



BOSLUIS- WEERSTAND TICK RESISTANCE

- DR TOM STRYDOM

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1. INTRODUCTION

The World Health Organisation (WHO) defines resistance as “the development of a strain of organisms with the ability to tolerate doses of toxins which are usually fatal for the majority of individuals in a normal population of the same species”. In layman’s terms this means that in any population of parasites, before a product is used for the first time to control a specific parasite there are individuals which are resistant to the specific drug or active ingredient in the product which is fatal to the majority of individuals. This means that in the same population of parasites there are individuals that are homozygous for susceptibility to the drug/active ingredient and individuals that are homozygous for resistance to the drug/active ingredient. The susceptible individuals are in the majority before the product is used on the farm for the first time. The development of resistance is a genetic process which develops over time and does not arise overnight.

2. TICK RESISTANCE

In the case of ticks it is mainly blue tick resistance that has dramatically increased in South Africa in the last 10 years. Two blue tick species are found in South Africa, namely the African blue tick (*Rhipicephalus boophilus decoloratus*), the vector of African Redwater, and the Asiatic blue

1. INLEIDING

Die Wêreld Gesondheid Organisasie (WGO) definieer weerstand as “die ontwikkeling van die vermoë van ‘n stam organismes om dosisse van gifstowwe te tolereer wat gewoonlik dodelik vir die meerderheid van individue in a normale populasie van dieselfde spesie is”. In kort beteken dit dat in enige populasie van parasiete daar individue is wat geneties weerstandig is teen ‘n spesifieke middel of aktiewe bestanddeel wat dodelik vir die meerderheid van individue is nog voordat die middel vir die eerste keer vir die beheer van die spesifieke parasiete gebruik word.

Dit beteken weer dat daar in dieselfde populasie van parasiete individue is wat homosigoties vatbaar is en individue wat homosigoties weerstandig is teen die middel/aktiewe bestanddeel. Die vatbare individue is in die meerderheid voordat die middel/aktiewe bestanddeel vir die eerste keer op die plaas gebruik word. Die ontwikkeling van weerstand is ‘n genetiese proses, ontwikkel oor ‘n periode van tyd en ontstaan nie oornag nie.

2. BOSLUISWEERSTAND

In die geval van bosluise is dit hoofsaaklik bloubosluisweerstand wat oor die afgelope 10 jaar in Suid-Afrika dramaties toegeneem het. Twee bloubosluis spesies word in Suid-Afrika aangetref

tick (*Rhipicephalus boophilus microplus*) which is the vector of Asiatic Redwater. Since the two species have almost the same life cycle the control of the two species is virtually the same; henceforth in this article we will just refer to blue ticks.

Blue ticks are single host ticks mainly found on cattle and are carriers of Redwater and gall sickness which cause large losses annually in the livestock industry. The life cycle of the blue tick can be schematically described as follows:

nl. die Afrikaanse bloubosluis (*Rhipicephalus boophilus decoloratus*) wat die vektor van Afrikaanse rooiwater is en die Asiatiese bloubosluis (*Rhipicephalus boophilus microplus*) wat die vektor van Asiatiese rooiwater is. Aangesien die 2 spesies feitlik dieselfde lewensiklus het en die beheer van die 2 spesies ook feitlik dieselfde is, word daar verder in die artikel net na die bloubosluis verwys.

Die bloubosluis is 'n eengasheer bosluis van hoofsaaklik beeste en is die draer van rooiwater en galsiekte wat groot verliese jaarliks in die veebedryf veroorsaak. Die lewensiklus van die bloubosluis kan skematies as volg voorgestel word:

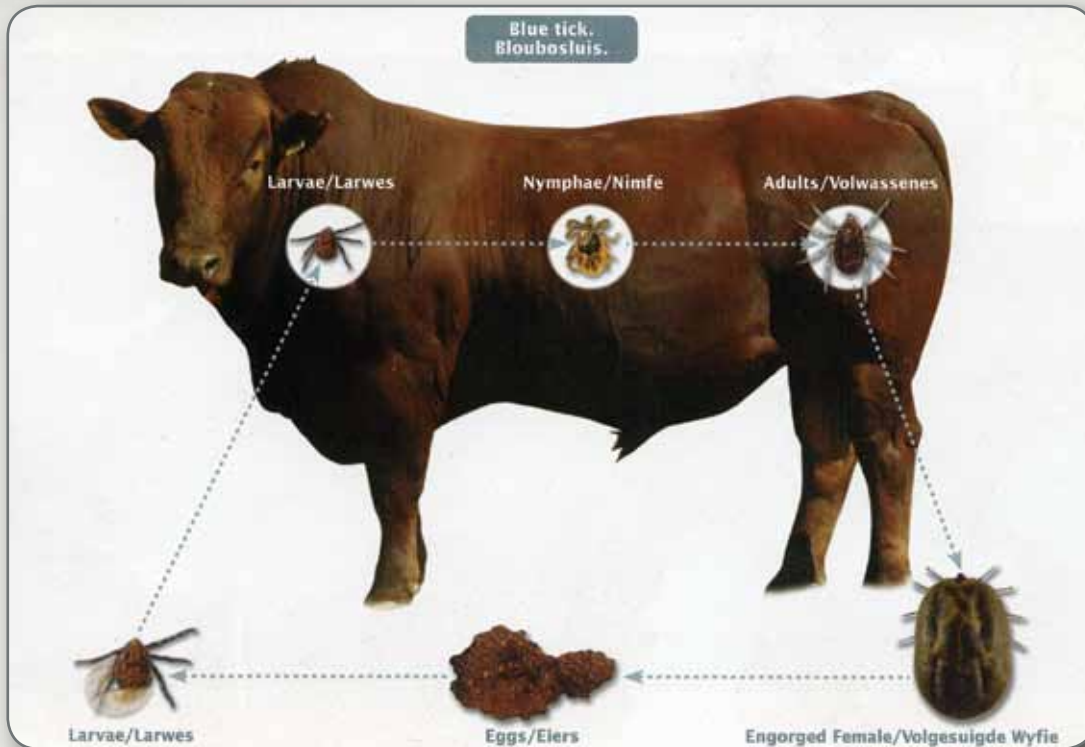


Figure 1. Diagram showing the life cycle of the Blue tick

The animal is infested by larvae which occur on the pasture. The larvae feed by sucking blood for about seven days, whereupon they moult and develop into nymphs. The nymphs then feed again for about seven days and then moult and develop into adults. The adult female ticks feed for roughly seven days, detach and fall off the animal. Within a week they then lay roughly 3000 eggs on the ground. The male tick remains on the animal waiting to mate with the next female to attach. The eggs take 3 weeks to develop and the larvae that hatch then wait to infest the next host available. The time period from when the larvae attach to fully developed females is thus roughly 21 days. Only the engorged female tick is usually visible on cattle.

