

2013 UPDATE ON NUTRIENT DELIVERY

Recent scientific findings on the role of red meat as part of a healthy, sustainable diet.



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- ✓ Importance of a balanced, varied diet
- ✓ Perspective on nutrient delivery
- ✓ The nutrient content of lamb and mutton
- ✓ Trimming makes the difference
- ✓ Barriers to red meat consumption

The average South African

The most recent population data from the South African National Health and Nutrition Examination Survey (SANHANES-1, 2012) indicates that many South African children are stunted (27%), while the rates of overweight and obesity (23%) have increased. These conditions associated with overnutrition increasingly co-exist with persistent nutritional deficiencies, including anaemia (11%) and vitamin A deficiency (44%) (SANHANES-1, 2012).

An even more serious scenario is observed in South African adults, especially women. The majority (more than 50%) of South African adult women are overweight or obese, with obesity becoming an increased threat to livelihoods. When compared to 2003 SADHS data, the SANHANES-1 found that underweight and normal weight decreased, while overweight and obesity increased. Obesity incidence increased substantially in adult females, from 27% in 2003 to 39% in 2012. However, this incidence occurred against a back-drop of severe food insecurity with nearly 55% of households classified as food insecure. Furthermore, many women of reproductive age still suffer from the consequences of micronutrient deficiencies, i.e. anaemia (23%) and vitamin A deficiency (13%).

The paradox of persistent under nutrition and the increasing incidence of overnutrition in this country, which is experiencing a nutrition transition, requires a new paradigm in food and nutrition.

Current dietary recommendations

Food-based dietary guidelines (FBDGs) are dietary recommendations based on foods and food patterns. They include a collection of short, positive, country-specific and science-based messages aimed to educate the general population on how to attain a prudent diet that will meet all nutrient requirements while simultaneously protecting against the development of non-communicable diseases.

The 2012 South African FBDGs, developed and revised by the Department of Health, are:

- 1. Enjoy a variety of food
2. Be active
3. Make starchy food part of most meals
4. Eat plenty of vegetables and fruit every day
5. Have milk, maas or yoghurt every day
6. Eat dry beans, split-peas, lentils and soya regularly
7. Fish, chicken, lean meat or eggs can be eaten daily
8. Use fats sparingly; choose vegetable oils rather than hard fats
9. Use salt and food high in salt sparingly
10. Drink lots of clean, safe water
11. Use sugar and food and drinks high in sugar sparingly

Recommended intake according to the Food-based dietary guidelines include:

- ✓ Up to 560g lean meat per week (approximately 80 to 90g cooked edible portion per day)
✓ 2 to 3 fish dishes per week
✓ ± 4 eggs per week

Correct portion sizes

Often the most important decisions made about food is what to eat, when to eat, and how much to eat. Health conscious consumers make informed food choices for three wholesome meals per day, but struggle with portion sizes. In many cases, individuals unknowingly eat portions that are too large which contributes to increased risk of overweight and obesity.

Consuming three regular meals per day has also changed to constant 'snacking', with individuals often losing track of what they are consuming throughout the day, which also contributes to the phenomenon of excessive food intake.



A recommended portion of lamb or mutton with visible fat removed

- ✓ 3 slices of roast lamb (90g)
✓ 2 grilled lamb chops (100g to 120g with bone)
✓ Portion of stewed lean mince (90g)

Recommendation: Keep a food diary and weigh individual food portions for a day or two.

What is a healthy portion of lean meat?

The South African Food-Based Dietary Guidelines recommend up to 560g lean meat per week (red and white meat), which is equivalent to 80g to 90g of cooked edible portion per day. This is in line with the average consumption statistics available for South Africans (Van Heerden & Schönfeldt, 2011). However, it is generally acknowledged that this range differs significantly from person to person.

Average cooking losses in meat vary between 20% and 30%, depending on cut composition (meat, bone and fat ratio), the temperature of the heat source, the internal temperature of the cooked meat, addition of condiments, etc. This means that an 80g to 90g cooked lean edible meat portion is roughly equivalent to 100g raw lean meat (without bone).

As a guide, a portion of cooked red meat is equivalent to the size of a deck of cards or the palm of your hand.



The factors that affect the nutritional requirements of individuals include the quality and quantity of the food they consume, the efficiency of their digestive systems in absorbing and utilizing the nutrients, as well as the biochemical availability of the nutrients once they have been absorbed into the body.

These factors are all taken into consideration when dietary guidelines and recommended nutrient intake values are developed and implemented. Such guidelines and recommendations are constantly revised as new insights become available.

