

WOAH Collaborative Centre Reports Activities 2022

Activities in 2022

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Centre Information

Title of WOA Collaborating Centre	Training in Integrated Livestock/Wildlife Health
Address of WOA Collaborating Centre	Faculty of Veterinary Science University of Pretoria Private Bag X04 Onderstepoort 0110 SOUTH AFRICA
Tel.:	+27-12 529.84.26
E-mail address:	anita.michel@up.ac.za
Website:	https://www.up.ac.za/woah-collaborating-centre
Name Director of Institute (Responsible Official):	Prof Vinny Naidoo
Name (including Title and Position) of Head of the Collaborating Centre (WOAH Contact Point):	Prof Anita Michel
Name of the writer:	Anita Michel

TOR1 AND 2: SERVICES PROVIDED

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by WOA

Disease Control	
Title of activity	Scope
	Validation and laboratory accreditation of the Rose Bengal Test (RBT) and complement fixation test (CFT for the screening and

Accredited brucellosis diagnosis for African buffalo	diagnosis of brucellosis in African buffalo) has been completed. These serological tests are mandatory for the movement of buffalo within and outside South Africa.
Wildlife	
Title of activity	Scope
Wildlife pathology services	Pathology services include full postem examinations (total of 22 performed) and histopathological examinations (total of 64 performed). Species included wild carnivores (lion, cheetah, tiger, serval, jaguar, leopard, African black-footed cat), black and white rhinoceros, buffalo, kudu, impala, giant anteater, Nile corcodile and others.
Training	
Title of activity	Scope
One Health Training	1. A 'One Health in Theory' workshop and 2. Two 'One Health in Practice' workshops (face-to-face) were organised for 23 young researchers in each course.
Wildlife	
Title of activity	Scope
Laboratory diagnosis of brucellosis in buffalo	410 African buffalo from 14 game farms were tested serologically and 5 buffalo were tested by culture for brucellosis.
Wildlife	
Title of activity	Scope
Reintroduction of southern African cheetahs (<i>Acinonyx jubatus</i>) to India	Cheetahs have gone extinct in India approximately 50 years ago. The CC has a lead role in driving the reintroduction of wild cheetahs into India as part of efforts to ensure the global survival of the species. It will be the first intercontinental species reintroduction of its kind. Disease risk analysis has been major focus in the planning. https://www.up.ac.za/faculty-of-veterinary-science/news/post_3089400-university-of-pretoria-vets-lead-revival-of-indias-extinct-cheetah

TOR3: HARMONISATION OF STANDARDS

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the main focus area for which you were designated

Proposal title	Scope/Content	Applicable area
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4. Did your Collaborating Centre maintain a network with other WOAHA Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?

No

TOR4 AND 5: NETWORKING AND COLLABORATION

5. Did your Collaborating Centre maintain a network with other WOAHA Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
Animal and Plant Health Agency and Federal University of Nigeria	United Kingdom and Nigeria	Africa Europe	Neutralisation profiles of sera from straw-coloured Fruit bats (<i>Eidolon helvum</i>) against SARS-CoV-2 isolates
University of Castilla- La Mancha (Christian Gortazar) and Neiker Tecnalia (Ramon Juste)	Spain	Europe	Vaccination of African buffalo against <i>Mycobacterium bovis</i> .
Rabies Reference Laboratory' - Onderstepoort Veterinary Research - Agricultural Research Council	South Africa	Africa	Investigation of a rabies outbreak in the Nelson-Mandela Metro
Animal and Plant Health Agency and National Veterinary Research Institute, Vom, Nigeria	United Kingdom and Nigeria	Africa Europe	Evaluation of Immunogenicity of a Dog Rabies Vaccine in young Naive Dogs in Local Communities
Washington State University (Kelly Brayton)	United States of America	Americas	Genetic diversity of <i>Anaplasma marginale</i> in cattle and in putative novel <i>Anaplasma</i> species from wildlife in Mpumalanga, South Africa
University of Fort Hare	South Africa	Africa	Zoonotic disease risk investigation for abattoir workers and zoonotic awareness education

