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African Horse Sickness - Sentinel Surveillance Report 2014/2015

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Contents

1. Overview of the program

The African horse sickness (AHS) sentinel surveillance program is aimed at providing additional confidence of AHS freedom in the AHS free and AHS surveillance zones in the Western Cape Province.

Serological sentinel surveillance candidates are selected based on their history of a lack of AHS vaccination while PCR candidates have not been vaccinated in at least the last 2 years. In the initial phases of the program vaccinated horses/ horses of unknown vaccination status were also selected during recruitment in an attempt to identify true sentinels. It is for this reason that horses with a serological outcome of "Stable positive" were detected (*see 2.2 below - Serology: Total broad outcomes*). This recruitment will continue into the 2015/2016 season. Some horses fell out of the sentinel program during the current period under review and this is due to results showing unsuitability of the horse as a sero-sentinel. However, for the sake of completeness in this report all results have been included and evaluated. In future horses that are recruited but found to be not suitable for either the serological or PCR surveillance will be removed both from the sentinel cohort and from the analysis.

The serological sentinel process is simple. Each horse in the program is tested monthly and on evaluation the previous month's test is selected as the initial sample in a series of two samples (paired samples). If no samples are taken for the previous month then we retrospectively select back to a maximum of 3 months prior to the month under review.

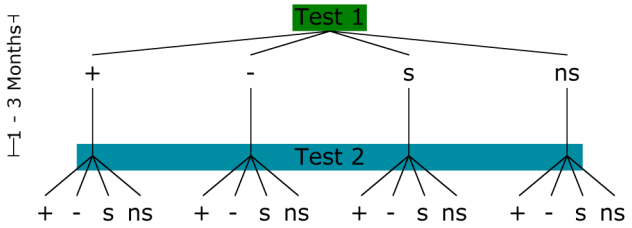

Figure 1: An overview of the permutations of outcomes of monthly sero-sentinel surveillance.

ns - Not sampled, + Positive, - Negative, s - suspect

For the sero-sentinels there are 16 permutations for each horse per month of analysis when tested in this program and these are illustrated in Figure 1. Seven of these consist of horses that were either not tested in the month of the paired serum sample analysis (i.e. figure 2 Test 2), or alternatively not sampled in the 3 months prior to the month under analysis (i.e. figure 1 Test 1). Analysis of each month therefore excludes any occurrences of "not sampled" events - see Figure 2 – "*No duplicate sample*" - in this analysis this totaled 137 events (21%) which could not be analysed.

The PCR sentinels are evaluated on an individual sample basis with either a positive or negative outcome. When analysing PCR results the entire review period result set per horse is taken into consideration.

1.1 Tests performed

PCR tests are performed by the Equine Research Center using the techniques for group specific quantitative RT PCR as described in Guthrie et al in 2013.

Serology tests (i-ELISA) were performed by the Onderstepoort Veterinary Institute as described by Maree and Paweska in 2005.

Period under review

2014-09-01 to 2015-08-31 - this is the standard annual AHS surveillance range adopted in South Africa.

2. General overview of results

2.1 Total number of samples tested in period

Serum: 646 samples tested
PCR: 1528 samples tested
Farms involved in program: 65

2.2 Serology: Total broad outcomes

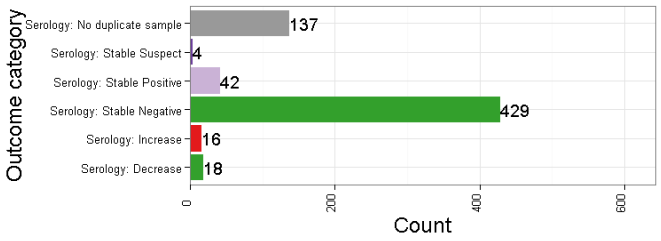

Figure 2: Broad outcomes of the period under review. Note that an increase in serology indicates both when a horse moves from negative to suspect/positive or from suspect to positive. The converse is true for the *"Serology: Decrease"* category

There were a total of 16 increasing serological levels which constitutes 3% of the total serological events (n=509) that could be evaluated.

2.3 Serology: Total detailed outcomes

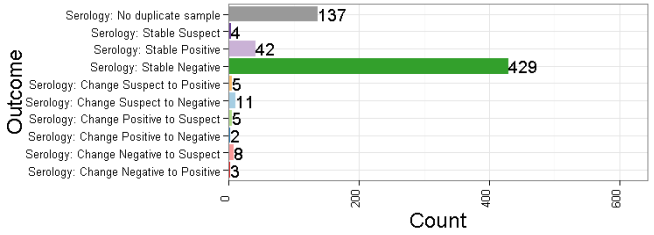

Figure 3: Detailed serological outcomes of the period under review.

2.4 PCR: Total outcomes

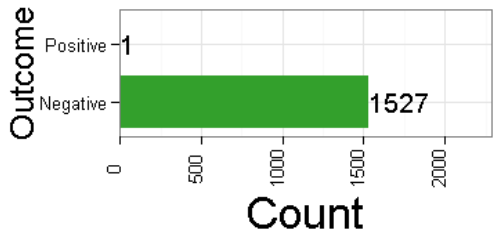

Figure 4: Detailed PCR outcomes of the period under review.

3. Detailed overview

3.1 Stable serology and negative PCR results overview and sensitivity of surveillance

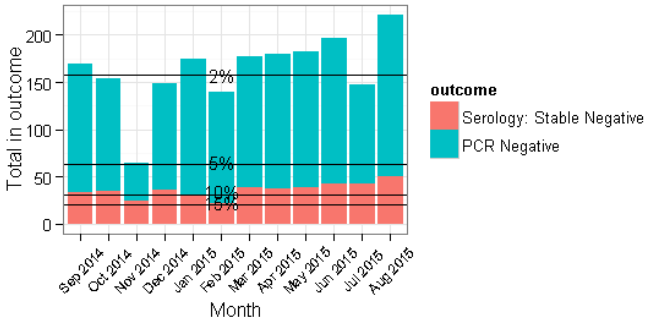

Figure 5: The number of stable negative serology results and negative PCR results per month for the period under review. The horizontal lines indicate the number of samples that would need to be taken to have a 95% confidence that we would detect AHS at the prevalence indicated – i.e. 2%, 5%, 10% and 15% respectively

3.2 Non-stable Results

3.2.1 Serology

3.2.1.1 Serology: Summarised non-stable results

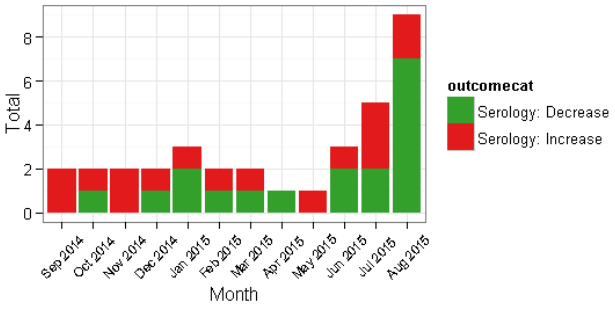

Figure 6: Summarised serological analysis where stable results were not achieved for each month of analysis

3.2.1.2 Serology: Detailed non-stable results

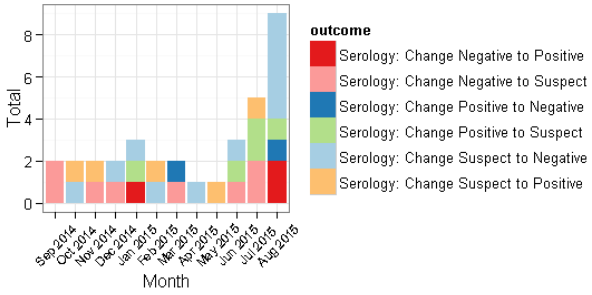

Figure 7: Detailed serological analysis where stable results were not achieved for each month of analysis

3.2.1.2.1 Serology: Increase in positivity: Detailed

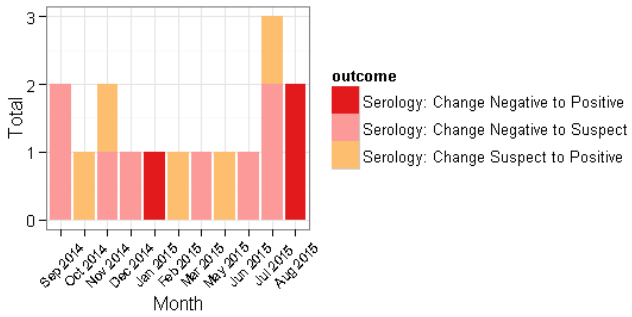

Figure 8: Detailed serological analysis where an increase in positivity was found for each month of analysis

The increases in positivity for a paired serological series are the important results to evaluate in a sero-surveillance program since these have an impact on the outcome of the program. Complete individual horse results for the period under review are necessary to evaluate the individuals that needed follow up. In the section below each horse represented in Figure 8 is evaluated, including, if applicable, results from horses on the same property. The reference numbers for the horses are indicated within each caption and where multiple horses are evaluated their reference numbers, along with that of their resident property, are shown. Both PCR and serology results have been added to each graph to assist in individual analysis. The date series below each graph is unique to that horse, so null data outside the range of testing is not shown.

3.2.1.2.1.1 - Horse 12

This horse had alternating suspect and positive serological results when tested during the year (figure 9). It started the sentinel program in Sept 2013 and was suspect on the first sample that was collected, so the results seen in the period under review, especially in conjunction with the negative PCR results, are certainly due to residual antibody from either a previous vaccination or previous exposure to AHSV. The vaccination history indicates that the horse was not vaccinated since 1999, but prior to this the vaccination history is unknown. The horse is situated in an area that was under movement restriction during the Mamre 2011 outbreak, however cases were not reported in the immediate vicinity. The ELISA percentage positive value (PP) remained very low for positive results in this horse (<20).

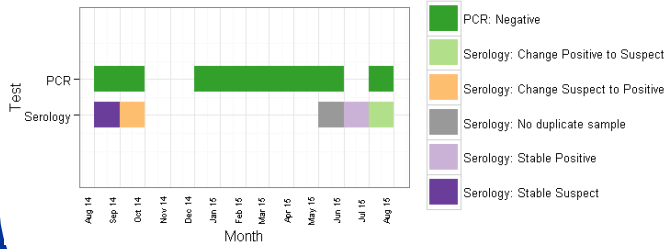

Figure 9: Individual PCR and serology results for the serological increase in horse number 12

3.2.1.2.1.2 - Horse 45

This horse had alternating suspect and positive serological results when tested during the year (figure 10). As with horse 12, this horse started the sentinel program in Sept 2013 and was suspect on the first sample that was collected, so the results seen in this period under review, especially in conjunction with the negative PCR results throughout the year, are certainly due to residual antibody from either a previous vaccination or previous exposure to AHSV. ELISA PP values also were very low (<20). This horse was previously vaccinated for AHS in 2001.

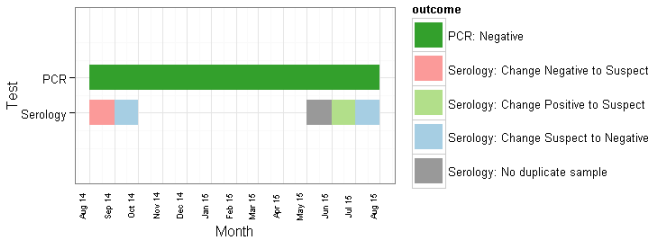

Figure 10: Individual PCR and serology results for the serological increase in horse number 45

3.2.1.2.1.3 - Horse 118

The results set for this horse appear to be a false suspect result in March 2015, with serology returning to negative the following month and consistent negative PCR results in the months leading up to and following the suspect result. This horse was previously vaccinated in 2009.

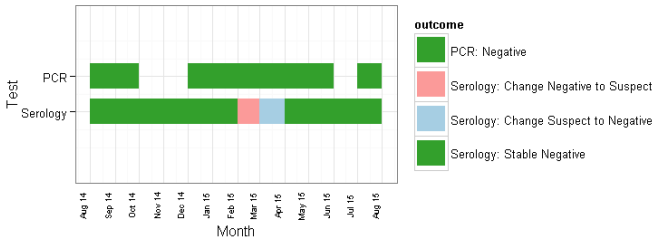

Figure 11: Individual PCR and serology results for the serological increase in horse number 118

3.2.1.2.1.4 - Horse 142

This horse's results are a good example of the potential difficulties of serological surveillance. In the face of negative PCR this horse has had 3 increases and 3 decreases in serology category over the year making analysis difficult (figure 12). Having a look at the rest of the sentinels on the property (figure 13): horse 140 only had PCR testing and was negative for the entire period under review, while horse 141 was serologically negative, stable for the entire period under review with negative PCR from Oct 2014 through to July 2015. Horse 142 therefore does not follow this trend. The negative PCR results do point towards no active circulation, especially seen in light of the other horses' test results on the property.

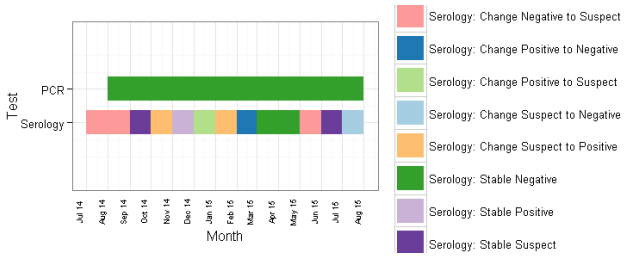

Figure 12: Individual PCR and serology results for the serological increase in horse number 142

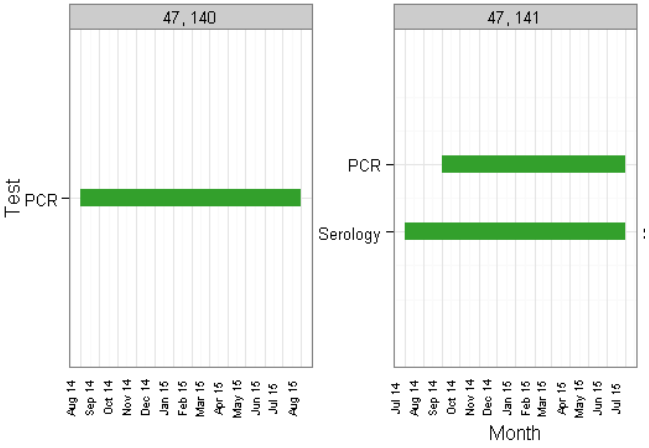

Figure 13: Property cohort results for horse 142 – Owner number 47 - legend as for figure 12 and horse 142 has been excluded

3.2.1.2.1.5 - HORSE 165

This horse had 2 events where negative results went to suspect but back down to negative immediately in the following month. Interpreting these results along with the negative PCR, this horse is not considered a possible positive. It was also the only horse on the property that was included in the program so no comparison between horses in close proximity is possible.

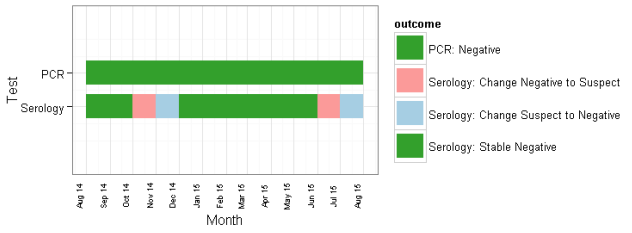

Figure 14: Individual PCR and serology results for the serological increase in horse number 165

3.2.1.2.1.6 - HORSE 214

In similar fashion to horse 165 above, this horse had a suspect result that carried through for one month longer than horse 165 but then reverted to negative. Again, along with the negative PCR (right throughout the period) this horse is not considered a possible positive. It was also the only horse on the property that was included in the program so no comparison between horses in close proximity is possible.

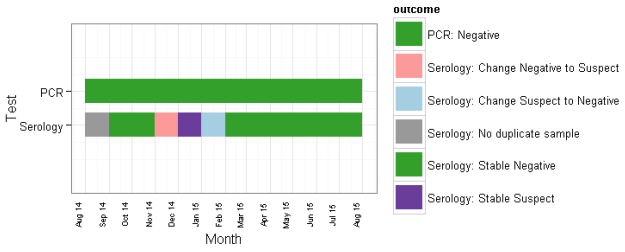

Figure 15: Individual PCR and serology results for the serological increase in horse number 214

3.2.1.2.1.7 - HORSE 223

This horse had a serological jump directly from negative to positive in Jan 2015 (with a few months of negative results prior to the jump) and stable positive results for the following 3 months (figure 16). There were negative PCR results throughout the period but unfortunately no further serology results. Having a look at horse 223's property cohort (figure 17): there were a total of 7 horses (including horse 223) on the farm. The PCR results were negative throughout with a few gaps in testing and one other horse was a sero-sentinel and had negative results throughout the year (horse number 6). Certainly the PCR results don't point towards a positive result but the freedom of disease cannot be ruled in completely with this serological response. Previous vaccination history for this horse is unknown. Fourteen of the non-sentinel horses on the farm were vaccinated in Nov, Dec and Jan (2014/2015) with both AHS bottle 1 and 2. The transmission of vaccine virus is a consideration as a possible source of the seroconversion of horse 223 (although again the negative PCR adds some uncertainty to this possibility) - see concluding remarks regarding vaccination protocols in the AHS control zones.

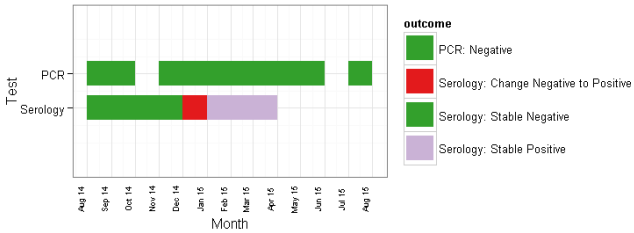

Figure 16: Individual PCR and serology results for the serological increase in horse number 223

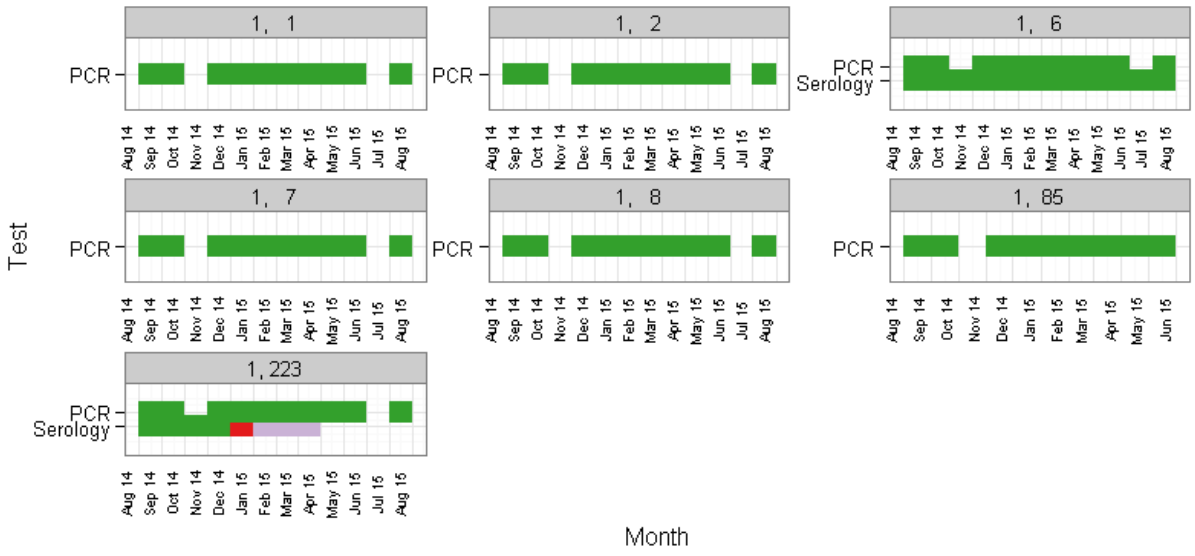

Figure 17: Property cohort results for horse 223 – Owner number 1 - legend as for figure 16

3.2.1.2.1.8 - HORSE 242

Horse 242 started the period with a suspect result but immediately reverted to negative (figure 18). This was repeated in Jul and Aug 2015. Because of the negative PCR this horse is not considered a possible positive. The rest of the horses on the farm included in the sentinel program (figure 19) totaled 6 horses, including horse 242. Two horses (240 and 310) were removed as sero-sentinels for starting with positive results – they had no testing prior to the period under review and previous vaccination history was unknown. Two horses had stable negative serology results for much of the period under review and for every event that they were tested. All PCR results for horses belonging to the same owner were negative.

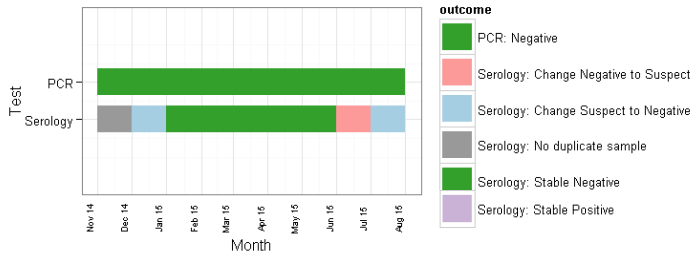

Figure 18: Individual PCR and serology results for the serological increase in horse number 242

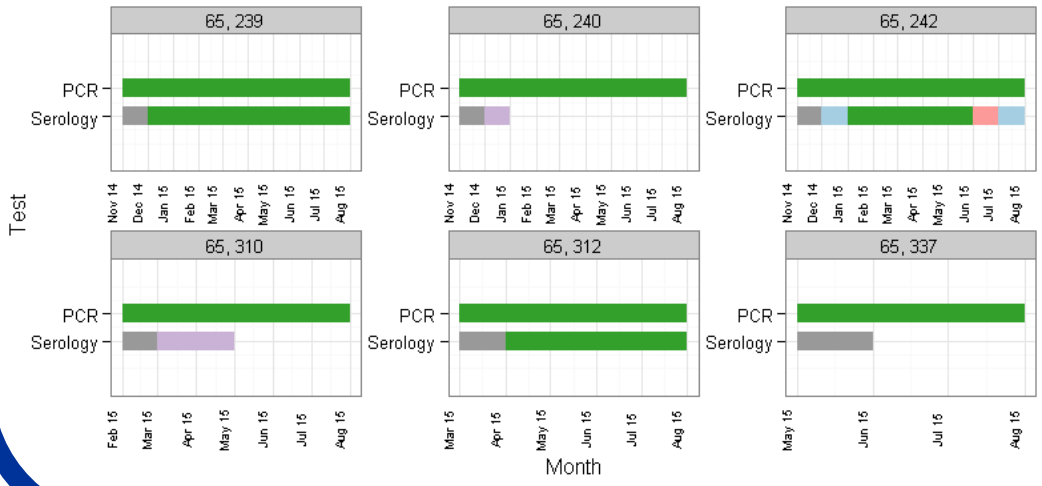

Figure 19: Property cohort results for horse 242 – Owner number 65 - Legend as for figure 18

3.2.1.2.1.9 - HORSE 256

This horse is clearly a true positive with a positive PCR result and a positive change from negative to positive in serology for the same month under observation (figure 20). For the same owner (Owner 66) there were a total of four horses in the program including horse 256 (figure 21). Two of the four had consistent negative PCR and serology results throughout the period under review and the remaining horse was a PCR sentinel only (its initial serology was positive and it was thus

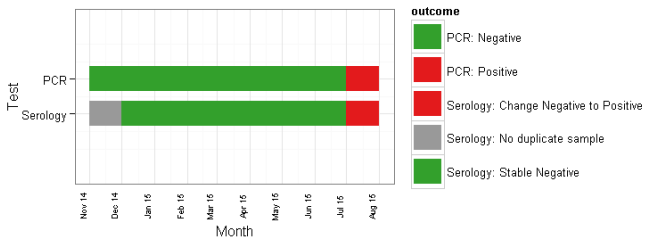

Figure 20: Individual PCR and serology results for the serological increase in horse number 256

not used further in the sero-sentinel program). It had negative results, albeit with a gap in testing during March and April 2015. After horse 256's results were received the owner was contacted and it was established that between the July and August sampling (1st July 2015 and 15 August 2015 respectively) the horse had been vaccinated with AHS bottle 1 (8th July) and bottle 2 (5th August). This horse is therefore considered as a false positive for the AHS surveillance program since vaccine strain AHSV was detected by PCR and the serological response was as a result of the vaccination.

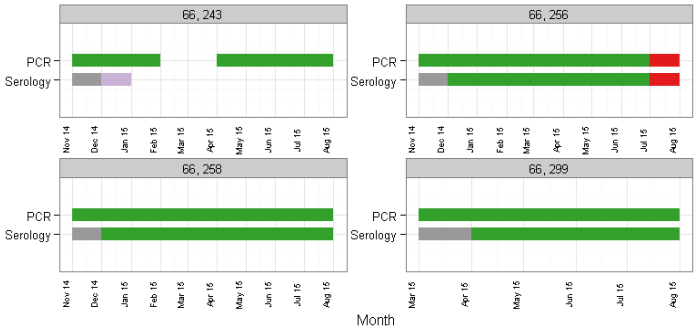

Figure 21: Property cohort results for horse 256 – Owner number 66 - For legend see figure 20

3.2.1.2.1.10 - HORSE 275

Horse 275 had an increase in serology from negative to positive right at the end of the period under review (figure 22). Its PCR results were negative throughout the year making it a different scenario to that of the vaccinated horse 256 (Figure 20). The positive result falls in the middle of winter making it an unlikely true positive and the PP value was very low (PPV 14). Furthermore, the rest of the horses in the property sentinel cohort (Figure 22) were both consistently negative on PCR throughout the review period, although they were not part of the sero-sentinel group. On the first test in the next surveillance period that this horse was involved in (Nov 2015) the iELISA AHS serology result was negative.

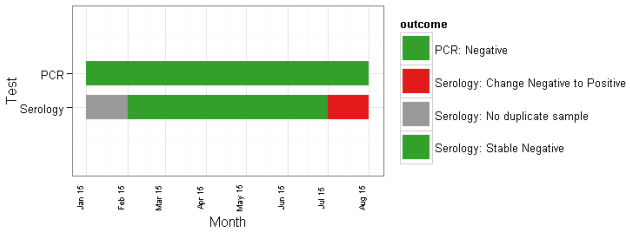

Figure 22: Individual PCR and serology results for the serological increase in horse number 275

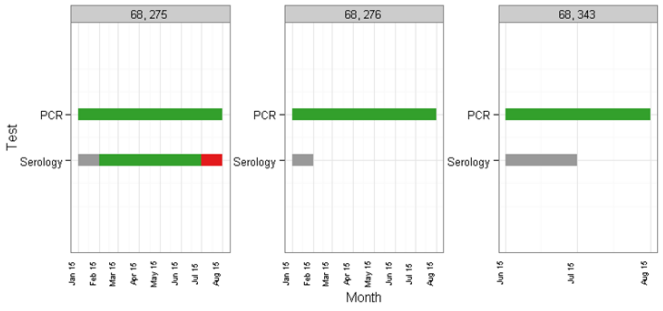

Figure 23: Property cohort results for horse 275 – Owner number 68 - Legend as for figure 22

3.2.1.2.1.11 - HORSE 311

Horse 311 started the sero-sentinel program in April 2015 and tested suspect on serology on the initial test and then alternated between suspect and positive on serology throughout the rest of the period under review (figure 24). This along with the negative PCR results indicates it was likely to have been vaccinated or exposed prior to the period under review and these were residual antibodies that were being detected, making it a false positive result. Also the rest of the surveillance cohort on the property (figure 25) showed consistent negative PCR results and the one other horse that was a sero-sentinel (horse 250) had stable negative results throughout.

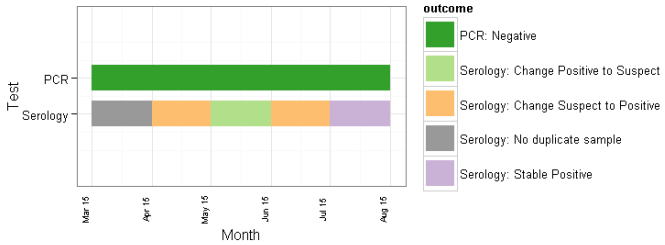

Figure 24: Individual PCR and serology results for the serological increase in horse number 311

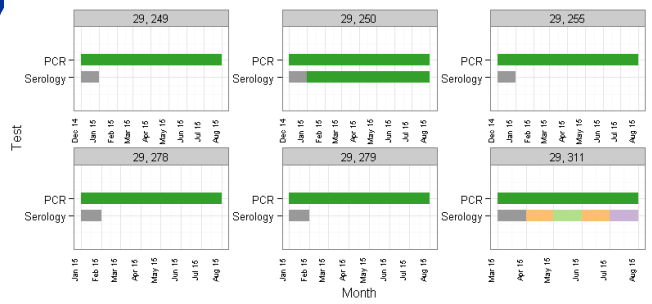

Figure 25: Property cohort results for horse 311 – Owner number 29 - legend as for figure 24

3.2.2 PCR

3.2.2.1 PCR: Positive results

A total of 1 sample tested positive for the period under review. This horse (horse 256) was also positive on serology and has been discussed under that section – see figure 20 and figure 21 – this horse had been vaccinated just prior to the positive result and was thus a false positive.

4. Location of sentinel farms

The ideal spread of sentinel properties and horses is illustrated in Figure 26. Under each area block's name is the ideal required number of horses to include in the program and below that the percentage of the total that should be covered by sampling in that area (for the concept of proportional sampling to be maintained) to detect a 2% minimum expected prevalence (MEP) of AHS. Overlaid on Figure 26 is a color range indicating the attained number of sentinels during the period under review with red, orange and yellow indicating where targets were not attained, green indicating where targets were either attained or very close to attained and then light blue through purple showing areas where more than the required number were attained. Remember that in Figure 5 the target of 2% MEP was reached on most occasions so the attained versus deficit levels will generally balance out for the entire surveillance area.

The highest requirement for sentinels is in the 4 block area of Philadelphia, Paarl, Belville and Stellenbosch (center of the map). In this area the targets of three of the four blocks either were attained or surplus sentinels were sampled, with the Paarl area showing the highest deficit (14 sentinels) for the entire area.

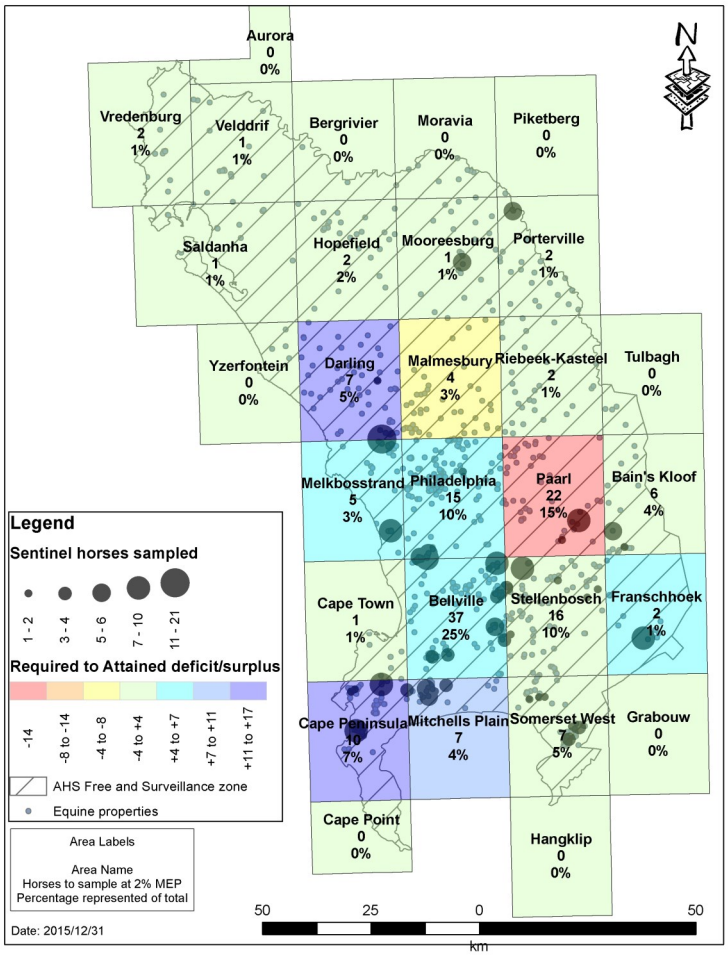

Figure 26: A map showing the AHS surveillance and free zone where sentinel surveillance has taken place. The map depicts the various areas with their estimated number of horses labelled that are required to be sampled to detect a 2% minimum expected prevalence.

The yellow to red areas are areas where sentinels were lacking while the bluer areas show where a surplus of sentinels were sampled.

continued on next page

5. Results and discussion

This is the first attempt at a detailed analysis of the sentinel program in the AHS surveillance zone which includes both PCR and serological testing. The program is not without its challenges, and the recruitment of sero-negative animals for the sero-surveillance aspect has been difficult, which has forced the recruitment of either horses of previously unknown vaccination status or of horses that have been vaccinated some time ago. Also, the surveillance zone has had outbreaks of AHS so the exposure status of some sentinels is unknown, leading to results which are difficult to analyse.

A total of 21% of the samples taken could not be used as part of the analysis because they did not fall within a period of 3 months of another serological result for the same horse. This number will hopefully decrease given that the program has now been established and for the next period sentinels will be selected based on their results this year and should be more representative of the "true" sentinel status.

From a serological point of view there were 16 events in total (from 11 horses) of the 509 events that had an increase in serology from negative to suspect/positive or suspect to positive. Of these there was one definite positive that was recently vaccinated – see Horse 256.

There were a further 2 horses (Horse 223 and Horse 275) that had results showing an increase in serology that could not be definitively confirmed as non-AHS associated. Horse 223, however, had negative PCR throughout the period (figure 16) under review, as did the other 6 horses on the same property with one other horse on the property having stable negative serology throughout (figure 17). The positive result, however, was in January 2015 which is a seasonally possible time for AHS to occur.