Die dier word met larfies van bosluise, wat op die weiding voorkom, besmet. Die larfies voed deur bloed te suig vir ongeveer 7 dae waarna hulle vervel, verhard en ontwikkel tot nimfies. Die nimfies voed weereens vir ongeveer 7 dae waarna hulle ook vervel, verhard en ontwikkel tot volwassenes. Die volwasse wyfiebosluise begin voed en wanneer hulle volgesuig is (na ongeveer 7 dae), val hulle spontaan van die dier af en begin binne 'n week op die grond eiers lê. Die wyfie lê ongeveer 3000 eiers. Die mannetjie bosluise bly op die dier en wag dan vir die volgende volwasse wyfie om mee te paar. Die eiers neem ongeveer 3 weke om uit te broei waarna die larfies weer vir die volgende gasheer wag om op te klim. Die tydperk vandat die larfies op die dier geklim het totdat volgesuigde wyfies waargeneem word is dus ongeveer 21 dae. Slegs die volgesuigde wyfiebosluise is gewoonlik vir die boer sigbaar op die beeste.

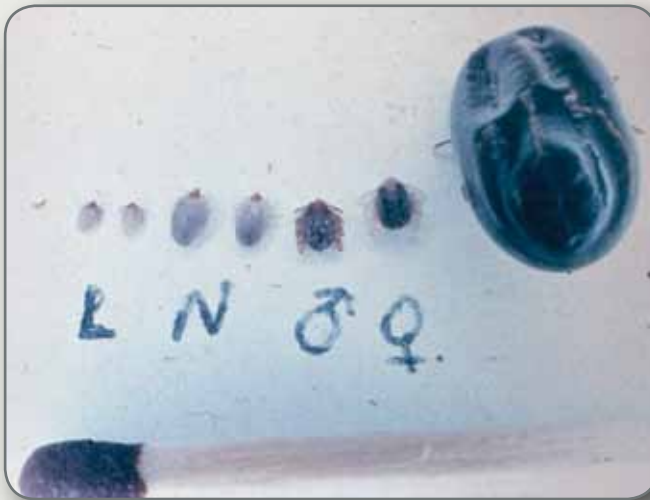


Figure 2. The different stages of Blue tick on cattle.
Die verskillende stadiums van die bloubosluis op die bees.

3. FACTORS WHICH CONTRIBUTE TO THE DEVELOPMENT OF RESISTANCE.

The following factors can contribute to the development of blue tick acaricide resistance:

- The repeated use of the same active ingredient year after year to control ticks.
- A short interval between dipping
- The relatively short life cycle of the blue tick resulting in more than one generation developing in one year.
- Ideal environmental conditions
- The misuse of drugs by farmers.

Repeated use of the same active ingredient.

When the same active ingredient is used year after year all ticks that are vulnerable to the acaricide are wiped out, while the resistant ticks slowly increase in number. This can lead to the situation where the whole population on a farm is resistant to a particular active ingredient.

Shorter dipping interval

Short dip intervals result in the susceptible ticks being exterminated more quickly and the increase in numbers of resistant ticks as compared to the susceptible ticks is quicker.

Life cycle of the Blue tick.

Resistance in parasites is inherited by the offspring. The shorter the life cycle of the parasite the greater the number of generations that can be produced in a single year. This means that the number of resistant individuals increases greatly relative to susceptible individuals. Comparing the short life cycle of the Blue tick with the longer life cycle of



Figure 3. Female Blue tick laying eggs.
Wyfie wat eiers lê

3. FAKTORE WAT BYDRA TOT DIE ONTWIKKELING VAN WEERSTAND.

Die volgende faktore kan bydra tot die ontwikkeling van bloubosluisweerstand:

- Die herhaaldelike gebruik van dieselfde aktiewe bestanddeel jaar na jaar om die bosluis te beheer,
- Kort dipintervalle,
- Die relatiewe kort lewensiklus van die bloubosluis wat teweegbring dat meer as een generasie van die bosluis deur die jaar voorkom,
- Ideale omgewingstoestande,
- Die wangebruik van dipmiddels deur boere.

Herhaaldelike gebruik van dieselfde middel.

Wanneer dieselfde middel/aktiewe bestanddeel jaar na jaar deur die boer gebruik word, word al die bosluis wat vatbaar is vir die middel oor die periode doodgemaak en letterlik uitgeroei terwyl die weerstandige bosluis stelselmatig begin toeneem. Dit kan dan gebeur dat die hele bloubosluis populasie op die plaas volledig weerstandig teen die aktiewe bestanddeel raak.

Verhoogde dipintervalle

Kort dipintervalle veroorsaak dat die vatbare bosluis vinniger uitgeroei word en die weerstandige bosluis relatief tot die vatbare bosluis, vinniger toeneem.

Lewensiklus van die bloubosluis

Weerstand van parasiete word aan hulle nageslag oorgedra. Hoe korter die lewensiklus van die parasiet is, hoe meer generasies sal daar deur die jaar voorkom, en hoe vinniger sal die weerstandige

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Wayne
Southwood

Ons strewe is om sorgvrye mediumraam beeste te teel wat aangepas is by hul omgewing. Om hierdie rede word insette beperk tot die minimum. Streng seleksie vir reproduksie waar alle oop diere geprul word na 'n kort teelseisoen verseker ook dat ons diere se grootte optimaal is vir die moeilike omgewing waarin ons boer.

Ons kudde het 'n gemiddelde TKP van 369 dae vir alle koeie in die kudde oor alle kalwings.



