

Surveillance Report

Disease	Dourine in Equids
Coverage Area	Western Cape – AHS Surveillance Zone
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Report # in series	Feb 2019: 2nd of 2

Introduction

This is the second surveillance report relating to Dourine, a sexually transmitted trypanosomal (*Trypanosoma equiperdum*) disease of equids, in the African horse sickness surveillance zone of the Western Cape Province. A detailed introduction to the program can be found in the first report¹ of this program. Dourine is a disease that impacts on the trade of horses between South Africa and the European Union². While the only explicit condition is the testing of horses in quarantine prior to export, the preamble in that decision describes a required period of freedom from Dourine in the Western Cape during the 6 months prior to export. Since 1997 and the direct exports of horses to the EU, freedom from dourine within the territory of dispatch has relied on primarily clinical passive surveillance by private veterinarians, the active surveillance undertaken within the breed societies and the individual testing of horses in quarantine prior to export. The active dourine surveillance described in this report relates to the additional surveillance undertaken to further address the freedom status of the AHS controlled area for export purposes.

Scope

To provide evidence for freedom of Dourine within the same area where active surveillance is undertaken against AHS, i.e. the AHS surveillance zone in the AHS controlled area, Western Cape Province.

Surveillance parameters

Table 1: Surveillance parameters used in design and evaluation of the surveillance event

Parameter	Value	Comments
Population at risk	14081	All horses in the surveillance and free zones. 14000 was the original estimate but current census figures show that there are currently 13320 and 761 horses registered in the AHS surveillance and free zones respectively.
Design Prevalence	~5%	Minimum expected prevalence in the population should dourine occur; parameter taken from the serological survey requirements of the EU for AHS sentinel surveillance given that the same population was used for the dourine sampling.
Test Sensitivity	90%	Estimate based on best scientific guess. The sensitivity of the complement fixation test (CFT) has not been established, although given the false positive rates (see specificity) the sensitivity is likely to be relatively high. The CFT is seen as the gold standard for individual horse testing prior to export and this also supports a test with relatively good sensitivity.
Test Specificity	Unknown but system specificity of 100% assumed	The CFT test is prone to false positives and does not have a published specificity. However, given that any positive CFT result will be investigated in full to establish a final diagnosis a specificity of 100% was used in establishing the outcome of the sensitivity of the surveillance
Type 1 error	5%	Used to provide a final probability of 95% that Dourine was not present if it was not detected using the surveillance parameters.

A goal of 60 serological sentinels per month is the requirement for AHS sentinel surveillance testing for direct exports from South Africa to the EU. Over and above this South Africa generally sample another 90 horses in the AHS

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<http://jdata.co.za/myhorse/documents/infographics/Reports/Biannual%20Dourine%20Surveillance%20%20in%20AHS%20surveillance%20Zone%20-%202018%20Segment%201.pdf>

² 2008/698/EC governing the trade of live equids between South Africa and the EU

surveillance zone to test approximately 150 horses in the zone using PCR testing. Given that serum samples are taken from all 150 horses, the sampled horses for the dourine surveillance were targeted from the remaining horses sampled but not tested serologically for AHS. Samples were taken between 1st and 20th February 2019.

Consent

Primary written client consent was initially obtained from the owners during the initial sampling in February 2018. Verbal consent was obtained for this survey in February 2019. The survey was voluntary, and owners/managers could withdraw their horses from the survey if they wished. Ethics approval was not obtained nor required for this survey since the samples were used from the existing AHS sentinel surveillance program that runs monthly in the AHS controlled area.

Results

A total of 95 horses were sampled on 39 locations across the AHS surveillance zone. Proportional numbers of horses sampled across the surveillance zone are shown in Figure 1 below. The AHS sentinel surveillance program makes every effort to sample horses in proportion to their relative underlying population at risk using a gridded surveillance system, as depicted in Figure 1. The majority of samples were thus taken from an area of approximately 50 km around the Kenilworth Quarantine Station, where horses are exported from.

