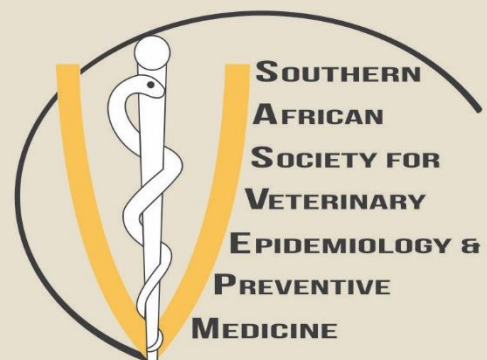


# 18<sup>th</sup> Annual SASVEPM Congress, 2021

25-27 August, Forever Resort Warmbaths, Bela-Bela, Limpopo

## PROGRAMME

*Creative animal  
health solutions for  
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**IDEXX**



The Southern African Society for Veterinary Epidemiology and Preventive Medicine (SASVEPM) was formed at the end of 2000, with the objective of promoting veterinary epidemiology and preventive medicine in the Southern African region. One of the reasons for starting a regional society was the realisation that we have unique problems and circumstances in Africa that require us to formulate a unique brand of epidemiology that can be applied in the region.

The best people to do this are the Africans themselves. For too long resources had been wasted on disease surveillance and control because of a lack of

understanding about epidemiology or because of the application of methodology that is inadequate for our region.

Our biggest problem was the lack of capacity in the discipline. We therefore needed a forum that would enable those with some expertise, or an interest, to cross pollinate expertise and ideas, with the objective of building capacity in the region, but also of creating a unique methodology applicable to our region.

The Society also aims to enhance communication between epidemiologists in the region. With the weakness of the currencies in the region it is also becoming increasingly difficult to attend conferences or continuing education courses overseas; a regional society thus allows local veterinarians to attain these goals at an affordable cost.

SASVEPM now has a multi-national membership of over 200, including private vets, state vets, vets in industry and others in academia and research. To date the Society has held fourteen Annual Congresses, which have been a highly successful blend of scientific papers, posters, and continuing education (CE) sessions. SASVEPM also hosted the twelfth International Symposium for Veterinary Epidemiology and Economics (ISVEE XII) during August 2009 at the ICC in Durban.

### SASVEPM Executive Committee 2019/20

 	 	 	 	 	 
<b>Dr Nelson Matekwe</b> President	<b>Dr Nolvuyo Magadla</b> Vice-President	<b>Dr Mohamed Sirdar</b> Secretariat	<b>Dr Sikhumbuzo Mbizeni</b> Treasurer	<b>Dr Japhta Mokoele</b> Communications	<b>Dr Wonderful Shumba</b> Executive Member

## LIST OF AUTHORS

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## MESSAGE FROM THE PRESIDENT

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Dear SASVEPM Members, delegates, and invited guests,

On behalf of the Southern African Society for Veterinary Epidemiology & Preventive Medicine (SASVEPM) I am

pleased to welcome you to the 18th Annual SASVEPM Hybrid Congress at the Forever Resort Warmbaths, in Bela-lBela Limpopo, South Africa, from 25-27 August 2021.

The COVID-19 pandemic has remained a challenge to our planning for more than a year now and we find ourselves in ever-changing times requiring continuous adaptability and flexibility. We are incredibly grateful to all who have made it to attend this event in person, even though you were aware of the risks involved. The virtual component of this congress has extended our reach even further and we thank the SASVEPM Executive Committee and SAVETCON for making this a reality.

This SASVEPM Congress' new flexible hybrid format will enable us to safeguard our members' well-being and facilitate your participation from wherever you are based, while at the same time serving you with access to valuable online scientific discussions within our society.

SASVEPM's partnership with the United States Department of Agriculture, Animal and Plant Health Inspection Services (USDA-APHIS) and the US Biological Threat Reduction Programme (BTRP), which was conceived last year during our continued professional development webinars is promising to become a long-term relationship. We are proud to announce that USDA-APHIS and BTRP are in partnership with us for this 18th edition of the SASVEPM Congress and we are indebted to their generous sponsorship for this congress. Onderstepoort Biological Products and IDEXX also provided significant sponsorship for this congress, and we are very grateful for that.

Our Southern Africa region is currently facing diseases challenges, which has led us to rethink the way disease surveillance and control has been conducted in the past half a century or so. Epidemiologically sound disease surveillance and control methods that used to suffice have now become null and void. Why? Pathogens seem to be a step ahead of us in their adaptive means. The current corona virus global pandemic is a classic example. Amidst the COVID-19 pandemic, Southern

Africa witnessed several outbreaks of highly infective avian influenza (H5N1) in poultry farms during the second quarter of this year. This has caused a huge economic impact in the region due to massive culls, local and international trade implications in the poultry industry. Foot and Mouth Disease and African Swine Fever also remain a big challenge in the region as diseases borders or zone have become difficult to define. It was great that a sizeable number of abstracts which fit in the context of these three important diseases were submitted for presentation at this congress.

Land use and farming practices coupled with climate change have been drifting over the years yet our approach to disease control has remained the same, relatively. To stay abreast, we need new cutting-edge insights and innovative methods for the control of challenging trade sensitive transboundary, endemic, emerging and re-emerging animal diseases that we are faced with. Therefore, our focal point this year is innovative methods and solutions for sustained disease control in a One Health approach for economic stability and growth.

SASVEPM 2021 is honoured to have Prof. Esron Karimurabo (Research Group Leader, Sokoine University of Agriculture (SUA), Tanzania who has led the research group in the area of disease surveillance since 2010, Prof. Folorunso Oludayo Fasina (Country Team Leader, ECTAD-FAO) a transboundary animal diseases wunderkind, Prof. Mary-Louise Penrith (Extraordinary Professor, University of Pretoria), a renowned biosecurity and biosafety expert and Dr Moetapele Letshwenyo, the current OIE Sub-Regional Representative for Southern Africa.

Time, effort, and commitment from fellow SASVEPM executive committee members and the SAVETCON team, together with the generous support from our partners and sponsors have made it possible to organise this congress. Lastly, we would like to thank all the speakers, presenters and congress participants for their contributions which are the foundation of this congress.

I thank you for choosing to participate in the 18<sup>th</sup> Annual SASVEPM Congress. May you enjoy your time at the congress.

**Dr Nelson Matekwe**  
President, SASVEPM



# WEDNESDAY, 25 AUGUST 2021

Time	Duration	Theme	Title	Speaker
07h30	(mins)	Registration opens - arrival coffee and tea		
07h30		Online platform opens		
Session Chair: Dr Noluvuyo Magadla				
08h00	15	Opening Session	Welcome & Opening - SASVEPM President	Dr Nelson Matekwe
08h15	10		Honouring the memory and legacy of Prof. Gavin R. Thompson	Dr Japhta Mokoele
08h30	60	Keynote 1	<i>Creative animal health technologies – Using less resources for more outputs</i>	Prof. Folorunso Fasina, FAO-ECTAD
09h30	20	Animal Health and Economics	Communal sheep farmer's knowledge and attitudes on the incidence of gastrointestinal parasites in sheep in the Eastern Cape, South Africa	Mr Mlungisi Jansen
09h50	20		Bovine brucellosis survey in Gauteng Province, 2019-2020	Dr Liesl de Boni
10h10	20		Determinants of market choice and strategies adopted by small-scale pig producers in redline areas of Mpumalanga province, South Africa. A fractional outcome-Tobit model approach	Ms Priscilla Munzhelele*
10h30	30	Mid-morning refreshments/ Poster viewing		
Session Chair: Dr Sikhumbuzo Mbizeni				
11h00	20	Disease prevention and control	Department of Agriculture, Land Reform and Rural Development - Directorate of Animal Health	Dr Michael B. Modisane & Dr Mpho Maja
11h20	20		An entry risk assessment of African Horse Sickness virus into the controlled area of South Africa through the legal movement of equids	Dr John Grewar
11h40	20		Genetic diversity of <i>Ehrlichia ruminantium</i> in <i>Amblyomma hebraeum</i> ticks from domestic ruminants of Ngaka Modiri Molema District	Mr Siza Mthi
12h00	20		The quantification of cattle movement in the Bushbuckridge Local Municipality, Mpumalanga, and implications for trade and disease control	Dr Oonagh Pretorius
12h20	15		Discussion Time	
12h35	20	Poster Speed Session A x 7 presentations		
12h55	10	Voting for best Poster Presentation		
13h05	55	Lunch		
Session Chair: Dr Wonderful Shumba				
14h00	20	Disease prevention and control	Spatial risk mapping of foot-and-mouth disease occurrence and spread in South Africa (2007-2016)	Dr Mohamed Sirdar
14h20	20		African swine fever among pig keepers in Gauteng Province, 2019-2021	Dr Liesl de Boni
14h40	20		Interrelationships of warthogs, Ornithodoros ticks and African swine fever virus in South Africa	Mr Anthony Graig *
15h00	15		Discussion Time	
15h15	30	Mid-afternoon refreshments		
Session Chair: Dr Japhta Mokoele				
15h45	20	Disease prevention and control	Do unique challenges to controlling bovine tuberculosis in South Africa require unique solutions?	Prof. Anita Michel*
16h05	20	One Health in Epidemiology	Knowledge, attitudes and practices on bovine fasciolosis of smallholder cattle farmers in the North-West Province, South Africa	Dr Charles Olaogun
16h25	15		Discussion Time	
16h40	-	End of Day 1		
17h30	90	Welcome Reception at the Hydro Gardens		

\*virtual presenter

# THURSDAY, 26 AUGUST 2021

Time	Duration	Theme	Title	Speaker
07h30		Online platform opens		
Session Chair: Dr Nelson Matekwe				
08h00	60	Keynote 2	The OIE mandate and activities in Southern Africa	Dr Moetapele Letshwenyo, OIE-SRR-SA*
09h00	20	Post-graduate Presentations	Distribution of aspergillosis in poultry and possible control measures in South Africa	Ms Kgomotso Setsetse
09h20	20		Prevalence, antibiotic resistance and molecular characterization of <i>Yersinia enterocolitica</i> isolated from retail meat and meat products in South Africa	Mr Emmanuel Seakamela
09h40	20		Evaluation of factors affecting the use of biosecurity practices for the protection of ruminant livestock and farm workers against disease in the Free State and Northern Cape, South Africa	Ms Veerle Msimang
10h00	20		Systematic review and meta-analysis of <i>Cryptosporidium</i> species infections in animal and human faecal samples in South Africa	Mr Mpho Tawana
10h20	30	Mid-morning refreshments/ Poster viewing		
Session Chair: Dr John Grewar				
10h50	10	VIP	Dr Lucas Mampane: A tribute to his contribution to South Africa’s veterinary science and disease control	Japhta Mokoele
11h00	60	Keynote 3	Innovative biosecurity practices for controlling African swine fever outbreaks in South Africa and the region	Prof. Mary-Louise Penrith, University of Pretoria*
12h00	20	Post-graduate & AHT Presentations	Knowledge attitude and practices towards African Swine Fever (ASF) in uThukela District, KwaZulu-Natal Province, South Africa	Ms Nicol Mbali Thusi
12h20	20		Knowledge and attitude towards rabies disease among residents of two communities of eThekweni District, KwaZulu-Natal Province, South Africa	Mr Titus Letsoalo
12h40	20		Assessment of risk factors for African swine fever in Gauteng province	Ms Keneiloe Montsu*
13h00	20	Poster Speed Session A x 7 presentations		
13h20	20	Voting for best Post-Grad Prize & Best Poster Presentation		
13h40	50	Lunch		
Session Chair: Dr Livio Heath				
14h30	10	AHT Presentations	Presentation by AHT Award Sponsor – OBP	Aubrey Dladla
14h40	20		Genetic diversity of <i>ehrlichia ruminantium</i> in ticks collected from domestic ruminants in Ngaka Modiri Molema district, South Africa and its effect on diseases control	Mr Sifiso Mnisi
15h00	20		Data quality assessment on a slaughter stock from surveillance areas at Gert Sibande District red meat abattoirs (October 2018 to October 2019)	Mr Mpendulo Xashimba
15h20	20		Socioeconomic factors and welfare of working equines in the 14 peri-urban areas around Mogalakwena Municipality	Ms Dimakatso Molapo
15h40	20		GMP traceability, the hidden gem for veterinary disease control - Northern Cape experience	Mr Gideon Kriel
16h00	20	Voting for AHT Prize		
16h20	20	Mid-afternoon refreshments		
16h40	60	SASVEPM AGM		
19h00	120	Gala Dinner		

\*virtual presenter

## FRIDAY, 27 AUGUST 2021

Time	Duration	Theme	Title	Speaker
07h30		Online platform opens		
Session Chair: Dr Mohamed Sirdar				
08h00	60	Keynote 4	A Community Focused Surveillance for Emerging and Transboundary Animal and Human Infectious Diseases	Prof. Esron Karimuribo, Sokoine University of Agriculture
09h00	20	Biosecurity, surveillance, and traceability	Feasibility of classifying beef feedlots in South Africa as compartments	Dr John Grewar
09h20	20		The epidemiology of African Swine Fever outbreaks outside of the controlled area of South Africa in 2016-2021	Dr Livio Heath
09h40	20		An evaluation of the notifiable avian influenza surveillance system in Gauteng Province (2017-2020)	Dr Shira Amar
10h00	20		Spatio-temporal clustering and risk factor analysis of bovine theileriosis (theileria parva) in Zimbabwe from 1995 to 2018	Dr Munyaradzi Marufu *
10h20	40	Mid-morning refreshments/ Poster viewing		
Session Chair: Dr Nolvuyo Magadla				
11h00	20	Antimicrobial resistance and residues	Village chickens as a source of antimicrobial resistance and emerging diseases: Eastern Cape case study	Mr Vincent Simbizi*
11h20	20		Detection and quantification of antibiotic residues in communal goat's milk in Mahikeng Local Municipality, South Africa	Ms Katlego Ndlovu
11h40	20		Population structure of Listeria monocytogenes isolated from the environment, meat and meat products in South Africa	Dr Itumeleng Matle
12h00	20	Closing Remarks		Dr Nelson Matekwe
12h20	60	Lunch and departure		

\*virtual presenter

## POSTERS

Theme	Title	Speaker
Animal Health and Economics	1. Effect of different dietary protein levels on goat's blood parameters of tswan goats reared in extensive production system	Dr Mpho Tsheole
	2. Molecular Characterization and Mapping of bovine trichomonas in the North-West Province, South Africa	Mr Afaq Syed
	3. Nutritional status of cows reared on natural pasture in communal areas around Mafikeng in the North-West Province	Dr Keitiretse Molefe
Antimicrobial resistance and residues	4. Prediction of heavy metal protein, resistance, and virulence features in highly tetra-fluoroquinolone resistant <i>Campylobacter fetus</i> subsp. <i>fetus</i> and <i>Campylobacter fetus</i> subsp. <i>venerealis</i> Isolated in South Africa	Dr Edoaurd Tshipamba
	5. Facilitating sustainable animal health solutions through understanding livestock keepers' knowledge, attitudes, perceptions and practices of livestock vaccines	Ms Zimbini Mdlulwa*
	6. Determination of antibiotic residues in fish sold in the supermarkets around Mafikeng, North-West Province	Ms Neoyame Sekhoto
Biosecurity, surveillance, and traceability	7. Biosecurity programs investigation for traceability of African swine fever outbreak in North-West Province, Dr Kenneth Kaunda district in Potchefstroom	Ms Lebogang Mnisi
Disease prevention and control	8. Geographic distribution of boophilid ticks in communal grazing cattle in the north-eastern region of the Eastern Cape Province, South Africa	Prof. Nkululeko Nyangiwe
	9. Construction of three foot-and-mouth disease virus peptide phage display libraries for the identification of epitopes	Ms Naledi P. B. Sekgobela
	10. Hand hygiene compliance in the intensive care unit of the Onderstepoort Veterinary Academic Hospital	Ms Dikeledi Sebola
One Health in Epidemiology	11. Knowledge, practices and seroprevalence of Taenia species in smallholder farms in Gauteng, South Africa	Ms Nothando Shongwe*
	12. An Exploratory Descriptive Study of <i>Staphylococcus</i> spp. isolated from human specimens submitted to a diagnostic laboratory in South Africa, 2012-2017	Mr Themba Sigudu
	13. Prevalence and factors associated with Salmonella species in mechanically deboned poultry meat imported through Durban port of entry, South Africa	Dr Tandile Ndobeni

\*virtual presenter



### Prof. Folorunso Fasina, FAO-ECTAD



Prof. Fasina is an extraordinary professor with the Department of Veterinary Tropical Diseases, University of Pretoria. He started his professional career with the National Veterinary Research Institute, Vom, in Nigeria where he served in various capacity including the head of the African swine fever/Foot and Mouth Disease (ASF/FMD) Unit of Viral Research Department until January 2011. He subsequently worked with the Departments of Production Animal Studies and Veterinary Tropical Diseases of the University of Pretoria and rose to the position of Associate Professor in Infectious Diseases before joining the ECTAD, Food

and Agriculture Organization of the United Nations in Kenya (2016-2017) and currently the same position in Tanzania (2018 to date). He brought a rich experience in animal disease surveillance, epidemiology (spatio-temporal, molecular and classical) and disease investigation. His basic degree was in Veterinary Medicine (DVM) and he holds two PhDs from Utrecht University, the Netherlands and the University of Pretoria, South Africa. He is involved in the preparation and implementation of country strategies and programs for the management, prevention and control of high impact emerging and re-emerging zoonotic and non-zoonotic TADs; and providing technical and policy guidance to ensure achievement of national priorities and FAO's Strategic Objectives. He has over 170 peer-reviewed publications and have supervised over 40 students' PhDs, MScs and undergraduates across Africa.

