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CONCLUSION AND RECOMMENDATIONS

With increasing consumer demand for lean meat, the relationship between fatness and eating quality as well as healthy lean meat portions has become the focus point for the red meat industry lately. The carcass composition (cutting data) in this study provides retailers with an insight into the variation in subcutaneous fat (SCF) of the different cuts of the carcass at different fat levels (fat scores). If the data is combined with efficient trimming skills of innovative retail operations, carcasses over a broad spectrum of fat levels could be processed into higher-value cuts that are more acceptable and attractive to the consumer. Trimming of visible fat in some cuts can result in less fat (10 g) per 100 g meat and can then be included in low fat diets.

In some instances, depending on the price of the carcass and the cost of trimming (labour and value of trimmed fat), further processing of over fat carcasses, can provide more affordable cuts to the consumer. On the other hand a certain sector of the consumer corps may be willing to pay premium prices if the final product is perceived as being healthier and this could perhaps justify the trimming of any cut to consumer standards. A limitation of this part of the study is the fact that no measurement was made of the amount of intermuscular or intramuscular (seam) fat. It could provide proper information on how much intermuscular fat could be expected to be present in the different cuts. Previous work has showed that excessive fat may still remain in certain cuts of over fat carcasses trimmed of SCF. Therefore, further investigation into the remaining fat of different cuts at different fat levels after trimming could be valuable, when decisions on trimming for specific markets are made. Consumer perceptions on the trimmed product vs. the price should also be investigated.

The majority of the population in most developing countries consume meat (and meat products) that significantly contribute to the nutrient intake. Meat provides a range of amino acids essential for the growth and development of the human body, fats which contribute to energy intake and essential fatty acids, minerals such as iron and zinc in a readily-digestible form and vitamins, particularly vitamin B₁₂ (Enser, 2000:124).

It is evident from this study that lamb also provides a variety of valuable nutrients. Meat from the A age class, fat class 2 lamb ($\pm 7\%$ SCF) is nutrient dense and can be regarded as an important dietary source of the B vitamins, although some may be lost due to leaching during the cooking process. Lamb is undoubtedly an excellent source of nutrients (protein, zinc, iron magnesium and the B-group

vitamins) that are required for good health and meat from the A2 lamb ($\pm 7\%$ SCF) makes a valuable contribution to the RDA for males, aged 25 – 50 years. Although there is no RDA for cholesterol the recommended maximum daily cholesterol guideline is less than 300 mg per day. Results from the study showed that a 100 g portion of cooked shoulder provides 85 mg cholesterol and a 100 g portion of cooked loin cut, 86 mg and the leg cut 91.7 mg. Therefore it can be recommended that a person can eat a 100 g of A2 lam in moderation as part of a healthy diet programme.

Another approach to good nutrition has been proposed namely Index of Nutritional Quality (INQ). If a food has an INQ of two or more for two nutrients or one or more for four nutrients, it makes a significant contribution to the total nutrient intake and therefore should be regarded as "nutritious" (Guthrie & Picciano, 1995:53). SA Lamb (A age class, fat class 2) contributes significant to the INQ in that three of the nutrients (protein, zinc and vitamin B₁₂) in the leg, loin and shoulder cuts are >2 and the lamb can thus be regarded as "nutritious". The leg and shoulder cuts each have 2 nutrients [(protein and cyanocobalamin (vit B₁₂))] that are >2, and four nutrients [(protein, iron, zinc and cyanocobalamin (vit B₁₂))] that are >1 and can therefore be regarded as nutritious because it makes a significant contribution to the total nutrient intake (Guthrie & Picciano, 1995:53).