University of Vienna (C Steyer, F Pohlin)	Austria		Improving the safety of veterinary management practices in African and European mammals
University of Glasgow	United Kingdom		Epidemiological and ecological aspects of anthrax
University of Wisconsin (Wendy Turner)	United States of America	Americas	Transmission and evolution of anthrax in two natural systems
National Bio and Agro-Defense Facility (William Wilson) USDA Agricultural Research Service (ARS)	United States of America	Americas	Molecular Characterisation of Arboviruses in South African Livestock
Diagnostic Medicine/Pathobiology, Center of Excellence for Emerging and Zoonotic Animal Kansas State University	United States of America	Americas	Interrelationships of warthogs (Phacochoerus africanus), Ornithodoros ticks and African swine fever virus in South Africa
ERFAN (Enhancing Research for Africa Network)	Italy and several African countries	Africa Europe	1. Scientific contributions to meetings of the Animal Welfare Working Group and the Brucellosis Working Group 2. Active research collaboration on scientific projects within ERFAN, e.g. CBPP

TOR6: EXPERT CONSULTANTS

6. Did your Collaborating Centre place expert consultants at the disposal of WOA?H?

Yes

NAME OF EXPERT	KIND OF CONSULTANCY	SUBJECT
Claude Sabeta	Presenter during 6th cycle training workshop for WOA?H National Focal Points for Wildlife in Africa (6 – 8 December 2022)	Rabies in wild carnivores
	Presenter during 6th cycle training workshop for WOA?H National Focal Points for Wildlife in	Root causes / drivers of disease and how to manage them: Theileriosis in antelopes

Johan Steyl	Africa (6 – 8 December 2022)	(associated with translocations)
Mary Louise Penrith	WOAH ad hoc Group	Evaluation of Classical Swine Fever Status of Member States

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

7. Did your Collaborating Centre provide advice/services to requests from Members in your main focus area?

Yes

1. A request for assistance with the investigation into the causative agents of "Giraffe skin disease" was received from the Tanzania Wildlife Research Institute. We proposed various laboratory analyses including histopathological examination of skin biopsies, bacterial and fungal culture of skin biopsies and skin scrapings, helminthological examination. An import permit for formalin-fixed tissue samples was provided as a first step to facilitate the service. Samples are currently awaited.

2. The reintroduction of southern African cheetahs (*Acinonyx jubatus*) to India with a focus on the disease risk analysis

8. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by WOA, to personnel from WOA Members?

Yes

a) Technical visit : 1

b) Seminars : 3

c) Hands-on training courses: 1

d) Internships (>1 month) : 3

TYPE OF TECHNICAL TRAINING PROVIDED (A, B, C OR D)	CONTENT	COUNTRY OF ORIGIN OF THE EXPERT(S) PROVIDED WITH TRAINING	NO. PARTICIPANTS FROM THE CORRESPONDING COUNTRY
b	Online 3-day training course in 'Early disease identification methodology in bovines' (observation of signs of disease, basic examination, disease process and prevention of disease)	Lesotho Eswatini Malawi South Africa	23
b	Online 1-day training course in 'Anthrax and haemoparasite diagnosis by light microscopy'	Malawi Namibia Lesotho Seychelles South Africa Zambia	21
a	Consultancy for Victoria Falls Wildlife Trust to undertake an Assessment of Animal Disease Laboratories in the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) to evaluate diagnostic capacity, with	Zimbabwe	5

	an emphasis on wildlife within the region and identify opportunities for collaboration.		
b	Managing international trade in infected countries – Experience from African countries’, Webinar on WOAAH standards, trade and African swine fever, hosted in Buenos Aires, Argentina, 22-23 November 2022.	A variety of WOAAH member countries	60
d	Detection of environmental pathogens	Italy	1
d	Laboratory diagnostic methods for brucellosis	Ethiopia	1
d	Laboratory diagnostic methods for Bacillus	South Africa	1
c	Training of community donkey care workers	South Africa	19

TOR8: SCIENTIFIC MEETINGS

9. Did your Collaborating Centre organise or participate in the organisation of scientific meetings related to your main focus area on behalf of WOAAH?