Horse 275 had the increase in serology in August 2015 after stable negative results from March of the same year. It also had negative PCR throughout, which was mirrored by the other two horses on the same property, although neither were involved in the sero-sentinel program. Certainly a positive result in August is seasonally very uncharacteristic of AHS and this result should be seen in this light. Also, the next test (iELISA) that was performed on the horse in Nov 2015 was negative for AHS, which would not be expected after a true seroconversion.

Figure 6 shows that in a program like this there are going to be horses with increases in serology pretty much throughout the year, and it is very important to follow these up to try reach some resolution, making a final survey analysis like this one more powerful. This also shows how important adding PCR to the program has been as most of these events can be shown to be false positive increases given serial negative PCR results for each horse. It also illustrates that results must be timeously analysed so that immediate follow up can be performed, for instance possibly the use of SNT (serum neutralization tests) could be incorporated into increases in positivity results.

The AHS vaccination protocol was amended in mid 2015 with either permissions to vaccinate (free and surveillance zone) or compulsory vaccinations (protection zone) now only allowed to occur during the low vector activity period (1 June through 31 October). This will impact positively on the sentinel surveillance program given that potential transmission of vaccine strains will be less of a consideration for potential seroconversions (see horse 223).

6. Conclusion

If negative PCR prior to, during and after an increasing serological result can be considered as categorising that result as false positive then the surveillance results show that it is unlikely that AHS was circulating during the 2014/15 AHS surveillance period in the AHS surveillance zone of the Western Cape at greater than a 2% minimum expected prevalence of detection with a 95% confidence level. Even allowing for false negative PCR (the period of detection for PCR is shorter than that of antibody detection) then there were only 2 horses which showed results that could be considered to be associated with AHS, one of which occurred in a season when AHS circulation is highly unlikely.

The results have been influenced by difficulties in recruitment of true sero-negative sentinels and future analysis will hopefully be easier given that horses not meeting sero-sentinel requirements have been removed from the program throughout the year (note that these horses have still been included in this analysis of the 2014-2015 review period).

The indirect ELISA that is being used in this program is not a truly reliable quantitative test, meaning that it's difficult to analyze a titre difference between stable positive results for instance for a horse that repeat tests positive – like horse 223.

Some positive general outcomes from this program are that cart horse owners in the City of Cape Town area (Mitchells plain and Cape Peninsula in Figure 26) have been recruited during the period reviewed. Also the analysis of monthly data is now automated to prepare a report similar to this one on a monthly basis. This should assist in timelier follow up of increasing serological results.

7. References and Acknowledgements

Camilla Weyer, Phillippa Burger and Esthea Russouw of the Equine Health Fund (EHF) epidemiology unit based in the Western Cape who are responsible for sample collection and logistics as well as data capture into the results database. The program is also partially funded by the EHF.

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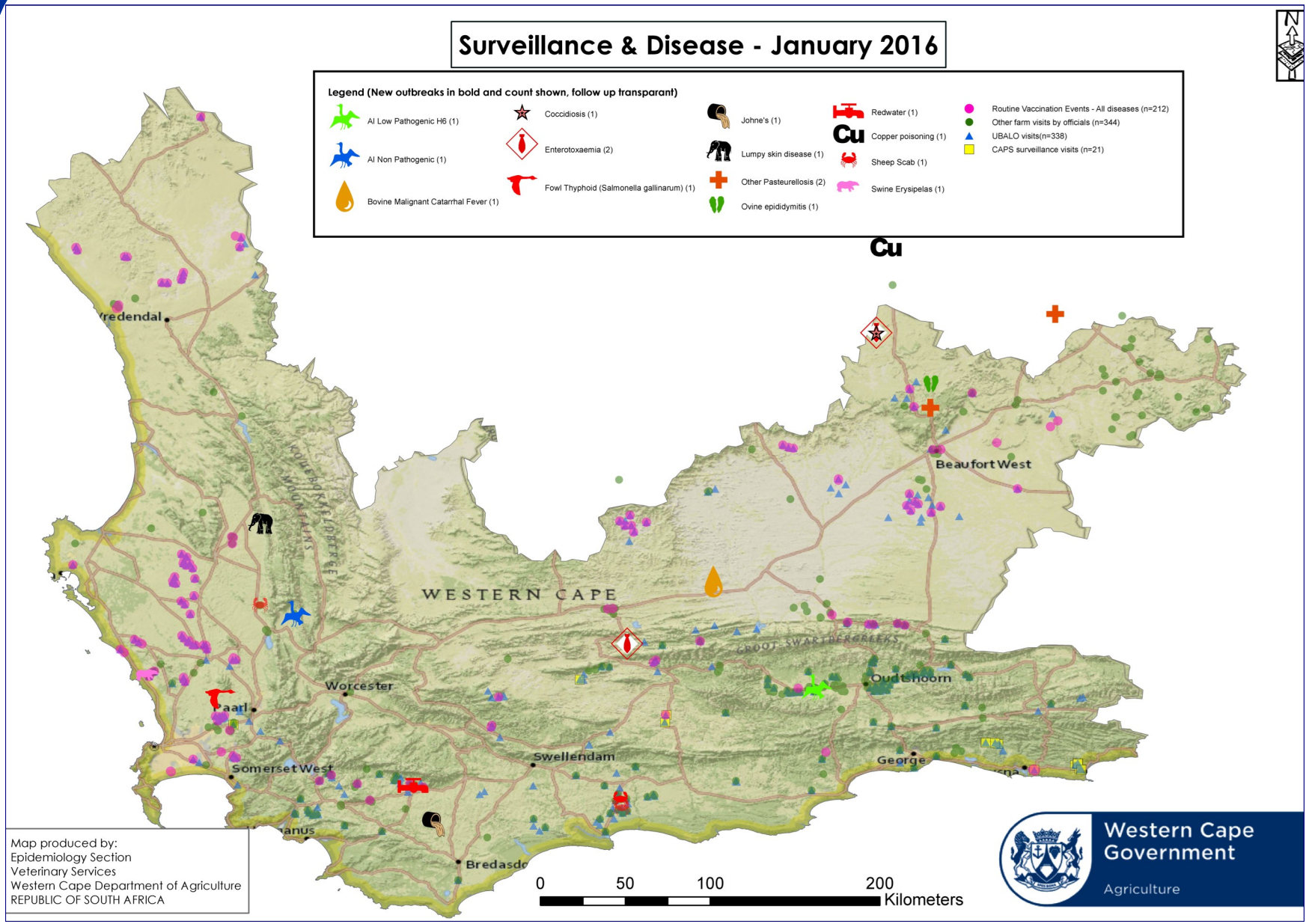

Figure 27: Surveillance and disease map of the Western Cape for January 2016 .

Outbreak events

- A **sheep** farm in the **Bredasdorp** area was confirmed positive for **Johne's disease** in October 2015 after chronic emaciation and diarrhoea was seen in the flock.
- A sheep farm in the **Heidelberg** area was diagnosed with **sheep scab** after a clinical inspection by a private veterinarian. The farmer had received weaner sheep from another farm treated for an outbreak of sheep scab in 2015. Early skin lesions were seen on the sheep in December 2015. This farm and the neighbouring farm have been put under quarantine and the first treatment of all sheep has been done under official supervision.
- A case of **lumpy skin disease** was picked up on ante-mortem examination by one of our newly graduated veterinarians doing his community service year at an abattoir in Hermon. The affected cow had been sold at a slaughter auction, but was returned to her farm of origin near **Piketberg** to recover from the disease before she could return to the abattoir.
- ***Brucella ovis*** was detected on a sheep farm near **Beaufort West**.
- ***Salmonella gallinarum*** (fowl typhoid) was diagnosed using culture on a layer farm near **Klipheuwel** after mortalities on the farm increased suddenly. This is the third farm reported infected with *S. gallinarum* in the province in the last six months, prior to which the province had been free of the disease. Poultry farmers are encouraged to institute strict biosecurity measures on their farms to prevent becoming infected, as well as to remain vigilant for signs of the disease and report it promptly if suspected.
- **Pneumonia** caused by ***Pasteurella*** was diagnosed as the cause of death in 3-week old dorper **lambs** and 4-month old boergoat **kids** near **Beaufort West.**
- **Coccidiosis** was identified as the cause of diarrhoea in **lambs** near **Beaufort West**.
- **Goats** near **Laingsburg** and a **lamb** near **Beaufort West** died of **enterotoxaemia**, identified on post-mortem examination.

Figure 28: Enlarged livers with a green-bronze sheen are often seen in chickens that die acutely of fowl typhoid.

- Serological surveillance (pre-slaughter) on an ostrich farm in the **Oudtshoorn** area detected **H6 N2/N8 avian influenza**. Follow up PCR was negative and since this was the final group to be slaughtered for this season all birds were slaughtered for local consumption and quarantine could be lifted
- Serological testing of a ostrich farm in the **Tulbach** area detected **avian influenza** on **ELISA** with negative HI results and thus far negative PCR results. This is therefore difficult to categorise and has been allocated as an Undefined AI event. The relatively high prevalence level of the ELISA results mean the farm remains under quarantine until absence of circulation of whatever AI is involved is confirmed.
- Not shown in Figure 27 is a potential **H5 avian influenza outbreak** on a **duck breeder farm** in the **Joostenburgvlakte** area. This farm was one of those affected last year by H6 avian influenza (see the June and July epi reports for some of those details) and sampling was being undertaken to establish whether that event could be finalised. Serological results showed however that H5 AI could either be currently circulating or had circulated in the recent past - HI results returned positive values on the H5N2, H5N1 and H6N2 antigens making H5N2 the likely responsible virus. The PCR testing of swabs on the affected farm were negative and follow up testing on serology showed relatively stable prevalences which point towards a detection of a historical outbreak. The farm however remains under quarantine as well as farms within 3 km (which have or soon will be tested).
- An case of **bovine malignant catarrhal fever** was detected in a **heifer** in the **Beaufort West area**. Interestingly the event occurred shortly after Wildebeest were introduced onto a neighbouring farm but the type found was **sheep associated MCFV** (tested twice for confirmation). The young heifer affected was in a herd that had been grazing with sheep on the farm but for the past many years raising interesting questions as to why it was affected only now,.

Epidemiology Report
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VOLUME 8 ISSUE 1

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EPIDEMIOLOGY REPORT

VETERINARY SERVICES
February 2016
Volume 8 Issue 2

Beyond our borders: Peste des petits ruminants

LvH

A month in which no outbreaks of controlled diseases occurred is a good month to focus our attention on the threat that exotic diseases can pose to our country's livestock. A recent report from Zambian Veterinary Services announcing that a suspect outbreak of peste des petits ruminants (PPR) was resolved in the north of the country serves as a good reminder that as animal health professionals in South Africa, we need to be aware of PPR.

Peste des petits ruminants (PPR) is a viral disease of sheep and goats (hereafter referred to collectively as shoats). It is caused by a highly contagious morbillivirus, antigenically similar to the eradicated rinderpest virus, and causes similar clinical signs. The virus has an affinity for epithelial and lymphoid tissue of the respiratory and gastro-intestinal tracts, causing the typical clinical signs of pneumonia, necrotic stomatitis and gastroenteritis.

Transmission between animals usually occurs through the respiratory system as a result of inhalation of exhaled infective droplets or aerosolised virus from secretions and excretions of infected animals. Infection can also be a result of contact with fomites shortly after contamination, as the virus is inactivated by ultraviolet light and desiccation within four days. On a larger scale, spread of the disease is facilitated by movement of live-stock for trade.

Although PPR is primarily a shoat disease, cattle and pigs can be infected. They subsequently seroconvert but do not show clinical signs of the disease and do not transmit the virus. Several species of wild ruminants are also susceptible, however, there is very little data available regarding whether clinical disease can occur in wild populations and what role wildlife plays in the epidemiology of the disease. In camels, clinical disease as a result of PPR seems to occur to a limited extent and experimental infections have shown transmission is possible to other camels and goats, but not sheep.

After an incubation period of approximately four to six days, infected animals present with acute pyrexia (up to 42°C), depression and anorexia. Shortly afterwards, a serous oculonasal discharge develops, which becomes progressively catarrhal (fig 2). Concurrently, painful erosive lesions, which can become necrotic, develop in the oral cavity. In the later stages of the disease, a watery, bloody diarrhoea and pneumonia can develop. Post-mortem signs include a dehydrated carcass, necrotic lesions in the oral cavity, "tiger striping" of the caecum, colon and rectum, enlargement of the spleen and mesenteric lymph nodes and bronchopneumonia.

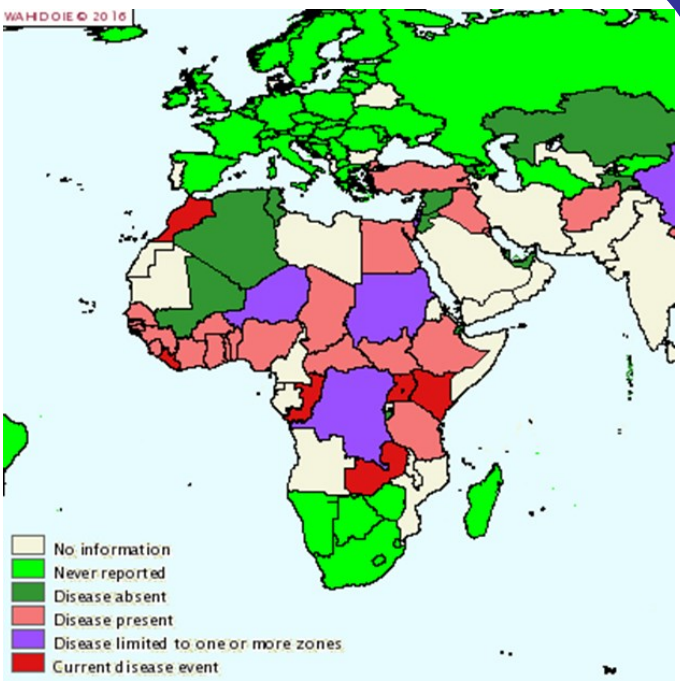

Figure 1: Country disease status of PPR in Africa (OIE, 2015)

In susceptible populations in non-endemic areas, morbidity of PPR is usually 60-90%, but can reach 100%. In addition to losses from mortality, heavy production losses occur as a result of dehydration from diarrhoea and anorexia due to painful stomatitis. Pregnant animals may abort their foetuses. In endemic areas, younger animals are usually affected, as older animals that have been exposed to the virus can develop life-long immunity if they survive the initial infection.

In Africa, PPR was first reported in Cote d'Ivoire in 1942, and following this, in several other West African countries, from where it spread over several decades into North and Southern Africa. South Africa is currently separated from several countries in which there are active outbreaks by a buffer of single countries (fig 1), including some states which are experiencing economic depression, decreasing their ability to implement effec-tive animal disease control measures. Increased vigilance against PPR is therefore necessary in South Africa. Introduction of the disease into the naïve animal population of South Africa would result in massive losses

Beyond our borders: PPR

to the small stock industry from morbidity, mortality and loss of production as well as the cost of disease control measures such as stamping-out of infected herds, movement controls and vaccination. Food security for South Africans would also be affected and revenue from exports of ovine and caprine products would be lost. Additionally, PPR poses an unknown risk to the diverse wildlife species of the country.

Clinical surveillance is an important aspect of detection of PPR infection, but PPR can be confused with other diseases that are endemic in parts of South Africa, such as foot and mouth disease, bluetongue, pasteurellosis, heartwater or heavy helminth infestations. Thorough follow-up testing to confirm the cause of a suspicious outbreak of disease resembling PPR should therefore always be undertaken.

There is no specific treatment available for PPR. Affected animals can be given treatment to alleviate symptoms as well as to combat complicating bacterial and parasitic infections. The disease can be prevented by use of a vaccine that provides protection for more than one year, but it is not advisable to vaccinate animals in non-endemic countries as this practice may mask presence of the disease, causing a delayed response to an outbreak. Additionally, vaccinated animals will test positive on screening tests, and therefore cannot be differentiated from infected animals. It is thought that this was the case in the aforementioned Zambian event, and that the positive animals detected were in fact vaccinated animals introduced from neighbouring countries.

Figure 2: A PPR infected goat showing a catarrhal nasal discharge (CIRAD, 2015)

In South Africa, vaccination is not allowed without special permission from the National Director of Animal Health. There is currently a state surveillance programme in place for early detection of a disease incursion, targeting high risk areas along the borders of our country, or where illegally imported animals are likely to occur. In addition, it is the duty of every veterinary and animal health professional to be vigilant for signs of this disease, and to report them to state veterinary services without delay if detected.

Outbreak events

- A case of **bluetongue** was detected in a sheep in the **Murraysburg** area showing lesions in the mouth and on the tongue, and with a serous nasal discharge. No clinical signs on the claws were seen. Unconfirmed reports of two other bluetongue cases occurred in this area as well. The affected sheep were treated and recovered well, and the entire flock was vaccinated against bluetongue. Farmers in the province are advised to make sure their bluetongue vaccinations are up to date.
- Three farms (two **ostrich** and one **duck**) showed testing evidence of **low pathogenic avian influenza** in January, and thus were reported in February. The duck associated event was determined to be residual to an outbreak that probably occurred in December 2015. Serological evidence pointed to an H5N2 AI subtype although further characterisation of the virus was not possible given that circulation was complete once the event was detected.
- An outbreak of **pneumonia** occurred in three week old **Dorper** lambs in the **Beaufort West** area. Vaccination of ewes and lambs in the flock with MultivaxP stopped the outbreak quickly.
- Severe ***Paramphistomum*** infestation caused the death of two affected **lambs** in this area.

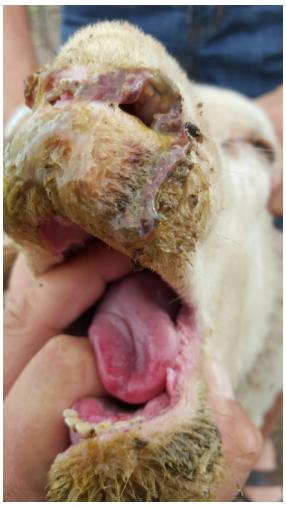

Figure 3: A bluetongue infected sheep (L Kruger)

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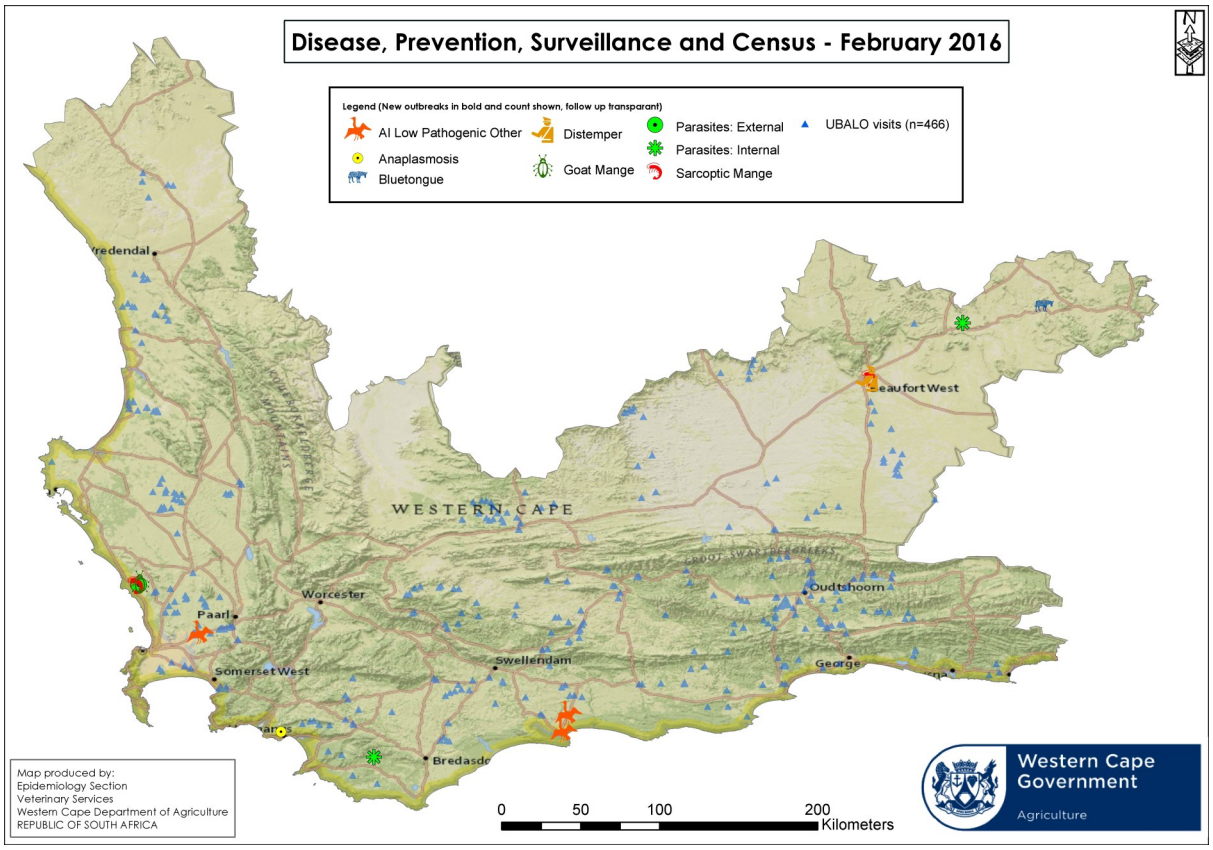
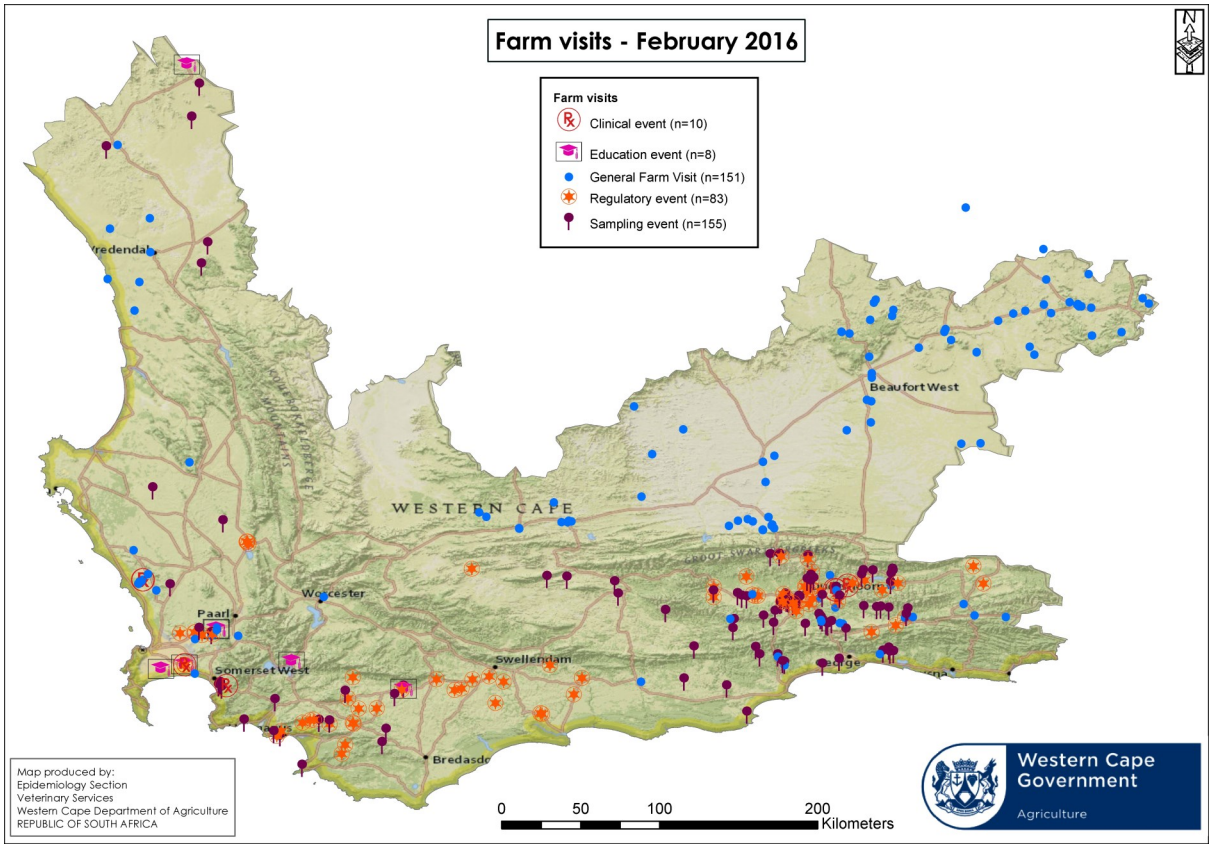

Disease, Prevention, Surveillance and Census - February 2016
Legend (New outbreaks in bold and count shown, follow up transparant)
AI Low Pathogenic Other
Anaplasmosis
Bluetongue
Distemper
Goat Mange
Parasites: External
Parasites: Internal
Sarcoptic Mange
UBALO visits (n=466)
WESTERN CAPE
Worcester
Paarl
Somerset West
Swellendam
Bredasdo
Oudtshoorn
George
Beaufort West
Map produced by:
Epidemiology Section
Veterinary Services
Western Cape Department of Agriculture
REPUBLIC OF SOUTH AFRICA
0 50 100 200
Kilometers
Western Cape Government
Agriculture


Farm visits - February 2016
Farm visits
Clinical event (n=10)
Education event (n=8)
General Farm Visit (n=151)
Regulatory event (n=83)
Sampling event (n=155)
WESTERN CAPE
Worcester
Paarl
Somerset West
Swellendam
Bredasdo
Beaufort West
Map produced by:
Epidemiology Section
Veterinary Services
Western Cape Department of Agriculture
REPUBLIC OF SOUTH AFRICA
0 50 100 200
Kilometers
Western Cape Government
Agriculture

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
March 2016
Volume 8 Issue 3

Freedom of Disease Survey – 2014 Porterville and Robertson AHS virus

JDG

Introduction

Freedom of disease is required to be shown following outbreaks of African horse sickness (AHS) within the Western Cape AHS control zones to give stakeholder confidence in the status of the disease in said zones. There was an outbreak of AHS in the Western Cape AHS protection and surveillance zones in 2014 (see our March, May and June 2014 epidemiology reports) and this report details the survey and results to show freedom of disease in the areas that were affected during these outbreaks.

Materials and Methods

Survey parameter definitions

The survey parameters were chosen based on data collected and collated during the 2014 outbreaks. The outbreaks (Porterville and Robertson) in 2014 were considered as distinct events given the areas they occurred in (see Figure 1) and the distance between them.

Of the two outbreaks it was the Porterville outbreak (AHS Protection Zone) that occurred first and spread into the AHS Surveillance Zone near Paarl and Wellington. The Robertson outbreak (AHS Protection Zone) remained within the immediate vicinity of Robertson town. The outbreak parameters and response in Robertson differed somewhat to Porterville, and unfortunately the collation of data for the Robertson outbreak was very much focussed on the positive results detected through surveillance. This was because of the concurrent outbreak in the Surveillance Zone, which was of more importance in terms of future exports of horses. The positive case numbers in Robertson were lower but there was also a higher rate of subclinical cases with 17 of the 22 cases being detected on routine sampling taken during the outbreak. There was only one death in Robertson and this was the index case for the outbreak.

Population at risk

Population data (herd and individual horse level) was obtained through census and outbreak surveillance (both clinical and sampled) and information was included for the sample frame to only include:

- Herds where at least one equine was present
- Herds which had available owner and location information since we needed to contact owners prior to sampling
  - * *A total of 20 herds were removed from the sample frames (10 in Robertson and 10 in Porterville) due to a lack of individual horse and/or contact/location data.*
- Dead horses were removed from the sampling frame (14 in Porterville and 1 in Robertson)

Survey design

To design the survey the following estimates/parameters needed to be defined:

Herd level design prevalence

The estimated between herd prevalence during the 2014 Porterville and Robertson outbreak was 32% and 23% respectively. For the purposes of this freedom of disease survey (in an effort to be conservative and

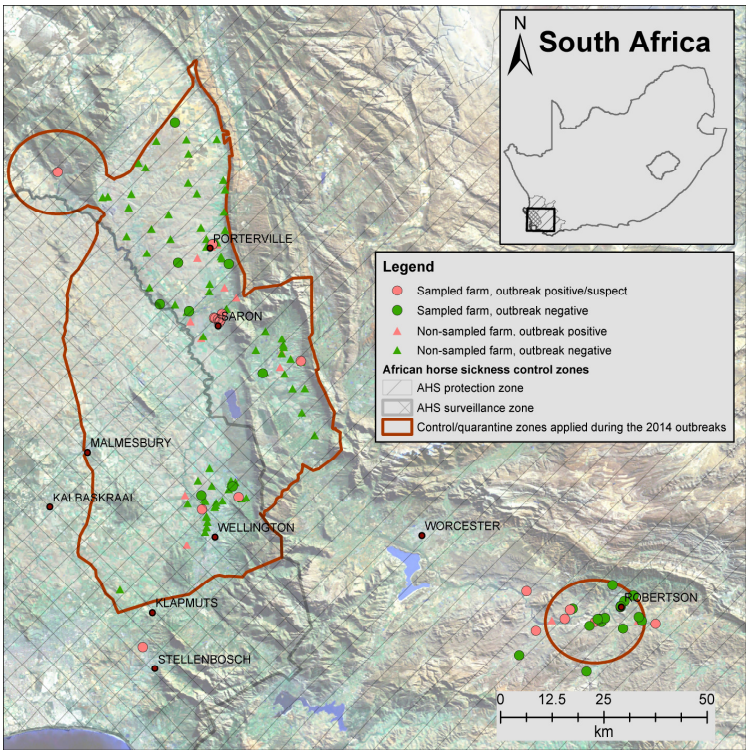


Figure 1: The control and quarantine areas of the 2014 Porterville and Robertson AHS outbreaks. Shown are the farms that were sampled during the 2016 survey (circles) with the outbreak AHS status of the farm indicated by colour - pink for positive farms and green for negative farms. NOTE: The Porterville farm in the Stellenbosch area was a positive farm near to Wellington but which has since translocated to Stellenbosch. It was included in the sampling frame given that the majority of the 2014 horses were still on the property.

increase sample numbers) a 10% design prevalence was used.

Intra-herd prevalence

Taking the counted equine population per outbreak as the denominator, the overall individual morbidity of the 2014 Porterville outbreak was approximately 10.2% while the Robertson outbreak was estimated at 2.5%. The morbidity of tested individual horses on positive farms was 35.4% and 8.5% for Porterville and Robertson respectively. Given that a conservative design prevalence was chosen, an intra-herd prevalence of 20% for both areas was used in the survey design.

Test sensitivity

The sensitivity of the real time RT-PCR that was used has been published[1] and has a sensitivity of 0.978.

Type 1 error level

A type one error rate of 0.05 (or 5%) was used, reflecting a required 95% probability level of detecting AHS should it exist within the survey parameters.

Herd sensitivity

Herd sensitivity is an estimate of the likelihood of detecting positive herds should they exist. In this case a herd sensitivity of 95% was used given the high PCR sensitivity and the relatively high within positive herd prevalence and between herd prevalence.

Risk

A risk based input was included in the sampling planning (Porterville only) where all positive and suspect farms from the outbreak have been allocated as higher risk properties, with the formula allocating the likelihood of selecting previously positive farms at a higher rate than that of the negative farms. A risk based approach could not be used for the Robertson sampling frame since, if a risk based strategy was used the *alpha* level required would not be reached.

Survey requirements

Parameter		Robertson	Porterville
Survey requirements based on FFD package[2, 10,11]	Total herds to sample/Herds available in sample frame	21/25	21/118
	Risk based approach used?	NO	YES
	Previously positive herds to sample		13
	Previously negative herds to sample		8
	Estimated samples to take/ estimated animals available in sample frame	148/839	118/868

Table 1: Sample frame requirements

Herds and individual animals to sample are shown in Table 1 with farm level samples to take, based on the current population on the farm, shown in Table 2.

Survey area	Herd Size	Samples to take
Both	1	entire herd
Both	2	entire herd
Both	3	entire herd
Both	4	entire herd
Both	5	entire herd
Both	6	entire herd
Both	7-9	7
Both	10	8
Both	11	9
Both	12-16	10
Both	17-21	11
Both	22-36	12
Porterville	37-69	13
Robertson	37-86	13
Robertson	87-256	14

Table 2: Sample size per farm based on population level on farm

Results

Results of the survey are shown in Table 3. During the survey there were farms that could not be sampled. Reasons for this are shown in Table 3. In order to comply with the sampling frame, the closest available farm (taking into consideration in Porterville whether it was positive/negative in the outbreak) was sampled according to Table 2 requirements. Across both surveys a differential of 1 additional farm was sampled with a loss of 6 individual samples compared to the expected number to be taken as shown in Table 1. See the *Conclusions and discussions* section below for the impact this had on the overall confidence of the survey.

			Robertson	Porterville
Survey parameters attained	Identified herds sampled/herd sample frame		14/21	15/21
	Reason for loss of herds identified	Property no longer contains horses	6/7	2/6
		Farm amalgamated with another property in frame	1/7	0/6
		Farm unavailable for sampling	0/7	4/6
Survey amendments	Farms **added** to initial frame : Samples taken on these farms		**4 : 16**	**7 : 44**
Survey considerations	Total **additional**/**loss** of herds : samples based on initial sampling frame		**-3 : -15**	**+1 : +9**
Survey results	**Positive : Negative AHSV results**		**0 : 133**	**0 : 117**
	Positive : Negative EEV results		**3 : 130**	**0 : 117**

Table 3: Survey results including farms that were not sampled and the addition of farms to compensate for this

All in all there were no positive AHS results across both the Robertson and Porterville outbreak areas. The laboratory also tested for Equine Encephalosis virus (EEV) and three cases were detected on a single farm in Robertson.

Constraints and considerations of the study

When performing a freedom of disease study it is important to try and find the disease in the right place, during the correct time and within the population that is most likely to have the disease should it exist. The following points are considerations that must be taken with regards to the current results.