**Presentation: Wednesday 25 August, 08h30-09h30**

### Creative animal health technologies – Using less resources for more outputs

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### Dr Moetapele Letshwenyo, OIE Sub-Regional Representative for Southern Africa



Dr Moetapele Letshwenyo is a veterinarian by profession, with a Bachelor's Degree in Veterinary Medicine and Surgery from Edinburgh University and a Master of Preventative Veterinary Medicine from the University of California, Davis and a Masters of Business Administration from the University of Botswana. For most part of his veterinary career, he worked for the Department of Veterinary Services of Botswana primarily as a field veterinarian in several veterinary districts, before settling at Ministry Headquarters initially as the Department epidemiologist. In this role, he was responsible for all sanitary and phyto-sanitary matters and assisted in setting up the

Veterinary Epidemiology and Economics Unit which was responsible for establishing the livestock identification and traceability system (LITS) of Botswana in 2001. He coordinated the control and eradication of several outbreaks of foot and mouth disease in the country and made presentations and talks on animal disease control in Botswana at conferences and seminars worldwide, organized by various international organizations such as OIE, FAO, AU IBAR, SADC, etc. He was a member of various technical committees of these Organisations. All this culminated with an award of a "Meritorious Honour" by the OIE. He progressed to become the Director of Veterinary Services and OIE Delegate for Botswana in 2008. In 2009 he became a Deputy Permanent Secretary in the Ministry until joining the World Organisation for Animal Health (commonly called OIE: *Office International des Epizooties*) as the Sub-Regional Representative for Southern Africa in 2014.

The OIE (*Office International des Epizooties*) or the World Organisation for Animal Health is a standard setting body on matters of animal health, welfare, and veterinary public health (zoonosis). It

works closely with member countries, through the Veterinary Services to ensure compliance to international standards, in order to facilitate safe trade in animals and their products. As the sub-regional representative Dr Letshwenyo is responsible for driving the mandate and representing the OIE in the sixteen member countries of the SADC sub-region, as well as in meetings with Collaborating Partners.

**Presentation: Thursday 26 August, 08h00-09h00**

## **The OIE mandate and activities in Southern Africa**

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### **Prof. Mary-Louise Penrith, University of Pretoria**

*BSc(Hons) (Cape Town), BVSc (Pretoria), PhD (Cape Town), DSc (Pretoria)*



After 24 years in zoological research, Mary Louise Penrith qualified as a veterinarian at the University of Pretoria in 1991. She joined the Pathology Section of the Onderstepoort Veterinary Institute (now ARC-OVR), where she developed a particular interest in pig diseases. African swine fever (ASF) became a special field of interest. In addition to a research project on genetic resistance to ASF in domestic pigs, she was a consultant to the Food & Agriculture Organization of United Nations (FAO) on epidemiology and control of ASF in nine countries in Africa and the Caucasus and has served as an expert

consultant to several other organisations including AU-IBAR. She also managed a programme 'Animal health for developing farmers'. After 10 years at OVI she moved to Maputo, Mozambique to the Veterinary Research Institute for 4 years to advise on laboratory management and managed a pilot project on improving health and production of smallholder pigs in Mozambique. She is now an Extraordinary Professor in the Department of Veterinary Tropical Diseases of the University of Pretoria and an independent consultant with a focus on managing animal health at the livestock-wildlife interface and on management of ASF. Her main interest now is in developing affordable biosecurity measures for poor pig farmers. She has published extensively on ASF as well as other animal diseases.

**Presentation: Thursday 26 August, 11h00-12h00**

## **Innovative biosecurity practices for controlling African swine fever outbreaks in South Africa and the region**

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## Prof. Esron Karimuribo, Sokoine University of Agriculture



Prof. Esron currently serves as Director-Postgraduate Studies, Research, Technology Transfer & Consultancy & Associate Professor- Department of Veterinary Medicine & Public Health, College of Veterinary Medicine and Biomedical Sciences, Sokoine University of Agriculture.

He was the first postdoctoral research fellow at Southern African Centre for Infectious Disease Surveillance (SACIDS) from 2009 to 2011. His research focused on resource mapping and application of mobile technologies in infectious disease surveillance across human and animal health sectors. He also an

Associate Professor at Sokoine University of Agriculture (SUA) in Tanzania from 2012.

He graduated in 1995 with a veterinary degree from Sokoine University of Agriculture (SUA) in Tanzania and in 1998 he was awarded a Master of Veterinary Medicine (MVM) degree of the same university. He worked as a research assistant attached to different research projects at SUA until 2000 when he was employed as an Assistant Lecturer. He pursued studies at the University of Reading in UK and awarded a PhD in 2002. He became a Lecturer at SUA in 2002 and maintained this position until 2009 when he was promoted to a Senior Lecturer position.

In 2007, he was awarded an African Research Fellowship by Rothamsted International and worked at Moredun Research Institute in Scotland (UK) for one year. Under the RF-funded project, Esron has collaborated with other key players in developing a one health surveillance strategy in three pilot study sites, namely the Ngorongoro, Kagera River Basin and Zambezi River Basin ecosystems. He has published more than 100 papers in peer-reviewed local and international journals as well as speaking in different local and international scientific conferences.

**Presentation: Friday 27 August, 08h00-09h00**

### **A Community Focused Surveillance for Emerging and Transboundary Animal and Human Infectious Diseases**

## IN MEMORIUM

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### In loving memory of Prof. Gavin 'Reckless' Thomson

3 February 1943 - 23 April 2021



Many of you will know Gavin for his lifelong contributions to veterinary science and his ongoing fight for the people and wildlife of southern Africa.

In the last six months of his life, he fought Pancreatic Cancer with the same level-headed, dogged determination and incredible bravery that he had shown throughout his life.

#### In his own words

Below is a recent biography Gavin wrote for his OP Class of 1966:

*"Although born in Johannesburg in 1943, I grew up and did my schooling in Zimbabwe (then Rhodesia) before graduate training in South Africa (one year at University of Natal [Pietermaritzburg] and 4 at University of Pretoria), earning a BVSc with the class of '66.*

*In line with conditions for the bursary and loan I received from the Rhodesian Government to study as a vet, I worked as a Government Veterinary Officer (GVO) in Rhodesia for 3 years in many locations after graduation (being the only bachelor GVO I was posted to wherever a "stop-gap" was needed).*

*My main recreational activity was playing rugby and I had the good fortune to play for various first league clubs around the country and even made it as a reserve for the Rhodesian team that played against the British Lions in 1968 but did not get onto the field. Work as a GVO was not taxing although sometimes interesting but it certainly did not satisfy the desire dating from my 3rd student year at Onderstepoort to become a virologist.*

*Realising that immunology is a pillar of practical virology, I enrolled for a MSc course in immunology in the Medical School of Birmingham University (UK), graduating in 1970. That year was most rewarding as the Department of Experimental Pathology that ran the course was highly academic and had a number of internationally recognized researchers, enabling interaction with leading immunologists at a time that field was developing rapidly.*

*I then returned to Rhodesia and worked in the vet laboratory in Salisbury (Harare), setting up the first virology unit there. However, the opportunity for academic advancement was limited in Rhodesia so I applied for and obtained a position as a virologist at the Royal Veterinary College, London (part of London University). That job enabled me to use my research to obtain a Ph.D. in virology.*

*The work was aimed at better understanding respiratory infections of Thoroughbreds, under the supervision of Prof Walter Plowright, a world-renowned virologist (he developed the vaccine that enabled the eradication of rinderpest). My research colleague, Dr Jenny Mumford, and I made some worthwhile contributions in the fields of equine influenza and what was then commonly known as equine rhinopneumonitis, more correctly equine herpesvirus 4 (EHV-4) infection. We also described a new virus: acid-stable picornavirus of horses.*



*I made the trip to London on a Union Castle liner that provided the good luck to meet my wife, Marguerite (Rice) of Grahamstown who was on her way to the UK for a holiday. We had a great social time in London before our first child (Charlotte) arrived; thereafter domestic life and the grind of post-grad study ended our carefree existence! We*

*had another daughter (Rowena) before returning to RSA. Our third daughter Robyn was born in Pretoria.*



*Charlotte is a lawyer who emigrated to Australia with her husband some years ago - they have two children and live in southern NSW (a beautiful part of the world).*

*Robyn - a graphic designer - and her husband live in New York. Fortunately for Margie and me, Rowena - a homeopath - and husband and one grandson still live in Johannesburg.*

*By the time I completed my Ph.D. studies (1977), the Rhodesian “war” was raging; I therefore applied for a position at the OVI and joined the Virology Department under the then leadership of Dr Baltus Erasmus. Initially I worked on pig diseases, mainly African swine fever (ASF). One of the outcomes of that research was explaining how the transmission cycle between warthogs and Ornithodoros spp. ticks are completed; until that time nobody could explain how the low levels of viraemia found in warthogs could provide a source of infection for ticks.*

*In 1980 I moved to the newly established FMD Lab at Onderstepoort as the head of the diagnostic/research section - under the overall leadership of Dr Atillio Pini. After Dr Pini returned to Italy, I was appointed Director of the Institute for Exotic Diseases, as the FMD Laboratory was by then known.*

*My position at Exotic Diseases enabled me not only to do interesting and practical research on FMD and ASF but also to obtain some international recognition, the basis of my election as a member of what is now known as the OIE’s Scientific Commission for Animal Diseases. I served on that Commission for 12 years, three years as President. That provided exposure to scientific issues associated with animal diseases around the world - invaluable.*

*Apart from work on FMD - mainly aimed at better understanding the interplay between SAT serotype FMD viruses and buffalo populations. Fieldwork was carried out mainly in the Kruger National Park in association with Dr Roy Bengis and his colleagues - I also for a time headed the OVI research team on rabies.*

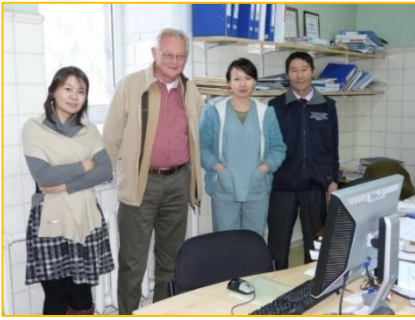


*That team, together with international collaborators (Dr Arthur King (UK) in particular), initiated the use of then-new molecular techniques (monoclonal antibodies & direct genome sequencing) to better understand the relationship between the two biotypes of rabies virus that occur in RSA, i.e., canid and viverrid. Our team demonstrated significant antigenic and genomic differences between these two biotypes that has subsequently been built upon. After the retirement of Dr Daan Verwoerd and the 1 re-amalgamation of the OVI and the Institute for Exotic*

*Diseases, I was appointed Director of the OVI in April 1999. That experience was not positive from my perspective, mainly because ARC Head office largely (in my opinion) removed authority for any worthwhile decision-making from directors of ARC Institutes, leaving the impression that one was required to field the blame for whatever went wrong while having little authority to implement measures that could forestall or remedy problems.*

*Therefore, when I was offered an international position by the FAO (Food & Agriculture Organisation of the UN) at the end of 2000 I was happy to accept and resigned from the ARC-OVI. That brought an end to, for me, 23 very productive and happy years at Onderstepoort. However, working for most of the time in a high-security lab had a down-side in that it constrained social interaction with colleagues working at the OVI and the Vet Faculty because of bio-security rules in place at that time.*

*While at Onderstepoort my main recreational activities involved marathon running, cycle road-racing, canoeing and squash. In none of these was I any better than average but they kept me fit and were highly enjoyable. I also became a co-editor of the first edition of the book “Infectious Diseases of Livestock” which Prof. Koos Coetzer initiated and was lead editor. Production of that book took 7 years during which time I rose at 03:45 every morning to work on “the book” before going to my day job at Onderstepoort. The success of the book was a satisfactory reward for me but not for my family!*



*On joining the FAO in 2000 I was seconded to work on a large European Union-funded project (Pan-African Programme for the Control of Epizootics - PACE) involving 30 countries of East, Central and West Africa: my role being 'main epidemiologist'. That job, based in Nairobi, turned out to be difficult but very stimulating; our task was to help improve surveillance for epizootic diseases in all those countries as well as ensuring the final eradication of rinderpest.*

*The epidemiology team that I headed comprised people of different nationalities and cultures, trained in very different places (Cuba, USSR, eastern Europe). None of these people had ever heard of me so gaining acceptance as a credible leader was challenging.*

*Before joining the FAO, I had assumed that UN agencies would be way ahead of RSA when it came to administration and general organisation, if not knowledge of African animal diseases. However, that turned out to be a misperception. Nevertheless, I learned a tremendous amount about "Africa" and the ways of international organisations. A product of that Project was the concept of "commodity-based trade" which, after a 12-year struggle, is now becoming accepted internationally as a way of enabling trade in commodities and products derived from countries or zones that are not free from trans boundary animal diseases (TADs) like FMD. It is still controversial but I'm sure it'll be widely applied one day even if not in my lifetime.*

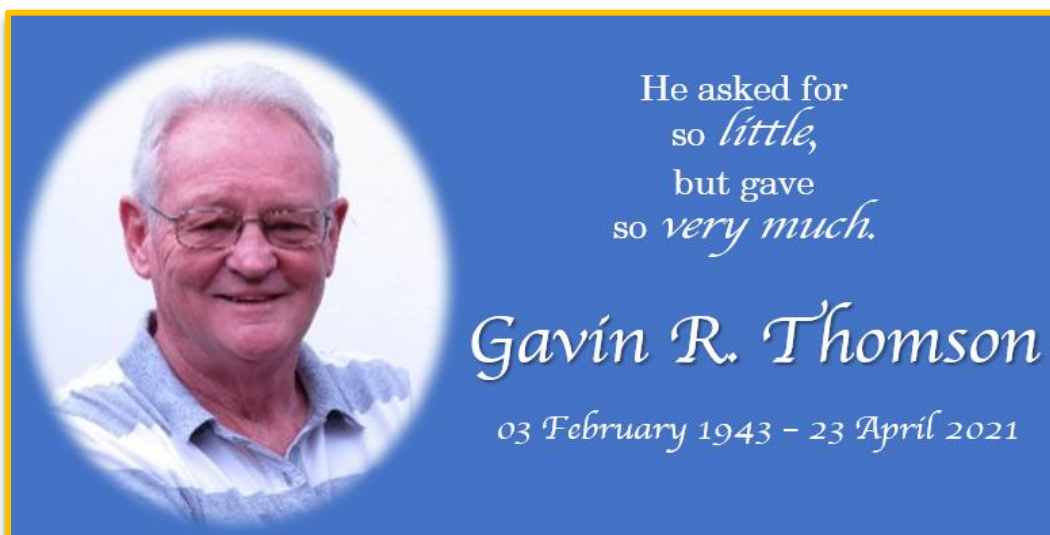
*Since 2005 I have been involved in consultation - most on behalf of a small company (TAD Scientific) that Dr Mary-Lou Penrith and I co-direct. We have a variety of clients both within and outside RSA. That has enabled me to work in some exotic locations such as the Philippines, Mongolia, India, Pakistan and many if not most sub-Saharan African countries.*

