

EXPERIENCE – A MEASURABLE ANAESTHESIA BENEFIT

Walzer C¹, Silinski S¹, Göritz F², Hermes R², Hildebrandt T²,
Schwarzenberger F³

¹Zoo Salzburg, 5081 Anif, AUSTRIA

²Institute for Zoo and Wildlife Research, Alfred-Kowalke-Straße 17, 10315 Berlin, GERMANY

³Institute for Biochemistry, Vet. med. Univ. of Vienna, Veterinärstraße1, 1210 Wien, AUSTRIA

Extended Abstract

In order to elucidate the problems of poor reproductive performance in captive white rhinoceros (*Ceratotherium simum*), the European Endangered Species Program (EEP) committee has encouraged intensive and serial reproductive monitoring in this species (SCHWARZENBERGER et al. 1999). Although the reasons for these problems have not been identified definitively, a multi-disciplinary, multi-institutional research proposal aims to work on possible solutions. The overall objectives of this project are to use an integrated approach to enhance breeding of southern white rhinoceroses in the EEP (SCHWARZENBERGER et al., 2001). The development of a reliable and safe anaesthesia method was an essential factor in this project. During the period March 1999 to January 2003 more than 110 elective anaesthetic events were performed using a combination of Detomidine-HCl (Domosedan®, Orion Corp. Farnos Finland), Butorphanol (Torbugesic®, Fort Dodge Animal Health, Iowa, USA) and additionally Ethorphine-Acepromazine (Large Animal Immobilon® C-Vet Veterinary Products, Lancs, UK). Anaesthesia was reversed in all cases with an i.v. combination of Naltrexone (Trexonil® Wildlife Laboratories Inc., Fort Collins, Colorado, USA) and Atipamezole (Antisedan®, Orion Corp. Farnos Finland) (WALZER et al., 2001).

We wanted to evaluate if the experience gained over the course of these numerous anaesthetic events directly benefited the animals – was anaesthesia measurably better due to our experience?

Seventy-four well-documented individual anaesthetic events between 07.01.2000 and 24.11.2002 were evaluated. The events were numbered sequentially in order of occurrence. In this initial study 3 arterial blood-gas derived criteria were used to define anaesthesia quality 1) pH; 2) PaCO₂; 3) PaO₂. Arterial blood samples were drawn from an auricular artery. The arterial blood samples were processed immediately with a portable blood gas analyzer (i-Stat®, SDI Sensor Devices Waukesha, Wisconsin USA). For this evaluation 217 individual samples were used for pH and PaCO₂ and 188 samples for PaO₂. Prolonged recumbency in white rhinos is associated with hypoventilation resulting in hypercapnia, hypoxemia and respiratory acidosis (WALZER et al., 2001; HEARD et al., 1992). We therefore assumed that the average pH and PaO₂ would increase and PaCO₂ would decrease with anaesthetic quality.

The data was analysed in SPSS v.10.07 (SPSS Inc., Chicago, Illinois 60606, USA). A logistic correlation between independent function 'experience' as defined by the sequential order of anaesthesias over time (with 1 being the procedure with the least experience and 74 with the greatest accumulated experience) and the dependent functions pH, PaCO₂ and PaO₂ was calculated. The results are shown in Figs. 1-3.