TIMING OF THE SURVEY

The two surveys ran concurrently and sampling took place between 12 and 25 Jan 2016 (Porterville) and 18-26 Jan (Robertson). Outbreaks of AHS in the AHS control zones have been generally later than January (see our June 2015 report for an overview). Outbreaks in South Africa have peaked in March and April between 2011 and 2015[3]. The current surveillance project was however focussed on detecting circulating AHSV that would still be linked back to 2014. Freedom from disease in this case was freedom from AHSV that overwintered in 2014 and 2015 and was still circulating in January 2016. This said, the temporal pattern of AHS outbreaks within the AHS control zones will be an outcome of vector, climatic, vaccination and population conditions.

VECTOR FACTORS

Vector studies have shown that in the Western Cape high *Culicoides* numbers are reported in early spring (September and October) with another peak in April[4,5], although the highest counts of *C. imicola* in the Venter et al. study[5] were detected in April and January respectively. Climate is an important factor to consider with regards to AHS epidemiology and the likelihood of maintenance of an outbreak virus between disease seasons. The Western Cape in general has warm dry summers with mild and relatively frost-free winters. These environmental conditions are suitable for *Culicoides* detection throughout the year[5] although the overwintering of AHS outbreaks has, to the best of our knowledge, not been detected within the AHS control zones to date.

VACCINATION AGAINST AHS

The vaccination against AHS and the timing thereof can play a role in the underlying population at risk that might enable an outbreak virus to remain circulating for extended periods of time. Vaccination against AHS in the AHS protection zone is compulsory according to South African legislation (Animal Diseases Act 35 of 1984) while in the AHS surveillance zone vaccination is prohibited unless requested and approved through the Provincial Director of Veterinary Services. This should therefore imply that there is a limited AHS susceptible population in the AHS protection zone, and thus in the majority of the Porterville outbreak area, and the whole of the Robertson outbreak area (see Figure 1). Changes to the policy of vaccination and potential permissions to vaccinate in the AHS control zones were made in late March 2015 with vaccinations against AHS summarily prohibited outside of the 1 June – 31 October period each year (Department of Agriculture, Forestry and Fisheries: Animal Health – 26 March 2015). Prior to this an AHS freedom of disease survey would have been overly complicated by the lack of a DIVA test in the face of vaccination, which is part of the reason why this study was only performed in 2016 and not 2015.

During our surveillance the vaccination status and last vaccination date against AHS was requested per horse sampled, primarily to ensure that, since a non-DIVA RNA based detection test was used, false positives as a result from recent vaccination could be investigated and excluded. Theoretically there should not have been a horse in the sample frame that had been vaccinated after 31 October 2015 which was 2.5 months prior to the earliest sample being taken, but the period of RNA detection post vaccination in horse, while not known, is likely to be greater than 2.5 months – certainly cases of naturally infected horses having AHSV RNA detected for greater than 130 days post infection have been documented[6]. As none of the samples collected were positive for AHSV, follow-up of vaccination status was not necessary, but the results of the vaccination status of the sampled horses have been shown in Table 4.

Parameter			Robertson	Porterville
Vaccination status	Unknown		15 (11%)	10 (8%)
	Unvaccinated		54 (41%)	22 (19%)
	Vaccinated	Total	64 (48%)	85 (73%)
		Oct 2015	12 (19% of vaccinated)	0
		Jan – Sept 2015	38 (59% of vaccinated)	28 (33% of vaccinated)
		2014	11 (17% of vaccinated)	48 (56% of vaccinated)
		<2014	3 (5% of vaccinated)	9 (11% of vaccinated)

Table 4: Vaccination status and last vaccination date of sampled horses

This leads to some overlap with the underlying ***POPULATION CONDITIONS*** consideration. The high percentage of unvaccinated horses in the Robertson area, where vaccination is compulsory, is largely to do with the fact that the sample frame included many unvaccinated foals born of Thoroughbreds in late 2015, this since Robertson is a hub for the Western Cape thoroughbred breeding industry. The management and timing practises of the Thoroughbred industry creates an environment of unvaccinated foals with decreasing maternal immunity in the first high risk orbiviruses season after birth[7]. This practice creates fluctuating levels of susceptible populations of horses even in areas of required vaccination. Maternal antibody levels in foals will wane after birth and therefore sampling in January

may have been in a period where higher levels of maternal antibody would have been present in the foal populations sampled. This said however, the decay rate of maternal antibodies to AHSV has been shown to vary among Thoroughbred foals born to vaccinated mares, and furthermore there is further variation between the differing AHS serotypes[8].

Data sources

It is unfortunate that the Robertson and Porterville outbreaks overlapped – this resulted in the primary collation of data in the Porterville outbreak to be relatively complete while the Robertson data was limited to complete census information but other parameters only collated from positive farms. This said, the survey parameters used were fairly conservative, and in particular the low design prevalence (10%) which was used results in a conservative sample frame.

Conclusions and discussion

The post-Robertson and post-Porterville AHS freedom of disease survey was performed in Jan 2016. The goal was to detect whether the 2014 outbreak virus was still circulating using the discussed design parameters with a 95% confidence of detecting the disease given these parameters. Given that during the survey some herds could not be sampled (reasons and totals shown above in Table 3) a calculation of the post sampling alpha level achieved[9] was performed resulting in alpha levels of 8% and 5% for Porterville and Robertson areas respectively. AHS was not detected in either the Porterville outbreak Control Zone nor in the Robertson outbreak quarantine zone.

It is important for future outbreaks in the AHS control zones that the freedom of disease survey that will follow the outbreak relies on collated and good quality information, and, while during an outbreak there is much focus on positive farms, the underlying population at risk in the outbreak control zone and the collating of negative reporting and sample results is crucial for a solid post outbreak sampling frame to be developed.

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We are very grateful to the following individuals and organisations who contributed time and/or funding to the project. WITS Health Consortium (Dr Beverley Parker, Dr Phillippa Burger); Equine Research Centre (Prof Alan Guthrie, Dr Camilla Weyer); Western Cape Compulsory Community Service Veterinarians (Dr Claire Gray, Dr Margs du Plessis); Western Cape Department of Agriculture (Mr Lugen Govender). Thanks also to the equine owners in Porterville, Wellington and Robertson who so freely gave their time to accommodate the sampling team.

Equine piroplasmosis and other vector-borne diseases

The reporting of a horse showing clinical signs similar to those of African horse sickness (AHS) within the AHS surveillance zone prompted an investigation by authorised equine veterinarian Dr Camilla Weyer.

The case presented in a colt of approximately one year of age. Initial clinical signs included swollen conjunctivae and ataxia resulting in recumbency with paddling. Death followed soon afterwards. The colt was unvaccinated against AHS and equine influenza, and had never been dewormed. His mother had, however, been vaccinated against AHS during the outbreak in Mamre in 2011.

On post-mortem examination, the mucous membranes were very pale, and covered in petechiae and suggillations. Petechiae and suggillations were subsequently found on all serosal and mucosal surfaces, as well as the myocardium and endocardium. Oedema was observed subcutaneously, intermuscularly in the neck and pectoral areas and in the mediastinum. A severe hydrothorax and hydropericardium were seen, along with pulmonary oedema. About 4 litres of fluid was found in the thorax (fig 2)

Whole blood samples in EDTA tubes were taken from the dead horse, as well as from nine other horses and a donkey that had been in contact with the colt. All horse owners in the surrounding area were verbally put under quarantine, DEET-containing spray for vector protection and thermometers for monitoring of the horses' rectal temperatures were provided.

The samples were tested by the Equine Research Centre in Pretoria using real-time PCR for AHS, equine encephalosis virus (EEV), *Theileria equi*, *Babesia caballi* and equine herpes virus (EHV) 1 and 4. The colt tested positive for *T. equi*, along with all nine of the other sampled horses. Positive results for *B. caballi* and EHV 1 were also found, each in a single horse.

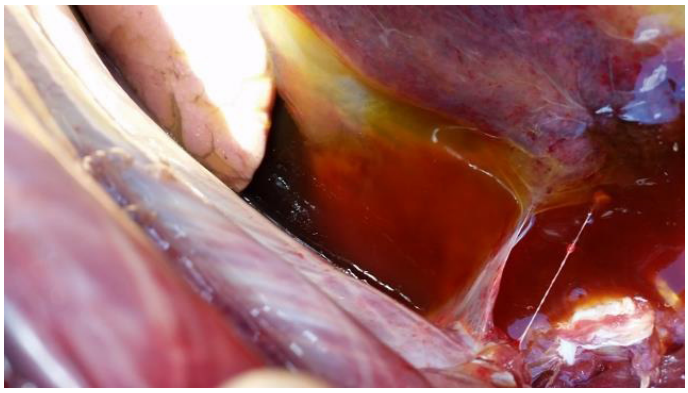


Figure 2: Fluid in the pleural space observed during necropsy

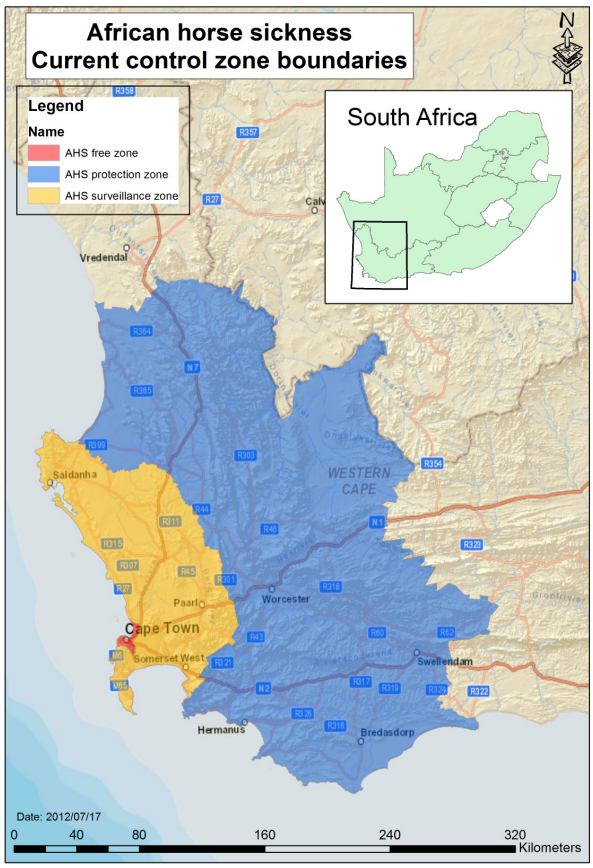


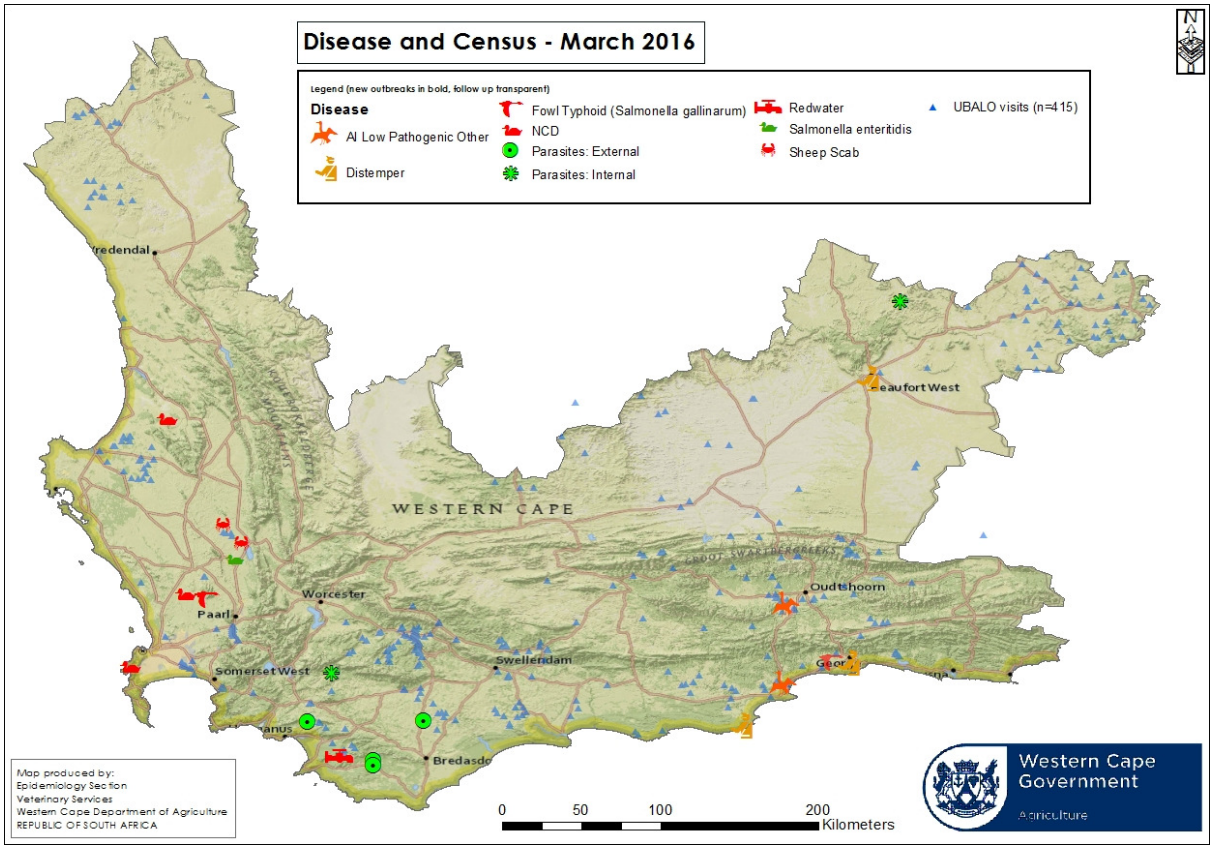
Figure 3: South African AHS control zones

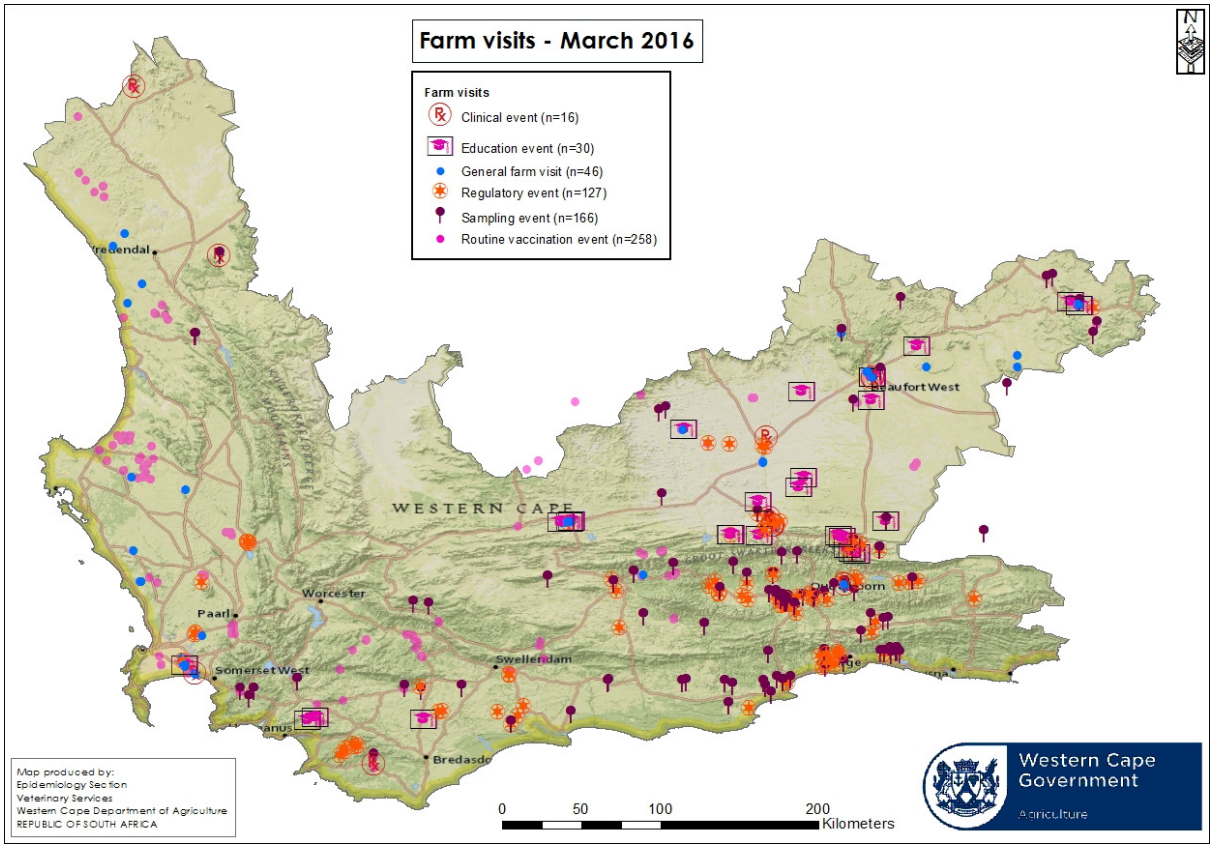
The property is being monitored and two of the in-contact horses are currently showing clinical signs of possible piroplasmosis: nasal discharge and pyrexia. There have been other deaths caused by piroplasmosis in the Mamre area, and a single equine death caused by EEV in the Tierfontein area.

All of the abovementioned equine diseases can present with similar clinical signs to African horse sickness, and so investigation and rapid response to these cases is of utmost importance within the AHS surveillance area.

Thanks to the speedy investigation and processing of samples by the vets involved, AHS could be excluded as the cause of this case. All horse owners or keepers within the AHS control zones are encouraged to report any illness involving sudden death, oedema of the head and neck and/or unexplained fever to their local state veterinarian as quickly as possible.

An interactive map of the African horse sickness control zones can be found at www.elsenburg.com/vetpei under the "Maps" tab.


Disease and Census - March 2016
Legend (new outbreaks in bold, follow up transparent)
Disease
AI Low Pathogenic Other
Distemper
Fowl Typhoid (Salmonella gallinarum)
NCD
Parasites: External
Parasites: Internal
Redwater
Salmonella enteritidis
Sheep Scab
UBALO visits (n=415)
WESTERN CAPE
Beaufort West
Oudtshoorn
Worcester
Paarl
Somerset West
Swellendam
Bredasdo
Map produced by:
Epidemiology Section
Veterinary Services
Western Cape Department of Agriculture
REPUBLIC OF SOUTH AFRICA
0 50 100 200
Kilometers
Western Cape Government
Agriculture


Farm visits - March 2016
Farm visits
Clinical event (n=16)
Education event (n=30)
General farm visit (n=46)
Regulatory event (n=127)
Sampling event (n=166)
Routine vaccination event (n=258)
WESTERN CAPE
Beaufort West
Worcester
Paarl
Somerset West
Swellendam
Bredasdo
Map produced by:
Epidemiology Section
Veterinary Services
Western Cape Department of Agriculture
REPUBLIC OF SOUTH AFRICA
0 50 100 200
Kilometers
Western Cape Government
Agriculture

Outbreak events

- **Ostrich** farms in **Mossel Bay** and **Oudtshoorn** tested positive for **low-pathogenic avian influenza**, types H5N2 and undefined respectively.
- Two outbreaks of virulent **Newcastle disease** in backyard **chickens** were reported from **Cape Town** and **Malmesbury**, as well as an historical outbreak from October 2015 from the Vredenburg area.
- ***Salmonella enteritidis*** was detected on environmental samples taken from a **broiler** breeder farm near **Malmesbury**.
- A fourth farm in the Western Cape, near **Malmesbury**, has been confirmed positive for ***Salmonella gallinarum*** in the past six months. A control strategy for the disease on this multi-age **layer** farm will be developed.
- Two **sheep** farms in the **Saron** area were confirmed positive for **sheep scab** after buying in infected sheep from a dispersal sale in September 2015. Both farms were quarantined and all sheep treated under official supervision three times.
- An increase in incidence of tick infestations and **bovine babesiosis** was experienced by a cattle farmer near **Gansbaai**.
- **Canine distemper** was diagnosed in dogs in **George**, **Gouritsmond** and **Beaufort West**.
- A commercial layer chicken farmer near Riviersonderend experienced sporadic mortalities of chickens with a drop in egg production and some blood seen on the eggs. Chickens sent for post-mortem examination at the Stellenbosch Provincial Veterinary Laboratory showed a severe necrotic pyogranulomatous cholangio-hepatitis, suspected to have a bacterial cause. Bacterial culture revealed growth of *Riemerella anatipestifer* (a duck disease that can also be pathogenic for chickens), *Escherichia coli* and *Enterococcus* sp. Internal parasites were also observed at post-mortem.

Figure 4: *Riemerella anatipestifer* causes nervous signs and sudden death in ducks (*poultrypics.com*)

Farewell to John

After six years in the Epidemiology Section, Dr John Grewar is moving on from State Veterinary Services to focus on equine research.

Regular readers of this monthly Epi Report will be familiar with his in-depth reports on disease outbreaks and surveillance systems, but may not be aware that, in his time here, John played a very important role in advancing veterinary epidemiology in the Western Cape, from founding the Epi Report to putting in place many of the efficient systems used every day by Veterinary Services officials for data recording, reporting and disease control.

This month's report will be the last Epi Report on which John is an editor. He will be missed in our offices, but we wish him well in his research career and future endeavours.

Epidemiology Report
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L van Helden **lesleyvh@elsenburg.com**

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
April 2016
Volume 8 Issue 4

African horse sickness in the surveillance zone

Almost exactly two years since the last outbreak of African horse sickness (AHS) in the official surveillance zone, a clinical case of AHS resulting in the death of a horse was detected in Paarl this month.

On 3 April 2016, a private veterinarian was called out to attend to a bay colt approximately 18 months of age. The colt presented with pyrexia and supraorbital swelling, and inspection of the mucous membranes showed petechiae as well as frank bleeding. Death occurred soon afterwards on the same day.

Blood and tissue samples were taken during a post-mortem examination. Microscopic examination of a blood smear taken during the post-mortem revealed *Babesia caballi*, one of the causative organisms of equine piroplasmosis. Further testing of the samples taken took place at the Equine Research Centre at Onderstepoort. Both blood and organs tested positive to AHS virus, subsequently identified as type 1. Tests for equine encephalosis virus (EEV) were negative.

A history obtained from the owner indicated that the affected animal was unvaccinated and had never travelled off the farm of origin. Other horses on the farm had travelled to the AHS protection zone and back approximately three weeks before the case occurred, but no recent cases of AHS were reported from this area. There were nine other horses on the same property, three of which had written records of being vaccinated against AHS in August 2015.

The affected farm was issued with a quarantine notice and the public informed of a containment area surrounding the case in which no movement of equines was allowed without a permit (fig 1). Horse owners were advised to stable their animals from two hours before sunset until two hours after dawn and to treat them with a registered insect repellent, as well as to cover all stable openings with 80-10% shade cloth. Vigilance for signs of clinical AHS was encouraged.

Surveillance began in the area, moving outwards within a 5km radius from the index case, with each property on which horses were kept being visited, horses inspected and blood samples taken. A second, simultaneous wave of surveillance began, starting approximately 10km away from the index case and working inwards, inspecting all horses for clinical signs of AHS. Any suspect cases were sampled for further testing. Suspect cases reported within the greater containment area were also visited and samples taken. Vector surveillance was included by setting up light traps for Culicoides species near the index case. Trapped insects will be tested for evidence of AHS virus.

By 26 April 2016, over 200 horses had been sampled within 5kms of the index case and 90% of the results received, all of which were negative for AHS virus. No evidence of clinical cases further afield was detected either. All horses present on the same farm as the index case tested negative for AHS. However, several cases of EEV and equine herpes virus were picked up in the surrounding area. As a result of the lack of new cases of AHS, indicating that the outbreak was not already widespread when detected, the containment area was revised to encompass a smaller area surrounding the case (fig 1).

A second round of surveillance in the 5km area surrounding the index farm began on 26 April 2016. Unfortunately, more positive cases were detected as a result:

- Three asymptomatic horses on the same property as the index case tested positive. At least one of these horses was vaccinated against AHS in 2015.
- A gelding on the neighbouring property experienced a mild pyrexia with quick recovery several days earlier. He had been vaccinated against AHS in 2012.

Between 27 and 29 April 2016, three more clinical cases were detected:

- A mare nearby in the Agter Paarl area showed signs of pyrexia and stiffness, and died after five days of illness. This mare had been vaccinated against AHS in the past (date unknown). On the same farm, an unvaccinated gelding showed similar clinical signs and was euthanased. Lab results for the latter case are pending.
- An unvaccinated Thoroughbred foal, also in the Agter Paarl area, with a severe roundworm infestation died suddenly with signs of lung oedema.
- A colt in the Soetendal area north of Wellington showed swelling of the supraorbital fossa and mild depression. This colt has a history of being vaccinated against AHS (date unknown).

All of these clinical cases (excepting the gelding with pending lab results) were identified as serotype 1.

Surveillance in the containment zone is continuing, to detect new cases of AHS as soon as they occur.

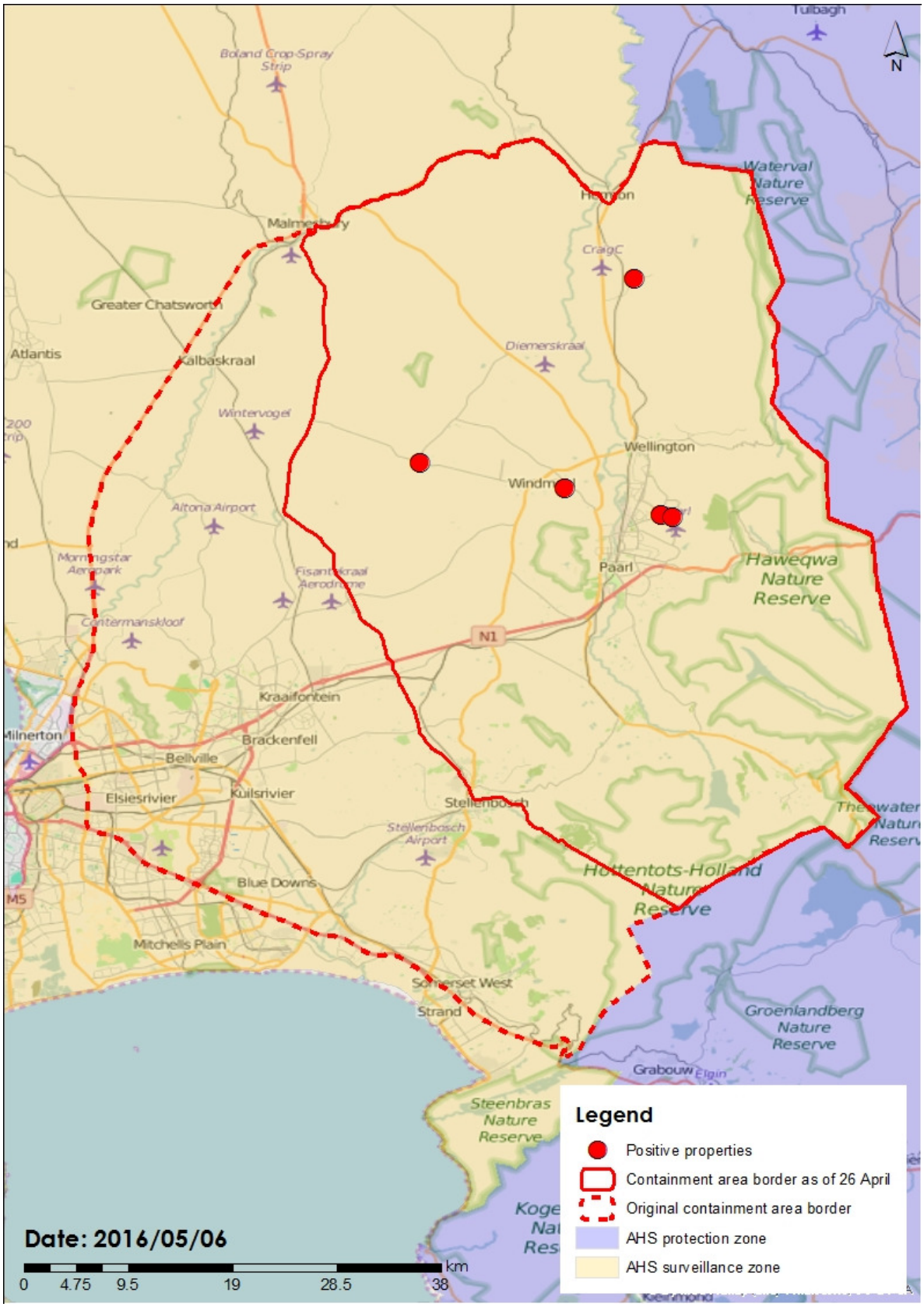


Figure 1: Positive properties in relation to the original and revised containment areas following the confirmed case of AHS in Paarl

EUS discovered in the Olifants River

On 8 April 2016, a farmer in the Citrusdal area reported that yellow fish and other fish in the river on his farm were infested with large, red "boils".

A smallmouth bass (*Micropterus dolomieu*) showing clinical signs was collected from the river and taken to a private veterinarian in Paarl. The affected fish had large, red, ulcerative lesions in its skin. Samples were sent to the DAFF Aquaculture Research Laboratory. Tissue samples were prepared and a diagnosis of epizootic ulcerative syndrome (EUS) was made using PCR.

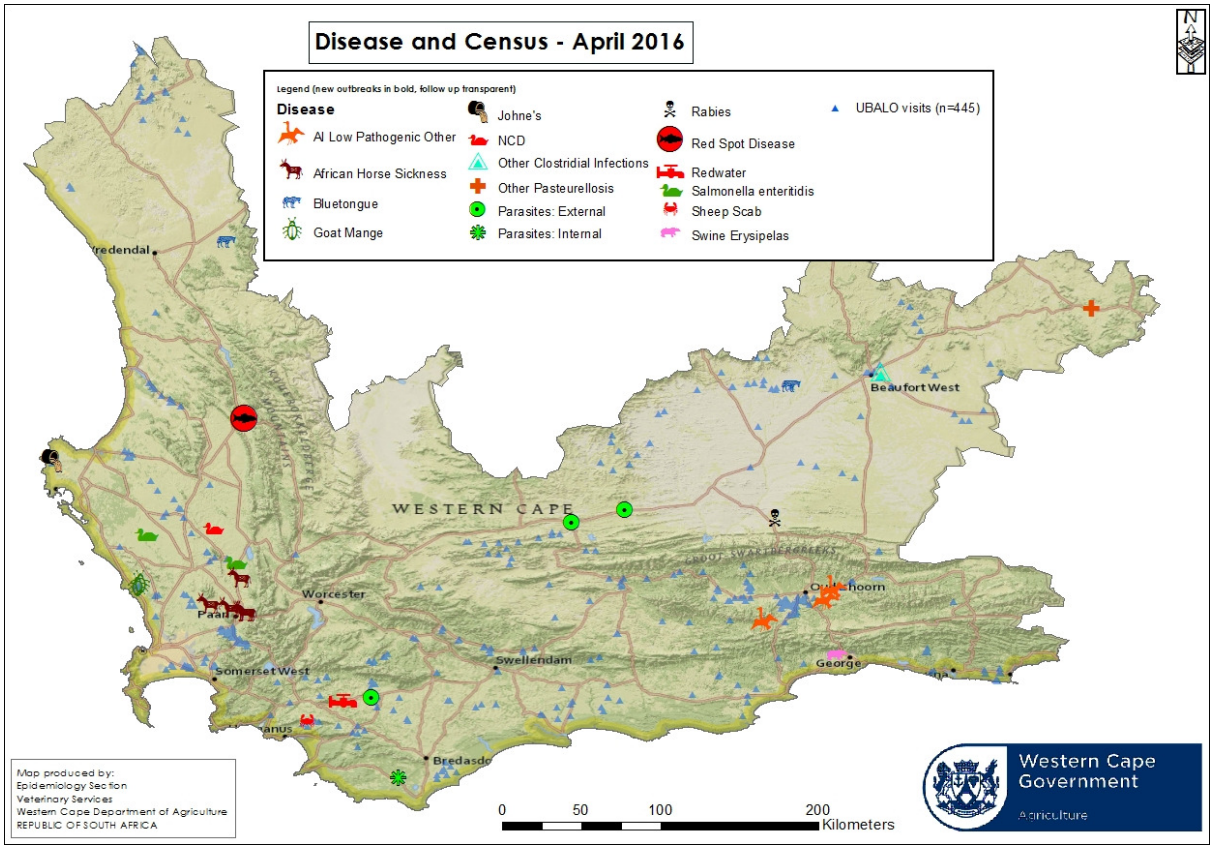
EUS, also known as red spot disease, is caused by an oomycete (*Aphanomyces invadans*) that causes disease in fish populations under conditions of stress and/or immunosuppression. The organism enters the skin of the fish through any small defect such as a cut or abrasion and causes deep, ulcerative lesions, leading to high mortalities.

This is the fifth confirmed case of EUS in the Western Cape since its discovery in the country in late 2010 (fig 2). Previous cases have occurred in the Eerste and Palmiet rivers, but this is the first reported case from the Olifants River. Several suspect cases have occurred in the past in the Olifants River and were investigated by officials from DAFF, but a diagnosis could not be made.

Figure 2: EUS cases detected in the Western Cape since 2010

Figure 2 shows the confirmed affected river systems in the Western Cape so far. Considering the length of time since the organism was shown to be present in the Western Cape, there is a high likelihood that other river systems may be affected. Farmers and anglers in other areas are encouraged to be vigilant and report any cases of ulcerative lesions on fish to their nearest state or private veterinarian.

There is no treatment for the disease and once it is in a river system, its effects can only be minimised by ensuring that fish experience as little stress as possible. Strict biosecurity should be observed by anglers to ensure that the organism is not spread to uninfected waterways. Fish should never be moved between river systems and, when handled, should be treated with care not to cause any sort of epithelial damage, as the pathogen can enter through the smallest of wounds. Fishing equipment should be thoroughly dried and disinfected between uses.


