

# OIE Collaborating Centres Reports Activities

## *Activities in 2018*

**This report has been submitted : 2019-01-18 15:16:20**

<b>Title of collaborating centre:</b>	Surveillance and Control of Animal Diseases in Africa
<b>Address of Collaborating Centre:</b>	Agricultural Research Council Private Bag X05 Onderstepoort 0110 SOUTH AFRICA
<b>Tel.:</b>	+27-12 529.93.38
<b>Fax:</b>	+27-12 565.46.64
<b>E-mail address:</b>	mulumbam@arc.agric.za
<b>Website:</b>	www.arc.agric.za
<b>Name of Director of Institute (Responsible Official):</b>	Dr M Mulumba
<b>Name (including Title and Position) of Head of the Collaborating Centre (formally OIE Contact Point):</b>	Dr M Mulumba
<b>Name of writer:</b>	Ms. D Wessels

**ToR: To provide services to the OIE, in particular within the region, in the designated specialty, in support of the implementation of OIE policies and, where required, seek for collaboration with OIE Reference Laboratories**

**ToR: To identify and maintain existing expertise, in particular within its region**

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

<b>Training, capacity building</b>	
<b>Title of activity</b>	<b>Scope</b>
AgSecure Africa Programme, USDA Foreign Agriculture Services, Less Risk, More Value. In collaboration with Texas A&M University	Biosafety and Biosecurity in the Laboratory
AgSecure Africa Programme, USDA Foreign Agriculture Services, Less Risk, More Value. In collaboration with Texas A&M University	Performing Postmortems in the Field
AgSecure Africa Programme, USDA Foreign Agriculture Services, Less Risk, More Value. In collaboration with Texas A&M University	On-Farm Biosecurity
USDA, In collaboration with Texas A&M University.	Scientific Business Development and Management Programme, Bench to Shop Course.
Workshop on HPAI in collaboration with USDA APHIS	HPAI epidemiology, surveillance and sampling
<b>Diagnosis, biotechnology and laboratory</b>	
<b>Title of activity</b>	<b>Scope</b>
Diagnostics: Rabies	Total number (National and International)  IMP 11  FAT 532  FAVNT 6628  MIT 49

<p>Diagnostics: Lumpy Skin Disease</p>	<p>Total number (National)</p> <p>SNT 300</p> <p>Virus isolation 6</p> <p>PCR 446</p>
<p>Diagnostics: African Horse Sickness</p>	<p>Total number (National and international)</p> <p>i-ELISA 1711</p> <p>VNT for serotyping 18</p> <p>Virus isolation 78</p> <p>hemi-nested RT-PCR 619</p>
<p>Diagnostics: Bluetongue</p>	<p>Total number: National and international)</p> <p>Blocking ELISA 989</p> <p>Serotyping 227</p> <p>Real-time RT PCR 742</p> <p>Virus isolation 60</p> <p>Virus typing 4</p>
<p>Diagnostics: Rift Valley fever</p>	<p>Total Number (National and International)</p> <p>Indirect IgG ELISA 3849</p> <p>Capture IgM ELISA 3849</p> <p>Real-time RT PCR 787</p>

Diagnostics: African Horse Sickness	Total number (National and international)  i-ELISA 1711  VNT for serotyping 18  Virus isolation 78  hemi-nested RT PCR 619
Diagnostics: Foot and mouth disease	Total number (National and international)  VNT 11  LPBE (5 serotypes) 57857  NSP ELISA 2919  Virus isolation 21  Real-time RT PCR 94  RT-PCR and sequencing 6  Antigen ELISA typing 22

***ToR : To propose or develop methods and procedures that facilitate harmonisation of international standards and guidelines applicable to the designated specialty***

**2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the surveillance and control of animal diseases, food safety or animal welfare**

Proposal title	Scope/Content	Applicable area
Genetic Characterisation and immunological studies of Rabies viruses isolates recovered from apparently healthy and suspect rabid dogs in SE Nigeria	To investigate the prevalence of rabies antibodies in dogs in Nigeria and genetically characterize rabies viruses recovered	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare

The epidemiology of rabies at the Limpopo National Park	To elucidate the epidemiology of rabies in the Limpopo National Park	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Study for the investigation into the apparent non-specific protective effect of rabies antigen against central nervous system infection/ inflammation	To determine if rabies vaccine has a non-specific protective effect that increases survival in puppies to diseases other than rabies in an owned largely free-roaming dog population in a resource-limited setting	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input checked="" type="checkbox"/> Animal welfare
Structural studies of the lyssavirus glycoprotein	Within the proposed project, we intend to establish a collaboration aiming at the structural characterization of neutralizing sites within different lyssavirus G proteins.	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Spatial and temporal analysis of animal and human rabies cases in South Africa: 1997-2017	In the study, we intend to combine spatial analyses of all laboratory animal and human rabies cases confirmed in South Africa in the last 20 years	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Novel livestock vaccines against viral diseases towards food security in Africa	<p>This project was aimed at refining and field testing of novel livestock vaccines. The first platform technology uses the lumpy skin disease (LSD) virus to protect against five economically important livestock diseases with significant social and economic consequences: LSD, Rift Valley fever (RVF), peste des petits ruminants (PPR), sheep pox and goat pox. The second platform technology uses the swine pathogen, porcine adenovirus, as a vector for developing a vaccine against African swine fever (ASF). The project's objectives are:</p> <ul style="list-style-type: none"> <li>• To develop an LSDV-vectored vaccine for</li> <li>LSD, sheep pox, goat pox, RVF and PPR.</li> <li>• To develop an LSDV-vectored vaccine for LSD, sheep pox, goat pox and RVF for use in African countries without PPR.</li> <li>• To develop a vaccine for African swine fever.</li> <li>• Analyse socioeconomic impact and stakeholder's attitudes as a basis for product launch strategy.</li> </ul>	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Lateral Flow test optimising for RVF antibody detection	To optimize a lateral flow device test developed by BBI (UK)	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Persistence of a highly contagious pathogen: ecological and evolutionary mechanisms in FMDV	<p>The main objectives of the study is (i) to understand the condition allowing persistence of FMDV;</p> <p>(ii) to evaluate a novel immunological mechanism for re-activation of carrier hosts in FMDV infection; and (iii)</p> <p>evaluate the role of antigenic shift at epidemiologically relevant time scales.</p>	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare

Novel counter measures designed for the progressive control of FMDV in Uganda	The main purpose of this study is (i) to conduct surveillance of FMDV in Uganda and identify the serotype, subtype and genetic makeup of FMDV circulating in the country. (ii) To carry out serological studies of FMDV circulating in Uganda in support of vaccine matching studies. (iii) Develop collaborations that will support fundamental and applied research ties with Uganda, South Africa and USDAARS scientists working on FMD.	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare
Tracking the antigenic evolution of FMDV	Tracking the antigenic evolution of FMDV: Genetic basis of antigenic variation of SAT3 viruses.	<input checked="" type="checkbox"/> Surveillance and control of animal diseases <input type="checkbox"/> Food safety <input type="checkbox"/> Animal welfare

***ToR: To establish and maintain a network with other OIE Collaborating Centres designated for the same specialty, and should the need arise, with Collaborating Centres in other disciplines***

***ToR: To carry out and/or coordinate scientific and technical studies in collaboration with other centres, laboratories or organisations***

**3. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?**

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
World FAO/OIE FMD Reference laboratory, Pirbright Institute	UK	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	the aim is to complete a PTS for virology and serology diagnosis for FMD and SVD during 2017/2018
The Pirbright Institute	UK	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	The main objectives of the study is (i) to understand the condition allowing persistence of FMDV; (ii) to evaluate a novel immunological mechanism for reactivation of carrier hosts in FMDV infection; and (iii) evaluate the role of antigenic shift at epidemiologically relevant time scales.