No

TOR9: DATA AND INFORMATION DISSEMINATION

10. Publication and dissemination of any information within the remit of the mandate given by WOAAH that may be useful to Members of WOAAH

a) Articles published in peer-reviewed journals:

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1. Ameh, V.O., Wu, G., Goharriz, H., Fooks, A., Sabeta, C.T. and Mcelhinney, L. Serum Neutralisation profiles of Straw-Coloured Fruit Bats (*Eidolon helvum*) against four Lineages of Lagos Bat Lyssavirus. *OP12.02 (455)*, Vol. 116, S69, 2022.

DOI:<https://doi.org/10.1016/j.ijid.2021.12.162> [Proceedings of the International Journal of Infectious Diseases].

2. Ngoepe, E., Chirima JG., Mohale D., Mogano K., Toru Suzuki, Makita K. and Sabeta, C.T. (2022) Rabies outbreak in black-backed jackals (*Canis mesomelas*), South Africa, 2016. *Epidemiology and Infection*. Doi: 10.1017/s0950268821002685.

3. Ameh, V.O., Chirima, G.J., Quan, M. and Sabeta, C.T. (2022) Public Health Awareness on Bats and Their Disease Carrying Potential among Bat Handlers and Persons Residing Near Bat Roosts in Makurdi, Nigeria. *Pathogens*. 11(9):975. doi: 10.3390/pathogens11090975. PMID: 36145407; PMCID: PMC9505307.