Comparing South African data with that of other countries (USA, Britain, Australia and New Zealand), shows that the use of non-local data sources can produce differences in the assessment of the nutrient composition and may cause conflicting interpretation of the dietary intake data. The greatest differences observed when comparing data from the USA, Britain, Australia and New Zealand, were for protein, total fat, ash, energy, some minerals as well as some of the fatty acids. The nutrient content of meat is influenced by amount of total fat it contains. As fat content (and therefore also fatty acids) increases, protein content (and amino acids) decreases per 100 g portion, with the concomitant associated increased energy content. The variation in the total fat content could furthermore be attributed to the proportion of fat to lean as suggested by different slaughter masses; natural variation in the fat content between animals, cutting up and trimming techniques, and visible subcutaneous and intermuscular fat included in cuts such as loin chops (Enser, Hallett, Hewett, Fursey, Wood & Harrington, 1998:339).

The results demonstrated that meat varies in its contributions to the diet, mainly due to the sources of the data (Annexure 1). When comparing South African food composition (lamb) data with the current data included in the South African food composition tables (Sayed, Frans & Schönfeldt, 1999) it is clear that there are large differences in the nutrient composition of lamb between these two sets of data. This illustrates that the use of non-local data sources can produce differences in the assessment of its nutrient composition and may cause conflicting interpretations of dietary intakes. On average lamb from South African A age class, fat class 2 lamb contained less fat, energy, magnesium, sodium, zinc and iron when compared to the values in the MRC tables (previous lamb data). It is also lower in water-soluble vitamins nutrients, monounsaturated fatty acids as well as polyunsaturated fatty acids.

Local data on nutrient composition is important for assessing dietary intakes, determining the relationship between dietary intake and disease occurrence, and for communicating meaningful nutrient information to the consumers. This study contributes valuable data to more accurate dietary intake by providing a more precise nutrient profile of South African lamb. However, this data is on A age class, fat class 2 lambs only ($\pm 7\%$ SCF), and more research and data is required on the other age and fat classes ensure a complete data set of South African lamb and mutton.

Meat quality is a multi-dimensional phenomenon and is influenced by a wide range of factors which can exert their effect from the animal to the plate. Focusing on the sensory attributes, meat is a favourite food in South Africa, therefore taste, aroma and texture are important sensory characteristics that contribute to the palatability of lamb (meat). However, there are numerous factors that may affect the quality, texture and flavour of lamb and sheep meat such as age, fat class, breed, nutrition and sex. From this study it seemed as if differences were smaller because only one age group was investigated. With the exception of juiciness, the results in this study showed that contrary to expected carcass fatness (in the same age over five fat classes), as portrayed in the SA Classification system, does not have a significant effect on the sensory qualities of *M. longissimus lumborum* (loin) from lambs of the same age. The study found that meat cuts within the same age (A age class, fat class 2) do not differ significantly from each other in tenderness. Meat from animals in the same age (A2) with increasing fat classes (up to 16 % SCF) is juicier with a higher percentage total cooking loss.

It can be concluded that the consumer will still have a palatable and nutritious product if some of the excess fat is trimmed from certain cuts. This conclusion is based on the results of this study, and only measured in the A age animals. It should be further investigated on all the other age groups and fat classes to determine the influence of age on the eating quality of lamb and mutton. It is recommended that the nutrient composition of the other age classes such as AB age (young animals with 1-2 incisors), B age (older animals with 3-6 incisor) and C age (the oldest animals with 7-8 incisors) (especially for Mutton Merino) also be analysed, to have representative physical and nutrient content values for food composition tables on South African lamb and sheep meat.

If it is considered that, in general, this study found a significant difference in previously-believed-to-be-accurate values, it is important to the Red Meat Industry to support further analysis of the nutrient composition of South African lamb and sheep. A further recommendation is to determine the Conjugated Linoleic Acid (CLA) content of A2 lam because ruminant meat is a natural source of CLA as CLA is produced in the ruminant and according to Mulvihill, (2001) lamb contains on average the most CLA. The dissemination of the information concerning the quality of South African lamb (carcass, nutrient and sensory attributes) to consumers, the meat industry and health workers is of the essence and therefore recommended.

From the results of this study, it is clear that the null hypothesis, that stated that there will be no differences in the carcass, nutrient and sensory attributes of selected raw and cooked cuts of the A age class South African lamb, can be rejected.