*My main recent endeavour has been, together with the AHEAD Group (initially affiliated to the Wildlife Conservation Society but more recently to Cornell University), to develop mechanisms whereby wildlife conservation and commercialisation of livestock production can be made more compatible in and around southern Africa's transfrontier conservation areas (TFCAs), with the Kavango-Zambezi (KAZA) – one of the largest in the world – being the major research focus.*

*I have been fortunate, over many years now, to be able to conduct research into epidemic viral diseases with a wildlife component and, more importantly, help develop ways that render wildlife conservation and livestock production more compatible in the extensive rangeland systems of sub-Saharan Africa. Although progress has been slow things are finally beginning to move in the right direction in my opinion.*

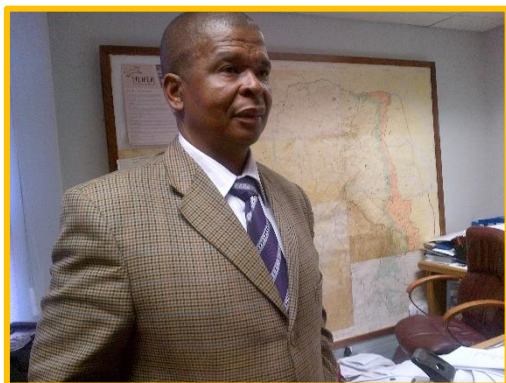
*Most recently my main effort has been directed at proposing better ways of managing the escalating FMD problem in Southern Africa, in South Africa particularly. This problem, as most vets will be aware, presents an unprecedented threat to healthy rural development in our region.*

*Hopefully I can continue to do that while body and mind remain together and more-or-less functional!"*



### Dr Lucas R. Mampane: Honouring his contribution to South Africa's veterinary science and disease control

The Southern African Society for Veterinary Epidemiology and Preventative Medicine would like to honour the retired Dr Lucas R. Mampane, former Director of Veterinary Services in Limpopo Province, for his support to SASVEPM and his contribution to disease control, specifically FMD in the interface.



Dr Lucas Ramosoane Mampane was born at Tisane Village in the then Transvaal Province, many moons ago on the 13<sup>th</sup> of June 1960. Fate had it that the homeland system would be introduced, and the area was then named Lebowa.

He attended Lobethal Primary School which was started by the Missionaries of the Lutheran Church from Germany and practiced Christian Doctrines aligned to that Church. The school is one example the Church played to ensure access to education for the marginalised.

There was no preschool education by then, with the school system starting at what was called Sub-Standard A, then Sub-Standard B before starting with Standard One and proceeding to Standard Six which was the last Level of Primary Education. Primary School was thus 8 years.

His Class was the last one to follow this model as the following year Standard Five and Standard Six were combined and moved to Secondary School.

Dr Mampane did Standard Six in 1974 and moved to Bopedi-Bapedi High School from 1975, matriculating in 1979. He then moved to the then University of the North, currently the University of Limpopo, where he followed a BSc Curriculum which he discontinued when Veterinary Science was introduced at the then MEDUNSA, joining the second cohort in 1983 and qualifying as a veterinarian in 1988.

Dr Mampane was sponsored by the then Lebowa Government since he was unable to afford the University fees since he came from a family that was not able to support his educational needs.

#### In his own words:

*"We were only three in class when we qualified, and I keep on boasting that I am the 3rd black person to qualify as a Vet in the RSA after Dr Emily Mogajane and Dr Griffiths Bawuti. My classmates were Dr Mike Modisane whom you all know, and Dr Dumisani Mtshali whose surnames came after mine alphabetically. As a class, we were supportive of each other and happy we could all make it far in our careers."*

*"On completion, I was appointed by the then Lebowa Government and started work immediately after qualifying in December 1988. The service was staffed by newly qualified Vets undergoing their compulsory military service (Army Vets). I was placed in Lebowa-Kgomo as a State Veterinarian and worked most of the then Lebowa Government territory. My duties included regulatory Services and Developmental Services in the form of clinical work."*

*"I take pride in Animal Health Technicians who ensured access to Animal Health Services and ensured our smooth entry into the system. We ran routine clinics on specific days and had many anecdotes of people marvelling at a black Vet performing surgical and other procedures."*

*"We were running Government livestock improvement projects which provided breeding material for the rural farmers. My other emphasis was on changing the herd composition by encouraging the reduction of male animals to a bare minimum."*



*I was also in charge of the Animal Health Programme of the erstwhile famous Lebowa Show, teaching people how to farm better with animals.*



*I was involved in Field Exposure of the Medunsa third-year class, with several people having trained under my supervision and enticed quite a few youths to study Veterinary Science – with a number who made it and are currently proudly practicing the profession.*

*The fact that we were few, however, came with a disadvantage in that we were kept busy all the time and never seriously considered our further studies and personal development. Colleagues are*

*encouraged to make full use of prevailing opportunities which will lead to new advancements being unearthed.*



*Going through the ranks, I worked as State Veterinarian, Senior State Veterinarian, and then Deputy Director when the new order was introduced and Government Services from various former administrations were integrated.*

*Thereafter I assumed the position of the Director of Veterinary Services in 2002, having acted in the position with the sudden departure of the then incumbent. In this position I ensured that funding for people interested in studying the profession was accessible and was also responsible for animal disease control of arguably the most disease-challenged of the*

*Provinces in South Africa. Noteworthy is my contribution to the formulation of various disease-control protocols and guiding actual application in the field, as I compiled the Ten Point FMD Charter for Limpopo Province which can be adapted for other Provinces to make FMD History, if well applied.*



*I collaborated with Researchers, mainly from the ARC-OVR in search of better disease control prospects and made it a goal to get presenters for the Annual Limpopo Veterinary Mini-Congress, where Researchers could present their work in front of an audience to get initial critique before being subjected to further panels.*

*I facilitated the process of full registration of graduates for the University of Nairobi and three of them are now registered whilst the others are authorized and working at full registration.*

*At the end of 2020, I retired as Director of Veterinary Services.*



*I accept the recognition in humility, knowing that it is not for me only but for all those who trained under similar conditions and made it to heading Veterinary Services in various Provinces. We thought we were just doing our work and this good gesture by SASVEPM is a great encouragement to do more, especially with time on our side now.”*

**“In the company of giants”**

18<sup>th</sup> Annual SASVEPM Congress

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Dr Willie Ungerer served as SASVEPM's first vice-president and as second president. He also served as a member of the Executive Committee for 6 years. After his term on the Executive Committee, his support for SASVEPM did not end. He continued his support through his Deputy Directorship for Epidemiology at the National Department of Agriculture, Rural Development and Land Reform by encouraging sponsorship of conferences and ensuring that officials of the Department were able to attend the SASVEPM Conferences.

Dr Willie Ungerer has also flown the SASVEPM flag by being the Secretary of the prestigious International Symposium for Veterinary Epidemiology and Economics (ISVEE) organising committee.

The Southern African Society for Veterinary Epidemiology and Preventative Medicine are honoured to announce the recipient for the 2020/21 Willie Ungerer Award:

### Dr Michael Botlhe Modisane



Dr Modisane has served the South African Veterinary profession for more than 30 years contributing through his role as Chief Veterinary Officer (CVO). His contribution has reached beyond South Africa to the SADC region, the continent and globally.

Dr Modisane is highly respected at the OIE for his contributions to the epidemiology, prevention, and control of animal diseases; he was elected as the President of the World Organisation for Animal Health (OIE) for a three-year term and has served in the OIE Council for six years.

Dr Modisane has been the CVO for South Africa for several decades and always been able to take on new challenges, such as writing the regulations for the veterinary profession regarding the zoonotic SARS 2 Corona Virus (COVID-19 strain) outbreak. He also presented very clear epidemiological reasoning for refusing the legislation on banning slaughter of old cows for human consumption in the time of the "Mad-Cow Disease" regulations promulgated by the EU and UK so many years ago, that would have had devastating consequences for our beef industry and food security in Southern Africa.

Dr Mpho Maja and he are a dedicated, hardworking team and have flown the flag for Epidemiology Internationally on behalf of South Africa.

# ORAL PRESENTATIONS

## Animal Health and Economics

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### Communal sheep farmer's knowledge and attitudes on the incidence of gastrointestinal parasites in sheep in the Eastern Cape, South Africa

Jansen, M.S.<sup>1</sup>

Nyangiwe, N.<sup>1,2</sup>, Yawa, M<sup>3</sup>, Mpendulo, T.C<sup>3</sup>, Jaja, I. F<sup>3</sup> & Dastile, M<sup>4</sup>

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<sup>3</sup>Department of Livestock and Pasture Science, University of Fort Hare, P. Bag X1314, Alice 5700, South Africa

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#### Background

Gastrointestinal parasites (GIPs) are known to affect small ruminant productivity worldwide especially in tropics and sub-tropics. Globally the most common nematode species known to affect small ruminants are *Haemonchus contortus*, *Trichostrongylus colubriformis*, *Teladorsagia circumcincta*. Intestinal parasites have become more difficult to manage in small ruminants because of the parasite's increasing resistance to several anthelmintics. Amongst livestock diseases, GIPs infection in ruminants results in adverse effects on feed intake, growth rate, carcass weight and composition, wool growth, fertility, and milk yield.

#### Objective(s)

The aim of the study was to assess the 'farmers' knowledge regarding the occurrence of gastrointestinal parasites in small ruminants in the Eastern Cape Province.

A questionnaire survey was carried out in three agro-ecological zones, humid (Wartburg), semi-humid (Allen waters), and arid region (Cradock commonages) from September to November 2018.

#### Results

About 107 farmers were interviewed during the survey, 68% were males and 32% were females. The highest percentage (85%) of livestock is owned by older age (46 to 65 years) and younger age (36 to 45 years) owned 15% across all vegetation types. Farmers reported that 82% of their animals are affected by wire worm during hot-wet months, followed by hot dry months (15%) and least during cold months (3%). The farmers perceived that 85% of young animals were susceptible to parasitic infection mostly by wireworm than mature sheep (15%) across all agro-ecological zones. Very few farmers (8%) had knowledge of the GIP lifecycle, other respondents (92%) do not know about the GIPs infection and their biology across all agro-ecological zones. It was also perceived in all agro- ecological zones that the increase in the occurrence of worms over the years is significantly associated ( $p < 0.05$ ) with resistance of the strain (wireworm) to deworming remedies (67%) and followed by changes in the weather patterns (33%). Farming experience was significantly ( $p < 0.05$ ) affected by gender and age. Significant higher helminths were reported in humid zones than other agro-ecological zones ( $p < 0.05$ ).

#### Discussion and recommendations

The study shows that farmers perceive that young animals are more susceptible to gastrointestinal parasites. Therefore, knowledge concerning gastrointestinal helminth biology and epidemiological infection patterns caused by nematode species is essential in developing appropriate control strategies, and farmers must adhere to remedy instruction; altering deworming remedies to avoid the build-up of resistance is key.

# Bovine brucellosis survey in Gauteng Province, 2019-2020

De Boni, L.<sup>1</sup>

Grobler, A.<sup>2</sup> & Geertsma, P.<sup>3</sup>

<sup>1,2,3</sup>Gauteng Veterinary Services, Johannesburg

liesl.deboni@gauteng.gov.za; adri.grobler@gauteng.gov.za; peter.geertsma@gauteng.gov.za

## Background

Bovine brucellosis, or contagious abortion (CA), caused by *Brucella abortus* causes substantial economic losses to cattle owners, and produces febrile illness in people who contract infection. Current compliance and enforcement of brucellosis control legislation is lacking. The national control policy is being revised to address the shortcomings.

## Objective(s)

To estimate the between- and within-herd seroprevalence of CA and explore management practices correlating with herd seropositivity.

## Methods

Epidemiological data were collected from owners/managers and serum was collected from all cows  $\geq 18$  months old from randomly selected Gauteng cattle herds. All sera were screened for antibodies against *B. abortus* using the Rose Bengal test (RBT), and all RBT-positive sera were confirmed by complement fixation test using a cut-off of  $\geq 30$  IU/ml for individual seropositivity. Between- and within-herd seroprevalence was calculated as a proportion of positive herds/cattle out of the total tested. Logistic regression analysis was used to explore associations between herd seropositivity and management practices.

## Preliminary Results

From May 2019 to October 2020, 254 herds (9094 cattle) were tested. With 11% (n=28) from Randfontein, the remaining herds were equally split between Germiston (n=115, 45%) and Pretoria (n=111, 44%) areas. Self-reported vaccine use ranged 47-60% for RB51 and 5-27% for S19. A quarter of owners (n=61) reported unvaccinated herds and 18% (n=43) did not know the vaccination status. Between-herd seroprevalence was 13.55% (95% CI: 9.8 – 18.4%), and within-herd seroprevalence was 1.73% (1.5 – 2.0%). Herds of large size (OR: 4, p=0.004), using communal grazing land (OR: 4, p=0.002), or known to be unvaccinated (OR: 3.7, p=0.006) experienced higher odds of being seropositive. Knowledge of current CA infection status correlated positively with their actual status (OR: 8.6, p=0.013).

## Discussion

The seroprevalence estimates remained unchanged compared with the 2015 survey, despite active test-and-slaughter programmes and reported herd vaccination coverage was poor. The barriers to CA control experienced by state veterinary services are discussed. To reduce prevalence, improving herd immunity by mass vaccination should be prioritised and resources from test-and-slaughter redirected for this. We need to understand the drivers and mechanisms behind CA vaccination behaviour to gain any control of the disease at this level of prevalence.

# Determinants of market choice and strategies adopted by small-scale pig producers in redline areas of Mpumalanga province, South Africa. A fractional outcome-Tobit model approach

Munzhelele, P<sup>1</sup>

Scheltens, M.L.<sup>1</sup> Oduniyi, O.S.<sup>2</sup>, Mbarjioko, C.<sup>2</sup>, Antwi, M.<sup>2</sup> & Fasina, F.O.<sup>3,4</sup>

<sup>1</sup>*Nooitgedacht Research Station, Department of Agriculture, Rural Development, Land and Environmental Affairs, Animal Research, Non-ruminant Sub-directorate, South Africa*

<sup>2</sup>*Department of Agriculture and Animal Health, University of South Africa, South Africa*

<sup>3</sup>*Emergency Centre for Transboundary Animal Diseases, Food and Agriculture Organization of the United Nations (FAO-ECTAD), Dar es Salaam, 14111, United Republic of Tanzania*

<sup>4</sup>*Department of Veterinary Tropical Diseases, University of Pretoria, Onderstepoort 0110, South Africa*

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## Background

Accessing a market is one of the frustrating challenges encountered in small-scale pig farming indicated in different studies. The market within the pig farming sector is regarded as competitive, with small-scale farmers having to confront many constraints, which impede their bargaining position within the market.

