Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

POST CAPTURE MYOPATHY SYNDROME IN RED DEER (<u>CERVUS</u> <u>ELAPHUS</u>)

A thesis presented in fulfilment of the requirements for the degree of Master of Veterinary Science at Massey University.

Hamish John Fenwick McAllum

ABSTRACT

The capturing of red deer from the wild to stock deer farms has brought with it problems of stress. Large numbers of deer have died due to poor catching techniques and inappropriate drugs. Efforts to minimize these deaths require an understanding of the physiology, pathology and epidemiology of the changes occurring within the animal and during capture.

To assist in the correct interpretation of the data collected, normal haematological and biochemical parameters had to be established. This was carried out on deer of different age groups and sex from deer farms. In addition the effects of the commonly used capture drugs on the biochemical parameters were established.

Blood and serum were obtained from captured animals at the site of capture and where possible further samples were obtained from these animals at set intervals.

The biochemical parameters found to vary from the normal in captured animals were pH, Pco₂, lactate, SGOT, (Aspartate aminotransferase), blood urea nitrogen, and potassium. The changes in these parameters clearly indicated a profound acute or delayed lactic acidosis and severe muscle damage both skeletal and cardiac. The captured animals were divided into those which survived (captured) and those which died (myopathic). It was found that the changes in the 'myopathic' group were more profound than in the 'captured' group.

The rising blood urea nitrogen levels and damaged cardiac muscle may account for the delayed deaths from uraemia due to a severe nephrosis and cardiac failure. ii

The clinical effects on captured animals were recorded and those that died in both the acute and delayed form were necropsied. The gross and histological lesions were described. The most obvious clinical changes in addition to temperature, respiration and heart rates were lameness, recumbency and the wry neck. Histologically, the muscle changes resembled those found in white muscle disease of domestic ruminants in this country.

The epidemiological studies suggested certain simple measures could be taken to reduce the effects of the respiratory depression resulting from the drugs and transportation, to reduce the stress of capture and to allow acclimatisation to the new conditions. These were (1) that less or no Nalorphine be used, (2) that the animals were caught early in the year, (3) that young smaller females were preferred to males (4) that a loose bag totally enclosing the animals was used, (5) that darkened conditions helped keep the animals quiet and (6) all captured animals should be retained in a dark house for two or more days before release into the paddocks.

iii

ACKNOWLEDGEMENTS

I wish to express my sincere thanks to my supervisors Dr R.H. Sutton and Mr A.R.A. Watson whose patience, understanding and encouragement have helped me considerably. I would also like to thank Mr T. Wallis of Alpine Helicopters Ltd., Mr G. Gosney of Wirlwide Helicopters Ltd., helicopter pilots Mr Eddy McGregor and Mr Frank Wright: Mr James Innes of Haldon Station: Mr John Beattie of St. Bathans Station, Mr Peter Elworthy of Papomoa farm and Mr Malcom Prouting of Mesopotamia Station: all of whom were enthusiastic and co-operative: The Director, Animal Health Division, Ministry of Agriculture & Fisheries for allowing me to carry out this thesis; Dr E. Fawcett of the Otago Medical School for allowing me to use the blood gas analysis machine I.L.200; my colleagues of the Invermay Animal Health Laboratory, particularly Dr T.C. Reid for guiding me through the intracacies of chemical analyses: Mrs C.E. Aitken for patiently typing the manuscript; Mr J. McGregor for the splendid diagrams and Mr P. Johnstone for help with the statistical analyses.

iv

CONTENTS

ACKNOWLEDGEMENTS

INTRODUCTION

PREDISPOSING FACTORS

Capture Methods

Pharmacological

Mechanical

Transportation

Tranquillization

THE DISEASE PROCESS

Clinical Signs

Physiological and biochemical changes

The role of adrenaline

Miscellaneous biochemical changes

Haematological and urine changes

PATHOLOGY

THERAPY

SUMMARY

MATERIAL AND METHODS

INTRODUCTION

ANIMAL AND BLOOD SAMPLE COLLECTION METHODS

Normal animals

Captured and myopathic animals

Blood samples and handling procedures

Blood samples

Blood handling procedures

Normal animals

Captured and myopathic animals

EPIDEMIOLOGICAL DATA COLLECTION

POST MORTEN PROCEDURES

ANALYTICAL METHODS

Haematology

<u>Haemoglobin (Hb)</u>

Packed cell volume (P.C.V.)

Mean corpuscular haemoglobin concentration (NCHC)

Total white cells (W.C.C.)

