Western Cape Government
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Veterinary Services
Animal Health

EPIDEMIOLOGY REPORT 2014

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VETERINARY SERVICES
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CAPS - Chicken And Pig Surveillance

INTRODUCTION and SURVEILLANCE OBJECTIVES

We launched our latest surveillance strategy called CAPS (Chicken and Pig Surveillance) towards the end of January. This was after a need was expressed by our technicians and control technicians as to the uncertainty regarding the sampling frames and strategy regarding the surveillance of avian influenza in what we called our backyard poultry flocks (we refer now to them as non-commercial flocks). Also in the past there was a formal sampling frame for the surveillance of CSF and PRRS in pigs: this after the outbreaks in the Western Cape a few years ago. This surveillance was stopped after national level surveillance was performed for these diseases with an outcome looking towards disease freedom. After the formal Provincial level CSF and PRRS surveillance was stopped the need for technicians to visit pig farms and bleed pigs also stopped: this was a situation that is not ideal in terms of surveillance because in the farming sector passive surveillance and reporting by farmers without any contact with officials is very limited.

In the face of this Drs Grewar, Sinclair and Van Helden from the Epidemiology section work-shopped how to formalise and re-introduce surveillance in the chicken and pig sector to comply with both DAFF requirements and to maximise the efforts and surveillance outputs from our technicians on farm visits.

SURVEILLANCE STRATEGY

The CAPS system will be primarily a clinical surveillance strategy with a sampling frame based on farm level and a "sample event " based on a farm visit. This is the primary arm of surveillance. The disease to be detected is non-specific infectious disease although in the surveillance document and in training we highlight the major controlled animal diseases linked to poultry and pig farming. The sampling frame has been estimated on previous data we had on non-commercial poultry flocks and on non-commercial pig farms. We spatially joined these points to magisterial districts to estimate a sampling target for each technician where we want each farm (non commercial poultry and all pig) to be visited at least once a year. We have designed a new database which we have decided not to prepopulate with our current data. This is because we feel the data is not up to date and repopulating it over the course of 2014 to create a accurate record of farms.

On top of the clinical surveillance we have a targeted surveillance strategy which involves the sampling and investigation of disease occurrences/suspicions. The targeted surveillance has two sub-categories. One is the DAFF compulsory sampling and testing for AI in 50 non-commercial chicken flocks twice a year. We have proportionally allocated these 50 farms throughout the Province where every Magisterial District will have at least one farm sampled.

The second sub-category of targeted surveillance is the investigation of disease. Every time a farm is visited a surveillance questionnaire is completed by the technician. While there is some farmer information on the form we essentially ask two important questions - one is whether over the past 6 months a significant (in the farmers opinion) clinical disease occurrence has been noted - and if so when and what. The second question is based purely on the technicians inspection of animals and answers whether in the technicians opinion there is currently a significant disease occurrence on the property.

If there is an affirmative answer to either of these questions the technician in consultation with their State Vet will perform an investigation. All questionnaires, sample submission forms and results will be captured by the Provincial central office.

UBALO

On top of the surveillance one of our objectives for the program is to collect more accurate census data in the sector of poultry and pig farming, so technicians are required to capture an UBALO event with each farm visit.

TECHNICIAN COMPLIENCE

In order to try to stimulate technicians to reach all their farms we have implemented a online portal for the pre-printing of completed farm detail questionnaire forms as well as pre-printed lab forms with the selected farm details included. This should decrease the admin time required for technicians. We are trying to create an environment where technicians are interested in knowing what is occurring on their pig and chicken farms and actively making an effort to identify potentially catastrophic disease. For more information and a detailed draft plan please go to www.elsenburg.com/vetepi and click on the CAPS link.

Sudden death in goats – Oudtshoorn

Marna Sinclair, Edwin Dyason, Cathy Fox

The State Vet George office received a call from the Eden District Health Services regarding 35 goats (of a herd of 100) that died acutely during the night, approximately 30 hours earlier, in the Oudtshoorn area. The goats belonged to a small scale farmer that rents a property located next to the De Hoek Nature reserve in the Oudtshoorn area.

The owner does not live on the farm, and the only person that sees the animals fairly regularly is a local resident that kraals some of the animals at night. According to him the goats graze in the veld during the day and at night those that return are enclosed in the kraal. On that particular day, 40 goats, all seemingly healthy, returned to the kraal for the night. The rest of the goats, approximately 60 animals, remained outside. The next morning 35 of the 40 kraaled goats have died during the night with foam at the mouth being the only abnormality noted by the local resident. Since his only means of communication involved walking to a neighbour, and it was raining heavily at that time, he could only alert the owner the next day.

The 60-odd goats that were not kraaled were not affected at all.

Figure 1: Mr Attie Erasmus (AHT Oudtshoorn) with the affected carcasses

The kraal area is a semi-roofed area (part of an old house) with no plant growth and no water available. The goats were not fed anything in the kraal and they get their water from the veld. There are also sheep and cattle on the property, but no other farming activities.

Post mortem examinations were performed on two animals and revealed red coloured fluid in the pericardium, liver cirrhosis, lung congestion and an empty intestinal tract. Due to the sudden death and involvement of the heart, cardiac glycoside poisoning was the most likely differential diagnosis. A private vet had also treated animals in the area that had ingested tulp shortly before this incident. Several organ samples were collected and sent to the lab to try and confirm the diagnosis. Unfortunately decomposition had already set in and the lab could not make a definitive diagnosis.

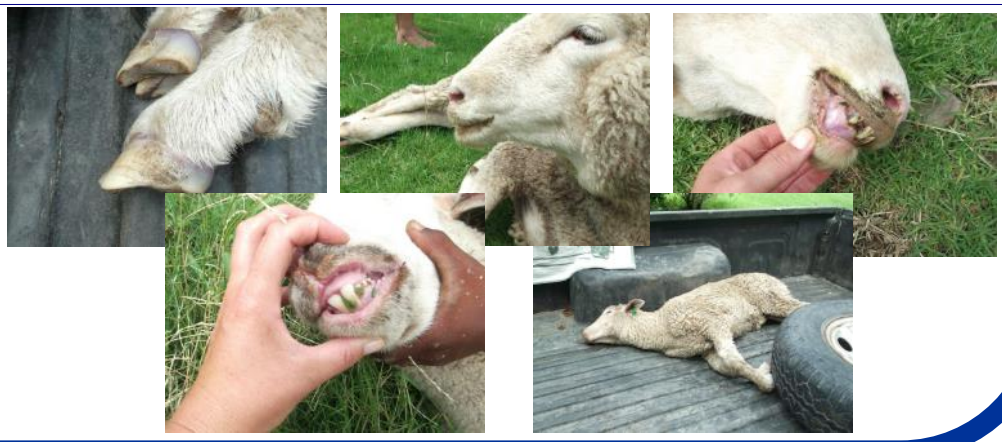
The exact chain of events that lead to these deaths will probably never be determined. The lack of management and the fact that the person responsible for closing the kraal gate at night does not actually get paid, further complicated the situation. One theory is that the group of goats that returned to the kraal had grazed in a different area than those who didn't and the latter group was thus not exposed to the poisonous plants. This incident happened after a weekend and it is therefore possible that the goats were left in the kraal for a day or two prior to the event, accounting for the empty intestinal tract and adding to the likelihood that goats will eat tulp indiscriminately and in sufficient quantities to cause problems.

Eds note: After a case like this with high morbidity and mortality it is important to remember that we have a passive surveillance system in place to detect the intrusion of PPR in small stock. This case is almost certainly a poisoning/toxicity with such a short incubation period and steep epidemic curve but PPR is a disease to rule out with high mortality and morbidity in small stock. Please contact your State vet if you ever suspect this condition so that the appropriate samples can be taken

Laingsburg -Bluetongue in sheep

Nita Vosloo - AHT Laingsburg

Bluetongue was diagnosed clinically on a farm in the Laingsburg region where 1 animal died and four were seriously ill. Advice regarding symptomatic treatment and preventive measures were given. The photos here come from that case.

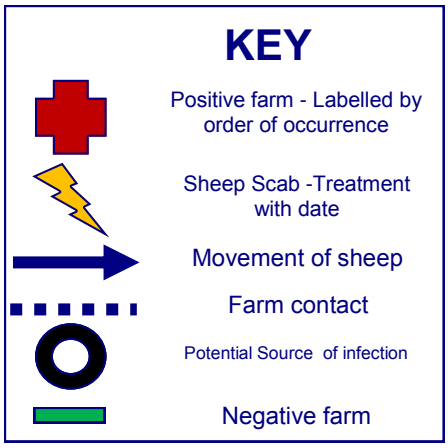


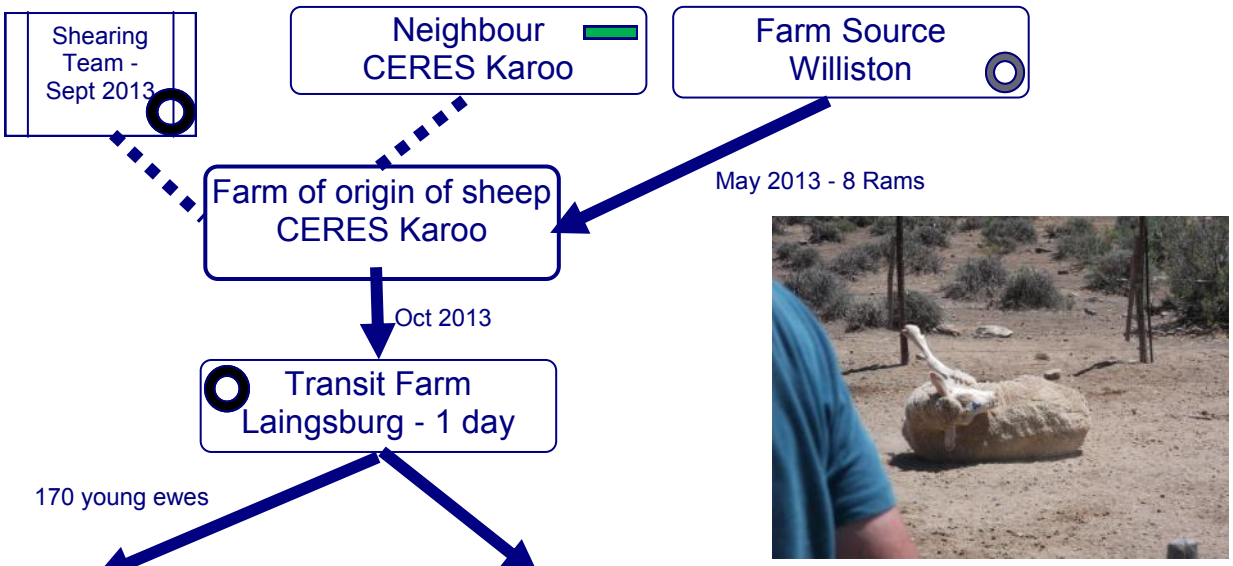
Information courtesy of Nita Vosloo

Sheep Scab - Laingsburg

There has been a recent outbreak of sheep scab in the Laingsburg region and the chart below depicts the events that occurred along with some images of the affected farms. The source of infection was determined to be most likely the shearing team on the Ceres farm but there are two other potential sources as well.

Both farms where sheep were moved to became infected and all 3 neighbours of the one positive farm became infected. Due to the heavy rains Farm 1b's neighbours have not yet been visited





Surveillance and Disease Map

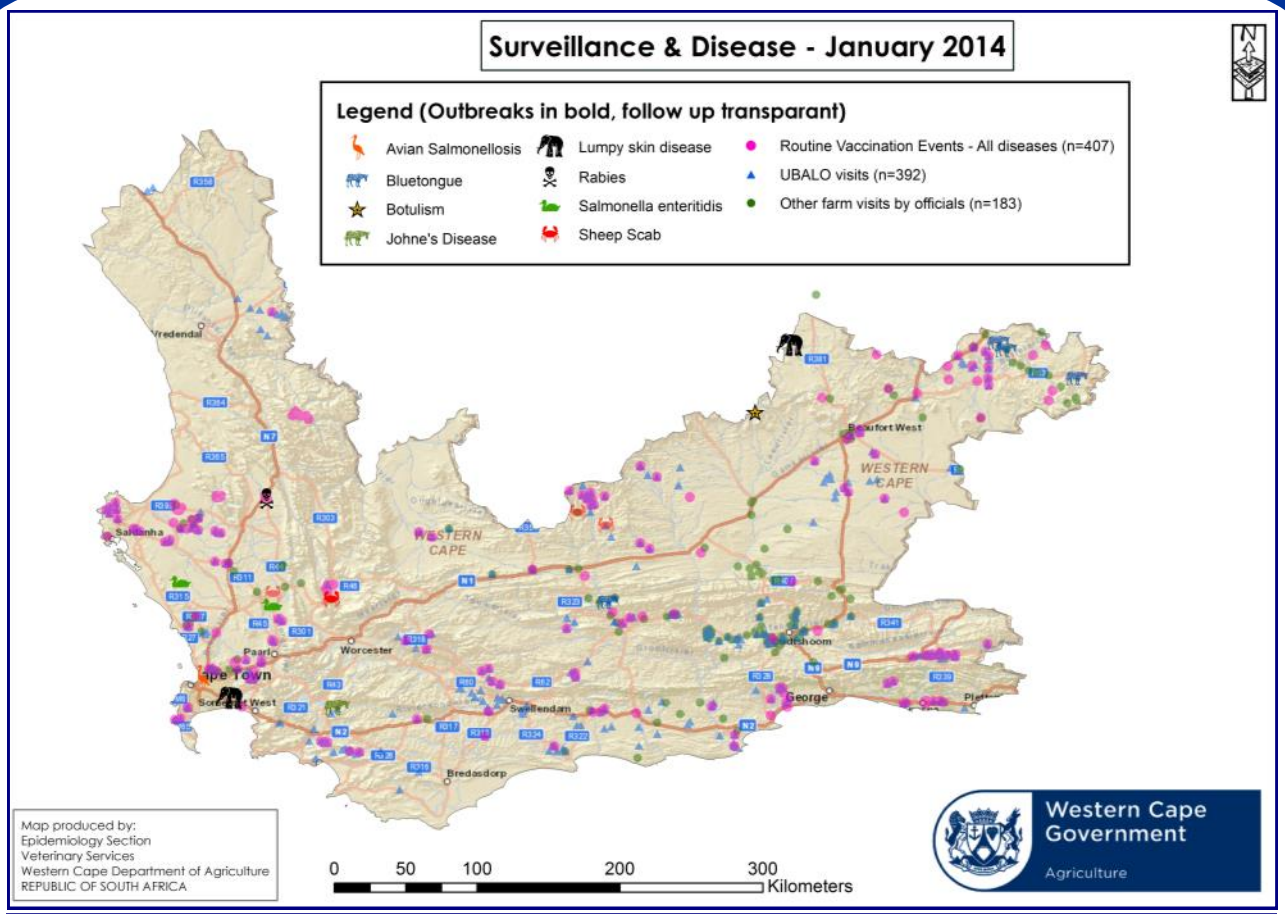


Figure 2: Surveillance and disease outbreaks in the Western Cape Province identified during January 2014

Other Outbreak Events

• **Lumpy skin disease** was diagnosed in **Kuilsrivier** and **Bloekombos** in the **Boland** and also in **Beaufort West** in January. 6 of 95 cattle in Kuilsrivier were affected with nodules covering their bodies and concomitant loss of appetite. All affected animals were treated with antibiotics and the herd was vaccinated. There were two deaths as a result of LSD in **Bloekombos** and other affected animals were also treated with antibiotics and advise was given to the farmer to vaccinate.

• ***Salmonella enteritidis*** has been diagnosed twice this month in the **Malmesbury** district. The first case occurred on a **broiler** farm where 2 of 3 houses on 1 of seven sites were found positive using boot swab sampling. Control measures according to the Salmonella action plan and DAFF SOP were introduced. The two houses will be slaughtered and product sent for freezing in early February. The second case occurred on a **broiler rearing site**, also after boot swab samples were tested. In this case one of 16 houses tested positive and it is suspected that rodents played a role in introducing the infection after swabs from rodent stations tested positive. Control measures here have therefore focussed on rodent control and also the biosecurity protocols of personnel entering the poultry units were improved.

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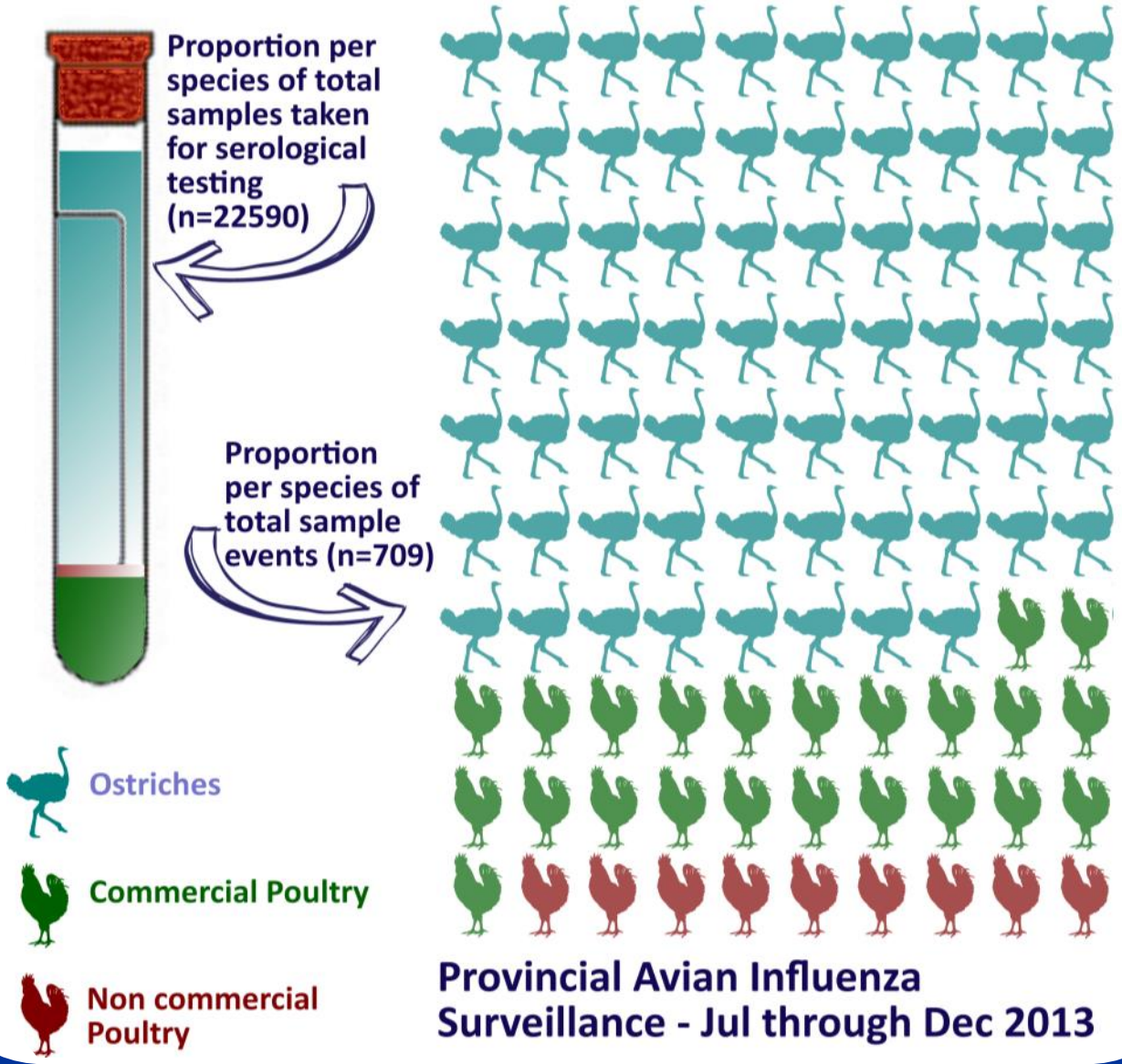
Avian Influenza - farms sampled - 2nd half of 2013

As alluded to in the main article of this report the formal surveillance requirements of avian influenza surveillance in Provinces is targeted mainly at 3 species and types - namely the routine sampling of ostrich farms, commercial chicken farms and non-commercial (so called backyard chicken farmers) chicken farms. The ostrich sampling entails pre and post-movement testing, pre-slaughter testing and biannual surveillance per registered ostrich farm. Commercial poultry farms (all) and non-commercial poultry farms (50 per year) are required to be sampled biannually and must be part of a routine serological surveillance program. Commercial farms in the Western Cape are serviced by private veterinarians with the majority of testing performed by the Stellenbosch Provincial Veterinary Laboratory (SPVL). The Western Cape Government performs the sampling of the non-commercial poultry farmers.

The graphic below depicts the proportions of farm types tested for our formal surveillance during the 2nd half of 2013. The data is very accurate in terms of the ostrich data as the Province manages and logs all samples taken for this industry. The commercial poultry data is only gathered from the data of the SPVL, and although most sampling events are captured it is certain that there a small amount of data missing. Non-commercial data will be >90% accurate as all samples are sent to the SPVL by our officials, with the estimate of total sampling not 100% because this office relies entirely on the Lab information system. We are hoping with the CAPS system to provide 100% data on the non-commercial surveillance in poultry from 2014 onwards.



Other Outbreak Events cont...

- A **Salmonella** outbreak occurred in the **Milnerton import quarantine station** and a more detailed report will hopefully follow next month.
- Over an above the **Bluetongue** discussed on page 2 in **Laingsburg** there was a clinically confirmed cases in the **Murraysburg** region as well.
- While they didn't occur in January there were three cases of **brucellosis** in **cattle** towards the end of last year which we haven't reported on in the monthly report yet. Three farms were affected in the **Piketberg** region and the farm of origin of infection of the three was determined by trace back procedures from the first detected property which was sampled as a 2 yearly routine in communal cattle. The third farm detected was from trace forward procedure from the farm of origin. Altogether 21 of 143 animals tested positive. They have all been separated and moved to the original positive farm and were due to be slaughtered early in 2014.
- Rabies occurred in a **Cape Fox** in the **Eendekuil** region in the **Malmesbury** State vet area. The fox approached and fought with two large dogs on a property while another small dog and cat on the same property did not have contact. The in-contact dogs have been vaccinated against rabies and the owner has decided to keep them separate and monitor for behaviour changes.
- Other than the **sheep scab** shown on page 3 of this report we also had an outbreak of sheep scab in the **Ceres** region. An emerging farmer grazes his stock near a sewerage works and there are other farmers in the same region. While the farmer cannot recall from where and when sheep were introduced into his flock he has definitely been introducing them and it is assumed this is where the infection originated from. A total of 15 cases were reported from a susceptible population of 47. All animals were treated and will continue to be treated and the area is under quarantine.

Total OIE logs

State Vet area	User	Total Logs
SV Malmesbury	michaelc	57
SV Malmesbury	hendrikh	53
SV George	Flipk	46
SV Boland	janicaf	33
SV Beaufort Wes	CobusF	33
SV Beaufort Wes	nitav	31

Total UBALO logs

User	Total events
Flipk	32
michaelc	27
wernerg	25
antonb	25
wynandf	24
thulit	22

Most rabies vaccinations performed

State Vet area	User	Total
SV George	johanb	600
SV George	Flipk	322
SV Boland	janicaf	321
SV George	Heidia	252
SV George	fanieb	230
SV Boland	judithg	170

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Web based event logging AHT leader boards

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EPIDEMIOLOGY REPORT

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Imported Canine Leishmaniasis

JdG & Dr Brendan Brady

BACKGROUND

Two dogs were imported from Angola into South Africa on the 5th of February 2014 and landed at Cape Town International Airport. From the airport they were transferred to the Cape Town import quarantine station in Montague gardens. It was immediately observed by the quarantine staff that the health certificate and testing history of the dogs were not complete and detailed (health certificate) or compliant (testing history). Dogs entering the country are required to be tested negative for a number of diseases which do not occur/or are endemic in South Africa. One of these diseases is leishmaniasis. Dogs are meant to be imported with blood results that are from samples taken less than 30 days prior to movement. The two dogs imported from Angola had been sampled on the 21st November 2013; 76 days prior to movement.

The test performed by the OVI for pre-import *Leishmania* is an indirect fluorescent antibody test which tests for *Leishmania infantum* antibodies. This test was negative on the pre-import samples.

THE DOGS

The two imported dogs are both Bull Terriers: a four-year-old male and a six-year-old bitch. While they were imported from Angola it sounds like they principally come from Russia. Their period of residence in Angola is not known.

SOUTH AFRICAN EVENTS

The quarantine station contacted their central authority to establish the way forward for these animals after the irregularities were noted. It was decided to keep them in quarantine and re-do the series of tests that are meant to be performed pre-import. The dogs were sampled on the 11 Feb and results for all tests including *Leishmania* were negative and were reported on by the lab on 13 Feb. The dogs were released to their owners on 14 Feb.

Six days later, on 20 Feb, the bitch was presented at Penzance Veterinary Clinic in Hout Bay with a generalized nodular skin condition. The condition looked a bit like a pustular dermatitis with multifocal nodules between 1-5mmØ spread diffusely over the body. The owner was not aware of how long the nodules had been present. Based on the history (recent import from Angola) the vet was concerned it may be a tropical disease rather than pyoderma and elected to take a skin biopsy the following day as the bitch was booked in for a sterilization anyway.

BIOPSY RESULTS

Even though the diagnosis of *Leishmania* on histopathology requires a lot of expertise and experience and South Africa is not endemic for the disease the pathologist (Dr Rick Last - VetDiagnostix) suspected *Leishmania* when evaluating the biopsy samples and did a further GIEMSA stain to visualize amastigotes intracellularly in macrophages and cutaneuous fibrobalsts. This led to a diagnosis of presumptive (*def. having a reasonable basis for belief or acceptance*) leishmaniasis. The private vet then contacted the Provincial veterinary services as any disease detected within South Africa that is not endemic/expected should be reported and regarded as controlled.

THE FOLLOW UP

While all the information regarding the dogs and owners could be collated from the private veterinarian, the import quarantine station and the OVI we have had no success in contacting the owner, despite numerous attempts - even to the degree of visiting the property at which the owner resides. The owner also has not returned to the private vet for suture removal after the spay (as of the writing of this article it has been 14 days since the operation). We contacted and informed the health department (as this is a potential zoonosis) of the case. It is crucial in this case to contact the owners to discuss control measures and options given the nature of the disease.

THE DISEASE

Canine leishmaniasis is caused by various species of *Leishmania.* The disease in both humans and dogs can cause a visceral or a cutaneous form. The human visceral form is caused primarily by *L. infantum* or *L. donovani*. Most *L. spp* cause the cutaneous form in humans. *L. infantum* is the most commonly reported species in domestic animals and the distinction between species causing the visceral vs. cutaneous forms in humans is not seen in animals. *L. infantum* is responsible for zoonotic leishmaniasis.

The distribution of the disease is generally limited to tropical and sub-tropical regions. In humans the clinical presentations are correlated to the species involved - *L. donovani* causes visceral leishmaniasis in South Asia and parts of Africa while the same disease is caused by *L. infantum* in the Mediterranean and Middle East.

PERTINENT EPIDEMIOLOGY

Leishmania completes its life cycle in two hosts - the phlebotomine sand fly vector and a mammal where the

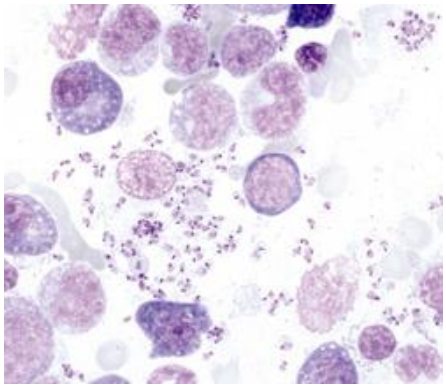

Fig 1. *Leishmania spp* in a bone marrow sample from an infected dog. Credit: Dr. C. Andreasen, Iowa State University, College of Veterinary Medicine, Department of Veterinary Pathology

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Imported canine Leishmaniasis - cont...

intracellular amastigote form develops and replicates. In few cases *Leishmania* can be transmitted by blood donation, vertical transmission and venereal transmission while suspected but unproven methods of transmission also include dog-dog transmission through bite wounds. Mechanical transmission by fleas and biting flies is also potentially possible. Imported *Leishmania* can be seen in non-endemic areas but the disease usually doesn't become established without the appropriate vector presence. The various species of *Leishmania* are also dependent on varying species of phlebotomid flies. There is a remarkable scarcity of data regarding phlebotomid fly presence and distribution in South Africa with very few having been caught and identified over the past decades. Interestingly though there have been sand flies caught in Cape Town (albeit very few and only one paper described them): and they were consequently called *P. capensis.* It is important to realize that not any sand fly will successfully transmit any *Leishmania* parasite successfully - it seems as if this is quite a specific relationship.

Leishmaniasis is a typical disease where there is a high prevalence of subclinical disease and there are a broad range of clinical manifestations in dogs. The sub-clinical nature of the disease is not necessarily permanent and any condition which induces immunosuppression may induce clinical disease. This is important in the human health aspect of the disease as HIV/AIDS concomitant infection with *Leishmania* may induce a clinical leishmaniasis.

Age seems to be an important factor in the epidemiology in dogs and a bimodal distribution is seen with dogs aged 3 and below and 8 and above are often most affected. Bull Terriers are not one of the breeds predisposed to infection.

The occurrence of leishmaniasis in South Africa is limited to isolated events with unpublished observations noting the visceral form of the disease twice in dogs. The cutaneous form of the disease has been reported twice in sheep (unpublished observations) in RSA with one other published case in an unknown species in the North West Province.

PUBLIC HEALTH CONSIDERATIONS

L. infantum is the responsible species for zoonotic disease and we are not sure which species this current case is. South Africa's high prevalence of HIV/AIDS is however important to remember and leishmaniasis is not a disease one wants to have in our population.

CONTROL

In this case the question has arisen: why not just treat the animal to get rid of the infection? The issue is that treatment is not straightforward and while you can get a clinical end point to the disease the length and likelihood of success of treatment is often dependent on the clinical presentation of the animal. Patients that recover can relapse. In the case of a single animal infected in a non endemic country this is deemed an unacceptable risk to take. It is for this reason that ideally the dog either be sent back to Angola or be euthanized. The import requirements for dogs into South Africa also states that if a dog is found positive for *Leishmania* in quarantine in South Africa it will be re-exported or euthanized at the owner's expense.

CONCLUSIONS

An interesting point regarding *L.infantum* infection in dogs is that clinically healthy dogs with self-limiting disease may show a low serological response with concomitant low parasite load. As the disease becomes more severe it becomes unlikely that it is self limiting and this is when parasite burdens are high and the likelihood of transmission increases. It is for this reason that it is not ideal that we have no contact with this owner. Even if ideal control measures in this case (euthanasia or return to endemic country) could not be carried out, the monitoring of such an animal would be crucial. In the same vein the companion dog that was also imported would ideally need to be followed over a period of months with serial serological testing and clinical examination - this given the potentially long incubation period of the disease.

Over and above the diagnostics mentioned in this case there are some important points to consider regarding diagnosis. The diagnosis can be complex and is not as straight forward as we have found here - and this highlights the excellent observations of both veterinarian and diagnostician involved. The IFAT test which OVI uses has advantages as it is a quantitative test and for import purposes a positive test be all that is required to screen dogs entering the country. Of course the disadvantage of this is the incubation period can be long and the infection localized, which is why it is imperative that clinical examination of animals be seen as just as important a test on import screening - and not just seen as a matter of procedure/administration. There are other diagnostic tests available in countries more used to seeing this disease and these include other serological assays like ELISA as well as molecular assays like PCR.

It is highly unlikely that infection will spread even if the dog is not removed from the country. The major reason for this is the very unlikely presence of a vector capable of transmission and an overall very low prevalence of disease in the environment from which to induce an outbreak. Risk, however negligible, is never zero and the consequence of transmission and spread, both in terms of animal and human health, in the authors opinion outweighs the trauma of the loss of one animal by the owner.

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Fig 2. *A Phlebotomus* sandfly Courtesy: ww.stanford.edu/

South Africa regains its zonal FMD free status

On the 14th of February the World Organisation for Animal Health's (OIE) scientific commission informed South Africa that South Africa's FMD free status of the FMD zone where vaccination is not practiced has been re-instated. This will have a positive impact on the export of ruminant meat from South Africa. The message from the OIE however also mentioned that an expert mission will be scheduled towards the end of 2014 to ensure that the control measures described by South Africa are being adhered to.

We take this opportunity to heartily congratulate all our veterinary colleagues and in particular the veterinarians of the DAFF epidemiology section who have worked tirelessly over the past 3 years to regain the free status we had prior to the 2011 outbreak.

Commando worm infestation in the George area

Marna Sinclair and Edwin Dyason

During the month of February SV George was informed of a commando worm infestation involving extensive areas from Hoekwil to Plettenberg Bay. Dr Dyason visited one of the properties and took the photos below.

Commando worms have been identified as one of the predisposing factors to kikuyu poisoning, although the exact mechanisms are not known and the specific cause has not been identified.

Fortunately no animals in the affected areas have shown symptoms of kikuyu poisoning yet. Farmers have started to chemically treat the worm infested pastures and the local vets as well as Disaster Management are aware of the situation. Hopefully we won't see any symptoms in the cattle, but only time will tell.

Fig 3: An affected pasture

Fig 4: An individual commando worm

Aflotoxicosis - Calitzdorp

Fig 5. Aspergillus-infected corn photo from Hoosier Ag Today

The SV George office was contacted by a very distraught dairy farmer in the Calitzdorp area after several of his dairy cattle died. Apparently some died acutely, while others became emaciated, followed by recumbency and death. At that stage, four private veterinarians were already involved in the difficult case and several initial differential diagnoses, including acidosis, prussic acid poisoning and botulism were considered while the animals were treated accordingly. The mystery was solved when a milk processing company tested and found **aflatoxin** in the milk and the mouldy feed source was subsequently detected.

Unfortunately the mouldy feed went unnoticed for more than a week and 36 cows died in total, while approximately another 14 are affected but are currently still alive. The milk was also rendered unusable and the loss of both the animals and the milk has had huge negative financial implications for the unfortunate farmer.

Aflatoxicosis occurs when toxogenic strains of *Aspergillus flavus* and *Aspergillus parasiticus* produce toxins after being allowed to grow on cereals (including in this case maize). This occurs when said cereals either grow in or are stored in conditions where there is a high moisture content as well as consistently high temperatures above about 21 deg Celcius. While the disease can occur in cattle, as was the case in Calitzdorp, it also manifests in growing poultry, pigs and other ruminants, among other species.

Reference: *Mercks Veterinary Manual - http://www.merckmanuals.com/*

Detail courtesy of Marius Vrey - Control AHT Malmesbury

The life of an AHT

Eds note: Every now and then there occur cases of serious broken telephone in the State veterinary services and the following story illustrates this perfectly. While we don't have any incidence, prevalence, case fatality or control measure data listed below...and not even a map...we always have to consider the unmeasurable social factors which play a role in animal disease surveillance and epidemiology. We have changed the names of the public involved ...

In November 2013 AHT Esthea Russouw went to farm A were she vaccinated 6 dogs and 3 cats belonging to Mrs Y- this being a standard routine part of her job. The next day Marius (Vrey) received an email from an FSD official from Atlantis to phone Mr X, a member of the public about a potential rabies case. Marius phoned him and was told about a dog, close to Mr X's small holding, that was put down (euthanased) because of rabies. This was the first Marius had heard of this.

The next day, Marius went to vaccinate 15 dogs on a small holding owned by a friend of Mr X and also vaccinated 3 dogs and 3 cats at Mr X's small holding. Mr X's mother showed Marius the SMS that they received from Mr S about the rabies case. "*Hi bud. Just a heads up there is a rabies outbreak on Farm A. Mrs Y's rottie (Rottweiler) has been destroyed. For safety have your animals inoculated - its free*."

Marius went to farm A to find Mrs Y and to hear the symptoms the dog showed and if the dog was buried on the farm: he wanted to exhume it and send the brain to Allerton for testing. Mrs Y then promptly told Marius the ACTUAL story...

THE ACTUAL STORY: When Esthea was on farm A in November to vaccinate dogs and cats for free, Mrs Y SMS'd a friend (Mr S) on the same farm asking if he wants his animals vaccinated because the "vet" is on the farm and vaccination is for free. Mr S didn't reply to the SMS and Esthea left the farm. Later that day, Mr S replied to the SMS to Mrs Y and wanted his animals vaccinated. Mrs Y SMS'd him back that "*the lady is gone*". Mrs Y 's rottweiler's name is also unfortunately "Lady". Mr S thought that the "vet" was on the farm to put down Lady because of rabies. He started sending SMS's to everybody about the rabies outbreak. Later he even SMS'd Mrs Y to sympathise because Lady the Rottweiler was 'put down'.

