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INTRODUCTION AND LITERATURE REVIEW

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Most developing countries face the consequences of both nutritional deficiencies and excesses and South Africa is no exception. They are all subjected to the double burden of persisting undernutrition in the midst of the growing epidemic of obesity and non-communicable diseases such as cancer and heart disease (Labadarios, 2000:3).

According to Schönfeldt (2005:13), chronic undernutrition affects some 215 million people in sub-Saharan Africa, or 43 percent of the population. According to the Food and Agriculture Organisation of the United Nations (FAO) and the World Health Organisation (WHO), an estimated 206 million people in Africa are iron deficient; 86 million are affected by iodine deficiency, and up to 31 million are deficient in vitamin A. Labadarios (2000:3) confirmed that a double burden of nutrition-related diseases is prevalent in many households and communities in Southern Africa, as both over- and undernutrition are experienced, due to rapid urbanization and acculturation. Schönfeldt (2005:13) noted that numerous South Africans suffer from the health-implications of inappropriate diets, with obesity being the most underlying nutritional disease in causing many of the major non-communicable diseases. This forms part of the massive global burden of diet-related diseases that drives consumers not only to improve their health through optimized nutrition, but to improve their health through positive eating and problem treating. As the incidence of chronic diseases continues to increase, the consumer's interest in the positive role food can play in controlling these afflictions, is growing. Schönfeldt (2003:1) furthermore mentioned that individuals are moving from efforts to optimize balanced nutrition, to acting in order to improve their health resulting in the concept of "food today for medicine tomorrow".

South African consumers frequently eat meat as part of their daily diet (ACNielsen, 2001). The consumer's behaviour is increasingly driven by product quality and health consciousness, with a newly emerging consumption pattern focused on "healthy eating" (Verbeke, 1999:8). From a health perspective, consumers are concerned about the amount of fat and cholesterol food products contain, as well as the long term effect it has on their well-being. Sañudo, Enser, Campo, Nute, Maria, Sierra and Wood, (2000:339) reported that too much visible fat discourages the consumer and it is often removed either before cooking or during the meal, especially by the younger consumer. The amount

of fat in the diet and its saturated fatty acid content are considered major risk factors for coronary heart disease (Sañudo *et al.*, 2000:339). Eating quality, price and safety are the other major factors the consumer considers when making a food choice. However, various other influences such as cultural acceptability, family income, symbolic status, food security, social status and society are recognized as contributing to these food choices (Shepherd & Sparks, 1994:203).

As consumers are increasingly more focused on the quality and nutritional characteristics of meat and meat products, fresh meat has been referred to as the food in which consumer confidence has decreased the most during the nineties (Verbeke, 1999:8). This could be attributed to the fact that many organizations including consumer organisations, industry, producers and government have been involved in debates on the issues of fat and cholesterol, growth hormones and price, to name but a few (Verbeke, 1999:8). Diseases such as foot-and-mouth disease, notifiable Avian Influenza and Bovine Spongiform Encephalopathy (BSE) have also impacted on consumer confidence in considering meat to be as safe (McCarthy & Barton, 1998:14).

Research on South African meat quality and more specifically on meat production was initiated at the Animal and Dairy Science Research Institute of the Department of Agriculture and Water supply in 1968. In 1973 a small abattoir with a few laboratories were erected and have been used since. Additional laboratories and a sensory evaluation unit were added in 1977. The initial programme involved meat production studies including carcass and muscle characteristics of cattle and sheep. In the early 1980's the Institute focused on and conducted investigations into the classification and grading of all red meat-producing species. This accommodates the carcass and meat quality requirements for consumers and meat producers. The classification of beef and lamb carcasses resulted in major adjustments to the official carcass grading system in 1981, and is still being used today (Meat Science Centre, s.a.). During this time a need for information on the quality attributes of all red meat products arose and was identified as a top priority. To this end, a major study was completed on the nutritional value of different classes of beef in the South African Meat Classification System (Schönfeldt, 1998).