## Objective(s)

It was to investigate the factors affecting the market and the strategies adopted by the small-scale pig producers in the red-line areas of the Mpumalanga province

## Method and Materials

The study was conducted in the redline area of Mpumalanga, which includes Nkomazi, Mbombela and Bushbuckridge. Primary data was collected from small-scale pig producers in the redline area. A total of 121 small-scale pig producers were selected and interviewed through multistage random sampling technique using a questionnaire. The data was entered into Microsoft Excel, then coded and transferred into STATA v15 computer software. Descriptive statistics such as means, median, minimum, and maximum values, frequencies, percentages, and standard deviations were used to describe the data. Similarly, the study applied two different models (The Tobit model and fractional response model) to identify the factors that influence the market channel choice and compare the outputs of the models to guide future use by other researchers.

## Results

The results of the descriptive statistics show that about 38% of the pig farmers engaged in local market, 21% used abattoir while 33% adopted auction as a means of market channel. Furthermore, the results from the two models showed similar significant factors, an indication that there is little or no variation in the two models.

## Discussion and Recommendations

The small-scale farmers in the redline areas are not allowed to move the livestock from redline zone to free zone to reduce the risk of spread of animal diseases. Therefore, the establishment of dedicated auctions and markets including the processing facilities in the redline areas of Mpumalanga province will reduce the tendency to move animals out of the region with positive impact in reducing the risk of disease transmission. Furthermore, the access to veterinary services influence market access, the professionals should be involved in community and stakeholders' engagements and teaching of good farming practices to these farmers.



# An entry risk assessment of African Horse Sickness virus into the controlled area of South Africa through the legal movement of equids

Grewar, J.D.<sup>1,2</sup>

Kotze, J.L.<sup>1</sup>, Parker, B.<sup>2</sup>, van Helden, L.S.<sup>3</sup> & Weyer, C.T.<sup>2,4</sup>

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<sup>2</sup>South African Equine Health and Protocols NPC, Baker Square, Paardevelei, Cape Town, 7110, South Africa

<sup>3</sup>Veterinary Services, Western Cape Department of Agriculture, Western Cape Province, South Africa,

<sup>4</sup>Department of Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Private Bag X04, Onderstepoort, 0110, South Africa

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## Background and Objective

South Africa is endemic for African horse sickness (AHS), an important health and trade-sensitive disease of equids. The country is zoned with movement control measures facilitating an AHS-free controlled area in the south-west. Our objective was to quantitatively establish the risk of entry of AHS virus into the AHS controlled area through the legal movement of horses. Outcomes were subcategorised to evaluate movement pathway, temporal, and spatial differences in risk. A 'no-control' scenario allowed for evaluation of the impact of control measures.

## Method and Materials

Using 2019 movement and AHS case data, and country-wide census data, a stochastic model was developed establishing local municipality entry risk at monthly intervals. The model was developed in R with 10 000 iterations. Risk was aggregated to annual probability of entry. Sensitivity analysis evaluated model variables on their impact on the conditional means of the probability of entry. 95% credibility intervals (CI) reflected outcome uncertainty.

## Results

The median monthly probability of entry of AHSV into the controlled area ranged from 0.75% (June) to 5.73% (February) for all movements into the AHS controlled area of South Africa, with annual median probability of entry estimated at 20.21% (95% CI: 15.89%-28.89%). Control measures decrease risk by a factor of 2.8 on an annual basis.

## Discussion and Recommendations

The annual risk of entry compared well with the annual probability of introduction of AHS into the controlled area, which is ~10% based on the last 20 years of outbreak data. Direct non-quarantine movements made up most movements and accounted for most of the risk of entry. Spatial analysis showed that, even though reported case totals were zero throughout 2019 in the Western Cape, horses originating from this province still pose a risk that should not be ignored. Not only do the outcomes of this study inform domestic control, but they can also be used for scientifically justified trade decision making, since in-country movement control forms a key component of export protocols.

## Note

This abstract is based on the published manuscript: Grewar JD, Kotze JL, Parker BJ, van Helden LS, Weyer CT (2021) An entry risk assessment of African horse sickness virus into the controlled area of South Africa through the legal movement of equids. *PLoS ONE* 16(5): e0252117. <https://doi.org/10.1371/journal.pone.0252117>

# Genetic diversity of *Ehrlichia ruminantium* in *Amblyomma hebraeum* ticks from domestic ruminants of Ngaka Modiri Molema District

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## Background

Medicinal plants play a major role in meeting the medical and health needs of people, especially in developing countries. However, lack of access to modern veterinary facilities, poor visibility of animal health personnel and high prices of orthodox medicines, most farmers rely on traditional healers for treatment of livestock diseases, who in general, rely on administration of medicinal plants for treatment of livestock ailments.

## Objective(s)

The present study was conducted with the aim to document ethnopharmacological knowledge of medicinal plants used in the management of livestock ailments in three rural communities of the Eastern Cape.

## Method and Materials

This study was carried out in three rural communities between July 2009 and February 2010. Data was collected by administering pre-tested semi-structured questionnaires and participative field observations. For the interviews, a sample of 48 knowledgeable respondents were purposively selected. Data was analysed using descriptive and inferential statistics, determination of information consensus factor and fidelity level.

## Results

A total of 12 medicinal plants belonging to 9 families were used by local people to cure different ailments. High number of medicinal plants was claimed by male as compared to female. Roots and barks constituted the major plant part used, and the least being leaves (27.3%). Six plants each were used to treat diarrhoea and fertility, five plants to treat wounds, and two plants to treat scab.

## Discussion and recommendations

This study showed that Eastern Cape flora is rich with various plants which could be used as alternative to current conventional drugs. Further studies are needed to determine the minimum inhibitory concentrations, biological activities, and toxicities, and to characterize the plants chemical compounds.

# The quantification of cattle movement in the Bushbuckridge Local Municipality, Mpumalanga, and implications for trade and disease control

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In the Bushbuckridge Local Municipality (BLM), Mpumalanga, the size and economic importance of the local, mostly informal, cattle trade has been considered negligible to date by local policy makers. Opportunities for the local cattle farmers to access formal live or product markets remain severely limited, mainly as a result of movement restrictions associated with foot-and-mouth disease (FMD) control. Data, in the form of movement permits and monthly cattle registers were used to analyse movement and trade activity in the area over a four-year period (May 2015 - April 2019). The population fluctuated around 77 166 head of cattle, distributed between 9739 emerging rural livestock farmers. The proportion of animals/products moved ranged between 3.1 and 7.2 percent ( $0.04 \pm 0.02$ ). Movements were found to be highly seasonal ( $p < 0.001$ ) with the 'cool dry' season (April-July) being the most active. Most movements consisted of live cattle which were herded to their destinations. The vast majority of trade did not leave Bushbuckridge and was informal in nature. Farmers moved animals and products much further to access formal markets ( $p < 0.001$ ) than informal markets, and generally required use of motorised transport to do so.

The FMD outbreak of 2017 did not prove detrimental to the local cattle industry in the medium term. However, distinct changes to the overall Bushbuckridge herd dynamics were noted, with small scale farmers most severely affected. As a direct result of the heightened movement restrictions in this period, an estimated 96% of formal trade; 85% of informal trade, and 54% of local trade were lost. In 2018, an improvement in cattle prices stimulated farmers to access the formal marketplace, and an increase in the proportion of the cattle population moved was observed.

It was concluded that farmers pursue formal marketing options only when financially incentivised or pressurised by adverse conditions. Growing established local markets is likely the best way to assist the local population with market access, development, and poverty reduction. The key constraints to marketability of animals/products originating in the BLM were identified as the absence of a competitive market system and associated infrastructure such as FMD designated abattoirs; disease control regulations; and seasonality of offtakes.

# Spatial risk mapping of foot-and-mouth disease occurrence and spread in South Africa (2007-2016)

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## Background

Foot-and-mouth disease is a controlled disease in accordance with the South African Animal Diseases Act (Act 35 of 1984). The OIE classified South Africa as having an FMD free zone without vaccination in 1996. FMD control in South Africa includes animal movement restrictions placed on cloven-hoofed species and products, prophylactic vaccination of cattle, clinical surveillance, and disease control fencing to separate livestock from wildlife reservoirs.

## Objective(s)

The objective of this study was to create spatial risk maps for the FMD protection zone of South Africa.

## Method and Materials

Eleven risk factors associated with FMD occurrence and spread were used to build a weighted linear combination scores model incorporating FMD expert opinion. Smoothed Bayesian kriged maps were generated for the 11 individual risk factors and overall risk scores for FMD occurrence and spread.

## Results

The far north of Limpopo Province and the central areas of Mpumalanga were at higher predicted risk of SAT1 and SAT2 FMD outbreak occurrence. In contrast, the central areas of Limpopo and the southern parts of Mpumalanga were at higher predicted risk for FMDV spread. Highly effective cattle inspections were observed within areas that previously reported FMD outbreaks, indicating the differences in cattle inspection (surveillance) effectiveness across the study region. These differences are likely associated with FMD outbreaks detection rate.

## Discussion and Recommendations

The study finding indicates the necessity to enhance animal health surveillance at areas identified as high risk for FMD outbreak occurrence and spread. Detecting actual outbreaks and studying the disease trends within the FMD protection zone with vaccination will assist in strengthening the current FMD control measure.



# African swine fever among pig keepers in Gauteng Province, 2019-2021

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## Background

African swine fever (ASF) is a severe contagious viral disease of pigs that causes significant mortalities, for which there is no vaccine. It is endemic in north-eastern South Africa and pig movements within/to/from this 'ASF control zone' are strictly controlled. There have been three epidemics outside of the controlled area since its inception in 1935.

## Objective(s)

To describe the nature, extent and control of the third ongoing epidemic as it pertains to Gauteng Province and reflect on lessons learned.

## Methods

This descriptive report covers outbreaks among domestic pigs, April 2019 to May 2021. Infected sites were identified by positive Polymerase Chain Reaction test of tissue specimens, and most isolates underwent molecular analysis. Forward and backward tracing was conducted at all infected premises and auctions linked to outbreak sites for case finding. Maps were created using Qgis. We performed descriptive analysis of the outbreaks and describe control measures applied.

## Preliminary results

Thirty-five outbreaks were identified over 3 years causing  $\pm 3000$  cases among an estimated 16945 pig population. The numbers of individual pig keepers ( $n=296$ ) affected, and pigs exposed per location ranged 1–125 people and 5–9000 pigs. Some herds were confined, while others could roam. Majority of outbreaks occurred in informal peri-urban settlements (71%, 24/35) followed by rural farms (26%, 9/35). Of those at-risk of ASF with known outcomes, 9727 (65%) were humanely destroyed, 2515 (17%) were salvage slaughtered, 2344 (16%) died naturally and 322 (2%) survived. Except for five caused by ASF virus genotype II, most outbreaks were caused by genotype Ib. Poor implementation, indecision, insufficient resources, and restrictions on disposal of infectious waste hampered the response. Outbreak control impacted pig keepers financially and had psychological effects on both keepers and responders. Drivers of the outbreak included livestock auctions, husbandry systems, pig movements and possible swill-feeding.

## Discussion

To safeguard pig production, drastic measures were necessary to control the outbreak in 2019. Consequently, severe losses were suffered by individuals. Considering subsequent ASF control policy change, we recommend increased preparedness of veterinary services, coordination with disaster management committees, improved farmer education and training, risk mitigation at livestock auctions and trauma counselling during outbreak response activities.

# Interrelationships of warthogs, *Ornithodoros* ticks and African swine fever virus in South Africa

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African swine fever virus (ASFV) causes a contagious and lethal disease of domestic pigs. In the savannah areas of eastern and southern Africa the virus is maintained through sylvatic circulation in warthogs (*Phacochoerus africanus*) that do not become ill following infection, and eyeless argasid ticks of the *Ornithodoros* (*Ornithodoros*) *moubata* complex that live in warthog burrows. However, where biosafety measures such as strict eradication of outbreaks and secure confinement of livestock are not applied, the infection can be maintained in pig populations in the absence of wild hosts or vectors.

In South Africa, the disease was first seen in the north of the country where domestic pigs potentially had contact with warthogs and ornithodorids. Outbreaks elsewhere were initiated by movement of infected pigs or pork products from the north. Consequently, a controlled area was declared in 1935, covering the known distribution range of warthogs at that time and the movement of pigs and pork products was regulated. These measures successfully limited spread of ASF, but since 2016 there has been a series outbreaks south of the controlled area that cannot be linked to movement of infection from the north. Meanwhile, there has been a marked increase in small-scale pig farming throughout the country as well as widespread translocation of warthogs to the south of the controlled area in association with the growth of an extensive wildlife industry, where the extralimital warthogs have flourished to become an invasive species.

A recent structured serosurvey found no evidence that ASFV was being maintained in pig populations at the sites of disease outbreaks in 2016 and 2017. We tested warthog sera acquired opportunistically for presence of antibody to the virus, plus ornithodorid ticks collected at selected sites, and found evidence of geographic extension of sylvatic circulation of ASFV in ticks and warthogs beyond the controlled area in South Africa.

# Do unique challenges to controlling bovine tuberculosis in South Africa require unique solutions?

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## Background

All effects taken together, bovine tuberculosis (bTB) is having a long-term detrimental effect on bovine herds, irrespective of the production system, and many wildlife species in South Africa. The disease is not only maintained by domestic cattle but also by African buffalo and has to date been diagnosed in more than 20 wildlife species, including several rare and endangered species, thus having a potentially serious effect on conservation and biodiversity in South Africa.

Our previous research has shown that proximity of cattle to wildlife and sharing of water sources and grazing are major risk factors for disease transmission (1). A recent study involving focus group discussions with livestock owners have identified Social and cultural practices major risky practices for bTB. These practices included the consumption of undercooked meat and soured /raw milk and the acceptance of animals into a herd without bTB pre-movement testing following traditional practices (e.g. *lobola*, 'bride price').

Presently, the recognised bTB control strategy in South Africa is based on "test and slaughter", using the intradermal tuberculin test followed by the slaughter of test positive animals. Affected herds are placed under veterinary quarantine with movement restrictions until the outbreak is eradicated which can take several years or last indefinitely if the outbreak cannot be eradicated. In infected buffalo populations the same measures apply, often with no prospect of ever being lifted.

## Discussion and Recommendations

The current control strategy as based on historic OIE recommendations suitable for developed countries. However, it is neither practical nor viable in the context of a communal farming system and becomes unethical when dealing with valuable wildlife reservoir hosts (3). Transmission of bTB between wildlife and cattle has been demonstrated and emphasises the need for an effective, affordable and culturally acceptable control strategy to curb the spread of bTB in South Africa. In countries with similar challenges vaccination has been explored and found to be a promising in wild and domestic reservoir species and may hence be of value as a complementary tool for bTB control in South Africa.

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### Knowledge, attitudes and practices on bovine fasciolosis of smallholder cattle farmers in the North-West Province, South Africa

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#### Background

Fasciolosis is an economically important but neglected parasitic disease that affects many species of animals and humans worldwide. It has negative economic impact on smallholder cattle farmers that include mortality, liver condemnation, productivity losses, reproductive failure and infertility and treatment costs. The importance of awareness, knowledge, and practices of smallholder cattle farmers for the effective prevention and management of bovine fasciolosis cannot be overemphasized

#### Objective(s)

The aim of the current study was to assess the knowledge and practices concerning bovine fasciolosis of smallholder cattle farmers in the North-West Province. It was hypothesized that smallholder cattle farmers possessed poor knowledge, attitudes and practices related to bovine fasciolosis epidemiology and control.

#### Method and Materials

A structured questionnaire was used to collect data from 153 smallholder cattle farmers in Makapanstad and GaMotle villages in the Moratele District of the North-West Province. Descriptive statistics were used to analyse data on farmers' demographic information, farm characteristics and management practices. Chi-square tests were used to determine the association between demographic and farm management parameters with bovine fasciolosis knowledge.

