COOLING METHODS TO TREAT CAPTURE-INDUCED HYPERTHERMIA IN BLESBOK *(DAMALISCUS DORCAS PHILLIPSI)*

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A dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science.

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DECLARATION

I declare that this dissertation is my own work, with all assistance acknowledged. This dissertation is being submitted for the degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

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(**JOANNA SAWICKA**)

……… day of …………………. 2010

I certify that the procedures used in this dissertation were approved by the Animal Ethics Screening Committee of the University of the Witwatersrand (AESC number 2008/34/04).

DEDICATION

I dedicate this dissertation to my family (both immediate, and to all my friends who have become my family) who supported me through all the difficult and rewarding times that went into making this dissertation possible. Thank you to my dad for all his encouraging words, my sister for all her help with grocery shopping and to my mom who helped me pack bakkies. The years of my dissertation have been incredibly stressful and I would not have made it without you all. A special mention and thank you to Allan Stacey for all his help when computer technology was an obstacle to be overcome. And thank you to my partner Alexei Krassnokutski, who has understood and supported me throughout many tribulations and frustrations. Lastly, I would also like to dedicate this dissertation to Charles Vermeulen, who will always be missed.

PRESENTATIONS AND PUBLICATIONS

The following presentations are offered in support of this dissertation

Sawicka JA, Fuller A, Fick L, Hetem R, Meyer LCR. 2009. The effectiveness of different cooling methods at alleviating capture-induced hyperthermia in blesbok *(Damaliscus dorcas phillipsi)* (oral presentation). At the South African Wildlife Management Association (SAWMA), Black Mountain, Free State, 13-16 September.

Sawicka JA, Fuller A, Fick L, Hetem R, Meyer LCR. 2009. The effectiveness of different cooling methods at alleviating capture-induced hyperthermia in blesbok *(Damaliscus dorcas phillipsi)* (poster presentation). At the University if the Witwatersrand's Postgraduate Symposium, Johannesburg, 20-21 October.

ABSTRACT

Wild animals are captured for management, health, translocation and research purposes. Capture is an unnaturally stressful event, which may result in morbidity or mortality. An attributing cause of the morbidity and mortality is capture-induced hyperthermia; the larger the magnitude and the longer the duration of this captured-induced hyperthermia, the greater the likely risk to the animal. The most common practice currently used in the field to lower body temperature is to douse hyperthermic animals with water. However, the water used is often at ambient temperatures and its efficacy is not known. We investigated whether this method and alternative methods are effective at lowering the body temperature of hyperthermic animals. To achieve these aims we implanted 19 blesbok with miniature temperature-sensitive data loggers in their abdomens and into their subcutaneous layers (at the sites of the flank, groin, lower neck and upper neck). The loggers continuously recorded core body temperatures of the blesbok throughout the study period at an interval of six minutes. We successfully retrieved complete data sets from 12 blesbok. The animals were captured on six separate occasions using a technique which elicited hyperthermia. Five animals were cooled by dousing with water of different temperatures (4°C, 17°C, 28°C) and fanning after dousing with 28°C water, in random order. Seven animals were cooled by ice packs, spraying a fine mist spray, intravenous (IV) infusion of one litre of 4°C water and 28°C water-dousing. Through the use of our continuous logging of body temperature we established the normal body temperature of the blesbok, which displayed a regular 24 hour body temperature pattern. The average daily body temperature of the blesbok was 38.8°C ± 0.4°C, with a minimum body temperature of 37.9°C ± 0.1°C and a maximum body temperature of 39.4°C ± 0.1°C. The body temperature after capture was as

high as 41°C-42°C, which was significantly higher than the normal body temperature (Student's t-test, $P < 0.05$). The animals were cooled once they were immobilised and the start of cooling was denoted as time zero. In the control (no active cooling) intervention the body temperature decreased to only about 40°C. Dousing animals with water, irrespective of its temperature, resulted in significant cooling ($P < 0.05$) of the animals, as indicated by their minimum body temperature reached, change in body temperature and rate of cooling. The water-dousing interventions decreased the body temperature to about 38°C after an hour, which was significantly lower than the control (RM-ANOVA, $P < 0.05$) but there was no significant difference in the minimum body temperature reached between the different water temperatures or by the addition of fanning (RM-ANOVA, $P > 0.05$). The water-dousing interventions cooled the animals more quickly than did the control (RM-ANOVA, $P < 0.05$), and the coldest water (4°) cooled the animals quicker than did the 28°C water-dousing (RM-ANOVA, $P < 0.05$). The core body temperature minus the subcutaneous temperature was calculated, and revealed a peak difference of about 3.5°C after the 4°C water-dousing. Ice-packs also resulted in significant cooling ($P < 0.05$) of the animals, as depicted by their minimum body temperature reached, change in body temperature and rate of cooling. The ice-packs lowered the body temperature to a minimum of about 38°C, which was significantly lower than the control (RM-ANOVA, $P < 0.05$). The ice-packs also cooled the animals significantly faster than did the control, intravenous infusion and mist spray (RM-ANOVA, $P < 0.05$) but cooled as quickly as the 28°C water-dousing (RM-ANOVA, $P > 0.05$). The core body temperature minus the subcutaneous temperature for the ice-packs peaked at a difference of about 3°C. The IV infusion and mist spray were ineffective cooling methods and did not significantly ($P > 0.05$) alter the minimum body temperature or rate of cooling. Even though the IV infusion caused a significant reduction in body temperature by

1°C, the cooling effect from the IV infusion was short-lived because the minimum body temperature reached after the intravenous infusion and mist spray was ultimately similar to the body temperature seen in animals receiving the control (RM-ANOVA $P > 0.05$). Also, the intravenous infusion and mist-spray cooled as slowly as did the control (RM-ANOVA $P > 0.05$). Therefore, water-dousing in this study was the most effective and practical method to cool hyperthermic blesbok. Although all the water temperatures (4°C, 17°C and 28°C) that we tested were effective, the coldest water (4°C) cooled the animals quickest. The addition of fanning to the 28°C water-dousing did not increase cooling. Ice-packs were also effective but may be not as easy to use as the water-dousing method as ice-packs are large and need to be kept frozen, and therefore are cumbersome for use in the field.

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