In the life of an AHT, this is a story with a bad start but a happy ending

Surveillance and Disease Map

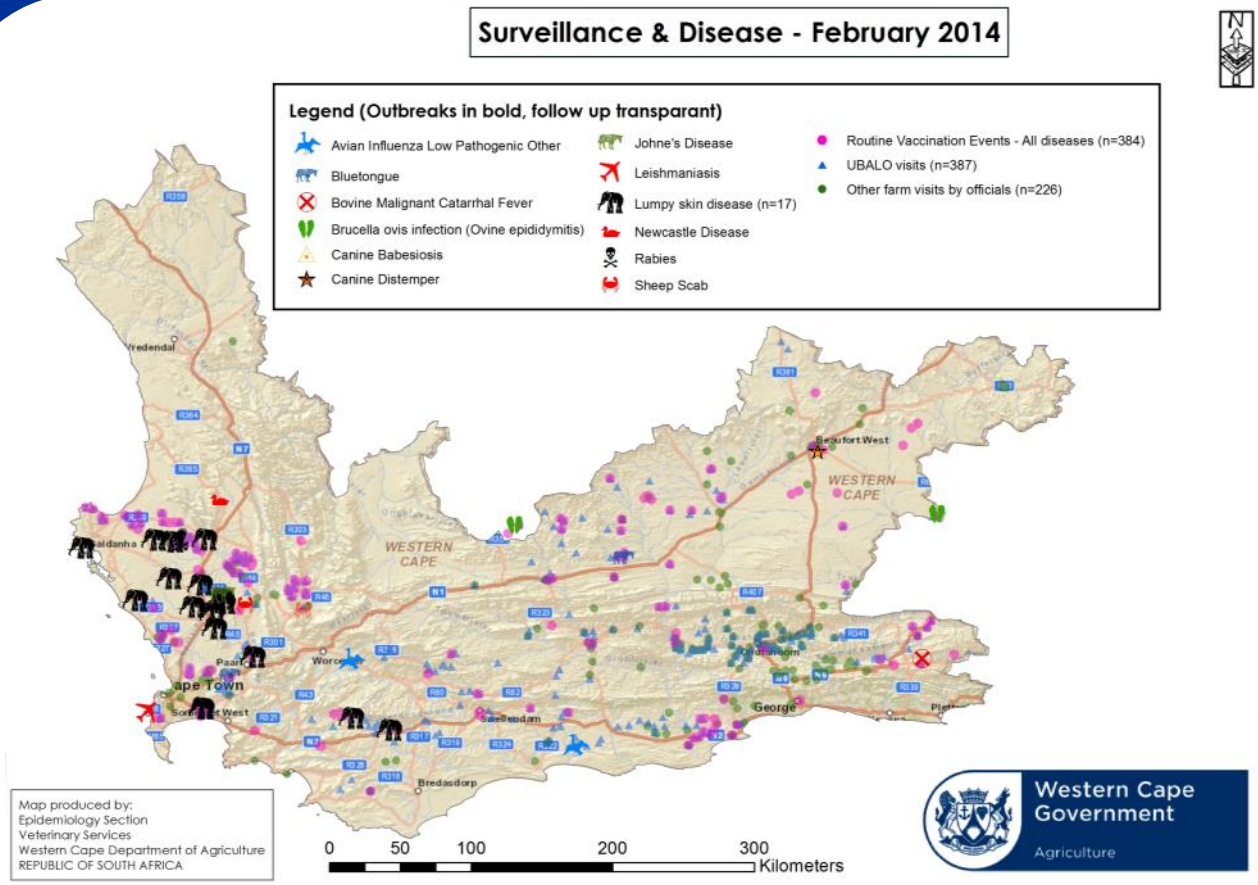


Fig 6: Surveillance and disease outbreaks in the Western Cape Province identified during February 2014

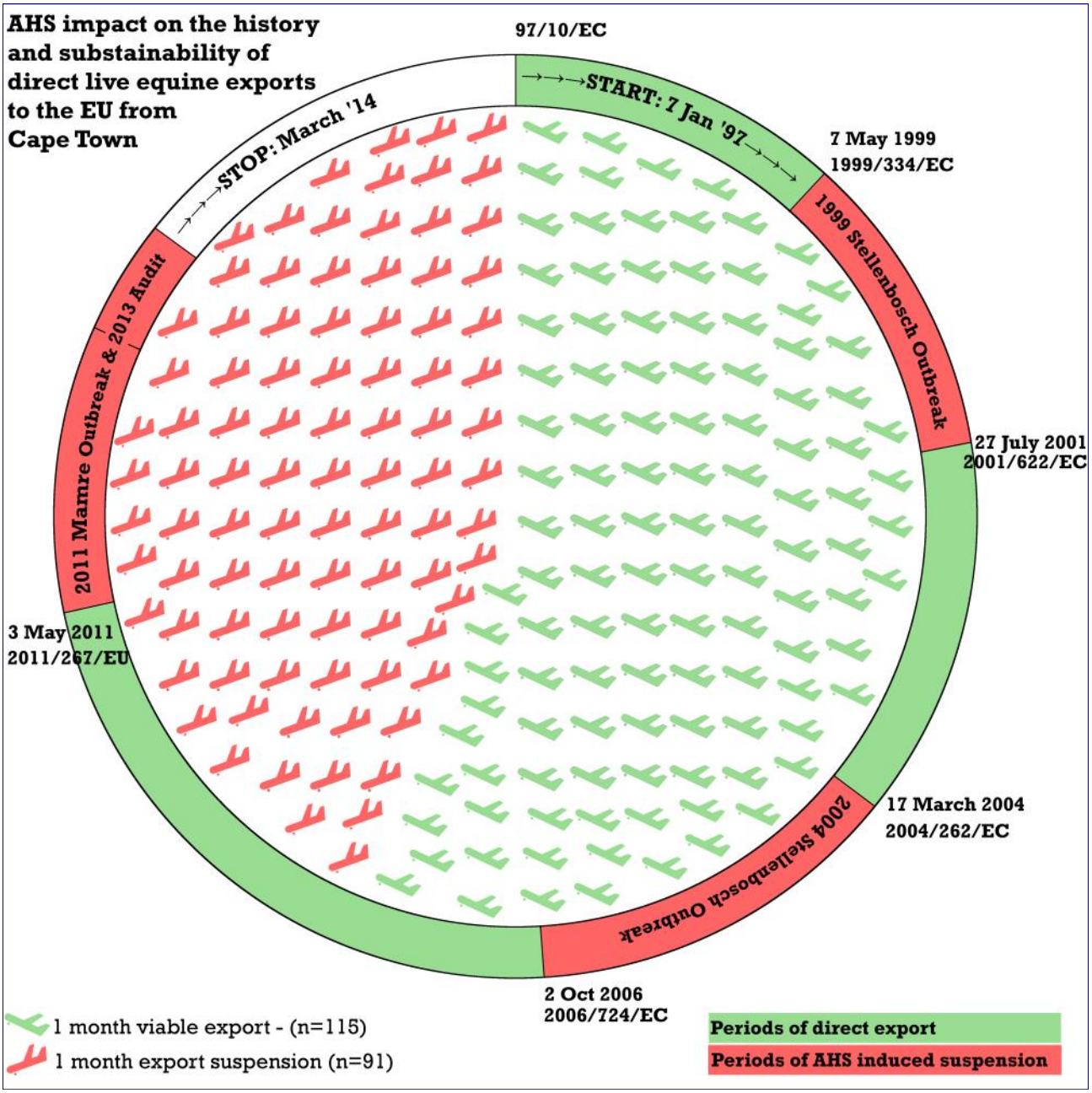
Monthly disease outbreaks

- In the follow-up from last month we reported on an imported ***Salmonella*** case - here in short are the details of the case which were received from the Import Quarantine Station. ***Ducklings*** *imported from the* ***United Kingdom*** *tested positive for* ***Salmonella hadar*** *and* ***S. farmsen*** *during routine post import testing while in quarantine at the Milnerton import quarantine station. Permission was granted for the ducklings to be treated under isolation at the importer's farm in Kraaifontein. The ducklings were treated with enrofloxacin and follow-up tests were negative for all strains of Salmonella.*
- **Lumpy skin disease** is a clear favourite for disease of the month and there are reported cases coming into the section thick and fast. We had 17 reported cases in February alone and the map on this page clearly shows this. The disease, based on reporting, is occurring in the **Malmesbury** area predominately but we have had reports from other areas and we are quite certain that the distribution of the disease is not so specific. We suspect that there is considerable under-reporting of this vaccine preventable infection. We will try get out a more comprehensive report soon on LSD.
- Another arbovirus, **bluetongue**, was reported from the **Laingsburg** and the **Boland** regions. Both outbreaks involved very low numbers of cases.
- Eleven of 60 **rams** tested for ***B. ovis*** tested positive from a farm near Rietbron. The vaccination status of the animals were either unknown or unvaccinated and rams were brought onto the farm from various

cont on the back page--->

African horse sickness in the province and its impact on exports directly to the EU

The formalisation of equine EU import requirements occurred in Jan 1997 with the publication of the European Commission Decision 97/10/EC which laid out the details regarding temporary admission and imports of registered horses from South Africa into the then Community. It was in this decision where reference was made to specific zones of the Western Cape including the AHS surveillance zone and the AHS free zone. While changes have been made to the requirements over time (97/10/EC was codified and repealed by 2008/698) the impact of African horse sickness on the export of live horses has been extensive. The graphic below shows over time when South Africa were exporting and when exports were suspended with indications of which AHS outbreak was responsible for the suspension. In the months to come we will be involved in workshops to evaluate the way forward in terms of AHS and its control in the country and in preparation for that it was necessary to evaluate how successful and potentially how sustainable adhering to the current import requirements are, and whether steps need to be taken to revise our control and focus . It is also important to understand that many countries follow the lead of the EU in determining import requirements of live horses.



Other Outbreak Events cont...

sources with inadequate biosecurity. It is interesting to note that while various breeds of rams were tested (Dorper, Merino and some goats - Angora and Boer goat) the only positives came from the Dorpers. Vaccination and slaughter of positive rams was advised.

- A buffalo succumbed to a **malignant catarrhal fever** infection which was thought to be (but not confirmed) a sheep associated strain. This occurred in the Uniondale district and was detected when a private vet suspected the disease after performing a PM on the five-year-old cow that had died suddenly. Samples were sent for histopathology and were returned as highly suspect for MCF.
- A **rabies** case occurred in the **Moorreesburg** area in a **bat-eared fox**. The animal entered a farmer's yard showing no signs of fear and the farmer shot and killed the animal. The brain was sent for testing at Allerton and was positive for the rabies on fluorescent antibody testing. There was no known contact with humans or domestic animals. The area's domestic dog and cat populations had been vaccinated by the local AHT in October 2013 but further follow up was performed and 15 dogs and 14 cats in the immediate vicinity were re-vaccinated. This is the second rabies case of 2014.

Fig 7: A Dohne Merino stud ram (www.dohnemerino.org/)

- **Newcastle disease** was diagnosed serologically on a non-commercial **poultry** farm in the **Eendekuil** area of the Malmesbury State vet region. Egg production drops were noted on the property and 3 of the 40 susceptible hens showed respiratory symptoms and later died. The farmer buys in hens from a commercial farmer that does not vaccinate his flock, which is why the diagnosis could be made serologically.
- **Johnes** disease was confirmed using ZN staining of organ samples in a flock of 460 sheep in the **Moorreesburg** region. Two ewes were showing signs of emaciation and depression - one was a mutton Merino; the other a Dohne Merino. The Dohne was still mobile but showed projectile diarrhoea. There are other emaciated sheep in the flock. Quarantine was instituted on the property.

Total OIE logs

State Vet area	User	Total Logs
SV Malmesbury	hendrikh	72
SV Beaufort Wes	antonb	51
SV George	heidia	46
SV George	attiee	42
SV Malmesbury	michaelc	41
SV Malmesbury	ELmienc	39

Total UBALO logs

User	Total events
attiee	45
hendrikh	35
alwynnk	32
nitav	29
wynandf	23
Flipk	18

Most rabies vaccinations performed

State Vet area	User	Total
SV Swellendam	wernerg	3894
SV Malmesbury	michaelc	992
SV Swellendam	thulit	631
SV Swellendam	gerhardvw	598
SV Boland	judithg	569
SV Malmesbury	estheaj	320

Epidemiology Report VOLUME 6 ISSUE 2

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EPIDEMIOLOGY REPORT

VETERINARY SERVICES
March 2014
Volume 6 Issue 3

AHS Outbreak in the AHS Protection and Surveillance Zone

INTRODUCTION

Suspect African horse sickness (AHS) cases were detected through clinical/passive surveillance by a private veterinarian consulting for an Arab horse farmer in the Porterville area in the AHS protection zone in early March 2014. (*The AHS protection zone is one of the AHS controlled zones and is an area between the AHS surveillance zone and the AHS infected zone. For a visual perspective on the AHS controlled zones please go to this link: http://g.co/maps/ppg8x*)

Samples collected from the property from the two clinical cases at the time tested positive to AHSV and were subsequently typed as serotype 1 AHS. Since then a number of cases have occurred in the area immediately around the index case and more recently the infection spread to the AHS surveillance zone where a positive case was identified in Wellington.

CONTROL MEASURES IMPLEMENTED

An initial AHS containment zone (CZ1) was declared by State veterinary services in early March shortly after the first positive confirmation of the disease was made. This zone incorporated the greater Porterville district and extended from Gouda in the south to the N7 in the north, with the Groot Winterhoek mountains on the eastern border and the Berg river (which is also the border of the AHS surveillance zone) on the west. The containment zone ensures that no horses are allowed to move into, out of or through the outbreak area. Horse owners were also requested to stable their horses in the evening through to mid morning to prevent biting midges, which transmit the disease, from feeding and potentially spreading infection between horses.

In late March the first case outside CZ1 was reported and confirmed. Based on the fact that the same serotype was evident in this case compared to that in Porterville this case was seen as an extension of the Porterville outbreak. Veterinary services decided to then increase the size of the containment zone and to make it contiguous with the initial containment zone. The new zone (CZ2) incorporated the extension down the eastern mountain range to the Huguenot tunnel, along the N1 in the south and then up to Malmesbury from the R304/R302 and extending to Piketberg and Piekenierskloof on the N7. This more than doubled the size of the containment zone.

OUTBREAK CASE DEFINITION

The current positive case definition for the outbreak is based on positive AHS q-RT PCR (real time PCR) results from horses where either clinical signs associated with AHS are present or where the prior vaccination history of the horse (against AHS) is known and cannot be associated with positive PCR results.

Suspect cases are those that have clinical signs of disease which may be as a result of AHS but where samples have been taken but results have not yet been received. Suspect cases will also include positively tested horses (against AHSV) that have recently been vaccinated and where vaccination and field strain virus cannot be differentiated.

Negative cases are either those horses that have been surveyed by State officials and found not to be showing clinical signs of disease in any way or any suspect horse that subsequently tested negative against AHSV.

SURVEILLANCE

The approach to the outbreak in terms of surveillance has been:

1. State officials undertook a census and clinical surveillance program in CZ1 starting around the affected property and moving outwards to its borders. Included in this was informing the public regarding the current state of the outbreak and explaining the containment zone movement requirements. A similar exercise will now occur within a 10 km area surrounding the Wellington case with possible extension along the Berg river towards Porterville to try establish how the infection jumped the almost 50 km between CZ1 and Wellington.
2. Owners (or owners' consulting veterinarians) who are informing State officials of suspect clinical cases are being visited and samples are being taken from suspect cases for AHS testing. This includes properties outside of the containment zone.

While data is still being collated the following was available at the time of this report. 104 properties have been visited (including those outside the CZ as shown in Figure 2 on the following page). 18 properties did not have horses on them while 72 had horses that were not showing any clinical signs associated with AHS infection. 13 properties are considered infected while one property is considered suspect based on recent AHS vaccination.

MORBIDITY AND MORTALITY

Farm level incidence is currently 15% while horse level incidence is 7% (total population captured of 557 equines). The case fatality rate is currently 18% (7 confirmed deaths). Compare this to the 2011 Mamre outbreak where overall the case fatality rate was 88%. This shows what has been experienced in the field—the cases have been mild in nature from a clinical perspective. The majority of cases have shown symptoms of fever, supra-orbital fossa swelling and ataxia. The ataxic symptoms seen in cases as well as suspect cases that were confirmed AHS negative leads us to believe that there is concomitant infection with other arbo viruses in the area. These include potential equine encephalosis, west nile fever and sindbis group viruses. Other aetiologies which

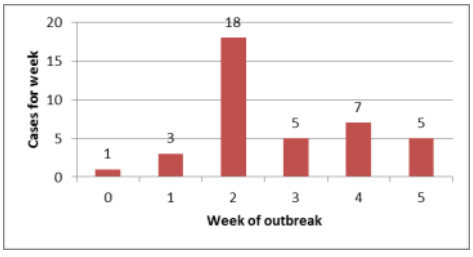

Fig 1: Epidemic curve of cases to date. The spike in week 2 is predominantly as a result of sub clinical cases sampled from the index property in that week.

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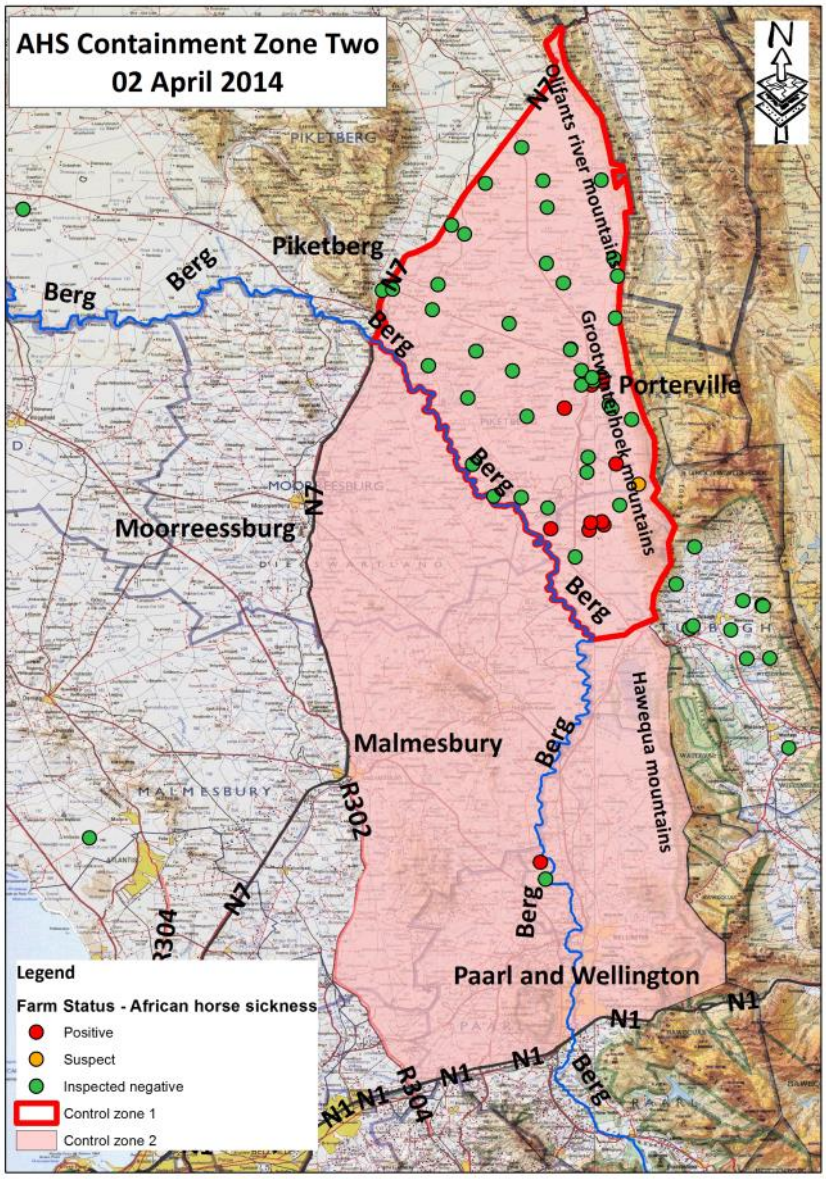

Fig 2: The containment zone as of 2 April 2014 as well as the confirmed and suspect properties within the zone and some indication of visited and clinically negative properties outside the CZ.

may be involved but that need to be confirmed include annual rye grass toxicity.

AHS VACCINATION

Large scale vaccination of horses in response to the outbreak has not been undertaken for the following reasons

1. The containment zone was initially an area (AHS protection zone) which is by law supposed to have a horse population which is fully vaccinated against AHS. Now that the containment zone extends into the AHS surveillance zone this point becomes somewhat less valid but an evaluation of the vaccine coverage in the area around the Wellington case will be made prior to any decision to blanket vaccinate horses in that area being taken.
2. The outbreak has occurred in a period during which the vector of the disease is present and it is unknown whether transmission of vaccine strain AHS can occur through these vectors.
3. The tests for AHS cannot definitively tell the difference between AHS field strain virus and AHS vaccine strain virus.

Part of the questionnaire that State officials filled during their surveillance was to do with the AHS vaccination status of horses and when last that occurred. It is going to be interesting to see what the coverage was like in the protection zone.

Owners that wish to vaccinate in the AHS Protection zone are not prohibited from doing so but the State encourages that bottle 1 of the vaccine (which contains serotype 1) is used initially and once the vector season is over (by June 2014) that the follow up bottle 2 is given. Owners are reminded that vaccination against AHS in the AHS surveillance zone is only to be performed after the necessary permissions have been granted by SV Boland. Private veterinarians have been asked to take a blood sample from any horses they vaccinate against AHS in the containment zone.

SOURCE OF THE OUTBREAK

While it has not been confirmed the source of this outbreak is almost certainly a movement of an AHS infected horse into the Porterville region which precipitated the outbreak. The Western Cape has in the past had outbreaks of AHS in the AHS protection and AHS surveillance zones (1999, 2004, 2006 and 2011) but the disease is very unlikely to overwinter based on the multiple seasons which are AHS free between outbreaks. This means that introduction of a infected horse is the most likely source of virus. The question that is interesting in this outbreak is how the virus spread from Porterville/Saron into Wellington. Again a movement of an infected horse could have been the cause but we also consider it possible that infected midges could have travelled that distance.

CONCLUSIONS

It is very unfortunate that the infection has spread to the AHS surveillance zone. While direct exports are currently not allowed to the EU as a result of other factors the current outbreak will delay any attempts to export in at least the next 2 years given the current export requirements.

Equine outreach in Greyton—AHT Werner Gouws

An annual equine outreach in the small town of Greyton was organised by a group of philanthropists from Hout Bay. The outreach is supported and receives assistance from multiple role-players including private veterinarians, the SAPS equine unit, Western Cape Dept. of Agriculture officials, equine dentists, farriers, the Greyton riding club, the African horse sickness trust and private individuals from Greyton and Hout Bay.

The recipients of the assistance are indigent locals in Greyton and surrounds who have horses which are used for transportation and for work in their small farms and veggie gardens. Horses are vaccinated against preventable diseases like African horse sickness and tetanus and are treated with dewormers and are dipped to treat for external parasites. Nutritional advise for horses is given to owners. Any wounds which are seen are treated and in this years outreach horses were microchipped as well to help in future identification of animals. In the same vein horses also have photo ID booklets made with their owners. The horses teeth were also inspected . In many cases tack was donated to the owners to improve their and their horses safety and comfort. The following are some statistics (and the photos below) which were kindly provided by Sharon Orpen who is the main organiser of the event.

112 horses were examined by vets and assistants with 106 body condition scores done. The average body condition score was 2.7 with a median of 3. Only 10 horses were noted for follow ups in future based on loss of condition from previous years or from current condition scores of less than 2. 108 horses were dewormed in total and 106 tetanus vaccinations were performed. 53 horses had their teeth attended to. The population of horses consisted of 50% mares, 43 % stallions and 7% geldings which is always interesting to see because in the formal sector we are used to seeing a much higher percentage of mares with very few stallions used to breed with.

Eds note: It is fantastic to hear of the effort and enthusiasm of volunteers in this sort of outreach and we commend all those professional and private individuals who gave up their time to assist.

Microchipping

Checking tack

Photo ID's

112 is a lot of horses!

Surveillance and Disease Map

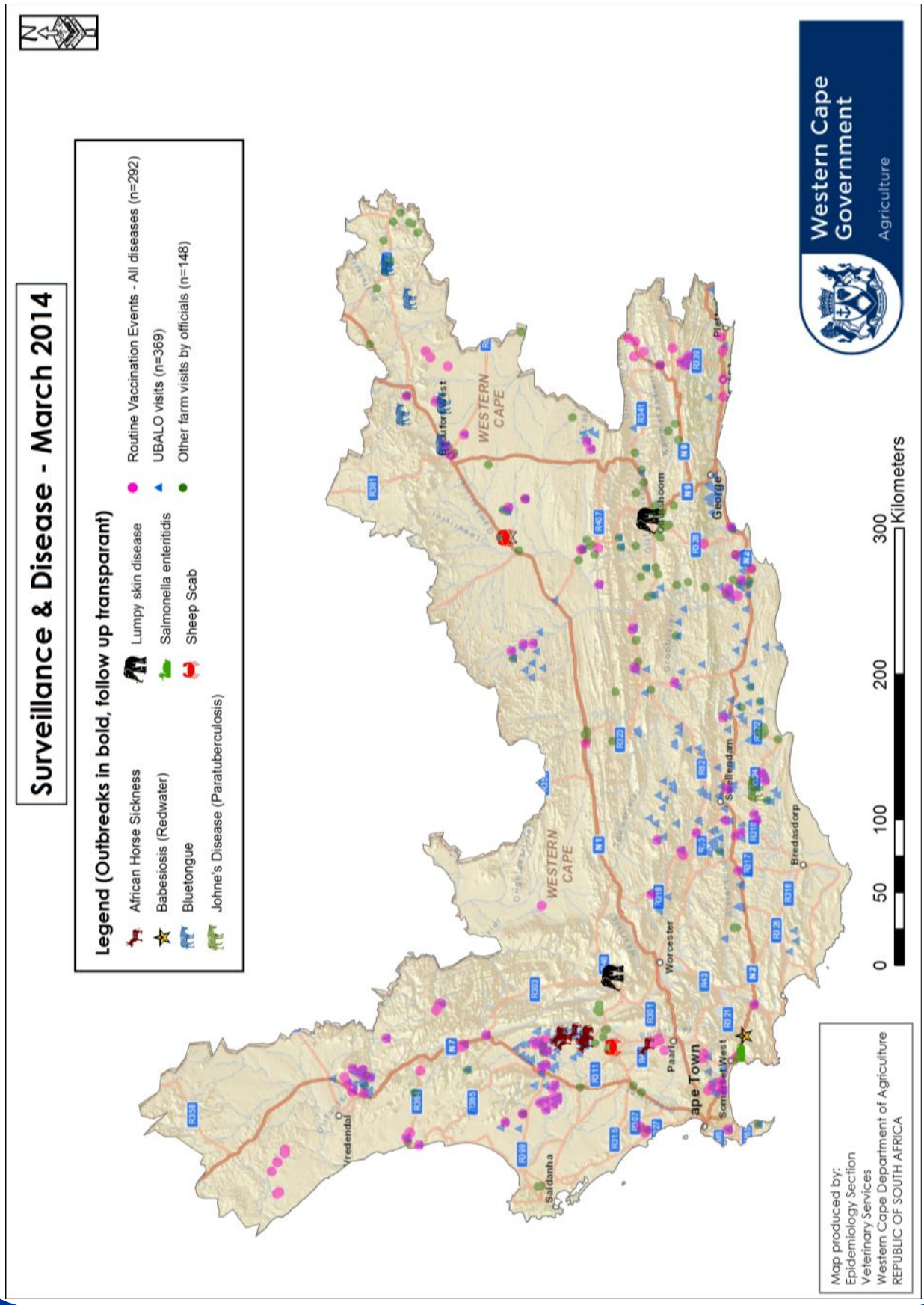

Fig 3: Surveillance and disease outbreaks in the Western Cape Province identified during March 2014

Outbreak Events

A sheep showing nasal discharge caused by bluetongue
Photo: J Kotze

- **African horse sickness** has occurred near **Saron** and **Wellington** in the AHS protection and surveillance zones. For more details on this outbreak, see the article on page 1 of this report.
- **Lumpy skin disease**: outbreaks are continuing around the province. Two outbreaks were reported in March: one near **Oudtshoorn** and another near **Ceres**. Both cases involved low morbidities (1-3%) in unvaccinated herds
- Several outbreaks of **bluetongue** were reported around **Beaufort West**. Outbreaks occurred in **Merino** and **Dorper** flocks, with observed clinical signs including swollen heads, nasal discharge, sensitive hooves and lameness.
- A **sheep** farm near **Swellendam** that had been experiencing emaciation with chronic diarrheoa since 2013 was confirmed positive for **Johne's disease**.
- **Bovine babesiosis** (redwater) was experienced by a small farmer in the **Grabouw** area. The diagnosis was confirmed by a private vet.
- Two outbreaks of **sheep scab** occurred near **Malmesbury** and **Beaufort West**. In Malmesbury, the agent of disease spread is suspected to be the shearing team that moved from farm to farm. Luckily, the farmer detected and reported the disease early and so control could be started. In Beaufort West, the method of spread is thought to be direct contact between sheep through the fence between neighbouring properties.
- Two broiler houses on a farm in **Gordons Bay** tested positive for **Salmonella enteritidis** and S. eastbourne, though no clinical signs were seen. The **chickens** in the houses were treated with enrofloxacin for five days, but no follow-up testing was done before slaughter.
- A suspect case of rabies occurred in Kuilsriver in the City of Cape Town when a man was bitten by his dog while he was feeding it. The dog then died two days later, causing the owner to become concerned and seek medical attention. On follow-up investigation it was discovered that the dog was very aggressive and had bitten several other people in the last few months. The dog was exhumed and rabies test results were negative.

Total OIE logs

State Vet area	User	Total Logs
SV George	heidia	37
SV Vredendal	irmis	37
SV George	flipk	30
SV Malmesbury	michaelc	29
SV Malmesbury	mariusv	28
SV Beaufort Wes	CobusF	26

Total UBALO logs

User	Total events
HENDRIKH	62
wynandf	39
gerhardvw	29
thulit	24
jacquesk	22
Heidia	18

Most rabies vaccinations performed

State Vet area	User	Total
SV Boland	maresaf	500
SV Boland	judithg	368
SV George	Heidia	326
SV Vredendal	irmis	135
SV Malmesbury	michaelc	84
SV George	ronniek	71

Epidemiology Report VOLUME 6 ISSUE 3

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EPIDEMIOLOGY REPORT

VETERINARY SERVICES
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Avian tuberculosis — LvH

Recently, the epi section has seen two suspect cases of the rarely encountered avian tuberculosis.

The first occurred on a small commercial layer farm near De Doorns. Unusually high mortalities were seen in one of the chicken houses, and a live, but very weak hen was sent to the Stellenbosch Provincial Veterinary Laboratory

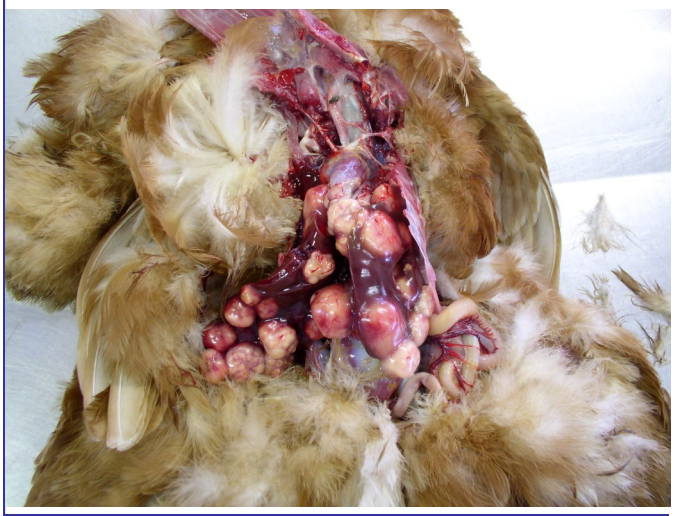

Fig 1: Tubercles seen on the internal organs of a layer hen. Photo: Dr S Gers, Provincial Veterinary Lab, Stellenbosch

for a post mortem. Multiple tubercles, confirmed histologically to be granulomas, were seen on the liver and spleen (see fig 1). However, impression smears of the tubercles stained with Ziehl-Nielsen revealed no acid-fast organisms. Mycobacterial cultures of the lesions were also negative. Mortalities on the farm have since dropped to zero.

The second case occurred in a pet Indian runner duck (see fig 2) kept in a garden in Greyton to control snails. The duck became weak, fell down and died acutely. The owner suspected botulism and sent the carcass to a private veterinarian who performed a post-mortem and submitted samples to a private laboratory. Histopathology of the organs revealed cause of death was a severe bacterial septicaemia with gram positive cocci, but necrotic lesions in the liver and ventriculus were positive for intracytoplasmic acid-fast filaments: mycobacteria. Unfortunately, samples were submitted in formalin, so bacterial culture could not be done to confirm the diagnosis. Two more pet ducks of the same owner have showed no clinical signs of illness to date.

The Animal Diseases Act of 1984 states that for tuberculosis caused by *Mycobacterium avium* in all animal species "*contact animals shall be isolated and tested*" and those found infected, marked and slaughtered. However, no laboratory tests for tuberculosis in live birds are available in South Africa. There is additionally no evidence to allow us to deduce that *Mycobacterium avium* is the cause of disease in these birds, as there are other mycobacterial organisms with the potential to cause avian tuberculosis, such as *M. intracellulare* and *M. genavense*.

Various mycobacteria that can cause avian tuberculosis have been found to be common in several countries in environmental samples such as those of soil, water and animal feed. It is questionable whether testing and slaughter of infected birds will affect the prevalence of these organisms in the environment or will have any effect on the clinical disease seen in the affected populations.

Furthermore, the organisms causing avian tuberculosis carry a low zoonotic risk. Like many environmental mycobacteria, they can cause disease in humans, but it usually only occurs in the immunocompromised.

A confirmed case of avian tuberculosis would therefore present an complicated situation in terms of disease control.

References

Tell, L.A. &Cromie, R.L. (2001). Tuberculosis in birds. *Scientific and Technical Review*, 20, 180-203.

World Organisation for Animal Health (2008) Avian tuberculosis. *OIE Terrestrial Manual,* Paris: OIE.

Fig 2: Indian runner ducks Photo: poultrykeeper.com

Surveillance and Disease Map

It's been a heavy arbo virus season...

Fig 3: A *Culicoides* midge

The last month has clearly been a very successful period for biting insects, with record numbers of vector-transmitted viruses being reported:

* Two outbreaks of lumpy skin disease in bovines on the border between the Northern and Western Cape near Beaufort West were reported telephonically.

* 55 individual outbreaks of Bluetongue virus were reported from the Beaufort West state vet area (see fig 4), and one outbreak from near Vredendal. These have been based on clinical signs in sheep consistent with the disease—investigations are underway to identify the viral type involved.

* 7 cases of African horse sickness have occurred near Porterville, Wellington, Robertson, Beaufort West, Murraysburg, Leeu-Gamka and Uniondale within the Western Cape Province.

* A number of West Nile virus cases in horses are being followed up on in the Province.

The above occurrences taken with the multiple AHS cases detected in March (mainly near Porterville) and the many lumpy skin disease outbreaks reported on in January and February's Epidemiology Report, clearly show that the environmental conditions have suited arbo-viruses and their vectors this year. Bluetongue, lumpy skin disease and African horse sickness are all vaccine preventable diseases and a season like this clearly shows that from time to time farmers are going to face a season where these diseases are almost certainly going to occur. We therefore continue to promote and encourage vaccination against these economically important diseases.