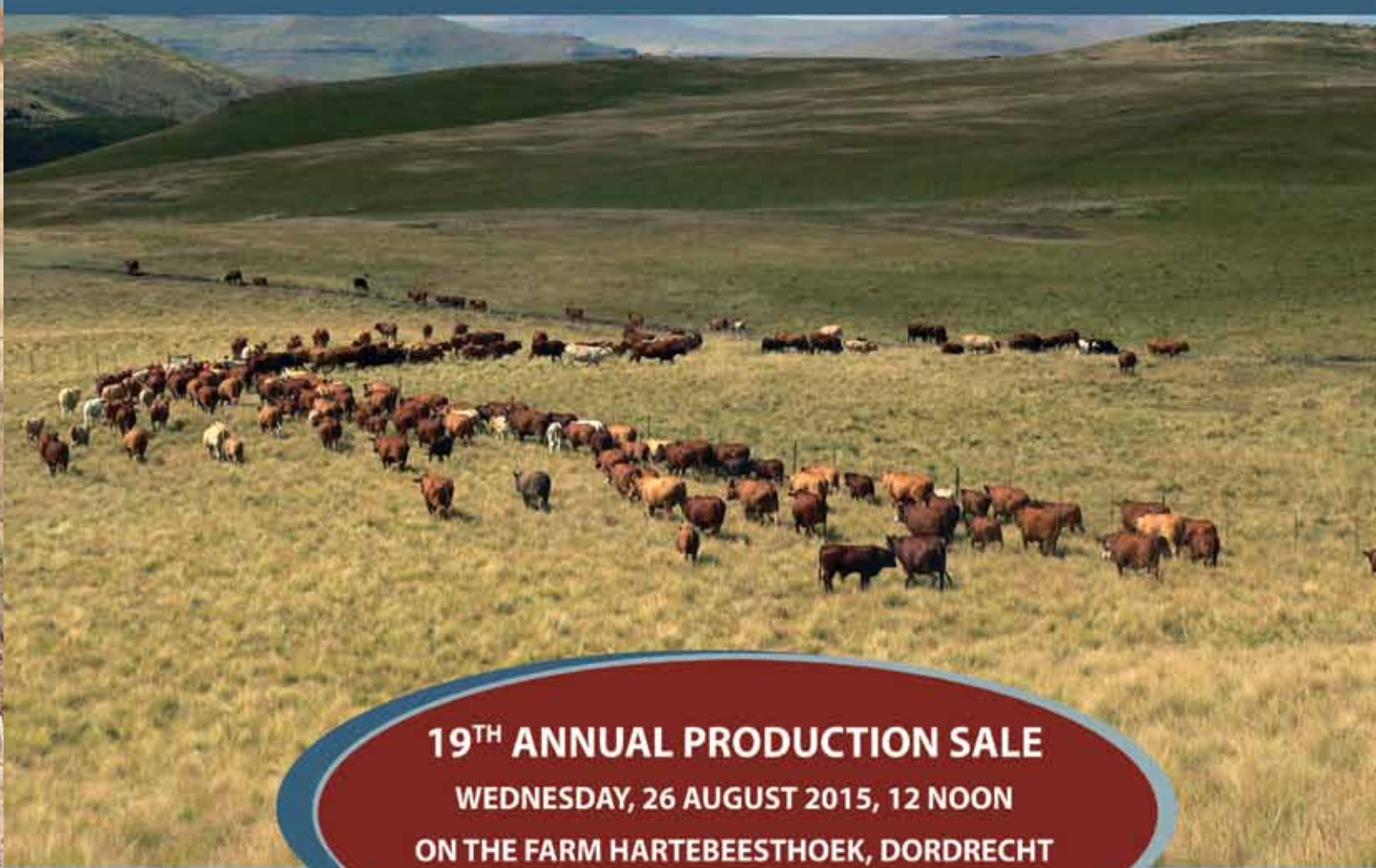
SALE REPORT 2014

At our annual bull sale held on 27 August 2014, 23 Tuli bulls sold for an average price of R26 350. The top priced bull, HBH 12-14 sold for R70 000 to Don Harvey Trust from East London.

11 Open Heifers were sold for an average of R 12 864 to Mr Paul Smit. Our top price heifer was sold for R19 000.

14 Cows in-calf were sold for an average price of R14 400. Mr Paul Smit bought the top price cow for R23 000.

Our sincere thanks goes to all our clients for their valued support during 2014. We have no doubt that our Tuli cattle will do extremely well for you.

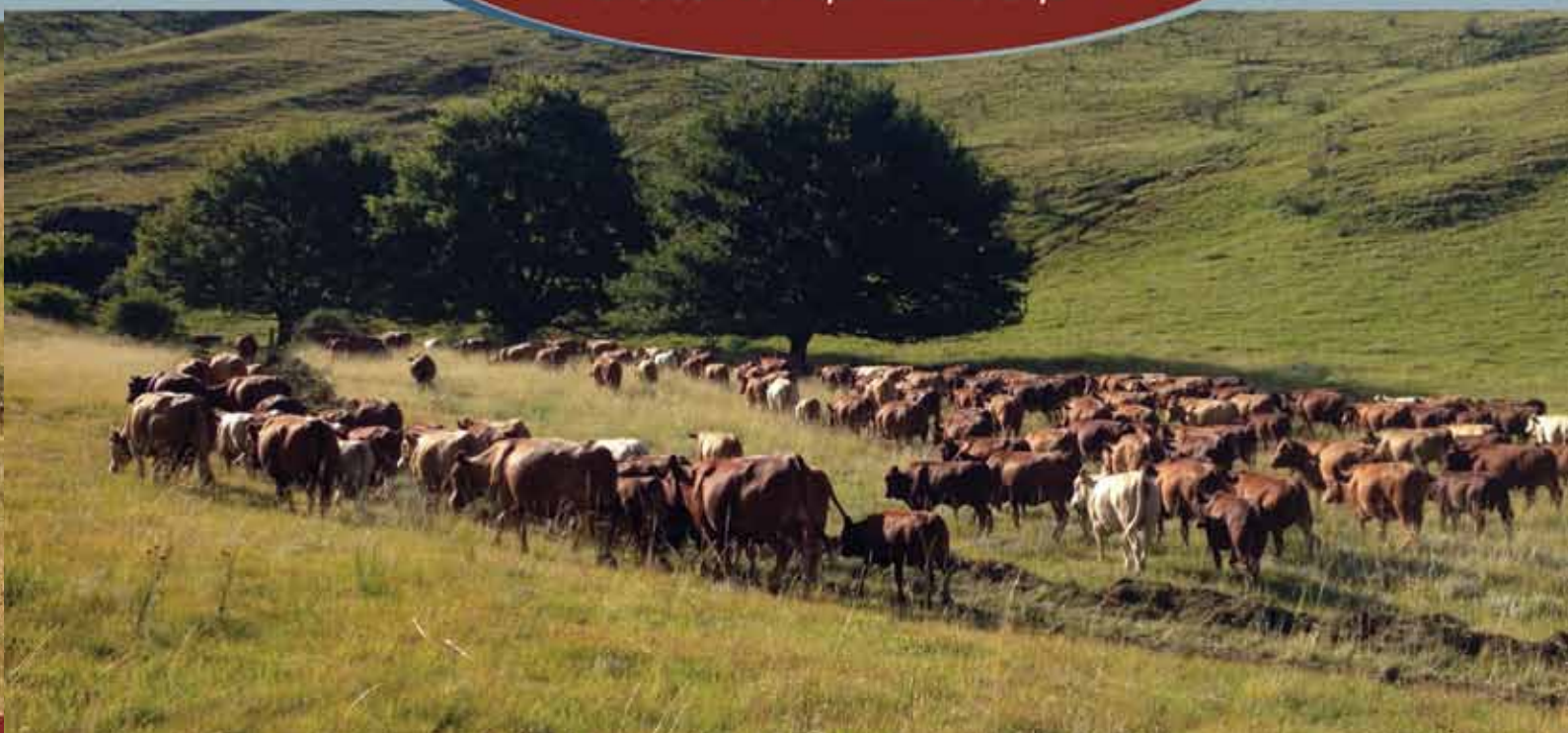


19TH ANNUAL PRODUCTION SALE

WEDNESDAY, 26 AUGUST 2015, 12 NOON

ON THE FARM HARTEBEESTHOEK, DORDRECHT

GPS: S31 16' 14,8" E27 15' 24,0"



2- and 3- host ticks (where at most one life cycle can be completed a year) explains why Blue ticks develop resistance quickly against acaricides.

Ideal environmental conditions

The ideal environmental conditions for ticks to survive and multiply are a temperature of approximately 27°C and an 80% relative humidity. Under these moist warm conditions ticks breed optimally and multiply quickly. If these conditions are met during the year the ticks will multiply quickly allowing several generations to develop. This explains why tick resistance is greatest in the warmer more moderate parts of the country as opposed to the drier colder parts of South Africa.