4. Mapatse, M., Sabeta, C., Abernethy, D. and Fafetine, J. (2022) Knowledge Attitudes and Practices (KAPs) of rabies among households and healthcare practitioners at the Human-wildlife interface in Limpopo National Park, Massingir District, Mozambique. *PLoS Neglected Tropical Diseases* 16(3): e0010202. DOI:10.1371/journal.pntd.0010202
5. Malan, A.J., Coetzer, A., Sabeta, C.T and Nel, L.H. (2022) Epidemiological interface of sylvatic and dog rabies in the North West province of South Africa. *Tropical Medicine and Infectious Diseases*. 7, 90. <https://doi.org/10.3390/7tropicalmed7060090>.
6. Mogano K., Suzuki T., Mohale D., Phahladira B., Ngoepe E., Kamata Y., Chirima G., Sabeta C. and Makita K. (2022) Spatio-temporal epidemiology of animal and human rabies in northern South Africa in 1998-2017. *Plos Neglected Tropical Diseases*. DOI: 10.1371/journal.pntd.0010464.
7. Mapatse, M., Ngoepe, E., Abernethy, D., Fafetine, J.M., Anahory, I. and Sabeta, C. (2022) Seroprevalence of rabies in dogs in Limpopo National Park and phylogeny of rabies viruses in Mozambique. *Pathogens*. 11(9):1043. doi: 10.3390/pathogens11091043. PMID: 36145475; PMCID: PMC9506193.
8. Byaruhanga C, Makgabo SM, Choopa CN, Mulandane FC, Vorster I, Troskie M, Chaisi ME, Collins. NE. Genetic diversity in *Babesia bovis* from southern Africa and estimation of *B. bovis* infection levels in cattle using an optimised quantitative PCR assay. *Ticks and Tick-borne Diseases (Epub ahead of print)* <https://doi.org/10.1016/j.ttbdis.2022.102084>
9. African swine fever in smallholder and traditional pig farming systems: research, challenges and solutions. *Frontiers in Veterinary Science*, 9, 878928. doi: 10.3389/fvets.2022.878928.
10. Janse van Rensburg, L., Penrith, M.-L., Etter, E. 2022. Prioritisation of provinces for African swine fever intervention in South Africa through decision matrix analysis. *Pathogens*, 11, 135. doi: 10.3390/pathogens11021135.
11. Mushagaluzo, A.C., Penrith, M.-L., Etter, E. 2022. Spatiotemporal analysis of African swine fever outbreaks on South African smallholder farms, 1993 to 2018. *Journal of the South African Veterinary Association*, 93(1), 10-16. doi: 10.36303/JSAVA.2022.93.1.161.
12. Penrith, M.L. & Kivaria, F.M. 2022. One hundred years of African swine fever in Africa: where have we been, where are we now, where are we going? *Transboundary and Emerging Diseases*, 69, e1179-e1200. doi: 10.1111/tbed.14466. (University of Pretoria & Food & Agriculture Organization of United Nations).
13. Penrith, M.-L., van Heerden, J., Heath, L., Abworo, E.O., Bastos, A.D.S. 2022. Review of the pig-adapted African swine fever viruses in and outside Africa. *Pathogens*, 11, 1190. doi: 10.3390/pathogens.11101190. (University of Pretoria, ARC-OVR-TAD, ILRI (Nairobi); processing costs financed by Ecology and evolution of infectious diseases National Program USDA-NIFA-AFRI Grant #: 2019-67015-28981 (Project: Dynamics of transmission of African swine fever at the wildlife interface and in pig value chains in Madagascar, Mozambique and South Africa).
14. Chenais, E., Depner, K., Ebata, A., Penrith, M.-L., Pfeiffer, D.U., Price, C., Ståhl, K., Fischer, K. 2022. Exploring the hurdles that remain for control of African swine fever in smallholder farming settings. *Transboundary and Emerging Diseases*, 69, e3370-e3378. doi: 10.1111/tbed.14642.
15. LUBBE C, MEYER CR, KOHN TA, HARVEY BH, WOLMARANS D. The pathophysiology of rhabdomyolysis in ungulates and rats: towards the development of a rodent model of capture myopathy, *Veterinary Research Communications*, , DOI:10.1007/s11259-022-10030-9, 2022
16. TETWA TK, SNELLING P, BUSS P, ZEILER GE, MEYER LCR. Reliability of pulse oximetry at four different attachment sites in immobilized white rhinoceros (*Ceratotherium simum*), *Veterinary Anaesthesia and Analgesia* 49, 650-655, DOI:10.1016/j.vaa.2022.08.006.051, 2022
17. LEIBERICH M, POHLIN F, HOOIJBERG EH, HOFMEYER M, COOPER D, REUBEN M, MEYER LCR. The effects of feeding and transport length on the welfare of white rhinoceroses (*Ceratotherium simum simum*) during long distance translocations: a preliminary study, *Journal of the South African Veterinary Association*, DOI:10.36303/JSAVA.480, 2022
18. LAUBSCHER LL, MEYER LCR, LAURENCE M, RAATH JP, PFITZER S.A comparison of immobilisation quality and cardiorespiratory effects of torphine-azaperone versus etorphine-midazolam in blesbok (*Damaliscus pygargus phillipsi*), *Journal of the South African Veterinary Association* , 93(1), DOI: 10.36303/JSAVA.2022.93.1.491, 2022
19. STEYER C, POHLIN F, MEYER LCR, BUSS PE, HOOIJBERG EH. Comparison of three methods of hematocrit measurement in the southern white rhinoceros (*Ceratotherium simum simum*), *Veterinary Clinical Pathology* , 51:225-230, DOI: 10.1111/vcp.13076, 2022
20. BUSS P, MILLER M, FULLER A, HAW A, THULSON E, OLEA-POPELKA F, MEYER LCR. Effect of azaperone on induction times in etorphine-immobilized white rhinoceros (*Ceratotherium simum*), *Journal of Wildlife Diseases* , 58(1): 245-247, DOI: 10.7589/JWD-D-21-00072, 2022
21. Katja Natalie Koepfel, Ockert Louis van Schalkwyk, Peter N. Thompson. 2022. *TBED Volume 69, Issue 2 March 2022 Pages 836-848*.
22. Musaemura Manyenyeka, Whatmore Munetsi Tagwireyi, Munyaradzi Christopher Marufu, Reverend Moregood Spargo, Eric Etter. Spatio-temporal clustering and risk factor analysis of bovine theileriosis (*Theileria parva*) in Zimbabwe from 1995 to 2018. *Transboundary and Emerging Diseases*.
23. G. J. Venter, S. S. Sebetsang, V. R. Swart, S. N. B. Boikanyo, C. J. de Beer. 2022. Comparison of the efficiency of the Onderstepoort- and Centres for Disease Control ultraviolet light traps for the collection of livestock associated *Culicoides* species in South Africa. *Medical and*