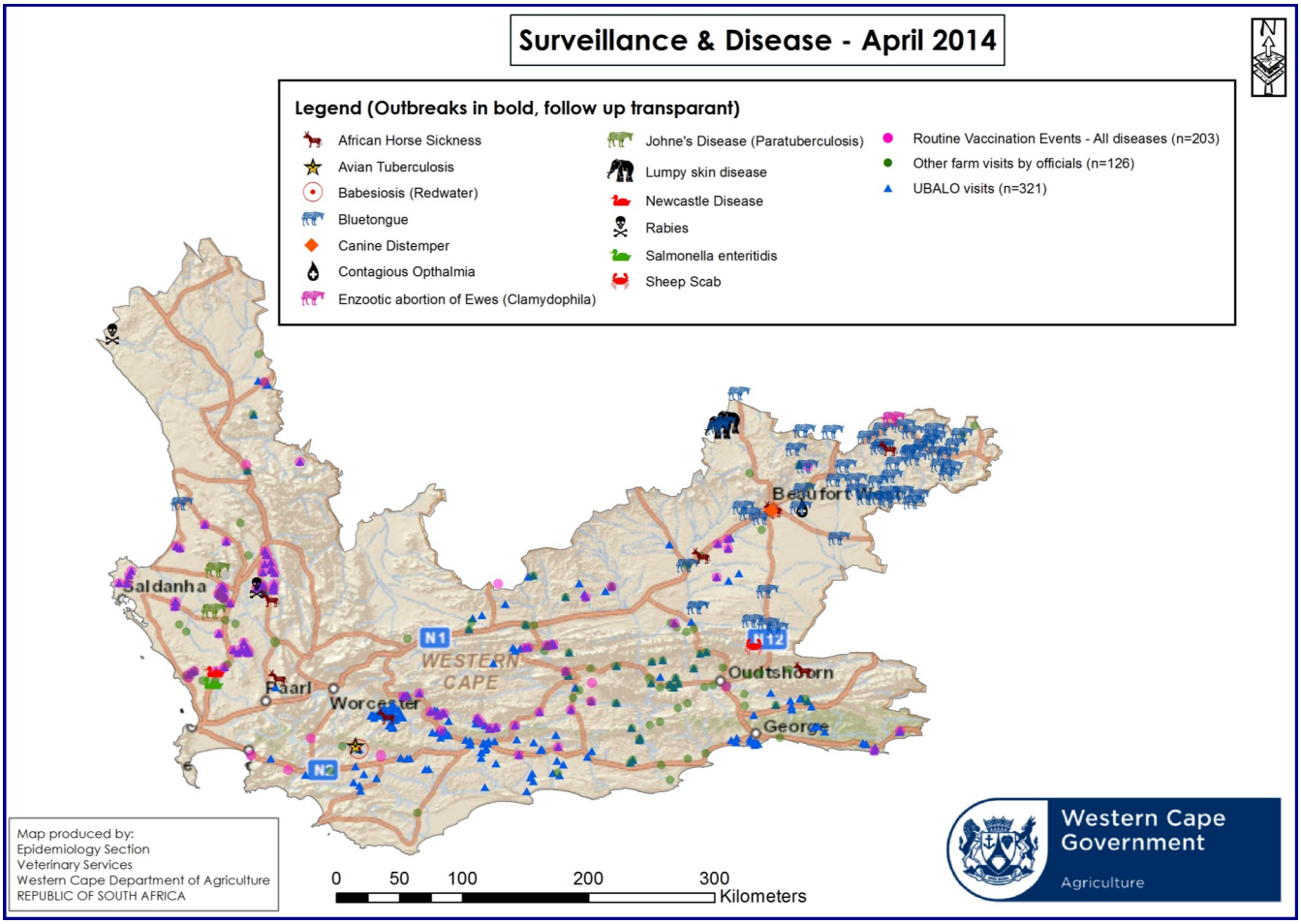

Fig 4: Surveillance and disease outbreaks in the Western Cape Province identified during April 2014

other Outbreak Events

- **Newcastle disease** occurred in an unvaccinated flock of free-range layer hens near **Malmesbury**. The hens showed nervous signs (stargazing), a drop in egg production and a spike in mortalities.
- Two sheep farms in the **Malmesbury** area were confirmed positive for **Johne's** disease after emaciation and diarrhoea were observed.
- ***Salmonella enteritidis*** was cultured from a boot swab taken from a broiler farm near **Malmesbury**.
- **Bovine babesiosis** was reported by a dairy farmer near Caledon. He apparently experiences problems with redwater often, which he identifies by a drop in milk production, and responds by treating the affected animal(s) with Berenil, Phosamide and Predef.
- ***Chlamydia pecorum*** was identified as the cause of an abortion storm in **Merino** ewes near **Beaufort West**.
- A farmer who had bought rams from a **sheep-scab** positive farm in the Eastern Cape placed them in quarantine as a precautionary measure. Two months later, clinical signs of sheep scab were observed on the rams.
- Young **Merino** sheep near **Beaufort West** were diagnosed with **contagious opthalmia** caused by *Moraxella.*
- **Distemper**, **parvo**, ***Ehrlichia canis*** and ***Sarcoptes*** infestation were seen in dogs in **Beaufort West**.
- Cases of **wildlife rabies** occurred in a **bat-eared fox** and a **grey duiker** in the **Malmesbury** and **Vredendal** areas respectively. Both animals displayed abnormal behaviour: the bat-eared fox appearing tame, and the duiker displaying severe aggression, injuring a farmer and attacking his vehicle.

Fig 5: A common or grey duiker

Total OIE logs

State Vet area	User	Total Logs
SV Malmesbury	michaelc	54
SV Malmesbury	hendrikh	49
SV Boland	janicaf	37
SV Beaufort Wes	jacop	31
SV Beaufort Wes	nitav	29
SV Beaufort Wes	louwk	26

Total UBALO logs

User	Total events
wynandf	46
thulit	45
nitav	30
gerhardvw	30
hendrikh	24
janicaf	23

Most rabies vaccinations performed

State Vet area	User	Total
SV Swellendam	wernerg	306
SV Malmesbury	hendrikh	187
SV Malmesbury	michaelc	150
SV Boland	judithg	147
SV Boland	janicaf	97
SV Swellendam	wynandf	69

Epidemiology Report VOLUME 6 ISSUE 4

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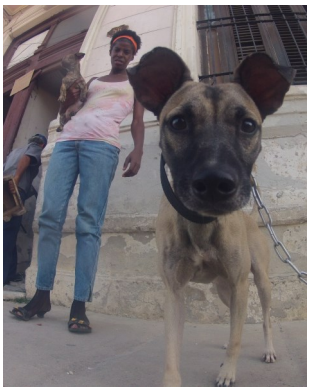
2nd International Conference on Animal Health Surveillance - Havana, Cuba, May 7-9 2014 - JdG



Drs van Helden, Roberts, Koen and myself were fortunate to attend the 2nd International Conference on Animal Health Surveillance hosted by Cuba. It was a very well attended event with surveillance experts from around the world sharing their knowledge and expertise. We really learnt a lot and hopefully we can apply some of the techniques discussed. The theme for the conference was 'Surveillance against the odds' which highlights that many countries, both developed and developing, have challenges in undertaking surveillance for animal health.

Keynote 1: **Surveillance against the odds: Can we meet the expectations of both science and policy?**

There is often a disconnect between science and policy as the focus of these two groups clashes based on differing pressures and interests. There is often little effort made from both parties to understand why these differences exist and this can lead to a disconnect which has a negative impact of a system like surveillance. It is the responsibility of both scientists and policy makers to interact and communicate their research needs. A situation where either party blindly forges ahead creates a fragile research environment.

Keynote 2: **Surveillance for environmental nasty surprises in a complex, messy world**

This talk focussed on two major points, i.e. ensuring that environment variables are considered in surveillance and secondly to focus more on health based outcomes and not so much on disease when doing surveillance. Ecological systems are complex and much work has been done on trying to understand systems using complex systems analysis. The vulnerability of a system to survive a disease outbreak and the resilience of systems not to break down through disease incursions was discussed. This is similar to the work done within our section with Christine Moore from UCT who looked at the vulnerability and resilience of the ostrich industry using the ostrich movement network as a dataset in analysing vulnerability of the industry to disease. Another interesting discussion from this keynote was the fact that disease events which surprise us and policy makers have a high level of perceived risk because of this surprise factor. An example is that most endemic chronic diseases have got a much higher impact than exotic 'surprise' type diseases, but the knowledge of and familiarity with these endemic diseases often decreases the interest in them, and much more is spent on surveillance and contingency against potential exotic and infrequent disease threats. The speaker also illustrated how just having a network of health professionals both from animal and human health leads to an environment where emerging diseases can be detected and he encouraged the input of effort into making and maintaining professional networks. In the Western Cape we have good relationships with the health sector but there is always room for improvement. Ironically it is often because of disease, like rabies, that these networks are stimulated so maybe it is easier for those of us in developing countries to do this.

Keynote 3: Digital Disease Detection: Harnessing online big data for global disease surveillance & Keynote 4: Synapse to synergy: A data-based framework for advancing public health surveillance

Both of the final keynotes focussed on accessing data from sources on the internet including Facebook, Twitter and webpages. It is interesting to hear of the challenges with collating this information, one of the which is the validity of this crowd-sourced information. As government officials are required to report only on validated information, we are often behind the wave of web-sourced data. There are numerous websites and institutions that display web-

sourced data, like HealthMap and EpiSpider, as well as email alert systems which many of us use, like PROMED mail.

SURVEILLANCE IN RESOURCE-CHALLENGED ENVIRONMENTS

There is no doubt that South Africa shares many challenges regarding surveillance in terms of available technology with other developing countries. Aspects of both cell phone and digital pen technology were discussed and it's likely that these technologies will continue to be used within our country. Of course with these systems often the data is stored on external, non-government servers and many presentations discussed that this is not restrictive but that MOA's are needed to protect information and ensure the privacy of parties involved. Another issue with many developing countries, and South Africa is included here, is the decentralisation of veterinary services. The example spoken of was Indonesia and the impact of this on policy and surveillance can be significantly detrimental.

EARLY WARNING SYSTEMS

The discussions surrounding early warning systems all included some use of syndromic surveillance which we are not currently using in Western Cape Vet Services. This technique makes use of surveying syndromes instead of specific diseases with an output of identifying issues early, before they have a significant impact. One of the issues with this system is that there is a disparity among centres about how specific syndromes are defined, which creates a problem in integrating multiple syndromic surveillance systems.

CHARACTERISING RISK

Risk-based surveillance is really a way of surveying for disease in the places you expect to find it. This technique is, for instance, particularly useful if you are looking for a disease to obtain free status, as it gives your policy maker or trade partner assurance that you are making the optimal effort in finding the disease should it occur. Of course the selection of risk factors must be scientifically justifiable.

Social network analysis was discussed and two major risk factors to consider are the number of movements onto a farm (in-degree) as well as the length of disease chains,

meaning how long the chains of connections are leading to a farm based on animal movements. In the Province we also make use of these parameters in disease outbreak investigation but not yet in surveillance. The one parameter that we have not considered which was added into a model was the period of time that is relevant between movements onto and then off a farm for specific diseases to propagate along an infection chain. For example: if farm A receives infected sheep and moves in-contact sheep off his property the next day to farm B its unlikely that a disease like Johnes would be able to propagate along that chain, but a disease like sheep scab could.

CHALLENGING POPULATIONS AND DATA

This session dealt mainly with vector borne diseases and the surveillance and understanding of the vector in many cases. This is important for Africa and an example close to home is the spate of vector-borne diseases we have encountered in recent months. The challenge is how to approach vector surveillance and what you hope to get out of it. Our example is AHS *Culicoides* surveillance: we know we have competent vectors and historically we know that *C.imicola* and *C.bolitinus* are most likely to be present. The question is then if we do vector surveillance as a result of AHS, what is it we are trying to find out?

A really interesting topic was covered where they are rolling out a small-animal clinical surveillance program in the UK using automated management software queries and collating data of syndromic parameters directly from practice software. Something that is relevant for us is that the major consideration for the developers was how to could decrease the amount of time per vet interaction (they looked at getting the vet time per consultation to 7

seconds on average per captured event) and then how best to provide useful feedback to the vets to encourage their participation.

ASSESSING EFFECTIVENESS AND BENEFITS OF SURVEILLANCE

Many surveillance programs are implemented and, unless they are a stand alone project, they are often then not reviewed and adapted to changing situations which, in the long run, can lead to unnecessary expenditure and waste of human capital. Analysis of surveillance systems needs to cover at least the following criteria: how complete, correct, timely and believable (qualitative) is your data; how sensitive and representative is your surveillance system and, finally, how acceptable and simple are the outputs? Good surveillance programs must be analysed from time to time to ensure they are relevant and their outputs are acceptable.

A brief discussion on the gap between contingency for outbreaks and actual capacity was also discussed. An example was used from the USA where an evaluation was made as to whether the laboratory capacity could manage the expected samples that would be generated from varying severities of FMD outbreaks. To my knowledge similar evaluations have not been made in our situation and an example of where it may have been helpful was the situation when AI broke out in the ostriches in 2011, where the lab capacity to test the outbreak samples was put under pressure and other labs first needed to be authorised to assist, all in all putting pressure on the outbreak response team.

OPTIMISING SURVEILLANCE DESIGN

A discussion on the fact that most surveillance programs rely heavily on lab results of diseases and disease effects in a world where participatory, clinical and syndromic surveillance techniques are well described. In our context an example is in the ostrich industry where a seemingly disproportionate amount of testing is performed even though we know that risk factors exist for certain areas, farms and production systems.

SURVEILLANCE ACROSS THE ANIMAL HEALTH – PUBLIC HEALTH INTERFACE

As with the majority of veterinary congresses that we have recently attended there was a discussion on One Health and how vets and human medical professionals can interact and assist one another. A talk was given on the human and pig influenza surveillance project performed in Switzerland, which sounds very similar to the project conducted by Prof Marietjie Venter with some of our colleagues in the Western Cape and Gauteng, so it will be interesting to see how the results compare.

Often the impact of surveillance is not seen, so it was great to listen to a talk on how surveillance for antimicrobial resistance in poultry in Canada led to a paradigm shift regarding the use of antimicrobials in poultry in that country - eventually leading to the voluntary banning of certain antimicrobials by the industry.

The Indonesian population embracing a data-capture and reporting system was discussed where the success was because of focus being on the data inputter and not because they are told to input. One of our outcomes which we must work on in the Province is to generate more automated reports for our technicians so that they become the primary beneficiaries of data-logging.

CONCLUSION

Those of us that were fortunate enough to attend the congress want to thank our Provincial Department of Agriculture for the fantastic opportunity. Surveillance for disease and freedom of disease is becoming more and more important in the maintaining of trade partnerships between countries and hopefully we can put some of the discussions from the conference into practise.

Surveillance - it's a team sport

AHS update; Surveillance and Disease Map

African horse sickness update

African horse sickness cases have now been reported from the following districts in the AHS controlled zones during 2014 (all AHS protection zone unless otherwise specified): Porterville, Wellington (AHS surveillance zone), Tulbagh, Piketberg and Robertson. Serotype 1 AHS has been confirmed from all these districts. We currently classify the Robertson events as separate from the rest purely because of the spatial difference between this town and Porterville, Wellington and surrounds. We have not been able to link the two by movement of horses yet. The clinical signs and obviously serotype are the same between the two outbreak areas and molecular work will assist in determining if they are the same event.

Porterville/Wellington/Piketberg and Tulbagh

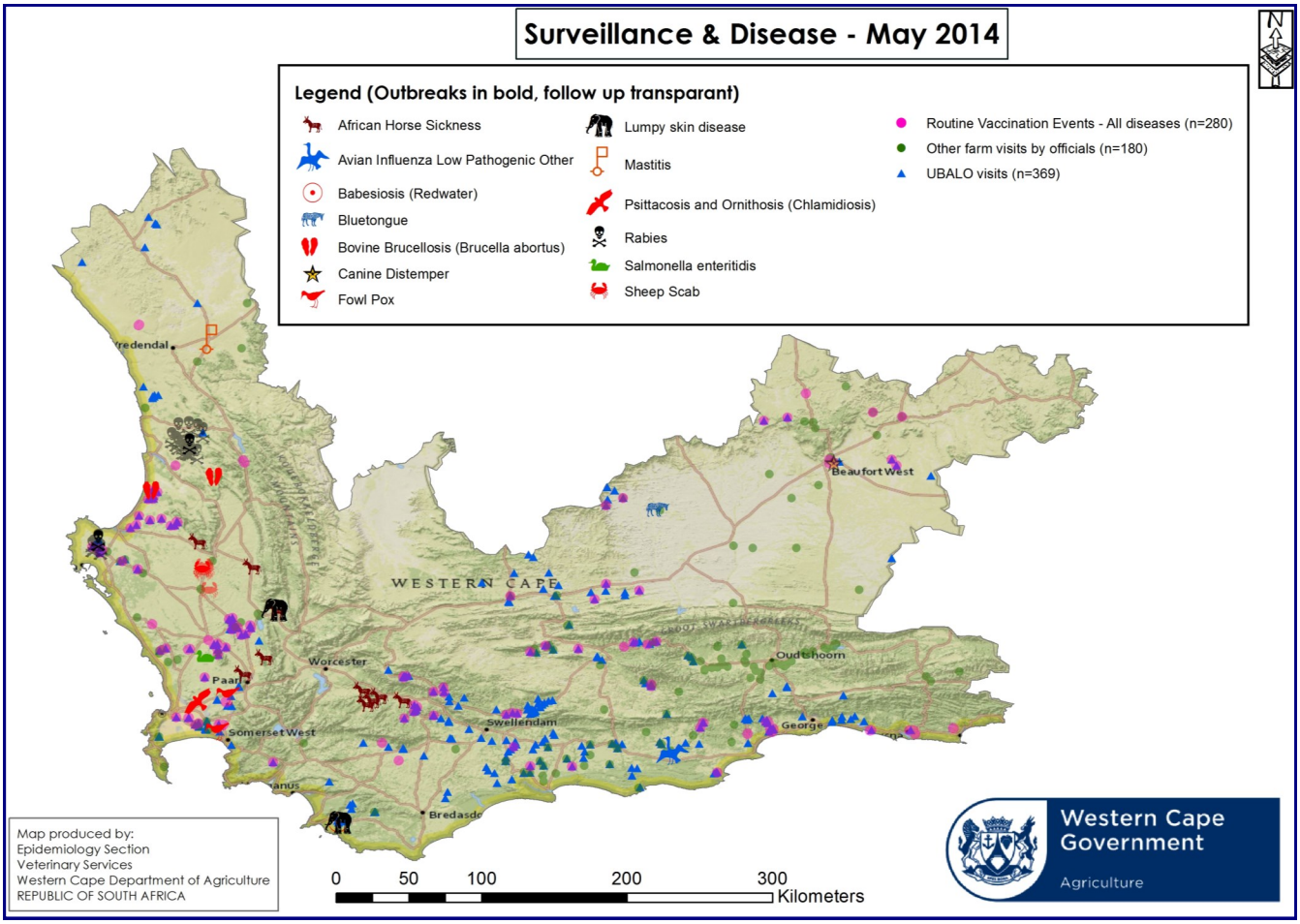
In total there are 28 affected properties in this outbreak zone with a total of 74 confirmed cases and 11 deaths as a result of the disease. The containment zone has been amended for a third time to include the most recent cases in Tulbagh (one property) and Piketberg (one property).

Robertson

In total six properties have returned positive AHS cases with a total of 19 confirmed cases of the disease in the Robertson district. There has still only been one death there and the total number of clinically affected horses is five, resulting in a case fatality rate of only 5% and a subclinical rate of 74%. Three of the six properties have horses which did not show any clinical signs of infection. All positive farms are either within or close to within a 10 km distance of the initial positive farm in the district

Resolution of the outbreak

We can start to consider resolving the outbreak if cases have not occurred in a period of 42 days. With the last cases having occurred in early May, it is possible that we may be able to resolve the outbreak during the course of June 2014.

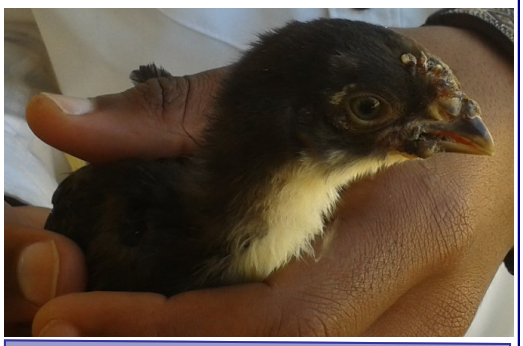


Surveillance and disease outbreaks in the Western Cape Province identified during May 2014

Outbreak Events

The tail-end of summer has seen continued reporting of outbreaks of vector-born disease. Hopefully the cooler weather that seems to have set in will see the picture of disease change dramatically in June.

- An unvaccinated beef cattle herd in **Tulbagh** experienced an outbreak of **lumpy skin disease**.
- **Bluetongue** occurred in a herd of **white dorpers** near **Merweville**, showing hyperaemia and oedema of lips and claws.
- Another case of what looks like **H5N2 avian influenza** was detected serologically in **ostriches** in the **Albertinia** region. It is the start of winter and we expect the number of AI events to increase at this time.
- Two small farmers in **Klapmuts** and **Somerset West** reported outbreaks of **fowl pox** in their unvaccinated chickens.
- A pet **African grey parrot** kept in **Cape Town** was found dead and cause of death diagnosed as **psittacosis**, caused by ***Chlamydia psittaci***. Three in-contact parrots are currently being treated .
- Two cases of **rabies** with human contact occurred in **bat-eared foxes** near **Vredenburg** and **Clanwilliam**.
- Two cattle farms near **Clanwilliam** were diagnosed positive for **bovine brucellosis**.
- A sheep farm near **Moorreesburg** experienced an outbreak of **sheep scab**.
- ***Salmonella enteritidis*** was cultured from environmental swabs from a broiler farm near **Malmesbury**. All chickens in the houses from which the swabs came were treated with enroflocaxin before slaughter.



A chick with fowlpox lesions

Total OIE logs

State Vet area	User	Total Logs
SV Malmesbury	janicac	76
SV Malmesbury	michaelc	49
SV Vredendal	irmis	41
SV George	Heidia	36
SV Malmesbury	hendrikh	36
SV George	carell	34

Total UBALO logs

User	Total events
wynandf	38
janicac	33
nitav	29
Heidia	27
thulit	25
gerhardvw	24

Most rabies vaccinations performed

State Vet area	User	Total
SV George	johanb	2664
SV George	Heidia	516
SV Malmesbury	janicac	495
SV Vredendal	irmis	249
SV Vredendal	ryant	183
SV Swellendam	wynandf	172

Epidemiology Report VOLUME 6 ISSUE 5

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Web based event logging AHT leader boards

Back Page Epi Lab | 05-2014 #1 | Epidemic curve

Introduction

In recent months the editors of this report have been more and more exposed to a stats program called R. Its an open source program which is freely available online along with a user interface called R-Studio which makes working with this program much easier. R has got a number of packages written by scientists and authors around the world which make it easier to get an output for specific problems. The problem with a program like R is that it's difficult to get used to and use if you are not doing it regularly. A recent workshop we attended has again piqued our interest in R and in an effort to learn the program for ourselves we'll be doing a monthly lab primarily focussed on R used to answer a specific question. We'll be using data sources that we make available to you so that you can run the code as you see it below in R Studio and you can see the output. Even if you just copy and paste this code once a month it means that you get a chance to learn a great program. We also want to encourage all of you that will start following our Back Page Lab to consider sending us a dataset and the code to answer one of your epi problems. We're just starting out but we'll try keep the format the same, giving you the best chance to get into this software. We are hoping that this leads to future labs outside of learning R—but the rule will be that the data is freely available and the software is open source

We want to make this work for you - please email johng@elsenburg.com if you need any help installing the basic R programs/packages which you'll need - we'll take this step by step and its all quite fun. We're also learning as we go.

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

Website where you can download requirements

System requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- epitools R package (this download code will be included in the code below so no need to pre-install this)
- Internet connection

Lab description

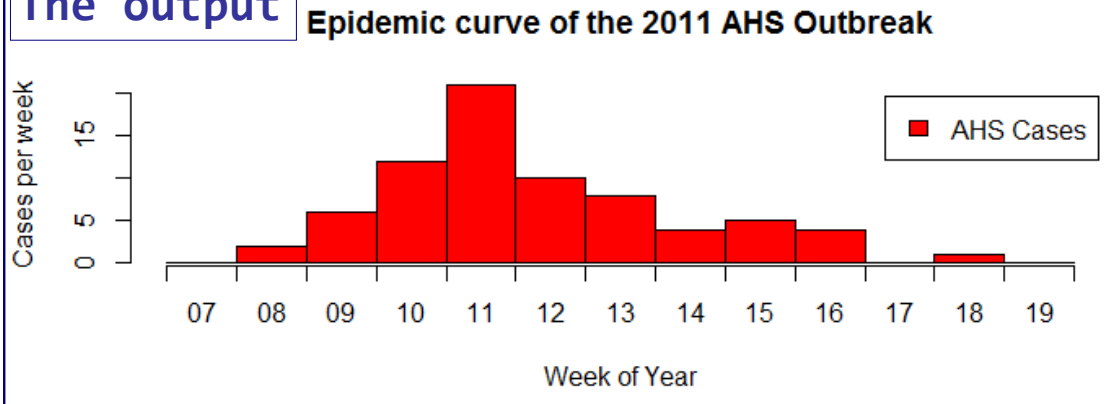
This month we create a basic epidemic curve using the epitools package in R. Epidemic curves are used in outbreak investigations. They can assist in determining an unknown outbreak aetiology or in determining if control measures have assisted in controlling an outbreak. Epidemic curves give an indication of the type of outbreak, e.g. sporadic vs endemic vs propagating vs point.

The code

```
#You can paste this entire code into your R console - the # makes a line of text comment out
#I recommend that you copy and paste the individual commands (in BLUE) to show how you built
#your epidemic curve. Hit #ENTER after each command in your console
#To read in data from on online source use the code below. This data is our Mamre 2011 AHS outbreak case data set
ahscases<-read.table('http://www.jdata.co.za/backpagelabs/backpagelabs_jdg_ahsoutbreak.txt',header=TRUE,
as.is=TRUE)
#This file is a text file with a space between columns which is the format that read.table takes as a default - you can
#copy and paste that website address into your web browser and have a look at the data
#I have specified that the headers must be imported as my text file had headers as column names
#The as.is function is NB! and in this case is used so that dates are imported as character classes and NOT as factors
#which is what would have happened if the as.is function had been left out
#A data frame is made called ahscases (note: the symbol "<-" in R code indicates that you are allocating whatever data
#is made from your function to a data set or variable - look to see if you see ahscases in your ENVIRONMENT WINDOW
#in R Studio Top Right Window)
head(ahscases)
#head shows the top 6 rows of data of a data source (tail would have shown the bottom 6)
class(ahscases)
#this shows a data frame has been imported
```

```
class(ahscases$casedate)
class(ahscases$deathdate)
#death date and case date are character classes which we need to convert to a date format
#to convert a character to a date use the as.Date function
ahscases$casedate<-as.Date(ahscases$casedate)
ahscases$deathdate<-as.Date(ahscases$deathdate)
#now we re check the class of these columns
class(ahscases$casedate)
class(ahscases$deathdate)
#OK now for the output of this back page lab - an epidemic curve of the cases
#On the x axis we want the week of outbreak,  on the y axis we want the number of cases within that week
#if you haven't installed the epitools package do so
install.packages("epitools")
#load the package - tick it in the packages section (bottom right window in R Studio) is the easiest
#You can also load it like this (but your directory will be different)
#library("epitools", lib.loc="C:/Users/johng/Documents/R/win-library/3.0")#
#run the code to make your epicurve
graphlabels<-epicurve.weeks(ahscases$casedate, axisnames=FALSE, legend= "AHS Cases",xlab = "Week of Year", ylab = "Cases per week", col="red")
#here we have made a curve but we have taken out the axis labels (the default is not helpful), we have added a legend, #we have added a X and a Y Axis label as well as changing the column colour to red
#note above: along with plotting the graph we have also allocated the graph data to a dataset called graphlabels Within #this dataset (you can view it by typing in graphlabels into your console) are weeks of the year within a column called #cweek
axis(1, at = graphlabels$xvals, labels = graphlabels$cweek, tick = FALSE, line = 0)
#here we have put in an axis  - 1 indicates the bottom axis (X), at indicates where we want the labels, labels indicates #what labels we want to add, we have removed tick marks and we said not to add a line to the axis we have created
#Now to add a title and you're done!
```

The output



Citations

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/

Tomas J. Aragon Developer (2012). epitools: Epidemiology Tools. R package version 0.5-7. http://CRAN.R-project.org/package=epitools

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
June 2014
Volume 6 Issue 6

Cyathostomin resistance to moxidectin - Dr Emma Alsop

It is well recognized that small strongyles (cyathostomins) are now the main parasitic pathogen in equines. Due to the use of anthelmintic strategies for the control of large strongyles, which has been extremely successful in reducing morbidity and mortality from this parasitic disease, selection of drug resistant cyathostomes has inadvertently occurred. There is a world wide increase in the reported levels of anthelmintic resistance, and of most concern is the resistance of the cyathostomins to macrocyclic lactones. There is already documented evidence of cyathostomin resistance to the benzimidazoles and pyrantel salts.

There is already reported evidence of reduced efficacy of moxidectin (a potent broad-spectrum endectocide of the macrocyclic lactone (macrolide) antimicrobial class) (Lyons et al 2010; Lyons et al 2011). Moxidectin resistant cyathostomins have also been reported in the UK (Trawford et al 2005). It is the authors own personal experience that there are now cases of moxidectin resistance in the Western Cape. Although this has not been proven on a large scale and is under further investigation, there are cases of a marked reduction in the egg reappearance period and complete failure of moxidectin to reduce fecal egg counts (FEC's). The author is sure that this is not a new thing, and surely not the first recognised incidents of moxidectin resistance in South Africa, but it does now need recognition from the equine veterinary profession. Strategies to slow down the selection for resistance, thereby extending the lifetime of currently effective anthelmintics, must be implemented whenever possible. A proactive approach must be taken involving the input of veterinarians into worming management and client education, if we are to expect chemical control of nematodes to be a viable option for the future. We, as a veterinary profession, must change our approach, take back control over parasite control programs and guide and educate our clients to change their approach, faster than the cyathostomins are changing their genotype.

Here are two tabulated case examples of evidence of cyathostome resistance to moxidectin. Certain assumptions have been made - including that all strongyle eggs seen on McMaster flotation were cyathostomin eggs.

Case one had been previously wormed with fenbendazole and ivermectin, with a failure in reducing the FEC.

All drugs were given at the following recommended doses for the cases below:

Moxidectin 0.4mg/kg per os
Praziquantel 2.5mg/kg per os
Fenbendazole 10mg/kg per os for 5 days

Case	1	2
Date	27 March 2014	
Initial FEC	4100	500
Initial treatment	Moxidectin and praziquantel	
Initial treatment date	10 April 2014	
Follow up FEC	900	1800
Follow up treatment	Moxidectin and praziquantel	
Follow up treatment date	20 April 2014	
Follow up 2 FEC	1000	700
Follow up 2 treatment	Moxidectin, praziquantel, 01.mg/kg dexamethasone iv	5 days fenbendazole 10mg/kg
Follow up 2 treatment date	6 May 2014	
Follow up 3 FEC	2400	0
Follow up 3 Treatment	???	

There are flaws in these case examples such as small case numbers and not differentiating the strongyle eggs seen, but the author feels that they do genuinely represent cyathostome resistance to moxidectin, which requires veterinary thought and attention.

It has been suggested that the criteria used to define anthelmintic resistance are that FEC's should be reduced by 95% after the administration of a macrocyclic lactone or benzimidazole, and 90% after administration of pyrantel, at 10-14 days post treatment (Dargatz et al 2000).

In case 2, moxidectin and praziquantel were repeated even though the FEC had increased in the face of using these drugs. This was in case there had been poor owner

Strongyle eggs: Dr. Dietrich Barth Merck Veterinary Manual

cont on page 2

Cyathostomin resistance to moxidectin continued

compliance. The dose administered on 10/04 was done by the author. A FEC reduction of only 39% was achieved. A larvicidal course of fenbendazole resulted in a FEC of zero.

The author also has had many cases of a reduced egg reappearance periods for moxidectin, which has been described at 13 weeks if resistance is not present (Mercier et al 2001).

References

Lyons, E.T., Tolliver, S.C., Collins, S.S., Ionita, M., Kuzmina, T.A. and Rossano, M. (2011) Field tests demonstrating reduced activity of ivermectin and moxidectin against small strongyles in horses on 14 farms in Central Kentucky in 2007-2009. Parasitol Res. 108, 355-60.

Lyons, E.T., Tolliver, S.C. and Collins, S.S. (2010) Reduced activity of moxidectin and ivermectin on small strongyles in young horses on a farm (BC) in Central Kentucky in two field tests with notes on variable counts of eggs per gram of feces (EPGs). Parasitol Res. 107(6):1495-8.

Trawford, A.F., Burden, F.A. and Hodgkinson, J. (2005) Suspected moxidectin resistance in cyathostomes in two donkey herds at The Donkey Sanctuary, UK. Proceedings of the 20th International Conference World Association for Advanced Veterinary Parasitology, New Zealand. P196.

Dargatz, D.A., Traub-Dargatz, J. L. and Sangster, N. C. (2000) Antimicrobic and anthelmintic resistance. Veterinary Clinics of North America: Equine Practice 16, 515-536.

Mercier, P., Chick, B., Alves-Branco, F. and White, C.R (2001) Comparative efficacy, persistent effect and treatment intervals of anthelmintic pastes in naturally infected horses. Vet Parasitol. 99, 29-39.

African horse sickness outbreak resolved

The African horse sickness (AHS) serotype 1 outbreak was resolved on the 17th June 2014 just over 3 months after the initial veterinary control notice was released as a result of positive cases detected in the Porterville region of the Western Cape AHS Protection Zone. The outbreak was initially limited to the AHS protection zone but further cases eventually spread to the AHS surveillance zone. The initial containment zone was amended twice and eventually included the Porterville, Wellington, Piketberg and Tulbagh regions.

AHS cases in Robertson were detected in early April 2014 and during the outbreak this was treated as a separate event given the distance from Porterville and no proof of spread of infection via the movement of infected horses. We later however merged the two areas to include all cases under the same outbreak. Although the movement link between the two main areas of cases could not be made the clinical signs (or lack thereof), low mortality and low morbidity has been similar throughout.

In total there were 36 affected properties. We had 96 confirmed cases. To give an indication of the lack of clinical signs associated with this outbreak: the total number of deaths came to 12 giving a case fatality rate of 12.5%. The total number of sub-clinical cases made up 60 of the 96 cases, showing a sub clinical rate of 62.5%. We are still evaluating our census data but even if we just look at the number of horses on the 36 positive farms (which totalled 866 horses); the morbidity rate was only 11%. In reality this number is going to drop significantly once our full census data is captured for the out-break areas. The above figures are not what we would expect from an AHS outbreak as normally the morbidity, mortality and case fatality rates are significantly higher.

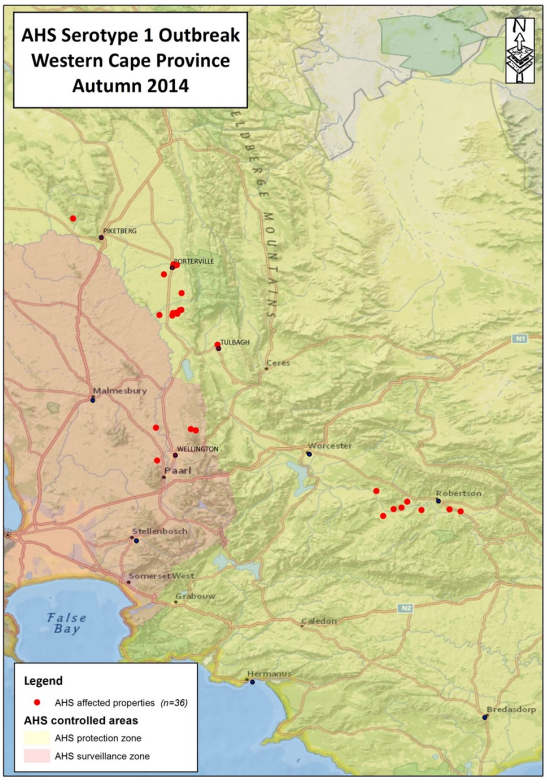
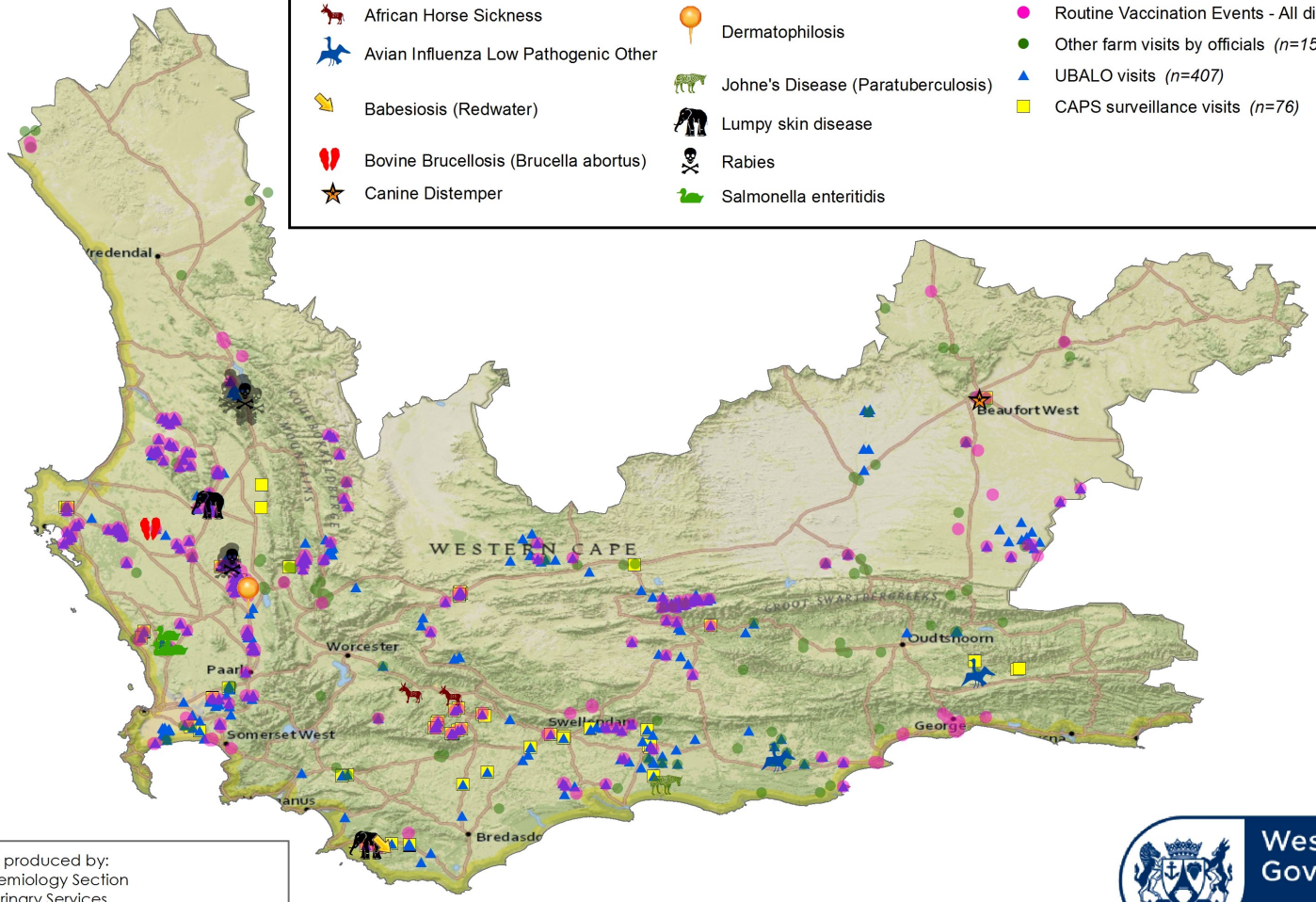


Figure 1: The spatial spread of AHS cases for the serotype one outbreak of 2014 within the Province.