Misuse of acaricides

If ticks are exposed to lower concentrations of acaricides over time they will develop resistance, whether it is in a plunge dip, hand jetting or as a pour-on. The misuse of acaricides, especially pour-on products, by farmers contributes to acaricide resistance. It is common practice for farmers in South Africa to formulate homemade remedies to combat ticks. Besides being illegal, ticks are exposed to low concentrations of the active ingredient in the homemade remedy and subsequently develop resistance to the active ingredients.

4. THE EFFECT OF ACARICIDE RESISTANCE.

Blue tick acaricide resistance causes enormous economic losses annually for cattle farmers in South Africa. Beside the direct cost of acaricides in an effort to control ticks there are also the deaths of animals caused by tick-borne diseases such as Redwater and gall sickness. In areas where Redwater was absent in the past the animals are susceptible and farmers experience large losses. Research in Australia shows that only 0.04% of the Asiatic blue tick population are carriers of Asiatic Redwater, whilst 0.23% of African blue ticks are carriers of African Redwater. Despite the low figures farmers still suffer huge losses. It is an indication of the increase in tick numbers due to acaricide resistance.

5. METHODS TO DETERMINE WHETHER ACARICIDE RESISTANT TICKS ARE PRESENT ON A FARM.

When we look at the schematic diagram of the life cycle of the blue tick and a farmer dips his animals at the correct strength and manner, all ticks (larvae, nymphs and adults) should die if they are susceptible to the acaricide. If the farmer

individue in 'n populasie relatief tot die vatbare individue toeneem. Die relatiewe kort lewensiklus van die bloubosluis in vergelyking met die lewensiklus van 2 en 3 gasheer bosluise (waarvan daar hoogstens 1 generasie van bosluise per jaar voorkom) verduidelik dus hoekom die bloubosluis vinniger weerstand teen dipmiddels ontwikkel.

Ideale omgewingstoestande

Die ideale omgewingstoestande vir bosluise om te oorleef en te vermeerder is ongeveer 27°C en 80% relatiewe humiditeit. By hierdie vogtige en warm toestande teel bosluise optimaal aan en vermeerder hulle dus vinnig. Indien die toestande dus deur die jaar gehandhaaf word sal daar meer generasies van die bosluise voorkom. Dit verduidelik hoekom bosluisweerstand 'n groter probleem in die warmer en meer gematigde dele van Suid-Afrika as in die droër, kouer dele van ons land is.

Wangebruik van dipmiddels

Indien bosluise aan laer konsentrasies van dipmiddels oor 'n tydperk blootgestel word, hetsy in 'n dompel dip, 'n spuitdip of wanneer 'n opgiemiddel nie teen die regte dosis toegedien word nie, sal bosluise weerstand teen die middel/ aktiewe bestanddeel ontwikkel.

Die wangebruik van dipmiddels, veral opgiemiddels, deur boere dra by tot die ontwikkeling van bosluisweerstand. Dit is 'n algemene tendens van boere in Suid-Afrika om tuisgemaakte opgiemiddels te "formuleer" om bosluise te bestry. Behalwe dat die praktyk onwettig is, word bosluise aan lae konsentrasies van die aktiewe bestanddeel wat in die "formulasie" gebruik word blootgestel, en ontwikkel die bosluise weerstand teen die groep van aktiewe bestanddele.

4. DIE EFFEK VAN BOSLUISWEERSTAND.

Bloubosluisweerstand veroorsaak jaarliks enorme ekonomiese verliese vir beesboere in Suid-Afrika. Behalwe vir die direkte koste verbonde aan dipmiddels in 'n poging om die bosluise te beheer, is daar ook verliese a.g.v vrektes veroorsaak deur bosluisoorgedraagde siektes soos rooiwater (babesiose) en galsiekte (anaplasiose). In areas waar rooiwater in die verlede afwesig was en die diere dus volledig vatbaar vir die siektes is, lei boere jaarliks nou groot verliese weens die siekte. Navorsing in Australië het bevind dat gemiddeld slegs 0.04% van die Asiatiese bloubosluis populasie op 'n plaas draers van Asiatiese rooiwater is terwyl 0.23% van die Afrikaanse bloubosluis populasie op 'n plaas draers van Afrikaanse rooiwater is. Hoewel die syfers as baie klein

sees engorged female ticks within 21 days it can mean that there is acaricide resistance in the tick population on his farm.

MSD Animal Health Unit can test engorged ticks for resistance at the Malelane Research Unit near Malelane in Mpumalanga. This is a free service to clients of MSD Animal Health to determine to which active ingredient/s the ticks are resistant. The test involves treating female ticks with all three groups of active ingredients (organophosphates, pyrethroids and formamidine). The females are then stuck on a glass slide and incubated. A week later the number of ticks that die is determined. Of those that did not die the number of ticks that laid eggs is determined. These eggs are then in turn collected and incubated for three weeks to see if the eggs hatch. This process allows one to determine which active ingredient will be effective in controlling resistant ticks on the farm.



Figure 4. An example of ticks that have been treated and stuck on glass slides and are busy laying eggs. (These ticks which were collected on a farm and are resistant to all 3 groups of active ingredients.)

Figuur 4: Voorbeeld van bosluise wat behandel is, op glasplate vasgeplak is en wat besig is om eiers te lê. (Hierdie is bosluise wat op 'n plaas gekollekteer is en weerstandig teen al 3 goepe van aktiewe bestanddele is.)

For further information about the test contact your nearest Intervet Schering-Plough Animal Health sales representative or the Malelane Research Unit.

6. THE MANAGEMENT OF ACARICIDE RESISTANCE.

When a farmer has acaricide resistant ticks on his farm, there is unfortunately no "quick-fix" for the problem. The most common method of tick control in South Africa is still chemical control, in other words by dipping cattle. There are only 3 groups of active ingredients for conventional tick control,

gereken kan word lei boere jaarliks steeds groot verliese a.g.v die siektes. Dit kan 'n aanduiding wees tot watter mate bosluisegetalle op plase toegeneem het a.g.v weerstand.

5. METODES OM TE BEPAAL OF BOSLUISWEERSTAND OP 'N PLAAS AANWESIG IS.

Wanneer ons weer na die skematiese diagram van die lewensiklus van die bloubosluis kyk beteken dit indien die boer sy beeste met 'n geregistreerde dipmiddel gedip het en die korrekte aanwysings op die pamflet gevolg is, al die bosluise (larfies, nimfe en volwassenes) op die dier dood gemaak sal word indien die bosluise vatbaar vir die middel is. As die boer volgesuigde bosluiswyfies op sy diere sien binne 21 dae nadat hulle gedip is, kan dit 'n aanduiding van bosluisweerstand wees.