Uganda, South Africa and USDA	Uganda	<input checked="" type="checkbox"/> Africa <input checked="" type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	The main purpose of this study is (i) to conduct surveillance of FMDV in Uganda and identify the serotype, subtype and genetic makeup of FMDV circulating in the country. (ii) To carry out serological studies of FMDV circulating in Uganda in support of vaccine matching studies. (iii) Develop collaborations that will support fundamental and applied research ties with scientists working on FMD.
The Pirbright Institute	UK	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Control and diagnostics of LSD with specific reference to Europe
Animal and Plant Health Agency	UK	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Rabies in the African civet; and incidental host for lyssaviruses
Nigeria	Nigeria	<input checked="" type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	Nigeria dog virus typing
Friedrich Loeffler Institute	Germany	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input type="checkbox"/> Asia and Pacific <input checked="" type="checkbox"/> Europe <input type="checkbox"/> Middle East	Lateral flow device comparative testing
Rakuno Gakuen University	Japan	<input type="checkbox"/> Africa <input type="checkbox"/> Americas <input checked="" type="checkbox"/> Asia and Pacific <input type="checkbox"/> Europe <input type="checkbox"/> Middle East	Spatial and temporal analysis of animal and human rabies in South Africa for the last 20 years

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

No

**ToR: To place expert consultants at the disposal of the OIE.**

**5. Did your Collaborating Centre place expert consultants at the disposal of the OIE?**

No

**ToR: To provide, within the designated specialty, scientific and technical training to personnel from OIE Member Countries**

**6. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries?**

Yes

- a) Technical visits: 4  
 b) Seminars: 0  
 c) Hands-on training courses: 1  
 d) Internships (>1 month): 0

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
a	FMD diagnostics	Eritrea	3
a	Hands-on training and consultancy	Ethiopia, Nigeria, Mozambique	3

**ToR: To organise and participate in scientific meetings and other activities on behalf of the OIE**

**7. Did your Collaborating Centre organise or participate in the organisation of scientific meetings on behalf of the OIE?**

Yes

National/International	Title of event	Co-organiser	Date (mm/yy)	Location	No. Participants
Regional	Sub-regional seminar on Rabies in southern Africa	No	April 2018	Windhoek, Namibia	30
Regional	2nd regional Enhancing Research for Africa Network (ERFAN)	No	November 2018	Pretoria, South Africa	30
International	OIE/FAO FMD laboratory annual network meeting	No	November 2018	United Kingdom	50



International	Meeting of the OIE Scientific Commission for Animal Diseases	No	February 2018	Paris, France	30
---------------	--	----	---------------	---------------	----

**ToR: To collect, process, analyse, publish and disseminate data and information relevant to the designated specialty**

**8. Publication and dissemination of any information within the remit of the mandate given by the OIE that may be useful to Member Countries of the OIE**