Disease and Census - April 2016
Legend (new outbreaks in bold, follow up transparent)
Disease
AI Low Pathogenic Other
African Horse Sickness
Bluetongue
Goat Mange
Johne's
NCD
Other Clostridial Infections
Other Pasteurellosis
Parasites: External
Parasites: Internal
Rabies
Red Spot Disease
Redwater
Salmonella enteritidis
Sheep Scab
Swine Erysipelas
UBALO visits (n=445)
WESTERN CAPE
Beaufort West
Worcester
Paarl
Somerset West
Swellendam
George
Bredasdorp
Map produced by:
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Veterinary Services
Western Cape Department of Agriculture
REPUBLIC OF SOUTH AFRICA
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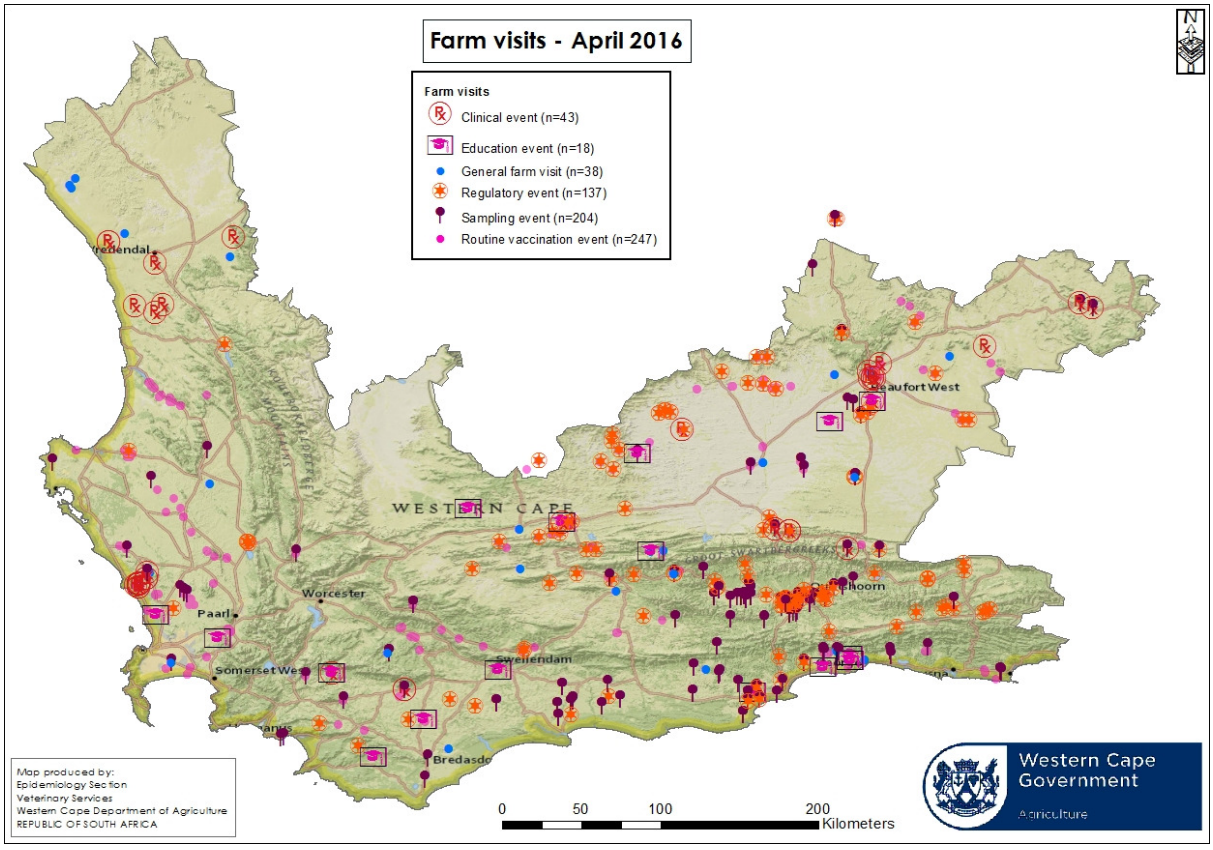
Western Cape Government
Agriculture


Farm visits - April 2016
Farm visits
Clinical event (n=43)
Education event (n=18)
General farm visit (n=38)
Regulatory event (n=137)
Sampling event (n=204)
Routine vaccination event (n=247)
WESTERN CAPE
Beaufort West
Worcester
Paarl
Somerset West
Swellendam
Bredasdorp
Map produced by:
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REPUBLIC OF SOUTH AFRICA
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Agriculture

Outbreak events

- Three **ostrich** farms near **Oudtshoorn** tested positive for **low-pathogenic avian influenza**: one likely an H5N2 type, the others undefined.
- Cases of **bluetongue** in **sheep** were reported from two properties near **Vanrhynsdorp** and **Beaufort West** respectively. There have been many rumoured cases of bluetongue in the province that have not been reported over the past few months. As bluetongue is a notifiable disease, confirmed or suspected cases must be reported to a state veterinarian.
- A suspect outbreak of **Newcastle disease** was reported in unvaccinated backyard **chickens** near **Riebeeck-Kasteel**. The farmer had several breeds of chickens in adjacent enclosures. Only the koek-koeks were affected, showing respiratory signs.
- A **sheep** farm near **Vredenburg** was confirmed positive for ovine **Johne's disease**. The farmer had noticed an increasing incidence of emaciation in the ewes in the flock over the past three years.
- ***Salmonella enteritidis*** was cultured from day-old **chicks** arriving at a layer farm, as well as from dead-in-shell chicks at a broiler hatchery, both near **Malmesbury**.
- An outbreak of **sheep scab** was detected in the flock of a developing farmer leasing land near **Caledon**.
- Typical skin lesions of **erysipelas of swine** were seen during meat inspection at a **George** abattoir. The affected carcass was condemned.
- A post-mortem examination done on **goats** near **Murraysburg** resulted in a diagnosis of **pasteurellosis**. Five goats had died recently.
- 167 **goats** in **Atlantis** were treated for **mange** after clinical cases were seen.
- An **ostrich** near **Beaufort West** was diagnosed with an intestinal **clostridial** infection.
- A **calf** near **Caledon** was treated for bovine **babesiosis** (redwater).

Figure 3: *Salmonella enteritidis* was cultured from chick box liners on one of the affected farms. *(rachel.prickett.wordpress.com)*

New publications

A paper from our section describing the highly pathogenic avian influenza outbreak in ostiches in 2011 was published this month and can be accessed on ScienceDirect:

van Helden, L.S., Sinclair, M., Koen, P. and Grewar, J.D. (2016) Description of an outbreak of highly pathogenic avian influenza in domestic ostriches (*Struthio camelus*) in South Africa in 2011. *Preventive Veterinary Medicine*, 128, 6-11.

doi:10.1016/j.prevetmed.2016.03.019

Epidemiology Report
Edited by:

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Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

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May 2016
Volume 8 Issue 5

Human *Brucella melitensis* case in Cape Town

On 16 May 2016, the Epidemiology Section was notified by the Western Cape Department of Health about a human case of *Brucella melitensis* in Cape Town.

A five-year-old HIV-positive girl living in an informal settlement in Philippi was taken to a clinic after complaining of fever and diarrhoea. The clinic referred her to Victoria Hospital in Wynberg, where a sample for blood culture was taken. A *Brucella* species was isolated by the NHLS at Groote Schuur Hospital, which was identified as *Brucella melitensis* by the National Institute for Communicable Diseases. The patient was concurrently diagnosed with tuberculosis.

The girl's mother stated that she purchases food from the shops only and does not buy or accept food from local livestock farmers who sell or donate animal products to people living in the settlement.

An investigation of the area immediately surrounding the settlement revealed open spaces frequented by grazing horses and foraging backyard chickens and dogs, but no other livestock. There are, however, several livestock farmers within five kilometres of the settlement, some of whom are known to be speculators. Many dogs in the area are free-roaming, and the possibility that they could spread the infection from livestock to people in the area was considered.

As a result, surveillance is underway by officials of the Boland State Veterinary Office of susceptible livestock, including cattle, sheep and goats, in all of Philippi.

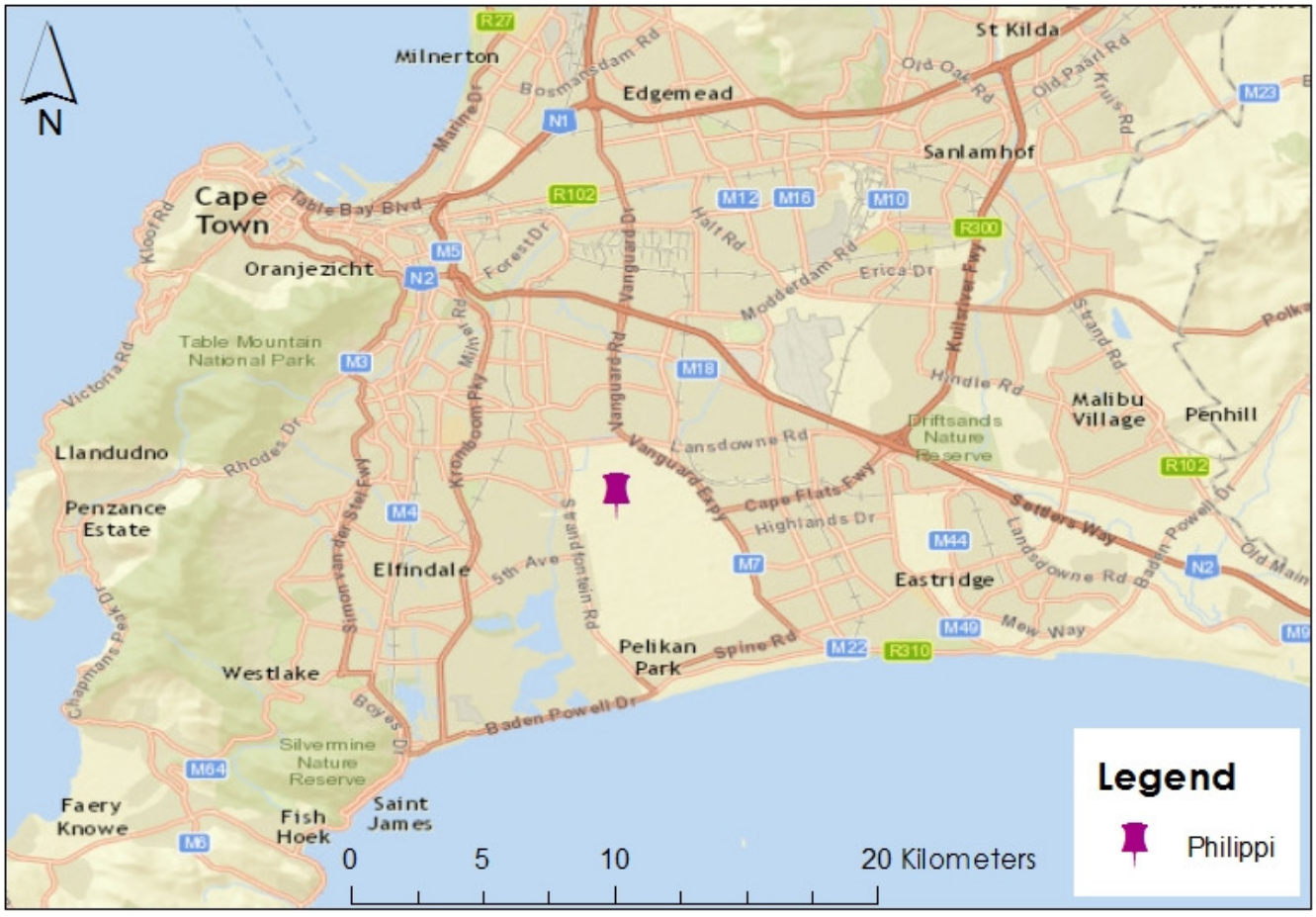


Figure 1: Location of Philippi within Cape Town

African horse sickness: update

A containment zone in which no movement of equines is permitted has been in place since a horse died of African horse sickness (AHS) near Paarl in early April 2016. Surveillance during April resulted in the detection of nine cases of AHS on five properties. Five of the cases were associated with clinical signs.

Surveillance of properties was performed by officials by taking blood samples from horses in the immediate area surrounding confirmed cases. This was combined with passive surveillance including clinical inspection by officials in the greater containment area and follow-up investigation and sampling of clinically ill horses reported by private veterinarians. This surveillance during May 2016 detected several new cases of African horse sickness described below.

Follow-up testing on two of the previously affected properties revealed nine asymptomatic horses with positive AHS test results. Surveillance on two nearby properties resulted in two more detected cases, both asymptomatic and in Thoroughbred horses that had been previously vaccinated against AHS.

One more clinical case occurred in an unvaccinated American Saddlebred colt that experienced pyrexia and supraorbital swelling.

The number of cases detected in the outbreak to date therefore comes to a total of 21 horses on eight properties. The last detected case came from a sample taken on 4 May 2016.

The cold weather forecast for June may play an important role in decreasing midge activity and therefore the risk of virus transmission. By the end of May, there had been no new cases of AHS detected for 27 days. As the outbreak could be considered to be resolved after 40 days without detection of any new cases, surveillance is continuing in the hopes that the outbreak is coming to an end.

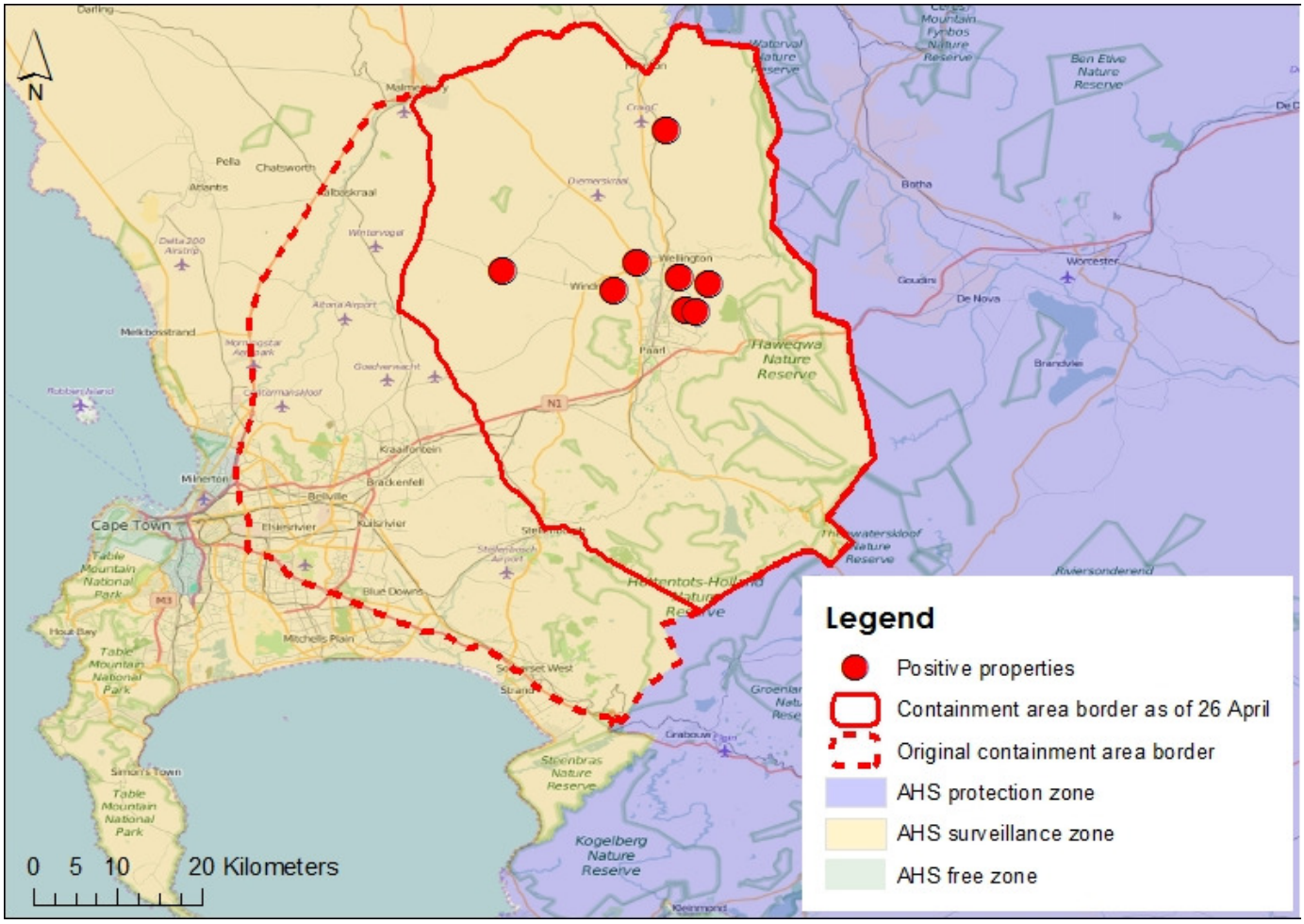
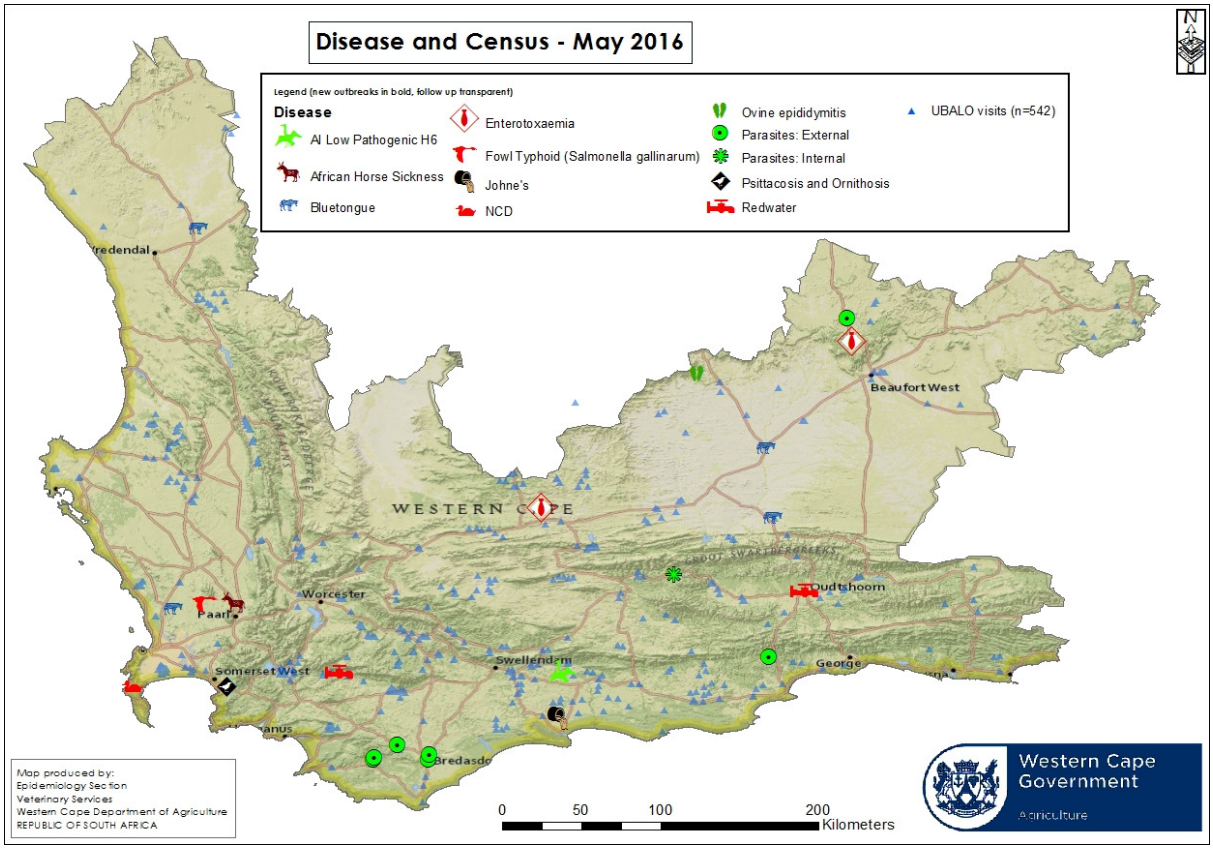


Figure 2: Positive properties in relation to the original and revised containment areas following the confirmed case of AHS in Paarl


Disease and Census - May 2016
Legend (new outbreaks in bold, follow up transparent)
Disease
AI Low Pathogenic H6
African Horse Sickness
Bluetongue
Enterotoxaemia
Fowl Typhoid (Salmonella gallinarum)
Johne's
NCD
Ovine epididymitis
Parasites: External
Parasites: Internal
Psittacosis and Ornithosis
Redwater
UBALO visits (n=542)
Beaufort West
WESTERN CAPE
Worcester
Paarl
Somerset West
Swellendam
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Map produced by:
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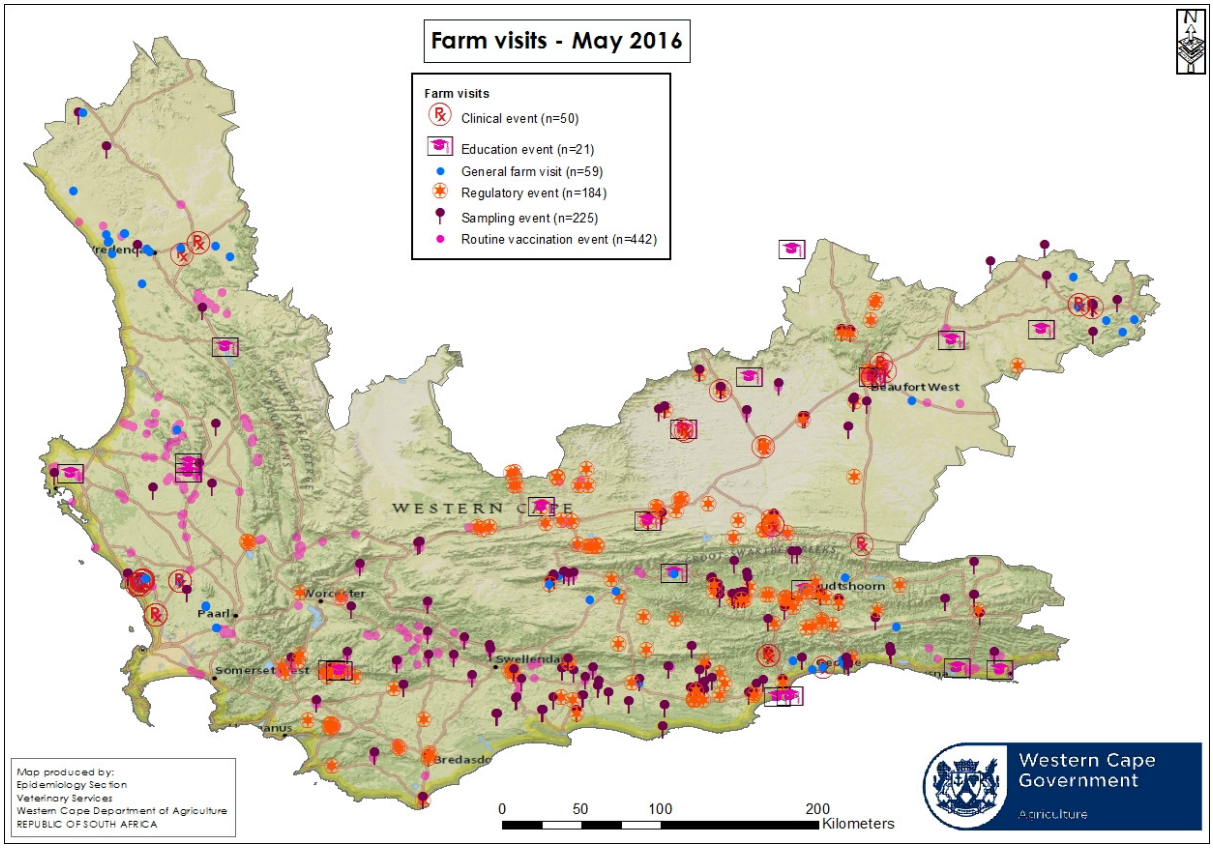
Farm visits - May 2016
Farm visits
Clinical event (n=50)
Education event (n=21)
General farm visit (n=59)
Regulatory event (n=184)
Sampling event (n=225)
Routine vaccination event (n=442)
Beaufort West
WESTERN CAPE
Worcester
Paarl
Somerset West
Swellendam
Oudtshoorn
Bredasdo
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Outbreak events

- A flock of 60 unvaccinated backyard **chickens** in **Cape Town** died as a result of virulent **Newcastle disease**. The chickens showed watery white faeces and neck torsion before death. In response to the outbreak, a small flock of 12 chickens on a neighbouring property were vaccinated.
- A hobby breeder of psittacines and poultry in **Cape Town** recently bought four breeding pairs of **African grey** parrots. A week after arrival, he found one of the females dead in her nesting box. ***Chlamydophila psittaci*** was diagnosed from swabs taken from the carcass. His property, as well as that of the supplier of the birds, was placed under quarantine and all birds will be treated with doxycycline for 45 days. There has been no history of death or illness of birds on either property.

Figure 3: A chicken showing neck torsion as a result of Newcastle disease *(fao.org)*

- A free-range **layer** farm near **Wellington** experienced a sudden spike in mortality, with affected hens showing enlarged, copper-coloured livers on post-mortem. As two other farms within three kilometres of this farm have experienced outbreaks of ***Salmonella gallinarum*** since February this year, the owner immediately put measures in place to halt the spread of the outbreak, including heightened biosecurity measures, vaccination against *Salmonella enteritidis* and acidification of feed. The affected house was treated with fosfomycin before being sold as cull hens, after which all remaining hens were sold as cull hens in order to leave the site empty for several months before restocking.
- A positive serological result for **low pathogenic H6 avian influenza** was received from an **ostrich** farm near **Heidelberg.**
- Four outbreaks of **bluetongue** were reported in **sheep** flocks this month: near **Vredendal**, in Merinos near **Leeu-Gamka**, near **Prince Albert** and near **Malmesbury** in a flock that was unvaccinated due to a shortage of bluetongue vaccine. Reporting cases of bluetongue can help to prevent future shortages as manufacturers are made aware of the need for vaccine. It is therefore vital that all those in the sheep industry report suspect cases of bluetongue when they occur.
- ***Brucella ovis*** was diagnosed in Damara **rams** near **Merweville**.
- **Redwater** was reported in **cattle** in the **Genadendal** community near Greyton and in a calf in **Oudtshoorn** that died despite treatment.
- Two outbreaks of **pulpy kidney** were detected in **sheep** in the **Beaufort West** state vet area, in one flock that was not vaccinated, and in another in merinos that had been vaccinated too late and no follow-up vaccination given.

Epidemiology Report
Edited by:

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Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
June 2016
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Brucella melitensis surveillance in Cape Town

Following a confirmed human case of *Brucella melitensis* in a child originating from the Philippi area of Cape Town, the Boland state veterinary office undertook a thorough livestock census and surveillance programme in Philippi in the area surrounding the case during May and June 2016.

Philippi is located on the Cape Flats and consists of plots of land where a mix of residential, business and agricultural activities take place. Many livestock owners are speculators who buy and sell animals to make a profit as the price of livestock fluctuates. Some of these therefore do not have dedicated animal keeping facilities and animals are kept in yards where other activities are taking place or where other equipment is stored.

All premises where livestock were kept were visited by animal health technicians. Animals were counted and blood samples were taken from cattle, sheep and goats to test for brucellosis. The opportunity was used to perform TB testing in the cattle herds visited as well.

Sheep and goats under the age of three months, as well as heifers (female cattle that have not yet given birth to their first calf) were excluded from the surveillance, as the incubation period of brucellosis makes it unlikely that they would test positive even if infected. Male cattle were also not sampled for practicality reasons.

Officials encountered several obstacles to surveillance, including the high turnover of livestock by speculators, leading to animals that had been counted being sold before it was possible to sample them. Few animals had ear-tags and so officials improvised by spray-painting numbers on the sampled animals in order to be able to trace positive test results. See page three for animal health technician, Maresa Fourie's personal account of the challenges of surveillance in the field.

Collected samples were tested using the complement fixation test at the Stellenbosch Provincial Veterinary Laboratory (PVL). All samples were tested for antibodies to *B. melitensis* (using a *B. abortus* antigen), while sheep samples were additionally tested for antibodies to *B. ovis* (using a *B. ovis* antigen), a *Brucella* species that causes epididymitis in sheep, but does not affect humans.

One positive CFT result was received from an adult cow of unknown vaccination status that died the day after sampling. The carcass was brought to the PVL where bacterial culture is currently underway to determine the *Brucella* species responsible.

Sheep on two properties tested positive for *B. ovis*. One sheep could not be traced back as it was eaten the day after sampling. In another flock of four sheep, three tested positive for *B. ovis*. These sheep had apparently originated from Ceres. All *B. ovis* positive sheep tested negative for *B. melitensis*.

Surveillance of any remaining herds in the outlying areas of Philippi will continue in July 2016.

Figs 1 and 2: Agile goats and rough terrain gave animal health technicians Judith Gavu and Magrietha Niewenhuis a run for their money during surveillance for brucellosis in the livestock of Philippi (photos: M Cupido)

Brucella melitensis surveillance in Cape Town

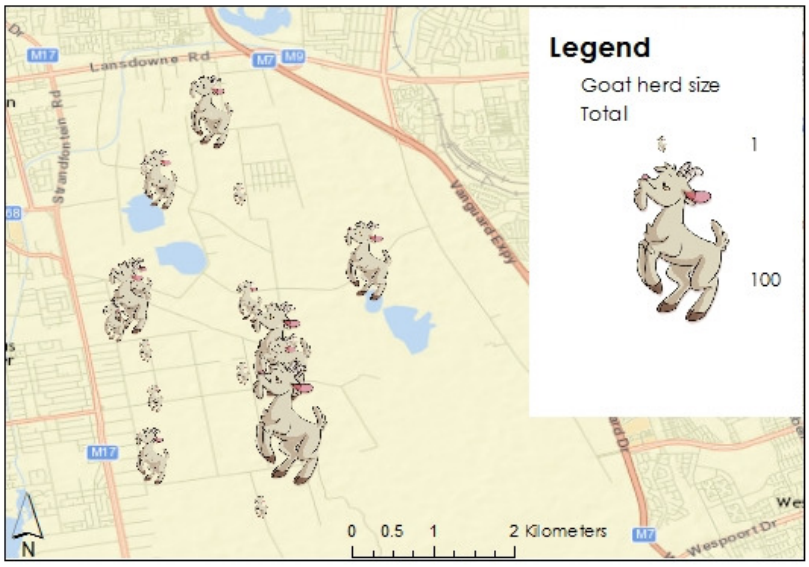


Fig 3: Caprine population size and distribution in Philippi.
Properties with goats: 19
Total goats counted: 246
Total goats sampled: 117
Results still pending for sampled goats: 0
Brucella positive results received: 0

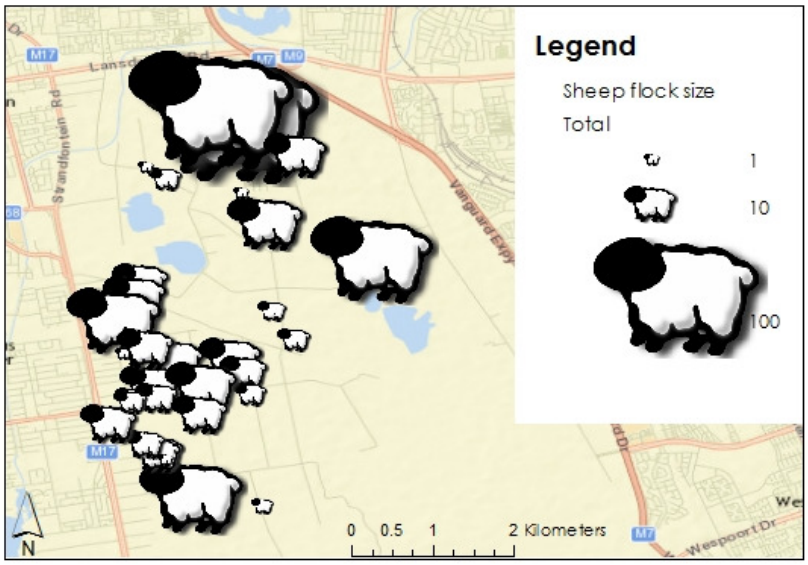


Fig 4: Ovine population size and distribution in Philippi.
Properties with sheep: 35
Total sheep counted: 576
Total sheep sampled: 330
Results still pending for sampled sheep: 1
Brucella positive results received: Four sheep from two different flocks tested positive for non-zoonotic *Brucella ovis*.

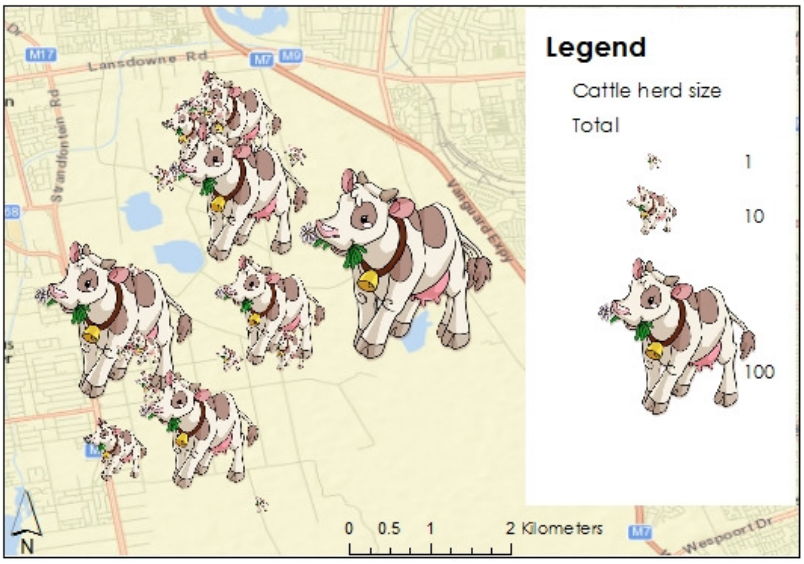


Fig 5: Bovine population size and distribution in Philippi.
Properties with cattle: 22
Total cattle counted: 691
Total cattle sampled: 301
Results still pending for sampled cattle: 1
Brucella positive results received: One cow tested positive on CFT. Bacterial culture is underway to determine the *Brucella* species and strain involved.

