UP researcher finds ways to improve the well-being of wildlife

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Dr Leith Meyer

Although wild animals have been captured and chemically immobilised for years (by using a form of anaesthesia induced by drugs in a dart), very little is known about the short- and long-term consequences of capture and the effects of immobilising drugs on wild animals. Dr Leith Meyer, Veterinary Sciences Pharmacology researcher at the University of Pretoria, is committed to finding solutions to improve the well-being of wild animals. The results of his research will help wildlife veterinarians and other conservation practitioners to ensure that the best methods of capture are practised and optimal immobilising drug cocktails and treatments are used.

Meyer's research attention is focused on three broad areas of work, namely the consequences of wildlife capture, the improvement of chemical immobilisation and the eco-physiological study of unique and rarely studied animals like the aardvark.

1. Consequences of wildlife capture

Previous studies have shown that stress-induced hyperthermia, or the rapid increase in body temperature as a result of stress, is a fundamental cause of capture-related mortalities. Meyer's research group, the Wildlife Pharmacology Research Group at Onderstepoort, is looking into the effects of wildlife capture to make the process more successful and less harmful to the animal. They recently commenced with a study at the Groenkloof Nature Reserve in Pretoria that focuses on the short- and long-term consequences of capture and capture-induced hyperthermia in blesbok.

One of the challenges of a study of this kind is that different animals respond differently to capture methods, but what remains evident is that most animals stress and show signs of hyperthermia during the capture process. The longer-term consequences of these capture-induced effects are unknown. While an

animal is immobilised, its heart rate and breathing patterns, as well as oxygen levels in the blood can be monitored; however, once the animal has been released back into the wild, it is not easy to obtain information on its coping abilities or of the rate of survival.

This project will study blesbok over set periods to determine the short- and long-term consequences of capture by evaluating how vital organs and systems, such as the cardiovascular system, are affected after capture. The project will also look at different capture methods and whether, for example, the cooling of immobilised animals reduces the negative consequences of capture. During capture, the temperature of a blesbok can rise to a dangerous level (that is, above 41 ^{0}C). Through his initial experiments Meyer has found optimal methods for cooling blesbok so as to normalise their body temperatures. Currently he is investigating whether these cooling methods reduce the negative consequences of capture. He and his team will also be looking at the role that hyperthermia plays in capture myopathy, a muscle disease condition that often results in mortality in captured animals.

While Meyer's previous findings have shown that ambient conditions do not affect an animal's body temperature as much as the animal's stress response, he highlights the fact that the way in which the animal is managed immediately after capture is key to its well-being. Putting an animal in a hot vehicle immediately after capture, for example, would perpetuate hyperthermia and lead to further unfavourable consequences.

National and international collaborations on parts of this study have been established, for instance with the University of Cape Town's Research Unit for Exercise Science and Sports Medicine, the University of the Witwatersrand's Brain Function Research Group and Cornell University. Through these collaborations Meyer plans to investigate the mechanisms behind the cause of capture myopathy in more detail, and to test novel drugs that may prevent or treat this condition and the other negative consequences of capture. Plans to exercise the blesbok and get them used to being chased are also in the pipeline to determine if capture myopathy can be ascribed to the unfitness of the animals or to the fact that they are not used to intensive chases.

While Meyer and his team are very grateful to the Groenkloof Nature Reserve for allowing them to conduct their study there, they have expressed a wish for a boma to be established on the Onderstepoort Campus so that studies such as these can be conducted in close proximity to researchers and diagnostic facilities.

2. **Improvement of chemical immobilisation (wildlife pharmacological study)**

Meyer's main research interest lies in wildlife pharmacology. This is a very important area of study, which investigates aspects about which very little is known as yet, such as wildlife capture methods and the effects of pharmaceutical agents on wild animals. Meyer's interest in the effects of drugs used to

immobilise animals has proved valuable to the broader community and can guide vets in the field with regard to the best drugs and methods to use when immobilising animals and treating any side effects.

‘Because goats do not stress like wild animals, they make good models to study the fundamental pharmacological effects of capture drugs typically used,’ Meyer says. Eliminating the interference of stress implies that the measured effects can be regarded solely as the results of the use of drugs. Experimenting on goats also means that tests can be conducted in a controlled environment and follow-up evaluations can be conducted to determine any long-term consequences of the drugs used. Once Meyer has determined the pharmacological effects of novel drugs used on goats he applies his findings to animals in the field.

Breathing patterns is an area of concern, with certain drugs slowing breathing to a dangerously low point. Animals can become hypoxic due to very low oxygen levels in the blood, but Meyer and his team, in collaboration with the University of the Witwatersrand and SANParks’ Veterinary Wildlife Service, have determined that using certain anaesthetic drugs in combination with oxygen can improve breathing by as much as 80%. In some cases breathing can be restored to normal levels. These studies are particularly important for species like the white rhino as they are very susceptible to the respiratory depressant effects of immobilising drugs.

With a recently completed study conducted at Onderstepoort to investigate anaesthetic agents in long-term anaesthesia in impala, and his on-going research into wildlife pharmacology, Meyer hopes that the drugs used in wildlife management will be better understood and that it will be possible to make a distinction between drugs that are preferable for specific situations, for example for animals kept in bomas and zoos as opposed to animals in the field, or for short procedures as opposed to long procedures. Meyer hopes that his research will provide important information about the effects of drugs on animals and about present options (and their pros and cons), and that it will lead to the discovery of novel agents for the improvement of wildlife capture, anaesthesia and immobilisation.

3. Research on rare and unique animal species (eco-physiological study)

Whenever a unique animal species, such as the aardvark or black-footed cat, has to be captured, Meyer is on hand to look at the safety of the immobilising and anaesthetic drugs to be used on these often under-studied animals. As with all his work, his objective is always to find safer alternatives to improve the well-being of the animal concerned. Studying unique species like these has also provided great insight into broader environmental issues like climate change.

Since aardvark belong to a specialised species that has rarely been studied before, very little material is available to guide initial research on the eco-physiology of these animals. Eco-physiology is the study of the adaptation of an organism’s physiology to environmental conditions. Aardvark fill a specialised niche in an ecosystem and, compared to other animals, they appear to adapt poorly to changes in the environment

and climate, and therefore they may be a species that provide clear evidence of the effects of climate change.

Aardvark have a specific diet consisting of ants and termites, and their home ranges are small. Meyer and the team at the Brain Function Research Group at the University of the Witwatersrand have established that a change in climate, like last summer's long, hot, dry spell in the Kalahari, could cause a mass death among aardvark. Their data showed that during this time the body temperatures of aardvark dropped to as low as 28 ^{0}C at night, making them severely hypothermic. Hypothermia is when the body loses heat faster than it can produce it, causing dangerously low body temperatures. Because of the lack of energy to defend their body temperatures, many aardvark most likely went into a prolonged state of sleep from which they never woke up. The lack of food and water during this time was the most probable cause of hypothermia, which resulted in many deaths.

This study gives more insight into the dire situation our planet will face if we do not take climate change more seriously and if we fail to make drastic changes to the way we operate. It also affirms the incredible ability of animals to cope under very difficult conditions and to endure extreme conditions for some time before dying.

What makes Meyer's work so inspiring is that it contributes significantly not only to the pool of knowledge about wildlife capture and pharmacology, but also to the well-being of the many wild animals that are captured and anaesthetised every year.

- Author Louise de Bruin