Congress of the Wildlife Group of the SAVA

2019

PROCEEDINGS

Misty Hills Hotel and Conference Centre
07 - 09 March 2019

Wildlife Group of the
South African Veterinary Association

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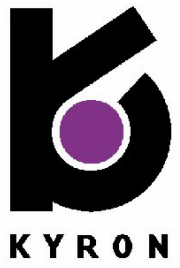
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DAY 01 | Thursday

07:30 REGISTRATION
08:30 Welcome by SAVA representative - Greg Simpson
08:45 Welcome and trade introduction - Greg Simpson
09:00 Biodiversity of marine life and human impacts - David Senn
09:30 The acute phase response in healthy and injured southern white rhinoceros (*Ceratotherium simum simum*) - Emma Hooiberg
10:00 TEA
10:30 Deer Industry History. How it started, where we are now (in terms of industry size etc.) + Stats on Industry Performance i.e. meat and velvet produced - Tom Macfarlane
11:00 Legal framework and practical applications in venison production from veld to fork - Mpho Maja/Mphane Molefe
11:30 Wild game meat production in SA - Tertius Bergh
12:00 LUNCH
12:50 Overview of processing Industry in NZ for velvet and venison, Markets, historic and current prices - with velvet as in interesting point but focus on venison as more applicable to our industry - Tom Macfarlane
13:40 Harvesting (Culling) of game for meat production - Tertius Bergh
14:20 Game meat abbatoir implementation - Peter Oberem
15:00 TEA
15:30 SAVF Wildlife Projects
15:40 Buffalo testing SOP DAFF - Mpho Maja/Gary Bauer
16:20 SAVC Feedback, topics and discussion - Clive Marwick
17:40 AGM
19:00 Drinks at Exhibitors
COCKTAIL DINNER

DAY 02 | Friday

07:30 REGISTRATION
08:30 Interaction of SANParks with the game industry: today and in future - Charlotte Nkuna
09:00 Cape Zebra and AHS - John Grewar
09:30 Buffalo investigation case study John Grewar
09:50 Disease reporting and vet management system. Disease diagnosis app - Danie Odendaal
10:30 TEA
11:10 GOLD SPONSOR: V-TECH
11:30 SANCCOB: 50 years of Saving Seabirds - Stephen van der Spuy
11:50 'Cities are for people not for nature…' – a review on urban wildlife ecology - Dorothy Breed
12:10 Orthognathic surgery to improve malocclusion in a chimpanzee - G. Steenkamp, F Hoogendijk, J.C. Almansa Ruiz, K. Koeppel
12:40 How to get the most out of your wildlife necropsy - Emily Mitchell
13:00 LUNCH
14:00 Our farming/breeding operation: Farm management/ deer handling through to breeding programmes, Implied reproductive performance etc. - Tom Macfarlane
14:30 On farm performance, integration of other stock classes - Tom Macfarlane
15:00 The importance of stress and the effect of cropping method on the meat quality of game meat - Liesel Laubscher
15:20 The translocation process: success or failure? The Veterinary Role in reintroductory projects - David Zimmerman
15:50 SILVER SPONSOR: WILDLIFE PHARMACEUTICALS
16:10 TEA
16:40 Managing human and elephant conflict - Henk Bertschinger
17:00 Managing human and elephant conflict - Alex Lewis
17:20 Elephants and big trees: developing mitigation methods to alleviate human-elephant conflict - Michelle Henley
17:40 Elephants and big trees: developing mitigation methods to alleviate human-elephant conflict - Robin Cook
18:00 Managing human and elephant conflict: Discussion
18:30 Drinks & Dinner Talk: Rhinos without Borders rhino translocation - challenges and opportunities of international rhinotranslocation - Markus Hofmeyer
19:00 BRAAI @ Riverbank Venue, Misty Hills

DAY 03 | Saturday

07:30 REGISTRATION
08:30 Sable/Roan semen collection with and without imipramin - Anndri Garrett & Katja Koeppel
08:50 The correlation between the horn measurements, scrotum circumference and semen quality of the male roan antelope *(Hippotragus equinus*) & sable antelope (*Hippotragus nige*r) - Sonya de Bruyn
09:10 Conservation through semem collection and cyropreservation in African rhinoceroses (*Cerathotherium simun simun; Diceros bicornis)* and elephants*(Loxodanta africana*) - Janine Meuffels
09:30 Anthropogenic effects on the viability of a Leopard (Panthera pardus) population at Loskop Dam Nature Reserve, Mpumalanga - Declan Morris
09:50 Oral bait preference for oral rabies vaccination for free ranging black-backed jackal - Katja Koeppel
10:10 Non-surgical artificial insemination trials in African lions *(Panthera leo)*: a new step into large fields conservation - Isabella Callealta Rodriguez
10:50 TEA
11:10 Three years of research into immobilisation and tranquilisation of impala and blesbok – a synopsis of key results - Silke Pfitzer
11:40 Capture stress in blesbok - Dorothy Breed
12:00 Using haematological measurands to assess translocation - stress in white rhinoceroses *(Ceratotherium Simum)* sedated with either Azaperone or Midazolam - Friederieke Pohlin
12:20 An update on lymphoplasmacytic gastritis in cheetahs - Adrian Tordiffe
13:00 LUNCH (CONGRESS CLOSE)

Rhinos Without Borders. Rhino Translocation

Markus Hofmeyr B.V.S.c.
Rhinos Without Borders team

Rhinos without Borders (RWB) is a collaborative partnership conservation project between Great Plains Conservation and & Beyond. Decisions and budgets are jointly managed by a steering committee made up of a core team of both organisations. The RWB project has pledged to bring at least 100 rhino to Botswana, and to date have successfully translocated 87. The remaining 13 rhino (and possibly more) will be translocated in 2019. The rhinos are sourced in South Africa from areas where they are in danger, where owners want to disinvest in rhino ownership or are available from excess animals in successfully protected populations. Up until recently Botswana has remained a safe haven for rhino and other wildlife.

The project raises funds via the Africa Foundation (& Beyond) and Great Plains Foundation to fund the purchase, capture and quarantine, translocation and post release monitoring costs. The budget per rhino to cover all these costs has been fine-tuned to US$ 40 000/ rhino. Once the rhino lands in Botswana it becomes the property of the Botswana government. RWB continue to support the government with monitoring of the rhino and other logistical issues (like veterinary input and recapture support when rhino move out of the designated safe areas). RWB also partners with other rhino conservation NGO stakeholders (the main partners are Rhino Conservation Botswana and Wilderness Conservation Fund Rhino Project) to support the overall rhino conservation effort of the Botswana Government.

There have been no direct translocation related mortalities during the various translocation events. There have been minimal post release mortality (total of 5 mortalities) and excellent calving rate (32 calves born to date). This population is therefore growing significantly since introduction – achieving the objective of taking rhinos to areas of better safety than from where they came from and allowing breeding to take place to grow the overall rhino population.

The translocations have been done by a consistent team. The Botswana Department of National Parks and Wildlife provide logistical support during the translocations. The Botswana Defence Force also escort the rhino and a large number of rhino have been flown in the BDF Air Force C130 Hercules transport aircraft directly to their release sites in remote parts of Botswana. The crew are now the most skilled military air force in transporting rhino into remote locations and landing on short landing strips.

The major lessons learnt during this international conservation initiative confirmed by the successful post release outcomes have been:

- Assembling a core team under an agile and committed project leader is key for consistency and dynamic learning aimed at improving the translocation process and outcomes
- Using experienced wildlife veterinarians and wildlife capture operators is key to ensuring best logistical and welfare outcomes during capture and translocation process
- Long lead time planning is essential as obtaining all the required permissions and permits take anything from 3 – 6 months or longer
- Political interference with release site selection during the translocation period was the main cause for rhino dying shortly after release when the release site was changed during one of the actual transport events of the rhino to less ideal sites than originally agreed to. Ensuring that release site approvals are in place well before translocation (in writing) and after suitable habitat and security measures are in place.
- Diligent and consistent post release monitoring forms an expensive but necessary part of any such long-distance cross b oundary translocation programs to ensure post release success is ensured, measured and future translocations adapted as lessons are learnt
- Poaching is a threat anywhere where there are rhino and Botswana has unfortunately not been spared the wildlife crime organised syndicate infiltration. Remaining vigilant and adapting to changing risk profile is required to keep rhino safe after translocation

This initiative has been good for rhinos, is a collaborative initiative between various private sector institutions and the government of Botswana with the sole aim at advancing the conservation of rhino and through that flagship species providing landscape wide protection of other species as well.

NOTES

The Acute Phase Response in Healthy and Injured Southern White rhinoceros *(Ceratotherium simum simum)*

EH Hooijberg[1], C Cray[2], G Steenkamp[1], P Buss[3], A Goddard[1], M Miller[4]

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[2] Department of Pathology & Laboratory Medicine, University of Miami Miller School of Medicine, Florida, USA;
[3] Veterinary Wildlife Services, South African National Parks, Kruger National Park, Skukuza, South Africa
[4] Department of Science and Technology/National Research Foundation Centre of Excellence for Biomedical TB Research/ Medical Research Council Centre for Tuberculosis Research, Division of Molecular Biology and Human Genetics, Faculty of Medicine and Health Sciences, Stellenbosch University, South Africa

The acute phase response is part of the innate immune system and is triggered by a variety of inflammatory stimuli. Acute phase reactants (APRs) are useful as diagnostic, prognostic and therapeutic markers (Cray et al., 2009, Eckersall and Bell, 2010). The acute phase response has not been investigated in the southern white rhinoceros (Ceratotherium simum simum), to the authors' knowledge (Bertelsen et al., 2009). The objectives of this study were to generate reference intervals (RIs) and to evaluate the diagnostic utility of APRs in white rhinoceros with acute and chronic tissue injuries.

SAA was measured with a sandwich ELISA, fibrinogen with the modified Clauss method and iron, albumin and haptoglobin with automated colorimetric methods. RIs were generated from a group of 48 clinically normal free-ranging adults except for SAA (n=23). Differences in APR concentrations between healthy animals and those with acute (n=13) and chronic injury (n=17) were assessed using the Kruskal-Wallis test. Receiver-operator characteristic (ROC) curve and stepwise logistic regression analyses were used to evaluate the diagnostic performance of the various APRs. $P< 0.05$ was considered significant.RIs were: albumin 18-31 g/L, fibrinogen 1.7-2.9 g/L, haptoglobin 1.0-4.3 g/L, iron 9.7-35.0 µmol/L, SAA <20 mg/L. Iron and albumin were significantly lower and fibrinogen, haptoglobin and SAA higher in both acute and chronic injury groups, compared to healthy animals. Iron showed the best diagnostic accuracy with an area under the curve (AUC) of 0.91 followed by fibrinogen (0.89), albumin (0.76), haptoglobin (0.72) and SAA (0.67). Iron ≤15.1 µmol/L and haptoglobin >4.7 g/L were significant predictors of inflammatory status and together correctly predicted the clinical status of 91% of cases. SAA >20 mg/L had a specificity of 100%.

