of glucose and cholesterol. Haloperidol also decreased heart rate and concentrations of urea and potassium. Our results demonstrate the suitability of using acepromazine and haloperidol in capture operations to reduce stress and prevent its adverse effects.

Key words: Acepromazine, box-trap, *Capra pyrenaica*, haloperidol, Iberian ibex, stress.

The management of wildlife populations involves animal capture and handling. Physical methods of capture induce stress in Spanish wild ungulates (Peinado et al., 1993; Pérez et al., 2003; López-Olvera et al., 2007). The study of changes in clinical, hematologic, and biochemical parameters is necessary to assess stress effects in captured animals (Williams and Thorne, 1996). Stress and its physiologic consequences, activation of the sympathetic-adrenal medulla and hypothalamic-pituitary-adrenal cortex, can produce tachycardia, hyperthermia, increase in some hematologic and biochemical parameters (hematocrit, eritrocitary indexes, hemoglobin concentration, red and white blood cell count, neutrophils, lymphocytes, enzymes [creatine kinase, aspartate aminotransferase, alanine aminotransferase, lactate dehydrogenase], glucose, lactate, urea, cholesterol, triglycerides, electrolytes) and decrease in others, including lymphocytes, eosinophils, and total proteins (Broom and Johnson, 1993; Jain, 1993; Williams and Thorne, 1996; Finco, 1997; Ganong, 2004; Kaneko, 2008).

Administration of short and long-acting neuroleptic drugs immediately after capture reduces the harmful consequences of stress and prevents syndromes such as stress-induced hyperthermia or capture myopathy. The choice of drugs depends on which drug prevents further stress effects (Ebedes and Raath, 1999). Evaluation of different tranquilizers is necessary to determine which is best for treating animals that will suffer capture-induced stress. To the best of our knowledge, haloperidol has not been used in Iberian ibexes (*Capra pyrenaica*). We measured the effects of acepromazine and haloperidol on stress response in this species captured by box-traps using clinical, hematologic and biochemical parameters.

We captured 23 free-ranging adult (≥2-yr-old) male, Iberian ibex by box-trap in the National Game Reserve of Ports de Tortosa i Beseit (40°50′N, 0°30′E), in Catalonia, northeastern Spain during March 2003 to June 2005. Only males were used because box-traps capture more males than females (Casas-Díaz, 2007). In our study area, the

sex ratio is equal and similar number of females and males were captured using other capture methods (e.g., drive nets; López-Olvera et al., 2009).

Seven animals received 0.10±0.02 mg/kg (mean±SD; 0.73±0.20 ml) of acepromazine maleate (Calmo Neosan®, 5 mg/ml, Smithkline Beecham, Madrid, Spain) intramuscularly in the femoral area, eight received 0.33±0.06 mg/kg (2.95±0.69 ml) of haloperidol (Haloperidol Esteve®, Laboratorios Dr. Esteve, Barcelona, Spain) and the eight remaining were controls, receiving 1 ml of saline.

Animal care activities and study procedures were conducted in accordance with the guidelines of the Good Experimental Practices, under the approval of the Ethical and Animal Welfare Committee of the Universitat Autònoma of Barcelona.

Once the ibex was physically restrained, the tranquilizer was injected. The animal was then blindfolded, its legs were restrained, and it was placed in a 4- by 4-cm mesh transport sack net and maintained immobilized for 3 hr. The transmitter of a heart rate recording device (Polar Vantage NV and Polar S710i, Polar Electro Oy, Kempele, Finland) was placed in the left precordial area and the receiver was placed around the neck. A telemetric temperature recording device (Mätman datalogger®, Chipsobits Eltex AB, Osby, Sweden) was inserted into the rectum. Data from these devices were recorded every 60 sec and a mean value was calculated every 5 min.

Blood samples were collected from the jugular vein; 2 ml of each sample was placed in a tube containing tripotassium ethylenediaminetetraacetic acid (EDTA K_3) as anticoagulant; and the remaining blood was placed in a serum collection tube with polystyrene granules. Once the clot had formed, samples were centrifuged at 1,811 × G for 15 min, and the serum was frozen at −20 C.