In 2003, the need for information on the quality of South African lamb and mutton to address consumer uncertainties was identified by the Red Meat Producers Organisation (RPO) as being of prime importance, following similar studies in Australia by the Meat and Livestock Australia (MLA). They subsequently requested that the quality of South African lamb be investigated. In 2004, the study was undertaken by the Agricultural Research Council-Animal Nutrition and Animal Products Institute (ARC-ANPI). The aim was to determine the quality of South African lamb, in terms of the carcass, nutrient and sensory attributes. However, due to financial constraints, only the most often consumed cuts of the most popular class (A age class, fat code 2) were analysed for nutrient content.

Sheep and goat numbers slaughtered in South Africa have declined from 8 505 000 in 1991/1992 to 5 042 000 in 2004/2005 (The Directorate: Abstract of Agricultural Statistics, 2005:64). The same trend

was observed for South African lamb consumption, which declined from 5.2 kg per capita in 1991/1992 to 2.7 kg per capita in 2004/2005 (The Directorate: Abstract of Agricultural Statistics, 2005:64). Therefore there is a unique opportunity for growth in this sector of the South African meat market.

South Africa is a country that has been renowned for sheep production for own consumption since the early 1900's. Small ruminants (sheep and goats) form an integral part of smallholder farming systems in South Africa and make a significant contribution to the total farm income, stability of the farming system and nutrient intake (Cloete, Hoffman, Cloete & Fourie, 2004:44). This is in contrast to the commercial sheep industry which competes against other animal protein sources such as beef, pork, poultry and fish for delivering an affordable product to the consumer. In this competitive environment, the sheep industry must monitor and react to the changing preferences of the consumer. This could be achieved in part by the production of uniform, safe, nutritious and lean lamb products (Shackelford, Leymaster, Wheeler & Koohmaraie, 2003:1).

In South Africa, lamb carcasses are classified according to age and fat class. This assists both the industry and consumer to choose the product that they best prefer. According to the Agricultural Product Standards Act No. 119 of 1990 and its regulations, (National Department of Agriculture, 1990:9-14), the classification system is designed to describe carcasses according to tissue composition and age. Age is described according to the number of permanent incisors, with age class A = 0 teeth, AB = 1-2 teeth, B = 3-6 teeth and C = more than 6 teeth, while carcasses are grouped into six fat classes by means of visual appraisal (fatness class from 0 = no fat, to 6 = excessively over-fat). According to the fatness classification (National Department of Agriculture, 1990:9-14), an A age class, fat code 2 lamb may have at least 1 mm, but not more than 4 mm fat cover, over the loin or 5.6 % but not more than 8.5 % subcutaneous fat (SCF). The South African classification system provides the basis for assisting the untrained consumers in the selection of meat cuts to contribute to health and to provide eating satisfaction (SAMIC, s.a.). It also assists the meat traders to describe their specific requirements in simple terms when purchasing carcasses and to utilize a variety of cuts with specific fatness levels in the market with the goal of optimum consumer satisfaction. It furthermore helps to contribute to a price structure for selling meat (SAMIC, s.a.).

Carcass composition

Carcasses of meat animals are composed primarily of proportions of muscle, fat and bone of which muscle is the most important part contributing to the diet of all people (Cloete *et al.*, 2004:44). The composition of fatness and muscling of lamb carcasses varies due to differences in gender, age, breed, and slaughter weight, although fat content is the most important quality criteria in the cooled carcass, as weight is used to set the carcass price (Díaz, de la Fuente, Lauzurica, Pérez, Velasco, Álvarez, Ruiz de Huidobro, Onego, Blázquez & Cañeque, 2005:61; Cunhal-Sendim, Murillo, Belenguer

& Castello, 1999:190-191). According to Johnson, Purchas, McEwan and Blair (2005:383), the value of a lamb carcass is mainly determined by the lean meat yield (LMY %) as excess fat is economically inefficient. Therefore, the major aim in any animal production system with regard to carcass quality should be to produce a carcass with the highest edible yield. The most valuable parts of the carcass are the loin and legs. The hind leg and loin contribute to the higher priced cuts of the carcass, because these cuts are less associated with fat and connective tissue (Sheridan, Hoffman & Ferreira, 2003:63).