MSD Dieregesondheid kan ook volgesuigde bloubosluis toets vir weerstand by die Malelane Navorsings Eenheid naby Malelane in Mpumalanga. Dit is 'n diens wat gratis aan kliënte van MSD Dieregesondheid aangebied word en met die toets kan daar bepaal word vir watter aktiewe bestanddeel/bestanddele die bosluise vatbaar of weerstandig is. Die toets behels die behandeling van die bosluiswyfies met al drie groepe van aktiewe bestanddele (organofosfate, piretroïede en formamidiene) waarna die wyfies op glasplate vasgeplak en geinkubeer word. 'n Week later word bepaal hoeveel van die bosluise gevrek het en of die wat nie gevrek het nie, eiers gelê het. Die eiers wat deur die bosluise wat nie gevrek het nie gelê is, word gekollekteer en vir 'n verdere 3 weke geinkubeer om te bepaal of die eiers gaan uitgebroei. So kan dan bepaal word watter aktiewe bestanddeel effektief sal wees vir die beheer van die weerstandige bosluise op die plaas.

Vir verder inligting omtrent die toets van bosluis kontak u naaste Intervet Schering-Plough Animal Health verkooppersoon of die Malelane Navorsings Eenheid.

6. DIE BESTUUR VAN BOSLUISWEERSTAND.

Wanneer 'n boer weerstand met bosluise op sy plaas ondervind, is daar ongelukkig nie 'n kitsoplossing vir die probleem nie.

Die algemeenste metode van bosluisbeheer in Suid-Afrika is steeds chemiese beheer m.a.w deur beeste te dip. Daar is slegs 3 groepe van aktiewe bestanddele beskikbaar vir konvensionele bosluisbeheer nl. organofosfate, piretroïede



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8 Oktober 2015

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organophosphates, pyrethroids and formamidine (truncated to amidine). The ingredients are used in plunge dips, spray dips and pour-on. If a farmer is not getting the desired result with one group of ingredient he should change to another group. It makes no sense to change from one product that contains pyrethroids as an active ingredient to another product that also has pyrethroids.

If multiple drug resistant ticks (2 or 3 active ingredients) are discovered the situation becomes complicated and leads to high costs. In instances such as these alternative methods of control are required, such as the use of systemic products. Drugs that control ticks systemically are the macrocyclic lactones (drugs that contain ivermectin, doramectin, abamectin and moxidectin) and the tick growth inhibitor fluazuron. It is essential that the farmer contacts an expert in the event of multiple drug resistant ticks being encountered, as the incorrect treatment can have catastrophic results.

7. PREVENTION OF TICK ACARICIDE RESISTANCE.

- 1) Use a product for as long as it is effective against ticks. When resistance is encountered with one group of drugs (e.g. pyrethroids) change to a different group (eg organophosphate or amidine). If this procedure is followed the farmer can return to the first group of drugs since the ticks will "lose" their resistance to that group of drugs. The alternating use of different groups of drugs is not recommended as research shows that ticks develop resistance to more than 1 active ingredient which can have disastrous results.
- 2) Dip less often in winter when ticks are inactive. As already mentioned dipping in quick succession contributes to tick drug resistance.
- 3) Use registered dip strictly according to instructions. Make sure that the correct dose of pour-on is applied and that the dip concentration in the plunge dip or spray race is correct. Clients of MSD Animal Health can send samples free of charge to the Malelane Research Unit to determine whether the concentration of dip used in the plunge dip is at the correct concentration. Contact the MSD Animal Health sales representative for advice. The use of homemade remedies is illegal and contributes to the development of acaricide resistance in ticks.
- 4) Prevent the purchase of "stud ticks". Blue tick acaricide resistance is common in South Africa and many farmers have fallen into trap of

en formamidiene (of kortweg amidine). Die middels word in dompeldippe, spuitdippe en opgietsmiddels gebruik. Indien die boer nie die gewenste uitwerking op bosluise met een van die groepe ondervind nie, moet hy na 'n ander groep verander. Dit maak geen sin om van een middel wat 'n piretroïed as aktiewe bestanddeel bevat na 'n ander middel ook met 'n piretroïed te verander nie.

Indien veelvoudige bosluiseerstand ondervind word m.a.w bosluiseerstand teen 2 of al 3 groepe van aktiewe bestanddele, raak die situasie meer ingewikkeld en lei gewoonlik tot hoë kostes. In so 'n geval moet die boer alternatiewe metodes van bloubosluisebeheer toepas soos die gebruik sistemies middels. Die groepe van middels wat bloubosluise sistemies beheer is die makrosikliese laktone (middels wat ivermektien, doramektien, abamektien en moksidektien bevat) en die bosluise groei inhibeerder, fluazuron.

Dit is egter noodsaaklik dat die boer 'n kundige nader in so 'n geval aangesien verkeerde praktyk katastrofiese gevolge kan hê.

7. VOORKOMING VAN BOSLUISEERSTAND.

- 1) Gebruik 'n middel so lank as wat dit effektief is teen die bosluise. Wanneer daar dan weerstand met een groep (bv piretroïede) ondervind word, moet daar na 'n ander groep (bv organofosfate of amidine) verander word. Indien die prosedure gevolg is, kan die boer weer terugkeer na die eerste groep aangesien die bosluise dan hulle weerstand teen daardie groep "verloor" het.

Die afwisseling met groepe van aktiewe bestanddele is nie aan te beveel nie. Navorsing het bewys dat wanneer daar met groepe afgewissel word, bosluise weerstand teen meer as 1 aktiewe bestanddeel ontwikkel wat oor die langtermyn katastrofiese gevolge kan hê.

- 2) Dip minder gereeld wanneer bosluise onaktief is bv in die winter. Soos reeds genoem dra kort dipintervalle by tot die ontwikkeling van bosluiseerstand.
- 3) Gebruik geregistreerde dipmiddels streng volgens voorskrif. Maak seker dat die korrekte dosis van die opgietsmiddel toegedien word en dat die dipkonsentrasie in die dompeldip of spuitdip korrek is. Kliënte van MSD Dieregesondheid kan hulle dipmonsters gratis by die Malelane Navorsingseenheid laat toets om te bepaal of die konsentrasie van die

buying cattle from farms where the ticks are resistant to 1 or more active ingredients. The animals are transported and released onto grazing on the buyer's farm and these acaricide resistant ticks drop off in the veld.

Roughly 40 tick samples are tested annually at the Malelane Research Unit originating from farms all over South Africa. In 2006, 51% of these samples tested were resistant to all 3 groups of active ingredients. It is an indication of how serious the problem of blue tick acaricide resistance is in South Africa.

dip wat in die dompeldip gebruik word op sterkte is. Kontak die MSD Dieregesondheid verkoops persoon vir advies.

Die gebruik van tuisgemaakte mengsels is onwettig en dra by tot die ontwikkeling van weerstand.

- 4) Voorkom die aankoop van "stoetbosluise". Bloubosluisweerstand kom algemeen in Suid-Afrika voor en menige boere het al in die slaggetrap deur beeste by veilings of van boere te koop afkomstig van plase waar die bosluise weerstandig teen 1 of meer aktiewe bestanddele is. Die beeste word dan op die koper se plaas summier veld toe gejaag waar hierdie weerstandige bosluise dan op die boer se veld afgegooi word.

Ongeveer 40 bosluismonsters word jaarliks by die Malelane Navorsingseenheid van verskillende plase oor Suid-Afrika vir weerstand getoets. In 2006 het 51% van hierdie monsters weerstand teen al 3 groepe van aktiewe bestanddele getoets. Dit kan 'n aanduiding wees van hoe ernstig die probleem van bloubosluisweerstand in Suid-Afrika is.