#### Results

Most respondents were male (84.3 %), farm owners (81 %), spoke northern Sotho language (87.9 %), had informal or primary school education (56.2 %) and were extensive farmers (71.2%). A few (35.9 %) respondents knew of bovine fasciolosis and only 18.3 % of these were aware of the disease's local name. Farm management practices were significantly ( $P < 0.05$ ) associated with farmers' knowledge and practices on bovine fasciolosis. Farmers using the extensive management system were less likely to correctly associate grazing contaminated pastures with the transmission of bovine fasciolosis to cattle ( $P < 0.05$ ). Semi-intensive cattle farmers were more likely to correctly link the drenching of anthelmintic drugs with prevention of bovine fasciolosis. Farmers employing the extensive management system were less likely to correctly identify warm wet weather as a risk factor for bovine fasciolosis ( $P < 0.05$ ).

#### Discussion and Recommendations

The present study identified that most of the smallholder cattle farmers had inadequate knowledge regarding bovine fasciolosis especially the mode of transmission, risk factors and control. Training and awareness sessions on bovine fasciolosis for smallholder cattle farmers, are therefore, recommended.



### Distribution of aspergillosis in poultry and possible control measures in South Africa

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Aspergillosis is one common disease in commercial and backyard poultry farming, usually in birds of 7-40 days of age, mainly due to poor management practices. Most frequently it occurs in turkey poults, chicks, ducklings, and goslings. Its aetiology in poultry has been linked to a fungal species; *Aspergillus fumigates*, *A. flavus*, *A. niger*, *A. nidulans*, and *A. terreus*. Inhalation of a number of small, hydrophobic fungal spores (conidia) causes the condition, therefore after infective spores invade tracheal, nasal, bronchial and air sac epithelium, they penetrate the respiratory tissue and reproduces, thus causing granulomas. Treatment is generally not effective, and prevention is considered the best way of controlling the disease. At present there exists very little published information on the cases of Aspergillosis in poultry and its effect on health and food safety. This paper reports an update to available data on poultry Aspergillosis in South Africa, which will include pathogenesis of *Aspergillus*, health implications, food safety and recommendation for public health. The adoption of good agriculture practices, safe food handling practices, good sanitation practices and good hygienic practices during rearing, handling, processing, preparing, storing and transportation of poultry products will enhance the reduction of Aspergillosis cases in human and animal health. It is hoped that through access to information on toxigenic *Aspergillus spp.* research will be geared at controlling this pathogen and empower farmers and poultry product consumers on modalities to prevent, reduce and control Aspergillosis, in feed and food.

# Prevalence, antibiotic resistance, and molecular characterization of *Yersinia enterocolitica* isolated from retail meat and meat products in South Africa

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## Background

*Yersinia enterocolitica* infections impose a significant socioeconomic burden on human and animal health worldwide. However, very little is known about the incidences, virulence and antimicrobial profile of strains circulating among animals and animal products in the country.

## Aim

To investigate the prevalence, antimicrobial susceptibility profile and molecular diversity of *Y. enterocolitica* in meat and meat products across various retail outlets in selected provinces of South Africa.

## Method and Material

A total of 600 retail meat and meat products were collected during September 2019 to April 2021 from 4 cities across three provinces of South Africa. Samples included 298 raw meat, 172 raw processed meat and 130 ready-to-eat (RTE) meat and were analysed using the classical microbiological methods for isolation, identification and biotyping of *Y. enterocolitica*. Conventional PCR was performed for confirmation of isolates as well as serogrouping, screening of virulence (11) and antimicrobial resistance (18) genes. Phenotypic antimicrobial resistance profiles were determined against 11 antibiotics discs using Kirby Bauer disc diffusion method.

## Results

All 4 cities had *Y. enterocolitica*-positive samples with total prevalence of 12.3% (74/600). The prevalence was high in samples collected from raw meat 15.4% (46/298), followed by raw processed 11% (19/172) and RTE 6.9% (9/130) meat. All isolates were of biotype 1A; 6.8% belonged to the pathogenic bioserotype 1A/O:8. Most (79.7%) isolates harboured *ymoA*, *ystB*, *fepD*, *ail*, *virF*, *ystA*, *ystC*, *fepA*, *invA*, *myfA* and *virF* virulence genes. High antimicrobial resistance (AMR) frequency was observed for ampicillin (95.9%), cephalothin (83.7%), and amoxicillin (42.0%), respectively. For every phenotypic AMR resistance observed, corresponding genes were detected.

## Discussion and Recommendations

In this study, which is arguably among the first in South Africa to investigate AMR profiles, prevalence and characteristics of *Y. enterocolitica* strains circulating in retail meat products, high antibiotic resistance is alarming and of public health concern. Moreover, most of 1A bioserotypes have been associated with human cases and outbreaks around the world, suggesting that strains of *Y. enterocolitica* in the country have a theoretical pathogenic potential.

# Evaluation of factors affecting the use of biosecurity practices for the protection of ruminant livestock and farm workers against disease in the Free State and Northern Cape, South Africa

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## Background

Every year, the livestock industry suffers economic losses because of infectious diseases; therefore, farmers apply biosecurity measures to prevent and control animal diseases and zoonotic exposure.

## Objective

The goal of this study was to see how often different biosecurity measures were used to prevent infectious diseases in livestock.

## Method and Materials

We present survey results from 264 ruminant livestock farmers in a 40000km<sup>2</sup> area in the Free State and Northern Cape about their biosecurity practices. To characterize both farm attributes and the implementation of measures and assess the strength of the association between the two, we conducted a descriptive and a multivariable Poisson regression analysis.

## Results

Ninety-nine percent of farmers said they used at least one of the ten biosecurity practices investigated, with a median (M) of six and a range of zero to ten. The most widely used biosecurity measures were tick prevention (81%, 214/264), vaccination (80%, 211/264) and isolation of sick animals (72%, 190/264). Farmers used fewer biosecurity measures (M:4) when their herd size was less than 65 animals compared to farms with 65-282 animals (M:6; count ratio [CR]:1.22; 95% confidence interval [CI]:1.03-1.43) or farms with 283 to 12030 animals (M:7; CR:1.32; 95%CI:1.12-1.55). Furthermore, farmers who raised two animal species used more biosecurity measures (M:7; CR:1.17; 95%CI:1.02-1.34) than single-species operations (M:4), while there was no significant difference with multispecies (>2) farms (M:7). Farmers who grazed their animals on communal land used fewer biosecurity measures (M:3.5) than landowners (M:6; CR:1.25; 95%CI:1.03-1.52). Most farmers did not use all the same biosecurity measures when introducing new stock into their herd as they used regularly for their existing herds: 34% (41/122) applied multiple biosecurity measures, 36% (44/122) used a single biosecurity measure, and 30% (37/122) used none.

## Discussion and Recommendations

More awareness and technical assistance are needed to support the implementation of a biosecurity approach appropriate for the type of farm operation and resources available in the area. Certain farm features, primarily those related to metrics and commercialization were associated with biosecurity

uptake. More socioeconomic indicators, as well as additional aspects of land and resource ownership and tenure, should, however, be considered in the investigation of biosecurity uptake.



# Systematic review and meta-analysis of *Cryptosporidium* species infections in animal and human faecal samples in South Africa

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## Background

Cryptosporidiosis caused by protozoan parasites of the genus *Cryptosporidium* including *C. hominis* and *C. parvum* results in a normal cause of gastroenteritis in animals and humans.

## Objective(s)

This study presents a systematic review and meta-analysis approach of *Cryptosporidium* species prevalence studies in animals and humans published between 1980 and 2020 in South Africa.

## Method and Materials

Extensive searches were conducted on three electronic databases including PubMed, ScienceDirect and Google scholar. The meta-analysis was performed using the Comprehensive Meta-Analysis (CMA) program.

## Results

The findings indicate an overall pooled prevalence estimate (PPE) of *Cryptosporidium* spp. infections in animals and humans at 21.5% and 18.1% respectively. The PCR-RFLP appeared to be the most sensitive at 77.8% for detection of *Cryptosporidium* spp. infections followed by ELISA 66.7%; LAMP 45.4%; PCR 25.3%; qPCR 20.7%; Microscopy 10.1%; IFAT 8.4%; and RDT 7.9%. In animals, *C. parvum* had the highest PPE of 3.7%, followed by *C. andersoni* 1.5%, *C. ubiquitum* 1.4% and *C. bovis* 1.0%, whilst in humans *C. parvum* also had the highest PPE of 18.3% followed by *C. meleagridis* at 0.4%.

## Discussion and Recommendations

This study highlights the necessity for a “One Health” strategic approach promoting public hygiene, animal husbandry and regular screening for *Cryptosporidium* spp. infections in both animals and humans. The occurrence and prevalence of *Cryptosporidium* spp. infections in animals is of public health importance, hence, more studies involving both domestic and wild animals are required.

### Knowledge attitude and practices towards African Swine Fever (ASF) in uThukela District, KwaZulu Natal Province, South Africa

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#### Background

Educating farmers about the risk factors of ASF is vital for preventing the spread of ASF.

#### Objective(s)

The present study assesses the knowledge, attitude, and practices with respect to ASF among pig farmers in uThukela District, KwaZulu Natal Province.

#### Method and Materials

This study employed a cross-sectional structured questionnaire-based study design. All emerging pig farmers in the study area were invited to participate in the study. 426 consented to participate. Data was analysed using descriptive statistics.

#### Results

Majority of respondents (31.46%) said ASF was a viral and contagious disease, while 26.06% and 22.5% said it was a viral or flue like disease respectively. Only 19.95% described ASF as a contagious disease. Regarding susceptible animals, majority (44.84%) indicated pigs, followed by 39.67% who said all of the above (i.e., pigs, wild pigs and warthogs), 9.62% who said wild pigs, and 5.87% who said warthogs. Regarding how ASF spreads, 39.91% mentioned illegal movement of pigs, followed by 32.63% who said all the above (i.e., illegal movement of pigs, lack of foot bath or biosecurity and feeding swill), 19.25% who said lack of foot bath or biosecurity and 8.22% who only mentioned feeding of swill. Asked to identify clinical signs of ASF, 59.62% indicated all the above (i.e., high fever, death occurring in 15-45 days, and ocular discharge), 12.44% high fever, 12.44% death in 15-45 days, and 9.62% ocular discharge. Almost all farmers (92.72%) indicated that an outbreak of ASF would have a disastrous consequence economically. A high number (89.44%) were aware ASF is a notifiable disease, and all respondents said they would inform the nearest State Veterinary Office if they suspected an ASF case. Over half (57.28%) feed their pigs with swill and 38.50% hunt wild pigs.

#### Discussion and Recommendations

Although majority farmers displayed a good attitude towards ASF, majority displayed a lack of knowledge about ASF. Farmers engage in practices that are known risk factors for the spread of ASF. Findings of this study could be used to design educational campaigns aimed at improving the knowledge of the respondents and enforce a positive attitude and good practices towards ASF.

# Assessment of risk factors for African swine fever in Gauteng province

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## Background

African swine fever (ASF) is a highly infectious viral disease of porcine (pig) species. In sub-Saharan African countries, it is characterised as an endemic haemorrhagic fever with the ability to cause 100% mortality in infected pig. In South Africa, reports of ASF date as far back as 1926 and in 1935 the ASF control zone were defined in KwaZulu-Natal, Limpopo, North-West (northern parts) and the Mpumalanga (North-eastern parts) provinces. In 2012, for the first time since 1996, an ASF outbreak was reported by the Gauteng Veterinary services outside the ASF control zone. After this outbreak, Gauteng has continued to experience more ASF outbreaks.

## Objective(s)

The aim of this project is to study the potential risk of African swine fever spread to Gauteng with specific reference to areas that are currently known to be free of ASF and those that are currently experiencing ASF outbreaks. This will be achieved by obtaining data from smallholder farmers using questionnaires that will help determine the number of pigs kept by smallholder farmers and further help us understand the domestic pig value chain in Gauteng.

## Method and Materials

A purposive sampling method was used due to the unknown number of pig farmers. In 2020, a farmer's day was hosted in Tshwane district in the Winterveld and Hammanskraal area. Twenty-seven farmers gave written consent during the day, which allowed the researchers to conduct interview's telephonically (during COVID-19 outbreak) or face-to-face.

## Results

Data collected highlighted gaps in biosecurity, some farmers do not quarantine pigs on arrival and in a few cases, visitors are allowed to enter pig facilities. Results further show that there is evidence of informal movements or even trade in the area because farmers do not request permission to move animals.

## Discussion and Recommendations

The data gathered from questionnaires in the ASF free area highlighted the need to educate farmers on ASF, importance of biosecurity as well as the need to implement some of the basic measures that could aid in ASF control.

# Knowledge and attitude towards rabies disease among residents of two communities of eThekweni District, KwaZulu-Natal Province, South Africa

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## Background

A good understanding and attitude towards rabies disease are necessary to reduce the number of fatalities due to rabies among humans. There is no evidence of studies that have assessed the knowledge and attitude towards rabies among communities in eThekweni District, KZN Province, South Africa. In this study, we investigated knowledge and attitude towards rabies among communities in the study areas.

## Methods

A cross-sectional prospective questionnaire-based study design was adopted to achieve the objectives of this study. Data was collected from a simple random sample (n=548) of respondents  $\geq 18$  years using structured interviews. Proportions and their 95% confidence intervals were computed for categorical variables. A logistic regression model was used to assess factors that predict knowledge of rabies as the outcome. Significance was set at  $\alpha \leq 0.05$ .

## Results

Majority of respondents (86.50%, n=474) were of the view that receiving anti-rabies injection was important. But equally a very high percentage of respondents (89.78%, n=492) indicated that they would not seek medical attention immediately after being bitten by a suspected rabid dog. In addition, just over half (58.21%, n=319) of the respondents said they would quarantine a dog that had bitten someone, meanwhile 16.79% (n=92) said that they would not take any action regarding the dog. Worse still up to 32% (n=175) said that they did not think it would be appropriate to put-down a suspected rabid dog. However, 84.17% (n=335) of the respondents were able to produce a certificate of vaccination for their dogs. Pet ownership was the only significant ( $p < 0.05$ ) predictor of knowledge of the respondents, with people who owned pets two times more likely to be knowledgeable about rabies compared to those who did not own pets (Adjusted Odds Ratio: 2.30, 95% CI:1.33-3.40).

## Conclusion

The vaccination coverage as evidenced by ownership of vaccination certificates, was above the recommended 70% vaccination coverage recommended by the World Health Organization and needed to prevent an outbreak in the area. The attitude of the respondents towards rabies was not satisfactory. There is a need to implement rabies awareness in the study area that targets people who do not own pets.



### Genetic diversity of *ehrlichia ruminantium* in ticks collected from domestic ruminants in Ngaka Modiri Molema district, South Africa and its effect on diseases control

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*Ehrlichia ruminantium* (*E. ruminantium*), causative agent of heartwater disease transmitted to livestock by *Amblyomma hebraeum* (*A. hebraeum*) tick. Heartwater diseases affects the economy negatively due to mortalities, costs involved in disease treatment and control. The aim of the study was to investigate the presence of *E. ruminantium* and its genetic diversity in ticks within Ngaka Modiri Molema District, North-West Province, South Africa. Two hundred and ninety-two (n=292) pooled DNA samples were extracted from *A. hebraeum* ticks. Conventional polymerase chain reaction (PCR) was used to detect *Ehrlichia* spp. targeting the (*dsbA*) gene, followed by nested PCR targeting the *Map1* gene performed on DNA samples that were positive from the first PCR. One hundred and six (106) out of the (n=292) (36.3%) tick DNA samples were positive for the presence of *Ehrlichia* spp. Six (6) different *Map1* genotypes (NWUe1 – NWUe6) were detected from *E. ruminantium* tick samples, which were identical to about thirteen (13) genotypes from the NCBI GenBank database. These findings suggest that although not all *A. hebraeum* ticks are infected with *E. ruminantium*, those that are infected show a very wide diversity of the pathogen in the area. The diversity of pathogens includes those known to be very virulent both in South Africa and internationally. The study also highlights the importance of continuously setting up of standards (strategies) to control the vector until such a time other disease control measures will become effective. Furthermore, it shows how important it is to determine proper candidates for vaccines as a result of the wide diversity of the pathogen.

