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Anaemia in East African short-horn Zebu calves: Field diagnosis, infectious causes and pathogen interactions

by

Ilana Conradie van Wyk

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Supervisors: Prof. B.L. Penzhorn &
Prof. J.A.W. Coetzer

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SUMMARY

This study formed part of the collaborative IDEAL (Infectious Diseases of East African Livestock) project, which focused on the sedentary mixed crop-livestock smallholding system in Western Kenya. This was a longitudinal study where calves were recruited at birth and followed at 5-weekly intervals until 51 weeks of age. The main aim was to investigate the total disease burden of cattle in the study area for the first year of life.

The main objectives of the study concerned anaemia as a syndrome in the calves. Anaemia can provisionally be diagnosed based on clinical signs, but a confirmatory diagnosis is based on measuring of red blood cell parameters, such as packed cell volume (PCV), red cell counts (RCC) or haemoglobin (HGB). The FAMACHA© score card, a field diagnostic test developed to detect anaemia and haemonchosis in sheep, was designed to test pallor by measuring the colour of the ocular mucosa against a colour chart. The FAMACHA© as a field diagnostic tool was validated for use in East African short-horn Zebus, using PCV as the gold standard. The red cell parameters and indices as well as white cell and platelet parameters and indices of the East African short-horn Zebu were measured by a Sysmex® automated cell-analyzer.

The age-related changes in the haematological profile of East African short-horn Zebu were investigated. The haematological profile of the study population, particularly during the neonatal period, differed from reference ranges for European breeds, both in levels and age-related trends. These differences could not be explained by what is known about the physiology for other cattle breeds. Anaemia was a significant syndrome in the general study population based on the high incidence of anaemic episodes and the longitudinal trend in the general study population towards an anaemic state.

In a tropical environment calves are exposed to a myriad of pathogens, even from early calfhood, many of which potentially cause anaemia. The prevalence and cumulative incidence of pathogens, in particular tick-borne parasites, trypanosomes and intestinal parasites, was investigated. The variation in prevalence with age has allowed the identification of high-risk periods. The prevalence of co-infection of pathogens was also found to be considerable, in particular pathogens known to cause anaemia.

The relative contribution of different pathogens to the development of anaemia was investigated through their impact on the haematological profiles of calves infected by specific

pathogens. Strongyle-type nematodes and trypanosomosis were found to be the major causes of anaemia in the calves during their first year of life.

Co-infections with pathogens were shown to have a significant impact on the haematological profile of calves. In many cases the cumulative effect of, or interactions between concomitant pathogens affected the severity of clinical symptoms, such anaemia, and in turn affected the prognosis of such calves. The impact of concomitant infections also complicates any diagnostic, treatment or intervention programmes in livestock and should be considered in any study on epidemiology in livestock kept under field conditions.

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AEZagro-ecological zone
AICAkaike's information criteria
APCantigen presenting cells
AUCarea under the curve
BICBayesian Information Criteria
CIcumulative incidence
CVcoefficient of variation
DCdendritic cells
DGdark ground buffy coat count technique
DVTDDepartment of Veterinary Tropical Diseases, University of Pretoria
ECFEast Coast fever
Eosabsolute eosinophil count
ELISAenzyme-linked immunosorbent assay
EPGegg per gram faeces
Hb Aadult haemoglobin
Hb Ffoetal haemoglobin
HCThaematocrit
HGBhaemoglobin concentration
ICCintraclass correlation
Ig A/E/Gimmunoglobulin A/E/G
IDEALInfectious diseases of East African livestock
ILinterleukin
ILRIInternational Livestock Research Institute
LR+positive likelihood ratio
Lymphabsolute lymphocyte count
MCHCmean corpuscular haemoglobin concentration
MCVmean corpuscular volume
mcrmicroscopy
MHCmajor histocompatability complex
Monoabsolute monocyte count
MPVmean platelet volume
Neutabsolute neutrophil count
ODoptical density
OPGoocysts per gram faeces
PCRpolymerase chain reaction

PCVpacked cell volume
PDWplatelet distribution width
Pltplatelet count
PP valuepercentage positivity
PV+positive predictive value
PV-negative predictive value
RBCred blood cells
RCCred cell count
RDWred cell distribution width
RLBTreverse line blot technique
ROCreceiver operating characteristic curve
SDstandard deviation
Sesensitivity
SEstandard error
SHZEast African short-horn Zebu
Spspecificity
TBDtick-borne diseases
Th-cellsT-helper lymphocytes
TSPtotal serum protein
varvariance
VATvariable antigen types in trypanosomes
VSGvariable surface glycoprotein in trypanosomes
WBCwhite blood cells
WCCwhite cell count