a) Articles published in peer-reviewed journals: 23

1. Glidden CK, Beechler B, Buss PE, Charleston B, de Klerk-Lorist LM, Maree FF, Muller T, Pérez-Martin E, Scott KA, van Schalkwyk OL, Jolles A. (2018) Detection of pathogen exposure in African buffalo using non-specific markers of inflammation. *Front Immunol.* 8:1944. doi: 10.3389/fimmu.2017.01944.
2. Chitray M, Grazioli S, Willems T, Tshabalala T, De Vleeschauwer A, Esterhuysen JJ, Brocchi E, De Clercq K, Maree FF. (2018) Development and validation of a foot-and-mouth disease virus SAT serotype-specific 3ABC assay to differentiate infected from vaccinated animals. *J Virol Methods.* 2018 May;255:44-51. doi: 10.1016/j.jviromet.2018.02.006.
3. Casey-Bryars M, Reeve R, Bastola U, Knowles NJ, Auty H, Bachanek-Bankowska K, Fowler VL, Fyumagwa R, Kazwala R, Kibona T, King A, King DP, Lankester F, Ludi AB, Lugelo A, Maree FF, Mshanga D, Ndhlovu G, Parekh K, Paton DJ, Perry B, Wadsworth J, Parida S, Haydon DT, Marsh TL, Cleaveland S, Lembo T. (2018) Waves of endemic foot-and-mouth disease in eastern Africa suggest feasibility of proactive vaccination approaches. *at Ecol Evol.*2(9):1449-1457. doi: 10.1038/s41559-018-0636-x.
4. Kotecha A, Perez-Martin E, Harvey Y, Zhang F, Ilca SL, Fry EE, Jackson B, Maree F, Scott K, Hecksel CW, Harmsen MM, Mioulet V, Wood B, Juleff N, Stuart DI, Charleston B, Seago J. (2018) Chimeric O1K foot-and-mouth disease virus with SAT2 outer capsid as an FMD vaccine candidate. *Sci Rep.* 8(1):13654. doi: 10.1038/s41598-018-31856-x.
5. Lazarus DD, van Schalkwyk OL, Burroughs REJ, Mpehle A, Reininghaus B, Rikhotso O, Heath L, Maree FF, Blignaut B, Fosgate GT. (2018) Serological responses of cattle inoculated with inactivated trivalent foot-and-mouth disease vaccine at the wildlife-livestock interface of the Kruger National Park, South Africa. *Prev Vet Med.* 158:89-96. doi: 10.1016/j.prevetmed.2018.08.003.
6. Becker E, Venter GJ, Greyling T, Molini U, van Hamburg H. Evidence of African horse sickness virus infection of *Equus zebra hartmannae* in the south-western Khomas Region, Namibia. *Transbound Emerg Dis.* 2018 eb;65(1):278-280.
7. Grewar JD, Weyer CT, Venter GJ, van Helden LS, Burger P, Guthrie AJ, Coetzee P, Labuschagne K, Bührmann G, Parker BJ, Thompson PN. A field investigation of an African horse sickness outbreak in the controlled area of South Africa in 2016. *Transbound Emerg Dis.* 2018 Nov 18.
8. Bakhoun MT, Sarr M, Fall AG, Huber K, Fall M, Sembène M, Seck MT, Labuschagne K, Gardès L, Ciss M, Gimonneau G, Bouyer J, Baldet T, Garros C. DNA barcoding and molecular identification of field-collected *Culicoides* larvae in the Niayes area of Senegal. *Parasit Vectors.* 2018 Dec 3;11(1):615.
9. Durán-Ferrer M, Agüero M, Zientara S, Smith S, Potgieter C, Rueda P, Sastre P, Monaco F, Villalba R, Tena-Tomás C, Batten C, Frost L, Flannery J, Gubbins S, Lubisi BA, Sánchez-Vizcaíno JM, Emery M, Sturgill T, Ostlund E, Castillo-Olivares J. Assessment of reproducibility of a VP7 Blocking ELISA diagnostic test for African horse sickness. *Transbound Emerg Dis.* 2018 Aug 2.
10. Venter GJ, Boikanyo SNB, De Beer CJ. The efficiency of light-emitting diode suction traps for the collection of South African livestock-associated *Culicoides* species. *Med Vet Entomol.* 2018 Dec;32(4):509-514.
11. Schade-Weskott ML, van Schalkwyk A, Koekemoer JJO. A correlation between capsid protein VP2 and the plaque morphology of African horse sickness virus in cell culture. *Virus Genes.* 2018 Aug;54(4):527-535.
12. Dungu B, Lubisi BA, Ikegami T., 2018. Rift Valley fever vaccines: current and future needs. *Curr Opin Virol.* 29:8-15. doi: 10.1016/j.coviro.2018.02.001. Epub 2018 Mar 4. Review.
13. Kara, P.D., Mather, A.S., Pretorius, A., Chetty, T., Babiuk, S., Wallace, D.B., 2018. Characterisation of putative immunomodulatory gene knockouts of lumpy skin disease virus in cattle towards an improved vaccine. *Vaccine,* 36 (31):4708-4715. doi: 10.1016/j.vaccine.2018.06.017.
14. Bakhoun, M.T., Labuschagne, K., Huber, K., Fall, M., Mathiue, B., Venter, G., Gardès, L., Baldet, T., Bouyer, J., Fall, A.G., Gimonneau, G. & Garros, C. 2018. Phylogenetic relationships and molecular delimitation of *Culicoides*

Latreille (Diptera: Ceratopogonidae) species in the Afrotropical region: interest for the subgenus *Avaritia*.