Albumin and iron are negative APRs and fibrinogen, haptoglobin and SAA positive APRs in the white rhinoceros, similar to domestic animals such as horses and cows (Hooijberg et al., 2014, Ceciliani et al., 2012, Crisman et al., 2008). The combination of iron and haptoglobin had an excellent diagnostic accuracy for detecting inflammation. The diagnostic performance of these APRs in other diseases should be studied further in this species.

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2. CECILIANI, F., CERON, J. J., ECKERSALL, P. D. & SAUERWEIN, H. 2012. Acute phase proteins in ruminants. J Proteomics, 75, 4207-4231.
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4. CRISMAN, M. V., KENT SCARRATT, W. & ZIMMERMAN, K. L. 2008. Blood Proteins and Inflammation in the Horse. Veterinary Clinics of North America - Equine Practice, 24, 285-297.
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6. HOOIJBERG, E. H., VAN DEN HOVEN, R., TICHY, A. & SCHWENDENWEIN, I. 2014. Diagnostic and Predictive Capability of Routine Laboratory Tests for the Diagnosis and Staging of Equine Inflammatory Disease. Journal of Veterinary Internal Medicine, 1587-1593.

A Hindsight and Foresight View of the Deer Farming Industry in New Zealand

Tom Macfarlane, Managing Director, Melior
Honours graduate in Agricultural Science

Hindsight

Deer were introduced to New Zealand for recreation in the 1800s. In an environment with no natural predators, numbers exploded. The ecological impact on New Zealand's native flora was huge, and required action to mitigate damage.
Professional deer cullers were organised and paid by the Government, to control stock that recreational hunters were not making an impact on. The deer were still beating men on foot in challenging terrain.
Innovative risk takers used helicopters to firstly, drop hunters into remote places, secondly shoot directly from, and thirdly, deliver carcasses to accessible collection points.
A market for wild shot venison as a game meat added further income potential to per head bounties.
Until 1969, deer were classified as a noxious animal.
As deer numbers reached a better equilibrium, and the potential to farm deer became obvious to some forward thinking individuals, techniques for live trapping and helicopter airlift developed. Soon, a net gun was developed to enable capture on the run from helicopters. In 1970, the first deer farming license was issued.
In 1975, the New Zealand Deer Farmers Association was formed and in 1985 the New Zealand Game Industry Board was formed.
A market for live deer ensured demand for females, but development of registered game slaughter houses ,with strict quality control procedures, to process males and cull animals, was required.
Capital requirements to buy deer were partially funded by investors with external capital. Typically, the deer were sharefarmed with the land owner , who was also the farmer. Part of the value proposition to the investor was tax write down.
New Zealand's economic restructuring in 1987 eliminated tax write downs from livestock, and hence the value proposition for external investors. Subsequently, livestock values collapsed, which turned deer farming from a live sale proposition to a product based industry.
In 2001, an Act of Parliament allowed NZGIB and NZDFA to merge, forming Deer Industry New Zealand.
Focus turned to the two key markets, being Korea for velvet, and Germany for Venison. As those markets grew, and deer farming became a realistic alternative to sheep and beef, focus turned to productivity improvement. The original feral deer herd in NZ was based on English and Scottish deer. Substantial imports of larger framed, deer of East European origin, increased the performance capability of the NZ herd. Introduction of Canadian Elk genetics also supplemented the existing feral Elk/Red deer cross, known as Wapiti.

Venison and velvet as healthy functional foods

In the late 1990s, the meat processing sector gained export licenses to kill and process venison, breaking the monopoly of Deer Slaughter Premises (DSP's)
An evolution from wild food to game meat eventually created a problem of lack of differentiation from other game meats, or wild shot venison from European countries.
Industry leaders formulated a differentiation strategy for new markets to lessen concentration risk on Germany. The Cervena strategy was formed, focused particularly on the USA where the appellation, Cervena, allowed differentiation from wild shot and took Cervena into white table cloth restaurants. While the strategy worked well in the US, Europe remained a game meat market.
The global financial crisis in 2008/2009 accentuated an oversupply of game meat as the German market was flooded with wild shot venison from Spain and Poland, in particular.
Low prices, low confidence and resultant declining deer numbers caused an industry rethink, focused on

differentiating farmed venison from game meat in Europe.
The resultant strategy, branded "Passion to Profit" was multifaceted, but essentially resulted in growth of the USA market, and used a strategy to launch Cervena into Europe as a summer grilling item. The strategy also demanded farm productivity improvements in order to deliver a better fit of supply and demand curves for venison.

The velvet industry had long been volatile, partly due to market concentration risk in Korea, and an associated volatility in supply volumes. This had potential to overflow into the venison supply chain as the velvet herd was scaled back without warning. Over the past decade Chinese deer velvet traders had become more dominant in trade for velvet, some of which was on sold to Korea.
The industry had grown on the back of Traditional Chinese Medicine (TCM) use, but a younger generation were seeing less value in TCM products. Deer Industry New Zealand worked with market partners to create a new category for deer velvet, as a healthy functional food, in Korea. Growth of the healthy functional food market in Korea has stabilized market demand and pricing, and enabled the NZ volume to grow.
Much of the growth in New Zealand volume has come from large genetic gains in velvet production per head.

Designing a farm system incorporating deer

Key requirements to attract external investment into an equity partnership to farm deer include, first, an industry story that can inspire participation, second, is profitable, third, can withstand reasonable debt funding, and fourth, is resilient in its ability to withstand climate and market volatility.
The Melior Venison property had traditionally been used for lamb and beef production. Well run neighbouring properties had shown the potential for increased profitability, utilising deer on hill country that was largely uncultivatable.
When applying the same principles to the Melior Venison farm it was clear that large scale pasture renewal would be required to back infrastructure development. The basis of developing an integrated profitable deer system has proven to be a combination of, growing more feed and of high quality, utilised well with permanent and temporary fencing systems.
A small proportion of irrigation in order to buffer dry summers increased system resilience.
Intensification of feed grown and carrying capacity (kg of live weight per hectare) also required a farm specific animal health plan to ensure that animal health issues did not limit productivity potential.
Our metrics of success are, kg of meat produced per hectare, EBIT per kg of product, EBIT per hectare, and return on capital.

Genetics for performance

Farming is a game of limiting factors.
Exposure to the commercial side of deer farming taught me how important good genetic programmes are. The returns from heavy investment in infrastructure development, pastures, and people development, can be limited by sub optimal genetic capability.
As a commercial farmer I recognised that the New Zealand dairy farmer owned cooperative, Livestock Improvement Corporation(LIC) had utilised the same genetic principles as the dairy industry to make very quick advancement in venison genetics. Venison was the studs' sole focus, as it was for the Melior Venison business. Thus we started using the genetics in our commercial farming system. The genetics pushed the production and profitability to levels we could not reach with other deer.
When LIC decided to concentrate on core business (being dairy), the opportunity came for us to invest in the stud. Jake Chardon, known as one of the worlds best dairy cattle geneticists in his home country of Netherlands, has run the genetics programme since the stud started, after he immigrated to NZ, uses a simple formula:
Genetic progress = genetic variation, multiplied by selection accuracy, multiplied by selection intensity, divided by generation interval.
A large embryo transfer programme is utilised each year to speed up generation interval, by creating large

numbers of progeny from the best yearling stags and hinds.
Artificial insemination is also utilised on the next tier of hinds, so that a large numbers of females can be sired by each of the top yearling stags.

The stud incorporates 1000 stud breeding hinds, 300 commercial recipient hinds, winters 1200 mixed sex yearlings and 500 rising 2 year old stags

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Legal Framework and Practical Applications in Venison Production from Veld to Fork

Mpho Maja & Mphane Molefe

NOTES

Wild Game Meat Production in South Africa

Export vs. local production of game meat. Legal requirements currently.

Tertius Bergh B.V.Sc.
(Meat Safety Consultant & MD. Mobile Slaughter Technologies)

The production of game meat in South Africa is under the control of the Meat Safety Act (Act 40 of 2000) The Act has 6 regulations i.e. Red meat, Poultry, Ostridge, Game, Crocodile and Rabbit.
Only the first three regulations are currently promulgated. In the absence of regulations, the act stays as overriding legislation and procedures to guide the industry needs to be supplied by the state to ensure acceptable standards for the production of a specific product. This is the current state of affairs when game meat is harvested /produced.

Export requirements of such a commodity, such as game meat, is guided by the country importing the product. This is set in the export certificate that is signed by the state veterinarian confirming that the import requirements have been met.

The process is usually initiated by trade agreements on political level but is then handed down to the Department responsible for the product. Game meat (all meat), under the South African law, is guided by the Dept. Agriculture, Forestry and Fisheries, Directorate Veterinary Services.
Due to the absence of Game Regulations the export of game is guided by Veterinary Procedural Notices.
Export falls under the control of the National Office (DAFF) while the local production falls under the provincial Authorities (PEO) Export can only be achieved when the exporter reaches the requirements set by the importing country

These standards are certified by the Competent Authority (DAFF) and the achieving of the standard needs to be guaranteed by this body.

The importing country has the right to audit this body for compliance while the supply of the product to the local consumer needs to be guaranteed by the Provincial Authority.
The differences and complexities in the South African context will be highlighted.
The requirements under the Meat safety Act will be discussed for the various destinations.

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1. Meat Safety Act (Act 40 of 2000.)
2. Game meat Regulations (In Progress)
3. Veterinary procedural Notices
4. Import/Export regulations and protocols

NOTES

Harvesting (Culling) of Game for Meat Production

Methods to supply the market, Veterinary involvement and meat inspection with a summary of typical lesions of public health importance that are often seen in game

Tertius Bergh B.V.Sc.
(Meat Safety Consultant & MD. Mobile Slaughter Technologies)

Safe meat production can only be achieved if the process of production is guided by a Food Safety Management System. Many systems are available and different countries favour different systems.
The general international tendency is to favour ISO, FSSC and HACCP systems. In essence the systems are well thought through risk management systems to reduce or eliminate food safety hazards that may produce disease or death in the consumer.

Due to the challenges in the harvesting of game the safe and clean production of game meat may sometimes be limiting in reaching the market unscathed.

The production may reach the market with different avenues but in all cases the slaughter process is an interrupted process which poses different risks and therefore different approaches in risk mitigating practices and can therefor with difficulty be seen as a simple and straight forward process as observed in conventional red meat abattoirs.