Blood smears

Biochemistry

Blood pH

Total carbon dioxide (Co₂)

Partial pressure of carbon dioxide (PCo2)

and base excess

Lactate

Blood urea

Glucose

- <u>Serum glutamic oxaloacetic transaminase</u> (Aspartate amino-transferase)
- Calcium and magnesium
- Sodium and potassium

Phosphate

Total protein

Urine Analysis

Statistical Analyses

RESULTS

NORMAL CLINICAL, HAEMATOLOGICAL AND BIOCHEMICAL

PARAMETERS

Clinical

Haematological

Biochemical

THE EFFECT OF DRUGS ON HAEMATOLOGICAL AND BIO-

CHEMICAL PARAMETERS

CLINICAL, HAEMATOLOGICAL, BIOCHEMICAL AND PATHOLOGICAL CHANGES IN CAPTURED DEER.

Clinical signs

Haematology and biochemistry

Gross pathology

Histopathology

Lung

Liver

Kidney

Adrenal glands

Thyroid glands

Gastro-intestinal tract

Lymph nodes

Spleen

Brain and cervical cord

Myocardium

Skeletal muscle

EPIDEMIOLOGY

DISCUSSION

ANTICOAGULANT, DISTANCE, TIME AND CONTAINER EFFECTS HAEMATOLOGY AND CLINICAL BIOCHEMISTRY OF NORMAL ANIMALS EFFECT OF TRANQUILLIZING DRUGS POST CAPTURE MYOPATHY SYNDROME PATHOGENESIS

REFERENCES

APPENDICES

Tables XIII-XXII

Statistical analyses

-

TABLES

Page

I	List of species affected by Post	
	Capture Myopathy	2
II	Comparison of rectal temperatures, cardiac	
	and respiratory rates between controls and	
	chased group (from Hofmeyr <u>et al 1973</u>)	10
III	Epidemiological data record sheet	29
IV	Respiratory rates, heart rates and rectal	
	temperatures in clinically normal 1 year	
	old red deer	35
V	Normal values for the biochemical para-	
	meters in the two female and one male	
	group	37
VI	Haematological and biochemical values in	
	blood collected from red deer tranquilli-	
	zed with Rompun and Fentaz	38

VII	The statistical comparison of blood	
	parameters between normal males and	
	"Fentaz" affected males using Students	
	"t" test.	39
VIII	Comparison of clinical parameters between	
	captured and myopathic groups	41
IX	Summary of parameters for captured and	
	myopathic animals	45
Х	Epidemiological data	54
XI	Post capture losses	55
XII	Comparison of normal haematological	
	parameters of this study and other authors	59
XIII	Normal haematological values	74
XIV	The statistical comparison of haematological	
	parameters using students 't' test	7 6
XV	Captured animals: analysis of blood taken	
	within the first half hour of capture	77
XVI	Captured animals: analyses of blood taken	
	within one hour of capture	78
XVII	Captured animals: analyses of blood taken	X
	within one hour and a half of capture	79
XVIII	Captured animals: analyses of blood taken	
	within three hours of capture	80
XIX	Captured animals: analyses of blood taken	
	more than thirtysix hours after capture	81
XX	Myopathic animals: analyses of blood taken	
	within half an hour of capture	82
XXI	Myopathic animals: analyses of blood taken	
	within one hour of capture	83
XXII	Myopathic animals: analyses of blood taken	
	more than twentyfour hours after capture	84

FIGU	RES Bet	ween pages	
1.	Location map of sampling sites	27-28	
2.	Distribution of haemoglobin (g/100mls)		
	in 86 adult males	35-36	
3.	Distribution of haemoglobin (g/100mls)		
	in 25 adult females	35-36	
4.	Distribution of P.C.V. in 86 males	35-36	
5.	Distribution of P.C.V. in 24 females	35-36	
6.	Distribution of W.C.C. in 25 females	35-36	
7.	Distribution of W.C.C. in 19 x 14		
	month old females	35-36	
8.	Distribution of W.C.C. in 86 adult males	35-36	
9.	A representative normal electrophoreto-		
	gram	37-38	
10.	Captured animals showing the "wry"		
	neck which develops soon after capture	43-44	
11.	Urine from a myopathic animal	43-44	
12.	Graph of pH for captured and myopathic		
	groups	45-46	
13.	Graph of lactate levels (mmols/) for		
	captured and myopathic groups	45-46	
14.	Examples of electrophoretograms from		
	'captured' animals	45-46	
15.	Examples of electrophoretograms from		
	"myopathic" animals	45-46	
16.	Muscles most frequently affected with		
	gross myonecrosis	45-46	
17.	Pale streaks in muscles at necropsy	47-48	
18.	Photomicrograph of kidney tubules		
	showing pale blue staining (Perl's)	47-48	

.

- 19. Acute condition showing disarranged ragged degenerate fibres and loss of striations 49-50
- 20. Chronic condition showing regeneration, enlargement of sarcolemmal cells and fibrosis 49-50
- 21. Deer catching country, St. Bathans. Vehicle in foreground is typical of many of the transporters used for deer 52-53
- 22. Captured deer confined within carrying bags 52-53
- 23. Post capture myopathy pathogenesis 72