# Data Quality Assessment at Gert Sibande District abattoirs from the slaughter stock on surveillance areas from October 2018 to October 2019

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## Background

During the animal diseases outbreaks, infected animals were observed at abattoirs for slaughter without any disclosure by the farmers. The disclosed consignments's majority with red cross permits(RCP) were lacking uniformity, correctness, completeness, accuracy, poor design and outdated. This caused confusion and a potential risk to the abattoir personnel and the spread of animal diseases. Data red cross permit (RCP) was collected from the cases presented for slaughter at abattoirs. A significant number of poor quality data was identified.

## Objectives

To evaluate the data quality used for controlled animal diseases at abattoirs. To determine the magnitude of the poor-quality datasheets and risks associated.

## Method and materials

The data was derived from a raw data (RCP's), readily available at 14 Gert Sibande District (GSD) red meat abattoirs, these constitute 51% of the population (n=27) of provincial abattoirs (MP). 189 RCPs were collected from October 2018 to October 2019. Data was scrutinized visually; a 'universal two-layer big data quality standard assessment method' was used. 10 State veterinary areas were covered, 3 neighbouring provinces were also represented as the sampled abattoirs get consignments with red cross permit from these provinces the data (RCP) was collected, captured, cleaned, analysed, and interpreted.

## Results

The proportion of poor-quality data was high i.e, 47% of RCPs complied with (*Act 13 of 1956*) which was replaced by the *Animal Diseases Act 1984*. On a population of (n=189); rate of; correctness 11%, completeness 4%, inaccuracy 96%, ambiguity of design 18%. General non-conformances were 52%, general compliance was 48% on the RCPs. High percentages of poor-quality data were the clear indication that no credibility of data ever conducted and as such the RCP/s issued cannot be relied upon.

## Discussion and recommendations

The shortcomings identified were due to the lack of training, monitoring and evaluation of surveillance activities, no credibility of data ever conducted, leadership and lack of law enforcement. Results were presented on provincial scientific day; it was recommended that the results should be presented to all affected officials provincially through internal trainings and protocol should be drafted. These findings influence the DALRRD data credibility as the DALRRD RCP has similar loopholes. Epidemiology office should have the strategic review to evaluate the credibility of datasets.

# Socioeconomic factors and welfare of working equines in the 14 peri-urban areas around Mogalakwena Municipality

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## **Background**

During the nineteenth century, working equines were essential for agriculture, transport, and mining in South Africa. After mechanisation, their numbers declined, however, today they still play an important role in low income rural and peri-urban communities in South Africa. Mogalakwena Municipality is a newly evolved peri-urban community in Limpopo where working equines have socio-economic importance in 2021. The aim was to investigate the socioeconomic role of working equines and welfare indicators.

## **Methods**

Mogalakwena local Municipality is a category B local Municipality, located within the Waterberg District Municipality of Limpopo province, consisting of 3 proclaimed townships and 178 villages and 14 peri-urban settlements. Descriptive statistics were used, and continuous variables tested for normality and summarised depending on whether the data was normally distributed.

## **Findings**

Mogalakwena Local Municipality makes up 45% of the Waterberg district population, with a total population of 307 682 and 79 396 households. The local economy is based on mining and agriculture, as well as working equids. This the dominant mode of transport in the peri-urban areas of this Municipality include donkey carts, taxis and buses. The welfare needs of working equids in the area fall under the Society for the Prevention of Cruelty to Animals, the Highveld Horse Care Unit and the Provincial Department of Agriculture. Further research is needed on the working equids in the study area to determine the demographic variables (age, gender, breed, type and size) related to their purpose, value and welfare.

# GMP traceability, the hidden gem for veterinary disease control – Northern Cape experience

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## **Background**

Animal traceability in RSA is limited to the systems used by the stud industry and a few private companies. No official traceability system exists for the RSA. The Northern Cape has piloted a system in 2005 and is using the GMP traceability system for the past 15 years in a very limited format, not utilising the full extent of the program. The national traceability system (LITS) to be implemented for the RSA, after several meetings are not forthcoming with any new system and the implementation leaves the RSA vulnerable to numerous disease challenges.

## **Objective(s)**

The initial intention for using the software was to have a traceability system for the export of lamb meat to the EU, followed by the exports of goat meat to the middle east and Asia. This developed into the software being used for the identification of animals for disease control together with traceability.

## **Method and Materials**

The computer downloaded software is registered per farmer or official, after which the system is active and allow for the capture of cattle, sheep, goat, pigs, camels, emus and water buffalo.

The animal's information is captured on the GMP Software, per owner and property, then exported to the national database. The data can now be verified on the national database from any computer or smartphone.

## **Results**

The national database allows one to have access to all captured animal data, including all vaccination, disease reports and movements if it was captured and maintained. This allows the veterinary services to verify animal status for disease and place of origin.

## **Discussion and Recommendations**

The availability of the software and the possible use of it in the RSA may prevent the spread of disease from properties to new properties and markets. This program had far-reaching success for the Northern Cape and should be explored and used on a national basis.

## **References**

[www.gmptags.co.za](http://www.gmptags.co.za)

### Feasibility of classifying beef feedlots in South Africa as compartments

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#### Background

Recent incursions of controlled animal diseases in South Africa have re-ignited the question as to whether compartmentalisation would be a feasible mechanism through which livestock industries can mitigate risk and become resilient to outbreaks of disease that have a major impact on their business. Specifically, the incursion of foot-and-mouth disease (FMD) in South Africa's previously recognised FMD free zone in 2019 has had an impact on the prospects for the export of beef products from the country.

#### Objective(s)

The primary objective of this scoping study was to establish the basis for, and the potential challenges that will face, the beef feedlot industry in South Africa should they wish to make use of the compartment model.

#### Method and Materials

The primary documentation reviewed was the World Organisation for Animal Health's Terrestrial Animal Health Code (TAHC) where international standards on animal health are set. The TAHC includes standards on compartmentalisation, traceability and on individual diseases. Since a legislative foundation is critical for the establishment and maintenance of compartments, and since compartments are relevant to specific diseases, South African law regarding animal diseases was also reviewed, including the Animal Diseases Act and its regulations, the published list of controlled and notifiable diseases in the country and their status. Relevant Veterinary Procedural Notices published by the South African Government were also evaluated.

#### Results

The key findings of this study highlight the need for the industry to:

1. Have a clear goal as to why compartmentalisation would be beneficial in a practical trade sense, both for existing and future trade partners
2. Identify those diseases that are targeted and feasible in terms of creating a higher health status through compartmentalisation.
3. Explore whether traceability is feasible in the context of compartments, and at what level traceability would be practical in terms of how far back along the commodity chain traceability is possible, and whether stock for the feedlots can be sourced from herds of known health status.
4. Explore whether any accreditation or surveillance schemes exist that may supplement compartmentalisation requirements.
5. In the same vein explore whether the partnership the industry has with both the Provincial and National Veterinary Services is evolved enough to ensure the sustainability of the regulatory oversight required by Government for compartments.

#### Discussion and Recommendations

There are challenges with regards to compartmentalisation for the industry, and while they are not insurmountable, the decision to compartmentalise should be approached with a clear goal in mind and an understanding of the challenges that exist to making it a sustainable and resilient system. This scoping study is by no means exhaustive. In particular, the economic benefits of compartmentalisation should be studied in more depth, as well as examples of this process outside of South Africa.



# The epidemiology of African Swine Fever outbreaks outside of the controlled area of South Africa in 2016-2021

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African swine fever (ASF) is an acute haemorrhagic fever in domestic pigs. It causes major economic losses, threatens food security, and limits pig production in affected countries. In Africa, ASF has potentially devastating effects on the commercial and subsistence pig production sectors, but the greatest losses are usually inflicted on the non-commercial pig producers who are less likely to implement effective prevention and control strategies or basic biosecurity. In South Africa, cases of ASF were largely confined to the northern parts of the country, with sporadic outbreaks in domestic pigs occurring due to the spill over from the sylvatic cycle. In 2012, South Africa experienced the first ASF epidemic associated with transmission of the disease via the domestic cycle. The epidemic was controlled by implementing movement restrictions and culling of infected and in-contact pigs. However, in 2016, the veterinary services of the North-West and Free State provinces reported cases of ASF affecting subsistence and small-scale pig farmers in peri-urban areas. These cases signified a marked shift in the epidemiology of ASF in South Africa from a sylvatic cycle spill-over situation to localised domestic cycle outbreaks. Following these initial reports, ASF domestic cycle outbreaks have spread and been reported in Mpumalanga, Gauteng and Northern Cape provinces. In 2020 the first ASF outbreaks were reported in the Eastern Cape province, followed by outbreaks in the Western Cape province in 2021. Here we report the phylogenetic relationships between outbreak strains in the various provinces and highlight the potential risk factors contributing to the dissemination of ASF in the formerly ASF-free areas of South Africa.

# Spatio-temporal clustering and risk factor analysis of bovine *theileriosis* (*theileria parva*) in Zimbabwe from 1995 to 2018

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## Background

Bovine theileriosis is considered the most important tick-borne disease of cattle in sub-Saharan Africa. It presents a huge economic threat to cattle production in Zimbabwe. The disease is a major constraint limiting livestock production and improvement through cattle mortalities and widespread morbidities. Despite the huge threat posed on the Zimbabwean cattle industry, bovine theileriosis remains a disease with scant and outdated distribution dynamics data in the country.

## Objective(s)

To investigate the spatial and temporal distribution of bovine theileriosis and to establish the high-risk areas and associated risk factors of the disease in Zimbabwe.

## Method and Materials

Records on bovine theileriosis spanning 23 years (January 1995 to December 2018) were obtained from the Epidemiological Unit of the Division of Field Veterinary Services of Zimbabwe (DVSZ). Data were analysed using SatScan® version 9.4.6 for spatio-temporal clustering and Studio R® version 11.0 for regression analysis.

## Results

Communal farmers (72%), adult cattle (29%), the year 2018 (60%) and the hot wet season (42%) had the highest proportion ( $p < 0.05$ ) of bovine theileriosis cases recorded. Seven out of the country's ten provinces and 36 of its 59 districts were affected. Bovine theileriosis was observed to lose seasonality when cases rose exponentially in 2018. Five and four high-risk clusters of bovine theileriosis were detected using one-year and one-month time aggregate, respectively, all within the last eight years of the study (2011–2018). Two potential risk factors (province and farming system) were significantly ( $p < 0.050$ ) associated with bovine theileriosis occurrence.

## Discussion and Recommendations

Bovine theileriosis was found to be widespread and if left unchecked will spread and adversely affect the whole country. Improved theileriosis surveillance and control is warranted. Recommendations for control and prevention strategies revolve around better farmer awareness about the disease, correct and consistent use of acaricides, cattle movement control and disease surveillance.

# An evaluation of the notifiable avian influenza surveillance system in Gauteng Province (2017-2020)

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## Background

Notifiable avian influenza (NAI) is any influenza A virus of serotype H5 or H7 affecting poultry. Recently, highly pathogenic avian influenza outbreaks caused mass global poultry mortalities and economic losses. In South Africa, Gauteng's NAI surveillance system (NAISS) monitors wild birds and commercial/backyard poultry through active and passive surveillance.

## Objective(s)

To evaluate three attributes (representativeness, predictive value positive and acceptability) of the NAISS from 2017-2020 and offer recommendations for improvement.

## Methods

The 2001 CDC Updated Guidelines for Evaluating Public Health Surveillance Systems were applied. NAI test results of commercial poultry submitted to the NAISS were compared to those recorded by the independent South African Poultry Association's Poultry Disease Management Agency to determine representativeness. Backyard poultry surveillance locations were visually compared to 2016 backyard poultry census locations. Predictive value positive (PVP) was the proportion of screening-positive commercial poultry tests (by enzyme-linked immunosorbent assay) confirmed positive by haemagglutination-inhibition or polymerase chain reaction tests. Acceptability was evaluated by questionnaire. Attributes were rated from low to excellent using percentage scores.

## Preliminary results

The NAISS detected 411 screening-positive test results (n=263 in commercial poultry, n=148 in backyard birds) and five PCR-positive results in wild birds. Representativeness of NAISS commercial poultry tests improved from 27.5% (96/349) in 2018 to 81.6% (775/950) in 2020. Backyard bird surveillance was geographically representative of provincial backyard bird distribution. PVP was low (4/61, 6.6%) and a high number of indeterminate screening-positive outcomes (129/190, 67.9%) was detected. Acceptability was excellent (mean score 81.2%, 31 informants interviewed). Respondents were agreeable to participate in the NAISS and considered it user-friendly. However, the frequency of screening and high rate of false positives raised concern. Resistance from backyard bird owners and the logistics of backyard bird surveillance created challenges for technicians in the field.

### Population structure of *Listeria monocytogenes* isolated from the environment, meat and meat products in South Africa

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#### Background

*Listeria monocytogenes* (*Lm*) is one of the most well-characterized foodborne pathogens in the world; however, in South Africa (SA), there is lack of information on the molecular characterisation of the pathogen in meat and meat products.

#### Objective(s)

The aim of this study was to investigate the population structure and genomic diversity of *Lm* isolated in food producing facilities, meat and meat products in SA

#### Method and Materials

In this study, 217 *Lm* isolated from the environment, meat and meat products analysed using Whole Genome Sequencing (WGS) to identify virulence genes, PCR-serogroups, and sequence types (STs).

#### Results

South African isolates of *Lm* were classified into two main groupings, lineages I (63%) and II (37%) which were differentiated into four PCR-serogroups (IIa, IIb, IIc and IVb) and representing 20 sequence types (STs). The most common STs were ST204 (n = 32, 14.7%), ST2 (n = 30, 13.8%), ST1 (n = 25, 11.5%), ST9 (n = 24, 11.1%) and ST321 (n = 21, 9.7%), respectively. Clustering analysis of the sample categories and the STs showed that isolates from “processed beef meat” and “raw-poultry meat” collected from “Butchery” and “Retail outlets” respectively harboured more heterogeneous STs (ST1, ST2, ST3, ST5, ST7, ST9, ST87, ST121, ST155, ST204, ST321, ST820, ST876 and ST1428) of *L. monocytogenes*. Pathogenic islands were present in 100% (LIPI-1), 67% (LIPI-3) and 12% (LIPI-4) of the isolates. Mutations leading to premature stop codons were identified *inlA* virulence genes

#### Discussion and Recommendations

This study is the first to report on the characterisation of *Lm* strains isolated from meat and meat product using whole genome sequencing in SA. The application of WGS in the current study has provided a partial overview of genomic diversity of *Lm* strains that are circulating in South African meat products. It also adds to the global data on genetic diversity of *Lm* from SA.

# Detection and quantification of antibiotic residues in communal goat's milk in Mahikeng Local Municipality, South Africa

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## Background

With poverty and a daily increase in the human population in South Africa, alternative protein sources are required. Goat's milk could be targeted as an important means to eradicate malnutrition since many rural communities depend on small ruminant farming for survival. However, the risk of food contamination by veterinary drug residues is one of the significant problems to public health due to the irresponsible use of veterinary drugs and the accessibility to antibiotics over the counter.

## Objectives

A total of 100 goat farmers were interviewed using a questionnaire on handling and use of veterinary drugs. Simultaneously, 266 goat raw milk samples were collected from August to October 2018.

## Materials and methods

The samples were screened for the presence of amoxicillin, tetracycline, sulfamethazine, erythromycin, and streptomycin residues using the Enzyme-Linked Immunosorbent Assay (ELISA) and High-Performance Liquid Chromatography (HPLC).