The harvesting avenues will be discussed in more detail with reference to its specific challenges and therefor risk mitigating practices.

Experiences in the field and general pathological conditions and diseases will be highlighted and discussed.

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1. Meat Safety Act (Act 40 of 2000.)
2. Game meat Regulations (In Progress)
3. Veterinary procedural Notices
4. Import/Export regulations and protocols

NOTES

Game Meat Abbatoir Implementation

Peter Oberem
Managing Director of Afrivet Business Management (Pty) Ltd.
Vice President of Wildlife Ranching South Africa (WRSA)
Councillor on the South African Veterinary Council

NOTES

Increasing the Capacity for Testing of Buffalo for Corridor Disease, Brucellosis, Foot and Mouth Disease and Bovine Tuberculosis

Gary Bauer, Gondwana Wildlife Services

In certain areas of the country there has been a deviation from the accepted norm for testing of buffalo for the above-mentioned diseases. This deviation includes, but is not limited to processing of buffalo without the supervision of or presence of the state, handling of samples by lay people, owners, private veterinarians, etc.

These problems were highlighted at the South African Veterinary Council Indaba in Irene and since then have been taken up by the NAHF (National Animal Health Forum) and have culminated in the forming of the BCDC (Buffalo Controlled Diseases Committee).

Problems were identified, causes of these problems were discussed, and ultimately a way forward is currently being worked on. Part of the solution proposed is to have privately employed veterinarians and animal health technicians authorised by DAFF, perform these functions on behalf of the State.

NOTES

Biodiversity of Marine Life and Human Impacts

David Senn

The oceans cover approximately 71% of the surface of our planet, the earth. They include various biotopes like the deep-sea abyss, the continental slope, the plains of the continental shelf, the very complex environments of coral reefs and the intertidal zones of the coastline. The oceans form the largest environment and where the place of the origin of life. This hydrosphere, together with the atmosphere, makes our planet special: the blue planet. Life, i.e. bacteria, plants and animals are special and are exclusively supported by the ocean and the atmosphere.

Major changes are now caused by the presence of the human species, the Homo sapiens. Due to our predominance over all aspects of life and our overpopulation we produce numerous impacts on the living world. Classical impacts like oil spills, pollution with chemicals, industrial sewage and plastics, non-visible damages are reported. Influence of tourism; changes and pollution of beaches and coral reefs; noise under water; transmission of sounds and noise are much faster and stronger underwater than on land in the air. The acidification of the sea water develops as a very difficult problem. Healthy sea water is slightly alkaline; the pH is 8.2. This enables various organisms to extract calcium from water to build strong skeletons; this is observed in corals (Hexacorallia), Molluscs (Prosobranchia and Bivalvia). The reason for the widely distributed acidificaion of marine water is quite clear: it is the high concentration of carbon dioxide, CO2, in the water. To stop the acidification could only be realized by decreasing the pollution with CO2. But this will cause a major challenge for our civilized world. Lots of our technologies rely on the use of fossil energies (oil, coal, gas) and result in higher output of CO2.

The list of impacts is manifold and big. The worst of all impacts is plastic. Almost 90 Mio. tons of plastic are floating in the oceans. We already mentioned the CO2. Another impact is noise; water transmits sound much faster than air; this is especially dangerous for whales, animals which rely highly on auditive perception. And empty freighters cruise around the world with ballast water; many organisms (plankton) are transported into areas where they have never been before. The major problem is the overexploitation of the world's resources.

NOTES

Interaction of SANParks with the game industry- today and in the future

Charlotte Nkuna
Bachelor of Veterinary Medicine and Surgery
Master in Business Administration

Mandate of the South African National Parks

SANParks has a conservation mandate, which the organisation carries out through excelling in the management of the National Parks System. To develop, expand, manage and promote a system of sustainable national parks that represents biodiversity and heritage assets, through innovation and best practice for the just and equitable benefit of current and future generations

The organisation manages nineteen National Parks with approximately four million hectares combined size, with Kruger making up about two million hectares of the total estate. The activities in the estate are guided by the goals set out and agreed with the responsible government department, Department of Environment Affairs. There are four goals that have been set, being, Sustainable Conservation Asset, Diverse and Responsible Tourism, Radical (equitable and fair) Socio-Economic Transformation and Effective Resource Utilisation and Good Governance. To advance any of the goals, the organisation forms partnerships with other government departments, training institutions, non-profit organisation and the private sector.

Progressing SANParks' mandate through partnerships

SANParks interacts with various stakeholders to fulfil its mandate and achieve its goals. These interactions take many forms depending on the objectives. However, the interactions with the game industry is primarily for Integrated Wildlife Management purposes, to create a sustainable conservation estate, radical socio-economic transformation as well as effective resource utilisation. The Wildlife Management is informed by an internal policy, which is largely informed by the various Acts of the country as well as the National Development Goals and SANParks' strategy.

The implementation of integrated wildlife management programme is done through a number of sub-programmes. The most important ones related to the parks interaction with game farmers are:

1. Species and Ecosystem Conservation
2. Predation Management
3. Banking of biological samples
4. Donation of Wildlife and Wildlife Products
5. Loan of Wildlife
6. Sale of Wildlife

The main interactions with the game industry is on species and ecosystem conservation, predator management, donation of wildlife and wildlife products, loan of wildlife as well as the sale of wildlife and sustainable resource use. These programmes are implemented both locally as well as internationally with the neighbouring countries as well as far afield countries on the continent. Even though SANParks does undertake activities for income generation, the primary objectives are conservation related and the income generation is pursued if it supports the conservation goals.

The main programmes in brief

1. Species and Ecosystem Conservation

SANParks develops conservation programmes using the best applicable science-based knowledge available. The organisation uses the principles of strategic adaptive management which provides for continuous

learning about wildlife management dynamics. Species groups or individuals are removed for conservation, research, species survival and other reasons, without a detrimental effect on the parent populations. Reintroduction and supplementations are done to ensure species survival.

2. Predation Management
SANParks has an active predation management programmes to ensure that the right balance between prey and predators is maintained to avoid total destruction of the prey species. Generally, where in areas where there is an abundance of prey it turns to attract predators. The predator management in the national park is made possible through the collaborations with metapopulational game reserves where animal exchanges are possible to ensure national sustainability of the species.

3. Banking of biological species
SANParks has the largest repository of free ranging game biological samples. These samples are collected at every opportunity where animals are immobilised for various purposes. These samples are used extensively by local and international researchers. Thus far, the samples are provided to researchers free of charge in aid of knowledge development. These biobanks are invaluable to SANParks and South Africa as a whole and preserving them is of priority to the organisation. The research outcomes from the samples have been instrumental in implementing some of the game management principles seen to date. SANParks is also a member of the biobank network established by the Department of Science and Technology (DST) through South African National Biodiversity Institute (SANBI).

4. Donation of Wildlife and Wildlife Products
In recognition of the need to develop strategies for to make conservation economically and socially just for previously disadvantaged local communities, the Department of Environmental Affairs developed the Biodiversity Economic Strategy (BES) which seeks to contribute to the transformation of the biodiversity economy sector. BES provides an opportunity to redistribute South Africa's indigenous biological and genetic resources in an equitable manner, across various income categories and settlement areas of the country.
SANParks routinely receives requests for donations of wildlife and wildlife products from local communities adjacent to national parks, including beneficiaries of land claims. The decision to donate takes into account; the particular species and conservation status thereof, the contribution to the national biodiversity targets and economic functioning, the sustainability of the habitat the animal will be relocated to, the socio-economic and historical circumstances of the applicant, the potential economic benefit to the applicant and the long-term benefit to biodiversity conservation.

5. Loan of wildlife
Where donations are provided for communities, the applications for wildlife loans are considered for the promotion of entrepreneurial development towards socio-economic empowerment in the wildlife industry. The loans assist emerging farmers with enhancement of their capacity and expertise in wildlife farming. SANAParks enters into a loan a loan agreement with the emerging farmer after he complies with permitting requirements, including, translocation, holding, disease freedom, animal welfare and other prior stipulated conditions.

6. Sale of wildlife and wildlife products
Wildlife sales are carried out for live surplus animals as part of the protected area management strategies. These animals are sold on auctions, best price principles, catalogues sales and others. The proceeds from the sales are ploughed back into conservation, enabling the organisation to continue fulfilling its principle mandate and contributions to conservation locally and globally. The animals are sold to private property owners after evaluation of their properties for suitability to hold such animals.

Concluding comments

South Africa has a wealth of wildlife resource, which SANParks is managing on behalf of the South Africa citizens. There is also wildlife that is in the hands of the private sector. SANParks acknowledges that sustainable utilisation of wildlife is a legitimate means of satisfying the subsistence, cultural, commercial and

recreational needs of all South Africans. Additionally, SANParks notes that hunting is a legitimate activity which is consistent with the sustainable management of wildlife, provided it is conducted in accordance with the appropriate permitting and other regulations set by national and provincial conservation agencies. It is important to point out, however, that no hunting is permitted in national parks.

The wildlife resource will only be preserved for future generations if there is alignment between the objectives of the private owners as well as the government. Future sustainability will require collaborations in research, education, management, technology as well as preservation of what is currently available, given the constant pressure from both within and outside the country and the continent.

NOTES

Dealing with the Zebra in the Room

John Duncan Grewar
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Introduction and Summary

It has become increasingly apparent that one of the detrimental perceptions that exist, from South Africa's potential equine trade partners, is that Zebra are playing a role in African horse sickness in the AHS controlled area of South Africa. While it is clear that Zebra play a role in the disease, this is more relevant to areas such as the Kruger National Park where populations are big enough to maintain the disease throughout the year, and therefore acting as a reservoir. There is also confusion between the definition of carrier status and reservoir host – we know that Zebra are not permanent carriers of the disease but rather as a potential reservoir of the disease in specific conditions.

In an attempt to address this perception a comparative study should be undertaken to establish the potential of Zebra in the AHS control zones to act as reservoir hosts of AHS. This project will also require some census and location data being collated for the controlled area which will assist in our upcoming EU audit.

Goals/Objectives

- Literature review
    - Comparative review between Kruger National Park and the AHS controlled area considering
        - » Herd dynamics – count, sex distribution, age distribution
        - » Population size
        - » Population spread
        - » Population dynamics – introduction of naïve animals, loss of protected animals, foaling rates
        - » Interaction between herds – movement, vector links, natural social links
        - » Virus – prevalence, age associated dynamics, force of infection
        - » Vector dynamics – Niche habitat and species considerations, biting rates
- Comparative analysis and viability model
- Summarised introduction, methods, results and discussion for presentation preparation

Process

Dr John Grewar will assist with the work primarily carried out by Dr Thibaud Porphyre (PhD), a Research Fellow at the University of Edinburgh. Dr Porphyre received a Master's in Biological Modelling from Joseph Fournier University, Grenoble (France), a Post Graduate Diploma in Preventive Veterinary Medicine and a PhD in Epidemiology from the Institute of Veterinary, Animal and Biomedical Sciences of Massey University (New Zealand).