Systematic Entomology, 43, 355-371. DOI: 10.1111/syen.12279

15. Bakhoum, M.T., Sarr, M., Fall, A.G., Huber, K., Fall, M., Sembène, Seck, M.T., Labuschagne, K., Gardès, L., Ciss, M., Gimonneau, G., Bouyer, J., Baldet, T. & Garros, C., (accepted) DNA barcoding and molecular identification of field-collected *Culicoides* larvae in the Niayes area of Senegal, *Parasites & Vectors* (accepted)

16. Grewar, J.D., Weyer, C.T., Venter, G.J., van Helden, L.S., Burger, P., Guthrie, A.J., Coetzee, Venter, G.J., Boikanyo,

S.N.B. & de Beer, C.J. 2018. The efficiency of light-emitting diode suction traps for the collection of South African Livestock associated *Culicoides* species. *Medical and Veterinary Entomology*, 32, 509-514. Doi 10.1111/mve.12313.

17. Kara, P.D., Mather, A.S., Pretorius, A., Chetty, T., Babiuk, S., Wallace, D.B., 2018. Characterisation of putative immunomodulatory gene knockouts of lumpy skin disease virus in cattle towards an improved vaccine. *Vaccine*, 36 (31):4708-4715. doi: 10.1016/j.vaccine.2018.06.017.

18. Romette J.L., Prat, C.M., Gould E.A. et al. 2018. The European Virus Archive goes global: A growing resource for research. *Antiviral Research*. <https://doi.org/10.1016/j.antiviral.2018.07.017>

19. Grover, M., Bessell, P.R., Conan, A., Polak, P., Sabeta, C.T., Reininghaus, B. and Knobel, D.L. 2018. Spatiotemporal epidemiology of rabies at an interface between domestic dogs and wildlife in South Africa. *Nature Scientific Reports*. 10864: DOI: 10.1038/S41598-018.

20. Sabeta, C., Mohale, D., Williams, J. and Didi van Rensburg. 2018. Rabies of canid biotype in wild dog (*Lycaon pictus*) and spotted hyaena (*Crocuta crocuta*) in Madikwe Game Reserve, South Africa in 2014-2015: Diagnosis, possible origins and implications for control. *Journal of the South African Veterinary Association* 89(0), a1517. <https://doi.org/10.4102/jsava.v89i0.1517>.

21. Sabeta CT & Ngoepe EC. 2018. "Controlling dog rabies in Africa: description of the successes and failures of rabies control in Africa and prospects for the future". *OIE Scientific and Technical Review*, 37 (2), 439-449.

22. Sabeta CT & Ngoepe EC. 2018. Preparation of fluorescent antibody conjugate for the direct fluorescent antibody test (dFAT). *WHO- Laboratory Techniques in Rabies*.

23. Ukamaka, E., Ngoepe, E.C., Anene, A.C., Ezeokonkwo, R.C., Nwosuh, C. and Sabeta, C.T. 2018. Detection of lyssavirus antigen and antibody levels among apparently health and suspect rabid dogs in South Eastern Nigeria. *BMC Research Notes*. 11:920.

#### b) International conferences: 10

1. K. Scott L. Maake, E. Perez-Martin, L. de Klerk-Lorist, L. van Schalkwyk, B. Beechler, E. Gorsich, B. Dugovich, J. Medlock, A. Jolles, B. Charleston, F. Maree. "Evolution and competition of SAT strains during buffalo transmission in a controlled challenge experiment." EuFMD Open session, 2018 conference, Puglia Italy, October 2018.

