

Differences in distribution of ventilation between lateral and sternal recumbency in common Hippopotami measured by Electrical Impedance Tomography

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Current studies in large land mammals show preferential ventilation of the non-dependent lung in lateral recumbency (Mosing et al., 2020). This study aimed to determine the distribution of ventilation in immobilised common Hippopotami (*Hippopotamus amphibius*). The Centre of Ventilation (CoV) was evaluated in 2 sub-adult and 2 adult hippopotami in left lateral and sternal recumbency, measured by Electrical Impedance Tomography (EIT). The hippopotami were immobilised for relocation purposes. Each animal was darted with a combination of butorphanol, azaperone, and medetomidine (0.12mg kg⁻¹, 0.05mg kg⁻¹, 0.05mg kg⁻¹ respectively), with body weight estimated visually. Ketamine (1mg kg⁻¹) was administered IM once recumbent, thus safe to approach. After placing the EIT belt around the thorax, the hippopotami were repositioned twice in each recumbency in randomised sequences, with 10-minute intervals between changes. After two recumbencies, ketamine 0.5mg kg⁻¹ was administered IM to maintain immobilisation. Measurements of the CoV from right-to-left (CoV_{RL}) and ventral-to-dorsal (CoV_{VD}) were analysed over the last two minutes in each position, presented as median (range) in percentages.

The CoV_{RL} in lateral recumbency was 59.82% (45.87-61.42) and 49.69% (44.77-59.82) in sternal recumbency. In lateral recumbency, the majority of ventilation occurred in the dependent lung in three hippopotami, whilst in one, ventilation was predominantly observed in the non-dependent lung. In sternal recumbency, the CoV_{RL} was located centrally except in one animal, where ventilation was more in the left lung. The CoV_{VD} was in the centro-dorsal aspect for both recumbencies: lateral 64.00% (61.78-67.09) and sternal 61.63% (59.62-63.05). Two animals showed a dorsal shift in ventilation when in lateral recumbency. In three out of four hippopotami, lateral recumbency is associated with preferential ventilation of the dependent lung, differing from previous findings in terrestrial animals. In sternal recumbency, ventilation was found in the centro-dorsal areas of the lung.

References

Mosing, M. *et al.* (2020) 'What hinders pulmonary gas exchange and changes distribution of ventilation in immobilized white rhinoceroses (*Ceratotherium simum*) in lateral recumbency?', *Journal of Applied Physiology*, 129(5), pp. 1140–1149. Available at: <https://doi.org/10.1152/jappphysiol.00359.2020>