## Results

All farmers (100%) were found to be using veterinary antimicrobials in animal farming. The majority (56%) of them reported that they use antibiotics only when their animals are sick or showing signs of infection. All (100%) participants responded positively when asked about antibiotics guidelines. However, 11% of them were not concerned about the correct dosage, 4% lacked knowledge on the route of administration, and 10% did not know the duration of therapy. ELISA results showed that erythromycin, sulfamethazine, and amoxicillin exceeded the accepted Maximum Residual Levels (MRLs) established by *Codex Alimentarius* in 94.7%, 82.3%, and 35.3% of analyzed samples, respectively. Tetracycline was present in all (100%) analyzed samples, and streptomycin was detected in 18.7% of samples; however, these results were below the established standards. Furthermore, the HPLC method showed that 90% of milk samples analyzed were positive for streptomycin and 40% for tetracycline, but these values were below the accepted MRLs. Approximately 76.6% of samples confirmed to be exceeding the established MRL for sulfamethazine and 10% for erythromycin. Unfortunately, in this study, amoxicillin was not detected in the confirmatory method.

## Discussion

Data on this study suggests that there is a need to increase awareness on the presence of antibiotic residues in animal food origin and its possible public health implications.



# Village chickens as a source of antimicrobial resistance and emerging diseases: Eastern Cape case study

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## Background

Village chickens serve as a source of income and ensure food security in the rural Eastern Cape Province. Information on the demographics, remedies used by village chicken farmers as well as on the prevalence of chicken diseases is scant.

## Objectives

The objectives were to study the demographics of village chicken farmers in the province; to identify the remedies used for treatment and prevention of chicken diseases and to estimate the seroprevalence of Newcastle disease (NCD), avian infectious bronchitis (IB), avian influenza (AI) and *Mycoplasma gallisepticum* (MG).

## Method and Materials

Two-stage sampling was used to select three villages per municipality and five households per selected villages were interviewed using a questionnaire.

Chicken sera (n=1007) from selected households were sampled and screened for NCD, AI, IB and MG using ELISA. The cross hemagglutination inhibition test (HI) was used to test ELISA positive NCD and AI samples.

## Results

Females and pensioners mainly represented village chicken's owners (69.05% and 66.06% respectively). Farmers with only a primary school level of education were predominantly involved in poultry farming (47.14%). Three groups of remedies were mainly used: traditional remedies dominated by "ikhala" (*Aloe ferox* Mill.), tetracyclines and "sulpha" products. A small proportion of farmers (12.61%) used chicken vaccines. The overall seroprevalence of NCD, AI, IB and MG in the province was found to be 69.2% (95% CI 51.9-86.5%); 1.8% (95% CI 0.2-3.4%); 78.5% (95% CI 74.9-82%) and 55.8% (95% CI 41.3-70.3%) respectively, with clustering found at the District level. HI tests indicated that the chickens were exposed to the NCD vaccine. HI test on AI ELISA-positive samples detected H6-specific antibodies (H6N2).

## Discussion and Recommendations

The use of antibiotics by untrained poultry farmers with low level of education could serve as a source of antimicrobial resistance (AMR). Due to the lack of vaccination and biosecurity, village chickens may serve as amplification hosts which increases the probability that virulent Newcastle virus could spill over into commercial poultry flocks. The zoonotic threat of circulating H6N2 viruses raise concern due to their mutation and reassortment among chickens. A further study on the role played by village chickens in this regard as well as on the economic impact of these diseases is recommended.

# POSTER PRESENTATIONS

## Animal Health and Economics

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### AHT Presentation

#### Effect of different dietary protein levels on goats' blood parameters of Tswana goats reared in extensive production system

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#### Background

Analysis of haematological parameters allows for the monitoring and evaluation of the health and nutritional status of animals.

#### Objective

This study aimed to determine the impact of different dietary protein levels on goat's blood parameters.

#### Method and materials

Twenty-four female Tswana weaner goats with similar body weights and age (3 months old and  $10.56 \pm 1.28$  kg) were used for the experiment. Animals were grouped into three treatment groups of eight goats each in a randomised block design according to live weight. Animals were fed of protein 23.51g/kg and energy 8.55g/kg DM and then given Lucerne ad libitum. Blood samples were collected on the first day of the experiment and then weekly until the end of the experiment (365) days. Samples collected were analysed for blood biochemistry using the IDEXX Catalyst Chemistry analyser at Animal Health Laboratory(North-West University). blood nutritional metabolite data were analysed using repeated measures on the procedures of SAS (SAS, 2015) on the General Linear Model (GLM).

#### Results

Different levels of protein supplementation in goats significantly affected blood glucose, albumin, albuglobulin and urea ( $P < 0.05$ ). It was also noted that haematological parameters were influenced significantly ( $P < 0.05$ ) by physiological stages of animals.

#### Discussion and recommendations

Supplementation of Protein influenced blood parameters that gave an indication of the nutrition and energy status of animals. Incident of fluctuations in some parameters were observed during this experiment and this might have resulted from undetected minor infection, weather extremities and poor management in the research area. The adoption of improved supplementary feeding practices by the communal farmers may be improved by creating awareness among goat reared through on-farm trials and participatory approaches. Future studies on the supplementation feeding by the goat farmers in the study areas can be carried out to assess impact of different dietary protein levels on blood parameters of Tswana goats in semi- arid area of North-West Province of South Africa.

## Post-grad Presentation

### Molecular Characterization and Mapping of bovine trichomonas in the North-West Province, South Africa

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#### Background

There is an alarming rate of bovine reproductive tract diseases in parts of the North-West Province of South Africa. This can be supported by the high number of clinical samples (sheath wash) submitted to the Vryburg state veterinary laboratories in the Dr. Segomotsi Ruth Mompoti district municipality of the Northwest province to test bovine trichomonosis caused by the Parabasalia *Tritrichomonas foetus* (*T.foetus*). The traditional methods of culture followed by microscopic examinations of wet mounts remain the preferred diagnostic protocol for *T. foetus* across South African state veterinary laboratories. This, however, may inaccurately identify other Trichomonadid protozoa in clinical samples as the bovine pathogen *Tritrichomonas foetus* (*T.foetus*).

#### Objective

To investigate the occurrence and identification of the species most commonly responsible for bovine trichomonosis in the North-West Province of South Africa.

#### Method and Materials

Two hundred and thirty-nine (n=239) sheath wash samples were collected from bulls of various breeds and ages in 5 sub-districts of Dr. Ruth Segomotsi Mompoti Municipality between October 2018 and October 2019. All the samples were subjected to culture, followed by morphological evaluation using microscopic. Fifty-one isolates were identified using preliminary screening Real-time Polymerase Chain Reaction (PCR), and the isolates were then subjected to conventional (PCR) methods for confirmation.

#### Results

The real-time PCR screening of all the samples (n=51) revealed that 41/51 isolates were identified as *T.foetus*, 6 samples were negative, and 4 were inconclusive. Further, a conventional PCR was performed using the *trichomonas* universal TFR1 and TFR2 primers to amplify the 5.8S rRNA gene and internal transcribed spacer regions (ITSRs). The results showed that 12/51 isolates were confirmed as *T.foetus* while the remaining samples could not be identified.

#### Discussion

The BLAST tool from the National Center of Biotechnology Information (NCBI) database revealed 12 positives out of 51 samples namely *T. foetus* (MT750331.1, MT750329.1, MT750327.1 MT750330.1, MT742151.1, MT742149.1, MT742152.1, MT752966.1, MT752967.1, MT742150.1, MT750328.1). The maximum likelihood phylogenetic analysis showed that some isolates from this study were closely (80%- 99%) related to *T. foetus* isolated from Namibia.

## Nutritional status of cows reared on natural pasture in communal areas around Mafikeng in the North-West Province

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### Background

Animal reproductive health can be affected by physiological disorders that arise because of mineral imbalances. Serum metabolic profiles have been widely used in animal health as a predictive tool for abnormalities in the reproductive system and risk assessment of cattle metabolic disorders.

### Objective

This study aimed to evaluate the nutritional status of cows experiencing reproductive conditions.

### Method and materials

Questionnaires (135) were distributed to farmers who reported cow reproductive conditions at the NWU (Dale Beighle) Animal Hospital. A total of 179 blood samples from the cows and pasture samples from grazing areas were analysed for mineral content using the ICP-MS 300Q machine. Serum metabolite concentrations were also tested using the IDEXX Catalyst Chemistry analyser. Descriptive statistics were used to show the distribution of the minerals and serum metabolites levels across the reproductive conditions. The data were analysed using SPSS version 25.

### Results

This study revealed that natural pastures had significantly lower ( $P < 0.05$ ) phosphorus ( $9.412 \pm 1.622$ ), zinc ( $0.209 \pm 0.125$ ), copper ( $0.389 \pm 0.125$ ), and iodine ( $2.858 \pm 1.943$ ). Significantly lower ( $P < 0.05$ ) zinc was also seen in cows experiencing abortions and dystocia. Concentrations of iron ( $\bar{x} = 12.688$  mg/L), magnesium ( $\bar{x} = 46.945$  mg/L), and phosphorus ( $\bar{x} = 42.751$  mg/L) were significantly higher ( $P < 0.05$ ) in cases of downer cow syndrome. Significantly higher ( $P < 0.05$ ) Urea/BUN concentrations ( $\bar{x} = 93.143$  mmol/L) was seen in cows with dystocia. The incidences of reproductive conditions were found to be significantly related to cow parity ( $P = 0.003$ ), knowledge about animal diseases ( $P = 0.001$ ), feeding system ( $P = 0.026$ ) and lack of use of veterinary services ( $P = 0.005$ ).

### Discussion and recommendations

Essential mineral deficiencies on natural pasture contribute to the poor nutritional state of cows reared in communal farms. Abnormal metabolic profile signifies nutrient deficiency on cows leading to impaired cow reproduction. This study provides a guiding tool that can be considered by veterinary practitioners and scientists when developing nutritional plans to reduce cattle losses and increase production through reproductive health. Proper adjustments of nutritional programs and supplementation of the cows during peripartum periods are essential to prevent the occurrence of reproductive conditions in communal farms.

### AHT Presentation

#### Prediction of heavy metal protein, resistance and virulence features in highly tetra-fluoroquinolone resistant *Campylobacter fetus* subsp. *fetus* and *Campylobacter fetus* subsp. *venerealis* Isolated in South Africa

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The anthropogenic factors associated with the application of antibiotics in human and veterinary medicine and specifically in modern agriculture have led to an important evolution of resistance mechanisms among zoonotic bacteria. This study aimed was to determine the incidence *Campylobacter fetus* subsp. *fetus* and *Campylobacter fetus* subsp. *venerealis* from the sheath wash obtained from bulls using molecular assays, investigate their antimicrobial profiles using disc diffusion methods and investigate the presence of heavy metal protein as well as genes involved in the occurrence of multidrug resistance using the whole genome sequencing.

The results of the study revealed the presence of *Campylobacter fetus* subsp. *fetus* and *Campylobacter fetus* subsp. *venerealis* in different municipalities of the North-West. The results of antimicrobial tests showed different levels of resistance for instance *Campylobacter fetus* subsp. *fetus* (91.7%), *Campylobacter fetus* subsp. *venerealis* (100%) display resistance to tetracycline. On the other hand, *Campylobacter fetus* subsp. *fetus* (91.7%) and *Campylobacter fetus* subsp. *venerealis* (83.3%) exhibited resistance against enrofloxacin meanwhile *Campylobacter fetus* subsp. *fetus* (100%) and *Campylobacter fetus* subsp. *venerealis* (100%) display resistance to norfloxacin.

The whole genome sequence result reveals the presence of different genomic features involved in the heavy metal resistance such as CzcD(Cobalt-zinc-cadmium resistance protein), Tellurite resistance protein (tehA), Mercuric ion reductase (Mer), Arsenic efflux pump protein (Ars). In addition, numerous efflux pumps involved in bacterial resistance were encoded such Broad-specificity multidrug efflux pump (YkkD), Outer membrane protein (TolC), ABC transporter multidrug efflux pump, fused ATP-binding domains, mobile genetic element (MGEs), Na<sup>+</sup> driven multidrug efflux pump and Transcriptional regulator, MarR family. The genome sequence also identified genes associate with bacterial motility and chemotaxis (fliI, flip, flhA, fliM, cheY, fliQ and fliN), genes associate with production of cytotoxin (Cdt A, B, and C), adhesion and colonisation (VirB10 and VirB9) and invasion (YidC, YidD and CiaB).

This study concluded that the main mechanisms of resistance encoded in the isolated bacteria are quietly linked to the presence of superfamilies of bacterial enzymes and due to their diversity of resistance genes encoded in them. Furthermore, the antibiotics resistance observed in these zoonotic bacteria is a serious threat to animal and public health.

# Facilitating sustainable animal health solutions through understanding livestock keepers' knowledge, attitudes, perceptions and practices of livestock vaccines

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## Background

Animal husbandry is one of the most important farming activities in South Africa; it constitutes the primary source of livelihood for a number of rural farmers. However, livestock production remains threatened by disease outbreaks. Preventive measures, such as animal vaccinations could play a significant role in the curbing of disease outbreaks. Farmers need to develop sufficient knowledge of the disease, adopt appropriate attitudes for preventing the diseases, and direct their perceptions towards practices that optimize livestock production while minimizing the risk of disease outbreaks and other causes of livestock loss.

## Objective(s)

To report findings of the study that investigated smallholder farmers' knowledge, attitudes, practices and perceptions towards primary animal healthcare, especially the use of animal vaccine for disease prevention.

## Method and Materials

Household interviews were conducted in Eastern Cape, Free State, KwaZulu-Natal, Mpumalanga and North-West provinces.

## Results

Farmers understood the roles of vaccines where 95% agreed that vaccines are for prevention of diseases. About 90% of farmers indicated that they see positive results from using vaccines. Within the provinces, it was agreed that vaccines are readily available to farmers; however, affordability was a challenge, hence, a strong sentiment that government should always pay for livestock vaccines. Although there were no disease outbreaks in their areas, farmers indicated that vaccines were important to prevent such outbreaks to avoid losses should they happen. Farmers preferred a multi-species vaccine that can be used to prevent multiple diseases.

## Discussion and Recommendations

From all study sites, farmers shared similar knowledge, attitude, perception and practices of animal vaccines and their use for disease prevention. There is need to improve access to information for farmers in terms of primary animal health care practices, technical information on livestock production, and product information on the range of animal vaccines and medicines that are available in the market. Development of animal health policies using the 'One Health' approach is advised to ensure a collaborative, multisectoral, and transdisciplinary effort at local and national level to achieve optimal health outcomes. Implementation of the 'One Health' approach policies will reduce production losses, improve livelihoods, alleviate poverty, reduce food insecurity, and facilitate better marketing opportunities for livestock keepers.



## AHT Presentation

### Determination of Antibiotic Residues in Fish Sold in the Supermarkets around Mafikeng, North-West Province

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#### Background

Globally, aquaculture is the fastest-growing animal-derived food producing sector and of great importance for human nutrition (Herrera et al. 2005). Antibiotics are used for treatment of both human and veterinary diseases. Regardless of the beneficial effect of these antibiotics, antibiotics in food products have the ability to cause serious side effects for human health (CDC, 2009 and Ekene et al., 2014), such as becoming resistant to the most commonly prescribed antibiotic treatments, resulting in prolonged illness and greater risk of death (Pallapothu, 2014). The occurrence of food borne in fish products is a function of the harvest environment, hygienic conditions and practices associated with equipment's and personnel in the processing environment (Kasozi et al., 2016). In order to protect human health from the potentially harmful antibiotic residues several authorities such as European Union and China have established maximum residues levels (MRL/ ug/kg) for substances authorized for the use of veterinary drugs in food producing animals (Wen et al., 2006).

#### Aims

Antibiotic residues, bacterial resistance in fish sold in different supermarkets in Mafikeng were determined and the reliability of different methods used to detect antibiotic residues was assessed.

#### Method and Materials

50 fish samples were randomly purchased from different supermarkets in Mafikeng and analysed at microbiology laboratory. The skin and bones were removed. Biochemical tests were performed according to manufactures instructions for bacterial morphology and identification. Sensitivity testing was done with paper disc diffusion method, according to the techniques described by Kirby (Bauer et al., 1966). Bacterial isolates were grown on nutrient agar at 37 °C for 18 to 24 hours. For each antibiotic, extraction procedure was done and analysed for antibiotic residue on the Elisa, TLC and HPLC machine.