2. K. Scott F. Mwiine, O. Sylvester, J. Lutwaama, M. Chitray, K. van der Waal, E. Rieder, F. Maree. "Serotyping seroprevalence of FMD in cattle from Uganda surveillance 2014-2018." EuFMD Open session, 2018 conference, Puglia Italy, October 2018. 3. EU African Horse Sickness and Bluetongue Reference Laboratories Workshop 2018. Otto Koekemoer. "Molecular diagnostics and epidemiology of AHSV in South Africa over two seasons". 4. 1st BIO Africa Convention, August 2018, Durban International Convention Centre, South Africa. A. van Schalkwyk. "Biotechnology in the Post-Genomic era".

3. Babiuk, S., Truong, T., Blyth, G., Kroeker, A., Kara, P., Mather, A., Babiuk, L., & Wallace, D.B. (2018). Development of a multivalent capripoxvirus vaccine to protect against sheeppox, goatpox, peste des petits ruminants and Rift Valley fever (oral). 22nd Poxvirus-Asfarvirus-Iridovirus Conference, Academia Sinica, (Taipei, Taiwan) 26-31 May 2018.

4. Lubisi, B.A. (2018). Impact of transboundary zoonoses on food safety and security in Africa. 2nd International Rift Valley fever - Baratang Alison Lubisi - south africa OIE Reference Laboratory Reports Activities, 2018 5 Conference for Food Safety and Security, 15 - 17 October 2018, Saint George Hotel - Centurion, South Africa.

5. De Beer, C.J. Boikanyo, S.N.B. & Venter, G.J. 2018. Development of a standardised protocol for the in vitro feeding of field-collected *Culicoides imicola* (Diptera: Ceratopogonidae) from South Africa. In: Abstract book of Book of the E-SOVE 21st Conference, 22-26 October 2018. Palermo, Italy, p 28.

6. De Beer, C.J., Venter, G.J. & Mans, B. 2018. Comparing methods for the assessment of blood meal volume of *Culicoides imicola* (Ceratopogonidae) fed on an in vitro feeding system. In: Abstract Volume of the 9th International Congress of Dipterology. (ed. by Kirk-Spriggs and Muller, B.). 25-30 November 2018. Windhoek, Namibia, p 62.

7. Venter, G.J. Boikanyo, S.N.B. & de Beer, C.J. 2018. The effect of site selection on light trap efficiency for the collection of *Culicoides* midges. In: Abstract book of Book of the E-SOVE 21st Conference, 22-26 October 2018. Palermo, Italy, p 43.

8. Attended the OIE Sub-Regional Seminar on rabies in southern Africa from 10-12 April 2018. During this meeting, Dr Sabeta made two presentations on i. The Global rabies situation with emphasis on Southern Africa and ii. The

Regional diagnostic capacity using the proficiency test as a yardstick. In addition, Dr Sabeta was a panelist for a discussion on Rabies surveillance: Laboratory needs in support of rabies surveillance.

9. Ms D Wessels made two presentations at the Regional Seminar for OIE focal points for Veterinary laboratories : "Towards a culture of Safety and Quality". Tunis, Tunisia, 18-20 September 2018.

10. Ms D Wessels made a presentation at the Regional conference of the Biological Weapons Convention: Biosafety and Biosecurity education - Experience held in Pretoria, July 2018.

c) National conferences: 11

1. 47th PARSA CONFERENCE 2018, Limpopo, South Africa. K. Labuschagne. "Seasonal distribution of Culicoides (Diptera: Ceratopogonidae) species in southern Africa" The impact of climate change on identified priority agricultural pests and diseases of the ARC Climate Change Collaboration Centre. K. Labuschagne & G.J. Venter. "Overwintering of African horse sickness virus (AHSV) in Culicoides species"

2. Mdlulwa, Z., Ngwane, C., & Mathebula, E. (2018). The determinants of livestock keeper's primary animal health care practices: a partial proportional odds model. 2018. 56th Conference of the Agricultural Economics Association of South Africa (AEASA), Cape Town, South Africa, 25-27 September 2018.

3. Masemola, M., Ogundeji, A.A., & Chaminuka, P. (2018). Using discrete choice experiment to estimate farmer preferences and marginal willingness to pay for livestock vaccines. 56th Conference of the Agricultural Economics Association of South Africa (AEASA), Cape Town, South Africa, 25-27 September 2018.

