A COMPARISON OF SELECTED NUTRITIONAL PARAMETERS BETWEEN WILD AND DOMESTIC MEATS.

Lauri-Beth Fine

A dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science

Johannesburg, 2008

Abstract

Many dietary factors, especially fat, are likely to influence the risk of cardiovascular disease by, amongst others, their effects on blood cholesterol concentration. The aim of this study was to analyse the lipid, energy and protein concentrations of local South African game in comparison to domestic meats. Fatty acid profiles were determined by chloroform-methanol extraction and gas chromatographic analysis. Total protein concentrations were determined by the Lowry Method. Energy analysis was performed using bomb calorimetry. Although no consistent, distinct differences between all the wild and domestic South African meats were found, individual differences were noted within and between species. Therefore, no general consumption recommendations can be made, but some wild meats appear to be more in line with general health recommendations than domestic meats.

Declaration

I declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted for any degree or examination in any other university.

Lauri-Beth Fine

(Signature of candidate)

_____ day of _____ 2008

Contents

Abstract	ii		
Declaration			
Contents	iv		
List of Abbreviations	viii		
Description of References			
List of Tables			
Dedication			
Acknowledgements			
1. Introduction	1		
1.1 Dietary Lipid	1		
1.2 Dietary History	3		
1.3 Dietary Lipid Categories	5		
1.3.1 Total Fat	5		
1.3.2 Saturated Fat	6		
1.3.3 Monounsaturated Fat	7		
1.3.4 Trans-Unsaturated Fat	7		
1.3.5 Polyunsaturated Fat	7		
1.3.5.1 N9 PUFA	8		
1.3.5.2 N6 PUFA	8		
1.3.5.3 N3 PUFA	9		
1.4 Lipids of Meat	10		
2. Materials and Methods	13		
2.1 Samples	13		

	2.2 Lipid Analysis	13
	2.3 Protein and Energy Analysis	14
	2.3.1 Protein Analysis	14
	2.3.2 Energy Analysis	14
	2.4 Data Analysis	15
	2.4.1 Lipid	15
	2.4.2 Protein and Energy	15
	2.5 Ethics	16
3.	Results and Discussion	17
	3.1 Individual Domestic Species	17
	3.1.1 Pig	17
	3.1.1.1 Lipids	17
	3.1.1.2 Protein	19
	3.1.1.3 Energy	19
	3.1.2 Rabbit	20
	3.1.2.1 Lipids	20
	3.1.2.2 Protein	21
	3.1.2.3 Energy	22
	3.1.3 Goat	22
	3.1.3.1 Lipids	22
	3.1.3.2 Protein	24
	3.1.3.3 Energy	24
	3.2 Comparison between Domestic Species	25
	3.2.1 Lipids	25
	a) Pig and Rabbit	25

b) Pig and Goat	26	
c) Rabbit and Goat	26	
3.2.2 Protein	27	
3.2.3 Energy	28	
3.3 Individual Wild Species	29	
3.3.1 Impala	29	
3.3.1.1 Lipids	29	
3.3.1.2 Protein	31	
3.3.1.3 Energy	32	
3.3.2 Wildebeest	32	
3.3.2.1 Lipids	32	
3.3.2.2 Protein	34	
3.3.2.3 Energy	35	
3.3.3 Springbok	35	
3.3.3.1 Lipids	35	
3.3.3.2 Protein	36	
3.3.3.3 Energy	37	
3.4 Comparison between Wild Species	37	
3.4.1 Lipids	37	
a) Impala and Wildebeest	37	
3.4.2 Protein	38	
3.4.3 Energy	39	
3.5 Comparison of Domestic and Wild Species		
3.5.1 Lipids	39	
3.5.2 Protein	40	