#### Results

Morphology and biochemical tests showed that all samples were contaminated. Bacterial resistance test was represented as Resistant, Intermediate and Susceptible, following recommendations of the Clinical Laboratory Institute standards (Wayne, 2009; Wikler, 2007). Most fish samples were positive of antibiotic count beyond the MRL recommended by the UN.

#### Discussion and Recommendations

*Enterococcus Faecium* was the most detected micro-organism from the 20 amounting to 19.44% followed by *Enterococcus sp.* with 13.89% then *Bacillus Cereus* which amounted to 11.11%. *Clostridium Sordeli* comprises only 5.56% of the detected micro-organisms whereas the other micro-organisms each comprise only 2.78% of the 20. Susceptibility of microorganism showed that there is no significant correlation (p-values> 0.05) between susceptibility. HPLC is most accurate and reliable method of antibiotic detection compared to TLC and Elisa methods. In conclusion, the results indicated that most samples examined in this study do not meet the bacteriological and the MRL quality standards, therefore they possess potential risks to the consumers. This should draw the attention of the relevant Authorities to ensure that proper hygiene standards are improved to reduce food borne.

#### **Biosecurity programs investigation for traceability of African swine fever outbreak in North-West Province, Dr Kenneth Kaunda district in Potchefstroom**

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The global rise in trade in animals and animal products opens new paths for exotic diseases such as African swine fever for many countries. Trading is the reason biosecurity exists because the global scale of biosecurity threats has created a need for meat producers to show compliance with regulatory and market access requirement. The aim of the study was to investigate and trace back where the virus originated and how it was spread. Interviews were conducted concurrently with biosecurity questionnaire telephonically and on-site were 4 commercial farmers/managers, ccs vet, 3 animal health technicians, auction manager and abattoir owners/ managers participated to gather data for the investigation.

The findings indicated that the virus originated from Johannesburg and was spread through auction sales to Potchefstroom farm in Wilgeboom. This outbreak has negatively affected the economy of pig markets in Potchefstroom such as auction, abattoir, and farms. The money value of about R35 880 000 was lost through this outbreak. However, history has shown that animal diseases affect trading and markets whether locally or globally. Biosecurity is vital to ensure that the spread of animal diseases are prevented from entering and leaving the country. This paper argues that the effectiveness of any biosecurity program is affected by what is in the program and whether the program is being followed. However, 3 out of 4 farms were tested positive and 1 out of 4 did not know anything about biosecurity. Those who confirmed to have biosecurity measures in their farms, somehow those biosecurity measures were not fully practised in their farms before and during the outbreak when handling dead pigs and burying them. There is a lot that needs to be done in terms of educating our farmers and assisting them with on-farm biosecurity programs.

### Geographic distribution of boophilid ticks in communal grazing cattle in the north-eastern region of the Eastern Cape Province, South Africa

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#### Background

Two boophilid tick species of the genus *Rhipicephalus* namely *R. decoloratus* and *R. microplus* have a high specificity for infesting cattle globally including South Africa. Unlike the African blue tick (*R. decoloratus*), *R. microplus* is known to be the cattle tick, as it is the most accountable tick for wide range spread of diseases in cattle production.

#### Objective(s)

This study sought to determine the geographic distribution of boophilid *Rhipicephalus* tick species in the north-eastern regions of the ECP, South Africa

#### Method and Materials

A geographical survey to investigate the distribution of boophilid ticks on grazing cattle was conducted seasonally between October 2018 and September 2019 at Elundini, Senqu and Walter Sisulu Local Municipalities in the north-eastern region of the Eastern Cape Province. Ten cattle were selected randomly during the tick sampling at each locality. Ticks were carefully removed from cattle and placed into sampling tubes containing 70% ethanol. During tick sampling, special attention was paid to the tick predilection sites such as lower perineum, neck, dewlap and ventral body parts which are the preferred sites for blue ticks.

#### Results

Based on the morphological traits, a total of 6176 ticks belonging to two boophilid tick species of *Rhipicephalus* were identified: *Rhipicephalus decoloratus* (98.30%) and *Rhipicephalus microplus* (1.70%). Locality and season significantly influenced boophilid tick distribution ( $P < 0.05$ ). *Rhipicephalus decoloratus* had a significantly higher prevalence ( $P < 0.05$ ) in Elundini during the hot-dry ( $3.37 \pm 0.121$ ) and hot-wet ( $3.35 \pm 0.121$ ) seasons compared to other localities. In Senqu, *R. microplus* had high counts ( $P < 0.05$ ) during the post-rainy season ( $1.06 \pm 0.027$ ) compared to other localities.

#### Discussion and recommendations

Ticks differ in distribution from locality to locality and from season to season. It was observed that the heaviest tick infestation was during the hot-wet season and low infestation during the cool-dry season. Interestingly, the current study recorded Asiatic invasive pantropical blue tick (*R. microplus*) for the first time in the north-eastern region of the ECP. This tick is of great veterinary economic importance locally and globally, and thus necessitates continuous monitoring and control.

## Construction of three foot-and-mouth disease virus peptide phage display libraries for the identification of epitopes

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### Background

Foot and mouth disease (FMD) is a transboundary animal disease that severely affect the production of livestock with significant economic impact. The OIE ranks FMD as an economically important infectious animal disease. There are seven serologically distinct serotypes *i.e.* A, O, C (last outbreak in 2004), Asia1 and the Southern African Territories (SAT) types: SAT1, SAT2 and SAT3. Five of the seven serotypes exist in sub-Saharan Africa and considering the virus maintenance host *i.e.*, the African buffalo, eradication is near impossible in South Africa. Thus, emphasis is placed on control *i.e.*, vaccination and movement restriction. Vaccination against one serotype does not confer protection against another due to high antigenic variation. Commonly variations occur on the capsid coding (P1) region of the genome. Knowledge of FMDV antigenic sites can be useful to produce recombinant FMD vaccines with broad immunological coverage, thus improving FMD control.

### Objectives

To address the scarcity of knowledge regarding SAT antigenic sites, the objectives were the construction of three FMDV peptide phage display libraries using the fragmented P1 regions of a FMDV SAT1, SAT2 and SAT3 and biopanning with IgGs.

### Method and Materials

RT-PCR of P1 regions followed by shearing using the Covaris Adaptive Focused Acoustics® technology to fragment DNA. This DNA was cloned into an appropriate digested vector and transformed using *E. coli* TG1 competent cells. The resultant libraries underwent phage rescue and were utilised for the identification of FMDV epitopes through biopanning with purified immunoglobulin (Ig)G from FMDV-infected/vaccinated bovine sera.

### Results

Antigenic regions to which IgGs bound were identified through DNA sequencing. The advantage of utilising immune sera and biopanning against virus-specific peptide libraries is that affinity maturation has already occurred in immunized animals and the recognized epitope regions are identifiable.

### Discussion and Recommendations

This study has added important value to our FMD knowledge on SAT antigenic sites and significantly contributes towards the future development of improved vaccines. Through recombinant, reverse genetics technology, identified epitopes can be incorporated into the FMDV genome and recombinant viruses can be used for vaccine production, thus producing vaccines that offer a broad immunogenic response and protection.

# Hand hygiene compliance in the intensive care unit of the Onderstepoort Veterinary Academic Hospital

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## Background

Hand hygiene compliance remains the cornerstone of infection prevention and control (IPC) in healthcare facilities. However, there is a paucity of information on the level of IPC in veterinary health care facilities in South Africa.

## Objectives

Therefore, this study evaluated hand hygiene compliance of healthcare workers and visitors in the intensive care unit (ICU) at the Onderstepoort Veterinary Academic Hospital (OVAH).

## Method

A cross-sectional study was conducted among healthcare workers (HCWs) and visitors in the ICU using the infection control assessment tool (ICAT) as stipulated by the South African National Department of Health. Direct observations using the “five hand hygiene moments” criteria as set out by the World Health Organisation were also recorded. The level of compliance and a 95% confidence interval were calculated for all variables.

## Results

Individual bottles of alcohol-based hand-rub solution and hand-wash basins with running water, soap dispensers, and paper towels were always easily accessible and available in the ICU. In total, 296 observations consisting of 734 hand hygiene opportunities were recorded. Hand hygiene compliance was also evaluated during invasive (51.4%) and non-invasive (48.6%) procedures. The overall hand hygiene compliance was 24.3% (178/734). In between patients, most HCWs did not sanitize stethoscopes, leashes, and cellular phones used. Additionally, the majority of HCWs wore jewellery below the elbows. The most common method of hand hygiene was hand-rub (58.4%), followed by hand-wash (41.6%). Nurses had a higher (44%) level of compliance compared to students (22%) and clinicians (15%). Compliance was also higher after body fluid exposure (42%) compared to after patient contact (32%), before patient contact (19%), after contact with patient surroundings (16%), and before an aseptic procedure (15%).

## Discussion and Recommendations

Hand hygiene compliance in this study was low, raising concerns of potential transmission of hospital-acquired infections and zoonoses in the ICU. Therefore, it is essential that educational programs be developed to address the low level of hand hygiene in this study.

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### Knowledge, practices and seroprevalence of *Taenia species* in smallholder farms in Gauteng, South Africa

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#### Background

*Taenia* species are increasingly contributing to foodborne parasitic diseases worldwide. *Taenia asiatica*, *Taenia hydatigena*, *Taenia solium* are species that utilize pigs as intermediate hosts, however, *T. solium* is of major public concern due to its impact on pig farming and human health. Poor agricultural practices, sanitary practices, and lack of knowledge increase the burden of *Taenia* species related diseases in susceptible populations. *Taenia solium* cysticercosis is endemic in sub-Saharan Africa and Latin America.

#### Objective

This study investigated the seroprevalence of *Taenia* species in pigs and factors associated with *Taenia* spp. infections in smallholder pig farms in Gauteng.

#### Method and Materials

Blood samples were collected from 126 pigs in three Gauteng township areas and analysed for active *Taenia* spp. infection using the B158/B60 Ag-ELISA. Questionnaire surveys were used to investigate the level of knowledge and practices associated with porcine cysticercosis as well as neurocysticercosis among smallholder pig farmers in four township areas in the Gauteng province. General observations were also made about the environment surrounding these smallholder pig farmers. Proportions of categorical variables and their 95% confidence interval were calculated. Logistic regression models were used to assess the relationship between explanatory variables and knowledge of porcine cysticercosis or knowledge of neurocysticercosis.

#### Results

Circulating antigens of *Taenia* spp. were detected in 7% (n/N) of samples tested. Running sewage water was observed between houses towards the farms. Dumping sites were also located near the pig farms and accessible to children, pigs, and dogs. In total, 56 smallholder pig farmers were interviewed and 46% practiced free-ranging system while 25% practiced a semi-intensive system. None of the farms had latrines, however, farmers (95%) indicated that they have access to latrines at home and always use them (89%). Respondents had low knowledge of porcine cysticercosis (55%) or neurocysticercosis (79%). The knowledge levels on porcine cysticercosis or neurocysticercosis was not associated with farm location, education level, age, source of income, purpose of farming, years in farming, and herd size.



### **Discussion and Recommendations**

The prevalence of active *Taenia spp.* infection was reasonably low in this study, yet the knowledge level was also low, thus calling for further educational and training programmes to prevent *Taenia spp.* transmission in these communities.

## Post-grad Presentation

### An exploratory descriptive study of *Staphylococcus* spp. isolated from human specimens submitted to a diagnostic laboratory in South Africa, 2012-2017

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#### Background

Although staphylococci are commensals of the skin and mucosa of humans and animals, they are also opportunistic pathogens. Moreover, some of the *Staphylococcus* spp. are zoonotic. However, there is no evidence of recent studies that have investigated the *Staphylococcus* species commonly isolated from humans in South Africa.

#### Objective(s)

This study describes the distribution of staphylococci isolated from human samples submitted to the National Health Laboratory Service (NHLS) diagnostic laboratories between 2012 and 2017.

#### Method and Materials

Retrospective data of 404 217 *Staphylococcus* spp. isolated from humans by the NHLS diagnostic laboratory between 2012 and 2017 was used. Descriptive statistics were computed and presented in terms of person, time, and space.

#### Results

Out of 404 217 *Staphylococcus* species isolated, 37 species were identified, of which 74,67% were coagulase positive (CoPS). The rest were coagulase negative (CoNS) (18,94%) and unspciated staphylococci (6,37%). *Staphylococcus aureus* (74,4%), *S. epidermidis* (11,0%) and *S. haemolyticus* (3,3%) were most isolated species. Unspciated staphylococci made up 6,4%, while species, each with a frequency of less than 1,0% made up the remaining 5,0%. Males contributed 51,2% while females contributed 44,8%. Patients whose sex was unspecified contributed 4,0%. Majority of the *Staphylococcus* isolates came from patients aged 0-4 years (21, 5%), while patients aged 5-9, 10-14 and ≥65 years contributed 7,60%, 7,50%, and 2,9% respectively. KwaZulu-Natal (32,8%) had the highest number of *Staphylococcus* isolates, followed by Gauteng (21,10%), Western Cape (14,90%), and Eastern Cape (13,50%). The lowest number of staphylococcal isolates (14,7%) was reported in 2012 but increased to 18,4% by end of 2016 and then declined to 17,9% in 2017. No difference was observed between the number of staphylococci isolates reported in autumn (25, 2%), winter (25,2%), spring (25,1%) and summer (24,5%) seasons.

#### Discussion and Recommendations

A diverse number of *Staphylococcus* species are associated with humans, with the *S. aureus* being the predominant species. CoNS such as *S. haemolyticus* and *epidermidis*, with zoonotic potential, are frequently isolated from humans. The burden of staphylococcal infections is highest among males and patient less than 4years old. Likewise, the burden was highest KwaZulu-Natal and Gauteng.

## Prevalence and factors associated with *Salmonella* species in mechanically deboned poultry meat imported through Durban port of entry, South Africa

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### Background

*Salmonella* species have been reported in foodborne illness and persons with underlying clinical conditions are at a higher risk of infection. Although studies have reported *Salmonella* species in poultry and poultry products, there is limited information on the prevalence of *Salmonella* species in mechanically deboned poultry meat (MDPM) imported into South Africa.

### Objective(s)

This study investigated the prevalence of *Salmonella* in mechanically deboned poultry meat through the Durban port of entry into South Africa.

### Method and Materials

This study uses secondary data of mechanically deboned poultry meat consignments imported and tested for *Salmonella* species between 2016 and 2017. The proportion of *Salmonella* positive consignments and their 95% confidence interval based on country of origin, month, season, and importer were calculated. A logistic regression model was fit to data to assess associations between the predictor variables and the outcome of *Salmonella* status.

### Results

A total of 7987 MDPM consignments were imported over the study period, 5636 (70.56%) were tested and 830 (14.73%) tested positive for *Salmonella* species. The odds of MDPM testing positive for *Salmonella* spp. was significantly higher among consignments from Country-A (OR:1.851,  $p=0.0030$ ) and Country-B (OR: 3.887,  $p < 0.0001$ ) compared to “All others”. Autumn (OR: 1.512,  $p < 0.0001$ ), spring (OR: 0.771,  $p = 0.0005$ ), summer (OR: 0.847,  $p = 0.0133$ ) had a significantly higher odds of consignments testing positive for *Salmonella* when compared to winter season. Consignments imported in 2016 were 1.563 times ( $p < 0.0001$ ) as likely to test positive for *Salmonella* when compared to consignments imported in 2017. Importer-I (OR: 0.275,  $<0.0001$ ) and Importer-III (OR: 0.593,  $<0.0001$ ) compared to “All others” had lower odds of importing a MDPM consignment positive for *Salmonella* species.

### Discussion and Recommendations

*Salmonella* species that were isolated in MDPM consignments in this study suggest that the risk of importing contaminated consignment exists. In addition, the odds of importing a *Salmonella* positive consignment differed significantly based on the country of origin, the type of importer and the time of importation. Therefore, efforts to mitigate the risk including monitoring and controlling must be continued.

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