In the field: Surveillance in Philippi

Maresa Fourie

At the end of May, the animal health technicians of SV Boland office embarked on a surveillance project in the Philippi area. Judith, Maresa and Magrietha concentrated on the census and sampling of goats and sheep while Rudolf and Thabile focussed on TB and *Brucella* testing in cattle, working with the mobile crush pen.

In Philippi there are a lot of small holdings and sellers of livestock. These sellers normally have some or other truck services going on as well, so when you enter the property you think it looks like a mechanic's workshop, only to find out the owner actually has livestock. Some of the animals are also being kept inside these huge stores.

The people in Philippi are very alert. Some of them want to see your identification to be assured that you are who you say you are, while others simply chase you off their properties. Thank goodness for our identity cards with the Animal Diseases Act authorisation at the back!

We could not work with farm names but instead used the erf numbers painted on their huge walls. Some of the erfs have big solid iron gates in front of their properties so that you cannot see what is going on inside. They also do not have intercoms or doorbells at the gates so there is no way for you to let the people know you are standing outside.

It seems that almost every property has a couple of horses. The horses are mostly hackneys and welsh pony breeds and crosses. Maybe the secret of the horses lies in the meaning of the name "Philippi", which has an ancient Greek origin and means "lover of horses".

Almost all the small holdings had merino sheep. Plunging into that thick wool trying to feel the vein at times seemed impossible, especially as all the livestock had a certain type of thorn woven into their hair or wool. So whenever you tried to make your way through the hair you had to deal with thorns pricking your fingers and tearing your gloves.

One of the first obstacles you had to overcome when arriving on the farm was to tell the volunteers how to catch a sheep and how to hold it so that you would be able to get a sample. Many of the owners refused to assist. At one property I met an 11-year old boy who told me he knew everyone who has sheep and goats, so I thought this a great opportunity to have someone assisting who knows the people and the area.

He was so eager to help and really did his part. He caught big merinos that even I would think twice about before catching them. At one point the sheep broke out of the small confinement into a big open space. He was running with extreme confidence after sheep that were mingled with horses and goats in an area that was almost as big as a rugby field. I thought he would give up like most people do when the challenge gets too big, but no. This was a really eager beaver who would not stop.

Of all the people in Philippi I will remember him. I later learnt from others that he was abandoned by his mother, trying to make a living for himself between grown-up men; a thin boy with ragged clothes but with a golden heart and smile; a spirit that will not die and enthusiasm most of us can only wish for.

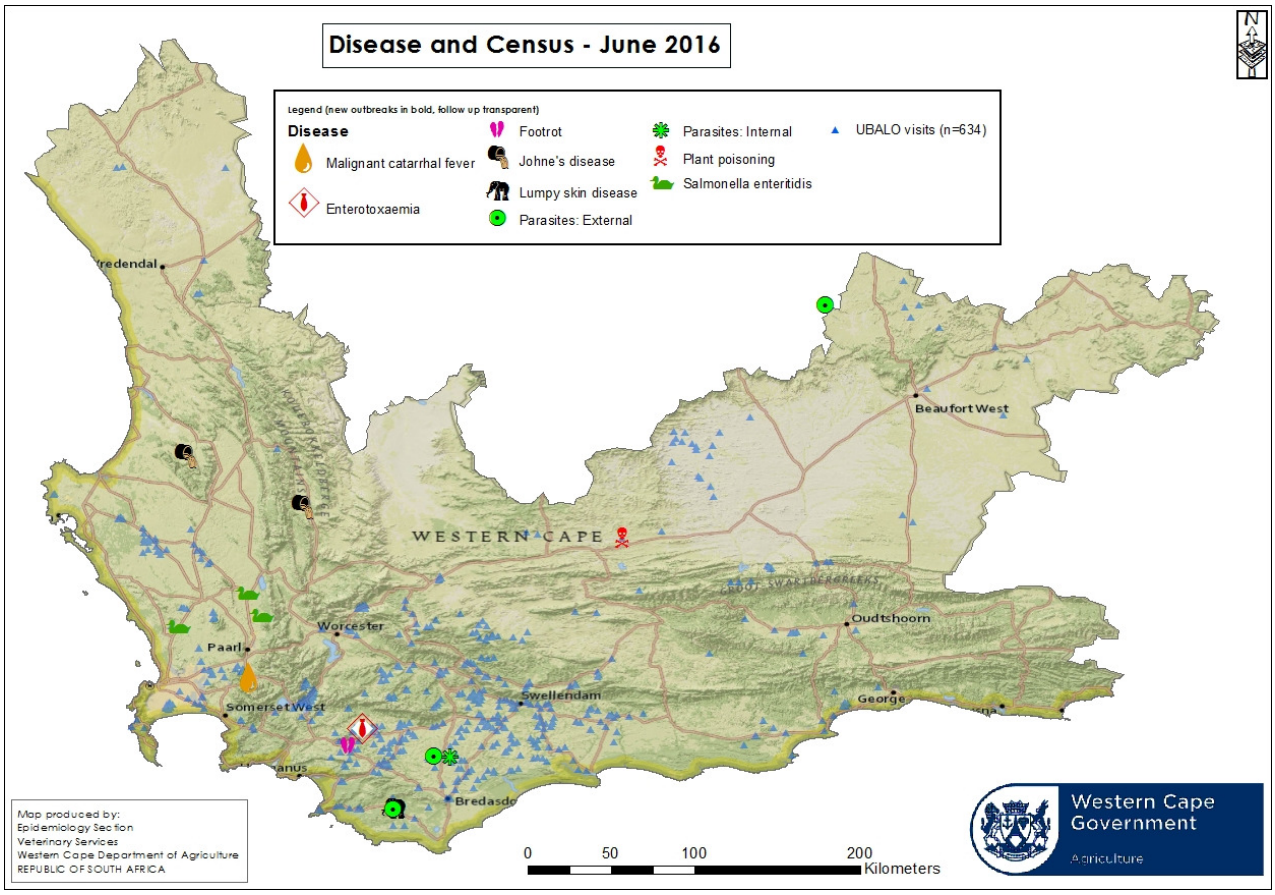
Challenges:

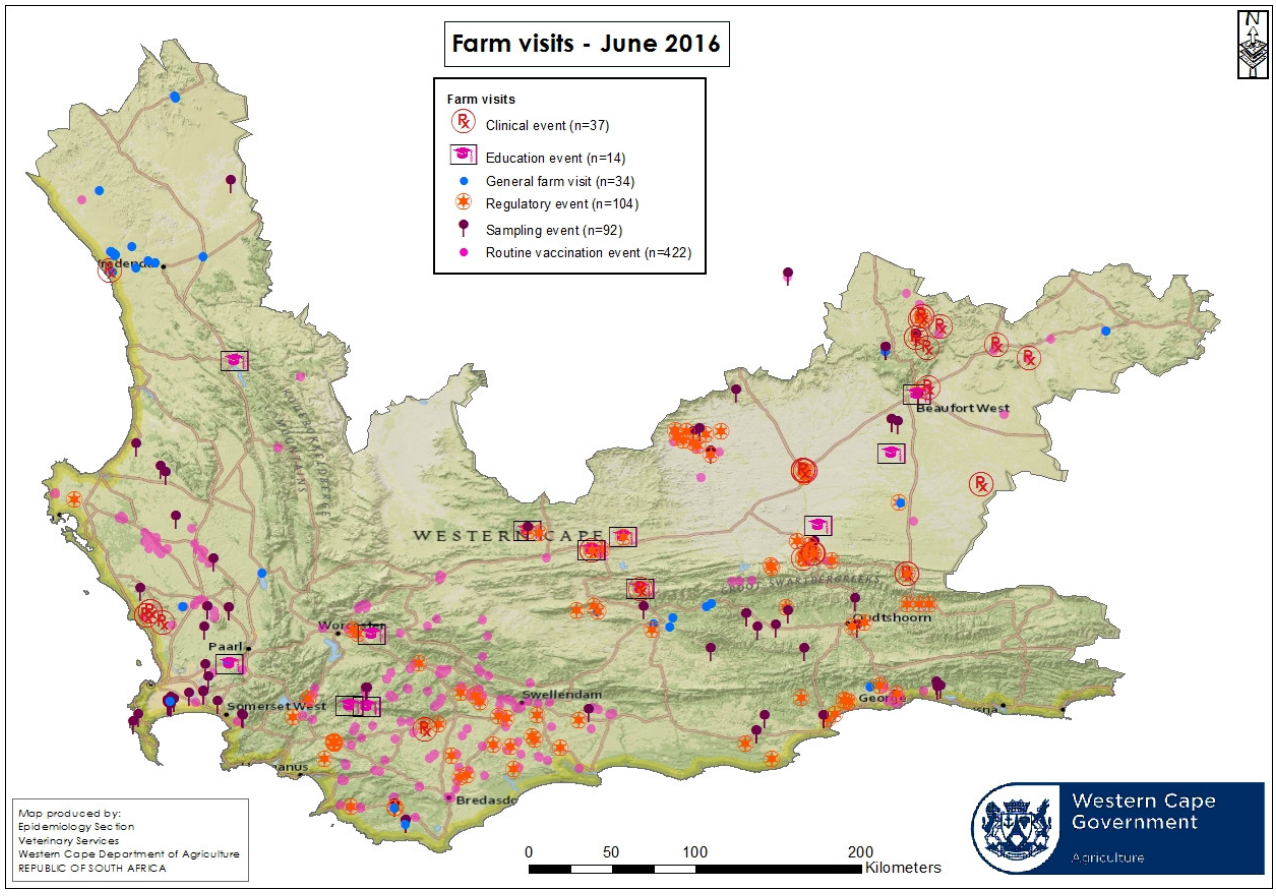
Needles sticking through fingers and hands —ouch—it's so sore you cannot believe that it happened
Knees that did not want to bend after 3-4 days of work
Thorns
Backache
Tiredness
Remembering all your tools and kit plus paperwork
Adapting to new forms created by the lab to assist us
Changing vehicles
Being on time for appointments every day
Gravel roads

What to be thankful for? We completed the work before the big rains started.

Figure 6: Thorns hidden in the wool of merinos at sampling (photo: M Fourie)

Disease and Surveillance





African horse sickness update

The outbreak of African horse sickness (AHS) in the surveillance zone surrounding Paarl is considered resolved after no new cases occurred for 40 days. The containment area surrounding the previously positive properties was dissolved and movement controls reverted to the normal AHS movement protocol from 13 June 2016. Applications for vaccination in the surveillance and free zones are again being considered by the Boland state veterinary office.

Outbreak events

- A blue **wildebeest** found dead on a farm near **Stellenbosch** tested positive for wildebeest-associated **malignant catarrhal fever** (MCF) virus. Wildebeest are known to be asymptomatic carriers of this virus and so this was not the cause of death for the wildebeest. However, MCF can cause fatal disease in cattle when the two species are in contact. Wildebeest and cattle should therefore be kept separately and should not use the same grazing camps.
- **Lumpy skin disease** was reported by small-scale farmers near **Bredasdorp.**
- Two **sheep** farms surrounding **Piketberg** were diagnosed positive for **Johne's disease**. One of the farmers had bought two rams from a breeder in Williston for use as teaser rams. After one of the rams became emaciated and died, Johne's disease was diagnosed. The presence of the disease in the entire flock was confirmed when two old ewes that were subsequently slaughtered were also diagnosed positive. The second affected farm had been traced back from a farm in the Vredenburg area that had bought 200 ewes from this property last year. After the farm in Vredenburg was diagnosed with Johne's disease in April this year, follow-up investigation revealed that the farm near Piketberg was also positive.

Figure 7: Wildebeest are known carriers of malignant catarrhal fever virus (photo: morguefile.com)

- After ***Salmonella enteritidis*** was diagnosed on a **broiler breeder** farm near **Malmesbury** in March 2016, the bacterium was isolated from a dead-in-shell chick at the associated hatchery: the second such case at this hatchery this year. The chicken house from which the egg originated had already been depleted by the time of the positive result.
- Two **broiler** farms also tested positive for ***S. enteritidis*** this month. Two houses on the first farm, near **Wellington**, received positive *S. enteritidis* results from boot swabs. In addition to *S. enteritidis*, *S. idikan* and *S. anatum* were found in two other broiler houses on the same property. The origin of the infection is unknown, but rodents are suspected to be involved. Rodents are also suspected to be the source of *S. enteritidis* on the second farm near **Malmesbury**, close to where extensive roadworks are taking place. The farmer noticed an increase in the number of rodents on his farm as a result of their habitat being disturbed by the roadworks. *S. enteritidis* was diagnosed on cloacal swab samples taken from one of the 22 chicken houses on the farm.
- Five Angora **goats** on a property near **Laingsburg** died of **krimpsiekte**: cardiac glycoside poisoning caused by several plants in the family Crassulaceae. Seven more affected goats were treated to alleviate the symptoms of the toxicosis.

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EPIDEMIOLOGY REPORT

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Salmonella enteritidis in poultry

Salmonella is a potentially pathogenic bacterium that is found world-wide. Although there are only two species of *Salmonella*, *S. enterica* and *S. bongori*, there are numerous subspecies and sero-types which have varying degrees of host-specificity. Of those which have the potential to be zoonotic, the most commonly encountered in the poultry industry of the Western Cape is *Salmonella enterica* sub-species *enterica* serotype *enteritidis* (known as *Salmonella enteritidis* or SE).

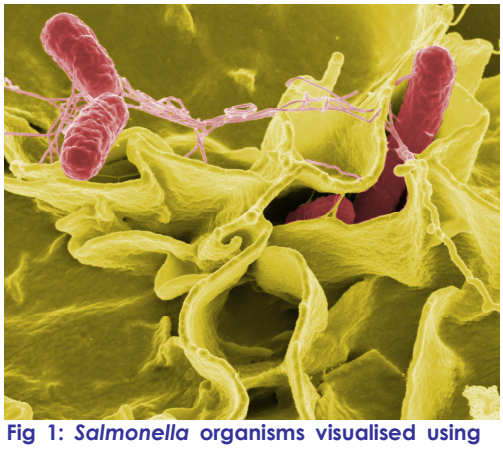


Fig 1: *Salmonella* organisms visualised using electron microscopy (Photo: Rocky Mountain Laboratories, NIAID, NIH)

Clinical signs of salmonellosis usually only occur in young chickens in their first few weeks of life. Often, infected chicks die in the shell before hatching. In hatched chicks, a variable mortality occurs, usually low to moderate, but ranging from 1-90%. Affected birds can show dehydration, diarrhoea, lethargy and sudden death. On post-mortem examination, enteritis and necrotic foci in the intestines, liver and other internal organs can be observed. Older infected birds usually have subclinical infections, but clinical signs are more likely in situations of stress. Infected adult birds can become carriers, harbouring the bacteria in their intestines and reproductive tracts, from where the pathogen can be shed in faeces and eggs.

Salmonella can be transmitted between chickens both vertically and horizontally. Egg yolks may become infected in the ovary of an infected hen, resulting in the infection of the chick. The outside of the eggshell could also be contaminated by faecal material as it is laid by an infected parent, leading to infection of the growing chick inside the egg when the bacteria enter the egg through the pores in the shell.

Salmonella is transmitted horizontally through the faecal-oral route, facilitated by contamination of the environment or fomites. Other infected hosts such as rodents, wild birds or humans can also introduce the infection onto a poultry farm.

Humans are infected by consumption of infected eggs or food that has been directly or indirectly contaminated by faeces from an infected animal. Salmonellosis is one of the most important food-borne zoonoses world wide, usually causing diarrhoea. In high risk groups such as children, the elderly and the immunocompromised infection can cause septicaemia and death if not treated with an effective antibiotic.

In humans, salmonellosis can be prevented with good food preparation hygiene and cooking of food at 80°C for several minutes.

In poultry flocks, due to the ability of the bacterium to spread vertically, breeder flocks should be kept free of infection by maintaining a closed flock and observing strict biosecurity and pest control. Good husbandry should also be practiced to prevent stress and preserve the natural gut flora of birds to inhibit intestinal colonisation by pathogens. These flocks should be monitored frequently to ensure that they remain free of *Salmonella* infection.

Once infection is present, chickens can be treated with various antibiotics including tetracyclines, amoxicillin and fluoroquinolones, but many *Salmonella* strains have developed antimicrobial resistance. Sensitivity testing should therefore be performed if the organism can be isolated. Treatment does not eliminate the infection, but reduces shedding of the bacteria and prevents morbidity and mortalities.

Vaccination can also be practiced to reduce bacterial shedding and disease transmission and decrease clinical signs, but does not necessarily prevent infection.

In the Western Cape, the vast majority of positive test results for SE have come from environmental swabs taken on poultry farms as part of a routine *Salmonella* monitoring programme. Usually, no concurrent clinical sings are observed. A small number of positive results come from tissue samples taken from dead chickens or from chicks at hatcheries originating from infected parent flocks (fig 2).

While the number of farms testing positive for Salmonella each year is highly variable, it seems to have increased in recent years (fig 3). Further investigation into the reasons for this observation is warranted, though it may be due to poultry farms increasing surveillance to improve the health monitoring of their flocks.

Salmonella enteritidis in poultry

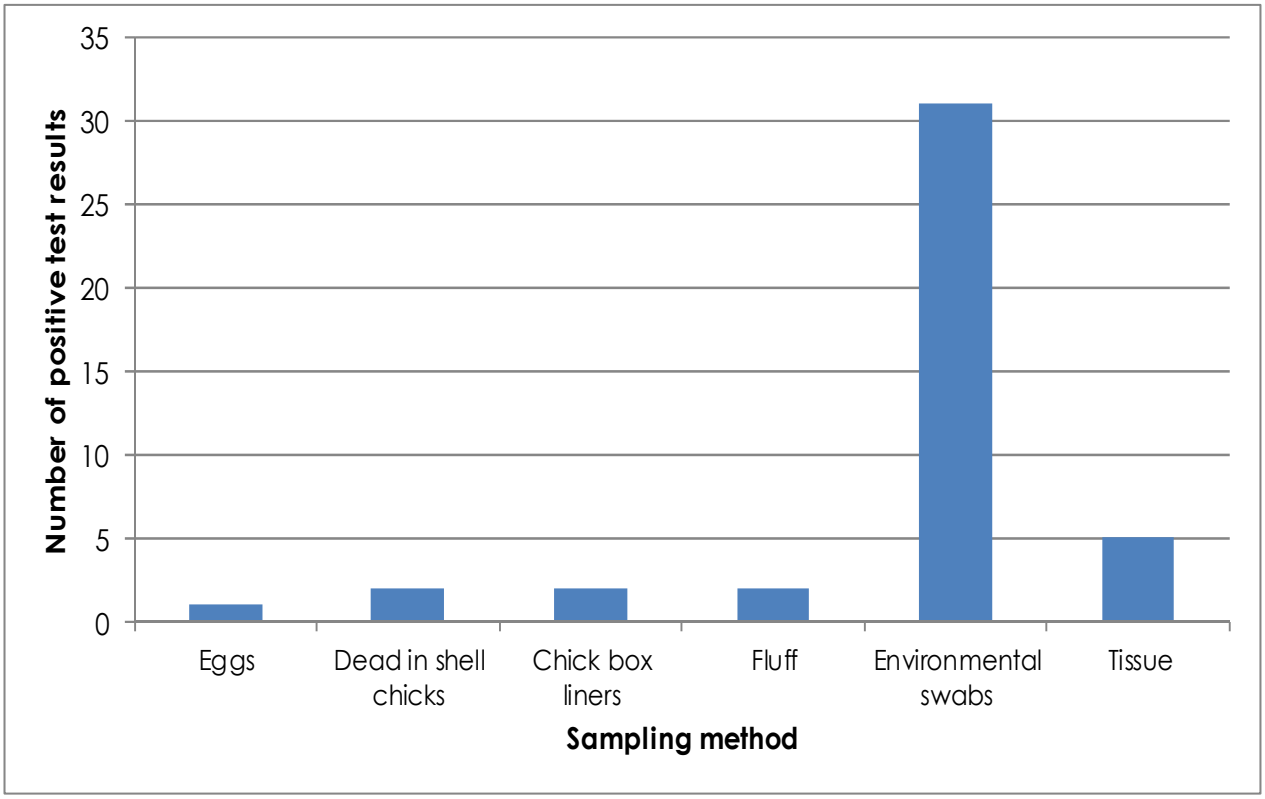


Fig 2: Graph showing the source of positive *Salmonella enteritidis* cultures from poultry farms in the Western Cape

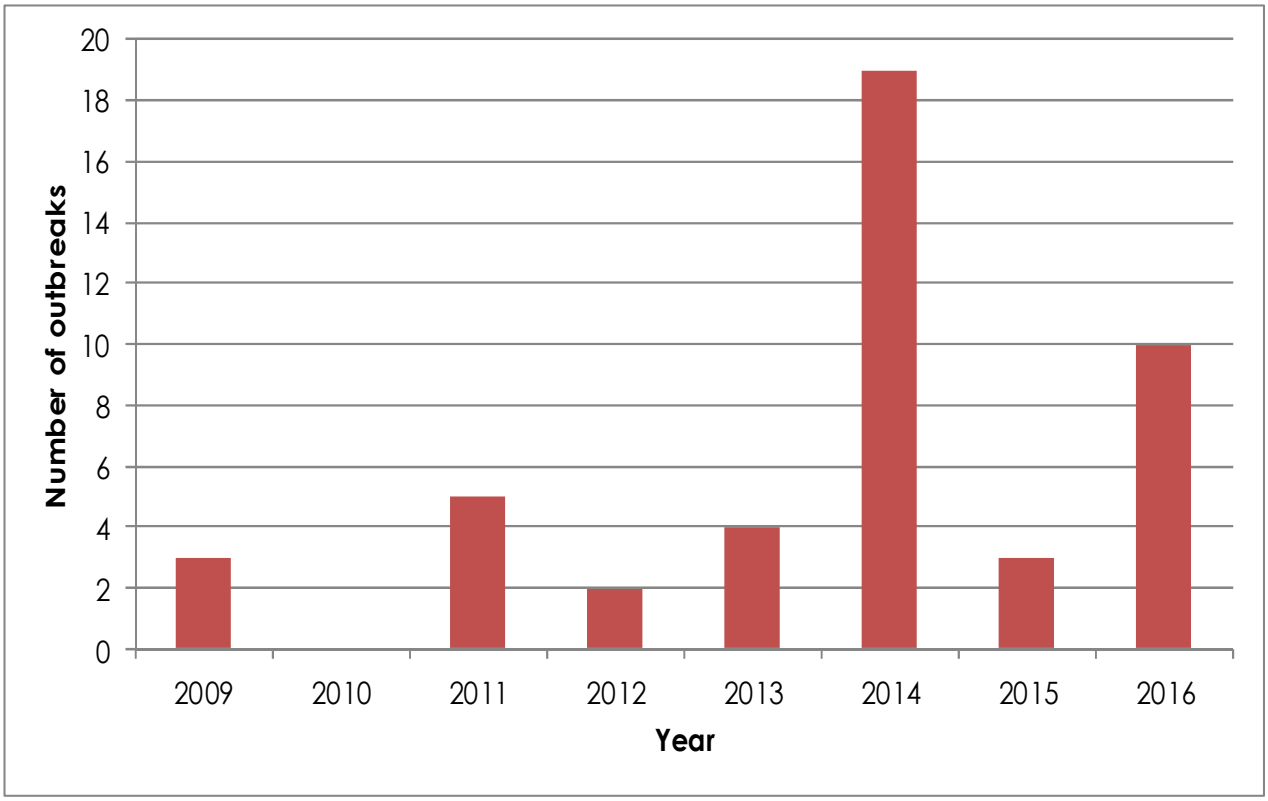
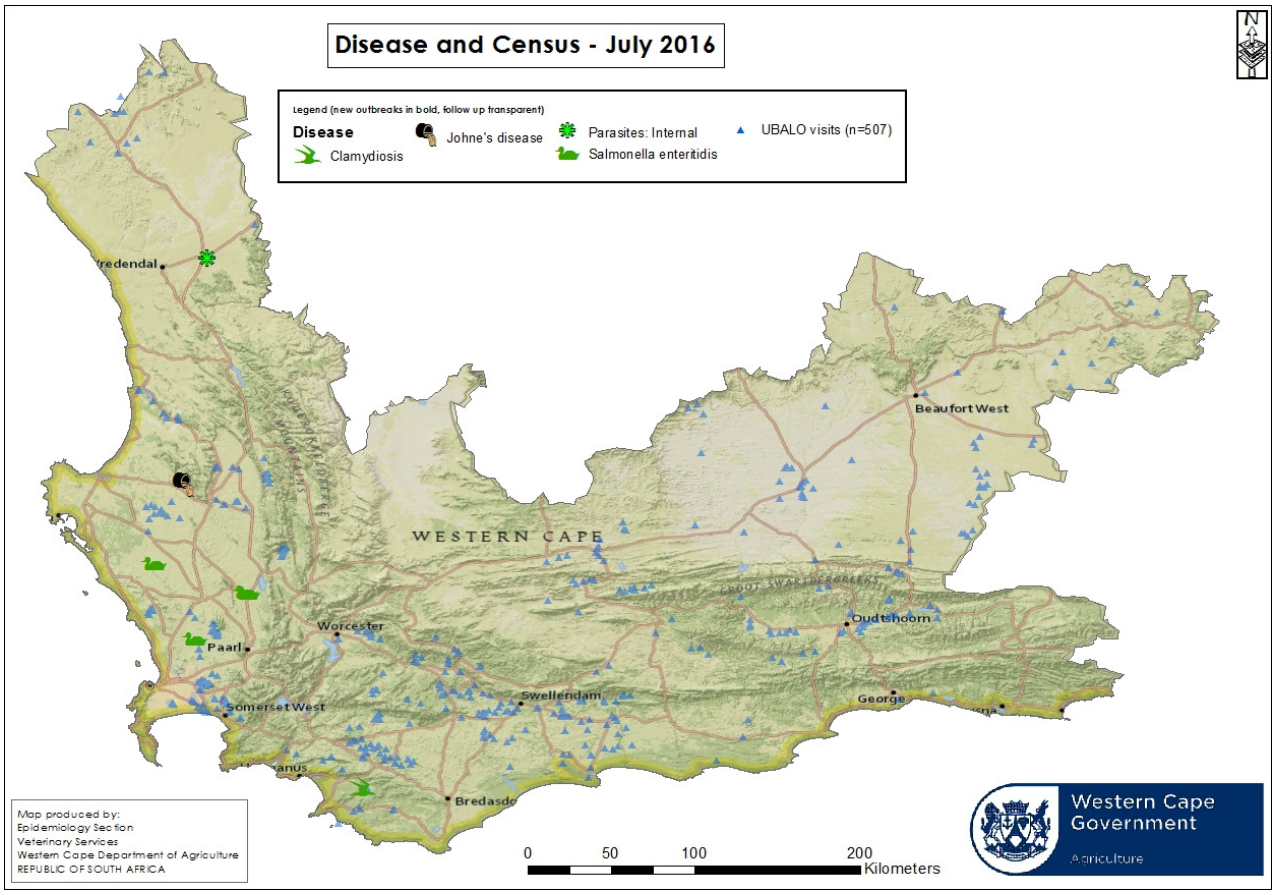
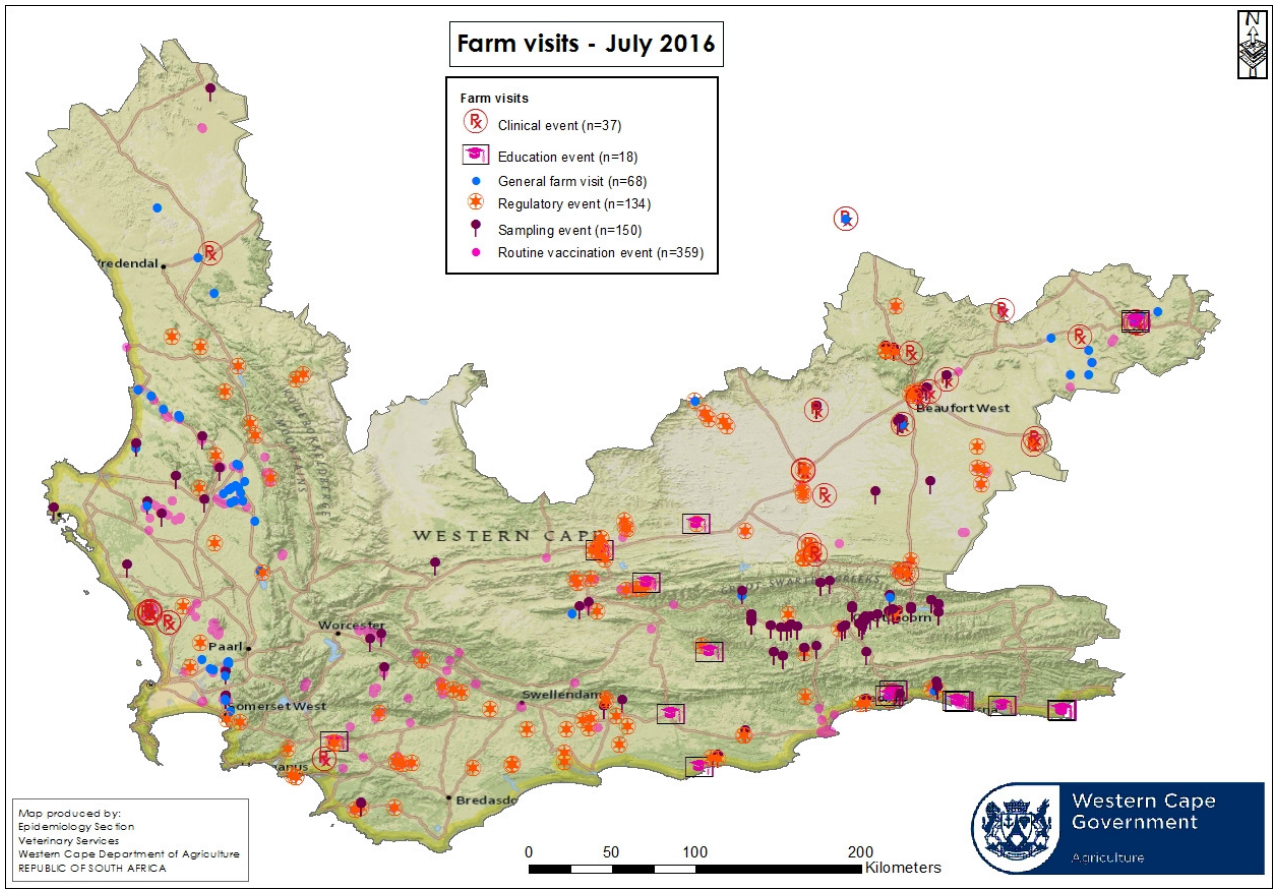


Fig 3: Graph showing the number of detected outbreaks of *Salmonella enteritidis* in poultry in the Western Cape over time

Disease and Surveillance





Brucella melitensis surveillance update

The surveillance for *Brucella melitensis* which took place in Philippi in June this year resulted in the detection of no animal cases of potentially zoonotic brucellosis. Bacterial culture of samples taken from the single cow that tested serologically positive to *Brucella* revealed *Brucella abortus* strain 19 (S19), the live vaccine strain used to immunise cattle in South Africa before the age of eight months. Vaccination of a cow older than eight months with S19 may result in a false-positive reaction on *Brucella* serology tests, as was seen in this case.

The source of the human case of *B. melitensis* in Philippi thus remains unknown.

Outbreak events

- A farmer from the **Piketberg** area heard in town that a farm from which he had bought ewes several years ago had recently been diagnosed positive with **Johne's disease**. In mid-June he noticed an old ewe that was eating well was losing condition and had diarrhoea. A post-mortem examination of the ewe confirmed the diagnosis of Johne's disease on his farm.
- ***Salmonella enteritidis*** was diagnosed on four **chicken** farms in the **Malmesbury** state vet area:

⇒ Boot cover swabs tested positive on a broiler rearing farm. Rodents are suspected to be the cause of the infection and so extra rodent stations were placed in addition to routine hygiene measures and antibiotic treatment.

⇒ Boot cover swabs tested positive on a second farm where no increased rodent activity had been noticed. The birds were treated with antibiotics.

⇒ Dead-on-arrival day-old chicks originating from a layer-breeder farm in Gauteng tested positive for SE. This group of chicks also experienced increased mortality in their first seven days of life. The breeder farm from which they originated had recently tested positive for SE in dead-in-shell chicks. The pullets were treated with antibiotics and vaccinated to control the disease.

Figure 4: Salmonella was cultured from chick box liners (photo: morguefile.com)

⇒ SE was cultured from air conditioner drip trays at a hatchery where dead-in-shell chicks had tested positive last month. As there are no eggs from the previously infected batch left in the hatchery, it is unknown whether this is a continuation of the previous outbreak or a new introduction.

- *Chlamydophila abortus* (**enzootic abortion**) was diagnosed by a private vet near **Bredasdorp** when a **sheep** aborted. The owner was advised to vaccinate the flock. Another case of enzootic abortion was diagnosed in a ewe that aborted near **Beaufort West**.
- A post mortem was performed in **Beaufort West** on a dorper **ram** that had been suffering from dyspnoea. The cause of the clinical signs was determined to be congestive heart failure caused by **vegetative endocarditis**: the heart was observed to be severely enlarged with large vegetative lesions on the heart valves.
- Heavy infestation of **internal parasites** caused the deaths of several **sheep** on pastures near **Vanrhynsdorp**.

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EPIDEMIOLOGY REPORT

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SASVEPM Congress 2016

The Southern African Society for Veterinary Epidemiology (SASVEPM) hosted its annual congress in Cape Town from 24-26 August 2016. Thanks to the location, the congress was well attended by officials of Western Cape Veterinary Services, with 36 state veterinarians and animal health technicians present. Dr van Helden is the current president of the society and thus was very involved in the organisation of the congress and the scientific programme.