	3.5.3 Energy	41
4.	General Discussion	43
5.	Conclusion	48
6.	References	49

List of Abbreviations

- TS: total saturated fatty acids
- TM: total monounsaturated fatty acids
- **18:2:** linoleic acid (18:2n6)
- 20:4: arachidonic acid (20:4n6)
- **22:4:** adrenic acid (22:4n6)
- 22:5: gamma-docosapentaenoic acid (22:5n6)
- TN6: total omega-6 fatty acids
- 18:3: alpha-linolenic acid (18:3n3)
- 20:5: eicosapentaenoic acid (20:5n3)
- 22:5: alpha-docosapentaenoic acid (22:5n3)
- 22:6: docosahexaenoic acid (22:6n3)
- TN3: total omega-3 fatty acids
- **TP:** total polyunsaturated fatty acids
- Dry: lipid dry weight
- S:P: saturated fatty acid to polyunsaturated fatty acid ratio
- N6:N3: omega-6 fatty acid to omega-3 fatty acid ratio

Description of References

First mention of reference uses all author's names, subsequently only first author and *et al* is stated.

List of Tables

 Table 1: Modifications in American Dietary Guidelines from 1980 to 2000

 Table 2: Equations used to estimate cholesterol change resulting from dietary fat and

cholesterol modifications

Table 3: Fatty acid profile of various muscle sites of pig

 Table 4: Protein concentrations of various muscle sites of pig

Table 5: Energy concentrations of various muscle sites of pig

Table 6: Fatty acid profile of various muscle sites of rabbit

Table 7: Protein concentrations of various muscle sites of rabbit

 Table 8: Energy concentrations of various muscle sites of rabbit

Table 9: Fatty acid profile of various muscle sites of goat

Table 10: Protein concentrations of various muscle sites of goat

 Table 11: Energy concentrations of various muscle sites of goat

Table 12: Fatty acid profile of domestic species

 Table 13: Protein concentrations of various muscle sites of domestic species

Table 14: Comparison of the statistical variation between protein concentrations in domestic

 species

 Table 15: Energy concentrations of various muscle sites of domestic species

Table 16: Comparison of the statistical variation between energy concentrations in domestic

 species

Table 17: Fatty acid profile of various muscle sites of impala

Table 18: Protein concentrations of various muscle sites of impala

Table 19: Energy concentrations of various muscle sites of impala

Table 20: Fatty acid profile of various muscle sites of wildebeest

ix

Table 21: Protein concentrations of various muscle sites of wildebeest

Table 22: Energy concentrations of various muscle sites of wildebeest

Table 23: Fatty acid profile of various muscle sites of springbok

Table 24: Protein concentrations of various muscle sites of springbok

Table 25: Energy concentrations of various muscle sites of springbok

Table 26: Fatty acid profile of wild species

 Table 27: Protein concentrations of various muscle sites of wild species

Table 28: Comparison of the statistical variation between protein concentrations in wild

 species

Table 29: Comparison of the statistical variation between protein concentrations in domestic

 and wild species

Table 30: Energy concentrations of various muscle sites of wild species

Table 31: Comparison of the statistical variation between energy concentrations in wild

 species

Table 32: Fatty acid profile of domestic and wild species

Table 33: Protein analysis of domestic and wild species

 Table 34: Energy analysis of domestic and wild species

 Table 35: Comparison of the statistical variation between energy concentrations in domestic

 and wild species

This Dissertation is dedicated to my Parents

MOM AND DAD

With all my love and appreciation

Acknowledgements

I would like to express my sincere thanks to my supervisor, Professor Bruce Davidson, for mentoring me, for his patience in addressing my endless barrage of questions, his support and encouragement. Thank you for refining my skills as a competent researcher.

Thank you to the School of Physiology for their support structure. I would especially like to thank Avonne Pickering, Margaret Badenhorst and Kennedy Erlwanger for their assistance, patience and encouragement.

I would like to acknowledge the staff of the Central Animal Services, particularly Peter Dawson, for their services.

I gratefully acknowledge funding from the Medical Faculty Research Endowment Fund.

To my parents, my husband, Ashley, and my sister, Kelli, this dissertation would never have been completed without your unconditional love, understanding, encouragement and support. Thank you, I could never have done this without you all!