NOTES

How Seemingly Simple Outcomes Become Challenges when Data Cannot be Converted Into Information – Tuberculosis in Buffalo as Case Study

Grewar, John Duncan
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Outbreaks of disease can result in an emergency situation that has the potential to destabilise an entire game farming operation. A case study is presented of a game farm that required an investigation into the Mycobacterium bovis status of its buffalo herd – this given a series of prior suspect tests and introduction years prior of a known positive animal. The political and social experiences learnt would require a discussion all on their own: here the challenges overcome to come to an epidemiologic conclusion that was justifiable and palatable to the relevant veterinary professionals, farm management and legal advisors involved with the situation are described.

It was immediately evident that the data that was available for analysis was going to be a challenge. Testing information (both the base comparative skin test and the use of IFNγ tests), while associated with individual animals, provided little information on the location of the animal within the farm spatially and in terms of which sub-group it was with when testing occurred. The identification of animals on test results made it difficult to follow single animals serially over time. This analysis was crucial in evaluating suspect results and to provide evidence for false positive classification. Census information on sub-group level made the generation of a time-based contact network tracing challenging. The case definition of positive and suspect animals, and the resulting control requirements were not clear and this single issue accounted for the situation arising. While in this case the case definition was set by legislated regulations, case definition determination remains the bedrock of any investigation.

Recommendations to mitigate the challenges that were experienced in this case study are provided. The situation described is not unique – whether an investigation is establishing the likelihood of infection or freedom, or evaluating a change in prevalence of disease, data required remains consistent and the analysis of these data is relatively standardised. If however the analysis goal is not considered when core data is captured in the field, any investigator will be following leads down blind alleys with no framework upon which to base their investigation.

NOTES

Disease Reporting at the Interface between the Animal and the Animal Handler

Danie Odendaal BVSc
Partner in Afrivet Training Services

The animal handler can't identify most specific diseases causes, but can identify disease syndromes, to a relative good extend like acute deaths, tick infestations, skin problems, lameness, abortions, diarrhoea, coughing, paresis, bloat and anorexia.

The animal handler can be empowered to identify and electronically record specific and individual first signs of disease through a structured system called the Daily Observation Card (DOC). This system provides a logical methodology for daily observation by the animal handler which anyway forms the basis of good livestock farming practice.

The system then also differentiate between that signs of disease which can be identified by observation and signs of disease which can only be identified by a further basic examination of the animal.
This system not only provides a recording system to enable remote veterinary support, but it's main function is to educate the animal handler about what is normal and to provide basic knowledge about the management actions that need to be executed in order to maintain health and production.

It further provides a level of differentiation between different signs of disease, in order for the animal handler to understand the importance or urgency, if specific signs of disease are identified.
It further teaches the animal handler about the progressive nature of disease, called the disease developing process.

This basic knowledge is needed for prevention or early treatment of the most common diseases or disease conditions, occurring on a regular or seasonal basis in a specific geographical area like parasite infestations and seasonal nutritional shortages.

It also alert the animal handler about diseases or disease conditions which is more complex or unknown for which immediate veterinary support must be sought.

The fact that the system is electronically available on a cell phone provides the opportunity that it can be used by any one owning a smart phone.

This information can then also be used in a passive surveillance system because of the fact that this information is electronically recorded and automatically stored in a central electronic database.

The data in such an electronic information system can easily be used to generate real time reports about first signs of disease per geographical area which is essential in the case of a disease outbreak or monitoring of the progression of a disease outbreak.

This presentation will provide an overview of the development and current status of this disease recording system at the interface between the animal handler and the animal as currently developed for the domestic livestock sector in South Africa.

Disease Reporting at the Interface between the Veterinarian and the Clinically Sick or Affected Animal

Dr Danie Odendaal BVSc
Partner in Afrivet Training Services

According to an paper presented by Dr Rodger Paskin at the Livestock Heath and Production Congress (17-21 July 2005, Natal, South Africa), the "OIE's philosophy at present is that diseases per se are not reported – events or phenomena are reported. A "reportable event" may be a disease occurring in a country or zone for the first time; an existing disease whose pattern of occurrence or host range has changed, or an emerging disease being seen for the first time.

The challenge in this case is the have a base line (incidence or prevalence) against which the occurrence of a disease can be interpreted.

In the case of state controlled diseases the can be good existing or historic records indicating disease distribution areas and incidence for a disease like Foot and Mouth disease (SAT strains) which is limited to a specific area of the country. Because this disease has a major implication on foreign trade there is more resources and focus on it.

But for other state controlled diseases which are not well managed like bovine brucellosis there can be totally inadequate information due to the limited active surveillance of this important disease which have major implications for health and productivity at individual farm level.

The opportunity for creating a baseline of disease occurrence do exist by involving private veterinarians throughout a country like South Africa that see and diagnose clinical disease cases and disease conditions on a daily basis.

This system must be very easy to operate and it must practically also provide the reporting veterinarian with information which is of importance to his/he business of providing clinical as well as disease prevention services.

If such a simple and practical system are actively used by the majority of veterinarians it will establish a dedicated and operational system for passive disease recording and development of a baseline for disease occurrence regarding the full spectrum of diseases affecting the livestock sector.

This system can easily be expanded to include qualitative and quantitative data for selected diseases for example specific state controlled diseases like bovine brucellosis.

It can give a clear and visible overview of high risk areas by analysis of disease affected and non-affected farms.

This presentation will provide an overview of the development and current status of this informal veterinary disease recording system at the interface between the veterinarian and diseased animals, for which veterinary support was requested in South Africa over the last 8 years.

SANCCOB: 50 Years of Saving Seabirds

Stephen D. van der Spuy
The Southern African Foundation for the Conservation of Coastal birds (SANCCOB)
Cape Town and Port Elizabeth

The Southern African Foundation for the Conservation of Coastal birds (SANCCOB) was established in 1968 by Althea Westphal, a dynamic, determined, self-motivated, dedicated and committed philanthropist and environmental conservationist who lobbied government and rehabilitated African penguins at her home in Newlands, Cape Town.

50 years on, SANCCOB has developed from it's modest early stages to become an internationally recognised leader in oiled seabird response, rehabilitation and applied research.

SANCCOB sees approximately 2500 seabirds very year, of those about 1500 are African penguins. 2018 marks the year in which the African penguin population in South Africa has reached its lowest number ever in history, we now only have 16 000 breeding pairs left in the wild, that is less than 2.5% of the historic population. Unfortunately, several of the other species that we see at SANCCOB are now also listed as Endangered, such as Cape gannets, Cape cormorants and Bank cormorants.

This presentation will discuss SANCCOB's involvement in numerous marine conservation projects, many of them in collaboration with our partners in conservation, locally and internationally. All our projects strive to contribute towards healthy, wild seabird populations and to reverse the decline in our seabird numbers.

NOTES

‘Cities are for People not for Nature…’ – a Review on Urban Wildlife Ecology

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The conservation of urban wildlife has received increased interest and is a growing field globally. This is due to rapid urbanization and the ability of certain species of wildlife to thrive in an urban environment. Many do not realise that the most contact humans will have with wildlife is in an urban environment1. This has implications for zoonotic diseases, safety and welfare[2].

Urban wildlife has an important role in controlling pest species, pollinating plants and also provide city dwellers needed contact with nature. The lack of biodiversity is the biggest driver of disease outbreaks2.

The spread of invasive species also often originates from urban areas, making control in these centres paramount[3]. In contrast, the disassociation of humans with nature is becoming more apparent and the ability to tolerate wildlife limited when animals are seen to be damage causing. Change of lifestyle, habits and management to allow for a more wildlife friendly environment takes education, exposure and social pressure. In South Africa, there is still severe economic pressure for housing, development and land which can come into direct conflict with urban conservation ideals. Many of the residents of South Africa have never had the opportunity to understand or experience the benefit of conservation, and they may only have had perceived negative interactions with wildlife[4]. However, social views on the place and management of wildlife is changing drastically, largely due to the positive platform that social media provides.

Cape Town is a biodiversity hotspot, and there is a surprisingly increasing diverse range of wildlife species[4]. As cities are taking up more space, so they are seeing more and more wildlife, including large carnivores[5]. The old approach of keeping conservation efforts to limited tracts of land in far off places are unpractical and unsustainable. Increased knowledge of urban wildlife ecology and habitat requirements is needed to allow for better inclusive management and urban planning.

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NOTES

Orthognathic Surgery to Improve Malocclusion in a Chimpanzee

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Claude, a 15-year-old male chimpanzee presented with chronic weight loss an inappetence for approximately 6 months. Closer inspection revealed mandibular brachygnathia (short mandible) as well as malocclusion. Computed tomography evaluation confirmed this original clinical diagnosis, but also revealed the left mandible was thicker, had several absent cheek teeth, was slightly rotated on its long axis and had a lingually deviating wisdom tooth (3 rd molar tooth). Ultrasonographically ventricular subcompaction was diagnosed.

Dental impressions were taken from this chimpanzee and a management plan developed based on the available information. It was decided to perform orthognathic (corrective jaw) surgery. This entailed doing a Bilateral Sagittal Split Osteotomy (BSSO). In this procedure the mandibles are split in a sagittal plane by making carefully planned incisions through the mandibular cortices. Care is taken not to damage the mandibular nerve and its associated blood vessels. The mandible is then split along these cut lines to create a loose fragment – the body of the mandible. The loose mandible is then repositioned and fixed with anchors. At this time the mandibles are fixed with a plate in the new position. All soft tissue is then closed.

Claude recovered uneventful and started eating hard foods in 7 days. To the authors' knowledge this is the first chimpanzee that was treated with a BSSO procedure.

NOTES

How to get the Most out of your Wildlife Necropsy

Emily Mitchell
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The detailed context surrounding the mortality and the technical expertise of the investigator determine how to get the most out of your wildlife necropsy. A necropsy is a golden opportunity to collect a lot of useful information, not only on the cause of death but on the management of the animal and the risk of zoonotic disease, as well as to collect samples and data for research. Key pointers to look for during the necropsy as well as technical tips will be discussed.