SASVEPM was formed as a result of Southern Africa's unique situation in terms of the animal diseases that are present, the species of wild and domestic animals that they affect and the impact these diseases and their control can have on human health, environmental health and the economy. Local expertise is therefore needed in our region, and so every year, SASVEPM hosts a congress which is attended by veterinarians, para-veterinarians and researchers who come together to share the latest knowledge and discuss challenges in the field.

The theme of this year's congress was "Epidemiology on the edge: economics, trade and movement". Keynote speaker Dr Jonathan Rushton, an agricultural economist from the UK, introduced the theme of the congress by presenting in detail the importance of assessing the economic impact of animal disease and cost-benefit analysis of control and prevention measures. A distinction that was made clear is that cost-cutting is not economics. Government spending should rather be optimised to achieve the desired benefits of government activities. In order to do this, however, more information is required on the economic impact of animal diseases on human health, food security and trade. As our population becomes more urbanised, people become increasingly disconnected from the animals they use for food, but ironically have more indirect contact with animals by consuming more animal protein in the form of meat, dairy products and eggs. These consumers take the fact that their food is safe to eat as a given and are generally not willing to pay more to be assured that it is free of disease and harmful substances. This results in little investment in disease and residue control in animals, which nevertheless requires considerable funding to ensure food safety and maintain trade agreements with other countries.

The best presentation award was received by Dr Misheck Mulumba, Senior Research Manager at the Onderstepoort Veterinary Institute, who presented an assessment of trends in regional and international trade of livestock products. The global per capita consumption of animal protein is increasing, especially in developing countries as people improve their socio-economic circumstances. There are therefore opportunities for export of animal products to high-value markets, but these opportunities have largely been snapped up and Africa has been left behind. We run the

continued on page 2

Delegates attend a presentation by Prof. Jonathan Rushton at the 2016 SASVEPM congress in Cape Town (Photo: A Cloete)

SASVEPM Congress 2016 continued

risk of falling even further behind as high-value markets like the EU introduce ever more stringent requirements in terms of freedom from animal diseases that are endemic to Southern Africa. In order to strengthen our economies and reduce poverty, trade within the SADC and COMESA regions should be encouraged, as these markets are expected to expand rapidly. As most countries in SADC are exporters of beef, each country should look at expanding in areas in which they may have a competitive advantage within SADC. For instance, in South Africa the pork and poultry industries are worth looking into developing in order to supply our neighbouring countries.

The following talks related to the regulatory work of Western Cape Veterinary Services were presented:

State veterinarian Boland, Dr Aileen Pypers, presented the challenges of *Salmonella gallinarum* control in commercial layer poultry flocks in the Western Cape. *Salmonella gallinarum* was absent from the Western Cape province until 2015. To date, the bacterium has been detected on five layer farms. As this disease can cause high mortalities of chickens, elimination of the infection as quickly as possible is necessary. However, without appropriate legislative and logistical support, as well as support from the poultry industry, control of the disease can be nearly impossible.

Dr John Grewar, former state veterinarian in the epidemiology section, presented a quantitative risk assessment of African horse sickness (AHS) in live horses exported from South Africa, setting out a procedure to export horses from the AHS infected zone in South Africa to AHS free countries with minimal risk. He also presented an assessment of the economic impact of bluetongue and other orbiviruses in Southern Africa. More detail on this work can be found in the epi report from November 2014.

Dr Camilla Weyer, an equine veterinarian authorised to perform regulatory work, presented the evidence of association between outbreaks of African horse sickness in the AHS control areas of the Western Cape and inappropriate use of the AHS vaccine. It is thanks to the evidence provided by Dr Weyer and her collaborators that changes to the AHS vaccination protocol in the AHS control zones of the Western Cape could be made to allow vaccination during the low-risk winter season only.

The first veterinarian to present at SASVEPM while completing her compulsory community service (CCS) year was Dr Sarah Halgreen from KwaZulu-Natal, who performed a study of horses in three rural areas to determine the prevalence of dourine and to help the local communities to control the disease in their working stallions. Dr Halgreen's presentation highlighted the positive effect the CCS programme is having on animal health in previously under-serviced areas of South Africa, and we hope to see more CCS veterinarians following her example and sharing their experiences at future SASVEPM congresses.

The Willie Ungerer Memorial Prize for Epidemiology was this year presented to Dr Johann Kotzé from Mpumalanga State Veterinary Services. Dr Kotzé has been involved for many years in the control of rabies in South Africa and the rest of Africa, developing new techniques for local elimination of canine rabies through identifying and targeting strategic key points with vaccination. Dr Kotzé's work is an excellent example of a uniquely Southern African response to our animal disease challenges, one that should serve as an inspiration to all of us working in the animal health industry to find optimal solutions to our specific challenges.

Sincere thanks are due to the senior management of Veterinary Services and the Western Cape Department of Agriculture for enabling our officials to attend and contribute to the SASVEPM congress.

Beyond our borders: foot and mouth disease in Mauritius

An outbreak of foot and mouth disease (FMD) has been reported from two islands of Mauritius. The outbreak began on Rodrigues, an island which is a dependency of Mauritius, in July 2016. It is suspected to have been introduced by infected meat transported by yacht. It spread to Mauritius when six cattle were imported from Rodrigues. Clinical signs were seen two weeks after their introduction and soon spread to neighbouring properties. As of 17 August, 527 cattle, 1128 sheep and goats and 190 pigs had been killed on 159 farms to control the outbreak. The virus has been identified as type O.

A red box indicates the position of Mauritius and Rodrigues islands in relation to the rest of Southern Africa.

Veterinary Services Roadblock

Early in August, officials from the South African Police Service (SAPS), Western Cape state veterinarians and animal health technicians, Provincial Traffic as well as representatives from the Equine Health Fund collaborated by organising a roadblock at the weigh-bridge near Rawsonville on the N1.

The primary purpose of the exercise was to enforce the requirements for horses moving into the African horse sickness controlled areas in the Western Cape. In order to move into these controlled areas, owners of horses must apply for a permit to do so. All horses being moved under a permit must travel with a passport that identifies each individual animal by its colour and coat markings and contains a record of its vaccinations.

Traffic officials agreed to pull over all vehicles transporting horses throughout the day. The roadblock got off to a slow start, as the early morning traffic was quiet. A little later, however, the first four vehicles with horses arrived almost simultaneously. One more vehicle was stopped later in the afternoon. There was a total of 10 horses in all the vehicles that were stopped throughout the course of the day.

One of the vehicles stopped with a horse was not carrying the required movement permit with it. Fortunately, the veterinarian who had issued the permit was present at the roadblock and aware that a permit was issued for that specific movement. The owner of the horses was contacted immediately and reminded that it was a requirement for the driver of the vehicle transporting horses to be in possession of the movement permit. Spot–checks of several horses' passports were also done to make sure that the passport identification corresponded with the horse being transported. All passports and other movement permits were in order and the people transporting the horses are thanked for their gracious co-operation. Some even indicated that they were glad to see that roadblocks are done and horse movements monitored.

A horse being transported has its identification checked by police and veterinary services officials.

Since Rawsonville falls within the Worcester state veterinary area, State Veterinarian Worcester, Dr Christi Kloppers, and his team made use of the opportunity to check for other transgressions in terms of the Animal Diseases Act and the Meat Safety Act. Vehicles transporting livestock or animal products such as meat or hides and skins were inspected.

The SAPS made use of the opportunity to inspect livestock for the presence of branding and/or tattoos as required by the Animal Identification Act. Two members of the Breederiver K9 Unit were also present with sniffer dogs to check vehicles for the presence of illegal drugs.

The roadblock finished in the late afternoon after a debriefing session with all officials who had taken part. Everyone involved was of the opinion that it was a worthwhile exercise and we hope to make this a regular activity in the future.

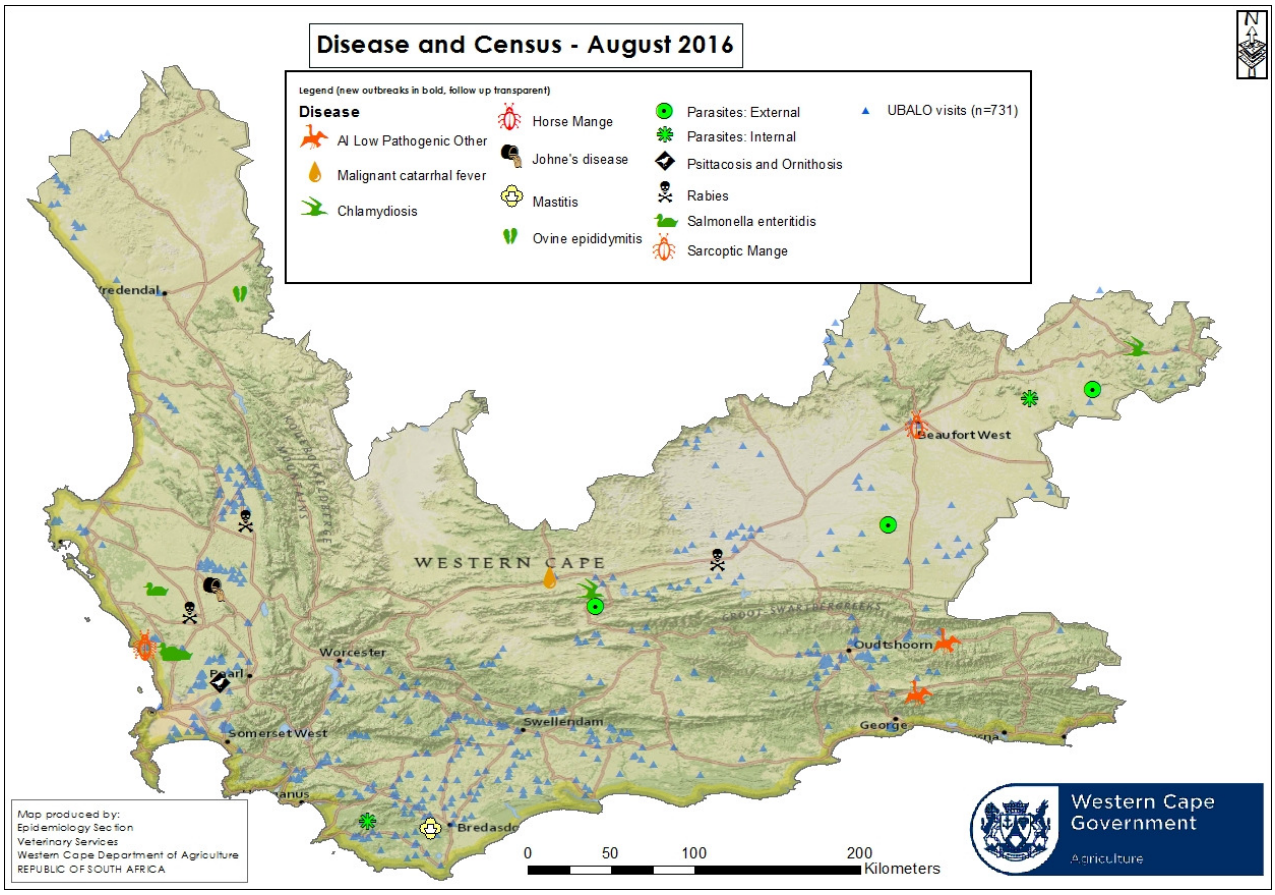
Many thanks must go to SAPS, the Western Cape Provincial Traffic Department and the Equine Health Fund for their assistance and collaboration in this initiative. The enthusiasm and professionalism displayed by everyone present was commendable.

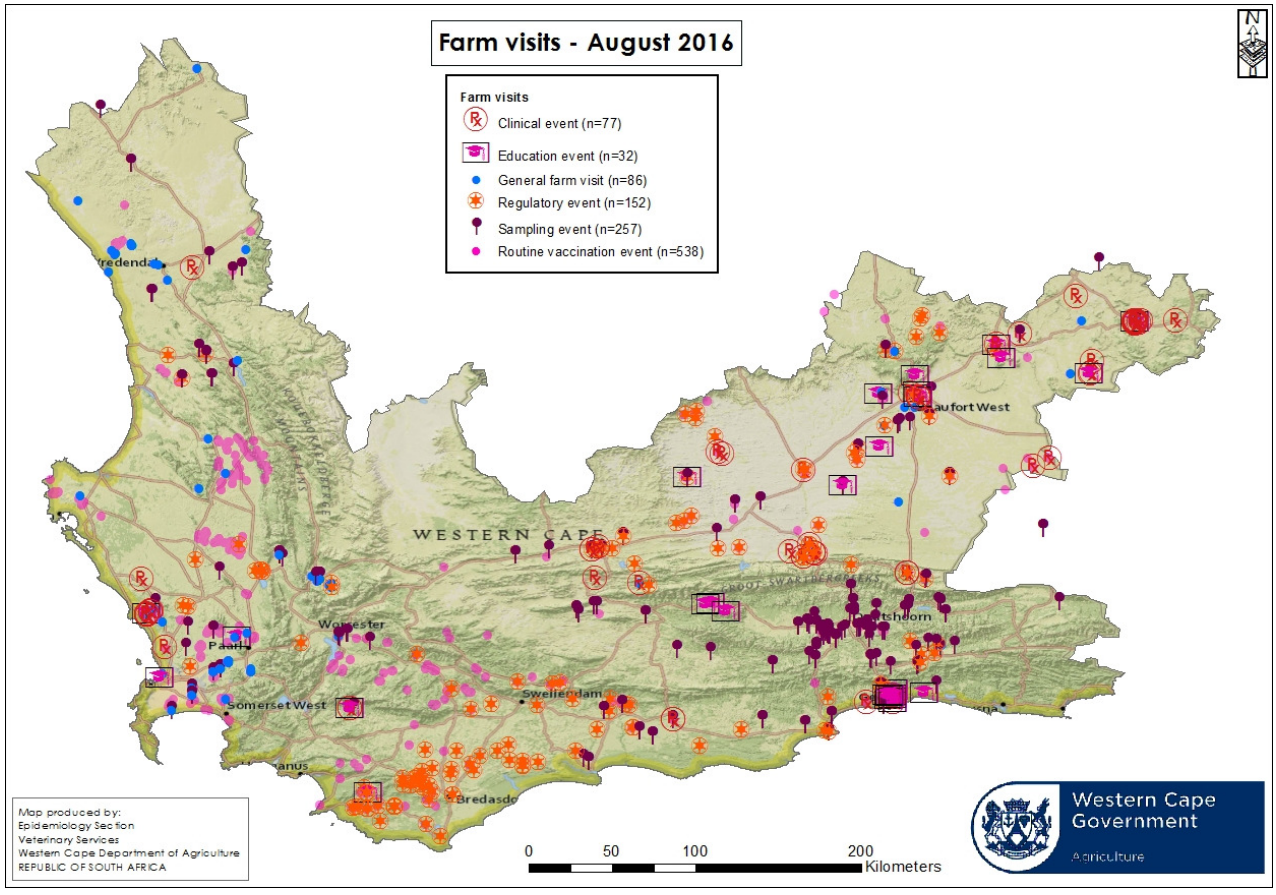

The opportunity was also used to perform other veterinary and regulatory checks on animals and animal products being transported.

Summary

Number of vehicles inspected for AHS control: 5
Number of horses in transit: 10
Number of transgressions: 1 (horses being transported without a copy of the movement permit in the vehicle)
Number of cases opened: 0

Disease and Surveillance





Outbreak events

- Three cases of **rabies** occurred in the province in August:

⇒ A **bat-eared fox** came onto a farm near **Laingsburg** and attacked the farmer's vehicle. The next day it was found dead. Samples taken from the fox subsequently tested positive for rabies.

⇒ An Angus **cow** near **Malmesbury** showed hoarse bellowing, tenesmus and an inability to swallow. She died two days after showing symptoms and samples taken at post-mortem were positive for rabies. The farmer and two assistants who had examined her received rabies post-exposure prophylaxis.

⇒ Near **Porterville**, two **bat-eared foxes** were observed displaying abnormal behavior by coming to the farm house during the day. The first bat-eared fox was found dead shortly after but ignored by the farmer. When he tried to chase the second bat-eared fox away it ran under the wheels of his vehicle and was killed. He then decided to contact his local animal health technician who took samples to be tested for rabies. The fox tested positive.

- A **sheep** farmer in the **Swartland** noticed ewes losing weight and experiencing diarrhea in 2015. He isolated and slaughtered those that were showing clinical signs. When more ewes showed the same signs this year, he submitted a ewe to a laboratory for a post-mortem examination. A diagnosis of **Johne's disease** was confirmed by histopathology. A total of eight farms between which this flock rotates were placed under quarantine as a result of the diagnosis. The farmer was advised to vaccinate his flock to attempt to reduce the impact of the disease in this flock in the future.

- Five positive test results for ***Salmonella enteritidis*** were received from **poultry** farms in the **Malmesbury** state vet area:

⇒ Two farms which received chicks from breeders in Gauteng received positive test results from chick box liners. The chicks from the affected batches were treated with antibiotics and follow-up cultures were negative.

⇒ Two farms which receive chicks from a hatchery that is experiencing contamination problems returned positive environmental samples. The hatchery is undergoing a deep cleaning process in an attempt to remove all *Salmonella* organisms.

⇒ Boot swab samples from a broiler house containing 14-day old birds tested positive. The farm instituted their *Salmonella* reduction programme as a result.

- On a farm near **Matjiesfontein**, two **cattle** showed mucopurulent nasal discharge and respiratory distress. The cause of the illness was confirmed to be **malignant catarrhal fever**. There are blue wildebeest on the same farm, but they are not in direct contact with the cattle.

- **Sheep** on a farm near **Vanrhynsdorp** tested positive for ***Brucella ovis***.

- A bird breeder near **Klapmuts** received a consignment of new birds which he immediately mixed with his current stock. 11 **African grey parrots** died soon after. A diagnosis of **psittacosis**, caused by *Chlamydophila psittaci*, was confirmed. All the birds on the property were treated with doxycycline as a result of the outbreak.

- Evidence of low-pathogenic **avian influenza** was detected on two **ostrich** farms in the **George** area. Both farms tested positive for influenza A matrix gene on PCR, indicating presence of the virus in sampled birds.

An African grey parrot (Photo: morguefile.com)

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African horse sickness sentinel surveillance report

Adapted from The AHS sentinel surveillance program 2015-2016 season report by J.D. Grewar[1], C.T. Weyer[2], P. Burger[1], E. Russouw[1] and B. Parker[1]

[1] *Wits Health Consortium: Equine Health Fund*
[2] *Equine Research Centre, University of Pretoria*

The African horse sickness (AHS) sentinel surveillance program is aimed at providing additional confidence of AHS freedom in the AHS free and surveillance zones of South Africa. The program incorporates the monthly sampling of recruited horses proportionately selected within the African horse sickness control zones based on the estimated underlying population of horses. The program has two programs of focus: a sero-sentinel program that evaluates the changing serological status of horses on a month to month basis and a PCR-based program that is used to detect circulating AHS viral genetic material (RNA) within recruits. The sero-sentinel sampling frame is drawn up to detect AHS at approximately a 5% minimum expected prevalence (with a 95% confidence level) whilst the PCR surveillance aims for a 2% minimum expected prevalence. Monthly targets are therefore approximately 60 and 150 recruits respectively. Individual recruits can be part of both programs. Sero-sentinels are required to be unvaccinated and are screened using serology prior to recruitment. The vaccination status of PCR sentinels is captured but does not influence their recruitment unless vaccination against AHS took place in their recent history resulting in positive PCR results on their initial testing.

A detailed description of the program is available in the January 2016 Western Cape Epidemiology Report, obtainable at http://www.elsenburg.com/vetepi/epireport_pdf/January2016.pdf. The analysis of the 2015/2016 sentinel program only incorporates recruited sero-sentinels and as far as possible, results used for recruitment screening have been omitted. The serological tests performed rely on the indirect ELISA (i-ELISA) as the base serological test. In this circumstance, it is a non-quantitative assay and changes between the permutations of positive, suspect and negative results across paired sample events are used for evaluation. Follow-up serological tests include the serum neutralisation assay (SNT), which is AHS serotype specific. All serology is performed at the Agricultural Research Council - Onderstepoort Veterinary Institute (ARC-OVI). Viral RNA testing is performed at the University of Pretoria's Equine Research Centre (ERC) in collaboration with their Veterinary Genetics Laboratory. The test used is an ERC-developed real-time RT-PCR. This report covers the 2015/2016 AHS season from 1 September 2015 to 31 August 2016. Notably, there was an AHS outbreak in the AHS surveillance zone in April and May 2016. The sentinel program, therefore, is largely academic for establishing a timeline of freedom for this season. The results indicate the progress made through the season, highlight the sensitivity of the surveillance on a monthly basis and confirm the detection of the 2016 Paarl outbreak through the program.

General overview of results

A total of 678 sero-sentinel samples were analysed at an average of 57 samples per month. This was an increase of 5% from the 2014/2015 surveillance period. Of these (Figure 1) 622 could be evaluated as they had relevant paired results. This averages out to 52 sampling events per month. Compared to the 509 analysable serological events of the 2014/2015 season there is an increase in this season of 22%.

A total of 1945 PCR sentinel samples were analysed at an average of 162 per month (the target is 150), an increase of 27% from the previous season. A total of 79 farms were visited during the season, compared to 65 in 2014/2015. The median number of horses per farm was three, with a range of 1-10.

Serology

Figure 1 shows the broad serological outcomes for the period. The total serology samples that could not be evaluated for lack of a paired sample amounted to 56 samples (8% of the total). This compared to 2014/2015 where 137 samples could not be evaluated (21% of the total) although the 2014/2015 evaluation included a higher proportion of recruitment serology tests, inflating the "*No duplicate sample*" classification. A total of 8 serology evaluations indicated an increase in status, warranting investigation. These 8 events consisted of the results of 6 horses, as one horse accounted for 3 increasing events. Follow-up investigation consisted of follow-up testing using SNT and PCR, as well as comparing the serology test results to previous results of that same sentinel and to current test results from other sentinels on the same property. Evidence gathered in these investigations indicated that these results were most likely false positive reactions.

PCR

Figure 2 shows the results for the PCR-based surveillance.

AHS sentinel surveillance report continued

By far the majority of results were negative on PCR with 3 positives originating from 2 horses that were infected during the Paarl 2016 AHS outbreak.

Spatial considerations

The sentinel surveillance program is based on a proportional sampling system with most sentinels in parts of the surveillance area that have the highest population of horses. Every year an evaluation of the distribution of the sentinels is undertaken to establish whether there are areas where improvements are required.

Figures 3 and 4 show the monthly average distribution of sentinels used for the sero and PCR sentinel programs respectively. The sero-sentinel areas where improvement can be made are in Paarl and Darling. The deficit of sero-sentinels in these areas was between -3 and -9 sentinels per month. In general, the overall deficit per area averaged out at -0.2, highlighting the difficulty in recruiting sero-sentinels, hence the use of PCR testing in the surveillance program. At worst, the PCR sentinel areas have a deficit of -2 PCR sentinels per month.

Detection targets of surveillance

The detection target of the 2015/2016 surveillance program would be a theoretical discussion since the Paarl 2016 AHS outbreak occurred in the AHS surveillance zone. What is important is that the PCR-based aspect of the surveillance program would have detected the Paarl 2016 outbreak if it had been missed on passive surveillance, as two of the PCR sentinels tested positive for AHS during the outbreak.

Discussion and Conclusion

The primary goal of the sentinel surveillance program for 2015/2016 of showing freedom of AHS could not be achieved as there was an outbreak of AHS in Paarl in April/May 2016. What is relevant is the fact that the sentinel surveillance system would have detected this outbreak.

The recruitment of sero-sentinels remains a challenge and this program currently relies on the parallel PCR surveillance system, not only to improve sensitivity but to assist in evaluating positive serological results, given the history of fluctuating results sometimes seen in the serological surveillance.

There have been significant improvements over the past year with regards to the sentinel program. The analysable serological results have increased by 22%. The PCR program involved the testing of 27% more samples compared to 2014/2015.

8 serological events from 6 different horses required follow up evaluations. None of these indicated a positive case of African horse sickness. The PCR program detected 2 cases of African horse sickness in May and June 2016.

A review of the laboratory processes has been made with regards to the sentinel program. Standardised processes will be followed in the coming season for any positive results that are obtained from the two participating laboratories. The sentinel program is managed by a surveillance team that will request follow-up if deemed necessary on a case by case basis. The serological follow-up will be focused on using SNT to type the antibodies, while the PCR follow-up will be focused on typing through type-specific PCR and post isolation plaque inhibition testing as well as sequencing which will assist in differentiating infected from vaccine based positive results. Sequencing is resource intensive and will be undertaken on a case by case basis.

Acknowledgements

This work would not be possible without funding from the Equine Health Fund (Wits Health Consortium) and the Government of South Africa. The primary laboratories involved are the Equine Research Centre (Veterinary Genetics Laboratory) and the ARC – OVI, and this surveillance would not be possible without timeous results from them.

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AHS sentinel surveillance report continued

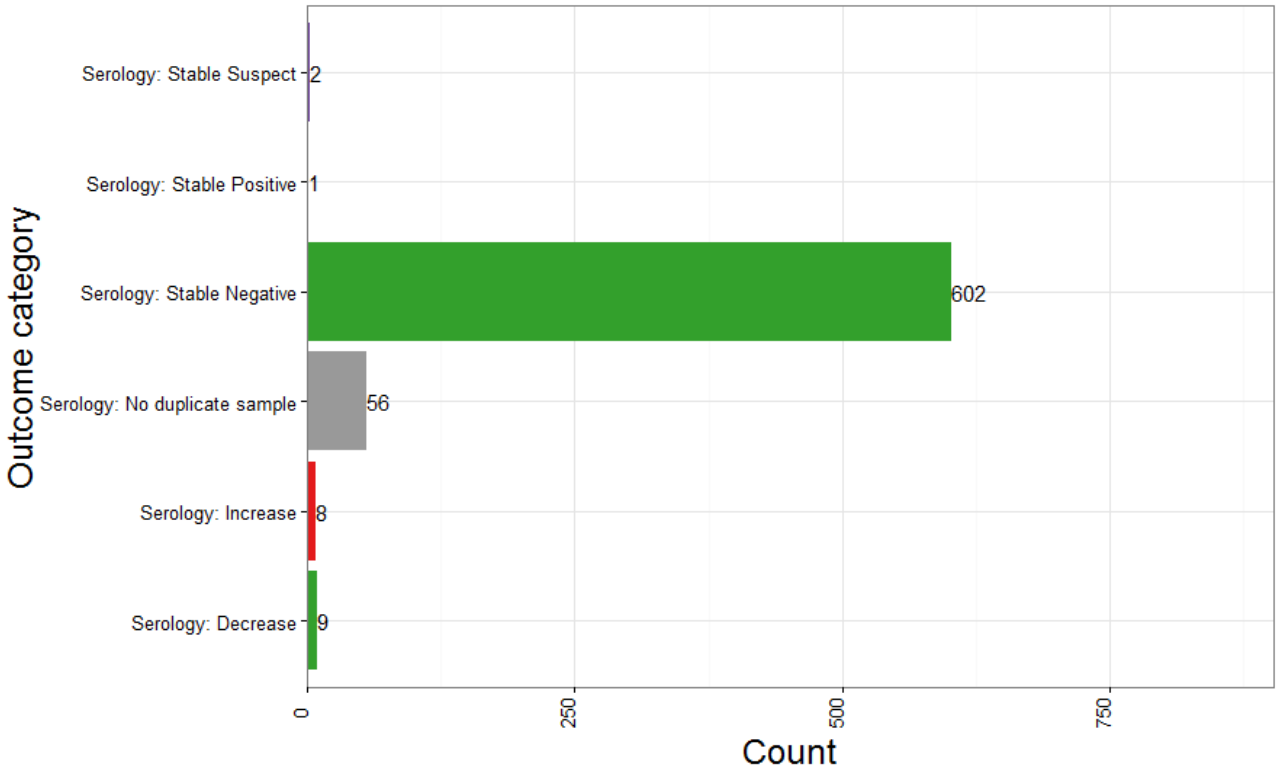


Figure 1: Broad outcomes for serological evaluation for the period under review. Increasing serology incorporates both the negative to suspect/positive and the suspect to positive permutations for serological change across paired samples.

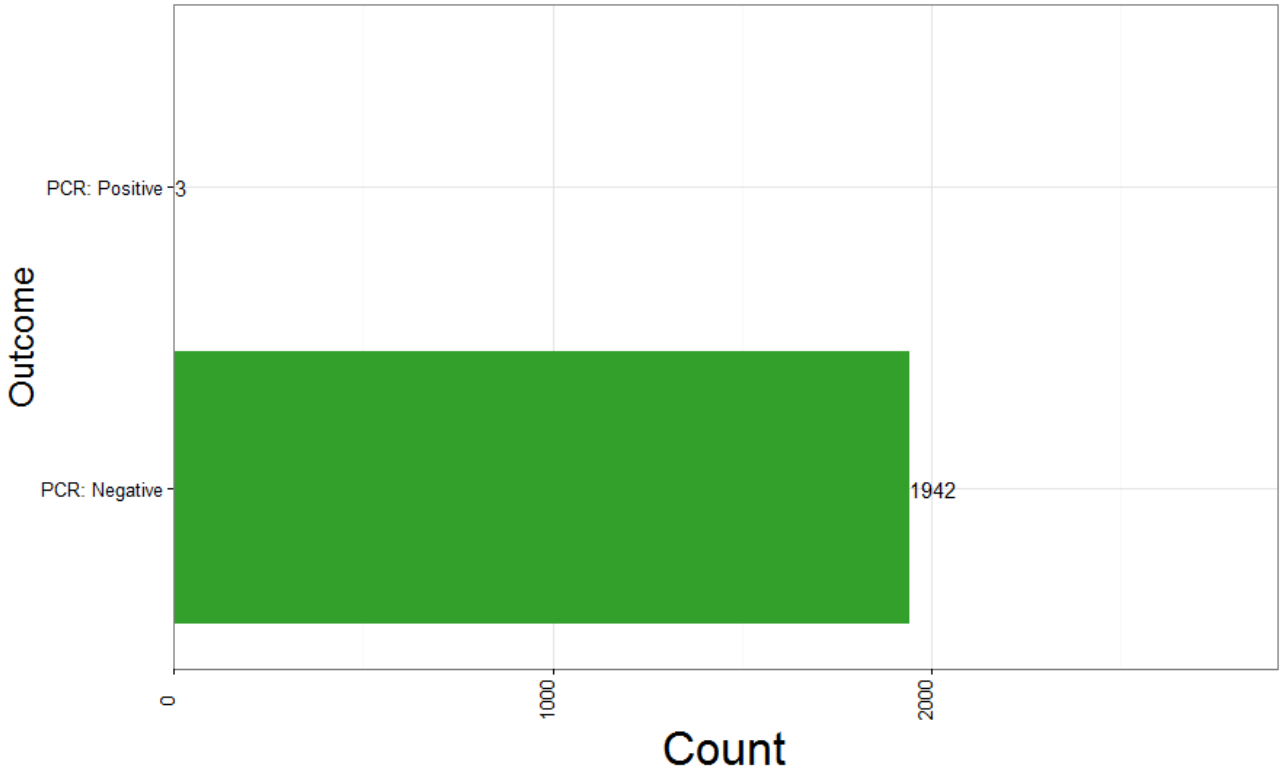


Figure 2: Broad outcomes for PCR evaluation for the period under review. All three positive results (from 2 horses) were part of the 2016 Paarl outbreak.

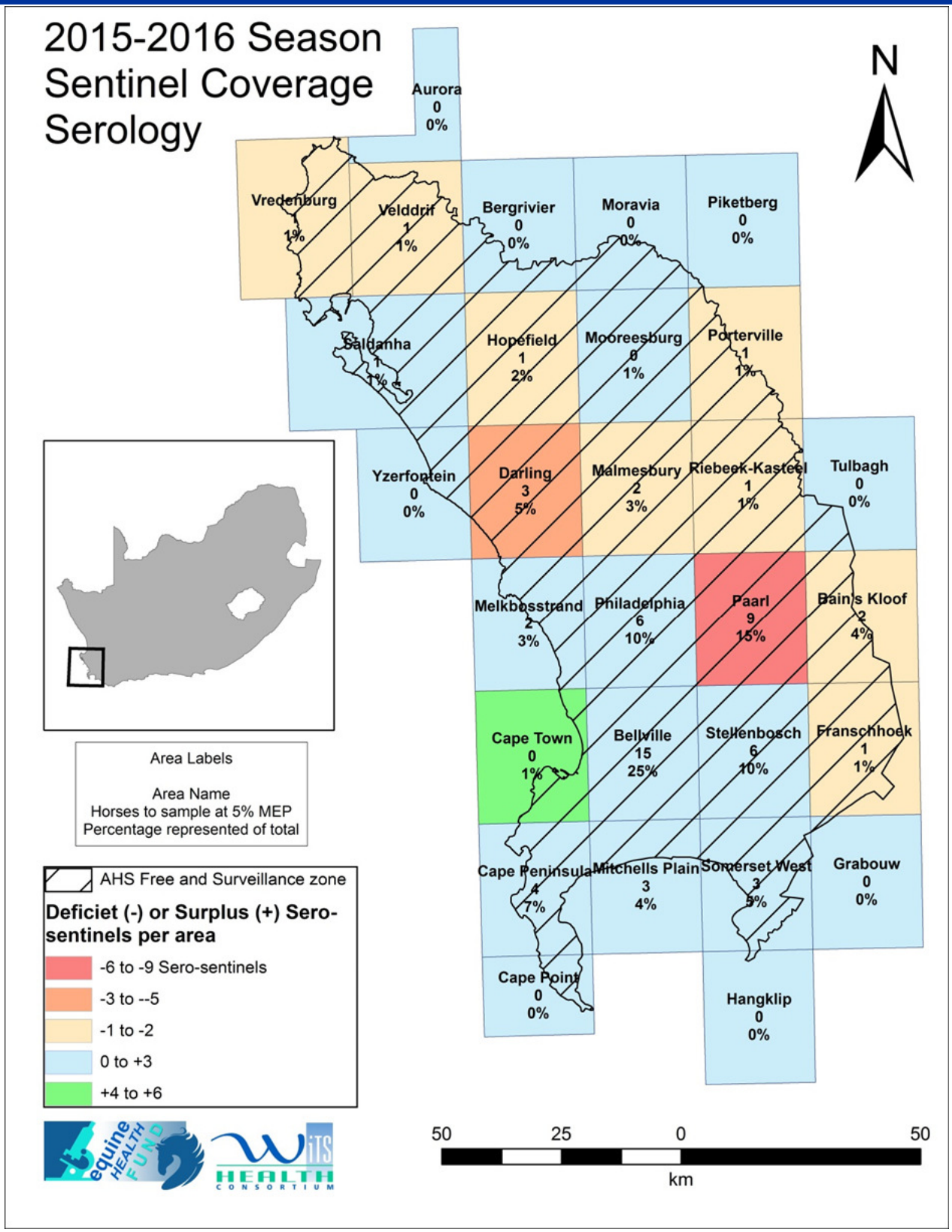


Figure 3: A map showing the AHS surveillance and free zones where sero-sentinel surveillance has taken place for the 2015/2016 season. The map depicts the various areas with their estimated number of horses labelled that are required to be sampled to detect a 5% minimum expected prevalence using a proportional sampling frame. The yellow to red areas are areas where sero-sentinels were lacking while the blue to green areas show where surplus sero-sentinels were sampled.