4. Labuschagne, K. 2018. Seasonal distribution of Culicoides species in southern Africa. In: Abstract book of the 47th annual PARSA conference, 16 - 18 September 2018 Tshipise Forever Resort, South Africa

5. Karien Labuschagne attend and present at the annual Limpopo Veterinary Services Mini-Congress 2018 from 28 to 29 November 2018 held at Belabela.

5. Wallace, D.B., Mather, A., Kara, P., Babiuk, S. & Lubisi, B.A., "Lumpy skin disease in southern Africa: History, Lumpy skin disease - David Wallace - south africa OIE Reference Laboratory Reports Activities, 2018 5 Lessons and Prospects." (talk), RuVASA Congress, 18 June 2018, Birchwood Hotel and Conference Centre, Johannesburg.

6. Wallace, D.B. and Mather, A.S. "Evaluation of a Lumpy Skin Disease Diagnostic Test and Disease Surveillance in Gauteng." (oral) 11th GDARD Symposium, 20th June, Midrand Conference Centre.

7. The determinants of livestock keeper's primary animal health care practices: a partial proportional odds model. 2018. Mdlulwa, Z., Ngwane, C., & Mathebula, E. Oral paper presented at the Agricultural Economics Association of South Africa (AEASA) 56th Conference, 25-27 September 2018, Cape Town, South Africa.

8. Using discrete choice experiment to estimate farmer preferences and marginal willingness to pay for livestock vaccines. 2018. Masemola, M., Ogundeji, A.A., & Chaminuka, P. Oral paper presented at the Agricultural Economics Association of South Africa (AEASA) 56th Conference, 25-27 September 2018, Cape Town, South Africa.

9. Dr Sabeta attended the 1st Bio Africa Convention, held at the Durban ICC, Durban, KwaZulu Natal, South Africa, between 27 - 29 August 2018. In this convention, Dr Sabeta made a presentation on "Polyclonal antibodies generated in goats - use(s) in current rabies diagnosis and the potential for surveillance".

10. Dr Sabeta attended the second regional ParaCon meeting jointly organised by GARC and the WHO and held at Birchwood Hotel (in Johannesburg), 12-14 September 2018.

11. World Rabies Day Symposium - co-organised the WRD symposium held at Onderstepoort on 4 October 2018.

d) Other

(Provide website address or link to appropriate information): 5

1. Global Foot-and-Mouth Disease Research Alliance (GFRA) Gap Analysis Workshop. Project Title: What are the knowledge gaps in the Host range/adaptation. 2018. Buenos Aires, Argentina.

2. Technical Report to Defense Threat Reduction Agency CBEP. Project title: Research and Development of Countermeasures to Support the Surveillance and Control of Foot and Mouth Disease virus in Uganda. <https://www.ars.usda.gov/office-of-international-research-programs/bep-uganda-fmd-countermeasures/> ARC Hub App: <http://www.arc.agric.za>

3. Wallace, D.B. and Mather, A.S. "Livestock vaccines against viral diseases for developing farmers in sub-Saharan Africa - project closure meeting" (telephonic radio interview, in English), RADIO OFM, aired 11 June 2018.

4. Wallace, D.B. and Mather, A.S. (2018). New livestock vaccines: A boost for farmers in Africa. Afriland magazine, 62:3 pages 24-25.

5. Ex-Ante Cost Benefit Analysis of the 2-In 1 RVF/LSD Vaccine on Livestock Industry in South Africa. 2018. Research report compiled by ARC's Economic Analysis Unit.

5. Lubisi BA, Romito M, Namanyane ML, August ML, Tshabalala MH, Tshabalala T and Mdlulwa N., 2018. Importance

of surveillance and high performance diagnostic tests in animal trade and movement: the case of African horse

sickness and bluetongue in endemic countries. EU Bluetongue Virus and African Horse Sickness Virus Reference Laboratory Workshop, 27-28 November 2018, Madrid, Spain