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NEWS RELEASE

UP researchers discover optimum way to monitor blood oxygen levels in immobilised rhino, boosting efforts to combat poaching

Inserting the pulse oximeter into the third eyelid (Photo credit Prof Leith Meyer)

PRETORIA - New research by scientists at the University of Pretoria (UP) has shown that pulse oximeters, originally designed for humans, can be used more effectively to monitor the blood oxygen levels of rhinoceroses who are under anaesthesia and immobilised – by attaching them at an unusual site: the rhino's 'third eyelid'.

"The third eyelid is a crescent-shaped fold of the outer eye structure which forms a thin, semi-transparent 'blinking' membrane over the eye," explains Dr Thembeka Mtetwa, an early-career comparative physiologist of UP's Faculty of Veterinary Science.

Immobilising rhino for dehorning or relocation is becoming a routine procedure for wildlife veterinarians working on the frontline to protect these animals from poaching. However, during these procedures, the rhino's lungs and heart may not respond well to the potent immobilising drugs.

"The drugs can negatively affect cardio-respiratory function; this can cause blood oxygen to drop to dangerously low levels," Dr Mtetwa says.

While the risks are managed as carefully as possible during these procedures, one of the greatest challenges to date has been identifying a reliable, field-friendly means of monitoring the animal's blood oxygen levels. Monitoring these levels is essential for making important decisions, such as whether to administer drugs to stimulate breathing or to give oxygen to the rhino.

That is why UP researchers have been working to adapt the use of existing technology and testing it in the field to find an appropriate solution.

Up until now, scientists and vets have typically been monitoring the blood oxygen levels of immobilised rhinos with blood gas analysers and pulse oximeters – which are designed for humans, not for a 1.5- to 2.5-tonne rhino – without any certainty of their reliability. Dr Mtetwa explains that these oximeters are not that different to the kind a doctor might attach to your finger to measure your blood oxygen levels. They provide a real-time reading of the oxygen levels in the blood.

"To give the pulse oximeters the best chance of working, we had to think carefully about where to place them on the rhino's body – where the animal's skin and membranes aren't too thick," Dr Mtetwa says.

The team discovered that the rhino's 'third eyelid' proved to be the most reliable site to attach the pulse oximeter.

"In humans, the third eyelid is that little pink structure snuggled in the corner of your eye that is barely noticeable – it is vestigial and has no function," Dr Mtetwa explains. "But in rhinos, it is, of course, much larger, and it contains lots of small blood vessels. It's also quite noticeable in dogs, cats and other animals; it functions to protect and clear the eye of foreign bodies when it closes, and to help keep the eye moist."

The new research by Dr Mtetwa and her collaborators – UP's Professor Leith Meyer, a wildlife vet and physiologist; experimental physiologist Prof Ned Snelling; wildlife vet Dr Peter Buss of SANParks; wildlife vet Dr Annette Roug; and ecophysiologist Dr Ashleigh Donaldson – was recently published in the journal *BMC Veterinary Research*. The group tested the reliability of different pulse oximeters at various attachment sites on the body of an immobilised rhino.

Prof Meyer, who has more than 20 years of experience in wildlife chemical immobilisation, came up with the novel idea to test the feasibility of placing the device on the third eyelid.

"The colour, moisture and capillary refill time of the external mucous membranes of the body are good indicators of hydration, circulation and the overall health of the animal, and are typically good sites to place a pulse oximeter probe," he says. "However, making use of these membranes on a rhino can be challenging due to their thickness and poor accessibility in some locations of the body, like the mouth. That's why we decided to explore the mucous membranes of the third eyelid as an alternative option. Luckily, it turned out to be a good idea!"

"The great thing about the rhino's third eyelid is that it is relatively thin," Prof Snelling adds. "It has lots of blood vessels close to the surface, and it's easy for vets and vet nurses to access it."

"Our findings highlight the importance of using appropriate monitoring techniques in large immobilised animals like rhinos, which have unique anatomical and physiological characteristics," Dr Mtetwa says. "This new research improves our ability to provide care and ensure the well-being of rhinos in the field."

>> Click here to see a gallery of how the procedure is done

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ABOUT THE UNIVERSITY OF PRETORIA

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on its Hatfield Campus in Pretoria. This 115-year-old institution is also one of the largest producers of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only university in the country with a Faculty of Veterinary Science, which is ranked the best in Africa. UP has 120 academic departments and 92 centres and institutes, accommodating more than 56 000 students and offering about 1 100 study programmes. It has the most academic staff with PhDs (70%), NRF-rated researchers (613).

The 2024 Times Higher Education subject rankings placed UP first in South Africa in the fields of Law, Veterinary Science, Accounting and Finance; Agriculture and Forestry and Electrical and Electronic Engineering. Quacquarelli Symonds (QS) ranked the University among the top five in Africa, as part of their 2024 World University Rankings (WUR). UP was the only South African university featured in the 2023 World University Rankings for Innovation (WURI), falling within in the 101-200 range of innovative universities.

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