There were four other areas within the Province where AHS cases have also occurred this season: Leeu Gamka, Murraysburg, Beaufort West and Uniondale. These (all non-AHS serotype 1) cases are not linked to the Protection and Surveillance zone cases.

Surveillance & Disease - June 2014



Map produced by:
Epidemiology Section
Veterinary Services
Western Cape Department of Agriculture
REPUBLIC OF SOUTH AFRICA

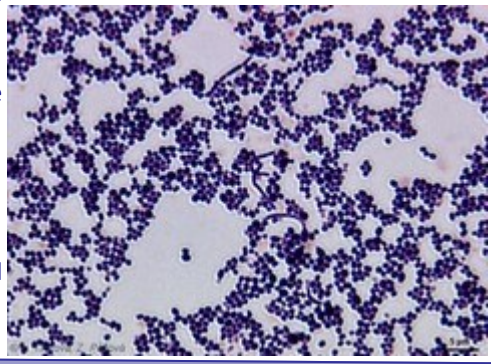
Western Cape Government
Agriculture

Outbreak events

- Two outbreaks of **lumpy skin disease** were reported: one in **Piketberg**, confirmed by a private veterinarian and the other in **Gansbaai**, where the farmer reported seeing only swelling of the joints without characteristic lumps.
- A serologically positive **H5 avian influenza ostrich** farm was identified in the **Oudtshoorn** area while a confirmed **H7N7 low pathogenic avian influenza** (again in ostriches) was identified in the **Albertinia** region after testing was performed surrounding the H5 case there.
- Two cases of **rabies** occurred in **bat-eared foxes** near **Clanwilliam** and **Piketberg**. Both foxes showed abnormal behaviour: one approaching the farmyard and attacking the farmer's vehicle, and the other appearing tame in a field in the middle of the day. Both foxes were killed on the farms without any human or animal contact.
- A sheep farm in the **Heidelberg** area was confirmed positive for **Johne's disease** after emaciation was seen in the ewes. The farm was placed under quarantine.
- Three broiler farms in the **Malmesbury** area tested positive for ***Salmonella enteritidis***

  ⇒Positive environmental swabs after broilers had already been slaughtered
  ⇒Positive sampling from carcasses at the abattoir
  ⇒Positive environmental swabs before slaughter: the infected house was processed last and carcasses sent to the frozen product line.

- A **bovine brucellosis** positive farm near **Moorreesburg** was identified after trace-forward of sales from a positive farm was performed. Another positive farm that had also bought cattle from the original positive farm was completely slaughtered out during June.
- A suspected case of **sheep scab** was investigated by the **Malmesbury** SV office. The case turned out to be one of dermatophilosis.



Dermatophilosis congolensis organisms

Total OIE logs

State Vet area	User	Total Logs
SV Malmesbury	michaelc	92
SV Malmesbury	hendrikh	78
SV Vredendal	irmis	51
SV Beaufort Wes	nitav	49
SV Malmesbury	elmienc	46
SV Malmesbury	janicac	43

Total UBALO logs

User	Total events
nitav	44
hendrikh	43
michaelc	42
maresaf	32
wynandf	30
janicac	25

Most rabies vaccinations performed

State Vet area	User	Total
SV George	eddiel	2304
SV George	Flipk	2277
SV George	carell	1681
SV George	ronniek	1539
SV George	Heidia	1444
SV George	johanb	1134

Epidemiology Report VOLUME 6 ISSUE 6

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Web based event logging AHT leader boards

Confidence interval - proportion

In this back page lab we are going to establish a confidence interval for a proportion. The background to this is that we are publishing a paper which describes the highly pathogenic avian influenza outbreak which occurred in the Klein Karoo in ostriches during 2011. One of our epidemiologic variables we want to include is a proportion of farms within our control area that ended up being positive. This will hopefully help future epidemiologists as a between farm prevalence is often used in working out a sampling frame for a surveillance strategy. To work out the proportion is very easy (positive farms divided by the population of farms at risk) However, in order to show how confident we are that our between farm prevalence is accurate we wish to add a 95% confidence interval into our proportion because we know that we sampled the majority of farms in the area and we believe our sample strategy was complete enough for an accurate estimate of between farm prevalence. The R code below is what we used to establish our 95% confidence interval of our between farm prevalence for high pathogenic avian influenza in the control zone we established in Oudtshoorn.

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

Websites where you can download requirements

Lab #2 requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- prevalence R package
- Internet connection
- JAGS - http://sourceforge.net/projects/mcmc-jags/

The code

```
#remember that you can just copy and paste the blue lines of data into your R Studio console
#we import the dataset which is a list of farms, their intermediate disease status and their final status based on whether
#they were within the control area we were evaluating. In the dataset I have omitted the column names to illustrate how
#to allocate column names to a dataset. Below we import the dataset and allocate it to a variable called x.
x <- read.csv('http://www.jdata.co.za/backpagelabs/backpagelabs_jdg_ci.txt', header=F)
#set the column names - first column is a reference number per farm, intermediate is the TRUE/FALSE status of disease
#and final status is the disease status of only those farms in our control area
colnames(x)<-c("Ref","Intermediate","FinalStatus")
#now view the top and bottom 6 rows of data in the x variable we have allocated the data to
head(x)
tail(x)
#note that the last two farms, while positive were no in our control area, so now we must exclude them from our analysis
#we use the na.omit function for this purpose and we make a new data set called finalstatuslist
#PLEASE NOTE - the way this seems to work well in R is if the empty data is represented in your source data as NA (not N/A
#or by a blank entry)
finalstatuslist<-na.omit(x$FinalStatus)
#lets see how many rows of data were in our original imported set - should be 248 farms
summary(x)
#now we look at how many rows are in our data where NA has been omitted - should be 246 farms
length(finalstatuslist); summary(finalstatuslist)
#for the denominator for prevalence we need the population at risk (PAR) so lets make this variable
PAR<-length(finalstatuslist)
PAR
```

```
#so our total population at risk is 246 farms
#now we need the number of positive farms for our numerator data
POS<-sum(finalstatuslist == "Positive")
#this code essentially sums the events that are Positive (each positive is taken as 1) in our final data set
POS
#so our number of Positive farms totals 40
#a basic prevalence is therefore calculated by:
POS/PAR
# now what this lab is for - the 95% confidence interval. An easy (there are others) way of getting confidence interval
#data for a proportion is by using a function propCI from a package called "prevalence"
#note that this requires the “prevalence” package but also you'll need to install a program called JAGS from the internet
#install it from the website listed under LAB REQUIREMENTS.
#if you haven't installed the prevalence package yet then type this into your R console
install.packages("prevalence")
#now to load the newly installed package
library(prevalence)
#Now for working out the confidence interval - we use the function propCI
propCI(x=POS,n=PAR)
# Here the positive total is the POS data variable we made, the total sampled is the PAR data variable. So you'll see that
#5 different CI's are given. We wont go into it here but they all have differing reasons for being used. Because our
#sample size is relatively big the different CI methods have very similar CI's of between 11.64% and 21.47%.
#for our research we would use the WALD method so I will be using the 4th row of information
#lets try to isolate the row of info we will be using
propCI(x=POS,n=PAR)[4,]
#in summary - x = 40 and is our positive farms, n = 246 and is our population at risk, p = prevalence of 0.1626 (so 16.26%) with a CI of between 0.1164 (so 11.6%) and 20.87%.Our confidence interval confidence level is 95% which is a standard but it can be changed if you wish
#for our publication we will say that the between farm prevalence of highly pathogenic avian influenza within the controlled area was 16.26% (95 Conf: 11.6%-20.87%)
```

The output

```
  x   n         p        method level     lower     upper
1 40 246 0.1626016 agresti.coull  0.95 0.1214537 0.2141249
2 40 246 0.1626016         exact  0.95 0.1187775 0.2147668
3 40 246 0.1626016      jeffreys  0.95 0.1205557 0.2125299
4 40 246 0.1626016          wald  0.95 0.1164901 0.2087131
5 40 246 0.1626016        wilson  0.95 0.1217406 0.2138381
```

```
  x   n         p method level     lower     upper
4 40 246 0.1626016   wald  0.95 0.1164901 0.2087131
```

Citations

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/

Brecht Devleesschauwer, Paul Torgerson, Johannes Charlier, Bruno Levecke, Nicolas Praet, Pierre Dorny, Dirk Berkvens and Niko Speybroeck (2013). prevalence: Tools for prevalence assessment studies. R package version 0.2.0. http://cran.r-project.org/package=prevalence

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
July 2014
Volume 6 Issue 7

Surveillance Reports - CAPS AND Avian Influenza JDG

CAPS

Introduction

In January 2014 we launched our CAPS surveillance program (www.elsenburg.com/vetepi/epireport_pdf/January2014.pdf) which targets piggeries (both commercial and non-commercial) and non-commercial poultry farmers. The surveillance program is split into a clinical surveillance program for all farm visits as well as a formal, targeted surveillance program looking to serologically survey a specific number of non-commercial poultry farmers for Avian Influenza (AI). We set targets per magisterial districts for the number of farms that should be registered based on our historical data. We planned to attempt to reach these targets within the year of CAPS starting but this is very dependant on whether the farms still exist so it more likely that 18 months will be needed before we are close to the accurate registration of the farms and their categories.

Visit report

Officials have in total visited and registered 380 farms onto the CAPS database up till the date of this report. We have 118 pig farms, 170 chicken farms and 92 chicken and pig farms logged - see figure 1 below. The pig farms total about 21% of our target for the year but there are still 19 areas which have not yet logged a farm. These areas have been identified and will be targeted for the following 6 months. The chicken farm visits account for about 25% of our annual target with 12 areas not yet registering a farm. Our formal DAFF avian influenza surveillance program in non commercial properties has merged nicely with the CAPS system. The DAFF target is 50 farms per province per 6 months. Our officials sampled 71 farms in total for this surveillance, so well above the 50 required by DAFF.

Results

To recap: CAPS surveillance is simplified to answer 2 basic questions per visit: 1. Has the farmer experienced any significant clinical disease on the property over the past 6 months and secondly does the official notice any clinical disease on the farm that could be as a result of an infectious disease? If the answer is yes to any of these questions the technician in consultation with his/her State vet decides whether to sample/investigate further.

Historical disease events

Chicken farms

199 visits were performed and on 193 occasions farmers indicated that they had had no experience of any significant clinical disease on the property within the last 6 months. Four of the 6 events were followed up with sampling. One of the historical events had occurred in the previous year and avian influenza (AI) samples had been taken with negative results in 2013 so no further samples were taken. Another of the 6 historical events did not have samples taken based on a decision of the AHT involved with or without consultation with his/her State vet.

Of the 6 events two were reports of death in chickens with clinical signs that were consistent with Newcastle disease (NCD). Three reports were of chickens that had "just died" with either showing weakness or not showing signs of disease. One report was of a case of confirmed pox in chickens that had been diagnosed at the Stellenbosch Provincial Veterinary Lab (SPVL). Table 1 below lays out the results of follow up investigations for this category.

CAPS ID	Diseases tested for	Final Diagnosis
114	NCD, AI	NCD positive, AI negative
155	Fowl Pox	Fowl Pox positive
189	AIV	Negative (NCD not tested)
266	AIV, NCD	Negative

Table 1: CAPS results - Historical events - poultry

Pig farms

166 visits were performed and 163 farmers indicated that they had had no experience of any significant clinical disease on the property within the last 6 months.

Of the 3 events two were still ongoing and are included in the current disease events section below. The last of the events the farmer had been losing pigs after separation of the sow and introduction to a new feed. The weaners were showing signs of nervous disorder but samples were not taken.

Current disease events

Chicken farms

199 visits were performed and on 195 occasions the technician indicated that there was no evidence of a suspect infectious disease on the property in the poultry.

Of the four occasions were clinical disease was evident samples were taken on 3 occasions as a result of the suspect disease – one disease suspected was a flea infestation and samples were not taken in this case. 2 of the three sampled clinical events were suspect for NCD/AI and one was suspect for fowl pox.

CAPS ID	Diseases tested for	Final Diagnosis
25	NCD, AI	NCD positive, AI negative
147	Fowl Pox	Fowl Pox positive
207	NCD, AIV	Negative

Table 2: CAPS results - Current events - poultry

continued on Page 2

Pig farms

166 visits were performed and on 158 occasions the technician indicated that there was no evidence of a suspect infectious disease on the property in the pigs.

Of the 8 events two were NOT sampled as sarcoptic mange and mastitis were diagnosed by the technician. Of the 6 remaining events all were sampled as a result of undiagnosed death/illness.

CAPS ID	Diseases tested for	Final Diagnosis
271	PRRS	Negative
52	CSF, PRRS	Negative
71	PM	Post weaning *E. coli* enteritis
77	PM	Oedema disease
92	PM	Multiple possibilities: Mycotoxicosis, OPP, Cocklebur poisoning, Oedema disease, *A. hydrophilia* infection
148	PM	Intussusception

Table 3: CAPS results - Current events - pigs

DAFF Avian Influenza Surveillance - Non Commercial Poultry

For the first six months of the year 1269 serum samples were taken in the DAFF NAI (notifiable AI) surveillance program from 71 non-commercial chicken farms. Fourteen farms in total returned results that were positive on AI ELISA (36 positive samples in total) but no cases were H5 or H7 HI tests positive (a total of 59 unique HN HI combinations were tested from the 39 positive ELISA samples). With the poultry blood there is often not enough blood to perform H6 HI testing and in these 6 months no H6 HI was tested against for this reason.

Figure 1 shows the location of the farms logged on the CAPS database as well as the 71 locations where we took samples for the formal DAFF AI surveillance program and then the places where ELISA positive results (with negative HI) were identified.

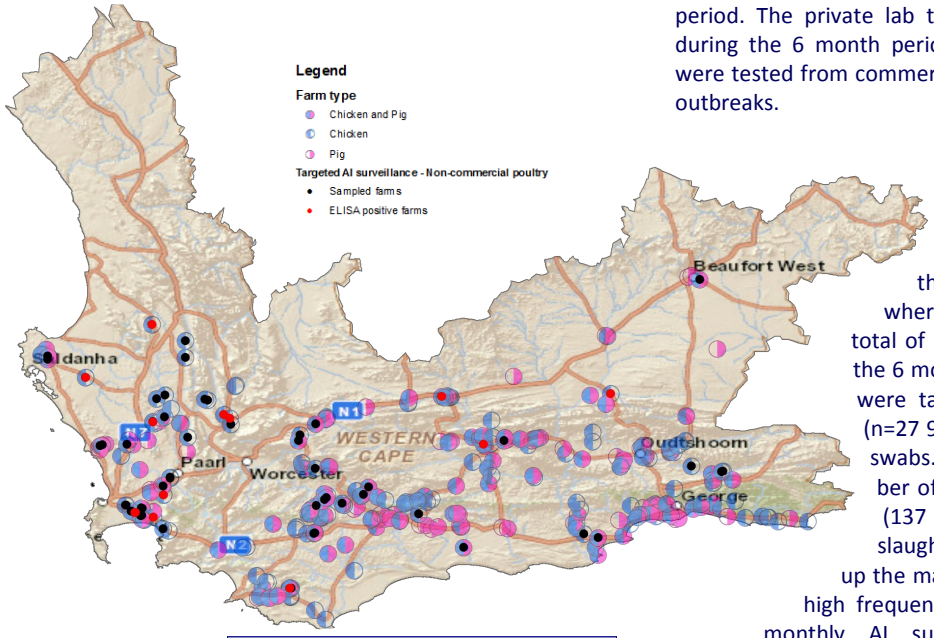


Figure 1: CAPS visits and DAFF NAI surveillance

OTHER AVIAN INFLUENZA SURVEILLANCE

Introduction

As discussed in previous reports the avian influenza surveillance within the Province is targeted at 3 major sectors - commercial poultry, non commercial (backyard) poultry and ostriches. We have discussed before the significant numbers of samples tested in the ostrich sector compared to the other two (January 2014 report) and the first 6 months of the year was no different. The non commercial surveillance has been discussed under the CAPS section.

Commercial poultry

The commercial poultry totals are not 100% accurate as we use data from the Stellenbosch Provincial Veterinary lab (SPVL) and there are producers that test at other institutions. We have received some data from private sources that do testing but this is aggregated data and thus only totals are available (no geographic or farm level data). The SPVL data we have showed 113 sampling events from all commercial farms totalling 3314 samples that were all tested using an ELISA test. A total of 41 ELISA tests were positive - all with negative HI results.

The private lab data as mentioned is aggregated and at the time of writing the positive ELISA count was unknown although all results were HI negative as positive HI results are reported to the regional State Vet and we have not had reports during this period. The private lab tested 5023 samples using the ELISA during the 6 month period. In total therefore 8337 samples were tested from commercial flocks for AI with no confirmed AI outbreaks.

Ostrich sector

We have a close to 100% accurate ostrich sector surveillance as we capture this information for our use throughout the year. Figure 2 shows where surveillance was performed and a total of 284 unique farms were sampled over the 6 month period. A total of 32 035 samples were taken with the majority being serum (n=27 997) and the remainder being tracheal swabs. Surveillance is performed for a number of reasons with samples for movement (137 farms, 12395 samples) and pre slaughter (138 farms, 9164 samples) making up the majority of samples tested for AI. Other high frequency sampling is through the formal 6 monthly AI surveillance program performed by

continued on Page 3

technicians (255 farms, 9671 samples) and outbreak investigation sampling (20 farms, 3570 samples).

The one interesting (and good) thing to note with the ostrich surveillance was the lack of overlap in reason for sampling between the slaughter and movement classes. We are advising the industry to be as unidirectional as possible in moving ostriches within the industry - i.e. to move birds between production specific farms (like chick raiser to slaughter farms) but not from farm to farm within the same production category (like slaughter farm to slaughter farm). The sampling analysis shows that this seems to be happening. Sample reasons are given for each sampling event and these can overlap - for instance a farmer could sample for movement and for slaughter and use negative results for either event. This did not seem to occur though: of the 21 559 samples taken for either slaughter or movement only 2156 (10%) were used for both.
Having said this though there is definitely room for improvement to make the surveillance more financially sustainable. Overlap between reasons for sampling should occur if appropriate. For instance: if a technician samples for a 6 monthly test that test should be used as a slaughter or movement test if possible and for this to happen improved communication between the sampling officials and the farmers must occur, preferably through the South African Ostrich Business Chamber (SAOBC). In the 6 month period under review only 18% of samples were taken for more than one reason and given that 30% of sampling was for 6 monthly surveillance one would hope that this number could improve.

Ostrich AI surveillance invariably brings with it positive results and this period under review was no different. A total of 7 farms were classified as positive for Avian Influenza. We had 1 unidentified virus where an H or N type could not be confirmed. 3 farms tested positive to H5N2 AI in the review period although their pathogenicity could not be elucidated since only one of the three was PCR positive on follow up testing and while the pathogenicity has not been definitively confirmed its likely to be LPAI (low pathogenic AI).

Three farms were H7 AI positive. Two of these were associated with a LPAI H7N7 virus in the Southern Cape (one positive and another determined positive on serology but through trace forward procedure from the confirmed LPAI farm).

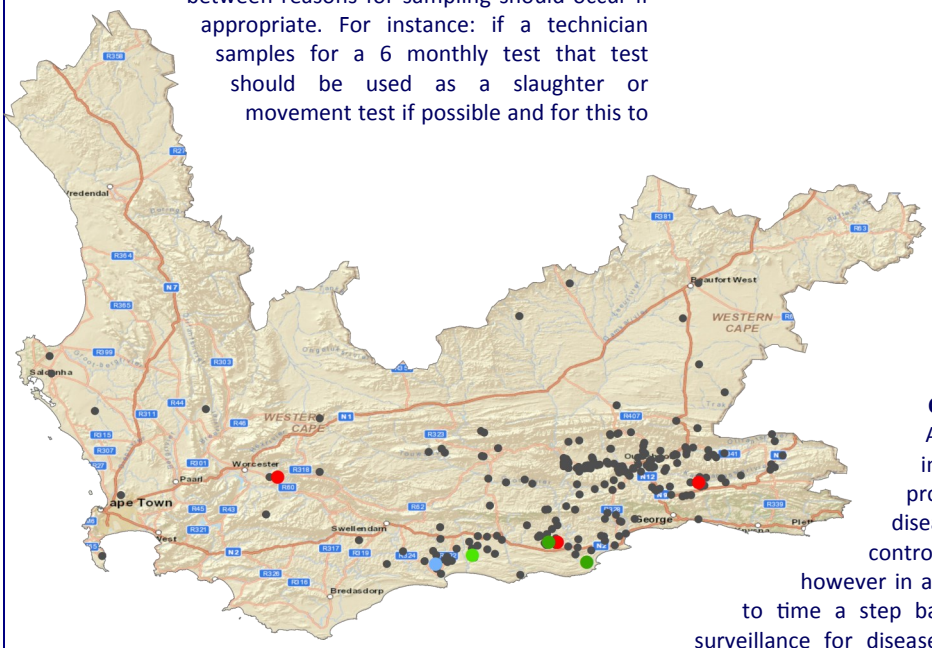


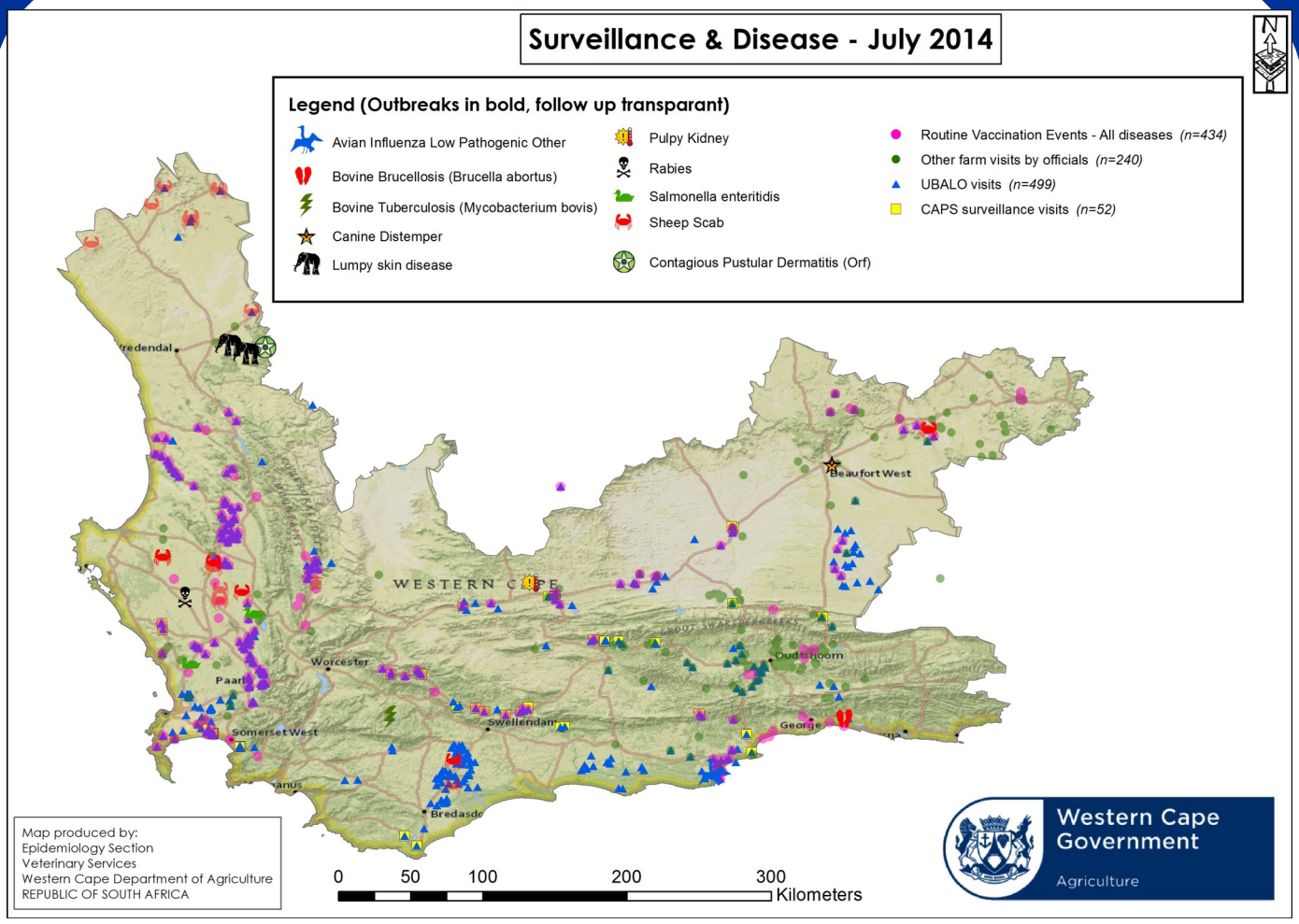
Figure 2: Ostrich farm AI surveillance and positive findings - Jan to June 2014

Conclusions

Avian Influenza contributes to a very intense and detailed surveillance program within our Province and often a disease's importance can be measured by its control and surveillance effort. It is crucial however in any surveillance program that from time to time a step back is taken to evaluate whether the surveillance for disease warrants the financial and logistical impact on both Government and industry. I think that avian influenza, particularly in ostriches needs to be re-evaluated and alternative forms of surveillance and surveillance techniques need to be incorporated to make this system more sustainable.

Welcome back Marna!

Dr Marna Sinclair has technically been back with the Department of Agriculture for well over a year now but she has only recently been posted back from George to our head office to take an active role in the Epidemiology Section. She has been a co-editor on this report for some time now and we are very glad she is back at Elsenburg and are looking forward to her making an impact within the field she has been trained and worked extensively in.



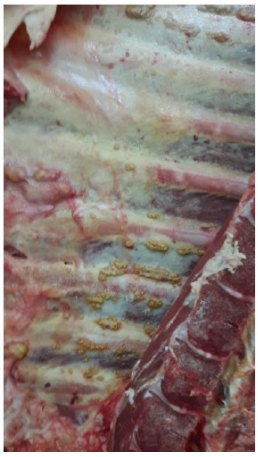
Outbreak events

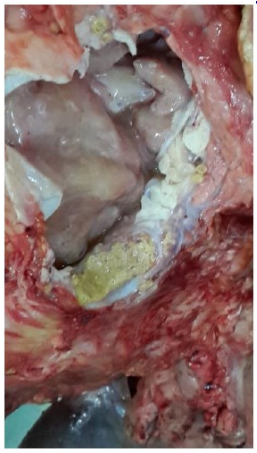
- **Sheep scab** season in in full swing with outbreaks in several flocks in the **Swartland**, **Namaqualand**, **Murraysburg** and **Overberg** areas. Officials are in the process of treating all affected sheep and performing tracing to identify in-contact animals.
- **Lumpy skin disease** outbreaks occurred in two small cattle herds close to **Vanrhynsdorp**. As this is an uncommon disease in the area and very few cattle are farmed here, no vaccine is available. Vaccine has now been ordered and farmers will be encouraged to use it once it arrives.
- Trace forward procedures from a **low pathogenic H7N7** positive ostrich farm found another positive farm in the **Mosselbay** region. The farm tested only positive on serology and viral circulation had stopped by the time that officials were aware of the situation.
- A **bat-eared fox** showing abnormal, tame behaviour was killed by farm workers near **Moorreesburg**. The carcass tested positive for rabies. Dogs and cats on the surrounding farms were subsequently vaccinated.
- Two positive lab results for ***Salmonella enteritidis*** from broiler farms were reported from the area around **Malmesbury**. The first case was identified during routine carcass testing at a poultry abattoir and the product was recalled. The second was a box-liner from a shipment of day-old broiler-breeder chicks from a *Salmonella* positive grandparent farm in the North West province. The birds are currently being treated with enrofloxacin.

continued on Page 5

Outbreak events

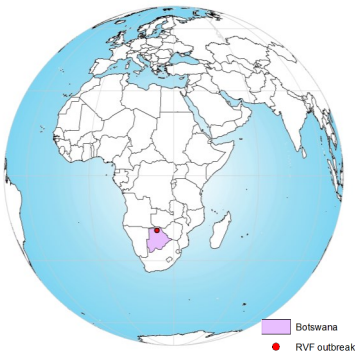
- Trace-forward from a ***Brucella abortus*** positive farm near **Clanwilliam** (identified in April 2014) resulted in the discovery of another positive cattle farm which had bought in cattle in 2012 and 2013. The farm has been quarantined and positive cows will be slaughtered, but the situation is worrying, as there are potentially more infected herds that have not yet been identified.
- Lesions highly suspicious for **bovine tuberculosis** were found in a Friesland carcass slaughtered in Paarl. Mycobacteria were identified on histology, but a culture is still underway at OVI. After much detective work, the farm of origin was traced to a speculator in McGregor. Unfortunately, the speculator buys cattle from many different sources and apparently does not keep records of his purchases. The remaining cattle on his farm were tested using the comparative intradermal test. There were six (27%) avian reactors, but no bovine reactors.





Highly suspect TB lesions found in a bovine carcass in Paarl

- An outbreak of **orf** occurred in a herd of goats near **Vredendal**, with a morbidity rate close to 100%.



Beyond our borders - RVF Botswana

Botswana reported a case of Rift Valley Fever during July that occurred in the northern parts of their country. The following is a quoted excerpt from their notification to the OIE.

"Two (2) cattle aborted from one crush pen following heavy rains from December 2013 to April 2014. The affected population has never been vaccinated against Rift valley fever. The affected area is generally hot with mild temperatures in winter. Mosquitoes and other vectors are in abundance in the area. There have been no other abortions reported since. Epidemiological investigations are continuing..."

Total OIE logs

State Vet area	User	Total Logs
SV Malmesbury	hendrikh	116
SV Malmesbury	janicac	52
SV George	attiee	51
SV George	carell	48
SV Malmesbury	elmienc	46
SV George	heidia	39

Total UBALO logs

User	Total events
hendrikh	65
Rudolfn	51
wynandf	46
wernerg	35
judithg	32
nitav	29

Most rabies vaccinations performed

State Vet area	User	Total
SV Boland	judithg	500
SV Malmesbury	elmienc	452
SV George	carell	403
SV Malmesbury	hendrikh	316
SV Beaufort Wes	louwk	274
SV Malmesbury	janicac	264

Epidemiology Report VOLUME 6 ISSUE 7

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Web based event logging AHT leader boards

Freedom from disease survey

In this back page lab we are going to do something a little different, using an R package with a graphic user interface (GUI). For the majority of this approach, we do not have to type code into the R console, but can work with a user-friendly "calculator" developed by the authors of the package. The package "FFD" is designed for designing two-stage freedom from disease surveys. In this example, we are going to work with the hypothetical situation that an outbreak of PRRS has occurred in the Western Cape. After controlling the outbreak, we want to make sure that the disease has been eradicated from the province by means of a survey to show freedom from disease in the pig population.

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

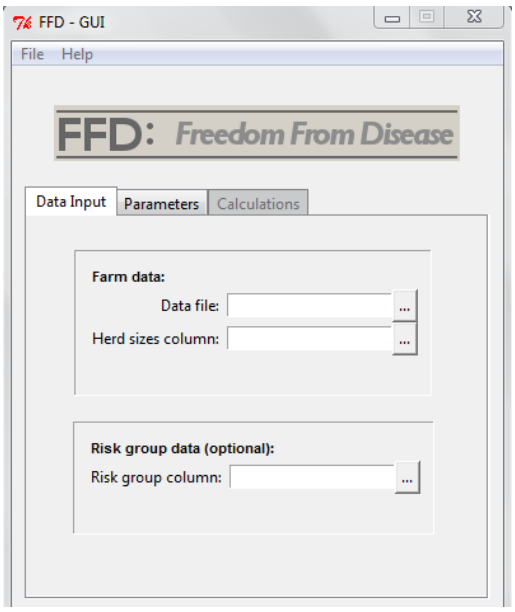
Websites where you can download requirements

Lab #3 requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- FFD R package
- Internet connection

The code

```
#First we need to install the Freedom From Disease package for R
install.packages("FFD", repos="http://R-Forge.R-project.org")
#Load the FFD package
library(FFD)
```

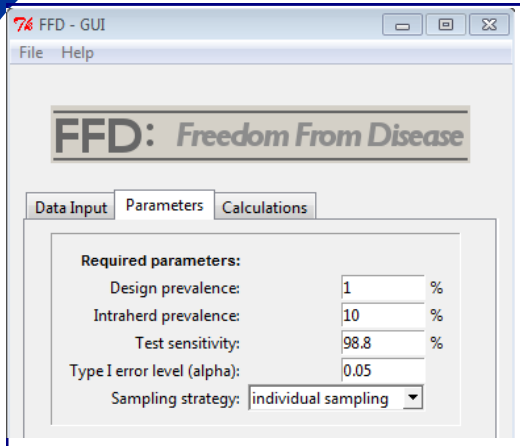



```
#Now we will activate the graphic user interface of the FFD package
FFD_GUI()
# A new window should appear.
#Using this graphic interface, the parameters for the survey can simply be filled in in the boxes.
#We start by loading the farm data we have for Western Cape pig farms.
#We have put the example file online and you can download it by going to the following URL in your internet browser: http://www.jdata.co.za/backpagelabs/backpagelabs_lvh_ffd.csv
#Save that file where you can find it again and then select it after clicking "…" next to "Data file"
```

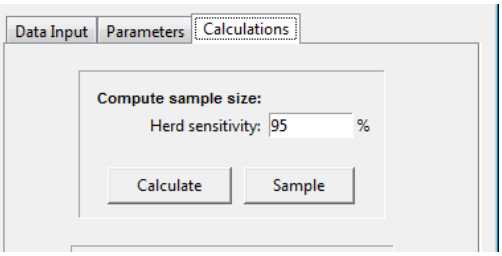
NOTE: Any farm census data may be uploaded into this box, as long as it is in the European .csv (semi-colon delimited) file format. MS Excel files can be saved in this format by doing the following:

1. *In Excel Go to File -> Options -> Advanced -> Editing*
2. *Uncheck the "Use system separators" setting and put a comma in the "Decimal Separator" field.*
3. *Save the file in the .CSV (comma delimited) format*

```
# Then click "…" next to "Herd sizes column" and select the PigPop column, this is the heading of the column which contains the numbers of animals in each herd.
```



#Now click on the Parameters tab and fill in the following values:
Design prevalence: 1% (aka between-herd prevalence: the minimum expected prevalence of positive herds, as recommended by the OIE for PRRS)
Intraherd prevalence: 10% (aka within herd prevalence: the minimum prevalence of diseased animals we expect to find in a PRRS-positive herd)
Test sensitivity: 98.8% (Using the IDEXX PRRS X3 Ab test)
Type I error level: 0.05 (meaning we are 95% confident that there is freedom from disease if the result of the survey is negative)
Sampling strategy: individual sampling (as opposed to limited sampling where we limit ourselves to a specific number of animals to sample per herd)



#Now click on the calculations tab and fill in 95% in the "Herd Sensitivity" box under "Compute sample size". We have chosen a high herd sensitivity because the high sensitivity of the diagnostic test implies that there is a low chance that a positive herd will not be detected positive in the survey. That means that for each herd that is being tested we say we have a 95% chance of finding the disease (=confidence level). There are more sophisticated methods of calculating herd sensitivity, but for simplification of this example we are using an estimated value.

#Click Calculate
A new window will appear with your required sampling parameters. At the bottom of the output window, you will find the following result (see left -below):

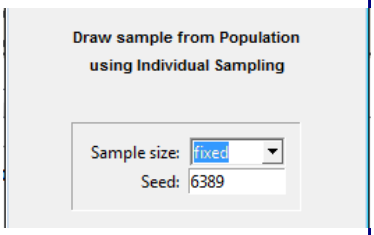
```
Sampling strategy:
------------------
Herd sensitivity:                          95.00 %
Number of herds to test:                   288
Expected total number of animals to test:  3317.91
No data on expected total costs of the survey.
```

Here we are given a sampling strategy using the parameters we entered. 288 randomly selected herds in the province should be sampled. Within each herd, the lookup table can be used to determine how many individual samples should be taken from each herd based on herd size.

```
Lookup table for the number of animals to test per herd:

   Herd size   |  No. of animals to test
 ---------------------------------------
   1 - 13      |        entire herd
   14 - 18     |             14
     19        |             15
     20        |             16
   21 - 22     |             17
     23        |             18
     24        |             19
   25 - 32     |             20
     33        |             21
   34 - 42     |             22
   43 - 44     |             23
   45 - 62     |             24
   63 - 73     |             25
  74 - 103     |             26
  104 - 163    |             27
  164 - 344    |             28
 345 - 12050   |             29
```

To get a list of farms to sample that is randomly selected you can click on the "Sample" button. A small box with a sampling strategy of "fixed" or "dynamic" comes up. We want to sample exact number of herds required (288 in this case) so we select fixed and then click on "Sample" (the "Seed" refers to the random number generator - don't worry about it)- you are prompted to save your file showing which farms to sample and the number of pigs present on each farm. You can then use the lookup table as discussed above to choose the number of animals to sample per farm.