Recently, more attention has been paid to U.S. consumer behaviour and attitude towards meat due to demographic, psychographic and ethnic forces (Veblen, 1988:129), which impact on meat consumption. These are worldwide, major issues, affecting the meat sector (Verbeke & Viaene, 1999:437). Once the desired cut is known, the product (cut) can be utilized by the industry to ensure that the consumer has a quality product - primal cuts with consistent size, colour, fat content and value for money. Marketing the right animal in South Africa, and presenting the desired cut with the most nutritious assets, contributes to promoting and increasing the consumption of lamb. Retailers will have the ability to provide a product that is low in fat content. However, certain cuts may need to be trimmed while others may fall within consumer's specification for fatness.

Knowledge of the carcass (physical) composition is necessary to provide the preferred cut as such or by further trimming of the cut to the consumers' preference (Hopkins, Watton, Gamble, Atkinson, Slack-Smith & Hall, 1995:34). Furthermore, these authors stated that retailers would be able to offer a diverse range of nutritious, lean cuts to the consumer. The composition of tissue, especially the lean meat proportion of South African lamb and mutton is of great importance, because it will make it possible to assign nutritional and economical value to the carcass (Hopkins *et al.*, 1995:39). Therefore, the ability to promote the nutritional attributes of lamb to the consumer is considered important to improve the health-related perceptions of lamb.

Nutritional importance of lamb

As consumers are conscientious about what they eat, the health aspect of food is important. For the health professionals and workers to guide the consumer, information regarding the nutritional value of food, in this case SA lamb is important and necessary. Therefore, as in many other countries, South Africa is actively involved in analysing food for the compilation of food composition data tables.

It is important for different countries to have their own food composition tables for meat products such as lamb, mutton, beef and pork. The reason for this is that different techniques are used to cut carcasses into primal cuts in the different countries. Different age groups and fat codes of the animals in various countries make the interpretation of the results difficult (Schönfeldt, 1998:4) as the composition of the carcasses has a direct influence on the nutrient content thereof. The difference in

climate, soil content and water composition of the various regions and countries also affects the nutrient content (specifically the minerals and vitamins) of the animal feed, as well as the production of vitamin D in the meat itself (Greenfield and Southgate, 2003:69).

TABLE 1: NUTRIENT VALUES IN LEAN LAMB PER 100 G COOKED EDIBLE PORTION OF SELECTED COUNTRIES

Nutrients	Unit	South Africa ¹	USA ²	UK ³	Australia ⁴	New Zealand ⁵
		Cooked Leg & shank	Cooked Leg-roasted, lean & fat	Cooked Lamb-roast	Cooked Fresh leg & shank	Cooked leg (shank & sirloin)
		Lean	Lean & fat	90 % meat	Trimmed to ± 4 mm fat	12 % separable fat
		100 g	100 g	100 g	100 g	100 g
Proximate analysis:						
Moisture	g	57.5	67.0	58.70	59.2	63.92
Protein (Nx6.25)	g	25.6	25.8	24.30	29.3	27.68
Fat	g	16.5	16.5	13.30	11.9	7.01
Ash	g	-	-	-	1.10	1.52
Food energy (calculated)	kJ	1046	1095	905	937	757
Minerals:						
Magnesium (Mg)	mg	24	-	24	19	21
Potassium (K)	mg	313	312	350	290	183
Sodium (Na)	mg	66	66	61	66	45
Zinc (Zn)	mg	4.4	-	4.5	4.5	4.0
Iron (Fe)	mg	2.0	2.0	1.9	2.4	2.2
Vitamins:						
Thiamin (B ₁)	mg	0.1	-	0.15	0.06	0.12
Riboflavin (B ₂)	mg	0.27	0.27	0.27	0.25	0.50
Niacin (B ₃)	mg	6.6	6.6	4.5	4.5	7.51
Pyridoxine (B ₆)	mg	0.5	-	0.22	-	0.14
Cyanocobalamin (B ₁₂)	μ g	2.6	-	4	-	2.63
Lipids:						
SFA	g	0.8	6.9	6.1	6.1	3.05
MUFA	g	3.5	6.9	5.3	4.3	2.75
PUFA	g	0.36	1.2	0.7	0.2	0.41
Cholesterol	mg	93	93	98	109	100