There are two important factors that will allow you to get the most out of your wildlife necropsy. The first is to consider the context in which the mortality occurs: history, history, history. Your pathologist can identify lesions but the significance of those lesions depends on the context. The second is the technical skills to take the best possible samples and preserve them for the specific tests you require. You need to know what pathology is good for (cell damage) and what it is not good for (abnormal cell function).

A dead animal is an asset –not only for rapid disease diagnosis to control disease in animals. But also for occupational health concerns. Always consider the whole picture, don't be distracted by obvious lesions. Necropsies are a source of very valuable information regarding the herd management policies, nutritional and parasite control strategies. They allow you to collect invaluable data and bank samples for research. I believe that Africa should be the source of key information about the health and disease of African animals. To do this we need to gather baseline information on both normal and diseased animals, and also need to learn normal anatomy. By regularly performing detailed necropsy examinations on your animals you learn what is normal, which makes comparison with diseased tissues easier especially if lesions are subtle. In many cases wild animals cannot be examined thoroughly without being anesthetized. Collect as much information as possible.

External examination and skinning

A peripheral blood smear enables you to become familiar with species differences in blood cell morphology and reactions to disease as well as to document blood parasites. You can evaluate the external parasite burden and collect blood and/or parasites for identification if necessary. Burns may be present if animals are kept with heated pads or lights, or involved in veld fires. While skinning the animal check for traumatic lesions due to fighting, self trauma in recently moved animals, or trauma associated with capture events. Check for signs of previous injuries such as healed fractured ribs. Predation may be important if enclosures do not exclude predators. Traumatic lesions may also result from inappropriate enclosure design or substrate. Birds that fly into enclosure walls often have severe haemorrhage at the base of the heart. Birds may also traumatize their beaks by inserting them through wire mesh that is the wrong size or into cavities in machinery or vegetation in the enclosure. Inappropriate substrate may result in hoof overgrowth or footpad damage. Stressed or inexperienced mothers may accidentally cause trauma to their young.

Opening the carcass

The major skeletal muscle masses as well as diaphragm, heart and tongue should be examined for myopathy (whether nutritional or exertional). Remember that feeding irrigated lucerne may lead to nutritional myopathy due to selenium deficiency. Assessing body condition in wild animals may not be straight forward. By the time fat stores depleted and skeletal muscle mobilization starts the animal is often dying. Evaluate subcutaneous, visceral and bone marrow fat reserves as well as check for liver atrophy. Once the chest and abdomen are exposed decide if it is infectious or not. In most cases non-infectious diseases are of key importance. If the spleen is flat with no lymphoid follicular hyperplasia, consider sampling stomach/rumen content, kidney, brain and liver for nutritional and toxic conditions.

Evaluate stress

In captive animals, stress plays a major role in determining susceptibility to disease as well as the likelihood of accidental trauma. Sample both adrenals (and the pancreas) for histology before removing abdominal organs and look for gastric ulcers, skin ulcers in fish, feather plucking in birds, renal and splenic amyloidosis in water birds.

Nutritional disease

Nutritional diseases are of paramount importance in captive wild animals: iodine deficiency results in goitre, enlarged parathyroids and bone malformations may indicate calcium/phosphorus imbalances metabolic or nutritional bone disease. Immature animals with growing bones generally show changes in the growth plates that affect joints, while in adult animals bones such as the mandible and the sites of tendon insertion are affected. Vitamin A deficiency in lions results in skull malformation due to abnormal membranous ossification. Iron storage disease is a constant risk in leaf eating birds, primates and rhinos. Inactive raptors on high fat diets may develop heart failure due to atherosclerosis. Fatty livers may be an indication of excessive dietary fat, obesity or sudden anorexia or toxic liver disease in a well conditioned animal. Food safety is also of paramount importance. Animals may be exposed to rodenticides, anti-inflammatories, botulinum toxins and poisonous plants. Check for pancreatic atrophy, gall bladder distension as well as the contents of the stomach. Check for poisonous materials such as plants, lead pellets or paint. Inappropriate food in ruminants may result in acidosis and/or poor rumen papillae development and lead to bacterial and/or fungal rumenitis. Ingestion of inappropriate substrate material or sand in the case of nutritional deficiencies may result in gastric impactions or gastric foreign bodies that may perforate the GIT.

Parasites

Necropsy examination is a means to monitor the effectiveness of your parasite control protocols, to collect information on parasites in various species to formulate meaningful quarantine protocols for animals entering the zoo and staff safety procedures. Particularly in hand-reared animals, especially birds, diseases related to incubator hygiene and humidity as well as food aspiration, gizzard impactions due to inappropriate food, and starvation due to improper feeding schedules may be seen. Accidental trauma and injection site reactions also occur.

In-breeding

Necropsy examination is also a valuable means of assessing the quality of genetic management in wild animals. Sample skin and blood for genetic tests.

Infectious disease

Infectious diseases are relatively rare in wildlife animals, although enclosure design, intensive management, over-crowding, poor hygiene and stress may result in infectious (and parasitic) disease. If the spleen is enlarged with lymphoid follicular hyperplasia and/or there are fibrin-rich effusions or serosal petechiae, sample for infectious diseases: bacterial, viral, fungal, protozoal etc. And take extra precautions against zoonotic disease. Always assume an abortion is a zoonotic disease.

Tuberculosis is an important disease in wild animals: ruminants, primates and other species are particularly susceptible to Mycobacterium bovis, and M. tuberculosis. Mycobacterium avium is relatively common in birds and Mycobacterium marinum and other environmental Mycobacteria are common in fish. Remember that maintaining environmental temperature ranges are critical for optimal immune system function in fish and reptiles. Good pest control is important to prevent diseases carried by feral cats (such as Toxoplasmosis) and rodents (such as Encephalomyocarditis virus, Salmonella typhimurium and Yersinia). Amphibian populations should be monitored for Chytrid fungus. Papillomas may also be an indicator of a compromised immune system.

Technical matters

The quality of test results you obtain from specialist diagnosticians depends on the quality of the sample you submit. Samples for microbiology should be taken using sterile techniques if possible. Sample lesions, draining lymph nodes, and the spleen. Tie off sections of intestine or seal inflammatory exudate in a syringe

to maintain the anaerobic environment. Samples for PCR should be on ice/frozen. Don't under estimate the value of impression smears to help you decide what further tests to do. For histology sample normal adjacent tissue (never more than 1.5cm dia) and take multiple sections if necessary. Use buffered formalin, at 2-10x the volume of tissue. Immunohistochemistry is compromised by prolonged formalin storage and unbuffered formalin. Handle the intestine, brain and lung with special care as they are very delicate tissues. Remember the bigger picture: important lesions may be microscopic.

The NZG maintains a Wildlife Disease Database includes data and stored samples from all national pathology laboratories. Databases facilitate the detection of trends that may be missed in the busyness of daily practice and therefore highlight relevant retrospective and prospective research projects. Not only can the database be searched for particular diseases; the diseases affecting certain species can be identified. In this case, recurrent cases of myocarditis was strongly suggestive of encephalomyocarditis virus infection although no test is available for this virus in South Africa. However, in Feb 2006 rodent control measures were put in place and the cases of myocarditis were no longer seen. Instead, we started to see traumatic and nutritional issues. Dassies have very poor thermoregulatory mechanisms and so each animal needs its own place to warm up in the sun or cool down in the shade. Because the population was growing due to reduced mortality due to viral infection, aggression and feeding management issues were resulting in deaths. Later, when rodent control was temporarily suspended, we started to see myocarditis virus infections again. Long-term data and stored samples can help us understand and research disease epidemiology.

NOTES

The Importance of Stress and the Effect of Cropping Method on the Meat Quality of Game Meat

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The production and export of game meat from southern Africa is increasing annually and with this growth, more emphasis should be placed on the quality of game meat being produced. Cropping methods and specifically the resulting ante-mortem stress can have a significant effect on the quality of game meat and should be considered during the production process. Meat quality is significantly influenced by the acidification of muscle post-mortem. The amount of glycogen available in the muscle for post-mortem glycolysis affects the rate and extent of the pH decline and the pre-slaughter stress experienced by the animal can have a profound effect on this (Lawrie, 1998). Acute stress activates the release of catecholamines, which rapidly mobilize glycogen stores prior to slaughter so there is a large build-up of lactic acid in the meat and rapid acidification. This hastens the onset of rigor mortis while the carcass temperature is still relatively high, resulting in the denaturation of approximately 20% of the sarcoplasmic and myofibrillar proteins – the result is pale, soft and exudative (PSE) meat (Tarrant, 1988; Honikel & Kim, 1986 as cited by Lawrie, 1998). The release of glucocorticoids caused by chronic stress, on the other hand, results in the depletion of muscle glycogen stores prior to slaughter so that very little lactic acid is produced in the meat which then results in a higher-than-normal ultimate pH. This high ultimate pH results in limited protein denaturation so that water is tightly bound to the proteins and little water is then released during chewing with meat then being perceived as dark, firm and dry (DFD) (Young and West, 2001). In South Africa, different cropping methods are employed during the production of game meat. These may include day cropping, night cropping, boma cropping and even conventional hunting. Depending on the species and the environment, each method can have a profound effect on the stress experienced by the animal ante-mortem. The effect of these cropping methods on the meat quality of game meat will be discussed.

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NOTES

The Translocation Process: Success or Failure. The Veterinary Role in Reintroductory Projects

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Over the last 30-40 years there has been an exponential increase in the relocation of fauna and flora across landscapes, be it for conservation or non-conservation reasons. As a conservation tool translocations are now well entrenched, but are still often a step into the unknown.

The IUCN recognizes three forms of translocations:

- Re-introduction is when an organism or species is moved into its' historically native range from which it has disappeared
- Re-enforcement is when a species is moved to re-enforce or restock an existing population
- Introduction is when an organism is moved to outside its' historical range.

Reintroductory projects aim to have 1) a high post-release survival of the animals being translocated, 2) settlement in the release site and 3) persistence through successful breeding, recruitment and population increase. There are numerous factors that can influence this outcome and either make a success or failure of the project. Three common themes have been identified in successful translocation projects:

- They are carefully planned and carried out, in collaboration, by a multidisciplinary team;
- the translocation planning and methodology is underpinned by an intimate biological and ecological knowledge of the translocated species coupled with appropriate husbandry and release techniques;
- stress is often cited as a significant reason for translocation failure and is thus consider both explicitly and implicitly (directly and indirectly).

As veterinarians we play and essential role during each step of the translocation process, from source to destination, and even post release monitoring of the released individuals. This process involves practical issues of the selection, capture, handling, welfare and management of the released individuals. All efforts should be implemented to ensure that the animals are released in good condition and into optimal habitat.
Using recent black rhino reintroductions as examples we explore these themes and the role we play as veterinarians in the success or failure of projects.