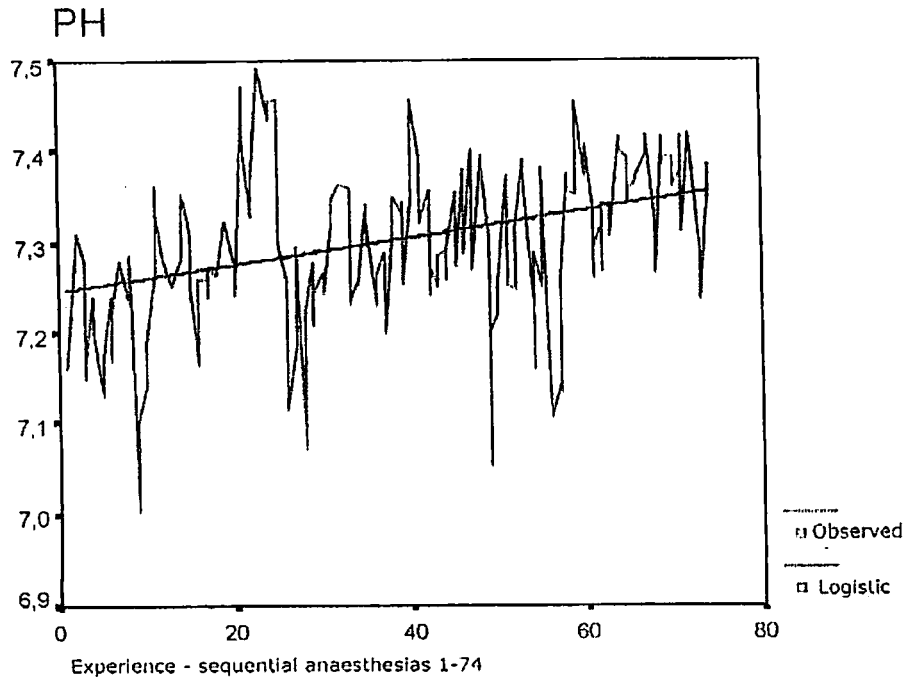


Fig. 1: Correlation: Experience and pH ($r^2 = 0.146$; $p < 0.001$).

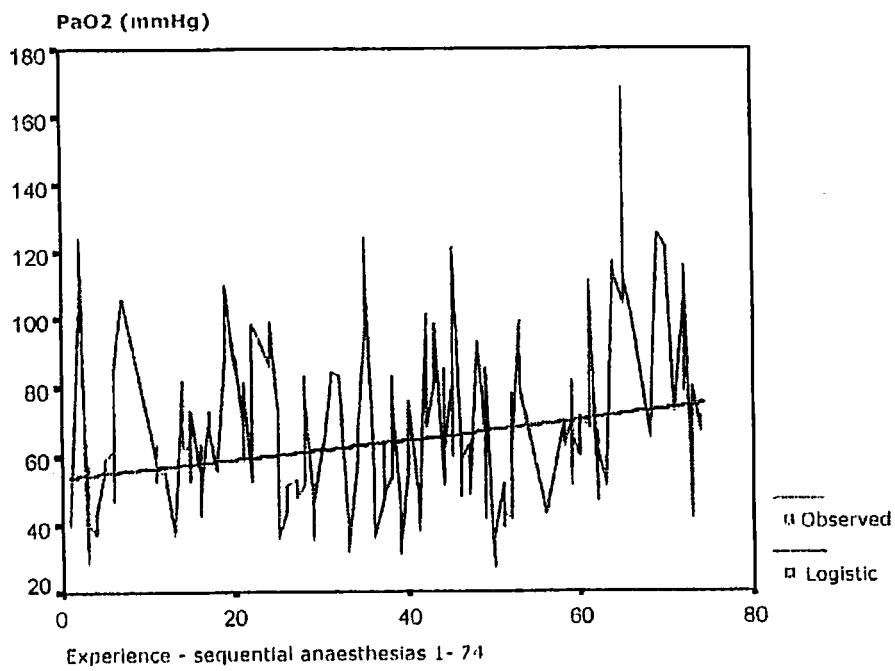


Fig. 2: Correlation: experience and PaO₂ mmHg ($r^2 = 0.064$; $p < 0.001$).