¹ Sayed, Frans and Schönfeldt (1999)

² Gebhardt and Thomas (2002:58)

³ Chan, Brown, Church and Buss (1996:56-59)

⁴ Lewis, Milligan and Hurt (1995, Vol. 1)

⁵ United States Department of Agriculture (1989:107)

- Value not available

Table 1 provides a comparison of macro- and micronutrients when different data sources are used, and illustrates that the use of different food composition tables may cause conflicting interpretation of dietary intake data. Iron content of meat is positively correlated with age of the animal (Lawrie, 1998:62). Variation is evident in the total fat content and this could be due to various factors such as intensive finishing or differing cutting up techniques between countries and that visible subcutaneous and intermuscular fat are included in cuts such as loin chops (Enser, Hallett, Hewett, Fursey, Wood & Harrington, 1998:339).

The Medical Research Council (MRC) is responsible for compiling South African food composition tables (Langenhoven, Kruger, Gouws & Faber, 1993:1). These tables are used in dietary surveys, nutritional intervention research, nutrition education, catering, consumer information, etc. The Research Institute for Nutritional Diseases (NRIND) issued the first food composition tables in 1991.

However, these tables did not include unique values for South African meat products, but consist of data obtained mainly from American and English composition tables and this is not readily applicable to the South African context.

Only 18 % of the foods in the 1991 MRC Food Composition Tables were authentic South African data (Langenhoven *et al.*, 1993:1). At a national symposium in September 1995, it was agreed that a national effort was necessary to compile food composition data for South Africa. A National Steering Committee for South African Food Composition Data (SAFCOD) was consequently formed in November 1995 with the aim to drive and promote a national food composition database. The 1999 MRC Food Composition Tables of South Africa was revised and the database has been increased with local South African data for vegetables, beef, chicken, fruit and dairy to 41 % (Langenhoven *et al.*, 1993:1). The nutrient content of 59 % of the food consumed daily in South Africa is largely estimated or extrapolated from foreign data (including the data on South African lamb) (Codjia, 2000:41). According to Cobiac, Droulez, Leppard and Lewis (2003:133) accurate nutrient composition data are essential communicating nutrition information to consumers and therefore it was priority to analyse the nutrient composition of South African lamb.

Cameron (2004:49) noted that the world is consuming less red meat now than it did 40 years ago. A study into the per capita consumption of red meat found that South Africans consumed 40 kg of red meat annually in 1960 but only 19 kg a year in 1990.

A South African national meat consumption survey was conducted by ACNielsen (2001). Personal at-home interviews with structured questionnaires (translated into six languages) were used in an area-stratified, probability sample of 2481 SA households. Results showed that 55 % of the consumers ate chicken, 36 % beef, 16 % lamb, 11 % fish and 4 % of the consumers ate pork at least three times a week, whereas 10 % of the consumers never eat lamb/mutton. Furthermore, ACNielsen (2001) reported that the older generation consumers (50+ years) showed a greater decline in consumption of red meat in comparison to the younger generation and that this could be attributed to the price as well as a belief that eating red meat aggravates and causes “affluent diseases” such as heart disease. Consumers perceived lamb and mutton to be expensive and considered it to be high in cholesterol. Poultry was rated to be the most nutritious meat source (60 %), followed by fish (49 %), beef (39 %) and lamb (32 %) (ACNielsen, 2001). Consumers preferred lean meat with minimum fat required for flavour and juiciness (Ward, Trent & Hildebrand, 1995:69). The quality and quantity of fat are important because consumers are more and more interested in healthy products and therefore prefer lean meat and carcasses (Cunhal-Sendim *et al.*, 1999:190-191).