This tool has several other functions available, including risk-based sampling plans and calculations of the cost of the survey. We would like to encourage you to explore these other possibilities using your own data, and let us know how you manage.

References

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Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
August 2014
Volume 6 Issue 8

Southern African Society of Veterinary Epidemiology and Preventive Medicine - Annual Congress - Aug 2014

The 12th annual SASVEPM congress was held in Port Elizabeth during August. This congress is becoming an important meeting point of members of the State veterinary services community (both provincial and national) and research institutions like the University of Pretoria and the ARC OVI (Onderstepoort Veterinary Institute). The congress provides a platform for researchers with a wide range of interests and this was particularly evident this year.

The continuing education speaker was world renowned veterinary epidemiologist Prof Dirk Pfeiffer from the UK. He gave a total of 5 presentations on the topics of: Spatial analysis in Veterinary Epidemiology, Antimicrobial resistance in animals, a systems perspective of avian influenza and then a final talk on animal health decision making in a one health context. What we enjoyed about the talks was the global perspective that he portrayed, so often we can be so focussed on the local work we are doing that we forget the wood for the trees. From an epidemiologic view point there is a lot going on globally and with a global community drawing closer through the use of technology and social media it is important that we as epidemiologists are aware of this.

One of the major focusses of the congress kept returning to the brucellosis status of South Africa and the challenges around surveillance, laboratory testing and analysis of results. There was a pre-congress workshop which was very well attended and while none of the editors of this report were present it sounds like it was a very informative 2 days. Brucellosis in the Western Cape is definitely on our radar with more cases being diagnosed in 2014. The latest case we have is in the George area .

The winner of the best presentation went to Dr Darryn Knobel from the University of Pretoria. He presented on the control of rabies in dog populations and in of particular interest the use of the '70% coverage ' theory which implies that where a 70% vaccination coverage is attained through vaccination of dog populations then the population coverage will always remain above 40% and the R_o of a rabies outbreak in said population will be below 1 and will ensure no outbreak continuation can occur. The important thing he stressed however was that this protocol can only work where regular yearly campaigns are held to maintain a population immunity of 40% through the annual 70% coverage.

Dr Darryn Knobel (left) receives the best presentation prize from Dr Alan Kalake, president of SASVEPM

It was very good to see a number of young researchers presenting their work, including some non veterinarians. In particular there was a presentation from Ms. Kemeiloe Malokotsa, a technician from ARC/OVI who is supervised by Dr Evelyn Madoroba. Kemeiloe presented on the "*Virulence profiles and antimicrobial resistance patterns of Escherichia coli among diverse animal species in South Africa*" Another excellent presentation was by Dr Laura Roberts, a masters student from the University of Pretoria, who presented on a very informative technique called multiple criteria decision analysis which helps convert subjective data into more useful quantitative data.

These presentations will hopefully stimulate all young state vets and technicians to consider formally publishing the results of the work that they do. SASVEPM does provide a platform for research reporting in South Africa. The content is scientific but the criteria are wide enough that almost all epidemiologic interests are catered for.

Both Dr Lesley van Helden and Dr John Grewar remain involved in SASVEPM and remain on the executive committee. John was also the recipient this year of the Willie Ungerer Memorial Epidemiology Prize presented annually at the SASVEPM AGM.

John receiving the Willie Ungerer Memorial epidemiology prize from Dr Kalake

As always the editors of this report are grateful to the Western Cape Dept. of Agriculture who allow them to attend important meetings like this.

Southern African Society for Veterinary Epidemiology & Preventive Medicine

Correcting our PCR prevalence when testing pooled samples

Introduction and Background

During the highly pathogenic avian influenza outbreak in ostriches in 2011 we received advise from the OFFLU (OIE/FAO Influenza) team that visited us to consider including the capture of individual bird serology results and also make use of prevalence curves to help in the analysis of positive avian influenza farms. We implemented both of these systems into our ostrich database structure. The former (individual bird result capture) almost immediately proved too data capture intensive with the limited data capture personnel we have in our section and this was stopped about a year after starting. The latter project however remained and has been the basis of much of our analysis since November 2012. See Fig 1 below for an example of what we graph automatically from the database

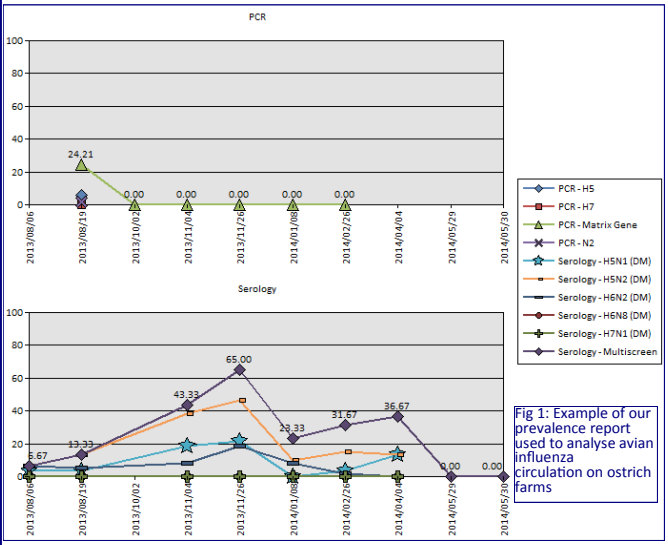


Fig 1: Example of our prevalence report used to analyse avian influenza circulation on ostrich farms

when evaluating farms. There are two sections to the graph - a PCR prevalence section and a serology prevalence section. The graph shows the tested prevalence for each sample date (x-axis) for the varying AI subtypes tested and for quick analysis we label the matrix gene PCR prevalence (green line in the PCR graph) and the Multiscreen ELISA results (purple line in the serology graph) To illustrate: in the example above we saw a PCR prevalence which immediately dropped to zero after the initial positive result with a corresponding rise in serological prevalence as one would expect. Shortly after the drop in serological prevalence about 4 months after the event we again saw a mild increase in serological prevalence, even in the face of negative PCR results. In this example this farm remained under quarantine until we were sure the serology had stabilised so only in late May did we lift quarantine.

Using pooled PCR prevalence

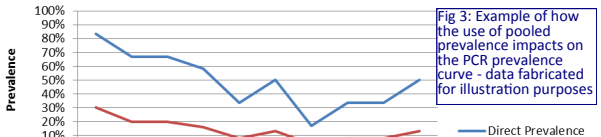
One of the downsides of our system since 2012 has been the fact that we are overestimating the PCR prevalence. In the field tracheal swabs are taken and pooled 5 to a pool and sent for testing. We had been working our prevalence out directly by dividing the number of positive pools by the total pools sampled - so if 6 pools were positive of 12 pools sampled we worked that out as a 50% prevalence. In reality though it's theoretically possible that only 1 swab per positive pool in this case is positive - so from the 60 samples taken in total its possible that only 5 are positive - this equates to a prevalence of 5/60 = 8.3% - a significant difference to the 50% we had been using. Dr Sinclair recently came across an equation (see Fig 2) which takes into consideration pooled samples in establishing a projected

$$p = 1 - (1 - x/m)^{1/k}$$

- p = estimated prevalence,
- k = pool size,
- m = the number of pools tested and
- x = the number of positive pools.

Fig 2: The pooled prevalence estimate equation we have now incorporated into our analysis. The equation assumes a fixed pool size (in our case 5) and a perfect test - i.e. 100% sensitivity and 100% specificity

individual prevalence. We have now updated our reports to incorporate the pooled prevalence estimates for the PCR testing. While there are a number of options with which equation to use we have decided on the more simple option which assumes that the PCR is 100% sensitive and specific and that the pool size is always 5 - which in our case is almost always so. We now believe we have much more accurate representation of the PCR prevalence on which to make decisions. Figure 3 below shows the impact of using the pooled prevalence. This data is fabricated and we have plotted what we would have used in the past compared to the now pooled



Week of Outbreak	1	2	3	4	5	6	7	8	9	10
Swab pools tested	6	12	6	12	12	6	12	18	12	6
Positive tests	5	8	4	7	4	3	2	6	4	3
Direct Prevalence	83%	67%	67%	58%	33%	50%	17%	33%	33%	50%
Pooled Prevalence	30%	20%	20%	16%	8%	13%	4%	8%	8%	13%

Fig 3: Example of how the use of pooled prevalence impacts on the PCR prevalence curve - data fabricated for illustration purposes

prevalence results. The table below the graph shows the information used to draw both graphs. It becomes quite clear that the new method results in lower prevalence but also the graph flattens out somewhat and sharp spikes in prevalence as seen in week 6 above will not hold the same significance and in general the pooled prevalence gives a truer perspective of the situation.

More Info

If you would like to read up more on pooled prevalence estimates then view the following paper: *Cowling DW, Gardner IA, Johnson WO, 1999. Comparison of methods for estimation of individual-level prevalence based on pooled samples. Prev. Vet. Med. 39: 211-25.* AusVet have also dedicated a website with pooled prevalence calculators for a variety of uses which may be of interest - view it at http://epitools.ausvet.com.au/content.php?page=PooledPrevalence. Included in the webpage are ways to estimate sample sizes if you are looking to do a prevalence survey using pooled samples.

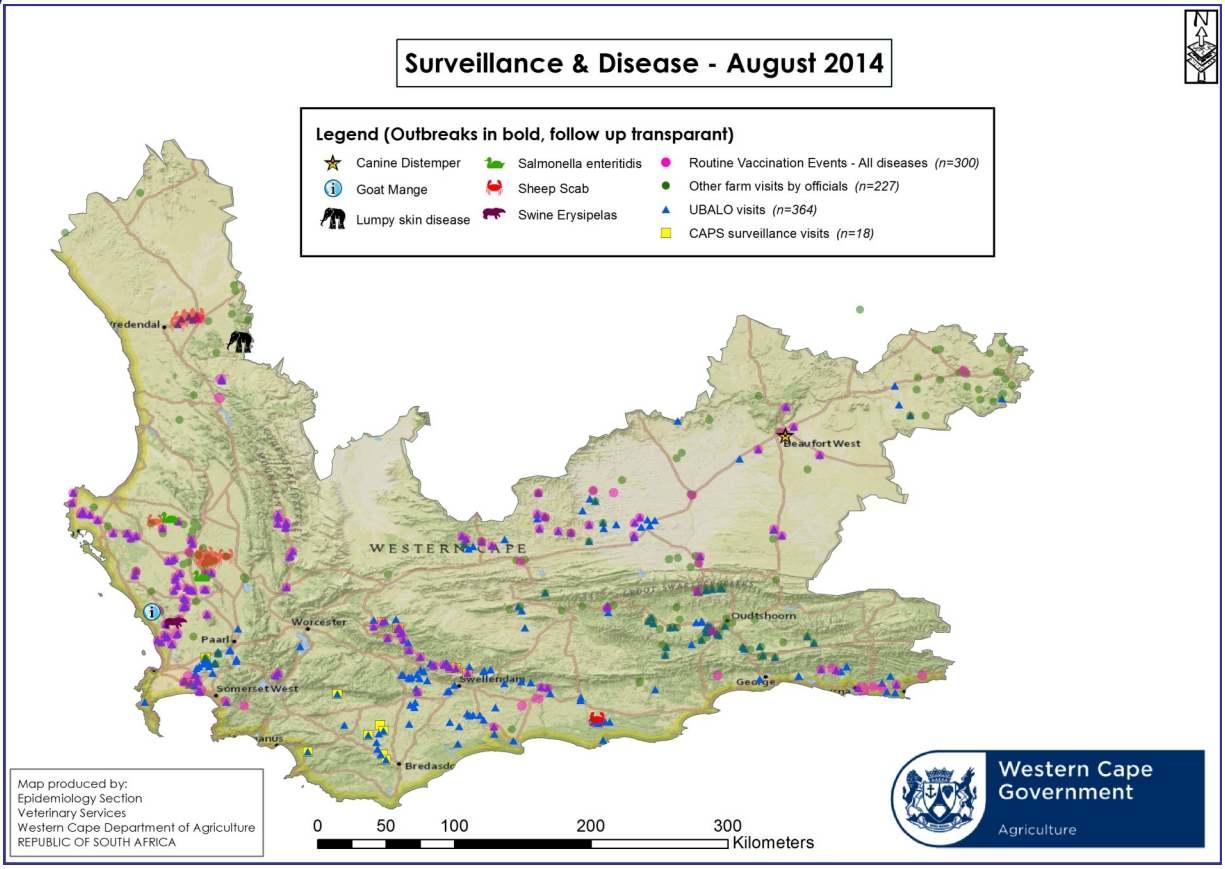


Fig 4: Surveillance and disease map of the Western Cape for August 2014

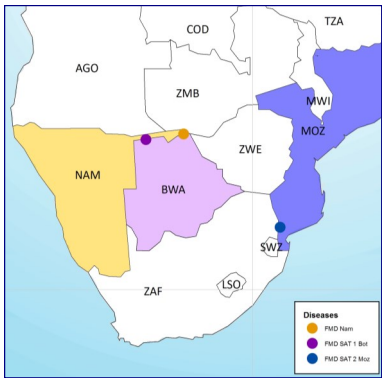
Outbreak events

- **Lumpy skin disease** cases continue to be reported from the field. Two cases (not shown in Fig 4 as it occurred in July but detected and reported on in August) occurred in the **Piketberg** and **Eendekuil** areas respectively where 1 of 6 cows and 1 bull in a herd of 60 showed typical lesions associated with the disease. Another clinical diagnosis was made in the **Vanrynsdorp** area where a cow showed typical skin lesions on the neck, udder and body. It seemed like the disease was still in the beginning stages. The farmer does not routinely vaccinate given that the disease occurs rarely in this area and cattle farming is limited there. In this case all clinically affected animals were isolated and treated with long acting antibiotics and treated symptomatically. Vaccination will be performed when there is vaccine available.
- Another **Johnes** case has been reported from the **Swellendam** area (also not in Fig 4 as the case was confirmed in April) The farmer had been vaccinating between 2006 and 2009 but since then had not vaccinated. The disease was confirmed using an ELISA with clinical signs of weight loss and emaciation present on the farm. The farmer is not a breeder and sheep only leave the farm to be slaughtered, however the farm has been quarantined to prevent any spread to other properties.
- Another 2 cases of ***Salmonella enteriditis*** have been detected in the Malmesbury State vet area. One case in **Koringberg** involved positive results from boot swabs from one house on a broiler breeder farm. The other case (also on a broiler breeder farm) occurred near **Malmesbury** town after chick box liners were tested from a consignment arriving from the North West. Follow up samples from the Malmesbury farm itself have since tested negative and there are no signs of abnormal mortalities. The farm will remain under observation. The placements from the infected origin farm were treated with Enrofloxacin for 5 days after placement. Before the placed birds start laying they will also be treated again. Contact with the State and private vet from the North West has been made.

continued on Page 4

Outbreak events continued

- As can be seen in Fig 4 sheep scab continues to remain a major part of veterinary services focus. **Riversdale** and **Stillbay** remain affected in the George State vet area and a previously affected (2013) farm in the **Vanrhynsdorp** area has once again shown positive cases. **Malmesbury** State vet is still performing follow up treatments on ongoing outbreaks. A total of 16 818 treatments for sheep scab were logged by technicians for the month of August and this excludes treated farms in the George outbreak.
- A case of **swine erysipelas** was noticed by a meat inspector post slaughter at an abattoir in **Malmesbury** from pigs originating near **Melkbosstrand.** There were no reports of pre-slaughter clinical signs. The Western Cape sporadically have cases of erysipelas.
- 2 cases of **H5N2 avian influenza** were detected in late July 2014. Both occurred within 3 km of each other on ostrich farms in the **Albertinia** region. Both farms were chick raiser farms. Both cases were associated with high numbers of especially sacred ibis and some Egyptian geese on the properties. Both farms were positive only on serology with PCR negative results on follow up sampling. The serology prevalence was above 50% on ELISA on both properties.
- In July 2014's map we plotted a case of ***B. abortus*** in a dairy herd in the **George** area but did not give any more details than that. The outbreak is ongoing and we will put together a short case report for next months report.



Beyond our borders - FMD

Both Namibia and Mozambique recently reported cases of FMD to the OIE. The Namibian serotype had not been reported at time of this publication. This case occurred in the Caprivi in 24 cattle (herd size of 247) with mouth lesions reported. Samples have been taken from affected cattle. Zoning control measures have been implemented.

In Mozambique SAT 2 FMD was reported to the OIE in early August. The outbreak occurred close to a game farm where it seems as if buffalo broke through a fence and mingled with cattle in the affected area. Quarantine, zoning, movement control and vaccination were part of the control measures implemented.

Included in the map is also the continuing FMD SAT 1 event in Botswana (this event began in June 2014) also up in the north near the Caprivi

Total OIE logs

State Vet area	User	Total Logs
SV Malmesbury	Michaelc	93
SV Malmesbury	JanicaC	70
SV George	carell	51
SV Beaufort Wes	nitav	34
SV Beaufort Wes	louwk	32
SV Beaufort Wes	CobusF	30

Total UBALO logs

User	Total events
janicac	31
carell	29
wynandf	29
MARESAF	28
thabileb	27
michaelc	24
nitav	24

Most rabies vaccinations performed

State Vet area	User	Total
SV George	Johanb	1330
SV George	ronniek	1001
SV Boland	thabileb	668
SV Boland	judithg	555
SV Malmesbury	janicac	478
SV Swellendam	thulit	258

Epidemiology Report VOLUME 6 ISSUE 8

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Web based event logging AHT leader boards

Cleaning input data JdG

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

Websites where you can download requirements

One of my personal fears about trying to learn a program like R is that it forces you to look at data from a different perspective compared to that of the classic tabular format so distinctive of Microsoft Excel and more importantly for me MS Access. Those programs are geared to allow quick and easy manipulation of raw data to get it to the format you need. In particular Access is powerful when querying your main data tables...needless to say R is quite different. It feels like the data is a lot more "hidden and inaccessible"...but all is not lost and this lab will be one in a series of a few where we show how to look at your data and evaluate it prior to doing any proper analysis. In this lab we purely look at categorical data, so nothing numerical for now. I have taken part of the registration list of our recent SASVEPM congress held in PE as the data source and pulled a few data fields to evaluate. This is a pretty basic example of some of the functions of R...no extra packages are necessary and it wont take very long to get through. While we are going to be editing some data in R I'm certain that you'll find it easier to clean your data prior to importing it into R, and while checking it is always worthwhile before going on to evaluate it, it might be easier to edit the data in your original capture program like MS Access.

Lab #4 requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- Internet connection

The code

```
sasvepmdata<-read.delim("http://www.jdata.co.za/backpagelabs/backpagelabs_jdg_sasvepmpreclean.txt")
#Here we import a text file of the data and assign it to a variable name called sasvepmdata
#There are a number of ways to evaluate your dataset and here we are going to go through a few that might help you set your data up lets look at the whole data set
sasvepmdata
#our data set here is pretty short (184 rows) but you can imagine that if you had a few thousand rows of data then running this command wont help you get a feel of your data, so lets be more specific
head(sasvepmdata)
#now we just see the first 6 rows of data, if you want to see the top ten then type
head(sasvepmdata,10)
#to view a nice full summary of the dataset go ahead and run this command
summary(sasvepmdata)
# this shows unique values for each column with counts of how many times each variable combination occurs
names(sasvepmdata)
#shows the column or field names of your data - also to see what unique values are in a column ("Designation" in this case) you could type
unique(sasvepmdata$Designation)
#Immediately we can see that it might be worth changing some of the column names - for instance "Designation" and "Field" are confusing - looking at the summary results above we can see what's in those fields and then change the names to something more useful so here we change the 2nd and 3rd column or field names from "Designation" to "workingfield" and "Field" to "institute" respectively
names(sasvepmdata)[c(2,3)]<-c("workingfield","institute")
#Case of letters are very NB in R so lets get all our field names to lowercase - so again - below we select the first column (square brackets) and rename it to title and later the fourth column to "location etc.
names(sasvepmdata)[1]<-"title"
names(sasvepmdata)[4]<-"location"
#"Hotel" and "Presenter" might also be confusing so lets change them as well
names(sasvepmdata)[5]<-"accomreq"
names(sasvepmdata)[6]<-"participation"
#so now we are ready with a solidly labelled dataset - have a look at it now
summary(sasvepmdata)
#lets create another column of data giving a unique number to each row of data so that if we have to edit some data we can select that row out. One quick way to do this is to use the rownames function which essentially returns the number of each row - in the following code we make a new column (callled "id") in the data set sasvepmdata...
#and assign it the value of the row that the line of data is in
sasvepmdata$id<-rownames(sasvepmdata)
#so lets check again our top couple of lines of data to see that an id field has been added
head(sasvepmdata)
```

Continued on next page

```
#you should see that your id field is sitting on the right, lets move it to the first column so that it reads easier
sasvepmdata<-sasvepmdata[,c(7,1,2,3,4,5,6)]
# what we have done above is to re-create sasvepmdata and we have made it from the original sasvepmdata where we have selected all rows (this is the blank prior to the comma in the beginning of the square bracket which refers to rows of data)
#after this we have specified the columns we want from the original data set but we have re-ordered them by creating a small vector of the column numbers and putting the 7th column first and then listed the rest of them - lets look at the result
head(sasvepmdata)
#check again what values are in each column using the summary command,
summary(sasvepmdata)
#lets look at each one to see what unique values are in each data column - do you spot the issue? - have a look at the title column - we have 2 "Dr" levels which must be a mistake - we can guess here that 2 rows have a space before or after the "Dr"
#the last part of this lab is to find the data issue and fix it, we'll continue next month with further data analysis of this set
#we create a vector variable isolating the unique values in the title column
uniquetitle<-unique(sasvepmdata$title)
uniquetitle
#our data issue culprits can be isolated by using the new unique dataset (note that the "Levels" result is just a attribute for the variable looked at - we'll discuss it at the end again)
#the two mismatched "Dr" categories are
uniquetitle[1]
uniquetitle[5]
#or you can look at both by
uniquetitle[c(1,5)]
#And lets check if they are different (we know they must be!) here we test if the 1st unique title is the same as "==" the 5th one even though both look like "Dr"
uniquetitle[1]==uniquetitle[5]
#lets ask if they are different...
uniquetitle[1]!=uniquetitle[5]
#TRUE means they are different, as expected. Now we look at the culprit incorrect data in the “title column” - using for the first time a very powerful function called subset()
subset(sasvepmdata,sasvepmdata$title==uniquetitle[5])
#it is evident that id's number 74 and 142 are the problem - lets look at how the data looks for those ids, and we select a few rows around them to compare with
sasvepmdata[70:76,]
#so here we show rows 70 through 76 and with nothing after the comma we want to view all columns - there is definitely a problem with id 74!
sasvepmdata[140:145,]
#and with 142...we get closer to sorting this out
#lets now change the data in those specific rows to "Dr" without spaces
#first id 74...and then id 142
sasvepmdata$title[sasvepmdata$id==74]<-"Dr"
#what we say here is that make the title field  of sasvepmdata equal to "Dr" for those rows of data that have an id of 74
sasvepmdata$title[sasvepmdata$id==142]<-"Dr"
#now to check that it works we re-look at what our unique values are in the title column
unique(sasvepmdata$title)
summary(sasvepmdata)
#so there is still a residual level of the wrong "Dr ", so lets drop the levels to what they should be
sasvepmdata<-droplevels(sasvepmdata)
#here we have rewritten sasvepmdata excluding all levels not remaining in dataset (so "Dr[space]” in this case)
summary(sasvepmdata)
#so thats our dataset cleaned up a bit and ready for next months analysis
```

The output

```
       id             title             workingfield            institute       location  accomreq    participation
 Length:184         Dr   :141   Veterinarian  :141   Academic        : 19   GP      :72   NO : 36   Attendee :165
 Class :character   Mr   : 27   AHT           : 32   Consultant      :  1   NW      :29   YES:148   Presenter: 19
 Mode  :character   Ms   : 12   Academic      :  3   Industry        :  2   EC      :26
                    Prof:  4   Vet Student   :  3   International   :  2   WC      :21
                               Lab technician:  2   Other           :  1   LP      :18
                               Diplomat      :  1   Private Practice:  1   KZN     : 8
                               (Other)       :  2   State           :158   (Other):10
```

References

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
September 2014
Volume 6 Issue 9

Brucellosis in the Southern Cape

JdG & Eddie Lottering

Background

A dairy farm in the Southern Cape area just north-east of George tested positive to brucellosis (*B. abortus*) on serum samples taken in late May 2014 (farm C - Fig 2). This was the first positive test for this farmer with the previous negative test event occurring in May 2013. An outbreak investigation took place and a further two farms (farms A and B - Fig 2) in contact were also found to be positive with high prevalences (see Fig 1).

Current situation

Animal demographics

See the top section of Fig 2 for the total cattle population density in the Southern Cape. This area is a highly dense cattle farming area and is dominated by dairy farming, given the availability of pastures and the generally year-round rainfall patterns in the area. The dairy herd affected has approximately 900 cows in milk (two milking's per day) at any given point in time and is a Jersey and Jersey cross herd. The herd is unvaccinated against brucellosis, making every animal on the property a susceptible animal. The farmer uses artificial insemination on the farm. Farms A and B had approximately 431 and 20 cows respectively prior to control slaughtering.

Spatial aspects

See the bottom section of Fig 2 for a view of the affected farms. The affected dairy has over-the-fence and road contact with farm A and B. It also has a common water source in the form of a shared dam with farm A. The dairy farmer uses maternity camps for calving cows. In our opinion this outbreak has shown the ability of brucellosis to spread easily laterally between farms.

Clinical presentation

The dairy farmer has experienced abortions on the farm since the first positive results were found and, in his opinion, they are above the baseline of what he normally experiences. About ten abortions have occurred in the last two months, with half of those occurring within the past two weeks.

Test results

	April '13	May '14	June '14	July '14	Aug '14	Sept '14
Farm A	-	-	-	-	37%	-
Farm B	-	-	-	-	40%	-
Farm C	0%	1%	-	3%	-	8%

Fig 1: Test prevalences for the three affected farms. On Farm A 219 animals were tested with 80 positives, Farm B had 8 positives out of the entire herd of 20 while farm C has had over 1220 animals tested on all three occasions during 2014 with a total of 50 reactors on CFT.

Test results are shown through tested prevalences in Fig 1. The dairy farmer involved has maintained negative milk ring tests throughout the outbreak thus far and this is likely as a result of the dilution factor, given the high numbers of animals being milked. The dairy had *Brucella* isolated after culture at the Stellenbosch Veterinary Laboratory.

Source

None of the positive farms can be considered as closed herds. The dairy farm (farm C) is the only one that could attain this status but this has not occurred. The farmer had sent some heifers to be raised on a family farm in the Eastern Cape and in Aug 2013 they had returned. The farmer as also brought in small numbers of bulls from stud breeders over the past few years with the latest movement in December 2013. Given the prevalence information in Fig 1, however, we get the impression that the infection is now picking up steam and that both farm A and B were likely to have been infected prior to the dairy.

Follow up and Control

Private vets have been informed of the outbreak and are busy testing the surrounding herds. Two herds (one beef and one dairy replacement herd) have already been tested negative (see the blue squares in Fig 2). Slaughter of reactors has occurred on all three positive farms so far. Farm B has slaughtered out all 20 animals on the farm, farm A has slaughtered 144 of the 431 cows on the farm and will be slaughtering the rest which will attain appropriate slaughter weight in December this year. The dairy (farm C) has been slaughtering all reactors and thus far has slaughtered 50 animals.

Control of the bacteria on the dairy farm has been attempted through the collection and burning of all post-partum material left in the maternity camps, including the aborted material.

Conclusions and remarks

It is important for positive identification of *Brucella* to occur on the dairy farm and therefore it is imperative that all abortions are tested for the bacterium prior to the aborted material being destroyed. This dairy farmer has not been vaccinating against the disease. Unfortunately, even if a farmer maintains excellent biosecurity the lateral transmission of the disease from neighbouring farms always will be a risk. If the dairy farmer had been vaccinating, the number of susceptible animals would have been significantly less, making the likelihood of successful intra-herd transmission very low and even if infection did occur the control thereof would have been easier and the impact the disease would have made would have paled in comparison to what this farmer must now deal with in the coming months.

There is a risk of abortions occurring after vaccination of pregnant animals with RB51. This risk may be increased with certain breeds, including Jersey cattle. The risk of abortion is increased further if vaccination is performed in an unvaccinated herd. Unfortunately the dairy farmer involved has Jerseys and his herd is unvaccinated, making this control measure difficult to proceed with, but in our opinion the only option going forward.

continued on Page 2

Brucellosis in the Southern Cape continued

The dairy farmer involved also now needs to consider removing all calves born to positive reactors over the past three months. Many farmers that have strict biosecurity principles in place on their farms will only integrate new animals into their existing herd after thorough testing, depending on the source of the animals. The dairy farmer now involved sits between a rock and a hard place since commercially it becomes extremely difficult to slaughter out positives while trying to maintain milking numbers, and bringing unvaccinated animals onto the farm just increases the risk of disease continuation.

This outbreak illustrates the need for extremely strict biosecurity measures coupled with a well devised and carried out vaccination and testing protocol against Brucellosis. Not maintaining these two principles is a recipe for disaster.

Brucellosis is a very important zoonotic disease. The dairy farmer must take the necessary precautions for himself and his workers to ensure that they are protected from infection. This includes the management of post partum materials and especially aborted materials as well as management of raw milk in the parlour and the access workers and their families have to this milk. It is also important to inform the abattoir where positive reactors are slaughtered of the status of the animals.

We visited more farms in the area and discovered that the farmer knowledge of brucellosis is not complete. Several farmers, including large dairy farmers, do not vaccinate against the disease. Brucellosis must not become a forgotten disease and information about its prevention must be carried across to farmers.

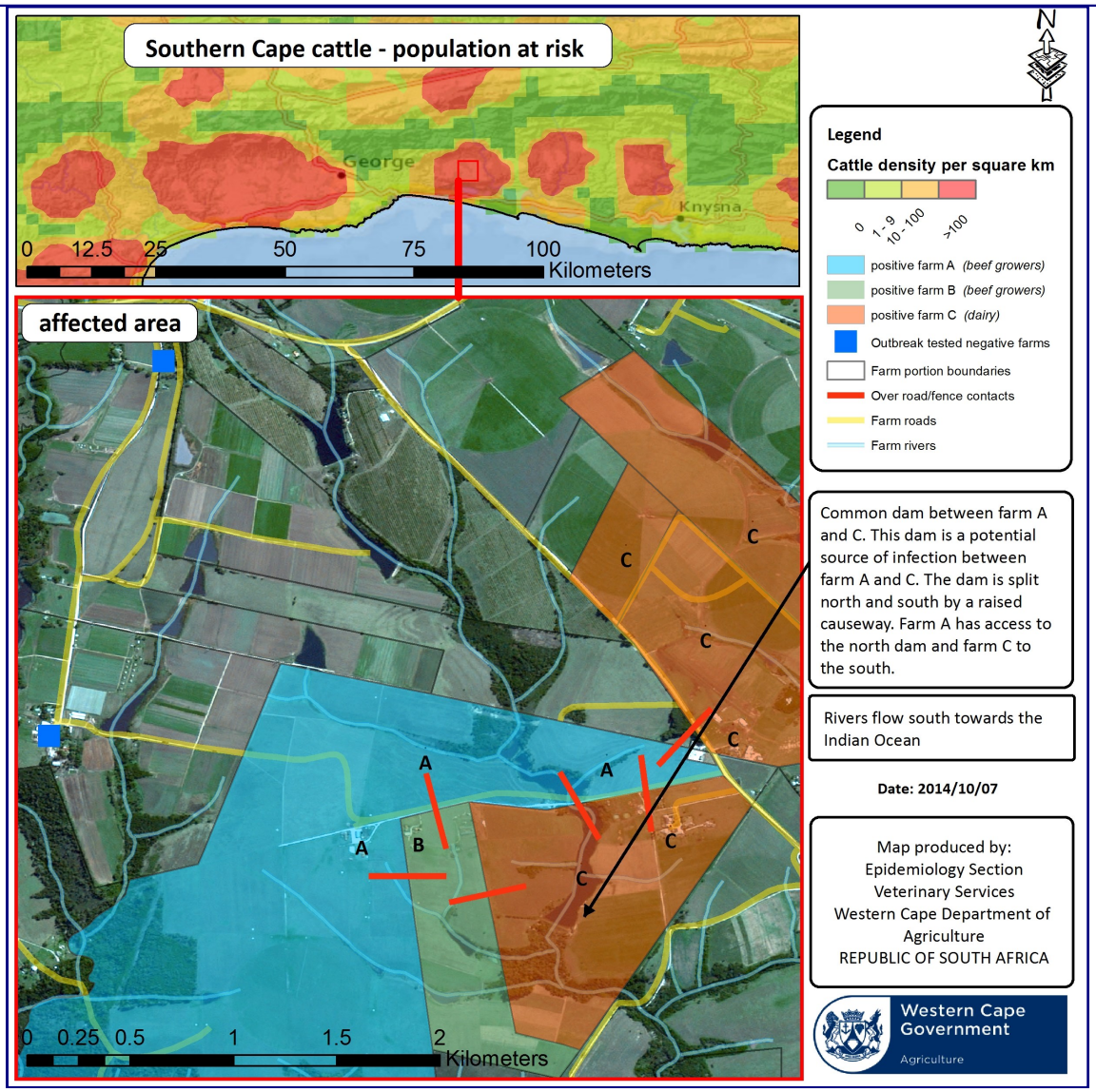


Fig 2: Map showing the overview of the Southern Cape (top) with the associated cattle farms as captured in the last 3 years by our Animal Health Technicians. The bottom map shows the affected farms as a result of the outbreak with farm C being the dairy farm detailed in this report. Shown in red lines are potential lateral spread mechanisms of the bacteria between properties with a common source dam being highlighted by the black arrow. All roads shown are dirt roads and are secondary and tertiary roads. Small rivers in the area are shown in blue. Bluesquares indicate negative tested farms during this outbreak.

H9N2 AI diagnosed in the Klein-Karoo MS

On 3 September a farm in the Klein Karoo area (showed as Farm A in Fig 3) tested ELISA positive for avian influenza (AI). Tracheal swabs were collected for PCR testing during the follow-up investigation and H9 AI was identified. Although the N-type was not determined by PCR, the serology results suggest the involvement of a N2 virus. There were no movements of ostriches to this farm in the 3-months prior to sampling.

On 30 September, during routine pre-slaughter sampling, Farm B tested ELISA positive to AI as well. On this farm there is a clear geographical distinction between the older slaughter birds and the chicks as shown on the map. The slaughter birds, which are kept in camps neighbouring Farm A (although divided by a dirt road and so no over-the-fence contact possible), had a high ELISA prevalence (87%), while all the chicks, which are further away, tested negative. All haemagglutination inhibition (HI) tests (to H5, H6 and H7) were completely negative. Further investigation is ongoing to determine the virus type although H9 is strongly suspected given the proximity to Farm A. Interestingly Farm B was also tested on the 3rd of September with negative results, indicating that Farm A was indeed first infected.

Both this farm and the slaughter bird section of Farm B were affected by an incident during August (and again later) when the water canals overflowed, causing muddy conditions which attracted a lot of sacred ibis and other birds. This occurrence considered together with the movement history, leads to the conclusion that the virus was most likely introduced via wild birds.

This is the first report of an H9N2 virus for the Western Cape over the past few years. Clinically there have been no indications of disease on either farm affected.

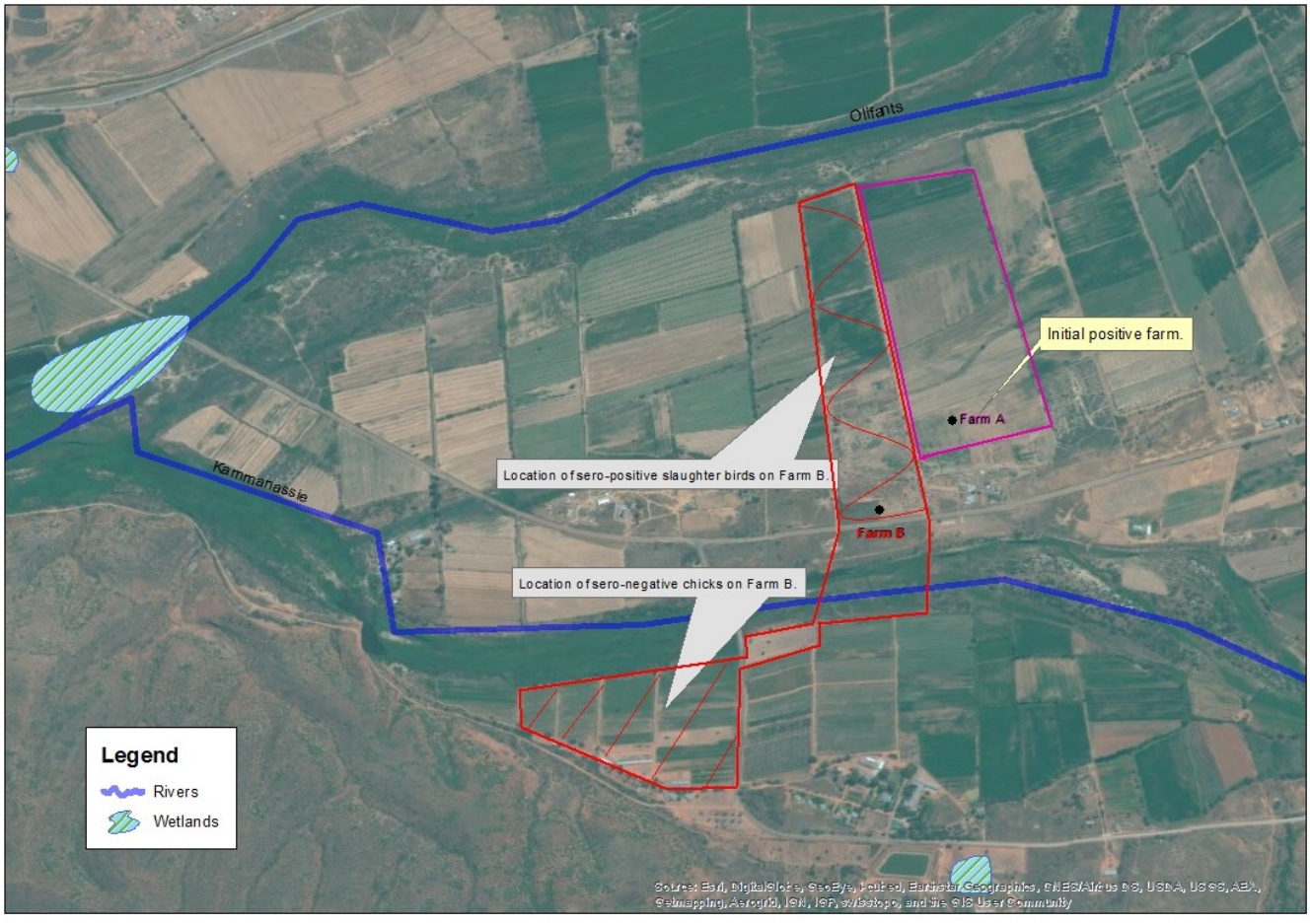


Fig 3: Map indicating the locations of the first infected farm (Farm A) and its association with Farm B where across-the-road transmission is thought likely. Interestingly, as yet there has been no transmission to the chicks on Farm B. Also included are the rivers and wetlands in the area.