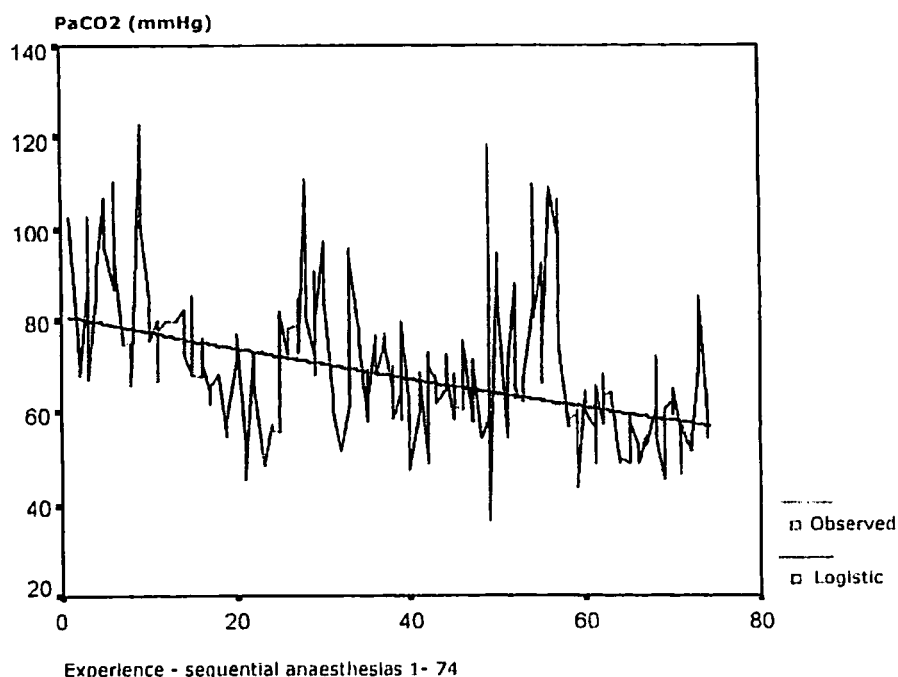


Fig. 3: Correlation: experience and PaCO₂ mmHg ($r^2 = 0.225$; $p < 0.001$).

Though these evaluated anaesthetics are influenced by a multitude of factors (e.g. various procedures, sex, individual animal variation) the results demonstrate that there is a significant correlation between the number of procedures and an increase in the average pH, PaO₂ and a decrease of PaCO₂. Though the r^2 values are not very high a marked improvement in the anaesthesia quality can be attributed to experience and the subsequent protocol development and enhancement over time. However, it is important to note that the collated data clearly demonstrates that rhinoceros anaesthesia was associated with hypoventilation resulting in hypercapnia and respiratory acidosis in all cases. Additional efforts into improving and adapting this protocol in the future are warranted. Familiarity with the anaesthetics and their effect on the target species and consequent monitoring allow for an improved anaesthesia management and constitute important safety factors in the rapid recognition of problem onset.

Acknowledgments

Financial support for this work was granted by IRF (International Rhino Foundation), SOS-Rhino and Burger's Zoo Arnheim, Zoo Givskud. We are grateful to all involved EEP and North American Species Survival Plan (SSP) institutions for giving access to their animals.

References

HEARD DJ, OLSEN JH, STOVER J (1992): *Cardiopulmonary changes associated with chemical immobilization and recumbency in a white rhinoceros (Ceratotherium simum)*. *J. Zoo and Wildlife Med.* 23, 197-200.

-
- SCHWARZENBERGER F, WALZER C, TOMASOVA K, GÖRITZ F, HILDEBRANDT T, HERMES R (2001) An IRF/SOS Rhino sponsored integrated approach for the enhancement of reproductive performance of white rhinoceroses in the EEP. In: SCHWAMMER HM, FOOSE TJ, FOURAKER M, OLSON D (Eds), *A Research Update on Elephants and Rhinos, Proc. Int. Elephant and Rhino Res. Symp.*, Vienna, 2001. Münster, Schöling Verlag, 219-221.
- SCHWARZENBERGER F, WALZER C, TOMASOVA K, ZIMA J, GÖRITZ F, HERMES R, HILDEBRANDT TB (1999): Can the problems associated with the low reproductive rate in captive white rhinoceroses (*Ceratotherium simum*) be solved within the next 5 years? *Verh.ber. Erkr. Zootiere* 39, 283-289.
- WALZER C, GÖRITZ F, SILINSKI S, HERMES R, HILDEBRANDT TB, SCHWARZENBERGER F (2001): Anaesthesia management in white rhinos for reproductive evaluation, semen collection and AI – a team approach. In: SCHWAMMER HM, FOOSE TJ, FOURAKER M, OLSON D (Eds), *A Research Update on Elephants and Rhinos, Proc. Int. Elephant and Rhino Res. Symp.*, Vienna. Münster, Schöling Verlag 237-241.