Innovative methods where boneless, fat-trimmed (even the intermuscular seam fat) sub-primals are presented to retailers, were suggested by Garrett, Savell, Cross and Johnson (1992:1829, 1836) to enable them to supply attractive retail cuts. In Australia, (Hopkins *et al.*, 1995:34) the introduction of the “trim lamb” range of cuts with boneless, fat-trimmed cuts and even muscle separation within primal

cuts were performed under the Prime Lamb Program. These cuts complied with Australian National Heart Foundation guidelines of a total fat content < 10 % per edible portion.

In South Africa, certain meat retailers started to change at least part of their operations to boneless retail cuts, although fatness is mostly controlled by restriction of carcass fatness and trimming is not generally performed (Just Lamb, 2004). Adjusting these operations to trim excess fat will not only result in a more acceptable product, but will also enable processors to use carcasses of various fat classes, thereby broadening the basis of supply. However, trimming is costly and this could potentially add to the high cost of sheep meat and it is therefore necessary to have an estimate of the fat yield of the different primal cuts. In addition, as different cuts accumulate fat at different rates, information of fat accumulation of cuts over different fat classes (fat levels), needs to be known in order to select the leaner cuts and carcasses to be processed for the consumer. The challenge is to ensure that high yield traits are not promoted at the expense of eating quality. A small amount of fat is desirable to increase and sustain tenderness and decrease the risk of the meat drying out, but too much fat decreases the retail cut yield. It should be noted that unknown to the consumer, red meat has become less fatty over the years (10 % for lamb) through new breeding, feeding and trimming techniques (Williamson, Foster, StanNer, & Buttriss, 2005:10-13) and in itself has started to affect palatability (Cameron 2004:49). However, consumers are more willing to compromise taste for a product that is perceived to be healthier, therefore nutrition, fat level and cholesterol affects meat consumption, (Ward, Trend & Hildeband, 1995:65).

Sensory characteristics

According to Veblen (1988:129) the six components important to the consumer when choosing meat, is convenience, price, nutrition, variety, quality and good taste. The human senses have been used for centuries to evaluate the quality of foods (Lawless & Heymann, 1998:6). Because the SA consumer consumes meat frequently as part of their diet and enjoys the product, quality and sensory attributes such as tenderness and overall flavour are important (ACNielsen, 2001). Texture, aroma and flavour characteristics are the main criteria used by consumers to evaluate the sensory quality of meat (Gorraiz, Beriain, Chasco & Iraizoz, 2000:137). These sensory attributes can be measured objectively by a trained panel, using descriptive techniques. Descriptive sensory evaluation addresses the complexity of food systems by taking into account as much food sensory attributes or flavour notes as possible (Brovelli, Brecht, Sherman, Sims & Harrison, 1999:707). Descriptive methods focus on the intensities of sensory characteristics of a product such as aroma, juiciness, flavour and tenderness (Lawless & Heymann, 1998:367).

Sensory evaluation has been defined by the Institute of Food Technologists (IFT) (1975) as “a scientific discipline used to evoke, measure, analyze and interpret reactions to those characteristics of foods and materials as they are perceived by the senses of sight, smell, taste, touch and hearing”.

Sensory analyses are sophisticated tools and are often the final step in the evaluation of various treatments of meat and other food products (Lawless & Heymann, 1998:341). Sensory analyses form an essential part in determining the quality of meat and profiling of food because these sensory factors of taste, aroma and texture contribute to the palatability of meat (Nevison & Muir, 2002:559). Results obtained during sensory evaluation can provide valid and reliable information with regard to a product's sensory properties (profile). It will eventually provide insight regarding the position of a product, relative to other competitive products in the current market on which sound decisions can be made by the meat industry (Lawless & Heymann, 1998:1).