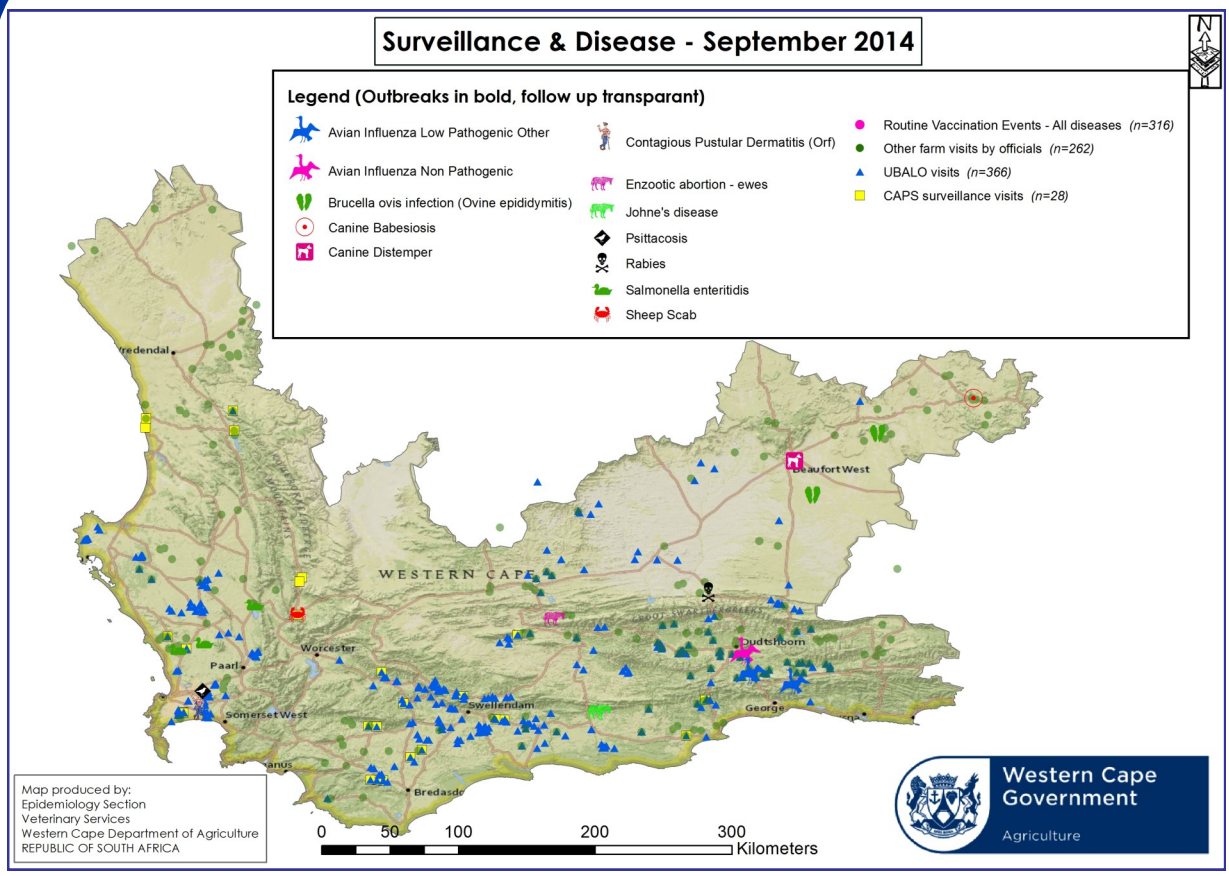


Fig 4: Surveillance and disease map of the Western Cape for September 2014

Outbreak events

- Over and above the H9N2 AI farms in the Oudtshoorn area another **H5N2 ostrich** farm has been identified in the **Oudtshoorn/George** area with serological results on follow up testing confirming the subtype. PCR results have stayed negative throughout and this farm is currently classified as a **LPAI** farm.
- **Orf** was reported in two herds of **goats** on the **Cape Flats in Cape Town**.
- A **wool** farm near **Riversdale** was confirmed positive for ovine **Johne's** disease. They had been experiencing an increased incidence of emaciation in their ewes for approximately six months.
- ***Salmonella enteritidis*** was detected from routine environmental swabs on several poultry farms surrounding **Malmesbury**. Affected houses are managed according to the salmonella reduction protocol, including treating chickens with enrofloxacin and disinfecting the houses after slaughter.
- **Two sheep** farms in the **Beaufort West** area tested positive for ***Brucella ovis*** on routine ram testing. Slaughter out of the affected rams and retesting was recommended.
- An atypical case of **sheep scab** occurred in a communal farming area near **Ceres**. Sheep were losing wool and had pustules on their bodies, but no pruritis was observed.
- A breeder of exotic birds in **Cape Town** noticed a dead **African Grey parrot** in its outdoor housing facility in June this year, but took no further actions. When a second African Grey died acutely in August, he submitted the carcass to the Stellenbosch Provincial Veterinary Laboratory. On post-mortem, peritonitis and multifocal areas of necrosis were seen. PCR testing on the spleen was positive for ***Chlamydophila psittaci***, but not before a second continued on Page 5

Outbreak events continued

mortality of an African Grey. The property was placed under quarantine in September and all birds on the property are being treated with doxycycline. The owner has disinfected the property and all equipment and his family has visited their local GP and are taking prophylactic antibiotics. The most recent introduction of a new bird (a Senegal parrot– see fig 5) occurred in March 2014, so it is suspected that the infection was introduced by wild birds, which have access to the outdoor, open-topped cages.

Fig 5: A Senegal parrot

- An **angora kid** on a farm near **Prince Albert** showed abnormal behaviour when it began nibbling at the ears of other kids as well as nibbling and licking people with whom it came into contact with on the farm. Later, it became aggressive, causing the farmer to suspect rabies and have it killed. After positive laboratory results for rabies were received, all goats on the farm as well as a small herd of dairy cattle were vaccinated.

  A vaccination campaign for dogs and cats in the area was also held. The people who had had contact with the rabid goat, including one who had had been licked in an area of broken skin, received rabies post-exposure prophylaxis at a local health clinic.

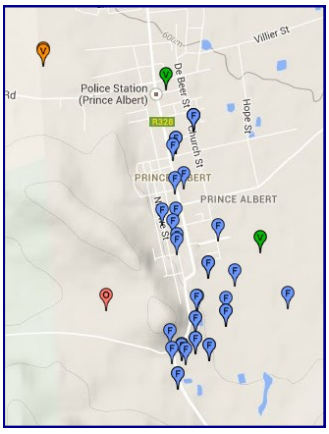
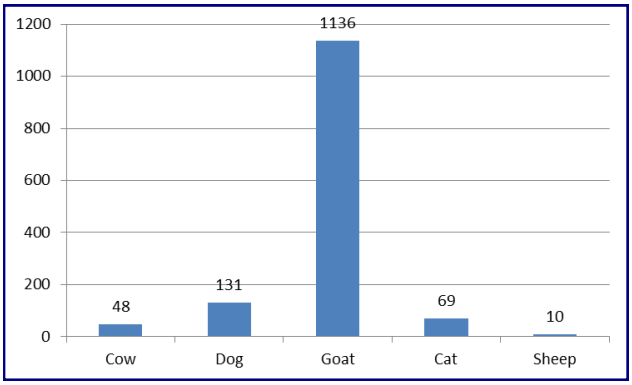


Fig 6 and 7 show the locations and vaccination totals performed by AHT Cobus Ferreira during the outbreak response. A total of 1394 animals were vaccinated with the majority being the goat herd on the affected farm.

Fig 6 & 7: Rabies vaccination campaign location (blue bubbles) and totals per species in response to goat rabies case in Prince Albert



Total OIE logs

State Vet area	User	Total Logs
SV Beaufort Wes	CobusF	76
SV Malmesbury	hendrikh	63
SV Malmesbury	janicac	47
SV Malmesbury	Michaelc	43
SV George	carell	40
SV George	heidia	24
SV Beaufort Wes	nitav	24
SV Swellendam	wynandf	24

Total UBALO logs

User	Total events
wynandf	41
thabileb	31
gerhardvw	30
thulit	26
eddiel	21
janicac	18

Most rabies vaccinations performed

State Vet area	User	Total
SV Beaufort Wes	CobusF	1566
SV George	Heidia	440
SV Boland	thabileb	388
SV Malmesbury	janicac	363
SV Beaufort Wes	nitav	268
SV Boland	maresaf	248

Epidemiology Report VOLUME 6 ISSUE 9

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Web based event logging AHT leader boards

Univariate analysis - Chi² JdG

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

Websites where you can download requirements

Lab #5 requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- Internet connection
- epicalc package (download info in code below)
- Internet connection

So last month we imported some SASVEPM congress attendance data and found that it needed some cleaning up. This month we start to analyse some of it for a bit of fun and this lab is focussed on two aspects - the first is an introduction to the use of a very cool package for epidemiologists called *"epicalc"* We use some of its summary functions as well as an attach function which helps in decreasing command input time in R. (as always, remember to hit TAB in R-Studio when typing in commands - it will help a lot!) The second aspect of the lab is to start analysis. In this case we are asking one question - Was there an association at the congress of academics attending and whether they presented a talk or not compared to non-academic attendees. We might be interested in this to determine whether a group of attendees like State officials are over represented in attendance but under represented in presenting - this may be something worthwhile knowing for the society when they advertise and call for papers for the next congress...

The code

```
# In this lab we are going to look at some very basic evaluation of data. Firstly we download the cleaned SASVEPM data which
#we performed last month If you haven't done that lab yet then go to http://www.elsenburg.com/vetepi/BPEL/
#BPEL_2014_08_EvalData_Clean1.pdf
#Here we download the cleaned data and put it into a data frame called 'sasvepmdataclean'
sasvepmdataclean<-read.csv('http://www.jdata.co.za/backpagelabs/backpagelabs_jdg_sasvepmclean.csv', header=T)
#to remind you of the data and its content
summary(sasvepmdataclean)
#for some reason - can't quite figure it out - R sometimes adds an additional X column with the same data as the id field into the data frame - so let's just
#remove that if it's there...if not don't worry
sasvepmdataclean$X<-NULL
#Before we get started we are just going to take a detour and use a very cool function in the epicalc package
#if you haven't installed the epicalc package yet then type this into your R console
install.packages("epicalc")
#activate the library after it has been installed (you can also tick it in R Studio's package window)
library("epicalc")
#note above how I needed to refer to the X column in the sasvepmdataclean data set by typing in sasvepmdataclean$X. This was of doing things is
#very pedantic and thorough but ultimately not necessary. In R there is a way to essentially attach your data frame that you are working with that it
#recognises column names without you having to refer to them explicitly. The epicalc package has a function that has simplified this so let's try it.
#first we see what is attached in your environment
search()
#these are all packages and data that is attached, so the epicalc package should be there
#now we want to attach sasvepmdataclean - the epicalc function is "use"
use(sasvepmdataclean)
#now try
search()
#again - you'll see a ".data" listed in the attached data and packages - this is your dataset you have now attached
#now instead of referring to say the participation field in sasvepmdataclean (sasvepmdataclean$participation) you could just type in
participation
#and get the same result
#ok to get back to our analysis - you'll remember that the summary command is a general one
summary(sasvepmdataclean)
#the epicalc package has some of its own summaries which are also useful - codebook is the first
codebook(sasvepmdataclean)
#this takes a look at each variable and does a frequency count for categorical variables (like most of the data in this example ) or measures of centrality
and spread for the continuous data - like id in our case - (which is meaningless) Another epicalc summary is:
summ(sasvepmdataclean)
#this seems more useful for continuous data so is not so worthwhile in our example. In this lab we are going to do some univariate analysis so we are
#going to try answer one question for now
#########Q1: Were presenters more likely to be from an academic institute?############
#First we need to create a two by two table to evaluate all participation by whether the participant was an academic or not.To do this we use a table
#command.
table(participation,institute)
#note this gives us categories of all participation by all institutes - but some categories are poorly represented and our
```

Continued on next page

```
#question however was really just isolating the academic versus non academic- so let's classify all non academic participants into one category. to make it
#simpler I'm going to create a new column with this info in it.
sasvepmdataclean$q1<-ifelse(institute=="Academic","Academic","Non-Academic")
#this uses an if-else function - essentially we look at the value in th einstitute field and if its "Academic" we store "Academic in the new field or if not (else)
we store "Non-Academic" in the new field.
q1
#gives an error but typing in
sasvepmdataclean$q1
#works - why is this even though we have attached the data to our environment using the use() command? essentially when you attach data R will
#recognise only data that you have attached, adding new data in the attached data frame is not automatically attached. Running the following commands
#will detach all data, add the column we wanted and the attach the data again
zap()
#this removes all attached data and removes your datasets in the environment- try type in sasvepmdataclean now and it should not work
#now to read in everything again
sasvepmdataclean<-read.csv('http://www.jdata.co.za/backpagelabs/backpagelabs_jdg_sasvepmclean.csv', header=T)
sasvepmdataclean$X<-NULL
sasvepmdataclean$q1<-as.factor(ifelse(sasvepmdataclean$institute=='Academic','Academic','Non-Academic'))
use(sasvepmdataclean)
codebook(sasvepmdataclean)
#note above I needed to first create the new column before I used the use() function. Also note I forced the new column into a factor class, if I did not do
#that it would have been a character class which differs from my other variables. This is what the table looks like prior to reclassification of the institute
#field
table(institute,participation)
#now reclassification making a 2X2 table
table(q1,participation)
#now we allocate the table to a variable we can use (not a necessary step but makes it easier in the long run)
q1table<-table(q1,participation)
#now we do a chi squared test of association on the table
chisq.test(q1table)
#you'll see the result but the chi squared test function does store the various elements of the test, so now we allocate the chi squared result to a variable
#and we look at each output at our leisure.
q1chitestresult<-chisq.test(q1table)
q1chitestresult$observed #the observed values (same as the input table)
q1chitestresult$expected #the expected values when your null hypothesis is true
q1chitestresult$p.value #so the actual p-value
q1chitestresult$statistic #the chi squared test statistic measuring the contrast between the observed and expected frequencies
q1chitestresult$parameter #degrees of freedom parameter
q1chitestresult$method #method used to calculate the statistic
#Try to reproduce the result but look at questions like: did specific Provinces present significantly more than others (although there may be some
#confounding there with the fact that certain academic institutes are only in certain Provinces:) Also were veterinarians over represented when giving
#presentations? Remember that if you want to use the epicalc use function then when you are making new columns if you wish to then zap() the
#environment and start from scratch creating the columns you need prior to using the use() function.
```

The output

```
               participation
q1              Attendee Presenter
  Academic              5        14
  Non-Academic        160         5
```

The input and observed table

```
 Pearson's Chi-squared test with Yates' continuity correction

data:  q1table
X-squared = 84.3806, df = 1, p-value < 2.2e-16
```

The chi squared test result

```
               participation
q1              Attendee Presenter
  Academic       17.03804  1.961957
  Non-Academic 147.96196 17.038043
```

The expected values if null hypothesis was true

```
[1] 4.081285e-20
```

The actual p-value for the result

```
X-squared
 84.38062
```

The chi squared statistic

```
df
 1
```

The degrees of freedom

```
[1] "Pearson's Chi-squared test with Yates' continuity correction"
```

The chi squared method

The result

Attendees that are from an academic background were associated ($p<0.05$) with being presenters at the 2014 SASVEPM congress

References

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/

Virasakdi Chongsuvivatwong (2012). epicalc: Epidemiological calculator. R package version 2.15.1.0. http://CRAN.R-project.org/package=epicalc

Thompson, P. and Gummow, B. (2005). Epidemiology 752 Chapter 1: Statistical Building Blocks. Department of Production Animal Studies, University of Pretoria, Pretoria, South Africa

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
October 2014
Volume 6 Issue 10

Foot and Mouth Disease zone change — LvH

Introduction

As reported in February's Epi Report, the foot and mouth (FMD) status of South Africa has been restored, but how have South Africa's foot and mouth disease control zones changed since we lost the status of our free area in 2011?

The short answer

They haven't, much.

The long answer

As pre-2011, there is an FMD infected zone and protection zone (see fig 1). However, in the World Organisation for Animal Health (OIE) terminology, both of these areas are regarded as parts of the "infected zone". Appropriate movement controls from the protection zone to the free zone therefore apply. The protection zone is divided into two areas: with vaccination and without vaccination. As the OIE requires animals in countries with disease free zones to be identified, a national identification and traceability system is in the process of being rolled out. Domestic livestock will be tagged with official barcoded eartags to identify them: green for those in the protection zone with vaccination and pink for those in the protection zone without vaccination. Over time, all animals in the free zone will receive yellow eartags, but this initiative will start in the high surveillance areas. The high surveillance areas are part of the free zone, and consist of a strip of land following our country's land borders and the border of the protection zone. There is also a small area of high surveillance in Gauteng. A special high surveillance area where there are movement controls in place exists in KZN in the Jozini area, called the "*Kwazulu Natal Province high surveillance area with movement control*". These movement controls are a temporary measure still in place after the FMD outbreak of 2011 and will eventually be stopped, allowing this area the same status as other high surveillance areas.

How does this affect us as state officials in the Western Cape? It is the responsibility of all officials to make themselves familiar with the new FMD VPN (see link below for access to this document), effective from 1 November 2014. A copy should be kept at each office for reference. With regards to FMD control measures, officials should continue to do clinical surveillance of cloven-hoofed animals at auctions, diptanks and on farms, as before. Any suspicious cases must be reported to the Animal Health head office immediately. Serological surveillance will also be performed in our province from time to time on request of DAFF as part of nation-wide surveillance campaigns. Lastly, once the national identification and traceability system has been rolled out, all cattle in the province will need to be tagged with official yellow ZA eartags.

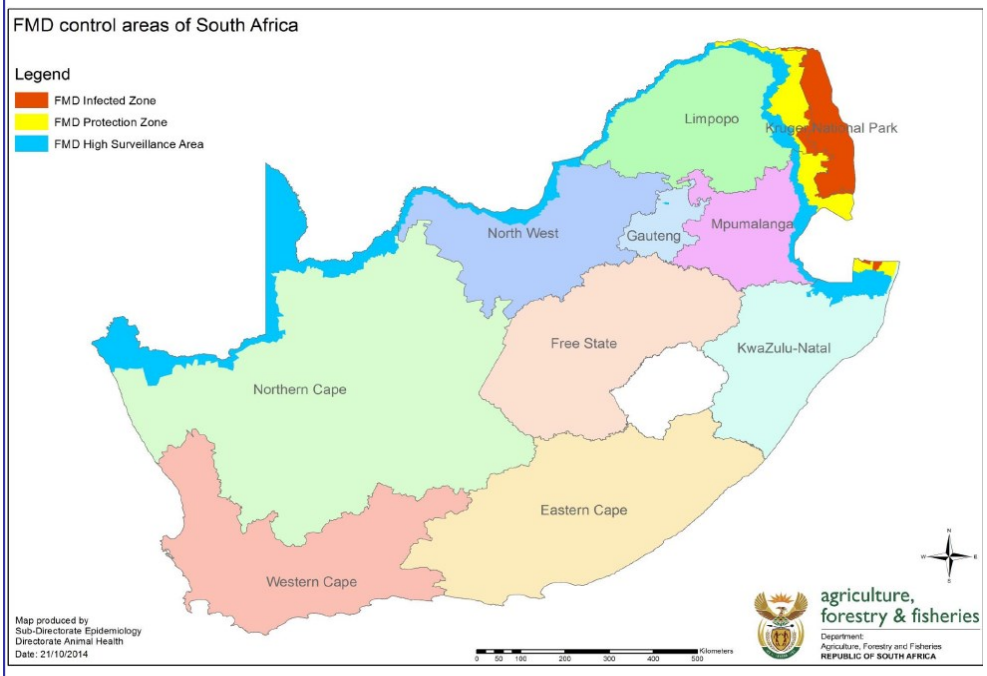


Fig 1: The official foot and mouth disease control zones of South Africa, courtesy of the Epidemiology sub directorate of DAFF's Animal Health component

A copy of the VPN concerning FMD is available at:

http://www.elsenburg.com/vetepi/SOP/VPN_FMD_Nov2014.pdf

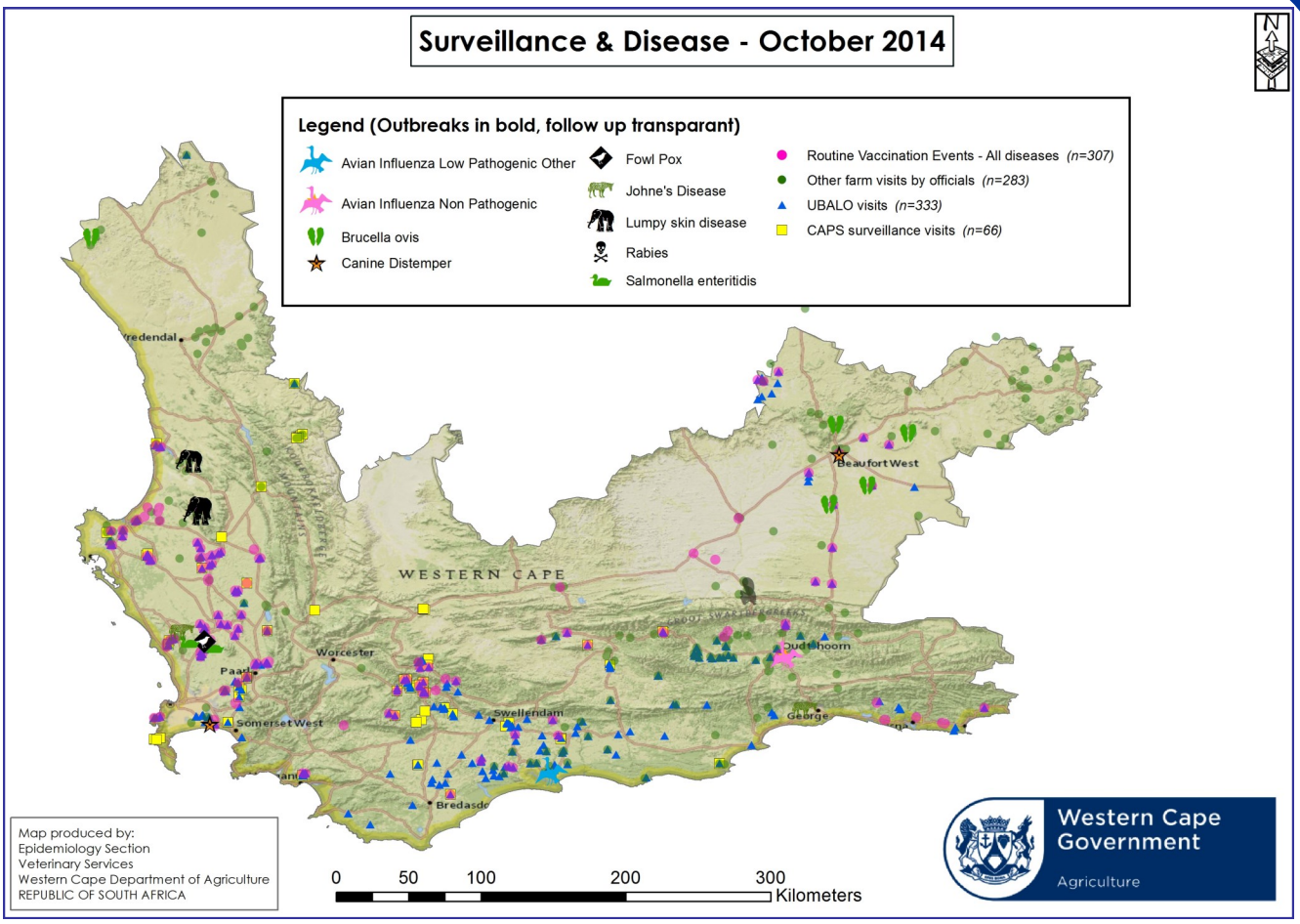
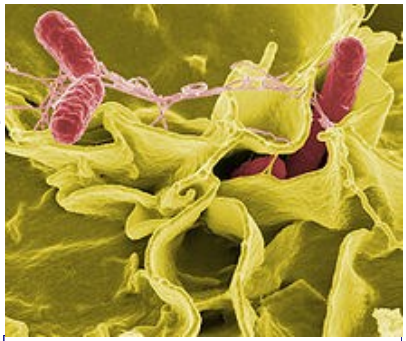


Fig 2: Surveillance and disease map of the Western Cape for October 2014

Outbreak events

- Routine environmental swabs from two **broiler** farms near **Malmesbury** tested positive for ***Salmonella enteritidis***. The farms have recently revised their *Salmonella* reduction plan: Pathopure will be used in the affected houses for the last three days before slaughter and the chickens will be slaughtered for the frozen product line only, after which the house will be washed and disinfected twice and workers tested for *Salmonella*. Broiler breeders will also be tested to try and find the source of the infection.



Salmonella organisms (Wikipedia)

- Several sheep farms near **Beaufort West** and **Vredendal** were positive for ***Brucella ovis*** infection on routine ram testing. Positive reacting rams are slaughtered and the flocks will be retested every two months until they are free. On one of the farms, the likely source of infection was Meatmaster rams that had been bought in from a positive farm, emphasising the importance of testing rams before introducing them into a flock.
- An emerging farmer near **Malmesbury** has suffered from an outbreak of **fowl pox** in his young **chickens**. He is isolating the affected birds from the rest of his flock until the outbreak is over.

Outbreak events continued

- Three herds of unvaccinated **cattle** in the **Bergriver and Cederberg** municipalities experienced outbreaks of **lumpy skin disease**.
- **Suspected rabies case** - *courtesy SV Malmesbury* - A woman living on the outskirts of Porterville saw a sick mongoose near her house and took it a saucer of water – it ran away. Later in the day she saw it again and it had started having seizures and salivating. Again she took it water and it ran away. Later she saw it on the neighbours front porch and again decided that it needed some water but this time the mongoose chased her and she ran away. She then contacted Cape Nature who could not find the animal to destroy it. Following this episode chief animal health technician Piketberg held a very successful rabies campaign in Porterville. Both Cape Nature and the local municipality helped with advertisement. Fortunately the woman was not bitten or came into contact with saliva of the suspect mongoose. 471 Dogs and 21 cats were vaccinated at the campaign. A wild house cat and African weasel was also submitted for rabies testing, both returning negative results.
- **H5N2 Avian Influenza** was identified on an ostrich farm in the **Southern Cape** area during routine sero-surveillance. PCR results on follow-up testing were negative and this farm is currently classified as a **LPAI** farm.
- For the last year, a feedlot near **George** experienced cases of diarrhoea, poor-doers, emaciation and a few fatalities among their sheep. A post-mortem on the dead animals revealed that the farm was positive for **Johne's disease**. Another sheep farm near **Darling** had been experiencing unexplained emaciations for the last four years before a post-mortem was done and the farm also confirmed positive for Johne's disease. Both farms were placed under quarantine, as required by the Animal Diseases Act.
- During a CAPS visit in the **Albertinia** region a small scale farmer reported significant losses (25%) in her laying hens. The farm neighboured on a ostrich farm which has in the past been diagnosed with low pathogenic avian influenza. A sick bird was killed and taken whole to the Stellenbosch lab in order to make a diagnosis and importantly to rule out Newcastle and avian influenza as a cause of mortality. A diagnosis of **coryza** (*Haemophilus)* was made by the lab and the NCD and AI results were negative.

Total OIE logs

State Vet area	User	Total Logs
SV Beaufort Wes	CobusF	70
SV Malmesbury	hendrikh	70
SV Malmesbury	Michaelc	67
SV Malmesbury	janicac	47
SV George	carell	38
SV Beaufort Wes	antonb	32

Total UBALO logs

User	Total events
Michaelc	28
thulit	28
wernerg	26
wynandf	26
gerhardvw	24
hendrikh	22

Most rabies vaccinations performed

State Vet area	User	Total
SV Swellendam	wynandf	1215
SV Beaufort Wes	CobusF	665
SV Malmesbury	hendrikh	597
SV Boland	maresaf	290
SV Malmesbury	michaelc	281
SV Malmesbury	janicac	230

Epidemiology Report VOLUME 6 ISSUE 10

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Web based event logging AHT leader boards

Connecting to a database in R

So far in our back page epi labs focussed on R we have used prepared datasets for analysis. This is however quite an artificial situation as most often our field data is sitting in already made databases. For sure you can query out your info in a database, export it to a CSV file and import into R but there is a way to skip this step and query your database (be it SQL or MSAccess) directly and this is what this lab introduces. This lab is really aimed at those of you that are familiar with databases and can make the required test access database. If this is not the case then maybe give this lab a skip or alternatively contact us so that we can get you started with getting a access database going.

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

Websites where you can download requirements

Lab #6 requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- Internet connection
- Microsoft Access installed
- RODBC package (install function in text below)

Preparatory work

There is some preparatory work to do prior to this lab

Create a Microsoft access (2007 + version - so *.accdb and not *.mdb) database on your computer in a folder of your choice - just make sure that you know where to find it later - mine was on my Desktop.

Call the database "test.accdb", open it and create a table called `tblname` with fields as illustrated below

tblname

Field Name	Data Type
ID	AutoNumber
personname	Text

Add a few lines of data into your table, including one `personname` of "John" and close the database

The code

```
#Install and load the "RODBC" Package
install.packages("RODBC")
library("RODBC")
#The name of this package is RODBC which is how R utilises and ODBC connection: ODBC means "Open DataBase Connectivity" whichis a universal way for programs to link to databases by creating a "tunnel" to the data and pulling the data through
#create a environment variable called accesloc and put the string where the created database is residing on your computer - note that yours may differ and note the direction of the FORWARD SLASHES
accessloc<-'C:/Documents and Settings/johng/Desktop/test.accdb'
#create a variable which is a channel to the database - we call it channel1 for want of a better name - note the function used is specific to Access2007 and therefore Microsoft Access databases with an *.accdb extension.
channel1<-odbcConnectAccess2007(accessloc)
# we now work through a few function of RODBC to show you how it works. note that the connection is live, so any SQL command you give will work, #including deleting data and database tables and databases!
#lets see what tables we have in the database
sqlTables(channel1)
#note that there you will have at least 13 tables, all but one are system tables that you wont be aware off, but you should see tblname in the last row of your result.
# lets fetch just that table
sqlFetch(channel1,"tblname")
#you should see your rows of data which you entered, including the row with "John" in it
#lets do a basic SQL query now on the data
sqlQuery(channel1,query = "SELECT ID, personname FROM tblname WHERE personname='John'")
#remember you can create a data frame from your query - try
queryresult<-sqlQuery(channel1,query = "SELECT ID, personname FROM tblname WHERE personname='John'")
queryresult
#just to show you to be careful: lets delete the row with John in the personname field
sqlQuery(channel1,query = "DELETE FROM tblname WHERE personname='John'")
#so now try query for "John" - you should get no result!
sqlQuery(channel1,query = "SELECT ID, personname FROM tblname WHERE personname='John'")
#to close all connections (channels) run the following
odbcCloseAll()
```

Continued on next page

some more Preparatory work

Now we are going to do the same thing except we use an already made 'channel' on your computer. This is a way of connecting to a database using an already made user DSN specific to your computer. A DSN is a Data Source Name and is used with ODBC, and the application on your computer is one place where this is used- it is essentially a channel registered with your computer. It contains at least the following information:

- the `name` of the data source
- the `location` of the data source
- the `name of a database driver` which can access the data source (so MS Access or MySQL or SQLServer etc.)
- a `user ID` for data access (if required)
- a `user password` for data access (if required)

Create a DSN on your computer:

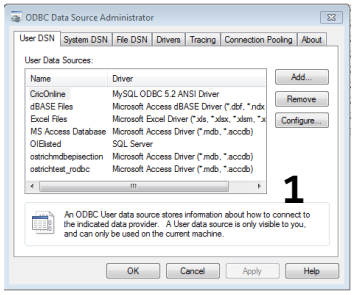
Go to `Control Panel` → (you may need to go to `System and Security` depending on your computer → `Administrative Tools` → `Data Sources` on your computer (fig 1 below)

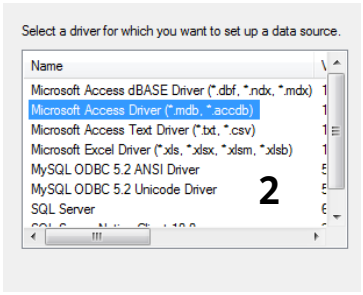
You will see there are User DSN's, System DSN's and File DSN's - read the description in the bottom section of the window for a definition of each

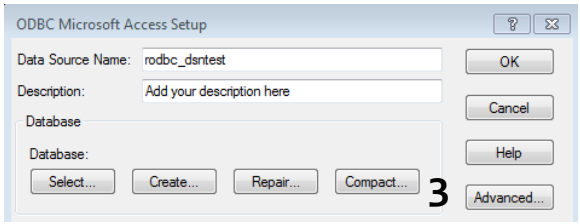
Click on `ADD` in the `UserDSN` Tab (fig 1 below)

Select the `Microsoft Access Driver (*.mdb, *.accdb)`(fig 2 below) - if this DRIVER is not on your list you'll have to go online and download it

Name your new data source "`rodbc_dsntest`" and click on `SELECT` and go and find your test.accdb database that you made (fig 3 below)







Click `OK` - you'll now see your new DSN listed under the User DSN's

back to The code

```
#to view all the DSN's on your machine (so similar to your DSN list you have just seen) run:
odbcDataSources()
#you should see you new DSN listed at the bottom
#similar to the first example we make a channel ("channel2" this time except this time we use the DSN and not the direct ODBCConnect method
channel2<-odbcConnect(dsn = "rodbc_dsntest")
#again fetch a table from the database - note "John should not be in your list since you deleted it!
sqlFetch(channel2,"tblname")
#just for fun lets put "John" back into the table
sqlQuery(channel2,query = "INSERT INTO tblname (personname) VALUES ('John')")
Now look at your data again and it "John" should be there
sqlFetch(channel2,"tblname")
#Remember to close your connections
odbcCloseAll()
```

Some notes

In future we can look at some more complex SQL expressions to start querying your databases

There is an `odbcConnectAccess` function in RODBC which directly connects to *.mdb access databases. However, it however only works in 32 bit windows environments, so if you work in 64 bit environments you will get an error when trying to do this method. The best way to connect then is to use the DSN method as shown above

The nice thing about using the second method is that the DSN you create can be used in other programs, so for example if you have a web server SQL database - you can create a DSN to it and using that DSN link to R or link to a program like access and see your linked SQL tables in the Access environment

There are a few other methods and functions in RODBC - have a look at their help file, but we'll be certain to use some more of them in future

References

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/

Brian Ripley and Michael Lapsley (2013). RODBC: ODBC Database Access. R package version 1.3-10. http://CRAN.R-project.org/package=RODBC

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
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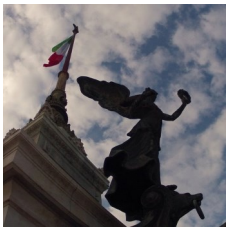
Volume 6 Issue 11

IV INTERNATIONAL CONFERENCE ON BLUETONGUE AND RELATED ORBIVIRUSES, ROME, 5-7 NOVEMBER, 2014



Introduction

John Grewar was invited by the European Commission to present information on the economic impact of bluetongue and other orbiviruses in the Southern African region at the 4th international conference on bluetongue and related orbiviruses that was held in Rome in early November. The details of his talk will be included in the publication of the conference proceedings which we will send out in a future report but the conference as a whole was applicable to South Africa and the Western Cape given our status as an endemic country for a variety of orbiviruses, including bluetongue (BT), African horse sickness, (AHS) equine encephalosis and epizootic haemorrhagic disease. The following short report summarises the conference goals and outcomes with relevance to the South African context.

