The occurrence of African horse sickness in Hartmann's mountain zebra and its *Culicoides* vector in the south-western Khomas Region, Namibia

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ABSTRACT

African horse sickness (AHS) was reported in the south-western Khomas Region, central Namibia (22° 24.063´ S, 17° 01.791´ E; 23° 32.617´ S, 15° 53.870´ E), contrary to expectations that the arid conditions in the area would limit its occurrence. This prompted investigation into the occurrence of AHS in horses, a possible reservoir animal, the Hartmann's mountain zebra (*Equus zebra. hartmannae*) and the occurrence of the *Culicoides* midge vector (Diptera: Ceratopogonidae) of the disease in the area.

Questionnaires were used to explore the geographic characteristics of the study area, the occurrence of an expected AHS virus reservoir animal, *E. z. hartmannae* and AHS in horses in the study area. According to the questionnaire, rainfall patterns seem to follow topography of the area, where the north-east formed the higher rainfall (420 mm/a) high-ground and the south-western formed the lower rainfall (120 mm/a) pediment zone in the south-west. Cases of AHS occurred mostly in mid-rainfall zones. *E. z. hartmannae* were present throughout the area. They migrated from the southwest towards the north-eastern high-grounds during droughts, presumably along ephemeral river beds.

E. z. hartmannae were sampled for blood and tissues and analysed for evidence of African Horse Sickness Virus (AHSV) infection by indirect ELISA, RT-PCR and virus isolation techniques. All useable samples tested positive for anti-AHSV antibodies. Viral RNA was demonstrated in 26% of all the zebra sampled. No viable viruses were isolated from these samples, however further research is required, as difficult sampling conditions may have yielded false-negatives.

From 6 July to 21 September 2009, *Culicoides* midges were collected during the dry winter season in suction UV-light traps installed at five selected sites along a rainfall gradient. In 38 collections, a total of 9091 *Culicoides* individuals, representing 25 species were collected. The dominance of the proven vector of AHSV, *Culicoides imicola* Kieffer, varied in dominance from 94% near Windhoek with high altitude and relatively higher annual rainfall, to 12% at the site situated farthest southwest, with the lowest altitude and annual rainfall.

From what was observed of the occurrence of AHS in horses, *E. z. hartmannae* and the distribution and abundance of the AHSV vector (*Culicoides spp*.), it was concluded that AHS can be maintained in the south-western Khomas Region even in the lowest mean annual rainfall zones.

Keywords

African Horse Sickness Virus; *Equus zebra hartmannae*; *Culicoides*; arid; Namibia

UITTREKSEL

Afrika-perdesiekte is in die suid-westelike deel van die Khomasstreek in sentraal-Namibië (22° 24.063´ S, 17° 01.791´ E; 23° 32.617´ S, 15° 53.870´ E), gerapporteer in teenstelling met die verwagting dat die droë toestande in die streek die voorkoms van perdesiekte sal beperk. Dit het aanleiding gegee tot die ondersoek na die voorkoms van perdesiekte, `n moontlike reservoirdier, Hartmann se bergsebra (*Equus zebra hartmannae*) en moontlike vektore (*Culicoides*-muggies) van die siekte in die gebied.

Vraelyste is gebruik om inligting in te win van die studiegebeid se geografiese kenmerke, die voorkoms van perdesiekte by perde en die verspreiding van *Equus zebra hartmannae* in die studiegebied. Uit die vraelyste is afgelei dat reënval getalle varieer en volg die patroon van die topografie van die terrein, met relatief hoë reënval (420 mm/a) op die plato in die noordooste en lae reënval (120 mm/a) oor die pediment in die suidweste. Perdesiekte is meestal aangemeld op die platorand, midreënvalsone. Hartmann se bergsebra word oor die hele gebied aangetref, maar hulle kom meer geredelik voor in die suidweste. Gedurende droë periodes migreer hulle vermoedelik langs die droë rivierlope na die noordooste.

E. z. hartmannae is tydens die studie getoets vir Perdesiekte Virus (AHSV) infeksies deur die analise van bloed- en weefselmonsters. ELISA -, RT-PCR - en virus-isolasietegnieke is toegepas. Alle geskikte monsters het positief getoets vir AHSV-teenliggame. Virus RNA was gevind in 26% van die monsters, maar geen lewensvatbare virusse kon geïsoleer word nie. Verdere navorsing is egter nodig omdat die moeilike toestande van monsterneming en gevolglik swak monstergehalte, vals-negatiewe resultate tot gevolg kon gehad het.

Vanaf 6 Julie tot 21 September 2009 is *Culicoides*-muggies versamel gedurende die droë, winterseisoen, deur middel van suig-UV-ligvalle by vyf opnamepunte langs ‘n reënvalgradiënt. In 38 versamelings was 9091 *Culicoides*-muggies versamel, wat 25 spesies verteenwoordig het. Die huidige hoofvektor, *Culicoides imicola* Kieffer, was dominant in die Windhoek versameling in die noordooste met 94% verteenwoordiging. Die spesie was minder dominant in versamelings uit die lae rëenvalstreek, suidwestelike studiepunt op die pediment, met net 12% verteenwoordiging.

Uit wat waargeneem was rondom die voorkoms van perdesiekte by perde, Hartmann se bergsebra en die *Culicoides*-vektor, word die gevolgtrekking gemaak dat AHS potensieel onderhou kan word in die suid-westelike Khomasstreek, selfs in die streke met die laagste gemiddelde reënval.

Sleutelwoorde

Perdesiekte; Perdesiekte Virus; *Equus zebra hartmannae*; *Culicoides*; droë gebiede; Namibië

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ABBREVIATIONS AND KEY TERMS

AHS	African horse sickness
AHSV	African Horse Sickness Virus
ELISA	Enzyme-linked Immunosorbent Assay
IgG	Immunoglobulin G
MET	Ministry of Environment and Tourism (Namibia)
OIE	Office International des Epizooties (Also : Animal Health Organisation)
p-value	The p-value is the probability of obtaining a test statistic at least as extreme as the one that was actually observed (Statistical attribute)
r	Correlation coefficient (Statistical attribute)
r^2	Coefficient of determination (Statistical attribute)
RNA	Ribonucleic acid
RT-PCR	Reverse Transcriptase-Polymerase Chain Reaction
t_0 horse population	Horse population at the start of the five-year period for which data was collected.
$TCID_{50}$	50% Tissue Culture Infective Dose
Attribute information	Descriptive, non-graphic information recorded as digital map data or an associated database table
Raster	Evenly spaced grid squares, each assigned a numerical value which is expressed as specific colour.
shp	ArcGIS shape file
lyr	ArcGIS layer file