AHS sentinel surveillance report continued

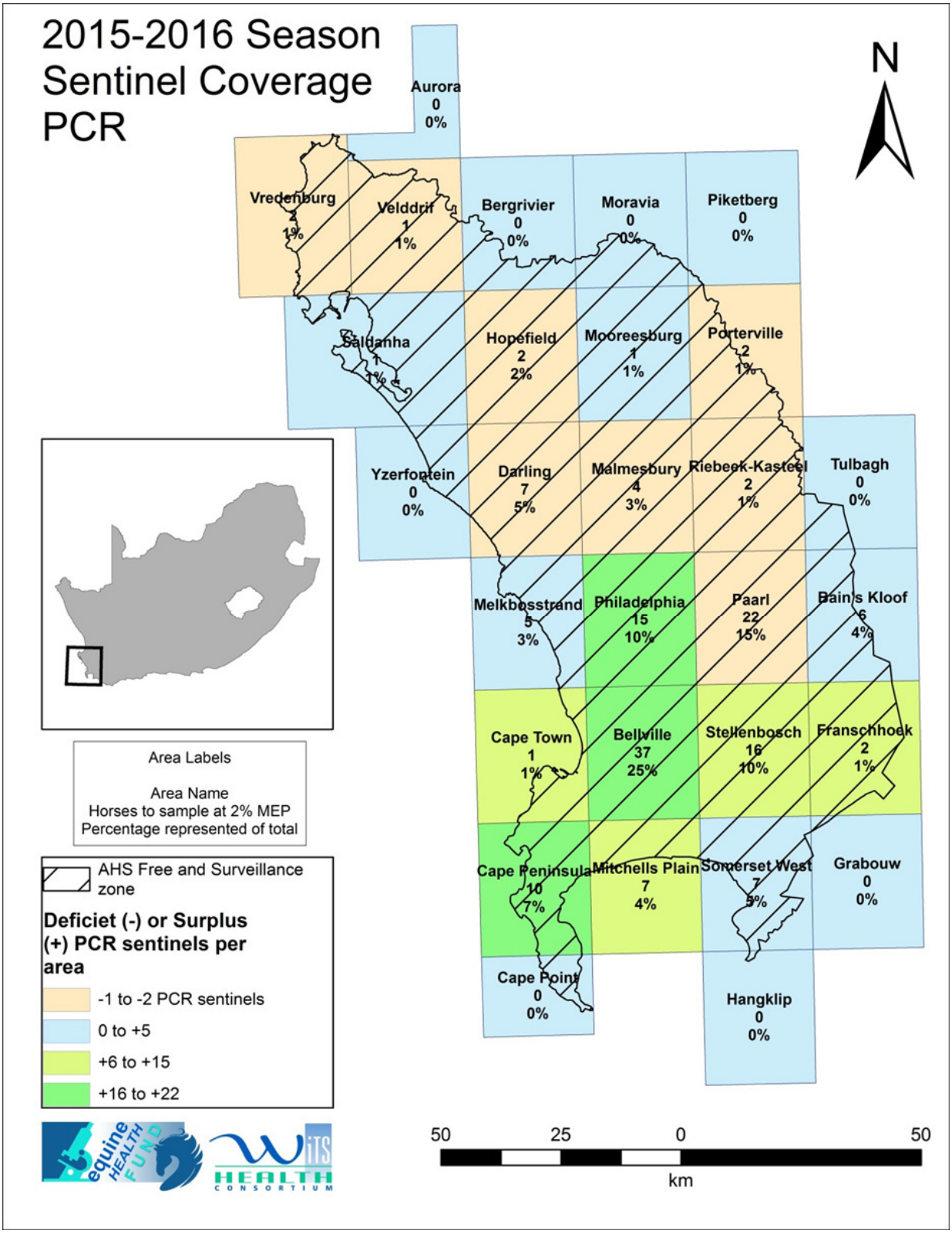
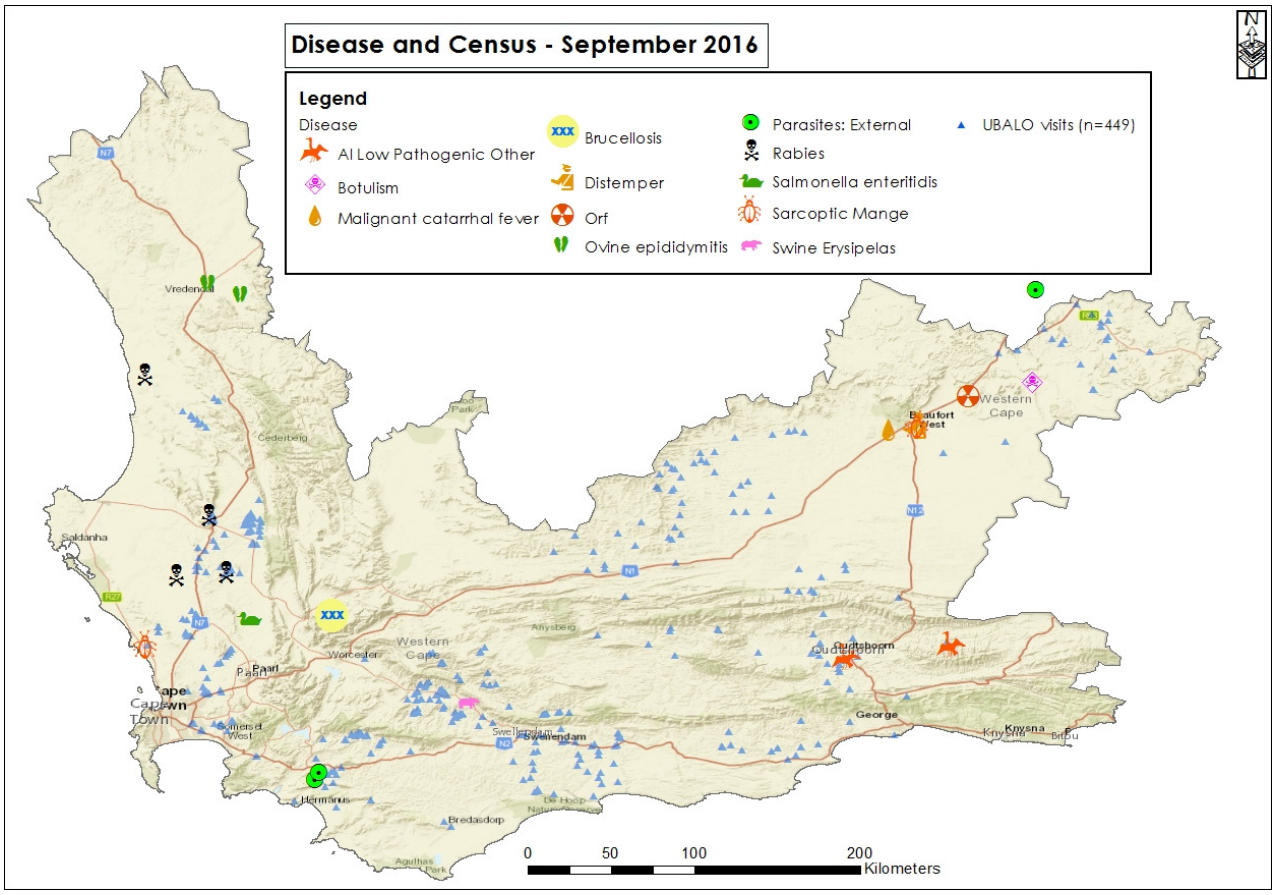
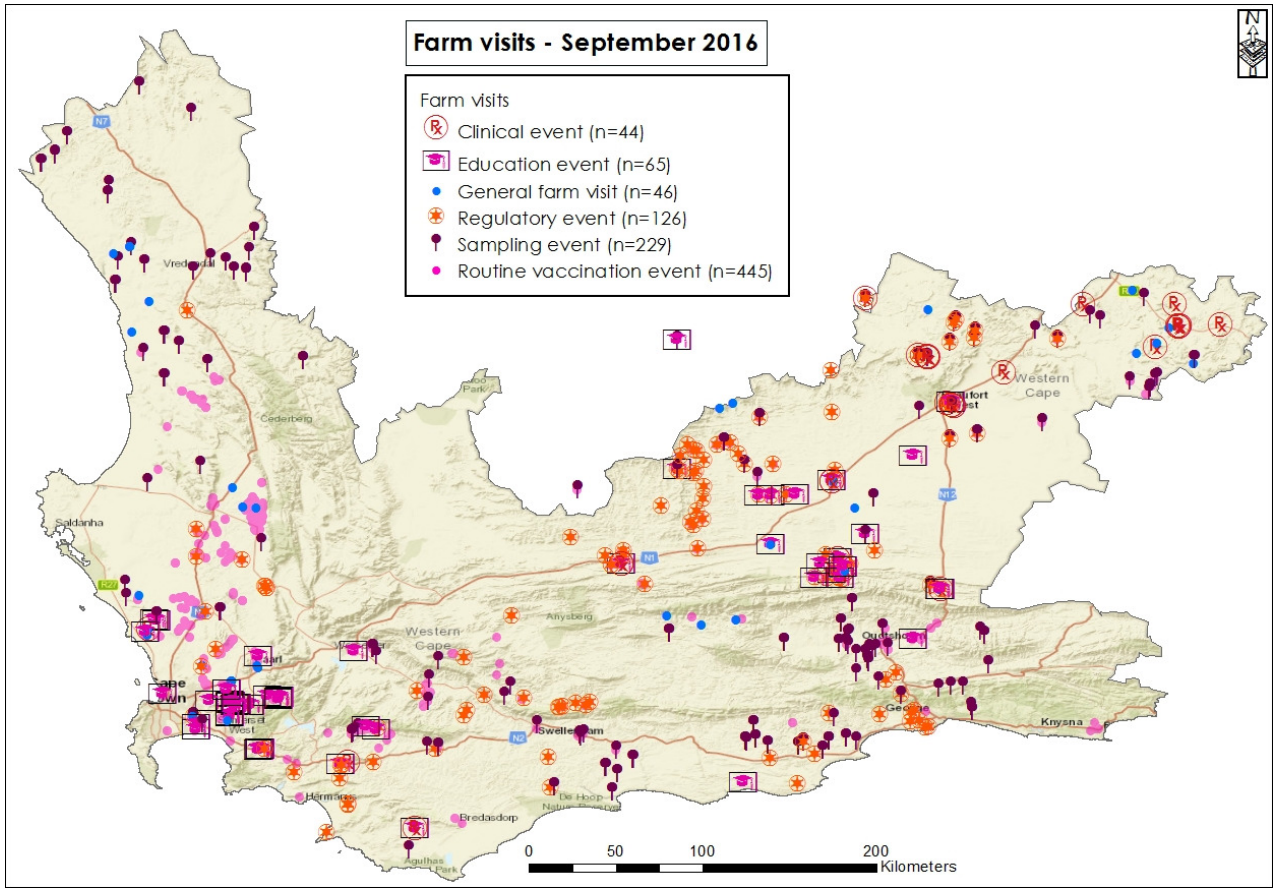


Figure 4: A map showing the AHS surveillance and free zone where PCR-sentinel surveillance has taken place for the 2015/2016 season. The map depicts the various areas with their estimated number of horses labelled that are required to be sampled to detect a 2% minimum expected prevalence using a proportional sampling frame. The light orange areas are areas where PCR-sentinels were lacking (max of -2 per month) while the blue to green areas show where surplus PCR-sentinels were sampled.

Disease and Surveillance





Outbreak events

- Four confirmed cases of **wildlife rabies** occurred in the western part of the province this month.

⇒ A bat-eared fox near **Moorreesburg** approached a farm worker's cottage where it attempted to attack a dog. The next day it was still in the vicinity and so the farmer shot it. Recently in the same area, a bat-eared fox entered a nearby farm school during the day. The police were called but refused to shoot the fox, which subsequently disappeared.

⇒ A bat-eared fox near **Saron** crept through a hole in a farmyard fence and approached the homestead, where it was attacked by the farmer's dogs. As there was a history of vaccination of the dogs, they were revaccinated in response.

⇒ A Cape fox approached a farm house near **Lambert's Bay** and lay under the compressor. The farm owner recognized this as abnormal behavior, killed the fox and contacted Veterinary Services to take samples.

⇒ A bat-eared fox was seen near a farm house near **Piketberg**. The fox had an unsteady gait and was falling over repeatedly.

A bat-eared fox (Photo: morguefile.com)

- A private veterinarian performing pregnancy diagnoses on a **dairy cattle** farm near **Ceres** noticed that some cows that were confirmed pregnant returned to oestrus, indicating early loss of pregnancy. When an aborted foetus was found in one of the pastures, it was submitted to the Stellenbosch Provincial Veterinary Laboratory for testing. Shortly afterwards, the farm tested positive on two consecutive milk ring tests (MRTs) for screening for brucellosis and so blood samples were taken for serological testing. Three samples tested positive on the Rose Bengal test, but negative on the subsequent complement fixation test. However, a positive culture of ***Brucella abortus*** type 1 was obtained from the placental cotyledons of the aborted foetus. The farm was placed under quarantine pending retesting of the entire herd in November. The source of the infection is unknown, as the farm has good biosecurity measures in place and introduces a small number of tested bulls only. Heifers are vaccinated with RB51 at the age of 6 and 12 months, and again as cows after calving each year. Negative MRTs have been received from neighbouring dairy farms throughout the year. Investigation and testing of the adjacent beef farm will take place.
- ***Brucella ovis*** was detected during routine ram testing on two **sheep** farms near **Vredendal**.
- ***Salmonella enteritidis*** was detected in a dead-in-shell chick in a hatchery near **Malmesbury**. There had been a problem with SE in this hatchery in the past and it is undergoing a deep cleaning process. The **broiler** breeder flocks from which the egg originated have been treated with antibiotics and the older flocks are being depleted.
- Two **ostrich** farms in the **Oudtshoorn** area tested positive on PCR testing for **avian influenza** matrix gene. One of the farms was within 3kms of another positive farm and shared workers on the weekends. Positive birds on the second farm had been moved from another farm, but evidence of active infection was not found when birds on the farm of origin were tested.
- A case of **swine erysipelas** was diagnosed by a meat inspector at an abattoir in **Bonnievale**. Veterinary services performed a follow-up inspection of the pigs on the farm of origin.
- **Bovine malignant catarrhal fever** occurred in a 1-year-old, hand-reared calf on a farm near **Beaufort West**.
- An outbreak of **orf** in **goats** near **Beaufort West** was controlled by means of an autogenous vaccine.
- Two Dorper **sheep** near **Nelspoort** showed clinical signs of **botulism**. The cause is unknown.

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Bovine brucellosis: what is going on?

In the veterinary community, brucellosis is a well-known zoonotic disease and the importance of its control is understood. Most veterinarians can name a friend or colleague who has contracted brucellosis and suffered greatly as a result. Even the famous veterinarian and author, James Alfred Wight (better known by his pen name of James Herriot) contracted brucellosis during his career and suffered for many years from recurring attacks of fever and depression caused by the bacterium. Additionally, brucellosis can have a devastating economic effect on herds that become infected, in the form of production losses and direct losses of livestock that must be slaughtered to control the disease.

Despite its severe influence in the agricultural community, lay people are largely ignorant of the existence of brucellosis. This was not always the case. As recently as the beginning of the 20th century, over 3600 cases of brucellosis were reported in British soldiers stationed on the Mediterranean island of Malta per year, warranting the military hospital to have a special ward reserved for soldiers suffering from "Malta fever", today known to be caused by *Brucella melitensis*. When researchers discovered that the disease was contracted by the drinking of unpasteurized goats' milk, the British Armed services banned the drinking of goats' milk by soldiers. The hospital ward was soon converted into a ballroom due to the dramatic decrease in the number of Malta fever patients.

Today, there are public health measures in place world-wide to protect members of the public against contracting the disease, namely, regular testing of commercial dairy herds and pasteurisation of milk. However, due to the nature of the disease, it is not possible to say with certainty that the prevalence in the human population is low. Clinical brucellosis in people causes non-specific signs such as fever, malaise, joint pain and depression and many doctors are not aware of the disease or how to diagnose it. As a result, those who are diagnosed are usually diagnosed late into the progression of the disease when treatment is less effective and the illness can become chronic. It is therefore possible that many people in South Africa are affected by brucellosis without knowing the cause.

In South Africa, several *Brucella* species are present, but bovine brucellosis caused by *Brucella abortus* constitutes by far the majority of reported cases. The number of outbreaks of bovine brucellosis in the country is high (fig 2), and in the last decade, the incidence of bovine brucellosis has been increasing. The reasons for this observed increase are not clear, but there are several factors which may have played a role, including an increase in the uncontrolled movement of cattle and a lack of vaccination of susceptible animals, possibly due to ignorance or lack of access to vaccine.

An erroneous belief exists that because brucellosis is a state-controlled disease by law, that the state alone is responsible for controlling it. This is, of course, false. Without the co-operation of the public, control of any disease is impossible. Without commitment and pro-active participation of all involved parties in a disease control programme, no progress towards disease eradication can be made. For instance, while the state handles the quarantine and action plan for farms where the disease is already present, livestock producers and their private veterinarians are responsible for putting in place several measures to prevent infection of their cattle with brucellosis, and/or minimize the effect of the disease, including strict biosecurity, vaccination and regular herd testing. In fact, animal owners are required by the Animal Diseases Act to take all reasonable measures possible to protect the health of their animals and prevent the spreading of any pathogen.

That commitment from all parties is essential to control brucellosis can be seen in the example of the eradication of *Brucella melitensis* from Malta. Despite knowing the cause and transmission methods of the disease since 1906, it took Malta almost 100 years before it could declare the country free of brucellosis in 2005. When pasteurization became available on the island in the 1930s, a control prgramme commenced to rid the island of brucellosis using vaccination of susceptible animals, public health measures to ensure safe milk was sold and regular testing and movement control to ensure healthy goat herds. The programme was largely unsuccessful due to lack of co-operation from the local population, many of whom refused to believe that their goats could be carrying a disease, moved goats at night to avoid movement control and didn't observe hygiene practices. Finally, a massive education programme started in 1996 reached all people on the island and together with strict legal control of animal testing and movement, often enforced by vigilantes, resulted in the eradication of the disease from the island.

In South Africa, in an effort to combat the current situation, State Veterinary Services and the National Animal Health Forum have come together to control brucellosis with the aim of eradicating the disease from South Africa in the future.

Bovine brucellosis continued

The first step in designing an effective brucellosis control strategy in South Africa is to determine the true prevalence of the disease in the country. While regular testing of dairy herds is compulsory, it is not for beef herds, leading to the belief that the prevalence of the disease is higher than that which has been reported.

At the same time, key factors that help or hinder the current control of brucellosis should be identified in order to modify the current control programme for maximum efficacy.

To assist with the first step of a new brucellosis control strategy, information regarding farms currently infected with brucellosis in the Western Cape was collated. There are currently 12 farms under quarantine in our province for bovine brucellosis (fig 1).

Although the observation has been made in other provinces that bovine brucellosis is especially a problem in smallholder or non-commercial farmers, this does not appear to be the case in the Western Cape. Veterinary Services officials perform regular *Brucella* testing for non-commercial farmers and in areas where livestock are kept communally. All current outbreaks of brucellosis in the province are occurring on commercial cattle farms.

While it is encouraging that the evidence suggests that brucellosis has not established itself in communal livestock of the Western Cape, it is vital to prevent the disease from entering these populations. In situations where there are no fenced-off pieces of land that can be placed under quarantine, disease control becomes much more difficult.

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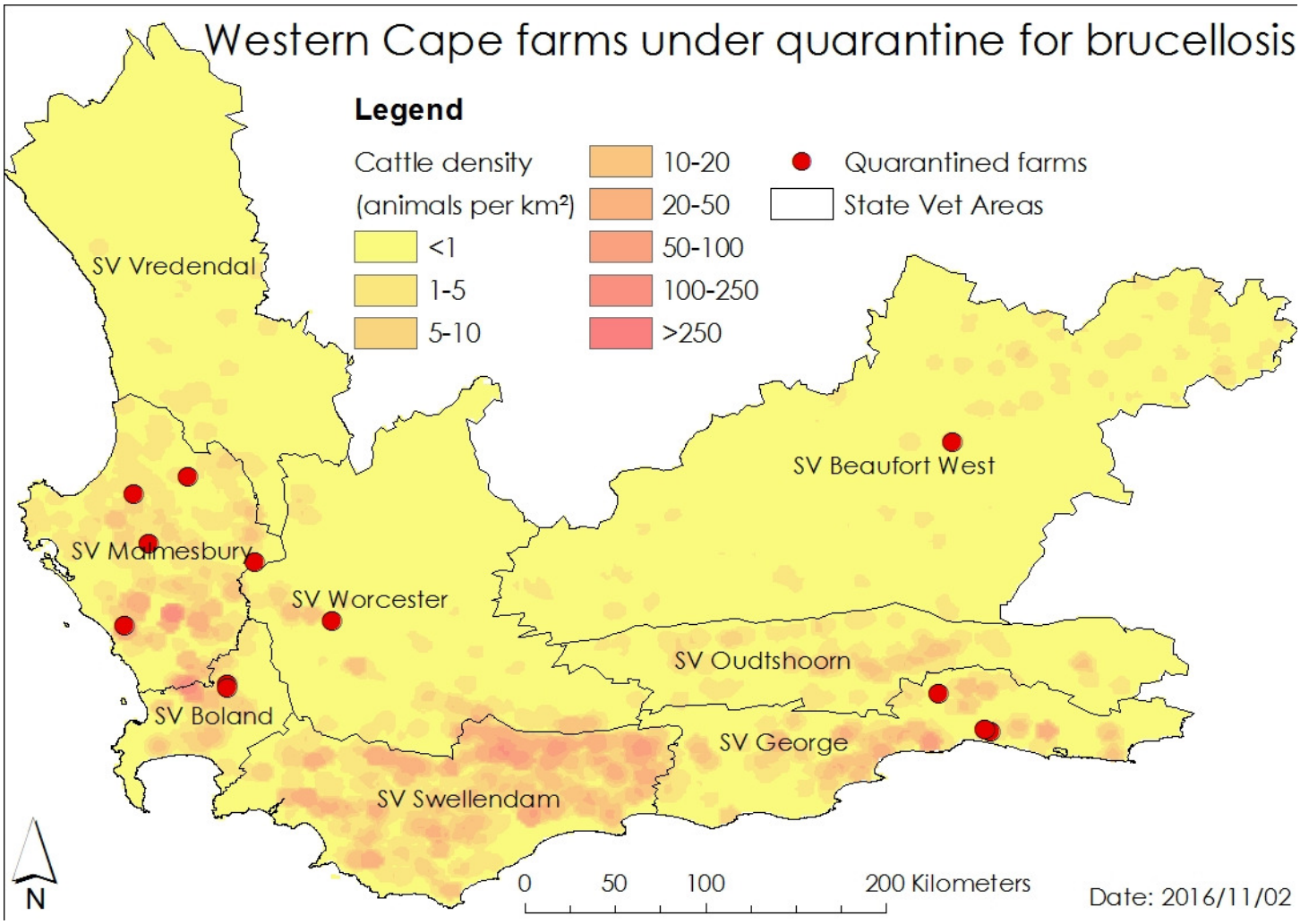


Figure 1: Farms in the Western Cape currently under quarantine for brucellosis

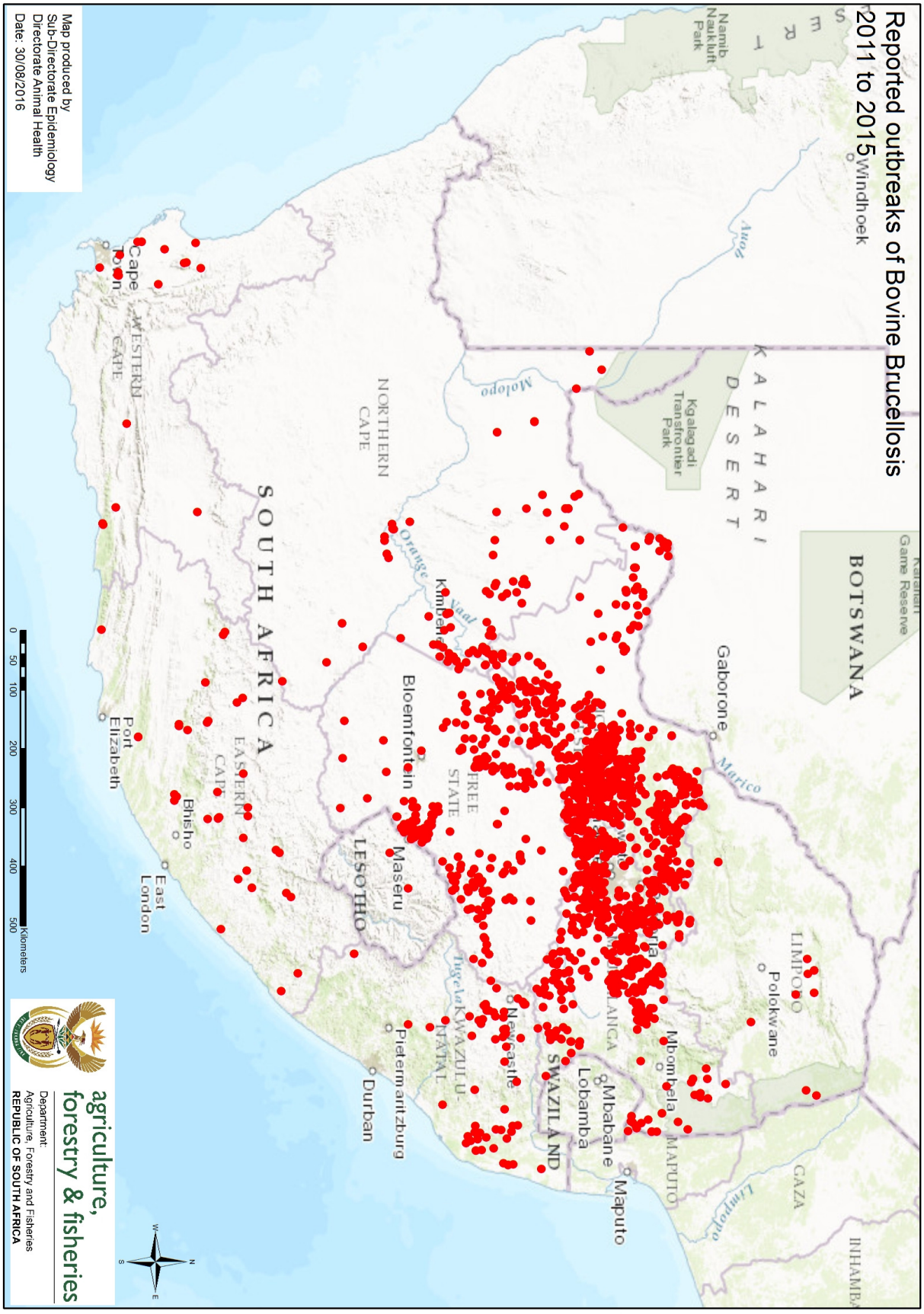
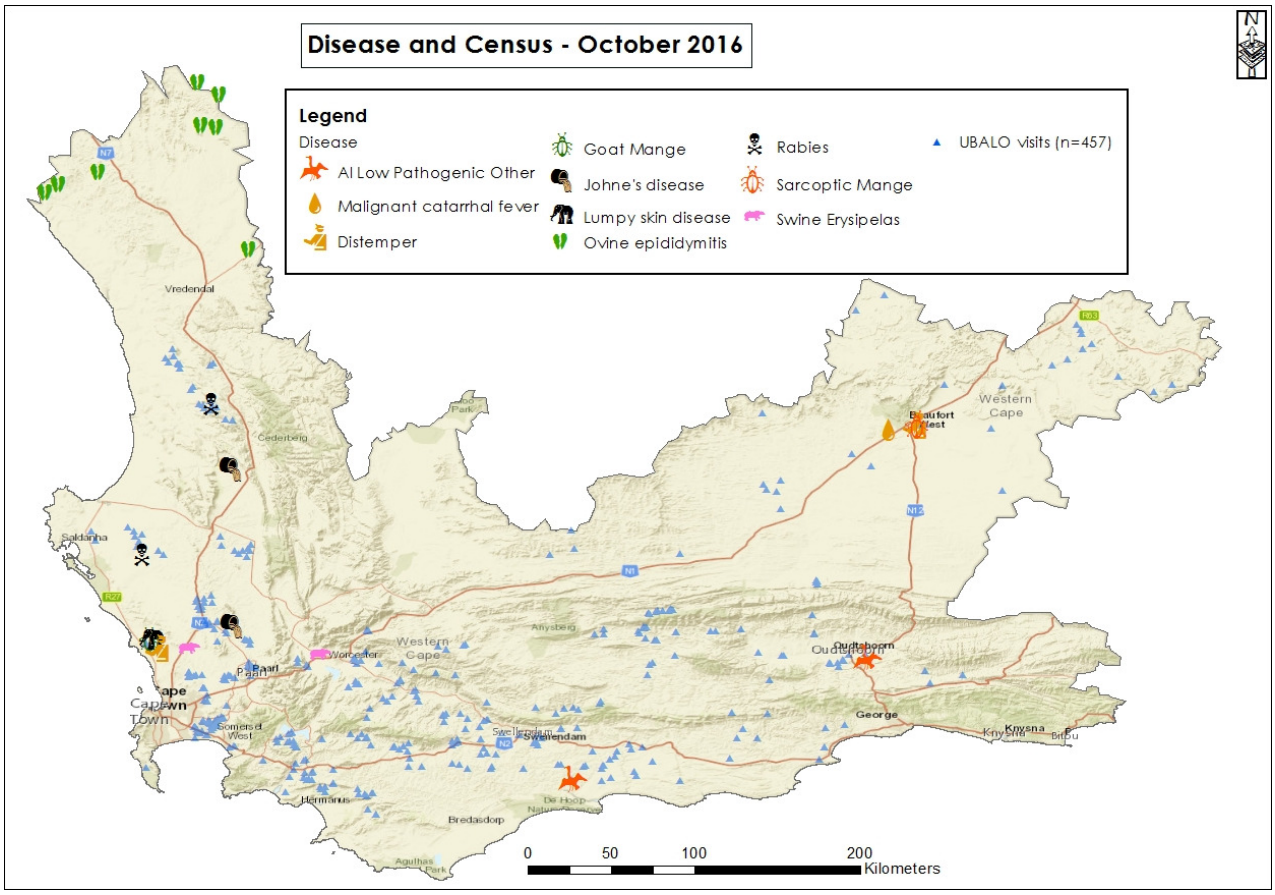
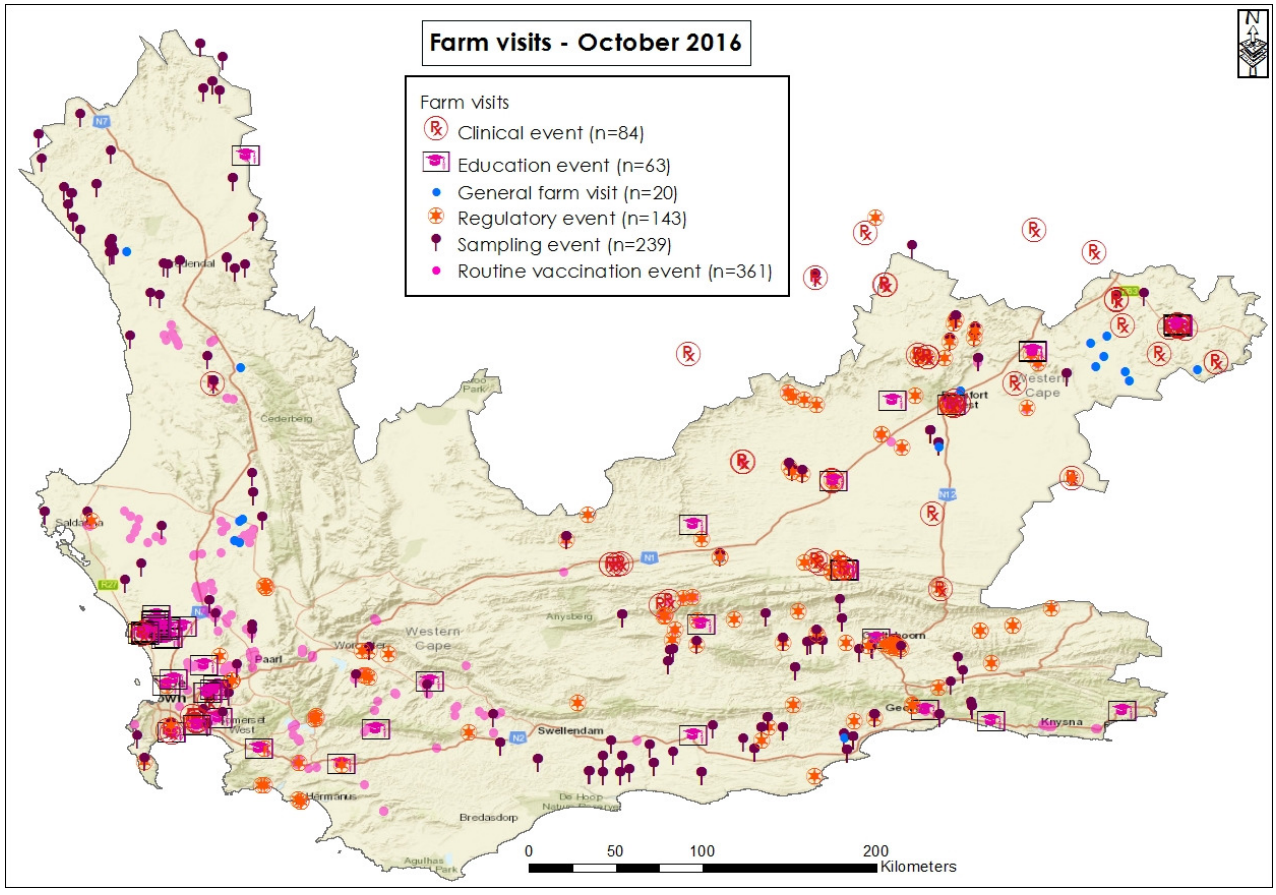


Figure 2: Reported outbreaks of bovine brucellosis in South Africa between 2011 and 2015 (DAFF, 2016)

Disease and Surveillance





Outbreak events

- A cattery near Malmesbury experienced acute illness and deaths of two-week old kittens from several litters. Although there were no macroscopic post-mortem changes observed, *Escherichia coli* and *Erysipelothrix rhusiopathiae* (the causative organism of swine erysipelas) were cultured from liver samples. While *E. rhusiopathiae* is a pathogen that can infect most domestic animals, in this case it cannot be said with certainty to what extent each cultured bacterium contributed to the clinical signs seen in the affected kittens.
- Two ostrich farms near Heidelberg and Oudtshoorn, respectively, tested positive for H5N2 avian influenza in birds being raised for slaughter. While the first farm has had only serological reactions thus far, the second farm has tested PCR positive for H5 and N2. Further sequencing of the virus is underway. Wild birds are the suspected source of the infection.
- A hand-reared orphan calf on a farm near Beaufort West showed chronic keratoconjunctivitis, lacrimation, nasal discharge, weight loss and diarrhea. Blood sample taken revealed that the calf was infected with wildebeest-associated malignant catarrhal fever virus. The wildebeest are kept further than 10km away on the farm, but the calf may have had indirect contact with them through other animals with which they had been in contact. The affected calf was euthanased.
- Control Animal Health Technician Malmesbury was called out to a suspect case of canine rabies. On inspection the dog showed classic nervous signs of distemper. The local SPCA removed and euthanased the dog.