Hematologic parameters were determined using an electronic impedance semiautomatic analyzer (Sysmex F-800; Toa Medical Electronics, Hamburg, Germany) and by the standard microhematocrit method, using a microhematocrit centrifuge (Haematospin 1400, Hawksley, Sussex, UK) at 14,000 × G for 6 min. A differential leukocyte count was made by identifying 200 leukocytes on blood smears stained with a commercial Diff-Quick-like stain (Química Clínica Aplicada, Tarragona, Spain). Biochemical parameters were determined with two automatic analyzers (Cobas Mira, Roche, Rotkreuz, Switzerland; Olympus AU400, Olympus, Mainz, Germany), except for sodium and potassium, which were measured by flame photometry (Corning 410C; Corning Medical, Medfield, Massachusetts, USA), and cortisol, which was analyzed with a commercial enzyme-linked immunosorbent assay (ELISA) kit (EIA-1887; DRG Instruments, Marburg, Germany).

The influence of tranquilizer type on temporal variations of clinical, hematologic, and biochemical parameters of ibexes was evaluated using generalized linear mixed models (GLMM). Fixed response variables were the single effects of drug type (e.g., a categorical factor with three modalities: control, haloperidol, and acepromazine), time of sampling (e.g., 0, 60, 120, and 180 min), and their two-way interaction. Because we took repeated measurements on the same individuals, the effect included individual ibex as a random intercept. To prevent underestimation of the variance components (Pinheiro and Bates, 2000), we used restricted maximum likelihood for fitting each statistical model. Therefore, previous to model interpretation, we checked for residual patterns and normality graphically following recommendations of Zuur et al. (2009). Mixed models were fitted using the "nlme" package (Pinheiro and Bates, 2000) of R 2.14.0 (R Development Core Team, 2011).

Acepromazine interaction with time decreased rectal temperature (Fig. 1), red blood cells (RBCs), packed cell volume (PCV), hemoglobin concentration,

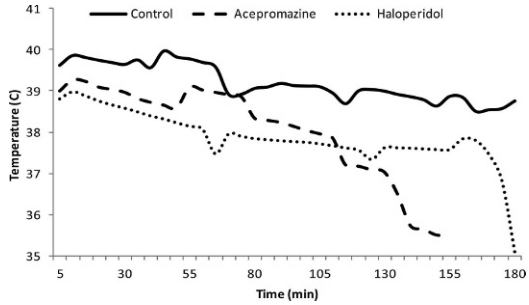

FIGURE 1. Rectal temperature of Iberian ibex (*Capra pyrenaica*) inoculated with two tranquilizers compared to controls, March 2003–June 2005, in northeastern Spain.