Epidemiology and risk analysis

The genetic evolution of BT needs to be monitored through molecular techniques, particularly as a result of the potential impact this evolution has on existing diagnostic assays and current vaccines available in South Africa. Molecular techniques are generally underutilised in the Province's veterinary service, mainly because of the logistical and knowledge gap associated with molecular epidemiology. Overwintering mechanisms of orbiviruses needs study: in the Western Cape this is important because of the impact that AHS can have on our local economy. Reassortment of vaccine and field strains of virus is known to occur in BT but this is poorly understood and needs work in the AHS context, especially-given the Porterville AHS outbreak and the potential source there-of.

In the past BT serotyping was determined by genome segment 2. This is becoming archaic and further work in determining various clades of virus must be undertaken and not limited to gene segment 2. In this light full genome sequence analysis is going to become the gold standard, and officials in the Department need to understand and be able to apply these techniques. South Africa is endemic for BT but if a new exotic serotype is imported it could cause serious issues.

Vectors

Vector study is integral in the study of the spatial and temporal incidence of orbiviral disease. The Western Cape Province should consider formalising their in-outbreak vector surveillance of orbiviruses including the sample - lab - result - action pathways associated with this type of surveillance.

Animal –vector-host-virus interactions

BT viruses 25 through 27 (new strains) need to be studied. A small sero-surveillance pilot campaign for the Province may be in order to start study in this area.

Cell virus interactions

BT has not been characterised into those viruses that are pathogenic and those that are not (unlike avian influenza for instance). This impacts on trade and control strategies. Decisions to assign pathogenicity are globally taken, but if taken will impact on local policy.

Diagnostics

Generally, diagnostics for BT and AHS are good with real time PCR (and recent serotype specific options in this regard) as well as VP7 ELISA's for serology. As mentioned earlier, however, full genome sequencing is the future for diagnostics and epidemiology. An issue that is important in South Africa is that we have very limited DIVA (differentiating diseased from vaccinated animals) capable serological (and PCR) tests: this is something which has and will continue to have an impact on us.

Surveillance and control

As always it was stated that surveillance must be fit for purpose, it must take cognisance which tests are to be used and their short-comings. Surveillance findings must be dealt with. Surveillance results must be quantifiable, especially when surveillance impacts on trade options.

Generally the use of live attenuated virus vaccines (RSA uses a modified live vaccine) should be reconsidered with BT and AHS. Inactivated vaccine (particularly in the case of AHS) should be a focus. Disease control should also be proportional to impact of disease, with this impact measurable on a local , regional and global scale.

Economic and trade impact

Economic impact in endemic countries (like RSA) is under-investigated. Disease impacts in non-endemic countries can be significant, especially with cost of control and future protection through vaccination. Trade of live products is more important in orbiviral terms than that of animal products and this must be considered in trade negotiations. Unnecessary NTB (non-tariff barriers) should be avoided, where applicable, when it comes to BT and other orbiviruses.

Acknowledgments

Dr Grewar thanks the European Commission for the invitation to attend and present at the conference as well as the Western Cape Department of Agriculture for the approval required to attend.

UBALO spreads its proverbial wings

Negotiations with the Northern Cape Veterinary services have been taking place for about the past 12 months regarding the deployment and implementation of some of our Epidemiology data systems. After a visit in July 2014 from Dr Wonderful Shumba (Deputy Director NCP Labs and Epidemiology), planning began in earnest. In November, John Grewar and FC Basson travelled to Kimberley to implement the first phase of the project. This entailed the installation of the required server services that the system requires as well as the installation of the back and front end databases which store and are used to interact with the data respectively.

After two days in Kimberley, three main databases and interfaces were implemented. Firstly, a stand alone Microsoft Access SR1 database (SR1 forms hold the data that is used when reporting animal diseases of importance to DAFF in Pretoria) was installed. This is a relatively simple system with, as yet, no web interface. Its power, however, comes from the reporting of the SR1 data where reports are drawn after data entry and make the creation and storage of SR1 reports easy and repeatable.

The second and third databases were really the main focus of this deployment. This is the UBALO system (which captures census data) and the OIE listed disease system (which captures disease outbreak, vaccination and farm visit events). Both UBALO and OIE listed diseases have a web interface allowing user input via the internet - this was coded by FC.

The web interface is the frontend for a Microsoft SQL Sever database. A Microsoft Access database then speaks to the SQL database, and this is the system that the main data validators will be using. These front end Access databases were designed by John and are set up to evaluate data, enter data if necessary and finally report on data.

Both UBALO and the OIE listed diseases systems are also geared to interact with ArcGIS. We designed them like this to decrease the amount of time our users require to actually enter data. An example is in the OIE listed disease system: our DAFF requires both local municipality codes and farm ID codes for every row of data captured. If you require users to capture coded data you often have data issues. Instead of this we developed a GIS tool that takes each point from the database for a specific time period (per month in the case of the OIE listed disease data) and pushes this point onto both a municipality spatial layer and a farm portion layer. We then retrieve the local municipality and farm portion code and send it back into the OIE listed disease database. In this way we comply with DAFF requirements but don't bother our users with capturing this information. As long as (and this is a given) the GPS coordinates of the captured points is correct the spatial data can be retrieved.

Phase two of the implementation will be an intensive training session, firstly with the super users of the systems and then with the web interface users. We were hoping to start this training on our trip but some IT issues prevented this. Certainly we've given enough info to the NCP vet services on how to get started and we're hoping that by January, when training is planned, that some data has been captured that we can start working with. For the OIE listed disease system the 2014 data that the NCP had has already been uploaded to the system.

We are very grateful to Dr Phemelo Kegakilwe who initiated this interprovincial collaboration, Dr Wonderful Shumba and Mr Deon Kriel who took it further and kindly hosted us in Kimberley. Unfortunately Wonderful could not be there during phase one but we'll be working closely with him and the rest of his team over the coming months. Thanks also to Hannes Pienaar from DAFF who kindly helped us out with a local municipalities ArcGIS shapefile on short notice.

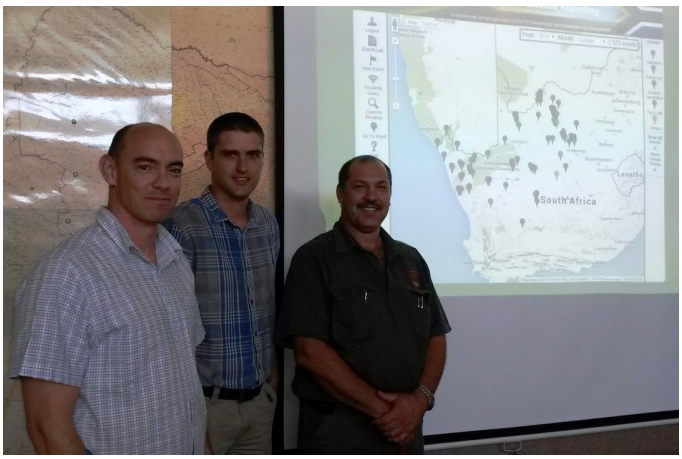


Fig 1:UBALO Deployment phase 1: From left - FC Basson, John Grewar and Deon Kriel. In the background is the live up and running UBALO and OIE listed disease web interface - ready for data input.

Avian chlamydiosis in Cape Town

November saw the reporting of the third case of avian psittacosis in the Northern Suburbs of Cape Town. Cases have been reported since April 2014 in Parow, Durbanville and Brackenfell. All cases involved parrots found dead, without any clinical signs being noticed by their owners. All were kept as part of breeding operations in outdoor aviaries, where contact with wild birds was possible. Post-mortem examinations by the Stellenbosch Provincial Veterinary Laboratory resulted in diagnoses of psittacosis, which was confirmed by PCR.

Fig 2: The affected birds consisted of five African grey parrots (left) and three rock pebblers (right), also known as regent parrots.

Psittacosis, caused by *Chlamydophila psittaci*, is a zoonosis that, in humans, usually causes fever, pneumonia and malaise. Complications such as endocarditis and encephalitis may occur, but less than 1% of cases are fatal.

In all cases, the properties were quarantined and the owners told not to allow contact between their birds and people. Those who had already been in contact with the birds were advised to contact their doctor to seek preventive treatment for psittacosis. All birds on the properties were treated with doxycycline for 45 days and the aviaries were disinfected before the quarantine was lifted.

Considering the similarities between the three different facilities, and the fact that none of them had had new introductions in the past six months, points towards the likelihood of the disease being maintained in the wild bird population of the Northern Suburbs.

A fourth case, reported from Kuilsriver in newly-acquired African grey chicks, was tested for *Chlamydophila psittaci* by PCR, but the test result showed an organism more closely related to *Chlamydophila abortus.*

Chlamydophila abortus was classified as a serotype of *Chlamydia psittaci* until the taxonomy was revised in 1999. Genetic studies suggest that *C. abortus* is derived from *Chlamydophila psittaci*, and the two species are very closely related. There have been reported cases of *C. abortus* occurring in avian species in other countries. Furthermore, genotyping of *Chlamydophila* strains in pet birds in Iran revealed some genotypes that appeared to be intermediate between *C. psittaci* and *abortus*.

In the genus, *C. psittaci* is the organism with the most important zoonotic potential, but *C. abortus* from livestock can also infect humans in rare cases. It is transmitted by inhalation, and can cause pneumonia, abortion, renal failure and death. The zoonotic potential of avian *C. abortus* is currently unknown, and so the case is being treated in the same way as if it had been positive for *C. psittaci*.

REFERENCES:

Chahota et al. (2006) *Microbiology and Immunology* 50, 663-678.
Madani & Peighambri (2013) *Avian Pathology*, 42, 38-44.
Rodolakis (2010) *Veterinary Microbiology*, 140, 382-91.
Sting et al. (2006) *Deutsche Tierarztliche Wochenschrift* 113, 41-80.

Marna moves to greener pastures (well, Bloemfontein)

In July we welcomed Marna Sinclair back to Elsenburg.

Unfortunately for our section she has accepted a new and challenging post in Bloemfontein and November was the last month she was with the Department. She was a welcome asset during the time she spent here and assisted tremendously in our section. We wish her all the best in her endeavours for the future!

AHS excluded in suspect horse death in Brackenfell

INTRODUCTION

On 22 and 23 October 2014, suspect but inconclusive PCR results for African horse sickness (AHS) virus were received from a pony that was euthanased on 19 October as a result of clinical signs that are generally consistent with AHS (as well as other arboviral diseases).

The suspect case had colic symptoms on 9 October and after symptomatic treatment was given, with no recovery, the pony was hospitalised on 11 October. Clinically, the 10-year-old Welsh cross did have swollen supraorbital fossae but did not have pulmonary oedema. The horse was euthanased on 19 October. Pre-death EDTA blood samples (15 October) returned inconclusive results.

Follow up investigations were undertaken on the property which is in the Brackenfell South area, within the AHS surveillance zone of the Western Cape Province (see Fig 3).

FOLLOW UP INVESTIGATIONS

TRACING

No significant movements onto the affected farm had occurred within the three months prior to the suspect event. Horses had however been to events/day rides within the Boland area in this time period.

VECTOR ACTIVITY

According to the owner of the affected property there were significant numbers of midges on the farm in the weeks prior to the event. The genus and species could not be confirmed. A midge trap was set up but results from these catches are not yet available.

CLINICAL SIGNS

Initially census was performed on farms within the immediate vicinity of the suspect case and clinical inspection for any other suspect AHS cases was done. There were AHS unvaccinated horses on the affected property (three of which are part of the AHS sentinel program in the Western Cape Province). No suspect AHS specific clinical signs on any inspected farms were noted. If owners informed the response team of horses that had recently been off feed then samples were taken from these horses for testing. Samples were also taken from unvaccinated horses or horses that had been previously vaccinated many years before.

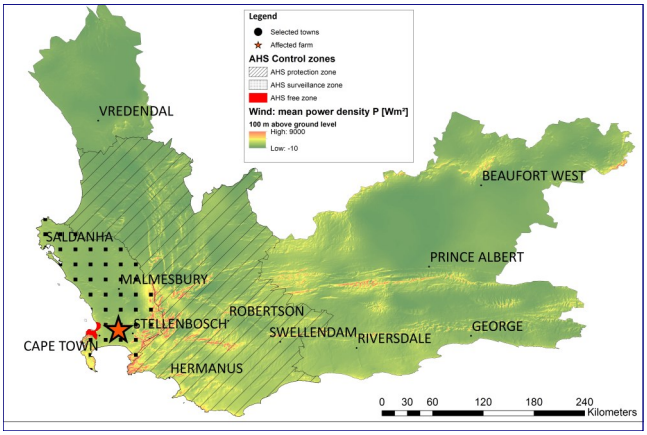


Fig 3: Location of the affected farm in relation to the AHS control zones found within the Western Cape. Just for interest a wind power density interpolation has been added as a backdrop given the interest in vector wind dispersion potential for diseases like AHS and BT.

CENSUS AND VACCINATION STATUS OF POPULATION AT RISK

There were five farms, including the affected farm, in the immediate response area with a total of 94 horses. The total area covered by these farms was 0.31 km^2 which returns a density of equines in that area of 300 equines per km^2 which is certainly a highly dense population. Its not particularly comparable given the heterogeneity of the South African landscape and suitability for horses, but for reference the equine density in South Africa is in the region of 0.24 equines per km^2.

The population at risk demographic (proportions calculated from know status only per variable) is shown in Table 1.

Variable	Variable sub category	Number of animals with known status	Measure of variable
Sex	Gelding	42/80	52% of population
	Mare	26/80	32% of population
Age		55 known ages	Average age - 11 years old, Median age 10 years old
Colour	Bay	43/80	53% of population
	Chestnut	19/80	24% of population
	Grey	13/80	16% of population
Breed	Thoroughbred (TB)	28/80	35% of population TB, the rest was made up of various breeds and cross breeds with no other breed standing out
Species	Horse	77/80	96% of population horses, with remainder a donkey and 2 mules
AHS vaccination status	Vaccinated	54/80	68% vaccinated at some point against AHS
	Unvaccinated	18/80	22% unvaccinated against AHS
	Unknown status	8/80	10% of unknown AHS status
	Months since previous AHS vaccination (Bottle 1)	51 known dates	17.3 months (1 year 5 months) average previous vac AHS bottle 1, 11 months median previous AHS 1 vaccination
	Months since previous AHS vaccination (Bottle 2)	50 known dates	16.7 months (1 year 5 months) average previous vacc AHS bottle 2, 10 months median previous AHS 1 vaccination

Table 1:Selected population and subpopulation demographics and AHS status within the response area which was censured by officials.

SAMPLING & RESULTS

A total of 31 animals were sampled (so almost a 30% representation of the population in the response area). All results for AHSV and EEV (Equine encephalosis virus) were negative.

Organ samples from the carcass of the euthanased pony were also taken to do repeat testing since the initial results were inconclusive. Unfortunately, only formalin samples were taken during the post mortem of the animal and fresh (or as close to fresh as possible) samples were more suitable for re-testing - hence the exhumation of the carcass. Results from these samples were AHSV negative on both real time PCR and hemi nested PCR. Various other arboviruses were tested with negative results including: West Nile, Wesselsbron, Middelburg, Sindbis and Shuni viruses and equine encepahlosis.

CONTROL

Given the clinical signs in the euthanased pony and the initially suspect AHS result this case was treated as a suspect AHS case, but given the time of year and the AHS status in the rest of the

AHS excluded in suspect horse death in Brackenfell - continued from previous page

country, which had been quiet, follow-up investigations and sampling results were waited for before any official controls were put in place. Horse owners neighbouring the affected property were, however, asked not to move horses until clarification of the results of follow-up investigations had been obtained. Horse owners in the Brackenfell, Kuilsriver, Joostenbergvlakte and Koelenhof areas were advised to monitor their horses and contact their private veterinarians if signs of fever, swollen eye sockets and/or inappetence were noted.

CONCLUSIONS

We are grateful for the cooperation of horse owners' that were affected while we were confirming results from the area. The risk period for AHS and other midge and mosquito borne horse viruses is generally from January to June in the Western Cape, and we ask that horse owners and vets remain vigilant in this period for AHS. Veterinarians are requested in suspect cases to rule out AHS as a differential diagnosis and even before they receive AHS results to inform their respective state vet of any suspect case. In cases where deaths have occurred that could be as a result of an infectious disease we ask that organ samples (particularly lung) be taken and sent on ice to a lab for testing for AHS.

ACKNOWLEDGMENTS

Wind data for Figure 3: SANEDI. UCT (CSAG), CSIR, SAWS, DTU Wind Energy and World in a Box Oy for Frogfoot development

Major assistance in response: Dr Camilla Weyer and Dr Phillippa Burger, with data capture assistance from Lugen Govender. and Danielle Piennaar.

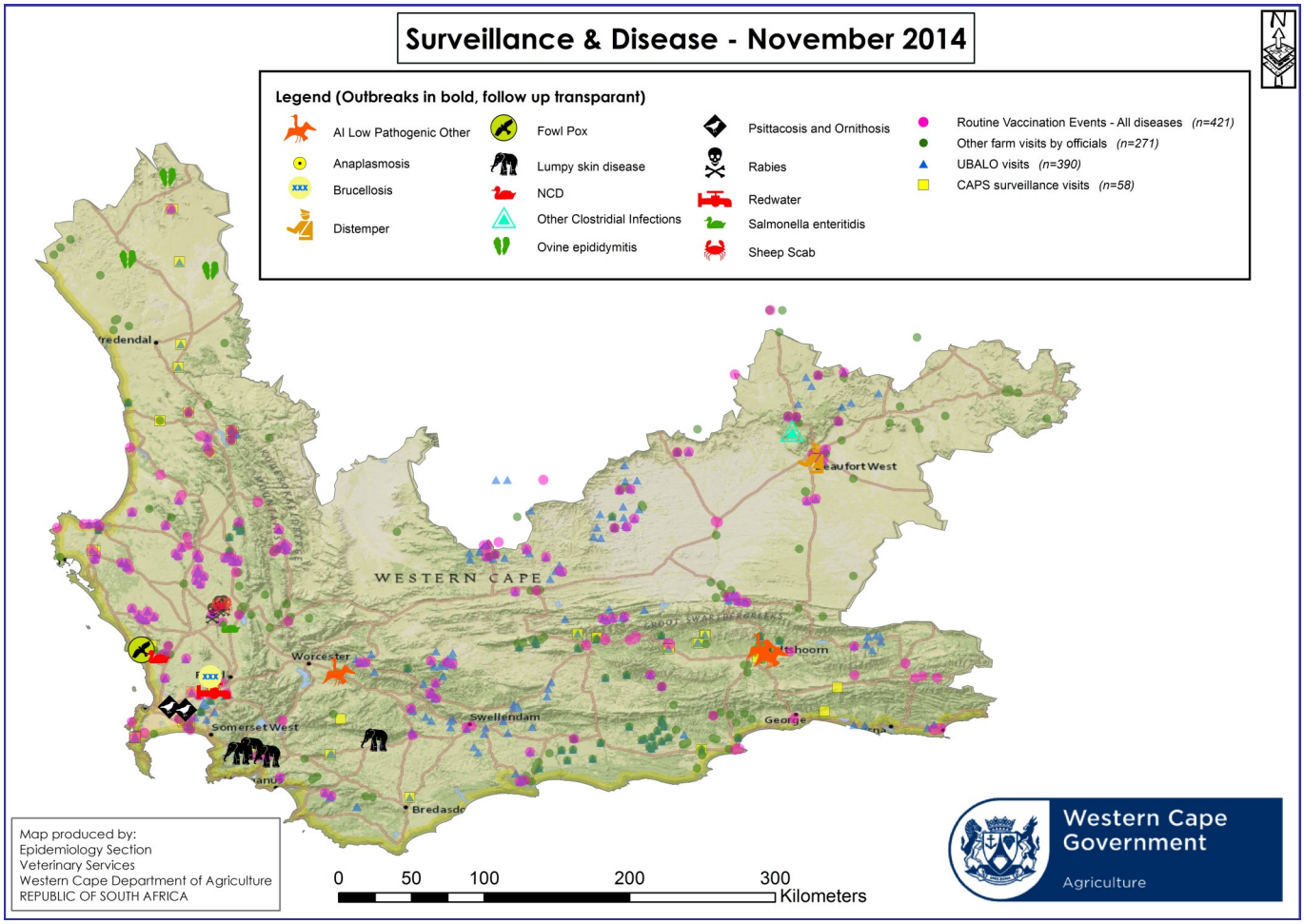


Fig 4: Surveillance and disease map of the Western Cape for November 2014

Outbreak events

- Several cattle herds in the **Grabouw and Caledon** area experienced clinical cases of **lumpy skin disease**.
- **LPAI** was detected on **ostrich** farms near **Oudtshoorn and Worcester**.
- An outbreak of **Newcastle disease** occurred in free-range poultry belonging to a small farmer near **Malmesbury**. Over half of the poultry showed nervous signs and died acutely. The survivors were vaccinated.
- Eggs (dead-in-shell samples) from a broiler hatchery near **Malmesbury** tested positive for **Salmonella enteritidis**. The farm has a comprehensive Salmonella reduction plan in place to which it continues to adhere.
- An eight-month-old heifer belonging to a small farmer in **Klapmuts** died. A post-mortem confirmed infection with **bovine babesiosis** and **anaplasmosis**.
- A farmer near **Klipheuwel** bought heifers from a Brucellosis-negative farm in November 2013. After calving in April and May this year, three heifers tested positive for ***Brucella abortus*** during routine testing. The farm has been placed under quarantine and forward and back-tracing is currently taking place.
- Three sheep farms in the northernmost part of the province (north of **Vredendal**) tested positive for ***Brucella ovis*** infection in rams.
- Three out of 15 chickens belonging to a small farmer near **Atlantis** showed clinical signs of **fowl pox**.
- A suspect case of ***Clostridium septicum*** occurred in **sheep** near **Beaufort West**.
- An outbreak of **sheep scab** occurred on a farm near **Malmesbury**.

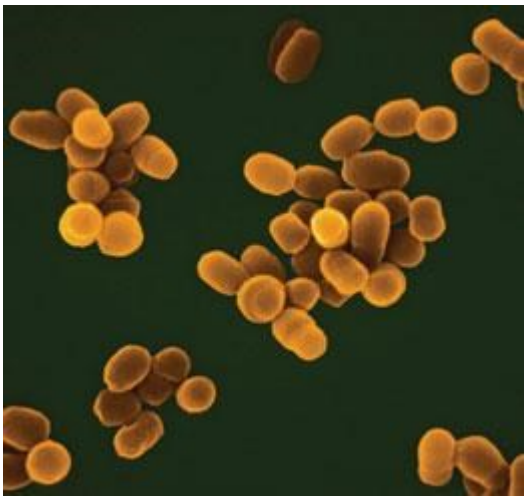


Fig: Brucella organisms (nature.com)

Total OIE logs

State Vet area	User	Total Logs
SV Beaufort Wes	antonb	62
SV Malmesbury	hendrikh	59
SV Malmesbury	Michaelc	53
SV Malmesbury	janicac	51
SV Beaufort Wes	nitav	47
SV Malmesbury	elmienc	42

Total UBALO logs

User	Total events
maresaf	41
nitav	41
wynandf	39
magriethan	35
hendrikh	26
antonb	26

Most rabies vaccinations performed

State Vet area	User	Total
SV George	eddiel	1654
SV George	johanb	974
SV Malmesbury	Michaelc	777
SV Malmesbury	hendrikh	645
SV George	Ronniek	556
SV George	theandp	486

Epidemiology Report VOLUME 6 ISSUE 11

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Web based event logging AHT leader boards

Epi Lab color code

Software/Packages/Add-ins required

Software/Packages/Add-ins recommended

Description text

R code to copy/paste into console

R code to copy/paste into console that needs adjustment to your personal workspace

Websites where you can download requirements

Lab #7 requirements

- R - http://cran.r-project.org/bin/windows/base/
- R Studio - www.rstudio.com/ide/download/desktop
- Internet connection
- epitools R package

Creating categorised epidemic curves

This month we re-visit epidemic curves - see the first back page lab at http://www.elsenburg.com/vetepi/BPEL/BPEL_2014_05_EpidemicCurve.pdf - in this case however we categorise aspects of the epidemic curve in order to include more information in one graph. Also, there are a few techniques in this lab that help with plotting information in R - its certainly not exhaustive but will be a start.

NOTE ON THE DATA: The data used are avian influenza outbreaks on ostrich farms classified by the Western Cape Department of Agriculture. The data has been altered slightly since the point of the lab is to get to the graph but not necessarily to evaluate it. Avian influenza outbreaks on ostrich farms are logged per farm and then classified per H and N type using PCR and/or HI testing. It does occur from time to time, especially on farms with low on-farm prevalence, that the H or N (or both) types are undefined and could not be further classified. In these cases the type is classified as UNDEFINED (a "U" in the data). This is also true for the pathogenicity of the viruses, with the difference here that if high path is not confirmed by PCR sequencing, or by epidemiological links to a high path farm, then the farm is considered low pathogenic. To re-iterate - the data are, firstly not available for further use outside this exercise and secondly the alteration thereof anyway renders it non-usable for purposes other than instruction.

The code

```
#load the epitools library if you've already installed it, if not then install and load it
library(epitools)
#import the required dataset and call it aidata
aidata<-read.csv("http://www.jdata.co.za/backpagelabs/backpagelabs_jdg_aidata.csv", header=T)
#view a summary of the data and check the class of the date field
aidata
summary(aidata)
class(aidata$posdate)
#the class for the date data (i.e. postdate is in a FACTOR form - a reminder for histograms using epitools : the class for the date should be a DATE class and the format ideally should be "yyyy-mm-dd"
aidata$posdate
aidata$posdate<-format(as.Date(aidata$posdate), "%Y-%m-%d")
aidata$posdate
#to start - a quick and nasty epidemic curve
epicurve.months(aidata$posdate)
```

1

```
#This gives a very ugly boring curve, with x labels that are pointless, so this lab is really about getting from this into to something worthwhile
#The goal is to have a epi curve for AI events separated into the H and N subtypes - we'll start with just the H types
#Before we start run the following to add a new field for the full HN type per event. For this we also need to concatenate the H and N type fields
aidata$subtype<-paste(aidata$htype,aidata$ntype,sep="")
#In this case its important to add that the separation between the two columns must be nothing (""), if you leave that out then the default separation is a SPACE
aidata$subtype
#first create a data list with all the variables needed for the epicurve graph
aicurve<-epicurve.months(aidata$posdate)
aicurve
summary(aicurve)
#you'll see that there are various variables created that essentially are the backbone of the epicurve and these can be used in the final graph
#For the x-axis we'll need some month and year information - so the $cmon or $cmonth variables, and the $cyear variable
#The $xvals variable indicates points on the x axis and run on for 50 months encapsulating the data
#The following commands we will run step for step - you could just run the final one but it shows the process followed to get to the final outcome
#first sort out the y-axis - you can see on the plot that one bar (6 months into the plot) extends past 12 events which is the current limit of the y-axis
#lets also remove the x-axis labels and y-axis, and also extend the y-axis limit to 15
epicurve.months(aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15))
```

2

```
#add segments to view each outbreak on each farm as a separate block
epicurve.months(aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True")
```

3

```
#in order to view outbreak by H-type we stratify by that variable
epicurve.months(aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True",
        strata=aidata$htype)
```

4

```
#we want to add colours for every unique H type instead of the grey range default
#We first need to know how many unique H types there are in the data set
length(unique(aidata$htype))
#6 it is, so we need to add 6 colours (in this case rainbow is a nice function)
epicurve.months(aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True",
        strata=aidata$htype,
        col=rainbow(6))
```

5

Continued on next page

```
#note that we could have also done that somewhat more automatically
epicurve.months(aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True",
        strata=aidata$htype,
        col=rainbow(length(unique(aidata$htype))))
#now to add the legend
epicurve.months(
        aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True",
        strata=aidata$htype,
        col=rainbow(length(unique(aidata$htype))),
        legend=TRUE)
#your legend will be overlapping parts of your graph and it's not ideal
#first lets get the legend text slightly smaller (cex  function)
#for this we add a argument into our string that influences the legend - namely"args.legend"
epicurve.months(
        aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True",
        strata=aidata$htype,
        col=rainbow(length(unique(aidata$htype))),
        legend=TRUE,
        args.legend=list(cex=0.5))
#for all legend options please see: http://stat.ethz.ch/R-manual/R-patched/library/graphics/html/legend.html
#for instance - lets take the box that's around the legend items out - using the bty  function
epicurve.months(
        aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True",
        strata=aidata$htype,
        col=rainbow(length(unique(aidata$htype))),
        legend=TRUE,
        args.legend=list(cex=0.5, bty="n"))
#in my plot the legend is almost in a good position - I want to move it up slightly and to the left - your screen will be different
#in R there is a way of locating an X and a Y location on a plot that you have in you PLOT WINDOW
#type in the locator  function and stipulate that you want to find one location
locator(n=1)
#now take your mouse and click where you'd prefer to see the your legend - you'll see that $x and $y results are returned, which you could add directly into your graph code
#in the code below we however incorporate the locator function directly into the plot. You'll need to click twice in your plot where you want the top right of the legend to be - first click for x location, second for y
#also add a Legend title
epicurve.months(aidata$posdate,
        axisnames=FALSE,
        yaxt="n",
        ylim=c(0,15),
        segments="True",
        strata=aidata$htype,
        col=rainbow(length(unique(aidata$htype))),
        legend=TRUE,
        args.legend=list(cex=0.5,
                bty="n",
                x=locator(1)$x,
                y=locator(1)$y,
                title="Legend"))
#I put the locator function in directly, you can hard code it as follows:
.....args.legend=list(cex=0.5,
                bty="n",
                x=47,
                y=15.....)
#OK - so we have a good starting point with physically how our graph should look - now to fill in the axis labels and plot title
#we can now manipulate (and insert in the case of the Y axis) the axes of the graph
axis(
    side=1, # puts the axis at the bottom - i.e. x axis
    at=aicurve$xvals, # labels will be placed in the xvals, fitting is automatic
    labels=aicurve$cmonth, # labels will be months in the aicurve data
    cex.axis=0.5, # changes the text size of the axis labels
    lwd=0, # width of the  axis line is zero, makes invisible
    lwd.ticks=0, # width of the tick lines also zero, makes them invisible
    mgp=c(0,0.2,0)) #mgp controls where labels are put - we want it 0.2 units below the x axis
#now to put the years underneath the months in the x axis
#we don't want to put in more than one label per year, to find out how many unique years there are
length(unique(aicurve$cyear))
#so 5 years - 2010 through 2014
length(aicurve$xvals)
#there are 50 points along the x axis where labels can be placed -if we look at the year data in the aicurve  dataset
aicurve$cyear
#we can see that there are two 2010 months, and then 12 months per year up to and including 2014
#a good way of labelling would then be to label maybe the 2nd 2010 month, and then every JUNE for the following years using the following functions to get the xvals month location
aicurve$xvals[c(2,8,20,32,44)] #location of label
aicurve$cyear[c(2,8,20,32,44)] #label to put down - could also have been "unique(aicurve$cyear)"
#so now the axis
axis(
    side = 1,  # puts the axis at the bottom - i.e. x axis
    at=aicurve$xvals[c(2,8,20,32,44)],  # labels placed in the specific xvals
    labels=aicurve$cyear[c(2,8,20,32,44)],  # labels for the years
    cex.axis=0.5,  # changes the text size of the axis labels
    lwd=0,  # width of the  axis line is zero, makes invisible
    lwd.ticks=0,  # width of the tick lines also zero, makes them invisible
    mgp=c(0,1,0)) # we want it 1 units below the x axis so its below the month labels
```

6

7

8

9

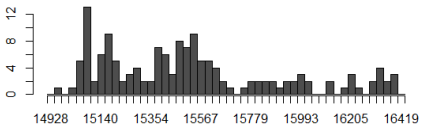
pre labels

Continued on next page

```
#now for adding the Y axis
axis(
      side=2, # puts the axis on the left
      line="-0.8", #indents the y axis slightly
      at=seq(0,14,by=2),  # creates a vector of label locations starting at 0 to
14 with points every 2 labels
      labels=seq(0,14,by=2), # here we put in a vector of labels, this must be
equal in length to the "at" value above - e.g. 7 labels for 7 points
      las=1, # rotate labels to be horizontal
      cex.axis=0.5, # changes the text size of the axis labels
      lwd=1, # width of the  axis line - 0 would make this invisible
      lwd.ticks=1, # tick marks are 1 wide
      tck=-0.02, # length of ticks, negative goes out from the plot
      mgp=c(0,0.35,0)) #location of labels
#Now to add axes titles - either text  or mtext  functions can be used
#mtext  place text in the margins (hence the m)
#text  places text in the plot area itself
#x-axis title
mtext(text="Year and Month of avian influenza outbreak",
       side = 1, # Bottom (or x as we've discussed above)
       adj=0.5, # Alignment parallel to margin
       line=1.5, # Alignment relative to margin
       cex=0.5) # text size

#classify the "U"
mtext(text="*U = undefined",
       side = 1, # Bottom (or x as we've discussed above)
       adj=0.02, # Alignment parallel to margin
       line=1.7, # Alignment relative to margin
       cex=0.3) # text size

#yaxis title one
mtext(text="Number of unique, farm level",
       side = 2, # Left (or y as we've discussed above)
       adj=0.5, # Alignment parralel to margin
       line=0.5, # Alignment  relative to margin
       cex=0.5) # text size

#yaxis title two
mtext(text="AI outbreaks",
       side = 2, # Left (or y as we've discussed above)
       adj=0.5, # Alignment parralel to margin
       line=0, # Alignment  relative to margin
       cex=0.5) # text size

#now to add the main title
title(main=list("The H type of avian influenza outbreaks on ostrich farms in
the Western Cape", cex=0.75))
```

The result

The following series of graphs are those that are created piece meal as the code is run in the lab. Labels of the graphs are linked to the labels in the text



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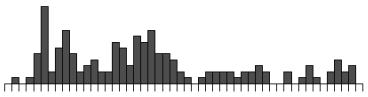

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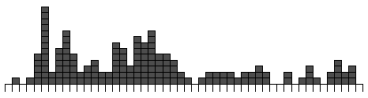

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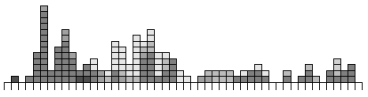

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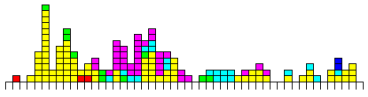

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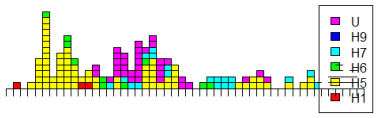

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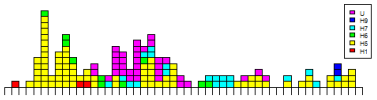

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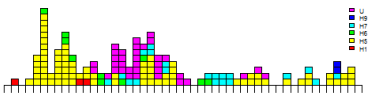
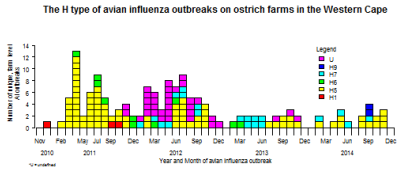


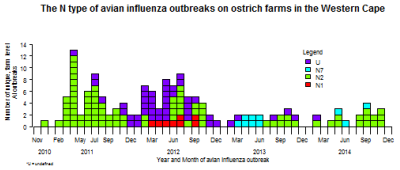
8

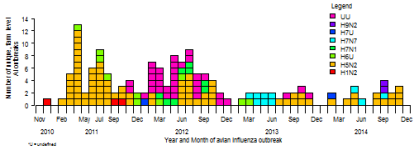
and finally

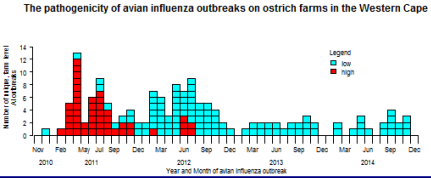


9

The n-type, HN type and pathogenicity types should look as follows when you alter the code to use these various subtypes - for these just change the stratify by variable and the `text` and `mtext` labels







References

R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/

Tomas J. Aragon Developer (2012). epitools: Epidemiology Tools. R package version 0.5-7. http://CRAN.R-project.org/package=epitools

Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
December 2014
Volume 6 Issue 12

In this month's report we do a brief overview of 2014 in terms of animal populations and the diseases that impacted them. Note that all the maps and infographics will be available on www.elsenburg.com/vetepi under either the MAPS or the INFOGRAPHICS tabs.

Ostriches

As always, ostrich work remains a large part of the Animal Health component of Veterinary Services and this filters down to the Epidemiology section as well. Dr Marna Sinclair joined the section at Elsenburg during 2014. She however accepted another job in the private sector late in the year and left us in early December. She managed much of the ostrich outbreak event information while she was here and dealt with much of the **H5 avian influenza (AI)** subtype that dominated during the year. Of the 23 farms affected by AI during 2014 17 were as a result of this subtype. **H9N2** was also identified in the **Oudtshoorn** region on two properties, with this subtype being a new finding in terms of AI compared to what we have seen over the past few years. Having 23 positive farms is slightly up from the 19 that we had in 2013 but still significantly lower than the AI events of 2011 and 2012, with the HPAI outbreak and the busy year following that. One interesting change that we have however seen is that in the past years the majority of outbreaks have occurred in late winter and early spring - in 2014 we had a significant spike in cases in late spring and early summer and are currently involved with a number of active positive farms. Please see the infographic (Figure 1 on page 3) to show you the spatial and temporal spread of our AI events for the year. Also we show the age group associated population of ostriches in the Province on a seasonal basis. The general population is depicted by a density plot and this is overlaid by the positive AI events. The cyclical aspects of ostrich production is included through a season series of population maps and graphs by age group, with these maps also showing the spatial distribution of each age group within the Province.