A neonatal kitten (Photo: morguefile.com)

- Two sheep farms in the Malmesbury state vet area tested positive for Johne's disease after observing animals losing condition. The affected farms were placed under quarantine.
- A single case of clinical lumpy skin disease was observed in a herd of 30 cattle near Atlantis.
- Eight farms in the greater Vredendal area tested positive for *Brucella ovis*. On one farm, the affected rams had recently been brought in and were still in isolation, facilitating the control of the disease.
- A farm owner near Clanwilliam heard his dogs barking in the night and awoke to see them attacking and killing a bat-eared fox. When the fox tested positive for rabies, the farmer opted to have his two dogs euthanased as they had no record of being vaccinated against rabies. Dogs and cats in the area were vaccinated in a 10km radius of the case.
- Another bat-eared fox near Hopefield entered a property where it attacked a horse by jumping against it. It left the horse temporarily to attack a hosepipe and when it returned, was kicked and knocked unconscious. The farmer killed the incapacitated fox, which subsequently tested positive for rabies. The horse and two pot-bellied pigs on the property were vaccinated. Co-incidentally, a vaccination campaign of dogs and cats took place in Hopefield on the day of the attack.
- A clinical case of diamond skin disease (erysipelas) was picked up in the carcass of a pig that originated from a free-range farm near Worcester. Several pigs had been caught and kept on a trailer for the night (a practice which is not legal) before being transported to the abattoir. It is likely that the stress of this treatment contributed to the development of clinical signs in the pig.

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Imported canine leishmaniasis

In July this year, a dog was presented to a private veterinarian in Cape Town with crusting skin lesions around the mouth, ears, nose and feet. The dog had been imported from Qatar in April and had undergone a standard pre-import indirect fluorescent antibody test for *Leishmania* infection, which was negative. In November, the owner returned to the private vet as the skin lesions were not improved and several had begun to cause extensive sloughing of the affected skin. At this point the case was referred to a specialist. A fine-needle aspirate from the popliteal lymph node revealed the presence of *Leishmania* amastigotes when examined microscopically.

Figure 2: A *Phlebotomus* sand fly (left) carrying *Leishmania* promastigotes (right) (www.cdc.gov)

Leishmaniasis is a disease caused by parasites in the genus *Leishmania* that can affect several species of mammals, including dogs, rodents, livestock and humans. The parasite is transmitted between hosts by biting female sandflies (fig 2) in many parts of the world (fig 1). Very little information regarding the presence and distribution of sand flies in South Africa is available, but local species have been described by E. Zielke in 1971. The possibility of the parasite being transmitted by South African sand flies or by other vectors has not been investigated. Furthermore, the current distribution of sand fly vectors has great potential to expand and to move into new areas as one of the effects of climate change. In our neighbouring country of Namibia, sand flies are known to carry *Leishmania* parasites and a small number of sporadic clinical cases of leishmaniasis have been diagnosed since 1970.

Most mammalian hosts of the parasite are subclinically infected, but in a small fraction clinical signs will develop, in many cases as a result of a weak or suppressed immune system. The disease occurs in three forms: cutaneous (causing ulcers of the skin), mucocutaneous (ulcers in the mouth, nose and throat that can completely destroy mucous membranes) or visceral (skin ulcers progressing to enlarged spleen and liver, fever and anaemia).

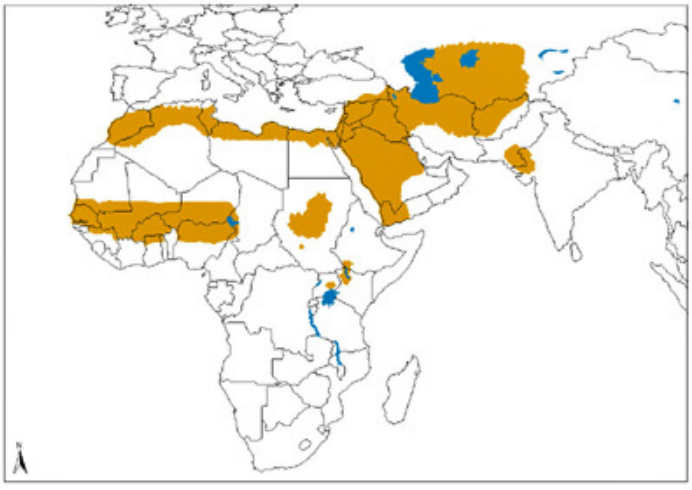

Figure 1: Distribution of cutaneous leishmaniasis in Africa and the Middle East (WHO, 2010)

Treatment using drugs is often unsuccessful in improving clinical signs and does not eliminate the parasite from the infected host. Cutaneous lesions can alternatively be excised if this is practical, but severe scarring can occur if they are large in size.

As leishmaniasis does not currently occur in South Africa and treatment carries no guarantee of success, the options for infected animals are to be re-exported to a *Leishmania*-endemic country or euthanased. In this case, the owner elected to euthanase the affected dog.

Those working in the veterinary and medical professions should make themselves familiar with the presentations of leishmaniasis as this is a disease we should be aware of. In humans, approximately 1.2 million new clinical cases of leishmaniasis occur annually worldwide, causing approximately 30 000 deaths. Early detection of pathogens entering the country is essential to prevent human and animal illness and mortalities.

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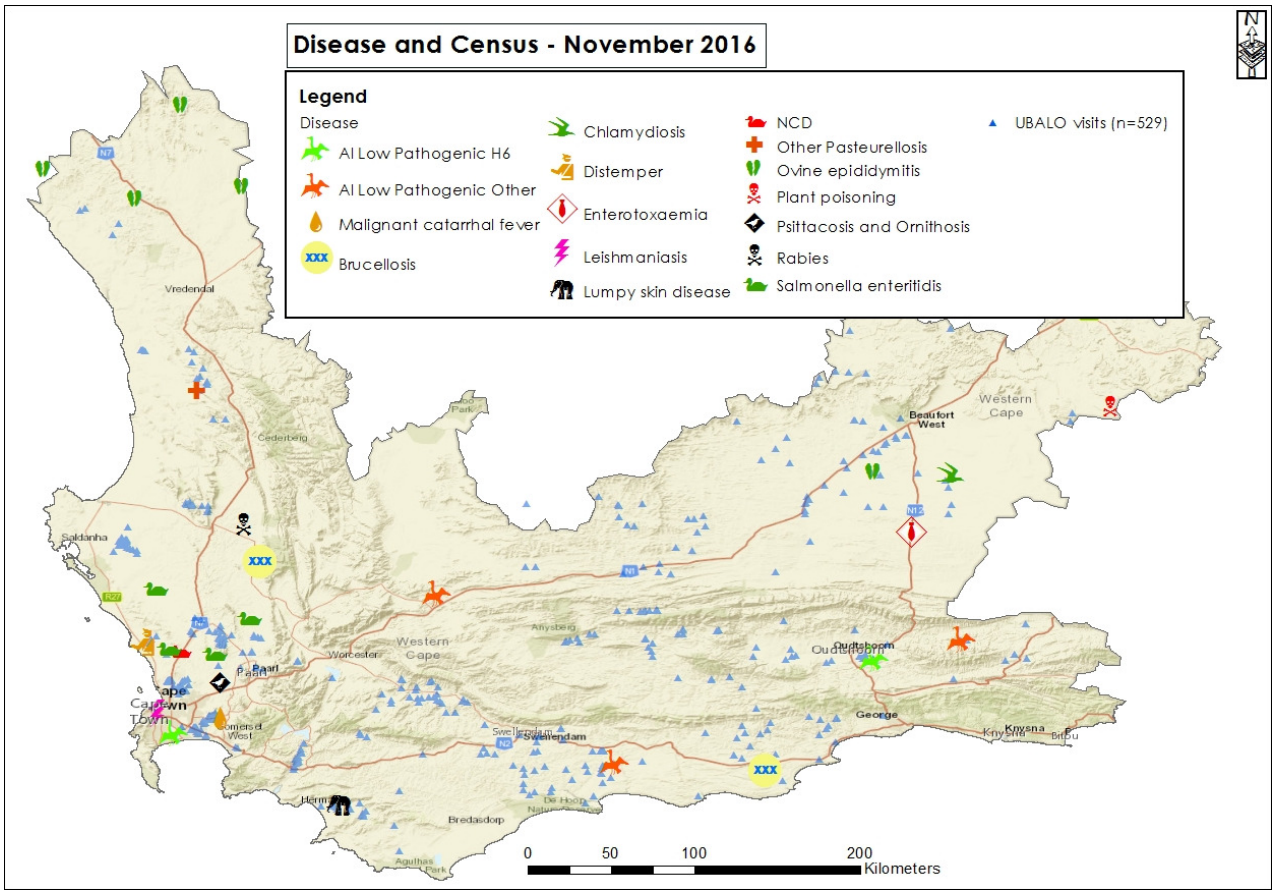
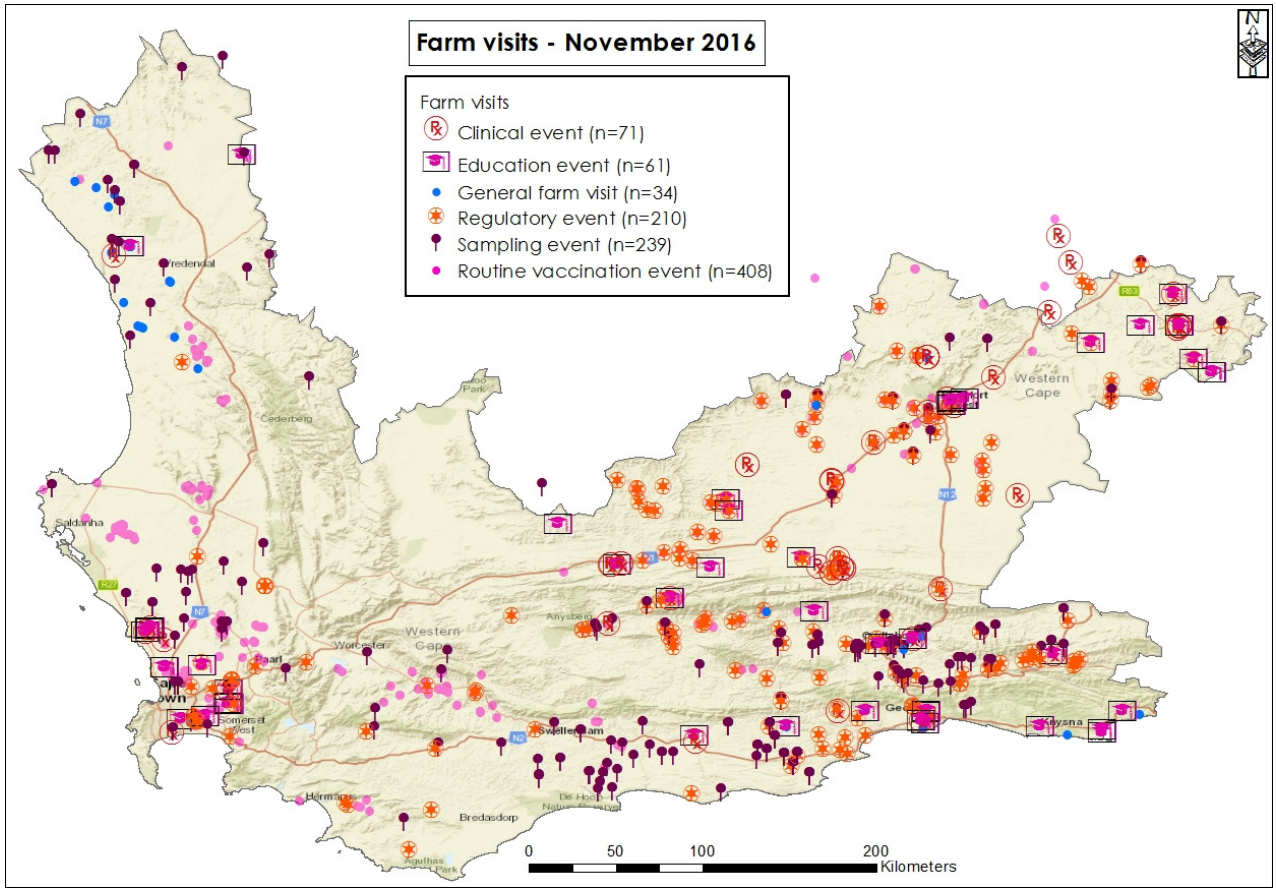
Disease and Surveillance





Outbreak events

- A **bat-eared fox** near **Porterville** showed abnormal behavior by coming onto a farm during the day. It was shot by the farmer and confirmed positive for **rabies**. There were no human or animal contacts, and dogs and cats on the farm were vaccinated in response.
- A small free-range **layer** farm in **Cape Town** tested positive for **avian influenza** on routine ELISA screening. Follow-up samples taken for haemagglutinin inhibition testing revealed evidence of an **H6** infection. The farm is currently under quarantine.
- Four **ostrich** farms in the province tested positive for **avian influenza**: three for **low pathogenic H5** and one for **H6**.
- A flock of three backyard **hens** near **Malmesbury** died of suspected **Newcastle disease**. Two of the hens showed poor body condition, lameness, diarrhea and respiratory symptoms before death.
- Routine testing for **psittacosis** in a breeding aviary near **Klapmuts** returned a positive result for a **blue-fronted Amazon** parrot (fig 3) which died a week later. The property was placed under quarantine and all in-contact birds were treated with doxycycline for 45 days. This same property experienced an outbreak of psittacosis in June 2016. Since then, all new introductions are kept in a separate quarantine area for 21 days before being introduced into the aviary. However, aviary cages do not have solid roofs, making contact with wild birds and their faeces a possibility.

Figure 3: A blue-fronted Amazon parrot (Sharp Photography)

- Two **cattle** farms in the province have tested positive for bovine **brucellosis**, pending further investigation:

⇒ A dairy herd near **Mossel Bay** experienced abortions assumed to be caused by tick-borne diseases. After two consecutive positive milk ring tests, the herd was tested and four cows tested positive on the complement fixation test (CFT). Two of these cattle have been slaughtered for further testing. This herd has not been vaccinated by the current owner, but cattle were bought from several different sources.

⇒ A beef herd near **Porterville** was tested as a result of being adjacent to a positive farm. Two cows were found positive on CFT. The herd has been a closed herd for many years, but cattle are moved to other farms in the country for grazing purposes. The farmer follows a vaccination programme including Strain 19 for his cattle.

- Four **chicken** farms in the **Malmesbury** area tested positive for ***Salmonella enteritidis***. There were no clinical cases in the flocks, but the bacteria were cultured from a dead-in-shell chick, dust and two chick box liners respectively.
- **Lumpy skin disease** was reported from a **cattle** herd near **Hermanus**. After detecting one clinical case, the farmer vaccinated his entire herd.
- A **cow** on a farm near **Stellenbosch** showed mucoid secretions from the nose and eyes, keratitis, ulceration of the abomasal mucosa, fibrinous adhesions in the pleura and consolidation of the ventral lung lobes with purulent exudate on cut surfaces. New wildebeest had been brought onto the farm about two months previously to join the pre-existing wildebeest. This was diagnosed as a case of wildebeest-associated **malignant catarrhal fever**.
- Five **sheep** farms in the province tested positive for ***Brucella ovis*** infection: four in the **Vredendal** area and one in the **Beaufort West** area.
- Abortions in Angora **goats** near **Beaufort West** were investigated and found to be caused by ***Chlamydophila abortus***.

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EPIDEMIOLOGY REPORT

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How can the veterinary profession save the world?

Lessons learned from attending the One Health Ecohealth congress 2016

LvH

The One Health Ecohealth congress 2016 was opened in Melbourne on 3 December 2016 with a formal acknowledgement of the Wurundjeri people of the Kulin Nation, the traditional custodians of the land on which the meeting took place. In Aboriginal culture, the relationship of people to the land is central. While many other cultures consider land to be a commodity off which people can live or profit, Aboriginals recognise that people are not just born into societies, but ecosystems in which their lives are integrally connected with those of all other living things as well as the soil and water. In the same way that children are expected to care for their parents when they become adults, all people have a responsibility to care for the land that raised them.

Members of the agricultural community that have started farming according to this concept are beginning to see the benefits. For instance, a study presented at the congress showed that Australian livestock farmers who used a regenerative approach to land management had a high subjective wellbeing. This means that farmers who applied techniques on their farms in an effort to restore the natural ecosystem identified an improvement in how they felt about their lives since adopting this approach. The study participants reported reduced financial stress due to reduced input costs, improved mental health from enjoying their work while feeling that they are responsible stewards of their land and feeling confidence in their abilities to make decisions due to the positive outcomes observed from regenerative farming.

Although the concept of one health has been recognised in the veterinary community for some time, awareness is still growing as to the full scope of this term. Partnerships between human and animal health authorities to integrate disease prevention and control measures are being formed, but one health can be developed beyond this. Although we may feel that we are just a small part of the puzzle, veterinarians and paraveterinarians have the ability to solve the global issues of land care, climate change and food systems, both through our own actions and by educating and empowering others. At the One Health Ecohealth congress, people from all backgrounds came together to discuss how best to confront these challenges and communicate their importance to others.

Land care

The preservation and restoration of ecosystems is sometimes seen as being in opposition to economic development or as a luxury only certain people can afford to be concerned about, but this thinking forgets that humans are a part of nature and that care for the environment is vital for our own wellbeing.

"I dream of the vast deserts, the forests, and all of the wildernesses of our continent; wild places that we should protect as a precious heritage for our children and for our children's children. We must never forget that it is our duty to protect this environment."
– Nelson Rolihlahla Mandela

The environment provides humans with numerous benefits known as ecosystem services. These range from the provision of oxygen, food and water to prevention of diseases and spiritual enrichment. Studies done around the world show that people who have access to nature have a lower incidence of non-communicable diseases (such as heart disease, diabetes and cancers). However, urbanisation and resulting cultural disruption have caused a disconnect between humans and nature. Further issues of socio-economic inequality result in relatively wealthy people having the choice and the resources to connect with nature while poor urban people do not. However, these problems can be overcome within communities if people are sufficiently engaged and given the opportunity to become custodians of land. For instance, a community that is inspired to come together to create and maintain a natural space such as a park, community garden or grazing area can result in a beneficial effect for everyone in that community. However, this can only happen if communities are empowered sufficiently with the necessary resources and support.

Climate change

Effects of global climate change already observed and predicted to increase in the future include an increase in average temperatures, a rise in sea level and more frequent hydrologic extremes (droughts and floods). These all have the potential to affect the epidemiology of many diseases, as well as have other major public health effects. For instance, outbreaks of mosquito-borne diseases increase when the temperature is higher, as heat allows many pathogens to develop inside the mosquito at a faster rate. Extreme rain events put strain on sewage systems which can lead to contamination of water with pathogens, while drought can result in food shortages, wars and refugees.

The good news is that reducing carbon emissions and living lower-impact lives is not difficult or expensive. Cost estimates from the USA show for a cost of $30 per ton of CO_2 reduced, a saving of $200 in public health costs is realised, meaning initiatives to combat climate change have a financial benefit for societies. In addition to the many well-publicised ways in which individuals, corporations and governments can reduce carbon emissions, preserving biodiversity in our ecosystems is an important way of reducing the impact of climate change. Biodiverse ecosystems are not only more robust to survive changes in climate, but can actually prevent or slow down some of the harmful effects of climate change.

Food systems

Our global food systems are not currently sufficient to meet the dietary needs of the large number of the world's people who suffer from malnutrition in terms of the quantity, quality or safety of their diets. An insufficient diet is the most significant risk factor for disease in humans. In addition to these pre-existing issues, food supply needs to adapt to the rapidly increasing human population. Historically, agricultural production has been increased by conversion of natural vegetation to farmland and subsequently by agricultural intensification. Currently, the cost of food does not take into account the value of land and water, meaning that the environment has borne the cost of food production that has not been directly carried by the consumer. This cheap food has resulted in poor health and land degradation. The challenge in the future will be to increase production without further environmental damage. There are several ways in which this can be achieved including the reduction of food waste (about a third of all food produced globally is lost or wasted), by reducing consumption of food by those who are already overnourished, by ensuring that food produced is safe for consumption, by developing sustainable methods to utilise wild food sources and lastly by controlling human and animal disease outbreaks that decrease productivity.

The role of the veterinary profession

Discussion panels at the congress identified certain groups of people with the ability to spread messages of benefit within their communities. These included parents' groups, spiritual leaders, physicians and veterinarians. Veterinary professionals are not only already aware of many of the issues already mentioned, but we occupy an integral role in society from which awareness can be created. Those who visit farms and food production facilities have the ability to communicate with and educate all of the role-players in this industry about the benefits and practicalities of land care, sustainability and food safety. Those drafting legislation have the ability to consider, for each piece of legislation drafted, whether the policy is beneficial to the community and the environment. Small animal veterinarians working in cities or towns have access to educating individual members of the community in a way that most other professions do not.

People are more likely to respond to a narrative or story with which they can identify than a collection of dry facts. As veterinary professionals, we are in the unique position to see the entire system of human, animal and environmental health and communicate it in a way that people in our communities can relate to. Veterinary professionals in general are motivated by compassion for other living things and a desire to improve health, so let us use that passion to enrol others in realising the vision of a healthy world.

Gula Guri mayin ("Heal the body"): artwork by Bernard Lee Singleton created as part of a partnership with the Australian Society for Parasitology to promote public understanding of parasite lifecycles.

I would like to thank the organising committee of OHEH 2016 and its sponsors for providing me with a fellowship to attend and present at the congress, as well as the Western Cape Department of Agriculture for supporting my attendance.

Thank you to all the presenters and colleagues at OHEH 2016 who shared their work and ideas incorporated in this article.

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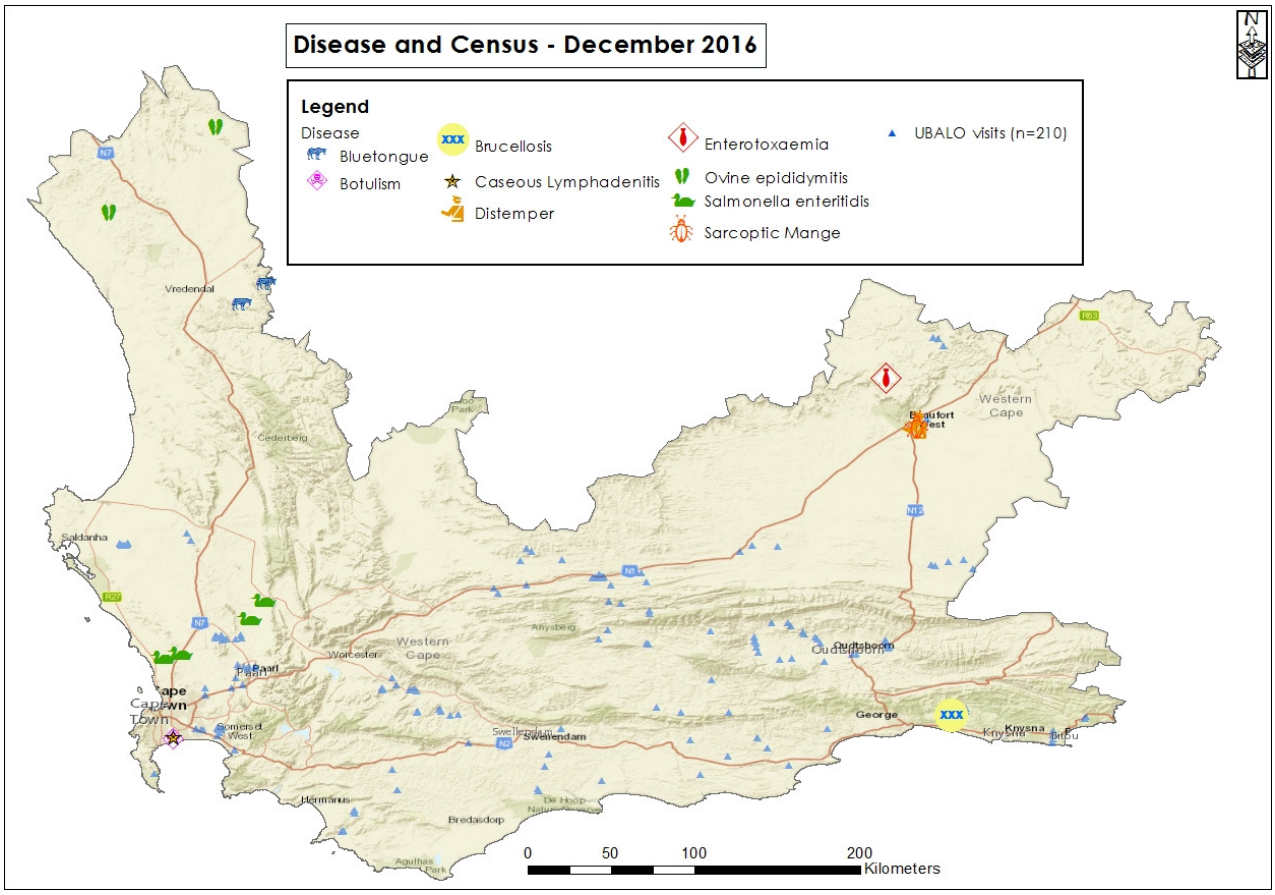
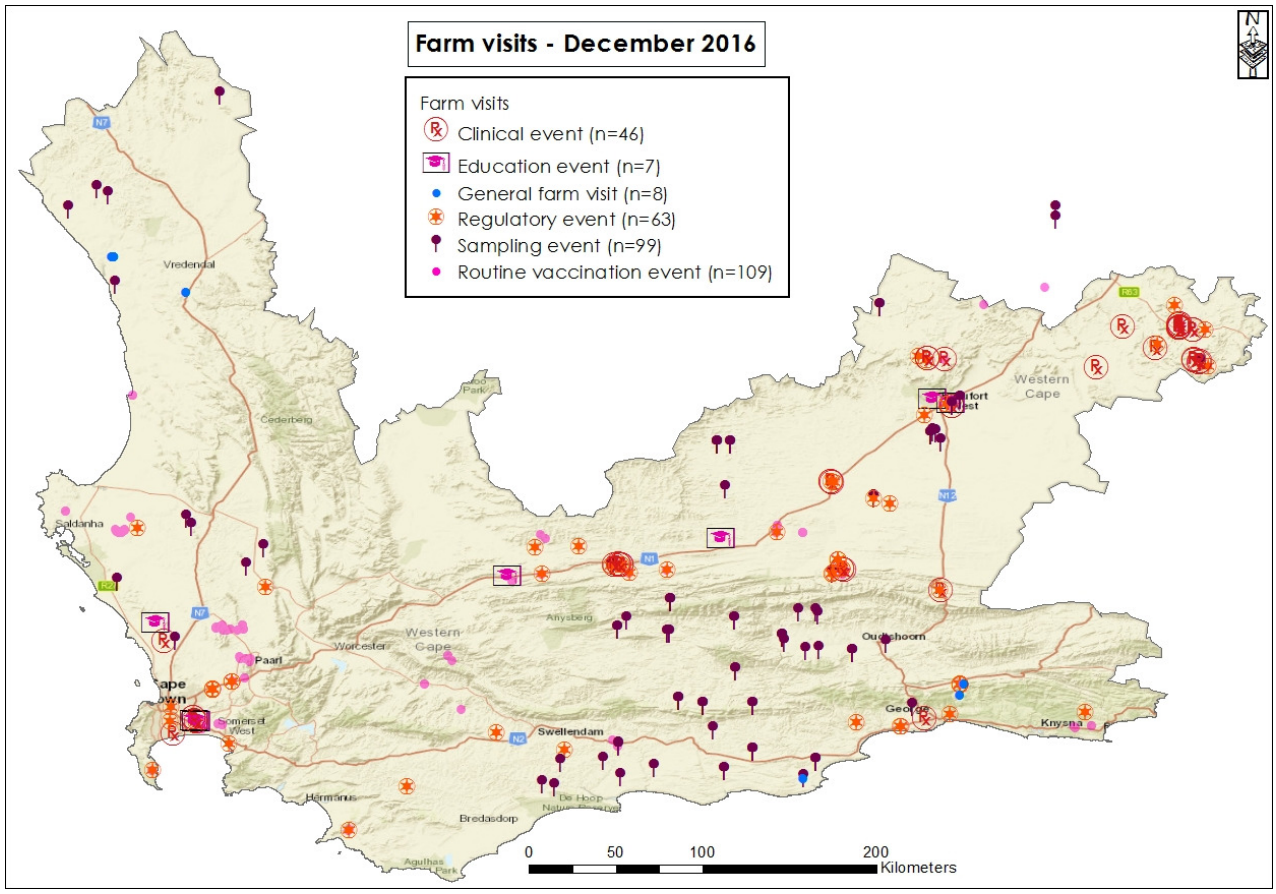
Disease and Surveillance





Outbreak events

- After testing positive during two consecutive milk ring tests, serological testing was done on a dairy herd near **George**. Five **cattle** that tested positive for brucellosis were slaughtered and tissue samples taken resulted in a positive culture for ***Brucella abortus***. Biotyping of the strain is still in progress. The herd is a closed herd which vaccinated according to the recommended schedule for brucellosis, but is situated only a few kilometers from another confirmed brucellosis positive dairy. The farm has been placed under quarantine and further testing and investigation are underway.
- Four **poultry** farms in the **Malmesbury** state vet area tested positive for ***Salmonella enteritidis*** (SE):

⇒ Routine environmental (boot) swabs taken from a broiler breeder facility tested positive for SE. No clinical signs or increased mortalities were seen on the farm. The house from which the positive sample came was treated for 7 days with enrofloxacin in its drinking water.

⇒ Box liners from day-old chicks sent to a broiler farm tested positive for SE. The hatchery of origin has been trying to rid itself of SE for some time now. Dead-in-shell chicks at this same hatchery tested positive for SE this month. Increased monitoring as well as increased washing and disinfection are continuing in the hatchery.

Caseous lymphadenitis and foot rot were detected in goats in Philippi

⇒ Boot swabs from a house of 26 week old layers tested positive for SE. There was an outbreak of SE in the grand-parent stock from which these birds originated 26 weeks ago, so infection of the eggs is suspected. The house was treated with quinolones for 7 days in its drinking water and will be treated with doxycycline for a further 8 weeks. All chickens on the site are receiving preventive medication in their feed.

- Two outbreaks of **bluetongue** were reported in **sheep** near **Vredendal**.
- **Rams** on two farms in the northernmost part of the province north of **Vredendal** tested positive for ***Brucella ovis***.
- A case of **bovine botulism** was investigated in **Philippi** by the local animal health technician and a private veterinarian.
- A **ewe** near **Beaufort West** died after showing diarrhoea. The cause was found to be **pulpy kidney (enterotoxaemia)** and it was discovered that this ewe had not received her booster vaccination this year.
- **Goats** in **Philippi** were treated for **foot rot** and the farmer advised on the control and prevention of this condition.
- **Caseous lymphadenitis** was detected in a **goat** in **Philippi**.
- Several cases of **canine distemper** and **sarcoptic mange** were diagnosed and/or treated at the community veterinary clinic in **Beaufort West**.

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