Amelia

since 1993

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ROOIWATER in SA REDWATER

- DR TOM STRYDOM

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Inleiding

Rooiwater is 'n protozoiese bosluisoordragbare siekte van beeste wat van die grootste verliese by veeboere in Suid-Afrika veroorsaak. Twee tipes Rooiwater kom in Suid-Afrika voor naamlik Afrika Rooiwater (*Babesia bigemina*) en Asiatiese of Europese Rooiwater (*Babesia bovis*). Asiatiese Rooiwater word slegs deur die Asiatiese bloubosluis, *Rhipicephalus microplus*, oorgedra terwyl Afrika Rooiwater deur die Afrika bloubosluis, *Rhipicephalus decoloratus*, sowel as die Asiatiese bloubosluis oorgedra kan word. Die rooipoot bosluis, *Rhipicephalus evertsi*, kan ook 'n rol in die oordraging van Afrika Rooiwater speel, maar die rol wat die bosluise speel is baie laer as in die geval van bloubosluis. Die bosluise word vektore van die siekte genoem.

Die verspreiding van beide Afrika en Asiatiese Rooiwater in Suid-Afrika word geassosieer met die verspreiding van die onderskeie vektore. Gunstige toestande vir beide bloubosluis spesies is tradisioneel warm, vogtige toestande, maar die bosluise het deur die land versprei deurdat boere diere aangekoop het wat met bosluise besmet was. Die bosluise het dan ook aangepas om te oorleef in hierdie "nie-gunstige" toestande.

Nuutste navorsing het getoon dat Afrika Rooiwater oor die grootste deel van Suid-Afrika voorkom en net die droër dele van die land soos die Noord-Kaap en die Groot Karoo is vry van die siekte. Asiatiese Rooiwater daarenteen kom voor oor die grootste deel van die Limpopo Provinsie, Gauteng, Mpumalanga, KwaZulu-Natal en teen die Oos-Kaapse kus tot by ongeveer Swellendam in die Wes-Kaap.

Introduction

Redwater is a protozoan tick-borne disease of cattle that causes the greatest losses of cattle in South Africa. Two types are present in South Africa, African Redwater (*Babesia bigemina*) and Asiatic Redwater (*Babesia bovis*). Asiatic Redwater is only transmitted by the Asiatic blue tick, *Rhipicephalus microplus*. African Redwater on the other hand is transmitted by both the African blue tick *Rhipicephalus decoloratus* and the Asiatic blue tick. The red-legged tick, *Rhipicephalus evertsi* can also play a role in the transmission of Redwater but this role is small compared to the role played by blue ticks. Ticks are thus vectors of the disease.

The distribution of both Asiatic and African Redwater in South Africa is associated with the distribution of different vectors. Favourable conditions for both species of blue tick are traditionally viewed as warm, moist conditions but the ticks are widespread due to the movement of animals that are host to blue ticks. Blue ticks have adapted to survive in these new unfavourable habitats. Latest research shows that African Redwater is distributed throughout South Africa and it is just the drier parts of the Great Karoo and Northern Cape where this disease is absent. Asiatic Redwater on the other hand occurs in most of the Limpopo province, Gauteng, Mpumalanga, KwaZulu-Natal and the Eastern Cape coastal areas down to about Swellendam in the Western Cape.

Both African and Asiatic blue ticks are single host parasites. In other words the life-cycle, from the larva that climbs onto the animal to the adult stage, is completed on a single host.

Beide Afrika en Asiatiese bloubosluise is eengasheer bosluise, m.a.w. die lewensiklus van die bosluise vandat die larfies op die bees klim totdat die wyfies volgesuig is word op een gasheer voltooi.

Simptome van Rooiwater

Rooiwater in beeste word gekenmerk deur depressie, verlies aan eetlus, 'n hoë koors ($>40.5^{\circ}\text{C}$), bloedarmoede en tipiese rooi-swart uriene, vandaar die naam Rooiwater. Geelsug kan in sommige diere gesien word.

In die geval van Asiatiese Rooiwater word dieselfde simptome as met Afrika Rooiwater gesien, maar in die meeste gevalle met die siekte gaan die dier in skok weens die aansameling van parasiete in sy perifere bloedvate wat lei tot 'n suurstoftekort in sy organe, orgaanversaking en akute dood. In sekere gevalle van Asiatiese Rooiwater word ook Serebrale Rooiwater gesien. In die geval samel die parasiete in die bloedvate van die brein van die dier aan en veroorsaak senuwee simptome in die dier. Die prognose (sukses van behandeling) van Serebrale Rooiwater is baie swak en diere wat die simptome toon moet dus van kant gemaak word.

Asiatiese Rooiwater is dus in die meeste gevalle 'n per-akute siekte en beeste wat met die siekte besmet word vrek ten spyte van behandeling wat toegepas word. Die vermoede is daarom dat die grootste verliese van Rooiwater in Suid-Afrika weens Asiatiese Rooiwater is.

Die voorkoms van Rooiwater in beeste word deur 'n veearts bevestig deur 'n bloedsmeer van die siek of dooie dier te maak en dit onder 'n mikroskoop te ondersoek.

Epidemiologie van Rooiwater in die bosluise

In die geval van Afrika Rooiwater word die vektore met die siekte besmet wanneer larfies op 'n besmette of draer dier voed. Die siekte word dan van die larfies deur die nimf stadium van die lewensiklus aan die volwasse bosluise oorgedra. Besmette wyfies wat van die dier afval dra dan weer die siekte deur die eier stadium (eiers word op die grond gelê) na die volgende geslag van larfies oor. Ons noem dit trans-ovariale oordraging. Die nimfe en volwassenes van die volgende nageslag dra dan die siekte oor aan vatbare diere.

Met Asiatiese Rooiwater is die verloop byna dieselfde deurdat besmette wyfies die siekte trans-ovariaal aan haar nageslag oordra, maar in die geval dra slegs die larf stadium van die bosluise die siekte aan beeste oor. Die larfies verloor die siekte na oordraging, maar die daaropvolgende

Symptoms of Redwater

Redwater in cattle is characterised by depression, loss of appetite, a high fever ($>40^{\circ}\text{C}$), anaemia and typical dark red urine from which it gets its name. Jaundice can be noticed in some animals. In the case of Asiatic Redwater the symptoms are the same as African Redwater but the animal goes into shock due to the accumulation of parasites in the peripheral blood vessels which leads to oxygen deprivation in the organs, organ failure and an acute death. In some cases of Asiatic Redwater the disease manifests itself as Cerebral Redwater. In these cases the parasite collects in the blood vessels of the brain and causes nervous symptoms in the animal. Success at treating Cerebral Redwater is poor and animals showing symptoms should be euthanased. Asiatic Redwater is thus in most cases a per-acute disease and animals infected die in spite of treatment. This is the reason for the presumption that the greatest losses due to Redwater in South Africa are caused by Asiatic Redwater. The presence of Redwater in cattle can be confirmed by a veterinarian taking a blood smear of sick or dead animals and examining it under a microscope.