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24. Sunday O. Ochai, Jan E. Crafford, Ayesha Hassim et al. . 2022. Immunological Evidence of Variation in Exposure and Immune Response to *Bacillus anthracis* in Herbivores of Kruger and Etosha National Parks. *Frontiers in Immunology*.
25. Mandla Yawa, Nkululeko Nyangiwe, Ishmael FestusJaja, Munyaradzi Christopher Marufu, Charles T. Kadzere. Acaricide resistance of *Rhipicephalus decoloratus* ticks collected from communal grazing cattle in South Africa. *Journal Of Advanced Veterinary And Animal Research Issn 2311-7710 (electronic) March 2022 Vol 9, No. 1, Pages 33–41*
26. Maphuti B. Ledwaba et al. 2022. Distribution and prevalence of ticks and tick-borne pathogens of wild animals in South Africa: A systematic review. *Current Research in Parasitology & Vector-Borne Diseases*.
27. A F. Craig, M L. Schade-Weskott, T Rametse , L Heath, GJ. P. Kriel , L-M de Klerk-Lorist , L van Schalkwyk, J D. Trujillo , J E. Crafford, J A. Richt, R Swanepoel. 2022. Detection of African Swine Fever Virus in *Ornithodoros* Tick Species Associated with Indigenous and Extralimital Warthog Populations in South Africa. *Viruses (mdpi)*
28. Katja N Koepfel, Peter Geertsma, Brian F Kuhn, Ockert L Van Schalkwyk, Peter N Thompson. 2022. Antibody response to Raboral VR-G® oral rabies vaccine in captive and free-ranging black-backed jackals (*Canis mesomelas*). *Onderstepoort Journal of Veterinary Research ISSN: (Online) 2219-0635, (Print) 0030-2465. <https://doi.org/10.4102/ojvr.v89i1.1975>*
29. Bokaba, R.P.; Dermauw, V.; Morar-Leather, D.; Dorny, P.; Neves. 2022. *Toxoplasma gondii* in African wildlife: A systematic review. *Pathogens mdpi*
30. Mogaugedi N. Malahlela, Beniamino T. Cenci-Goga, Munyaradzi C. Marufu, Thierry Y. Fonkui, Luca Grispoldi, Eric Etter, Alan Kalake and Musafiri Karama. 2022. Occurrence, Serotypes and Virulence Characteristics of Shiga-Toxin-Producing *Escherichia coli* Isolates from Goats on Communal Rangeland in South Africa. *Toxins (MDPI)*.
31. Sabrina Ganzinella Charles Byaruhanga María E. Primo Zinathi Lukanji, Kgomotso Sibeko, Tshepo Matjila, Luis Neves et al. 2022. International interlaboratory validation of a nested PCR for molecular detection of *Babesia bovis* and *Babesia bigemina*, causative agents of bovine babesiosis. *Veterinary Parasitology Volume 304, April 2022, 109686*.
32. Jean Bosco Ntivuguruzwa, Francis Babaman Kolo, Emil Ivan Mwikarago, Henriette vanHeerden. 2022. Characterization of *Brucella* spp. and other abortigenic pathogens from aborted tissues of cattle and goats in Rwanda. *Veterinary Medicine and Science*
33. Claire Julie Akwongo, Melvyn Quan, and Charles Byaruhanga. 2022. Prevalence, Risk Factors for Exposure, and Socio-Economic Impact of Peste Des Petits Ruminants in Karenga District, Karamoja Region, Uganda. *Pathogens MDPI*.