Although the perceived healthiness of a food is of great importance for consumer preference (Fisher, Enser, Richardson, Wood, Nute, Kurt, Sinclair, & Wilkinson, 2000:141), one of the most important aspects of eating quality for meat that determines overall acceptability is texture (tenderness) (Risvik, 1994:67). Factors affecting muscle and meat tenderness have been extensively researched over the past 70 years and according to Dransfield (2001:74), tenderness is the primary determinant of the acceptability and eating quality of meat. Meat tenderness is a very complex characteristic of meat quality, as it is biologically dependent on factors such as species, age, fat code, gender, the retail cut chosen, the method of cooking, and muscle type (two protein fractions, namely connective tissue and myofibrillar properties) (Dransfield, 2001:74). Furthermore, tenderness is determined by conditions during the early *post mortem* period and includes factors such as electrical stimulation, aging, chilling temperature, cooking method, and cooking time, internal and end-point temperature of the meat (Lawrie, 1998:194). Where sensory evaluation is a subjective evaluation method, Warner-Bratzler shear force measurements give an objective measurement of tenderness which is used in research laboratories to evaluate relative differences in tenderness or toughness of meat products. A low shear force value (measured in kg force) indicates that less force is required to shear through the sample and therefore the meat is tender. Generally the overall shear force values reported in the literature (Duckett, 2001:22) for lamb are lower than most beef values. According to Duckett (2001:22), the threshold values (cut-off point for toughness) in beef, for shear force (broiled chops, cooled and four half-inch cores) is considered to be around 4.5 kg. Values below 4.5 kg (threshold) indicate that consumers could rate it slightly tender or better for the overall tenderness. No published values are available for lamb yet, but based on shear force values reported for beef, it appears that consumers would consider similar lamb shear force values acceptable for palatability (Duckett, 2001:22).

Flavour is an important sensory characteristic for the overall acceptability of meat products (Shahidi, 1996:1). According to Woods (1998:603), the sensation of flavour is the result of a combination of responses on the tongue, and in the mouth, throat and nose. Bett (1993:122) reported that many flavour descriptors for cooked meat are the same for all species e.g. brothy / meaty, but there are species-specific characteristics such as "porky, beefy or muttoney", made up of several factors including odour and taste. Lamb flavour is primarily an aromatic flavour described as fragrant, oily, fatty, sweet and somewhat musty, a blend of many chemical compounds present when lamb is cooked (Jeremiah, Tong & Gibson, 1998:234). Young, Reid, Smith, and Braggins (1994:80) reported that it is

believed that as animals grow older; their meat becomes more strongly flavoured because sheep become fatter as they age. They also reported that fat tends to accumulate in subcutaneous depots rather than intramuscularly or around organs. Since fats are strongly implicated in mutton odour it seems reasonable that the increased fattiness alone may be important in odour (Young, *et al.*, 1994:81).

Both the quality and quantity of fat in meat products are important to the consumers who are becoming more and more interested in healthy choices and prefer lean meat and carcasses (Cunhal-Sendim *et al.*, 1999:190-191). Consumers demand tender, lean meat with the minimum fat required for flavour and juiciness (Ward *et al.*, 1995:96, 70). The South African classification system provides the basis for assisting untrained consumers in the selection of meat cuts with positive health attributes and eating qualities. It also assists the meat traders to describe their specific requirements in simple terms when purchasing carcasses, for utilization in a variety of markets, with the goal of optimum consumer satisfaction by providing products and meat cuts that address different needs of the consumer.

The aim of this research is to contribute valuable data to the South African consumer concerning the quality of South African lamb, particularly with regard to the carcass, nutrient and sensory attributes.

MOTIVATION FOR THE STUDY

The most important challenge facing mankind in the future is to provide adequate nutrition and safe food as well as clean water for all in an environmentally safe way (Vorster & Houtvast, 2002:9). Globally, nutrition is recognised as a major determinant of a wide range of diseases of public health importance. Today, most developing countries face the consequences of both nutritional deficiencies and excesses and are subjected to the double burden of persisting undernutrition in the midst of a growing epidemic of obesity and non-communicable diseases (NCD) such as cancer and heart disease (Shetty, 2002:329). In developing countries, numerous deficiency diseases continue to exist, especially in rural communities, due to essential nutrient deficiencies in the daily diet. Increasingly these now co-exist with the presence of diet-related chronic diseases previously only seen in developed countries (Schönfeldt, 2005:13). Not only do all people eat nutrients in the form of food, but their health depends on the combination and quantity of nutrients in the food consumed, within a given time period.