Epidemiology of Redwater in ticks

In the case of African Redwater the vector becomes infected with the parasite when a larva feeds on an infected animal. The disease remains within the tick from the larval stage and through the nymph stage into the adult phase. The parasite is transferred to the eggs which the adult female lays on the ground. The parasite is thus in the next generation of larva. This is known as trans-ovarian transmission. The nymph and adults of the next generation infect susceptible animals. With Asiatic Redwater the course of events is the same except that the larval stage is the only stage which infects animals. The nymph is re-infected from feeding on an infected host and the infected nymph develops once again into an infected adult.

Immunity and resistance in the animal

Both types of Redwater probably developed in the tropical parts of the world and although all cattle breeds are susceptible to the disease, Sanga and Zebu breeds show more resistance than European breeds. European breeds that have not been previously exposed to the disease are highly susceptible to both types of Redwater. Most animals develop a long-term immunity which can be life-long after a single exposure to the disease. Animals that have recovered from African Redwater have a degree of immunity against Asiatic Redwater, but the reverse is not true.



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nimfe word weer met die siekte besmet wat weer die siekte aan die volwasse bosluise oordra.

Immuniteit en weerstand in die dier

Beide Rooiwaters het waarskynlik hulle ontstaan in die tropiese dele van die wêreld gehad en alhoewel alle beesrasse vatbaar is vir die siektes, is Sanga en Zebu rasse meer weerstandbiedend teen die siektes as Europese rasse. Europese rasse wat nie voorheen aan die siektes blootgestel was nie is veral hoog vatbaar vir beide Rooiwaters. In die meeste diere ontwikkel 'n langdurige immuniteit wat selfs lewenslank kan wees na 'n enkele blootstelling aan die siektes.

Diere wat herstel het van Afrika Rooiwater het wel 'n mate van immuniteit teen Asiatiese Rooiwater maar die omgekeerde is nie waar nie.

Kalwers van koeie wat geen immuniteit teen Rooiwater het nie is vatbaar vir die siekte vanaf geboorte tot 2 maande ouderdom. Vanaf 2 maande ouderdom het die kalf dan 'n nie spesifieke natuurlike immuniteit teen die siekte wat tot ongeveer 8 maande ouderdom duur.

Kalwers van koeie wat voorheen aan 'n spesifieke Rooiwater blootgestel was en wat immuun is teen die Rooiwater is immuun teen die siekte van geboorte tot ongeveer 8 maande ouderdom. Die eerste 2 maande van die kalf se immuniteit in die geval word van die biesmelk van die ma af gekry en word passiewe immuniteit genoem.

Die immuniteit van kalwers is egter nie absoluut nie. Kalwers waarvan die immuunstelsel nie optimaal is nie bv diere wat siektes soos BVD onder lede het, wat onder voed is of hoë parasiet ladings (interne sowel as eksterne parasiete) het, kan vatbaar vir Rooiwater wees.

So kan selfs ouer diere wat voorheen aan die siekte blootgestel was en immuniteit teen die siekte ontwikkel het vatbaar vir die siekte raak tydens "stress" toestande.

Beheer van Rooiwater

Die ideaal om Rooiwater in 'n kudde te beheer is om na 'n situasie van endemiese of enzootiese stabiliteit op die plaas te streef. Per definisie is endemiese stabiliteit vir Rooiwater die teenwoordigheid van beide vektore, Afrika sowel as Asiaties bloubosluise, en beide Rooiwaters, Afrika en Asiatiese Rooiwater, met minimale siekte op die plaas en in die kudde.

Om immuniteit teen Rooiwater in die kudde te verseker moet diere van 'n jong ouderdom af, tussen die ouderdom van 3 tot 8 maande, aan die siekte blootgestel word. Daarom is dit van uiterste belang

Calves of cows that have no immunity against Redwater are susceptible from birth to 2 months of age. From 2 months the calf does not have specific immunity against the disease till it is about 8 months old. Calves from cows previously exposed to a specific Redwater and which are immune, are themselves immune from birth until they are about 8 months old. The first 2 months of the calf's immunity is derived from the colostrum of the cow and is known as passive immunity. The immunity of calves is however not absolute. Calves whose immune system is not optimal, e.g. animals which are suffering from BVD, or are underfed, or which have a high parasite load (internal or external parasites) can be susceptible to Redwater. Even older animals that do have resistance to the disease are vulnerable under stressful conditions.

Control of Redwater

The ideal way to control Redwater is to strive for a situation of endemic or enzootic stability on the farm. The definition of endemic stability for Redwater is the presence of both vectors of African and Asiatic Redwater and the presence of both diseases, African and Asiatic, and minimal disease in the cattle herd. To ensure immunity to Redwater in a herd the animals must be exposed to the disease from a young age (3 to 8 months). Therefore it is essential that the farmer know whether he has Asiatic or African Redwater on his farm. The infection rate of blue tick populations infected with Redwater is very low. In the case of Asiatic Redwater it can be as low as 0.04% and in the case of African Redwater 0.26%. Thus high numbers of tick species need to be achieved to ensure that they are naturally infected and exposed to the disease. It is generally accepted that in South Africa where African Redwater is present there is a degree of endemic stability. Due to the low infection rate of Asiatic Redwater (approximately 6 times lower than in the case of African Redwater) it is accepted that endemic stability using natural infections is unachievable.

Tick Control

Both types of Redwater can be controlled by keeping animals free of ticks, especially blue ticks. Weekly dipping with water-soluble dips is effective in controlling ticks. Tick resistance to dips has dramatically increased in South Africa, and on some farms ticks can no longer be controlled through dipping or hand jetting. By keeping the animals free of ticks the herd is highly susceptible to Redwater and when exposed the farmer can suffer extensive losses.

dat die boer moet weet watter een van Asiatiese of Afrika Rooiwater op sy plaas teenwoordig is. Die besmettingsyfer van bloubosluispopulasies op plase met Rooiwater is baie laag. In die geval van Asiatiese Rooiwater kan dit so laag as 0.04% wees en in die geval van Afrika Rooiwater 0.26%. Dus word hoë getalle van die verskillende bosluise spesies op die kalwers benodig om te verseker dat hulle deur 'n natuurlike besmetting op 'n jong ouderdom aan die siekte blootgestel word.

Oor die algemeen word aanvaar dat die situasie met Afrika Rooiwater in Suid-Afrika, waar die siekte voorkom, redelik stabiel is. Weens die lae besmettingsyfer van Asiatiese bloubosluis met Asiatiese Rooiwater (ongeveer 6 maal laer as in die geval van Afrika Rooiwater) word dit egter aanvaar dat die situasie met die siekte onstabiel is en dat endemiese stabiliteit, deur op natuurlike besmettings staat te maak, nie haalbaar is nie.