NOTES

Management of Aggressive Behavior and Musth in African Elephant Bulls

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Free-ranging elephants in large reserves are seldom problematic. Problems that do arise are inevitably the result of humans behaving stupidly or inappropriately. Incidents that result from such human behaviour may then lead to learned behaviour on the part of the elephants. An example would be the turning over or trampling of motor vehicles. Elephants in smaller fenced reserves are more frequently associated with conflict situations. The reasons for the increased frequency are probably numerous. Most of these populations were introduced during or just after the culling years in the Kruger National Park. During the culling years many elephants were 'saved' as calves or subadults and relocated to new reserves. The lack of matriarchal or adult bull leadership very often resulted in abnormal behaviours in such elephants. Another consideration is the make-up of breeding herds that were translocated. Although the endeavour was to translocate entire breeding herds, some were incomplete while others consisted of some individuals that originated from a different herd. Such animals often do not integrate well. A few other causes of conflict are high elephant population densities or reserves that are too small, especially for bulls, availability of 'tasty' feed sources (citrus plantations) fenced within or on the perimeter of the reserve.

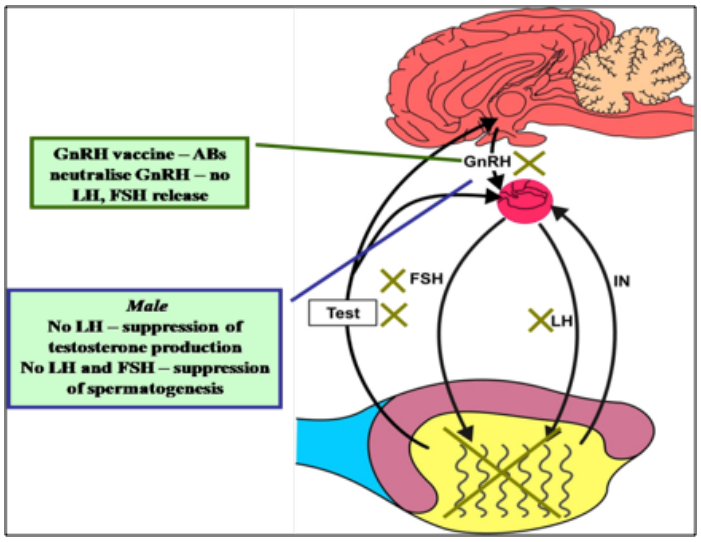

Figure 1: Endocrine control of testicular function in the male and the effect of anti-GnRH vaccines. X indicates down-regulation of a particular hormone and testicular function

Over the past 30 years or so, a number of elephant bulls have been captured as calves or subadults, especially during culling operations (Bertschinger and Sills, 2013). Elephants are easy to train in captivity, particularly in groups, and very quickly adopt their keepers as part of their new family. The keepers would normally be regarded as the dominant individuals. Bulls in particular, however may start to challenge this hierarchy as they approach puberty. Following a number of incidents in South Africa and Zimbabwe, one soon realised that either androgen-related behaviour needed to be controlled or problem animals had to euthanized (Bertschinger et al., 2008). During puberty testosterone concentrations start increasing, causing bulls to become more assertive, difficult to handle, and even aggressive. Ultimately the expression of testosterone-driven behaviour in elephant bulls is musth, and bulls in musth are generally impossible to handle and often dangerous. Free-ranging African elephant bulls are seldom a problem in larger reserves, but in small reserves

the likelihood of encountering a bull in musth is probably increased. Elephants are highly intelligent and quickly realise that 'vehicles' are scared of them and often terrorise people on game drives.

So what is the role of musth in the complex social structure of the elephant? The likelihood of a bull mating a cow in oestrus is largely dependent on body size and reproductive behaviour. The latter is driven by testicular androgens (mainly testosterone). For elephants, the ultimate reproductive state attributed to very high levels of testosterone is musth (Kaewmanee et al., 2011), and in adults of both species of elephants this occurs in a cyclic pattern once a year with cycle peculiar to each bull (Eisenberg et al., 1971; Ganswindt et al., 2010). A thirty-year study which determined the paternity of calves in Amboseli showed that bulls 45 years and older (importance of body size) sired 50% of all calves. It also showed that 75% of calves were sired by bulls that were in musth at the time of mating (Hollister-Smith et al., 2007). Musth is thus a normal physiological phenomenon and the aggression and dominant behaviour associated with high testosterone levels increase the chances of a bull mating a cow in oestrus. The foul-smelling pheromones present in urine and temporal gland secretion of musth bulls, and which appear from about the age of 35 years attracts cows in oestrus but repels younger bulls (Rasmussen and Riddle, 2002). Aggressive behaviour and musth, while important from a breeding point of view and social structure of elephant, are inconvenient when it comes to the management of captive bulls, or in some instances, bulls in smaller game reserves.

It would be naïve to believe that testosterone is the only hormone controlling aggressive behaviour in animals. Examples of other hormones involved are other steroid hormones, neuropeptides (GnRH) and neurotransmitters, serotonin, noradrenalin, dopamine, GABA and pheromones that stimulate the vomeronasal organ. The latter is highly developed in elephants. In humans and laboratory animals, it appears that the wiring for dominance and behaviour is established early in perinatal life (Yu and Shi, 2009), and testosterone acts by stimulating existing pathways following puberty. Subjectively, it would seem that the same applies to elephant bulls. This variation is demonstrated by elephant bulls that can produce blood testosterone levels as high as 150nmol/l or greater yet only some behave aggressively towards motor vehicles, humans, or other animals (Bertschinger and Sills, 2013). Life experiences and the influence of adult elephants also play an important role in these intelligent animals. Being threatened or hurt by humans, may lead to elephant-human conflict situations - elephants truly do not forget.

Previous attempts to control musth and androgen-related behaviour with GnRH agonists met with limited success. Following the successful use of anti-GnRH vaccines in a range of domestic and wildlife species we decided to carry out the first trial in African elephant bulls using a modified GnRH-tandem-dimer-ovalbumin conjugate combined with an adjuvant (CovaccineTM) in 2003. Five captive and one free-ranging (in musth during first treatment) bull were treated 3 times each at intervals of 3-7 weeks. Behaviour and faecal epiandrosterone concentrations (FE) were monitored. The correlation between faecal androgen metabolite concentrations (FAMC) and aggressive behaviours was highly significant before the start of treatment (De Nys et al. 2010). Aggressive behaviour ceased after 2nd or 3rd booster and FE concentrations also decreased. The free-ranging bull went out of musth after the first treatment. All bulls remained non-aggressive for the remainder of the six-month observation period. Treatment of the three of the captive bulls was resumed and in 2006 we switched to the pig anti-GnRH vaccine Improvac (Zoetis, South Africa). The bulls, now all older than 32 years of age, have been on treatment every 5-6 months since then and have remained tractable over the entire period. Today some 45 bulls, mostly captive, are successfully being treated with Improvac. Where problems have been experienced, they have been the result of irregular use of the vaccine in the same individual (Bertschinger and Lueders, 2018).

In 2011-2014 we conducted a trial to investigate the possible effects of Improvac on semen quality and the internal reproductive organs of 12 captive and 4 free-ranging elephant bulls. The results have clearly shown that 12 months after the first 6-monthly treatment all bulls had either dead or no sperm in their ejaculates (Table 1). The sizes of the testes, secondary sex glands and ampullae reduced significantly over time. These results clearly show that GnRH vaccines can be used as a male contraceptive in African elephants, although the method would only be suited to small populations with one or two adult bulls (Lueders et al. 2017). The reversibility of the effects of GnRH vaccines after ≤ 3 years of treatment was demonstrated in one of two but

not in two free-ranging bulls and captive bulls, respectively. The effects of prolonged use (>3 years) on semen quality and the reproductive organs still need to be established (Bertschinger and Lueders, 2018).

Table 1: Effect anti-GnRH vaccinations on median variables of semen quality in captive and free-ranging Africa elephant bulls (modified from Lueders et al. 2017).

Number of vaccinations	Ejaculate volume (ml)	Sperm conc. (x106 /ml)	Total motility (%)	Morphology (% normal)
Untreated (n=6) MEDIAN (range)	32.8 (8-175)	1172.5 (410-4000)	62.5 (0-90)	57.6 (33.8-93.8)
2 vaccinations (n=6) MEDIAN (range)	13.8 (7-169.5)	445 (47-1540)	0 (0-68)	53.9 (33.3-78.7)
3 vaccinations (n=7) MEDIAN (range)	5.0 (0.5-29)	294 (0-9800)	0 (0-2)	6 (0.7-26)
4-5 vaccinations (n=8) MEDIAN (range)	17.5 (0-65)	0.05 (0-220)	0	0
> 8 vaccinations (n=6) MEDIAN (range)	0.2 (0-27.8)	0	0	0

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NOTES

Managing Human and Elephant Conflict

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NOTES

Elephants and Big Trees: Developing Mitigation Methods to Alleviate Human-Elephant Conflict

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The human population is expanding and compressing elephants within their range. In South Africa, where we still have expanding elephant populations within enclosed Protected Areas, two forms of conflict can arise. Firstly, elephants can break out of protected areas, causing damage to crops and threatening human lives as a severe form of human-elephant conflict (HEC). Secondly, elephants' impact on big trees continues to produce debates amongst conservation managers and scientists as to whether elephants and big trees can indeed coexist in conservation areas. These debates often centre on the culling of elephants for the survival of big trees. This leads to a mild form of HEC, where human's perceptions of an ideal stable savanna-system are challenged by elephants continually pushing down big trees or severely bark-stripping them. The protection of particular iconic trees, whether for ecological or tourism purposes, requires the development and testing of elephant mitigation methods. These methods focus on directly protecting trees from elephant impact, thereby protecting trees without reducing elephant numbers. Evaluation criteria are required to assess whether the method works, its ecological impact, and what conservation managers are willing to pay for and use on their trees. Therefore, our presentation's objectives are to (1) describe ways in which severe HEC from elephant breakouts can be mitigated and addressed, (2) explore the complex relationship between elephants and big trees and why focusing on elephants alone will not prevent the loss of big trees, and (3) identify and evaluate the various elephant mitigation methods in practice in the Greater Kruger National Park to address both forms of HEC due to expanding elephant populations. Our aim is to provide conservation managers with potential ways in which elephant breakouts can be addressed, and provide managers with an elephant mitigation toolkit of tested methods which can also be used to protect particular iconic trees from elephant impact.