It is clear that meat plays a prominent role in the diet of many people and this proposed study will make a significant contribution to the understanding of its composition. Presently there is little scientific information available on the carcass composition and nutrient content of South African sheep meat (lamb and mutton). Although it can be argued that since South African sheep meat (lamb and mutton) all originated from international genotypes and that their composition should therefore be similar, both national and international experience in Australia, Europe and the United States found

unique values when analysed, due to different climate, feed, genotype and classification systems. The difference in the cutting up of the carcasses between the various countries also makes the interpretation of their results limited due to the composition of meat and fat for these cuts (Schönfeldt, 1998:4). Furthermore, animals in South Africa are slaughtered at different slaughter weights and fatness percentages than in other countries, this limits the utilization of their results, as these factors have a direct influence on the nutrient content of the carcass. Greenfield and Southgate (2003:50) stated that differences in climate, soil content and water composition in South Africa will also affect the nutrient content of the animal feed (specifically the minerals and vitamins) as well as the production of Vitamin D in the meat itself. The physical composition of an animal, changes as it matures and ages (Micol, Robelin & Geay, 1991:54, 68).

Consumers are increasingly more focused on the quality and nutritional characteristics of meat and meat products. Fresh meat in particular has been referred to as the food in which consumer confidence has decreased the most during the last decade, due to its perceived contribution to the amount of fat in the diet and its content of saturated fatty acids. These are considered to be major risk factors for coronary heart disease (Sañudo, *et al.* 2000:339).

For consumers to make appropriate choices in respect of nutrition, it is necessary to understand the nature of nutritional problems. Nutrition (what we eat and drink) is a complex social issue, which requires action across a broad front. McCance and Widdowson (1940:5), defined nutrition as: “*A knowledge of the chemical composition of foods that is essential in the dietary treatment of disease or in any quantitative study of human nutrition*”. The food choices one makes influence the individual body's health positively or negatively and therefore each day's choices may harm or benefit one's health. Although food intake is also shaped by a variety of other factors such as pleasure, culture, traditions, religion and other social and economic reasons, the eating quality, price and safety are the major factors considered when making a food choice (Dransfield, 2001:76).

With the correct analysis and interpretation of the carcass composition of South African lamb the nutrient content and quality characteristics of South African lamb can effectively be marketed to address the negative health image that lamb and mutton has. A study conducted on the quality of goat and sheep meat by Schönfeldt (1989:209) confirmed that meat of younger animals (irrespective of species) is juicier, more tender and contains less connective tissue, residue and that typical species-characteristic flavours are less typical than those of older animals. When the correct data on the nutrient content of South African lamb is incorporated into the food composition tables of the MRC, the data will serve as a reliable standard of reference for the health professionals and the food industry.

The consumer should be able to make a more informed choice when purchasing and consuming lamb if the new information on the quality attributes, carcass and chemical composition as well as the vitamin, mineral, cholesterol and fatty acids are known. Therefore, the aim of the study is the first step

in building up a scientific data bank on the nutrient content, carcass and quality attributes of South African lamb.

STRUCTURE OF THE DISSERTATION

The dissertation is presented in the form of articles, according to the following chapters:

CHAPTER 1:	Introduction and literature review
CHAPTER 2:	Research design and methodology
CHAPTER 3:	The influence of fat score and fat trimming on primal cut composition of South African lamb
CHAPTER 4:	Nutrient content of South African lamb (A2 class)
CHAPTER 5:	Effect of fatness on meat quality of the loin cut of SA Dorper lamb
CHAPTER 6:	Discussion, conclusions and recommendations

In the following chapters the style and layout, as prescribed by the Journal in which the article will be published has been followed. Chapter 3: South African Journal of Meat Science.

Chapter 4: Journal of Food Composition and Analysis.

Chapter 5: Journal of Sensory Studies.

Relevant references for each chapter are provided at the end of each chapter.

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