Bosluisbeheer

Beide Rooiwaters kan beheer word deur diere vry van bosluise, veral bloubosluis, te hou. Weeklikse dip van diere met wateroplosbare dipmiddels moet dus toegepas word. Die prosedure word egter nie aanbeveel nie en boere wat die prosedure toepas moet seker maak dat die dipmiddel wat op die plaas gebruik is effektief is om die bosluise te beheer. Bloubosluisweerstand teen dipmiddels het oor die afgelope 15 jaar in Suid-Afrika dramaties toegeneem en op sommige plase kan die bosluise nie meer suksesvol deur dompeldip of handbespuiting beheer word nie. Deur diere skoon van bosluise te hou word die kudde volledig vatbaar vir Rooiwater en wanneer die diere dan aan die siekte blootgestel word kan die boer groot verliese lei.

Ons moet onthou dat enige middel wat vir die beheer van bloubosluis geregistreer is Rooiwater kan beheer, maar die middels sal nie die siekte voorkom nie. So bv sal Asiatiese Rooiwater nie voorkom word deur beeste met middels wat 'n sistemiese werking soos bv die makrosikliese laktoon groep van middels (bv Ivotan) of 'n bosluis groei-inhibeerder (bv Acatak) te behandel nie. Om bosluise met die middels te beheer moet die larfies eers bloed suig en dit neem gewoonlik 4 tot 5 dae voordat bosluise deur die middels geaffekteer word. Aangesien larfies van die Asiatiese bloubosluis verantwoordelik is vir die oordraging van Asiatiese Rooiwater, sal die siekte reeds aan die diere oorgedra wees voordat die larfies met die middels geaffekteer is.

We must remember any product that is registered to control ticks will control Redwater but will not prevent the disease developing. So for example Asiatic Redwater will not be prevented by using the macro-cyclic lactone group of products (e.g. Ivotan) or the tick growth inhibitors (e.g. Acatak). To control ticks the larvae must first suck blood and it takes 4 to 5 days for ticks to be affected by the above-mentioned products. Since larvae of the Asiatic blue tick are responsible for the transmission of the disease the animals will already be infected by the time the product has had an effect on them.

Immunisation of animals

a) Inoculation of calves.

The only way to ensure that calves are exposed to the disease is to vaccinate using Onderstepoort's live vaccine. Vaccines against both types of Redwater are available and can be directly ordered from Onderstepoort Biological Products. Currently in South Africa animals are only vaccinated against Asiatic Redwater and therefore the handling of this vaccine will be discussed.

The vaccine integrity is preserved as a dry-ice shipment and only enough vaccine is sent for use in one day, unless a supply of dry-ice is available. The vaccine cannot be stored in an ordinary fridge as the temperature of fridge is not cold enough for the storage of this vaccine. A 1ml dose of the vaccine is inoculated intra-muscularly. Calves younger than 2 months should not be inoculated since the passive immunity from the dam can affect the effectiveness of the vaccine.

b) Inoculation of animals older than 8 months

Animals older than 8 months have no immunity to Redwater if they have not been exposed to it previously. Therefore older animals need to be monitored for the disease after vaccination. The first sign of fever due to vaccination against African Redwater is seven days after vaccination and 10 to 14 days after vaccination for Asiatic Redwater. Animals that exhibit a vaccine related fever must immediately be treated with a drug containing diminazene such as Berenil or a drug containing imidocarb such as Imizol. Animals must NOT be treated with either of these drugs until they show signs of fever. If treated too early the diminazene and imidocarb will neutralise the vaccine and prevent immunisation. After vaccination against Asiatic Redwater temperatures of animals must be taken between day 5 and day 21. It takes about 6 weeks for full immunity to develop and therefore animals must be free of ticks before they are exposed to natural strains. They can be treated

Immunisering van diere

a) Inenting van kalwers

Die enigste manier om te verseker dat kalwers wel op 3 tot 8 maande ouderdom aan die siekte blootgestel word, is om die kalwers met die lewendige entstof van Onderstepoort te ent. Entstowwe teen beide Rooiwaters is beskikbaar en word direk van Onderstepoort Biologiese Produkte bestel. In Suid-Afrika word diere egter deesdae net teen Asiatiese Rooiwater ingeënt en daarom gaan die hantering van die entstof hier bespreek word.

Die entstof word op droë ys versend en net genoeg entstof wat op een dag gehanteer kan word moet bestel word tensy 'n bron van droë ys beskikbaar is om die entstof wat nie gebruik word nie, bevrore te hou. Die entstof kan nie in 'n huishoudelike vrieskas gestoor word nie aangesien die temperatuur daarvan nie koud genoeg is vir die stoor daarvan nie.

Die entstof word teen 'n dosis van 1 ml per dier binnespiers toegedien. Kalwers jonger as 2 maande moet nie geënt word nie aangesien passiewe immuniteit wat van die ma verkry word, die effektiwiteit van immuniteit van die entstof kan beïnvloed.

b) Inenting van diere ouer as 8 maande

Diere ouer as 8 maande het geen immuniteit teen enige Rooiwater as hulle nie voorheen daaraan blootgestel was nie. Daarom moet ouer diere wat met die entstof geënt word gemonitor word vir die siekte na inenting. Die eerste koorsreaksie na inenting teen Afrika Rooiwater word gewoonlik 7 dae na inenting en met Asiatiese Rooiwater 10 tot 14 dae na inenting gesien.

Diere wat 'n koorsreaksie toon moet onmiddellik met 'n middel wat diminazene soos bv Berenil of imidocarb soos bv Imizol behandel word. Diere moet nie met enige van die 2 middels behandel word voordat hulle nie koorsreaksies getoon het nie. Indien dit gedoen word sal beide diminazene en imidocarb die effektiwiteit van die entstof neutraliseer en sodoende voorkom dat die diere immuniseer. Tydens inenting teen Asiatiese Rooiwater moet die temperatuur van diere gemeet word vanaf dag 5 tot dag 21 na inenting. Dit neem ongeveer 6 weke vir diere om immuniteit teen die siekte te ontwikkel na inenting. Daarom moet diere skoon gehou word van bosluise tydens hierdie 6 weke periode voordat hulle aan die veldstam van Rooiwater blootgestel word deur hulle bv weekliks met Taktic Cattle Spray, wat amitras bevat, te dip. Dit word dus aanbeveel dat inenting van diere ouer

weekly with a product like Taktic Cattle Spray which contains amitraz. It is recommended that vaccination takes place in winter months when tick numbers are lower and easier to control. Animals treated with imidocarb (Imizol) should not be inoculated with Asiatic Redwater vaccine within 4 months. Animals treated with diminazene (Berenil) should not be inoculated within 2 months of the last treatment. These drugs will sterilise the infection and prevent immunity developing. Once immunity has developed, only circumstances affecting the immune system will make the animals susceptible to Redwater again.

Treatment of Redwater

Drugs that are effective in the treatment of Redwater contain diminazene (Berenil) and imidocarb (Imizol). The success of treatment depends on how soon after the onset of the disease treatment is started. The prognosis of Redwater in animals with advanced stages of Redwater is poor and intensive treatment by a veterinarian may be needed to save the animals. Even with this intensive treatment the prognosis may be poor. In the event of an outbreak of Redwater in a susceptible herd the entire herd needs to be blocked with Imizol or Berenil. Farmers who give half or quarter doses of Berenil run the risk that the Redwater parasite will develop resistance to the drug and over a period the drug will no longer be an effective treatment.

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