NOTES

The Correlation between the Horn Measurements, Scrotum Circumference and Semen Quality of the Male Roan Antelope *(Hippotragus equinus)* & Sable Antelope *(Hippotragus niger)*

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Aim and Objective

To determine a possible correlation between the horn measurements, scrotum circumference and semen quality of the male roan antelope *(Hippotragus equinus)* & sable antelope *(Hippotragus niger)*

Experimental procedures

Prior to handling, the antelope was immobilized, by making use of darting, using a mixture of the opioid derivatives etorphine hydrochloride and thianfentanil and an alpha 2 sedative. The animals were darted from a vehicle. The team waited for the medication to take effect at a safe distance, there after Dr Garrett and their team secured and stabilize the animal.
Once the animal was approachable the level of anaetehsia was evaluated and animals were supplemented with midazolam and ketamine intravenously if necessary..

According to phylogeny the caprinae subfamily is the closest domesticated relation to the genus Hippotraginae (1). For this study we made use of goats (Caprinae) as guideline for all sample collection.
Scrotal circumference (SC) measurements was taken by making use of a flexible tailor measuring tape or a scrotal tape. The testicles was manipulated in the scrotal sac and measurements was taken at the area of greatest circumference(2).
The length of the testicles, shape, ascertainment of shape, equality of testes length, tone of testes and the shape and tone of the epididymis will be recorded (3)..
Incisor teeth length, shape, wear etc. will be recorded(4)
The different horn lengths were measured, and the horn rings of each horn was recorded manually, and photos was taken of each animal for record purpose.
After all the physical data was collected, semen was collected by means of electro-ejaculation El-Toro electro stimulation box with a nylon rectal probe, fitted with four surface mounted electrode stripes was be used(5). During this procedure voltage and a number of stimulations at different lengths and intervals was required for the male animal to have an erection and ejaculate. It has been noted that the deeper the anaesthetic plane, the more stimulation is required (6).
Collected semen was placed in a water bath at 37°C. and send to the home base laboratory within 15 min after collection (7) for evaluation.
Macroscopically evaluation: recording volume (ml), colour, pH, marbling, smell and density. Microscopically evaluation: recording mass movement (0-5), sperm motility (%), sperm abnormality (%) and sperm viability (%), eosin- nigrosin staining for morphology and sperm concentration (n x 10^6 sperm/ml) by haemocytometer(7).

Facilities

Permission was granted by Dr Anndri Garrett, owner of Dreyer van Zyl Game ranch, to conduct the study on their breeding animals on the farm that is situated 35km outside Kimberley in the Northern Cape (GPS: S28'28.531' E0q24'51.205')

Dr's Greg Garrett and Anndri Garrett manages the Dreyer van Zyl ranch. They are both registered veterinarians with extensive knowledge and experience in the keeping and management of antelope, specifically sable and roan antelope. The ranch has been used for the keeping of sable and roan antelope since 1991. Dr's Garrett have been involved in the management since 2001 and have been managing the ranch full-time for over 3 years.

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NOTES

The Use of Imipramine in Semen Collection in Roan and Sable Antelope

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Semen collection in wildlife can be difficult, partly because wildlife needs to be sedated prior to semen collection but also because different species react different to transrectal massage of the accessory sex glands and to electrical stimulation. For breeding bulls it is important to evaluate semen quality to ensure that a bull has a normal capacity to fertilise cows. Imipramine is a tricyclic antidepressant which inhibits the re-uptake several neurotransmitters, such as noradrenaline, dopamine and serotonin in the central and peripheral nervous system. Cordel (2005) could show that imipramine potentiates the noradrenergic effect on smooth muscle contractions of the ampullae in vitro if given at a dose equivalent to 0.05-0.2 mg/kg BM. The in vitro effect on the smooth muscle activity occurred within 8 minutes. Imipramine on its own had no effect in vitro and had a negative effect if given at higher doses in combination with noradrenaline. It has been used in human medicine for aspermia caused by ejaculatory problems (Gilja et al. 1994). In horses it has been administered orally to improve erection and ejaculation, in particular in stallions that are collected standing without the use of a phantom or a teasing mare (McDonnell et al. 1994; McDonnell 2001). The central and peripheral adrenergic effects of imipramine are assumed to play a role in the enhancement of emission, i.e. of the expulsion of semen from the ampullae into the caudal urethra and, at least in the stallion, erection and ejaculation.

Electro-stimulation as a means of semen collection is common practice in wildlife to evaluate semen quality. Imipramine was used intravenously at three different dosages 0.1 mg/kg, 0.2 mg/kg and 0.4 mg/kg, to facilitate semen collection and semen quality.

Semen collection and volume of semen collection improved with imipramine at a dosage of 0.2 mg/kg intravenously prior to collection via electro ejaculation. 1 to 4 ml of semen was collected in roan bulls and 1 to 5 ml in sable bulls. Time of collection and ease of collection improved with the use of intravenous imipramine. After the injection of imipramine semen could be collected from some bulls with gentle manual transrectal stimulation of the accessory sex glands alone.

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NOTES

Conservation through Semen Collection and Cryopreservation in African Rhinoceroses *(Cerathotherium simum simum; Diceros bicornis)* and Elephants *(Loxodanta africana)*

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Abstract:
Biodiversity is globally declining on an immense scale and many species are currently on the brink of extinction (Andrabi & Maxwell, 2007). Besides the environmental pressures caused by the human population size, like climate change, human-wildlife conflict, shortage of natural resources, habitat degradation and fragmentation (Milligan, et al., 2009), rhinoceroses and elephants are facing an increased threat of poaching for the illegal trade of horn and ivory (Chase et al., 2016; Milliken, 2014; Roth et al., 2016).
To maintain healthy populations, it is of great importance to conserve genetic diversity. Conventional conservation efforts, consisting of protected areas, anti-poaching operations, captive breeding and public education, have to be complemented by other sustainable conservation and management strategies on a population and individual level to prevent (local) extinctions (Seddon et al., 2014).
One approach is biobanking of gametes for use in Assisted Reproductive Technologies (ART). The collection and cryopreservation of viable gametes (oocytes and spermatozoa) offers the opportunity to re-grow or sustain viable populations and to secure species survival. The combined use of semen cryopreservation and artificial insemination (AI) or in vitro fertilisation (IVF) has the potential to lengthen the reproductive capability of individuals beyond their natural lifespan (Hermes et al., 2007; 2009).
Semen collection in rhinoceroses and elephants can be performed during general anaesthesia for management procedures (e.g. translocation, dehorning, ear-notching, collaring) by the means of electro-ejaculation and on poached or euthanized animals by epididymal sperm collection (Roth et al., 2016).
Artificial insemination with both fresh and frozen semen has already successfully been used to produce healthy offspring in African rhinoceroses and elephants (Hermes et al., 2009; Hildebrandt et al. 1999; 2007; 2012; Stoops et al., 2007). However, semen collection techniques and cryopreservation methods are limited and current protocols are often expensive and impractical for in-the-field use (Hermes et al., 2005; 2013; 2018; Arnold et al., 2017).
Here we present a review on what has been achieved and discuss possibilities of the use of ARTs in wildlife in the future. The aims of this study are to improve current techniques, to develop in-the-field friendly collection techniques for semen collection and processing and to optimize cryopreservation protocols.

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NOTES

Anthropogenic Effects on the Viability of a Leopard *(Panthera pardus)* Population at Loskop Dam Nature Reserve, Mpumalanga.

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In order to sustain the ever-increasing human population, human settlements continue to expand and encroach into natural areas. This increases the risk to biodiversity as it not only contributes to habitat destruction and fragmentation, but it also introduces new threats to wildlife living in close proximity with humans, livestock and domestic species. Such threats include the introduction of new diseases, new disease transmission vectors and a greater risk of human-animal conflicts occurring. The Leopard (Panthera pardus) is a large carnivore that is highly susceptible to anthropogenic effects due to its ability to roam over large distances and persist in many different habitat types. The aim of our project was to investigate anthropogenic factors that have the potential to negatively affect the population of leopards that persist at Loskop Dan Nature Reserve (LDNR) in Mpumalanga province. We investigated the genetic diversity of the population, gene flow to other protected areas in the province, disease prevalence, disease susceptibility and conflicts occurring with land owners surrounding the reserve. Results pending

Preliminary results have found:

- Leopards in the reserve regularly move off the protected area into game and livestock farms into contact with humans and domestic species
- There is a high level of conflict (livestock and game predation) occurring between humans and leopards
- Some LDNR leopards have tested positive to protozoan antibodies (Toxoplasma and Neospora) which suggests close contact with domestic species such as cats, dogs and cattle
- Full genetic analysis will be completed in October

NOTES

Oral Bait Preference for Oral Rabies Vaccination for Free Ranging Black-backed Jackal

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Black-backed jackals (Canis mesomelas) are small mesopredators that are found around cities and towns. They are close proximity to livestock and wildlife. They have are responsible for the spread of rabies in South Africa. Oral bait rabies vaccine has bee used in Europe and USA for the control of rabies in reservoir species. It significantly reduced rabies in reservoir hosts and lead to the eradication of rabies in some countries(Maki et al. 2017). The efficacy of the oral vaccine in jackal is depending on the effectiveness of the vaccine and the uptake of the bait in the target species (Linhart et al. 1997). This study looked at the uptake of the bait by free ranging jackal in the Cradle of Humankind, Gauteng. Three different baits were offered: commercial fishmeal polymer, pieces of meat or chicken heads and monitored with camera traps to evaluate uptake by both target and non target species as well as time to be eaten. The study was performed both during winter and summer months. In general all the baits were well accepted with an uptake of 91%. Most bait (72 %) was consumed within 40 hours of placement with a faster uptake in the winter months. Jackal consumed 20 % of baits placed and took chicken heads and fish polymer equally (38 % each) but showed a clear preference for chicken head (p=0.025) if offered the choice. This shows the possibility to use Raboral R-VG for the reduction wildlife especially jackal in South Africa.

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NOTES

Non-Surgical Artificial Insemination Trials in African Lions (*Panthera leo)*: A New Step into Large Felids Conservation

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Assisted reproduction techniques (ART), such as artificial insemination (AI), have incredible potential in wildlife conservation. However, overall ART success in felids remains, to date, <25%. African lions represent an accessible model for the study of large, non-domestic feline reproductive biology, and the applicability of ART within their conservation breeding programs. Thus, the aim of this project was to develop a non-surgical AI protocol for African lions using GnRH (20 µg burserelin-acetate, (Receptal ®, IM) to induce ovulation in females presenting natural oestrus. This methodology was preferred over the traditional AI approach (ovulation induction with gonadotropins, and laparoscopic insemination), to avoid the potential risks associated to repetitive use of eCG and hCG, and surgery.

Four AI protocols were tested, differing in the time lapse between GnRH injection and insemination, on days 4, 5, and 6 from onset of natural oestrus. Fresh semen was collected by urethral catheterization and electro-ejaculation, after anaesthetizing the male with a combination of medetomidine (50 µg/kg) and ketamine (1,8-2 mg/kg). Once semen was evaluated, the female was immediately anaesthetized using medetomidine, ketamine, and midazolam (6,5-14 µg/kg), and placed in sternal recumbency. After transrectal ultrasound examination of the reproductive tract, the female was inseminated either intravaginally or transcervically by a commercial urinary catheter (2,0 x 500mm, Buster, WDT) with a stylette.

All females receiving GnRH injections entered either a non-pregnant luteal phase (which lasted around 60 days) or a pregnant luteal phase (which lasted around 112 days). Thus, exogenous GnRH administration induced ovulation successfully. However, the timespan between GnRH injection and end of oestrus differed widely (range: 0-120 hours). In total, 14 AI trials were performed, of which 4 were successful (28,6%). Here, we will discuss the different protocols for non-surgical AI during natural oestrus. This method has potential to be adopted for other endangered large felids.

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Three Years of Research into Immobilisation and Tranquilisation of Impala and Blesbok – a Synopsis of Key Results

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Chemical immobilisation is commonly used during the translocation of African wildlife, specifically as it allows for the safe handling, loading and clinical examination of the animals. Drug combinations commonly used for the immobilisation of blesbok (Damaliscus pygargus phillipsi) and impala (Aepyceros melampus) are opioid-based mixtures which can include the presence of a butyrophenone derivative such as azaperone or alpha-2 agonists such as medetomidine as well as cyclohexamines (Kock & Burroughs, 2012). However, few studies have reported on the complete monitoring of the quality of immobilisation and impact on physiological parameters of different immobilisation protocols in blesbok and impala. This presentation will highlight some key findings in various immobilisation protocols of these two species. The following topics will be discussed:

- Effect of azaperone on quality of immobilisation and cardiorespiratory function in blesbok
- Effects of high dose opioid immobilisation of impala and blesbok
- Species specific differences between blesbok and impala with regards to opioid immobilisation
- The effects of medetomidine / ketamine immobilisation on impala and blesbok
- The effects of the HT1A serotonin agonist R-8-OH-DPAT during opioid immobilisation
- Are blesbok and impala representative models to develop drug protocols for antelopes in general?

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NOTES

Can you Physically Condition Wild Antelope, and does it Increase their Resilience to Stress during Capture?

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Stress related conditions like capture myopathy is still the main cause for losses during translocation[1,2]. There are anecdotal reports of those involved in wildlife translocation that 'fit' animals are more resilient to capture myopathy. In the wild it has been noted that impala only run for about 5% of their daily exercise[1]. Antonie Harthoorn was one of the first to record capture myopathy in East Africa in 1964[3]. In the seventies he postulated that lack of exercise or physical condition predispose animals to capture myopathy. He suggested that increased fitness could have a protective effect and suggested the use of corrals to capture and condition wild ungulates prior to relocation [4,5]. Inspired by this, we planned and conducted an exercise intervention study to see if there was truly scientific evidence to prove these claims.

In 2017, we obtained forty (40) blesbok and placed them in bomas for two weeks to habituate at Wildlife Pharmaceutical's Ngongoni Farm, near Nelspruit. During that time, a temporary circular exercise track was connected to the bomas. Over a subsequent four-week period, we physically conditioned twenty of the buck according to a predesigned exercise program. The other twenty remained in their bomas unexercised as control groups. At the end of the exercise period, we subjected half (10) of each group to 'typical' stress during a capture operation. The other half remained in the bomas where they were darted with minimal disturbance.

The animals were immobilised three times after the stress event on day 0, 2 and 5. Each time we monitored vital parameters, took rectal and muscle temperatures for all animals. We collected blood for blood gas analysis, biochemistry, haematology and catecholamines. We took muscle biopsies and at the end of the study post mortems were conducted on all animals.

The first part of the analysis we are conducting is to see if the exercise provided was successful in creating physiologically 'fit' animals and whether this adaptation could create increased resilience when subjected to stress. Future analysis will also look at muscular adaptation and the pathological changes of the different groups.

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Using Heamatological Measurands to Assess Translocation-Stress in White Rhinoceroses *(Ceratotherium Simum)* Sedated with either Azaperone or Midazolam

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Translocation represents an essential practice used in the management and conservation of the white rhinoceros.[1] Capture and transport are part of translocation, and are associated with stress which could ultimately lead to translocation failures.[2] The evaluation of haematological measurands as a method to assess stress is becoming more popular with wildlife researchers as characteristic changes in blood leukocyte counts can be quantified and related to glucocorticoid-concentrations.[3] The aim of the present study was to assess the stress response to capture and transport in free-ranging white rhinoceroses, sedated with either azaperone or midazolam, by using haematological measurands.

Twenty-three free-ranging white rhinoceroses were transported 280 km within the Kruger National Park for management purposes unrelated to the study. Rhinoceroses were captured with a combination of standard-doses of etorphine plus either azaperone (n=11) or midazolam (n=12). Azaperone or midazolam were re-administered every two hours during transport at 25 times the etorphine dose, mg. Serial blood samples were collected from an auricular intra-venous catheter at (T1) capture; (T2) start of transport; and (T3) after 6 hours of transport and analysed with the Abaxis VetScan HM5 and by manual blood cell count. Changes in haematological measurands over time and between groups were compared using general mixed effects models with sample time and study group as fixed effects and the individual as random effect.

Packed cell volume, red blood cell count, and haemoglobin concentration decreased from T1 to T2 and T3, possibly indicating splenic contraction caused by circulating catecholamines during capture.[4] Neutrophils progressively increased and lymphocytes progressively decreased from T1 to T3. These changes most likely reflect glucocorticoid-induced transmigration of lymphocytes from the circulation into tissues and the influx of neutrophils from the bone marrow into the blood together with a shift from the marginating to circulating pool.[5] According to studies conducted in other animal species, the relative proportion of neutrophils to lymphocytes (N:L ratio) significantly increasing from T1 to T3 indicates a stress response.[3] No significant differences in this response or other measurands were found between rhinoceroses sedated with azaperone versus midazolam.

The results of this study support our hypothesis that the evaluation of haematological measurands can be used in assessing the stress response in translocated rhinoceroses. Potential implications for animal welfare need to be further investigated.

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NOTES

Failure of Captive Breeding in the Black-footed Cat *(Felis nigripes)* as a Result of Stress

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Aim and Objective

1. To establish and validate an enzyme-immunoassay for fGCM (faecal glucocorticoid metabolite) monitoring in black-footed cats (BFC).
2. To compare fGCM levels between BFC in different captive facilities and to identify possible stressors.
3. To compare fGCM levels between BFC in captivity and free-ranging BFC.

Materials and method

Captive black-footed cats in six different captive facilities over South Africa were used in this study. Out of this group, two randomly selected, adult individuals (one male and one female), were identified for conducting the ACTH challenge test and to validate an enzyme-immunoassay for fGCM. The existing study site at Benfontein Nature Reserve, in collaboration with the BFCWG (Black-footed cat working group), was used for the comparative study between the captive and wild population of BFC. All the data was collected during the normal daily routine to ensure minimal disruption and any changes in the management or routine were documented. The ACTH Stimulation test was performed by catching the BFC with a net and manual restraint for a single intramuscular injection of 2-3 IU/kg (female) and 0.5 -1 IU/kg (male) synthetic ACTH analogue (Synacthen® depot, Novartis). Faecal sample collection from these individuals commenced 5-10 days before the ACTH injection (Day 0) and continued for 5-10 days post adrenocortical stimulation.

A t-test or Wilcoxon signed rank-test for non-parametric data was used to examine the differences in hormone concentrations between the two sets of data. A one-way analysis of variance (ANOVA) followed by respective all-pairwise post-hoc analysis was used to test differences in hormone concentrations between more than two sets of data (fGCM concentrations of BFCs from different institutions). Descriptive analysis was used to compare differences in captive environment and management between different facilities as well as to draw a comparison between the stress levels in captive versus free-ranging individuals.

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An Update on Lymphoplasmacytic Gastritis in Cheetahs

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An unusual form of gastritis remains a significant cause of morbidity and mortality in captive cheetahs worldwide, typically affecting more than 90% of animals at some facilities. The lesions principally occur in the gastric fundus and are characterised by the infiltration of plasma cells and lymphocytes into the superficial lamina propria. In some cases, gland hyperplasia or metaplasia, parietal cell necrosis and atrophy and/or fibrosis may be seen. In severe cases, symptoms include chronic vomition, weight loss, diarrhoea and poor coat condition, but in many (mostly milder) cases, no clinical symptoms are seen. Although four different Helicobacter spp. have been isolated from cheetahs with gastritis, these bacteria are unlikely to be the primary cause of the disease since most free-ranging cheetahs have Helicobacter, but do not suffer from significant gastritis. Therefore, captivity associated factors such as chronic stress-associated aberrant host immune responses, low major histocompatibility complex gene diversity, temperament and diet have been suggested for this disease in cheetahs, yet to date the pathogenesis has not been clearly demonstrated.

We evaluated selected serum and urine biochemistry parameters together with histopathological gastritis scores in adult cheetahs housed at the AfriCat Foundation in Namibia over a period of four years. A total of 86 sample sets were collected from 15 to 30 cheetahs in June/July each year. Only eight cheetahs had no evidence of gastritis (9,3 %), while mild gastritis, moderate gastritis and severe gastritis were detected in 22 (25,6%), 23 (26,7 %) and 33 (38,4 %) animals, respectively. The severity of the gastritis was not associated with the age or sex of the cheetahs, nor did it influence their body weight or body condition (BMI). The levels of gastritis fluctuated in individual animals from year to year, sometimes improving despite the fact that none of the cheetahs ever received any treatment for the condition. In a One-way ANOVA, Urine specific gravity ($p = 0,0008$), urine urea ($p = 0,0009$), and serum albumin ($p = 0,0037$) concentrations decreased, while serum creatinine ($p = 0,0146$) increased with increasing gastritis severity.

Recent metabolomic studies in cheetahs suggest that glycine plays a central role in their metabolism. Deficiencies of this amino acid, possibly due to the reduced intake of collagen-rich food items in their diet in captivity, may be linked to the development of gastritis. In a pilot study, 4 out of the 5 cheetahs with severe gastritis in 2017 were given 20 grams of glycine in their food per day for 4 weeks prior to the sampling period in 2018. All five cheetahs had reduced gastritis scores after the period of glycine supplementation, with four showing no evidence of gastritis. The changes in the serum and urine biochemistry for these five individuals are discussed in light of the broader gastritis study and possible mechanisms proposed by which a glycine may be involved in the development of gastritis in cheetahs.