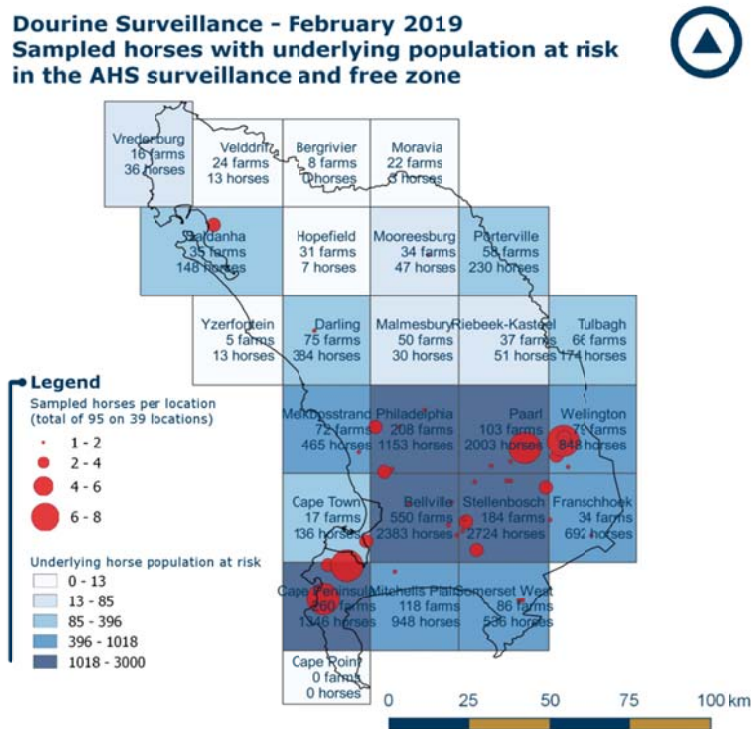


Figure 1: Dourine survey locations showing proportional circles for number of horses tested per location. The underlying population at risk is shown as a light to dark blue gradient, this to show that locations were chosen to reflect the relative underlying population at risk per surveillance grid.

All 95 samples tested negative for Dourine antibody using the CFT test (tested at the Agricultural Research Council’s Onderstepoort Veterinary Institute – Laboratory reference 2019-D-4712.)

The sensitivity of the surveillance program is shown in Table 2 below for each surveillance period (**the current period highlighted in red**) and categorized for evaluation as both a single herd (as designed) and a multiple herd level two-stage analysis. Note that in this latter analysis we reverted to an effective population design prevalence of 2% (within herd design prevalence of 20% and herd level prevalence of 10% throughout the population) – this in an effort to depict a reasonable minimum expected prevalence with so few cases of Dourine reported in the prior 2 decades in the AHS surveillance zone (see Figure 2).

Table 2: Design prevalences with resulting surveillance sensitivity and probability of freedom outcomes for two different scenarios: the sentinel program design prevalence and the generic values used given the history of cases in the AHS controlled area.

Parameter	Descriptions and values based on varying data sources					
	Single Stage population sensitivity (P*U = 5%)			Generic prevalences to result in effective design prevalence of 2% with 2-stage analysis where P*U = 20% and P*c = 10%		
	2018 01	2018 02	2019 01	2018 01	2018 02	2019 01
<i>MeanSSH</i> - Mean herd level surveillance sensitivity	n/a	n/a	n/a	0.462	0	0.423
<i>SeP</i> - Population surveillance sensitivity	0.981	0	0.986	0.795	0	0.812
<i>PFreeU</i> - Confidence of population freedom	0.977*	0.879	0.996	0.799*	0.719	0.9076

* uninformed prior of 0.5 initially – note these values are slightly less than the originally published 0.981 and 0.829 confidence of freedom percentages respectively - this as a result of the use of an adjusted prior reflecting the probability of introduction in the first time-step of the surveillance which effectively reduces the initial prior probability of freedom from 0.5 to 0.45

Currently the probability of freedom in the AHS surveillance zone for dourine ranges between 90.8% and 99.6% depending on the effective design prevalence used. Figure 2 below shows the progression of the overall confidence of freedom afforded by this surveillance adjusting for changes in prior probabilities of freedom and accounting for a zero surveillance activity in August 2018.

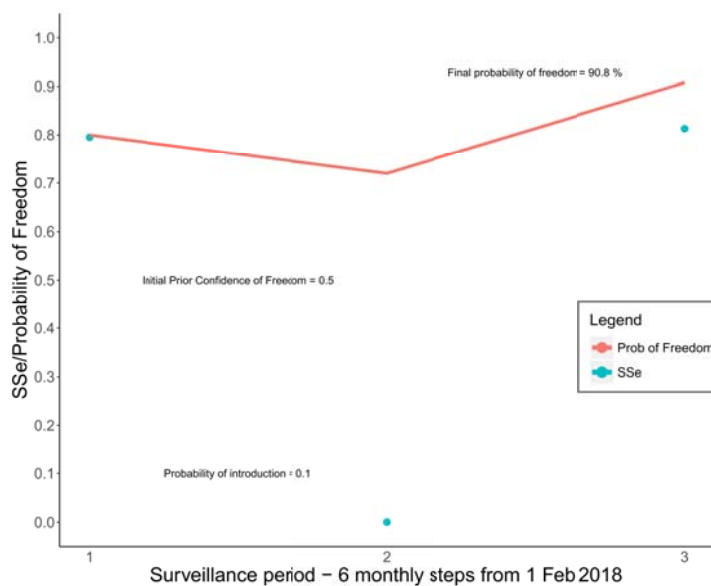


Figure 2: The probability of freedom from Dourine (active surveillance component and 2 stage analysis only) over time in 6 monthly time steps starting from Feb 2018. No surveillance was performed in August 2018 hence the Population Sensitivity of 0% for that period and the resultant impact on the system probability of freedom.