34. Ntivuguruzwa, J.B., Michel, A., Kolo, F.B., Mwikarago, I.E., Ngabonziza, J.C.S., Van Heerden, H. 2022. Prevalence of bovine tuberculosis and characterization of the members of the *Mycobacterium tuberculosis* complex from slaughtered cattle in Rwanda. *PLoS Neglected Tropical Diseases*.
35. DE Zimmermann, I Vorster, C Dreyer, W Fowlds, BL Penzhorn. 2022. Successful treatment of babesiosis in a south-western black rhinoceros (*Diceros bicornis bicornis*). *Journal of the South African Veterinary Association*.
36. Samantha Mnkandla, Luis Neves, Ilse Vorster and Raksha Vasantraai Bhoora. 2022. Development of Cathepsin L-like Real-Time PCR Assays for the Detection of African Animal Trypanosomosis (AAT) in South Africa. *Pathogen MDPI Pathogens 2022, 11(2), 136; <https://doi.org/10.3390/pathogens11020136>*
37. Darryn L. Knobel, Anne Conan, Felix N. Toka, Sintayehu M. Arega, Charles Byaruhanga et al. 2022. Sex-differential non-specific effects of adjuvanted and non-adjuvanted rabies vaccines versus placebo on all-cause mortality in dogs (NERVE-Dog study): a study protocol for a randomized controlled trial with a nested case-control study. *BMC Veterinary Research*.
38. Taya L. Forde, Tristan P. W. Dennis, O. Rhoda Aminu, William T. Harvey, Ayesha Hassim, Ireen Kiwelu, Matej Medvecký, Deogratius Mshanga, Henriette Van Heerden et al. 2022. Population genomics of *Bacillus anthracis* from an anthrax hyperendemic area reveals transmission processes across spatial scales and unexpected within-host diversity. *Microbial Genetics*.
39. Folorunso O. Fasina, Bernard Bett, Michel Dione et al. 2022. One Health gains momentum in Africa but room exists for improvement. *One Health*.
40. Leonhard Schnittger, Sabrina Ganzinelli, Raksha Bhoora, David Omondi, Ard M. Nijhof, Mónica Florin-Christensen. 2022. The Piroplasmida *Babesia*, *Cytauxzoon*, and *Theileria* in farm and companion animals: species compilation, molecular phylogeny, and evolutionary insights. *Parasitology Research volume 121, pages 1207–1245 (2022)*
41. "Carien van den Bergh, Peter N. Thompson, Robert Swanepoel, Antonio P. G. Almeida, Janusz T. Paweska, Petrus Jansen van Vuren, William C. Wilson, Alan Kemp, and Estelle H. Venter. 2022. Detection of Rift Valley Fever Virus in *Aedes (Aedimorphus) durbanensis*, South Africa. *Pathogen MDPI*.
42. Martha M. O'Kennedy, Peter Coetzee, Otto Koekemoer et al. 2022. Protective immunity of plant-produced African horse sickness virus serotype 5 chimaeric virus-like particles (VLPs) and viral protein 2 (VP2) vaccines in IFNAR-/- mice. *Vaccine*.
43. Sunday C. Olaogun, Charles Byaruhanga, Sunday O. Ochai, Geoffrey T. Fosgate and Munyaradzi C. Marufu. 2022. Comparison of Three Diagnostic Methods to Detect the Occurrence of *Fasciola* Species in Communally Grazed Cattle in the North West Province, South Africa. *Pathogens MDPI*.