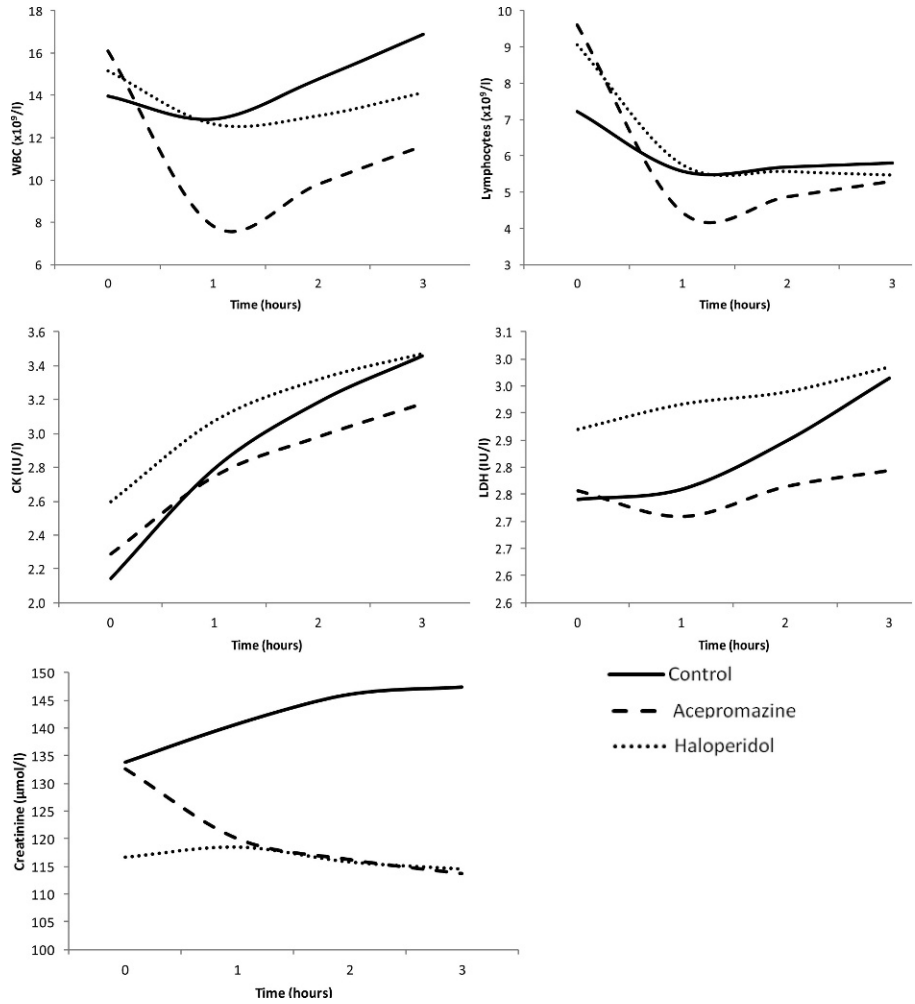

FIGURE 2. White blood cells (WBCs), lymphocytes, creatine kinase (CK), lactate dehydrogenase (LDH), and creatinine concentration of Iberian ibex (*Capra pyrenaica*) inoculated with two tranquilizers compared to controls, March 2003–June 2005, in northeastern Spain.

white blood cells (WBCs), lymphocytes, neutrophils, glucose, creatinine, cholesterol, creatine kinase (CK), and lactate dehydrogenase (LDH; Fig. 1). Haloperidol decreased heart-rate, rectal temperature (Fig. 1), WBCs, lymphocytes, urea, creatinine, CK, LDH (Fig. 2), and potassium. No differences were observed in mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, platelets, monocytes, eosinophils, basophils, cortisol, lactate, total bilirubin, triglycerides, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, sodium, or total proteins.

Iberian ibex captured with box-traps showed similar stress responses to other wild ungulates captured by physical methods (Montané et al., 2003; López-Olvera et al., 2007). Casas-Díaz et al. (2010) demonstrated the suitability of using acepromazine to reduce the stress response and potential adverse effects in Iberian ibex following capture with drive nets, with a reduction in many physiologic and blood parameters indicative of stress, including rectal temperature, RBCs, PCV, hemoglobin concentration, WBCs, lymphocytes, neutrophils, CK, AST, ALT, LDH, and concentrations of urea, total bilirubin, and potassium. In our study, the decrease of hematologic values in both treatment groups could be associated with hypotension due to induced vasodilatation (Gross, 2001). Nevertheless, butyrophenones, including haloperidol, induce a less pronounced hypotensor effect, and this was reflected in the decrease of the heart rate in this group (Plumb, 2002). Other changes due to vasodilatation of renal arterioles promoted by adrenergic blocking effect are increase in the filtration and excretion of urea, creatinine, and potassium, causing their concentrations to decrease (Plumb, 2002). The blockage of alpha-adrenergic receptors in striated musculature increases blood flow and could explain the decrease of levels of CK and LDH (Booth, 1982). Glucose and cholesterol are related to stress, but also to exercise and diet (Coblentz, 1975; Broom and Johnson, 1993).

In our study, the vasodilatation, hypothermic, and muscular protective effects of acepromazine and haloperidol demonstrated their efficacy in reducing stress response and preventing its adverse effects, thus improving the welfare of captured Iberian ibexes. However, more studies are needed to determine the effects of haloperidol in female Iberian ibex.

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