Discussion

The surveillance evaluation to obtain a probability of freedom estimate is reliant on random and representative sampling. The sample frame for this surveillance is primarily in the commercial sector, horses are repeat sampled across periods and the selection of samples has a degree of convenience. Furthermore for horses to be included in the sentinel program they should not have been recently vaccinated against AHS and this does bias the selection of horses. Furthermore the geographical scope is limited to the AHS surveillance zone. Having said this we believe this program is just a part of the overall dourine surveillance undertaken and should assist in export protocols that require dourine freedom statements where horses are exported from AHS free zone quarantine facilities such as Kenilworth Quarantine Station.

Figure 3 shows all dourine cases reported in South Africa from 1993 through Jan 2018 (data accessed April 2019 from www.daff.gov.za and collated to South African local municipalities). The cases reported in the last year do not influence these results since only an additional 3 cases, as indicated by stars in Figure 3, were added to the disease database in the last year. Also in Figure 3 we've included the equine movements that occurred from the AHS infected zone into the AHS controlled area during the 2017/2018 period³. The majority of movements are horses within the commercial sector. In our previous report we suggested that Dourine is likely to be circulating in the non-commercial sector. The movement patterns of horses show that movements from heavily prevalent dourine affected areas occur less compared to those from non-dourine affected areas. Movements from the Eastern Cape, the most heavily affected Dourine province, occur primarily from the south-eastern sector, with dourine occurring primarily in the north-eastern sector of this province. Similarly from KwaZulu-Natal, while there are dourine cases reported from areas where horses move from these are less affected than surrounding districts in the province.

**Dourine Cases reported to DAFF
May 1993 through to final case reported Jan 2018**

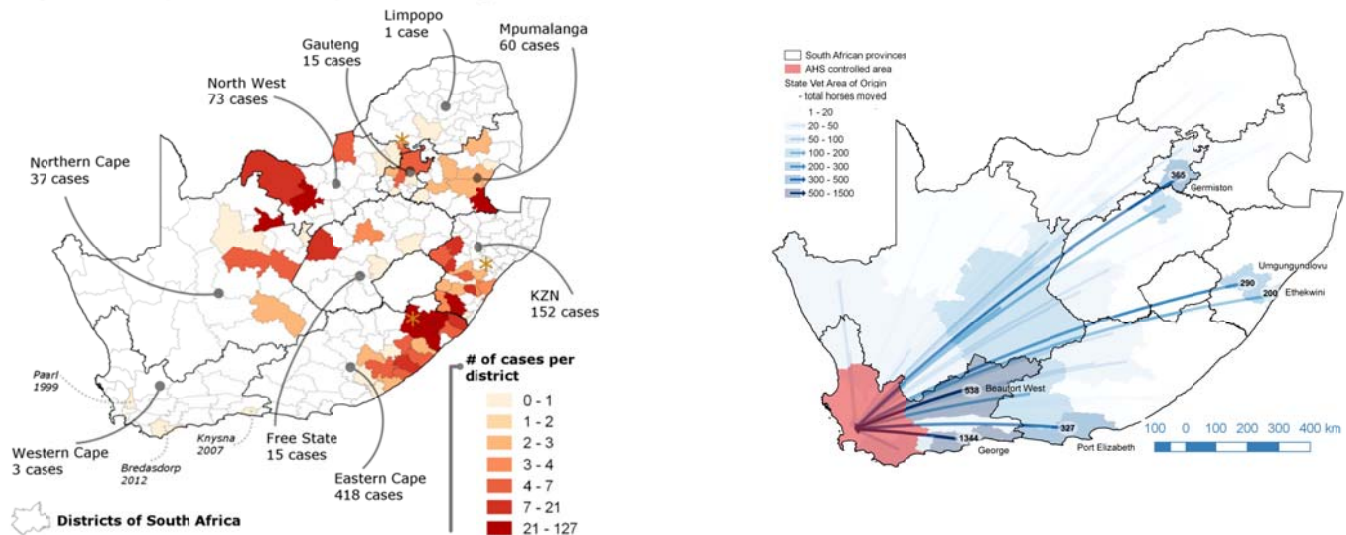


Figure 3: LEFT: Historical Dourine cases reported to DAFF from 1993 through June 2016 (National Department of Agriculture, Forestry and Fisheries). Cases have been aggregated by district while case totals per province are labelled. The three cases reported in the Western Cape are also labelled specifically. Additional cases reported since the last Dourine surveillance report are indicated by yellow stars (n=3). RIGHT: Movements of equids between the AHS infected zone and the AHS surveillance zone between September 2017 and Aug 2018. The 6 most common origins for these movements are labelled.

The recommendation initially for this surveillance is that it is repeated every six months in the AHS surveillance zone. Surveillance was not performed as planned in August 2018 due to logistical issues at the time. This lack of

³ <http://jdata.co.za/myhorse/documents/infographics/Reports/2017%202018%20Movements%20Report.pdf>



surveillance impacts the probability of freedom and for both August 2018 and for the February 2019 periods, as reflected in Figure 2.

Acknowledgments

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