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45. Sintayehu M. Arega, Darryn L. Knobel, Felix N. Toka, Anne Conan a Non-specific effects of veterinary vaccines: a systematic review. *Vaccine*
46. Kerstin Junker, Joop Boomker, Ivan G. Horak, Boris R. Krasnov. 2022. "Impact of host sex and age on the diversity of endoparasites and structure of individual-based host-parasite networks in nyalas (*Tragelaphus angasii* Angas) from three game reserves in KwaZulu-Natal province, South Africa. *Parasitology Research*.
47. Tilaye Shibbiru Mengistu, Ilana van Wyk, Marinda Oosthuizen, Lientjie Cohen, Jeanette Wentzel. 2022. A One Health approach to investigate bats as a potential source of zoonotic mycoses in selected areas of Mpumalanga province, the Republic of South Africa (Short Comm). *Ethiopian Veterinary Journal*.
48. Mareledwane, V.E., Adesiyun, A.A., Thompson, P.N., Hlokwé, T.M. 2022. Application of the gamma-interferon assay to determine the prevalence of bovine tuberculosis in slaughter livestock at abattoirs in Gauteng, South Africa. *Veterinary Medicine and Science*, 8(6), pp. 2568-2575.
49. Msimang, V., Rostal, M.K., Cordel, C., (...), Paweska, J.T., Thompson, P.N. 2022. Factors affecting the use of biosecurity measures for the protection of ruminant livestock and farm workers against infectious diseases in central South Africa. *Transboundary and Emerging Diseases*, 69(5), pp. e1899-e1912
50. Chimera, E.T., Fosgate, G.T., Etter, E.M.C., (...), Kamwendo, G., Njoka, P. 2022. Spatio-temporal patterns and risk factors of foot-and-mouth disease in Malawi between 1957 and 2019. *Preventive Veterinary Medicine*, 204, 105639.
51. Steyrer, C., Miller, M., Hewlett, J., Buss, P., Hooijberg, E.H. 2022. Markers of inflammation in free-living African elephants (*Loxodonta africana*): Reference intervals and diagnostic performance of acute phase reactants. *S. Veterinary Clinical Pathology*.
52. Emily P Mitchell, Adrian Tordiffe, Peter Caldwell. 2022 A case for ovarian transdifferentiation in six adult captive masculinized lionesses (*Panthera leo*) in South Africa: Pathological evidence. *Theriogenology Wild* 1 (2022) 100012.
<https://doi.org/10.1016/j.therwi.2022.100012>
53. Sarah J. Clift, Bernat Martí-García, John A. Lawrence, Emily P. Mitchell, Jeanni Fehrsen, Jorge Martínez, June H. Williams, Johan C.A. Steyl. 2022. Pathology of fatal theileriosis in naturally-infected roan antelope (*Hippotragus equinus*) with phenotypic characterization of target leukocytes. *Veterinary Pathology* 1-16. DOI: 10.1177/03009858221120011;
54. V Simbizi et al. 2022. A review of pig and poultry diseases in the Eastern Cape Province of South Africa, 2000–2020. *Journal of the South African Veterinary Association* 93:1-11. DOI: 10.36303/JSAVA.2022.93.1.495
55. K. Koeppel et al. 2022. Antibody response to Raboral VR-G® oral rabies vaccine in captive and free-ranging black-backed jackals (*Canis mesomelas*). *OJVR*. DOI: 10.4102/ojvr.v89i1.1975
56. BM Johnson et al. 2022. Disease ecology of a low-virulence *Mycoplasma ovipneumoniae* strain in a free-ranging desert bighorn sheep population. *Animals* 12(8)
DOI: 10.3390/ani12081029
57. K Manlove et al. 2022. Bighorn sheep show similar in-host responses to the same pathogen strain in two contrasting environments. DOI: 10.22541/au.162132849.95999154/v1
58. J Vesga et al. 2022. Vaccine efficacy trials for Crimean-Congo haemorrhagic fever: Insights from modelling different epidemiological settings. DOI: 10.1101/2022.06.09.22276201
59. G James et al. 2022. Multiple-Locus variable-number tandem repeat analysis genotypes of *Listeria monocytogenes* isolated from farms, abattoirs and retail in Gauteng Province, South Africa. *Journal of Food Protection* 85(9) DOI: 10.4315/JFP-22-081
60. C. Labuschagne. et al. 2022. Characterisation of *Staphylococci* isolated from milk samples of a water buffalo herd. *Antibiotics* 11(11):1609. DOI: 10.3390/antibiotics11111609
61. K. Koeppel et al. 2022. SARS-CoV-2 reverse zoonoses to Pumas and Lions, South Africa. *Viruses* 14(1):120 DOI: 10.3390/v14010120
62. LL Laubscher et al. 2022. Complication with re-sedation in southern ground hornbills (*Bucorvus leadbeateri*) following partial reversal of two orally administered sedation protocols. *Veterinary Record Case Reports* 10(3) DOI: 10.1002/vrc2.250
63. W Strasheim et al. 2022. Method to assess farm-level vaccine and antibiotic usage utilizing financial documentation: A pilot study in a commercial pig farm in South Africa from 2016 to 2018. *July 2022 Frontiers in Veterinary Science* 9:856729 DOI: 10.3389/fvets.2022.856729