Bovine

The bovine events for 2014 were certainly increased from 2013 in terms of number of disease events experienced (Figure 2 on page 4). Of concern was the increase in **lumpy skin disease (LSD)** outbreaks (49 in 2014 compared to 10 in 2013) and **brucellosis** outbreaks (6 in 2014 compared to 2 in 2013). Underreporting of LSD in 2013 could account for that difference but brucellosis is concerning, in particular the incursion into the dairy farming area in the **George** region. The increased cases of **bovine malignant catarrhal fever** experienced in 2013 was not repeated in 2014 with just one case reported from the **Uniondale** area. The good work our technicians are doing can be seen nicely on the density maps if you compare 2013 to 2014 (2013 Year in Review at www.elsenburg.com/vetepi); the 2014 map is quite a lot smoother and with areas of similar densities more contiguous with each other.

Small Stock

2014 was dominated by **bluetongue** (figure 3 on page 4) with 67 reports being submitted (most based on clinical examination within a current outbreak). The majority of cases occurred in the north-eastern parts of the Province in the **Murraysburg** and **Beaufort West** regions. **Sheep scab** and **Johne's disease** continued to keep officials busy with a slight increase in numbers of outbreaks reported compared to 2013. The other point of interest was in an **Angora goat** that contracted **rabies** in the **Prince Albert area**. Census information gathered over the past two years continues to show the areas of highest small stock density in the Swartland and

Southern Cape regions with extensive farming in the Karoo. Some improved census information has come through for the north-western parts of the Province showing that there are certainly some highly dense small stock farming sectors on the West Coast.

Rabies (Figure 4 Page 5)

Part of the general day-to-day work of technicians in Animal Health is maintaining a high rabies vaccination coverage in both the urban and rural parts of the Province. 2014 vaccination totals mirrored in number those of 2013. The number of rabies cases and season in which they occurred was also mirrored between the years with the only major difference being the domestic goat case as mentioned above. Figure 4 also shows a comparison of the spatial distribution of our rabies vaccination density, and with similar totals the differences are generally not due to decreased or increased effort but rather a change in location of campaign vaccinations.

Equine

The equine disease distribution was dominated by the **Porterville African horse sickness** outbreak in Autumn 2014 (see Figure 5 on page 6). This outbreak spread to **Wellington** and **Robertson**. During that time there were also 4 cases of non-Porterville serotypes in the **Beaufort West**, **Murraysburg** and **Uniondale** regions.

Avian

The CAPS surveillance strategy has certainly helped in our (particularly non-commercial) avian census data and while it is still difficult to portray the data given the differences in numbers of birds per property due to the large range of values, a log transformation of the census points is starting to look accurate and the area around our 2014 outbreaks can be seen in Figure 6 on page 6. In terms of disease, the occurrence thereof is almost exclusively found in the **Boland/ Malmesbury/Swartland** area where there is both a high density of farms and good surveillance by officials. **Psittacosis** events occurred with higher than normal frequency in the **Cape Town** region and again ***Salmonella enteriditis*** dominated the outbreaks in commercial poultry farms, generally identified through environmental swab samples. Only 4 **Newcastle disease** outbreaks were reported - similar to the 2 reported in 2013.

Education and Publications

Both John and Marna were co-authors in publications in 2014. John collaborated with a UCT MSc student who published: *Moore, Christine, et al. "**Tracking Socioeconomic Vulnerability Using Network Analysis: Insights from an Avian Influenza Outbreak in an Ostrich Production Network.**" PloS one 9.1 (2014): e86973.* and work that Marna had done in the States was published: *McReynolds, Sara W., et al. "**Direct and indirect contact rates among livestock operations in Colorado and Kansas.**" Journal of the American Veterinary Medical Association 244.9 (2014): 1066-1074.* John presented a paper at an international congress (which will hopefully be published in 2015) on the **economic impact of Bluetongue and related orbiviruses in Southern Africa**. A **social network analysis and contact tracing** workshop was also presented by John on behalf on SASVEPM.

Both John and Lesley remain part of the SASVEPM (Southern African Society of Veterinary Epidemiology and Preventive Medicine) executive committee.

Projects

Our major projects of the year included the launching and mid year review of our **CAPS (Chicken and Pig Surveillance)** program. We'll hopefully do a full annual review on the program soon but its been quite successful so far and we'll definitely be continuing with the program in 2015. We also started with the **Northern Cape inter-provincial deployment** of our online data capture systems for census and OIE listed diseases, this is an ongoing project but things are looking good for it to succeed. During this period we also upgraded our own front end databases for these systems. We did a major **spatial review for technicians** and State vets on the OIE listed and UBALO data capture systems which we'll report on in the coming months.

Plans for 2015

We wanted to upgrade our Ostrich database in 2014, and while we did do work on the current one, a full upgrade is still necessary. The section has a few publications in the pipeline including a review of the high path avian influenza events from 2011/12.

Our Oudtshoorn State Vet office is now a lot more formally functional and along with this needs to come the revision of a few of our data and reporting systems.

We are very grateful to all technicians and vets in the State services who contribute to the data that we present here. We make every effort to analyse their data and turn it from raw data into information and hopefully into knowledge. We must also thank the various industries and private veterinarians with whom we work closely, your continued support and interaction with our section is very valuable.

We trust that 2015 will be a successful year for you all

Epidemiology Report Volume 6 Issue 12

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Ostriches and Avian Influenza

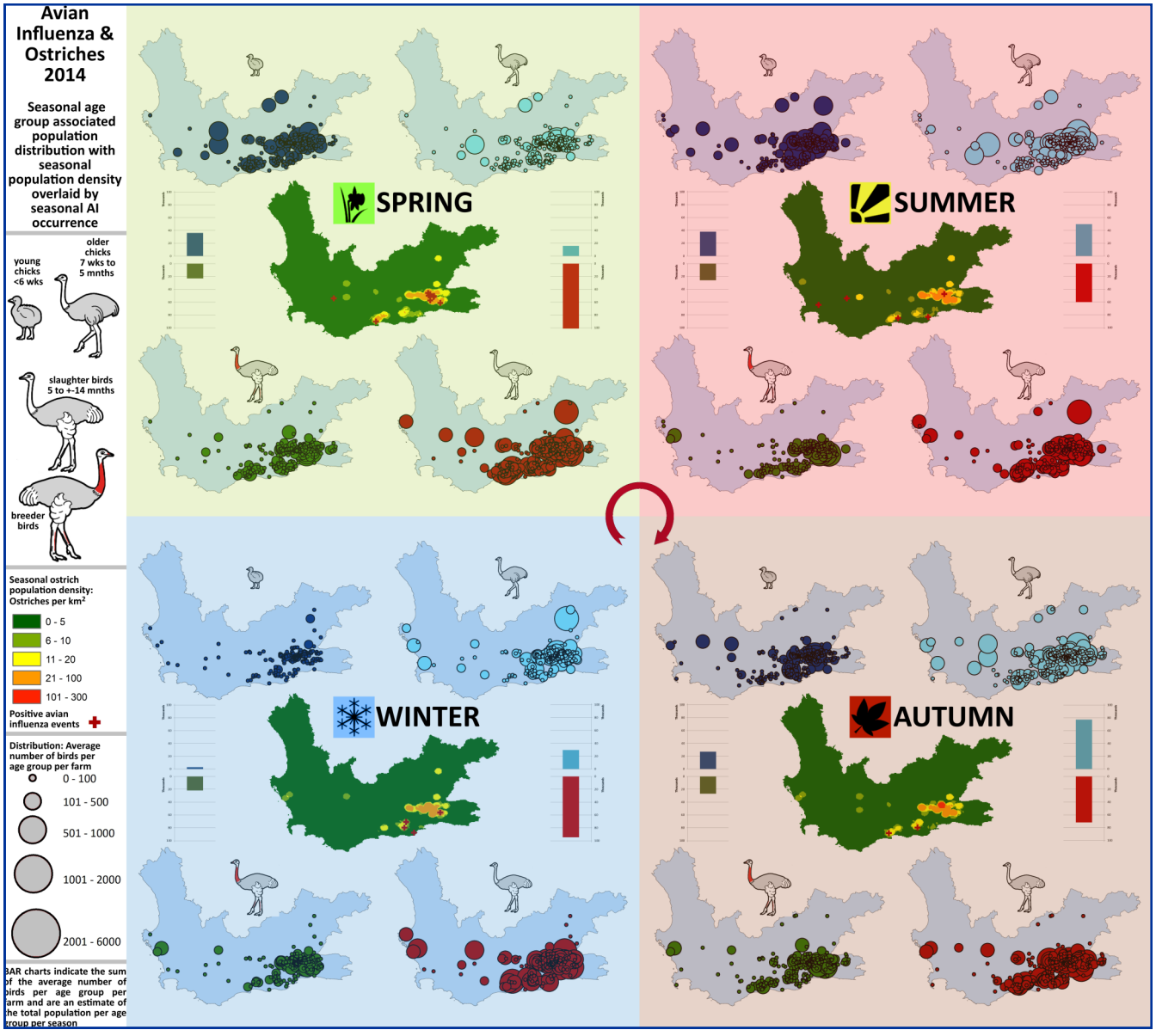


Figure 1

Large and Small ruminants

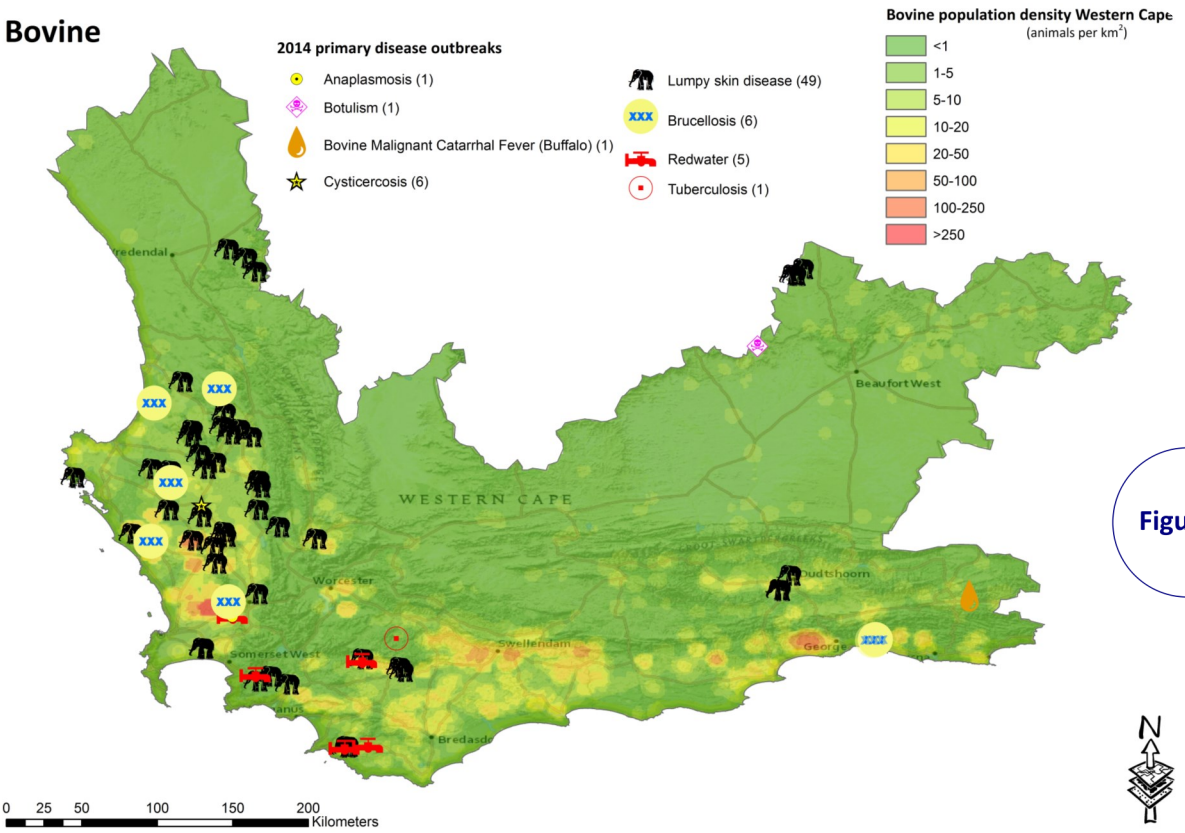


Figure 2

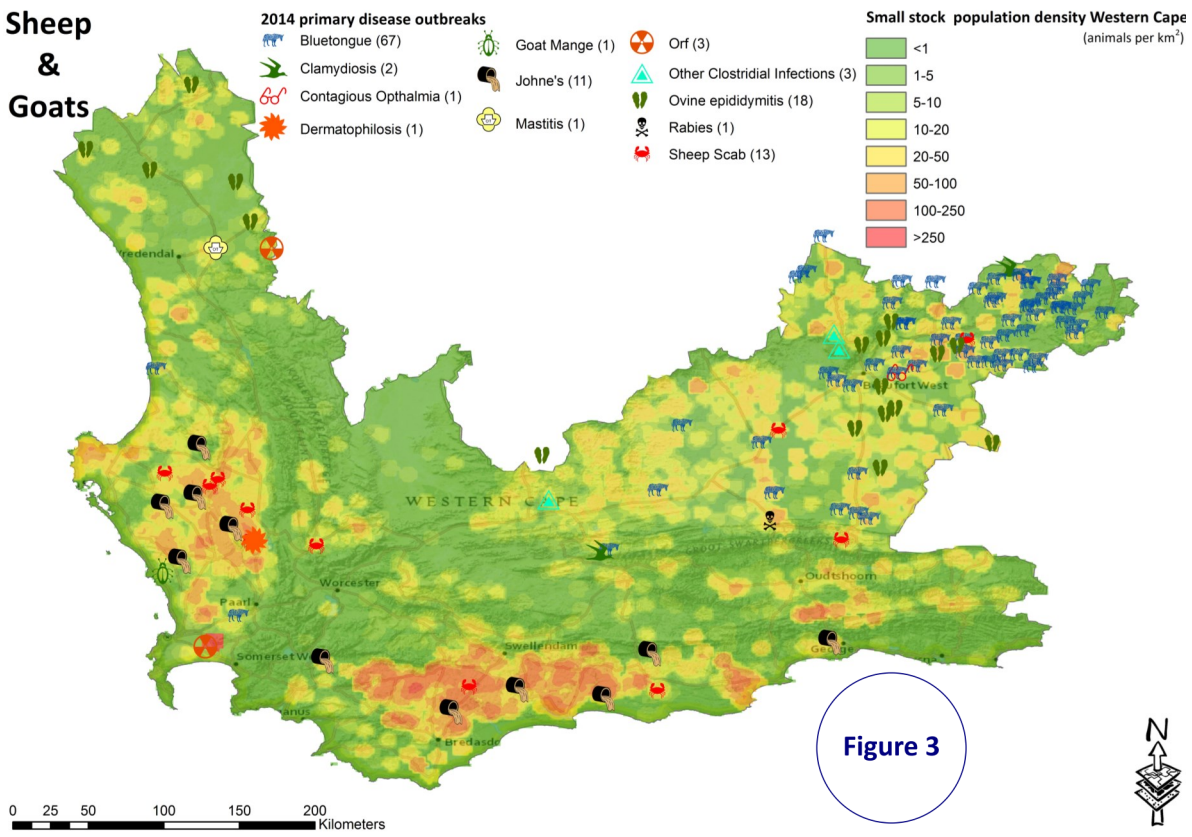


Figure 3

Rabies - outbreaks and vaccinations

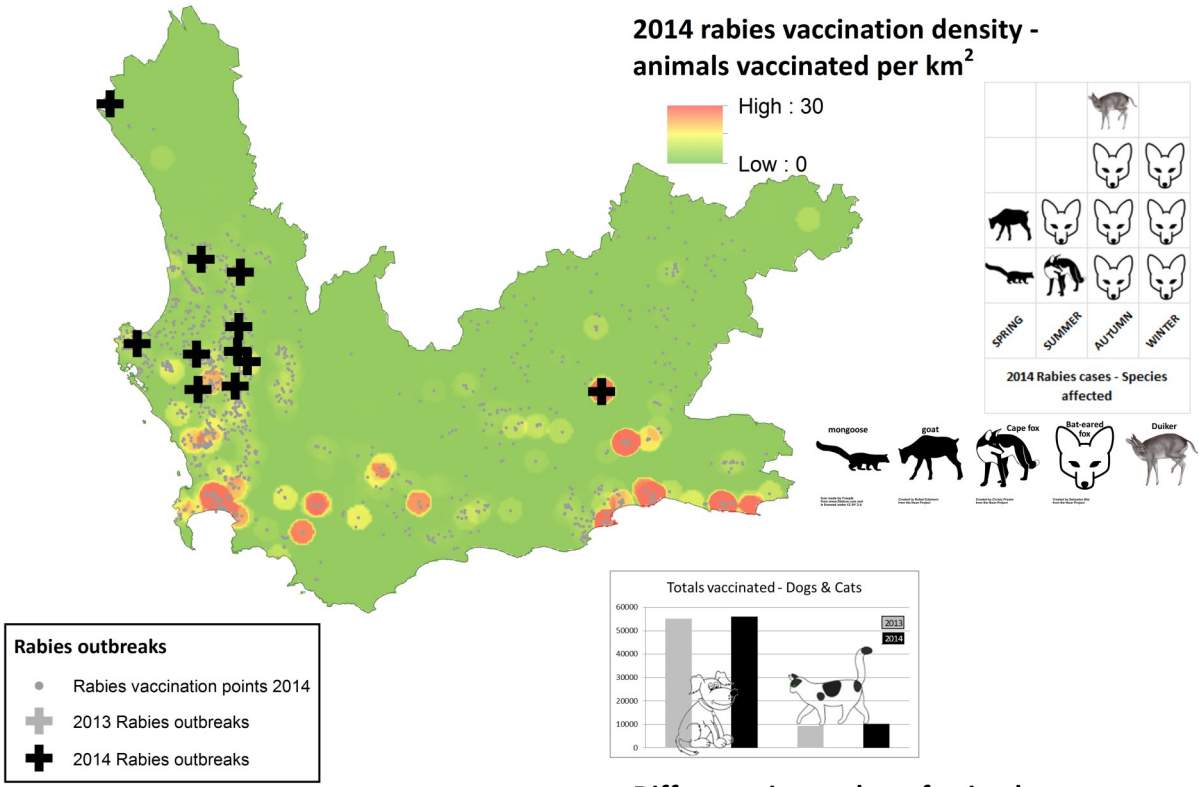
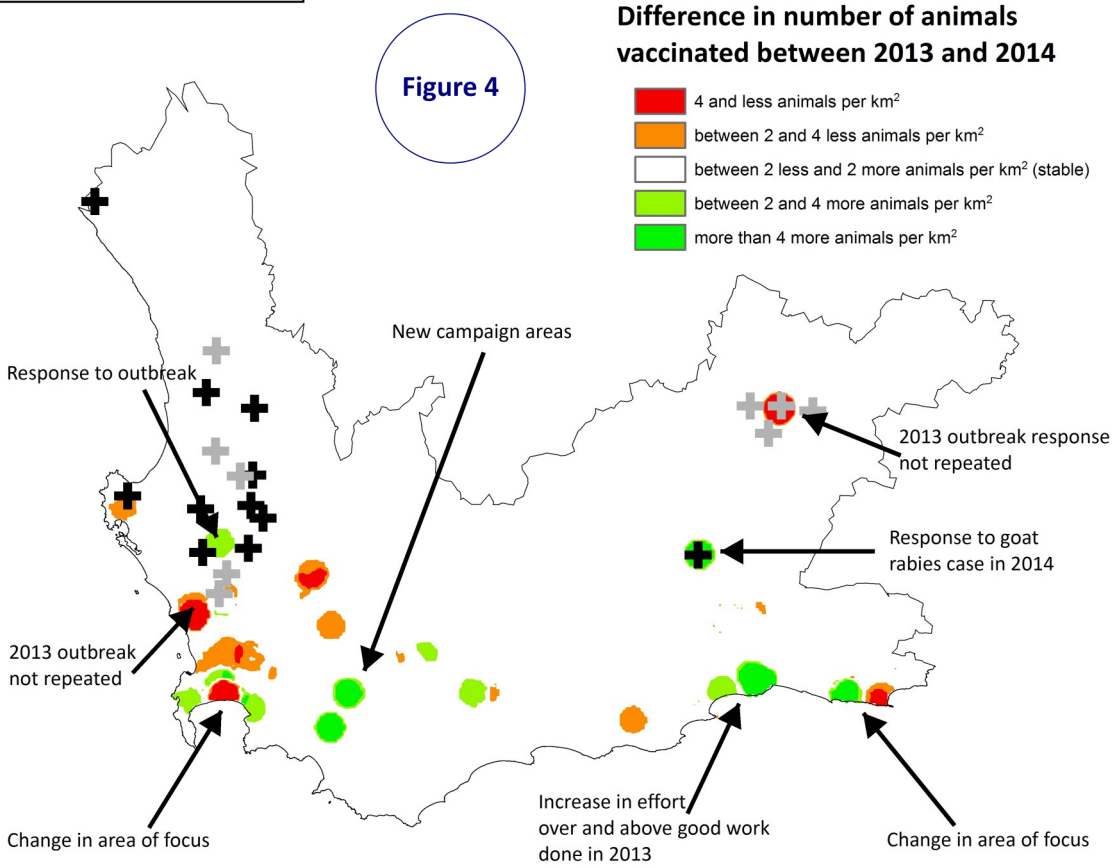
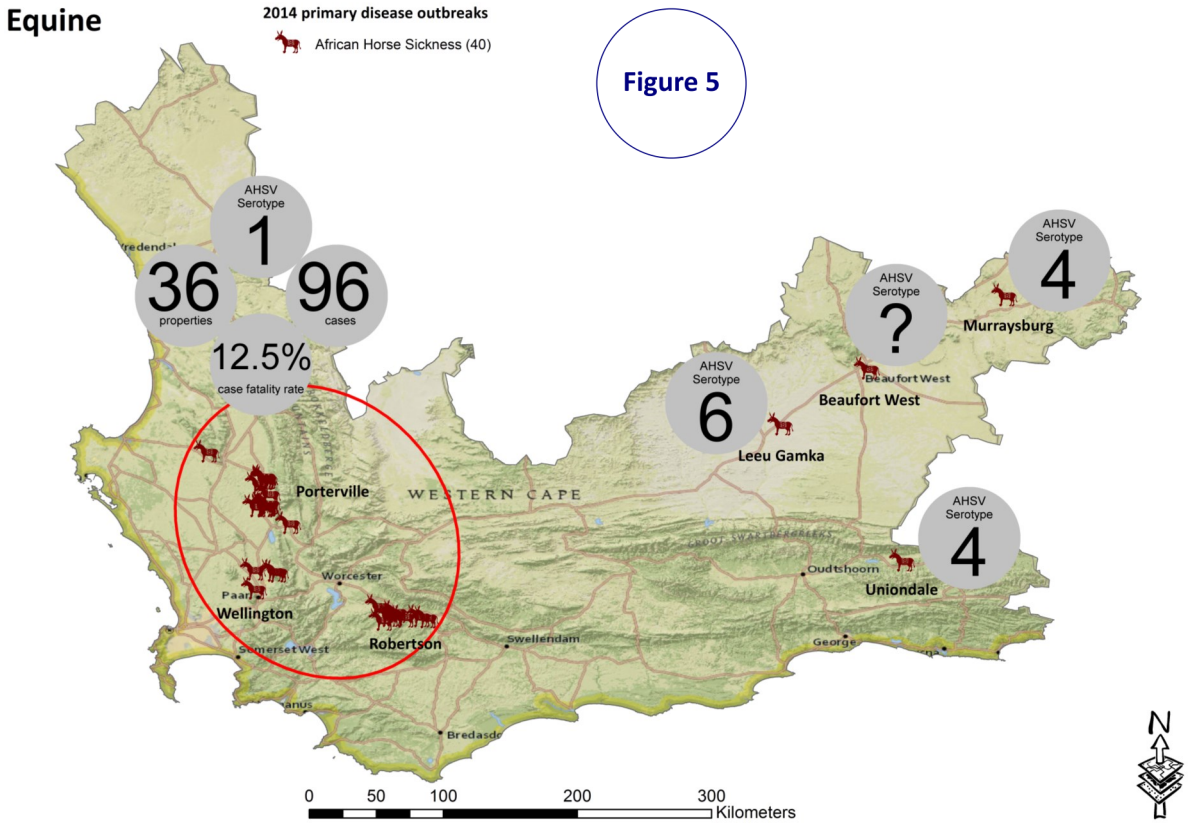
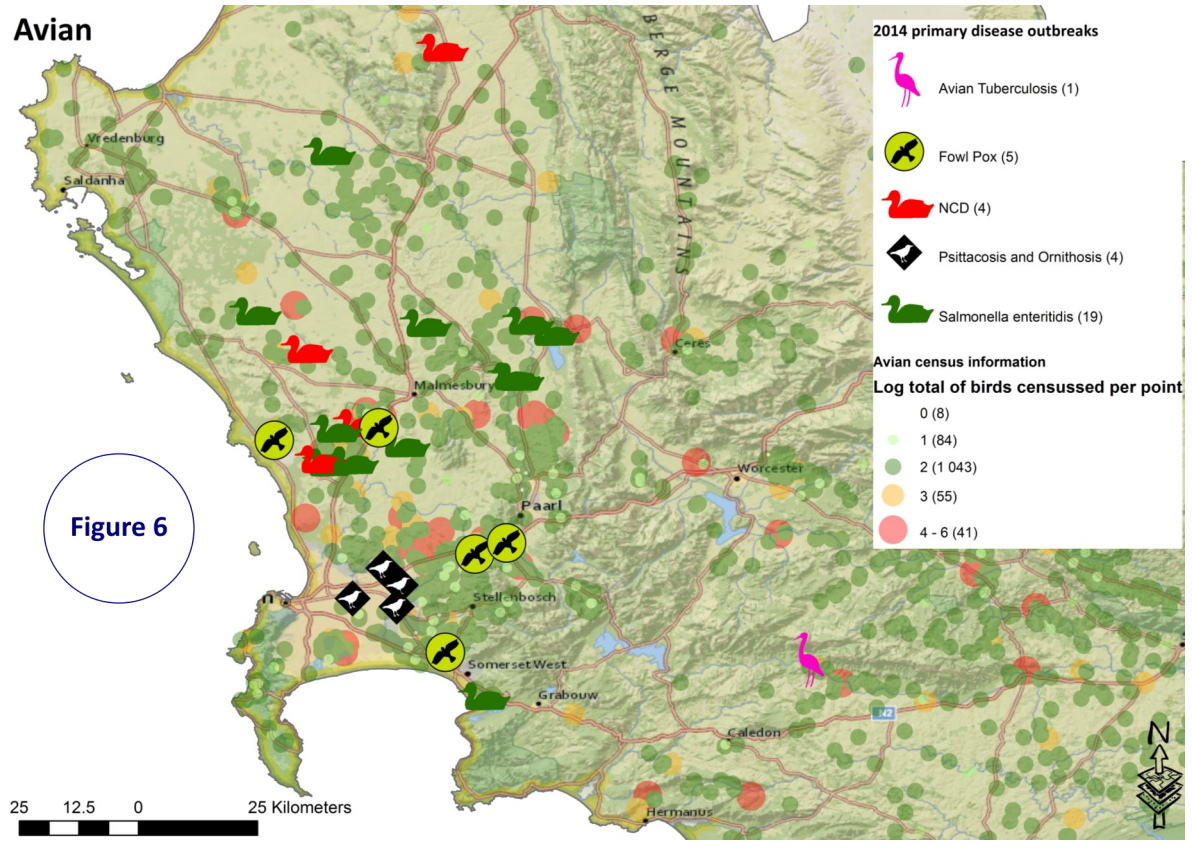


Figure 4



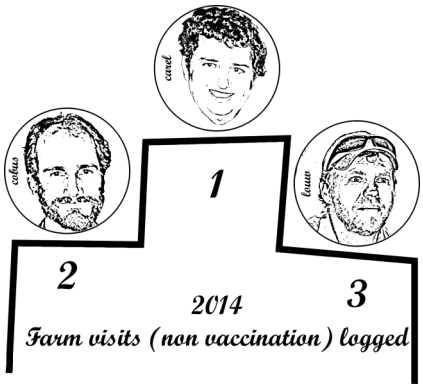
Horses, AHS and Poultry

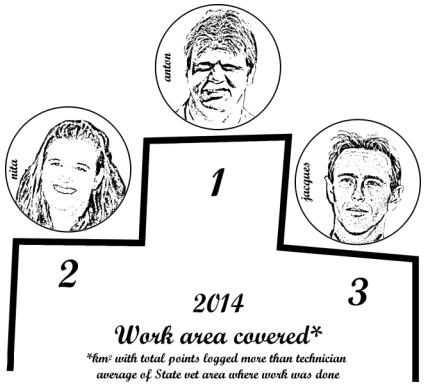


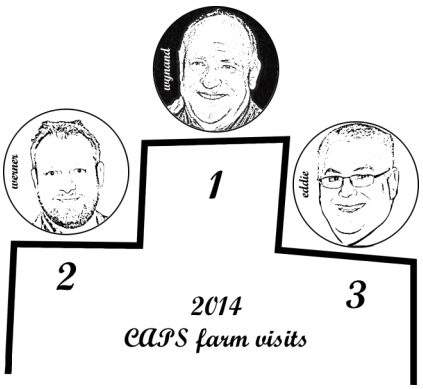


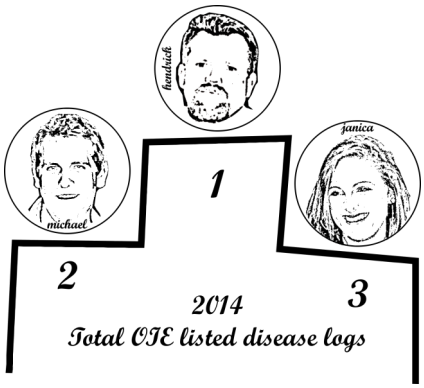
Top performers - THANK YOU!

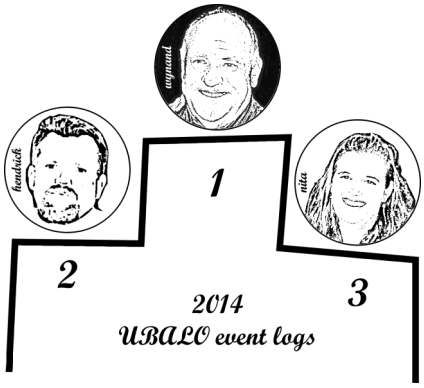
Every year we do a small evaluation on the top performers that log on our various online systems. While we highlight a few here really we are very pleased with all technicians that have supported our systems throughout 2014 and that have contributed to the strength of our data

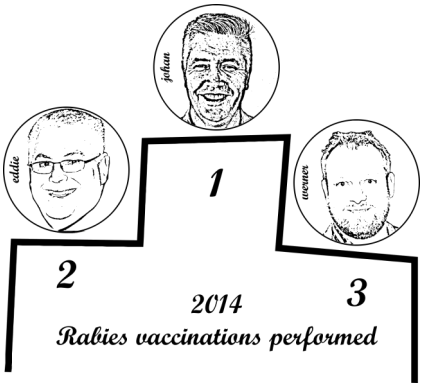


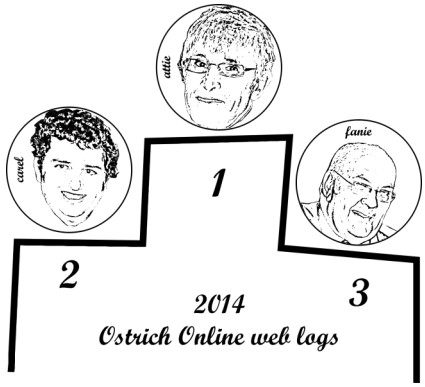


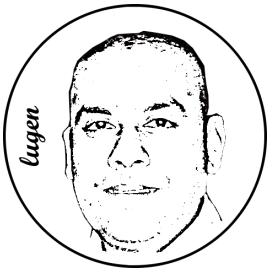












We also acknowledge **Lugen Govender**, our data processor, who does much of the behind the scenes work

The logo we have chosen this month is represented by all logs made by technicians on our OIE listed and UBALO systems during 2014 - and its encouraging to see that you can pretty much make out the borders of the Province using this information alone

The back page - for the record DEC 2014 info

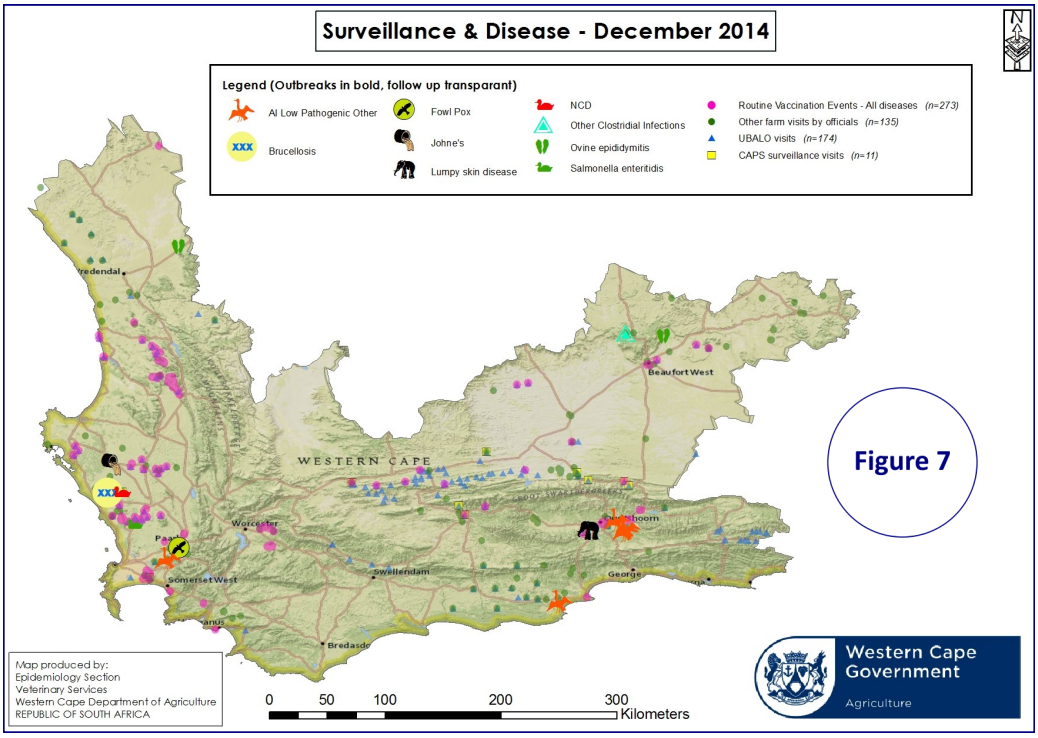


Figure 7

- **Low path AI** was detected in late November and during December on farms in the **Boland**, **Southern Cape** and **Oudtshoorn** areas.
- An outbreak of virulent **Newcastle disease** occurred in unvaccinated backyard **chickens** on a farm near **Malmesbury**. Approximately 200 poultry belonging to a farm worker died acutely and two of 30 bantams belonging to the farm became anorexic. The farmer was advised to vaccinate the bantams with La Sota vaccine.
- Ovine **Johne's disease** was confirmed on a **sheep** farm near **Hopefield**, where chronic emaciation had been noticed.
- ***Salmonella enteritidis*** was diagnosed from boot swabs on a commercial **broiler** farm near **Malmesbury**.
- Back tracing from a ***Brucella abortus*** positive farm in **Klipheuwel** identified another positive herd near Darling, which will be slaughtered completely. The **cattle** have moved around in the past, grazing hired pastures and the town commonage, so much more back-tracing will take place in the new year.
- Routine ram testing revealed ***Brucella ovis*** infection near **Beaufort West** in **rams** that had been bought from a previously positive. Luckily the farmer had kept these rams separate from the rest of his herd for the two years since they had been purchased. The positive animals were slaughtered.
- **Cattle** on two neighbouring farms near **Oudtshoorn** showed clinical signs of **lumpy skin disease**. Neither of the herds had been vaccinated against the disease.
- An outbreak of **fowl pox** occurred in **chickens** near **Paarl**, causing lesions on heads, beaks and thighs, but no reported deaths.
- A **ram** died from ***Clostridium novyi*** infection on a farm north of **Beaufort West**.

Total OIE logs

State Vet area	User	Total Logs
SV Vredendal	irmis	47
SV Malmesbury	michaelc	41
SV Malmesbury	janicac	36
SV George	carell	22
SV George	ronniek	22
SV Beaufort Wes	CobusF	21

Total UBALO logs

User	Total events
johng	66
nitam	51
flipk	19
janicac	14
michaelc	13
maresaf	12

Most rabies vaccinations performed

State Vet area	User	Total
SV George	ronniek	1305
SV George	eddiel	1270
SV George	carell	1229
SV George	flipk	731
SV Boland	judithg	701
SV Malmesbury	janicac	627