Annexure 1

TABLE 1: INDICATION OF THE ABSOLUTE DIFFERENCES OF THE NUTRIENT COMPOSITION FOR THREE COOKED CUTS AS WELL AS FOR RAW AND COOKED LEAN (MEAT) ONLY LAMB BETWEEN THE SOUTH AFRICAN 1999 MRC FOOD COMPOSITION TABLES AND THE RESULTS OF THE CURRENT STUDY ON THE A AGE CLASS, FATNESS 2 LAMB

PER 100 G EDIBLE PORTION F	ABSOLUTE DIFFERENCE		ABSOLUTE DIFFERENCE		
	RAW	COOKED	SHOULDER COOKED	LOIN COOKED	LEG COOKED
PROXIMATE ANALYSIS:					
Moisture	10.8	14	47	23	14
Protein (Nx6.25)	1.4	-1.4	-19	10	-4
Fat	-12.59	-12.96	-59	-66	-54
Ash			-	-	-
Food energy (calculated)	-443	-1891	-46	-41	-31
MINERALS:					
Magnesium (Mg)	-1.9	-2.3	-25	0.83	-5
Potassium (K)	131	2	5	0.92	-3
Sodium (Na)	-146.6	-1.3	-8	8.18	-6
Zinc (Zn)	-1.08	-3.03	-80	-37	-61
Iron (Fe)	-0.64	-1.43	-	-1.2	-40
VITAMINS:					
Thiamin (B ₁)	-0.02	-0.05	-57	-60	-40
Riboflavin (B ₂)	-0.13	-0.19	-81	-72	-81
Niacin (B ₃)	-4.63	-5.24	-78	-82	-75
Pyridoxine (B ₆)	0.27	-0.01	20	0	-23
Cyanocobalamin(B ₁₂)	1.14	-1.7	-70	-63	-60
LIPIDS:					
Saturated fatty acids (SFA)	-1.08	-1.18	-62.87	-61.06	-40.25
14:0	-0.3	-0.32	-35	-54	-22
16:0	-2.53	-2.6	-61	-61	-43
18:0	-1.52	-1.82	-76	-6	-43
20:0	0.02	0.02	1	2	3
Monounsaturated fatty acids(MUFA)	-3.12	-2.8	-68.79	-3.32	-55.00
16:1	-0.44	-0.43	-69	-75	-63
18:1	-4.53	-7.83	-69	-70	-54
Polyunsaturated fatty acids (PUFA)	0.33	0.33			
18:2	-0.97	-0.97	-97	-79	-72
Cholesterol	-9.2	-15.3	-27	-14	-1

Data from current study (Table 4)

Difference: Calculated on the difference between the values of the current study (Table 4) and that of the 1999 MRC food composition tables (Sayed, Frans & Schönfeldt, 1999)

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Indicates that the current study has **less** of the particular nutrient than the MRC-tables

REFERENCES

- ENSER, M. 2000. *Producing meat for healthy eating*. Proceedings of the 46th International Congress of Meat Science and Technology. 27 August – 1 September 2000, Argentina. p 124.
- ENSER, M., HALLETT, K.G., HEWETT, B., FURSEY, G.A.J., WOOD, J.D. & HARRINGTON, G. 1998. Fatty acid content and composition of UK beef and lamb muscle in relation to production systems and implications for human nutrition. *Meat Science*, 49(3):329-341.
- GUTHRIE, H.A. & PICCIANO, M.F. 1995. *Human nutrition*. Mosby. St. Louis, Missouri.
- MULVIHILL, B. 2001. Ruminant meat as a source of conjugated linoleic acid (CLA). *Nutrition Bulletin*, 26(4)
- RADER, L. & LE ROUX, R. 2005. Factors effecting food choice in relation to venison: A South African example. *Meat Science*, 71:583-589.
- SAYED, N., FRANS, Y. & SCHÖNFELDT, H.C. 1999. *Composition of South African Foods: Milk & Milk products, Eggs, Meat & Meat products*. Supplement to the MRC Food Composition Tables 1991. SAFCOD. Medical Research Council. Cape Town.