b) International conferences:

6

1. A.L. Michel & P. Sichewo. *Control of bovine tuberculosis in a high biodiversity developing country: feasible or fictional? Seventh International Conference on Mycobacterium bovis (M. bovis), Galway, Ireland, 07 - 10 June 2022.*
2. J Hewlett & A. Michel. *Control and management of bovine tuberculosis in African buffalo (Syncerus caffer); Poster presented at the Seventh International Conference on Mycobacterium bovis, Galway, Ireland, 07 - 10 June 2022*
3. Makgabo SM, Brayton KA, Oosthuizen MC, Collins NE (2022). *Identification of Anaplasma species in wild animal species in the Kruger National Park and surrounding game reserves using a bacterial microbiome approach. Paper presented at the virtual meeting for Association of Institutions for Tropical Veterinary Medicine (AITVM) and the Society for Tropical Veterinary Medicine (STVM), Virtual Conference. 17 May 2022.*
4. L Meyer. *Applied physiology in immobilized wildlife: Applied cardiorespiratory physiology required to critically monitor immobilized wild mammals (invited oral presentation), 37th World Veterinary Association Congress, Abu Dhabi, UAE, March, 2022.*
5. L Meyer. *Practical monitoring of immobilized wildlife: The art of critically monitoring cardiorespiratory function in immobilized wild mammals (invited oral presentation), 37th World Veterinary Association Congress, Abu Dhabi, UAE, March, 2022.*
6. Henriette van Heerden. *Brucellosis in wildlife and livestock. Keynote lecture. Brucellosis International conference, Teramo, Italy, 16-19 September 2022.*

c) National conferences:

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1. Anita Michel, Alessandra Scagliarini, Victor PMG Rutten. *ELEPHANT – Empowering research through One Health training. 11th Biennial Congress South African Veterinary and Para-Veterinary Congress. Emperor's Palace, Kempton Park. Gauteng. 25-27 October 2022.*
2. Mokano, K., Suzuki T., Mohale D., Phahladira B., Ngoepe E., Kamata Y., Chirima G., Sabeta C. and Makita K. *Spatio-temporal epidemiology of animal and human rabies in northern South Africa during 1998-2017 (oral presentation). Southern African Society for Veterinary Epidemiology and Preventive Medicine (SASVEPM) Conference, 24-26 August, 2022*
3. Miyen, M.J., Lopez, L. and Sabeta C.T. *A serological assessment of rabies-neutralising antibodies in wildlife species to facilitate international movement (poster). Southern African Society for Veterinary Epidemiology and Preventive Medicine (SASVEPM) Conference, 24-26 August, 2022*
4. Khoane, A.O., Mphuthi, N.B.M., Sabeta, C.T. and Syakalima, M. *Molecular characterisation of cattle rabies viruses linked to cattle exposures in North West Province of South Africa (poster). Southern African Society for Veterinary Epidemiology and Preventive Medicine (SASVEPM) Conference, 24-26 August, 2022*
5. L Meyer. *Using novel pharmacological approaches to improve the welfare of captured wildlife invited oral presentation), South African Society for Basic and Clinical Pharmacology, online, RSA, October, 2022*
6. L Meyer. *Capture-induced stress in wildlife: Deficiencies in its current assessment and treatment (invited oral presentation), 11th Biennial South African Veterinary and Paraveterinary Congress, Johannesburg, RSA, October, 2022*
7. J Hewlett & A. Michel. *Towards control of bovine tuberculosis: A vaccination study in African buffalo. 1st Afrivet Technical Conference, 1-3 August 2022. Pretoria.*

d) Other (Provide website address or link to appropriate information):

1

We provided online educational material for bovine brucellosis and anthrax in bovines to ERFAN: <https://www.erfan.it/en/home/>

11. What have you done in the past year to advance your area of focus, e.g. updated technology?

1. Preparation of the establishment of an "African Centre for Biosecurity and Disease Risk Assessment".

2. Strategic planning towards the establishment of a BSL3 laboratory to study high-impact diseases of wildlife and livestock.

12. Additional comments regarding your report: