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Assessing current feeding practices of farmers and energy requirements of working farm dogs in New Zealand

A thesis presented in partial fulfilment of the requirements of the degree of

DOCTOR OF PHILOSOPHY
Animal Science

At Massey University
Palmerston North, New Zealand

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2013

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ACKNOWLEDGEMENTS

Completing a PhD is truly a marathon event, and I would not have been able to complete this journey without the aid and support of countless people over the past four years. This study mainly took part on various farms around New Zealand and my heartfelt gratitude and thanks go out to all the farmers that participated in my trials, without them this study would not have been possible, I hope in some way this work gives back to the farming community.

I am most grateful for my supervisors Dr. David Thomas, Dr Kay Rutherfurd-Markwick, Dr. Lucy Waldron and Dr. Jill Cline. I have been most fortunate with my supervisors, who complemented each other wonderfully and contributed to the work in their own unique ways. My sincere thanks to my chief supervisor Dr. David Thomas for his continued encouragement and invaluable suggestions during this work, and whose guidance and support from the initial to the final stages enabled me to develop an understanding of the subject. I am extremely thankful to Dr Kay Rutherfurd-Markwick, whose guidance kept me sane through the final hurdle of the writing and editing process. My sincere gratitude to Dr Lucy Tucker for her statistical and editing expertise, for keeping me motivated, and for her advice and guidance through my first international conference. Dr. Jill Cline joined the supervisory panel mid-way through my PhD, however her enthusiasm in my work re-invigorated my own enthusiasm.

I would like to show my gratitude to Nestlé Purina for their sponsorship of my research, with special thanks to Tania Gulliver and Barry Wallace, whom I am honoured to call my friends. Tania Gulliver, whose questions made me think outside the box, whose laugh and positive attitude was always contagious and Barry who introduced me to the dog trialling culture and furthermore introduced me to the fantastic farmers who participated in these trials. A special mention to Miranda Smithers, who opened her home and allowed me to stay during my trial work in Palmerston North.

I would also like to thank Dr. Alaisdair Noble for assistance with statistical theory and Dr. Patrick Morel for his invaluable help with SAS coding.

The doubly labelled water trial would not have gone so smoothly if it had not been for assistance from Dr John Speakman and Dr Paula Redman. Paula with guiding me through the trial set up and all the way through to the DLW calculations. The GPS analysis was made possible with the GIS lessons from Matthew Irwin and Ina Dragnova, who answered all my questions.

I would also like to thank the IFNHH team in Wellington, especially Dr. Rachel Page for accommodating me by finding desk and computer space. The writing phase of my PhD would have gone considerably slower if it not been for them. I'd like to acknowledge Dr. Isabelle Lys, for her friendship, for listening and offering sound advice in all areas of life as a PhD student.

My family members are my pillars, they held me up when things went wrong (which during the course of a PhD is inevitable), and shared in the many joys I've received during the course of my work. I am grateful to my parents for their understanding and endless patience, and my siblings, especially my sister Nivedita Findlay, who will never have to hear "but I'm a student" ever again. I owe my deepest gratitude to Justin Heegers for being my rock throughout this process; he's not only supported me from the very beginning and tolerated my constant ramblings of research progress, but also helped proof read this thesis and 'offered' his professional editing service. Above all else I am most grateful for my family's unwavering belief that I could do this.

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ABSTRACT

Working farm dogs in New Zealand (NZ) where studied in this thesis, and were found to usually be fed once a day on a diet consisting of 50% TUX Energy biscuits and 50% homekill (50:50). Diet composition does not change between peak and off-peak work periods. Instead the amount fed changes, with dogs fed more during peak periods. The digestibility of the average diet of the working dog is high and working farm dogs fed 50:50 or 100% homekill meets all energy and minimum nutrient requirements, including essential amino acids, calcium and phosphorus as set by the Association of American Feed Control Officials (AAFCO). The calcium: phosphorus ratios were high in both diets (1.85:1 in 100% homekill and 1.93:1 in 50:50). However, these minimum requirements are defined for the household pet dog and may not fulfil the requirements of working farm dogs.

Actical® activity monitors were calibrated with doubly labelled water to estimate activity associated energy expenditure in the dog. A constraint of this study of the weight range and number of dogs used and may only be useful for dogs weighing between 18 and 26 kg. However, when using activity monitors, the basal metabolic rate (BMR) has to be estimated.

The mean energy requirements for Heading dogs and Huntaways were different between peak and off-peak periods, with dogs requiring more energy from their diets during peak periods. Global positioning systems were used to measure the distances covered by farm dogs in this study (10 ± 0.7 km/d during off-peak periods and 20 ± 1.3 km/d during peak periods), with these results similar to distances that sled dogs cover while training (Grandjean and Paragon, 1993a), and they are also similar to data obtained from Australian cattle dogs.

Currently there are no nutritional guidelines which state the requirements of a working dog, and the findings from this work show that the farm dogs in NZ may not be receiving the energy required for work from their current diet.

ABBREVIATIONS

AAFCO	Association of American Feed Control Officials
Ach	Acetylcholine
ADP	Adenosine diphosphate
AEE	Activity associated energy expenditure
ANOVA	Analysis of variance
ATP	Adenosine triphosphate
BCS	Body condition score
BMR	Basal metabolic rate
BW	Bodyweight
C	Carbon
Ca^{2+}	Calcium ion
cFQ	Corrected food quotient
CO_2	Carbon dioxide
d	Day(s)
DE	Digestible Energy
dGPS	Differential Geographic Positioning System
DLW	Doubly-labelled water
DM	Dry matter
DNA	Deoxyribonucleic acid
EE	Energy expenditure
EGNOS	European Geostationary Navigation Overlay System
FMCP	Fragmentation of the medial coronoid process
FFA	Free fatty acids
FQ	Food quotient
G	Generalisability
g	Gram(s)
g	Gravity force
GPS	Geographic Positioning Systems
^{1}H	Hydrogen
^{2}H	Deuterium
^{3}H	Tritium
h	Hour(s)
H_2O	Water

ha	Hectare
HAD	3-hydroxyacyl CoA Dehydrogenase
HB	Hawke's Bay
Hz	Hertz
IQR	Inter-quartile range
IRMS	Isotope-Ratio Mass Spectrometry
IU	International Unit
Kcal	Kilocalorie(s)
k_d	Flux rate of deuterium
Kg	Kilogram(s)
KJ	Kilojoule(s)
k_o	Flux rate of oxygen
l	Litre(s)
LNI	Lower North Island
LQ	Lower quartile
m	Metre(s)
ME	Metabolisable Energy
min	Minute(s)
MJ	Mega joule(s)
ml	Millilitre(s)
mm	Millimetre(s)
N	Dilution space
n	Number
N_d	Dilution space of deuterium
NMR	Nuclear Magnetic Resonance
N_o	Dilution space of oxygen
NRC	National Research Council
NZ	New Zealand
NZSDTA	New Zealand Sheep Dog Trialists Association
O_2	Oxygen
^{18}O	Heavy oxygen
PTT	Platform Transmitter Terminals
rCO_2	Rate of CO_2 produced
RQ	Respiratory quotient

$R_{dilspace}$	Average dilution space ratio
s	Second(s)
SEE	Standard error of the estimate
SEM	Standard error of the mean
SIRIS	Stable Isotope Ration Infrared Spectrometry
sx	Surgical treatment
T4	Thyroid hormone
TEE	Total energy expenditure
TCA	Tricarboxylic acid cycle
UQ	Upper quartile
Vet	Veterinarian
VO_2	Oxygen consumption
WAAS	Wide Angle Augmentation System

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