Update on the international discussion on protein requirements

Protein plays an important role in human health and well-being. Proteins are sources of essential amino acids, which the human body cannot produce by itself. However, not all proteins provide the right amounts of these essential amino acids. High quality proteins are considered those that are readily digestible and contain the dietary essential amino acids in quantities that correspond to human requirements.

In 2011, South African experts, together with other international professionals, participated in the Food and Agriculture Organization of the United Nations (FAO) Expert Consultation on Protein Requirements in Human Nutrition, held in New Zealand. In 2012 an official report was released, which supports the implementation of a new method of protein quality measurement, namely the Digestible Indispensable Amino Acid Score (DIAAS).

While further research is necessary to validate the proposed method, this new approach provides a clearer picture of how each dietary protein source can meet our nutritional requirements for protein and amino acids. With DIAAS, high quality proteins, such as proteins obtained through the consumption of animal-source foods, may score 30% higher than when using the older methods of assessing protein quality (such as Protein Digestibility Corrected Amino Acid Score (PDCAAS)). Different amino acids have different functionality (IUNS, 2013). Implications for labelling legislation will only become clear as additional research results become available.

*Truncation: In an attempt to simplify a value, some decimal numbers are often removed without considering its influence on significance.

The importance of protein quality

Protein requirements are often defined as the minimum dietary intake which satisfies the metabolic demand and achieves nitrogen equilibrium and maintenance of the body protein mass, in addition to the needs for growth. Protein and amino acid recommendations for normal “healthy” children and adults have varied considerably over time, and the importance of protein quality, in addition to quantity, is increasingly recognised. In undernourished individuals, and when protein sources with low protein quality are predominantly consumed, protein requirements may be significantly higher than previously recommended (UAUY, 2011).

DIAAS vs. PDCAAS

Since its adoption by FAO/WHO in 1991, the PDCAAS method for protein quality evaluation has been widely accepted but also criticized for a number of reasons. In addition to the issues of truncation* and overestimation of protein quality, PDCAAS did not adequately adjust for foods susceptible to damage from processing and anti-nutrient factors, which can make some amino acids unavailable for absorption.

DIAAS determines amino acid digestibility at the end of the small intestine, providing a more accurate measurement of the amino acids absorbed by the human body and the contribution the protein makes to human amino acid and nitrogen requirements. Using DIAAS will enable professionals to differentiate protein sources by their ability to supply amino acids for use by the human body.

Global discussion on iron requirements

The WHO/FAO report on Vitamin and Mineral Requirements in Human Nutrition set the total physiological daily iron requirement for adult men and fertile women as 1.37mg and 2.94mg respectively (WHO/FAO, 2004). These requirements were adjusted according to the percentage dietary absorption to derive the Daily Intake Reference Values (DIRV), specific to dietary habits (WHO/FAO, 2006). These recommendations are currently being discussed on the international CODEX platform. In addition to the two values presented below for different dietary habits, it has been suggested that a DIRV be developed for diets that include mainly cereals and a low intake of vitamin C. These diets are commonly observed in households at lower socioeconomic levels in different regions of the world.

Mean DIRV (mg) (WHO/FAO, 2004) (WHO/FAO, 2006)	% iron absorbed into the human body	Dietary habit description
14	15	Diets rich in animal protein and vitamin C
22	10	Diets rich in cereals but including vitamin C



Nutrient-density is defined as the ratio of the nutrient content (in gram) to the total energy content (in kilojoules) of a specific food product. The more nutrients and the fewer the kilojoules that are present, the higher the nutrient-density. The term nutrient rich is commonly used as a synonym for nutrient-dense.

Evidence suggests that the inclusion of nutrient rich foods such as lean meat as part of a healthy diet lifestyle can help lower the risk of developing chronic illnesses such as heart disease, diabetes and cancers.

Lean red meat including lamb, mutton, beef and veal, is a nutrient-dense food source, relative to the amount of kilojoules it provides. It plays a key role in a balanced diet by providing a nourishing package of nutrients. A serving of lean lamb or mutton (80g to 90g cooked edible portion) provides numerous essential nutrients with many of these, such as protein and zinc, in significant amounts.

Contribution of a cooked lean portion (<10% fat) of South African sheep meat (90g) to current Recommended Daily Allowances (RDAs)

Nutrient	RDA		Contribution (%) to RDA
	Unit	Value	
Protein	g	56	37
Zinc	mg	11	38
Phosphorus	mg	1250	15
Iron	mg	18	8

In addition to nutrient quantity, the quality of the nutrient delivered should also be considered, as this significantly influences the amount of the nutrient absorbed from the gastrointestinal tract into the human body for utilization. Red meat is a good source of many essential nutrients and these nutrients are also considered to be of high nutritional quality.

“Knowledge on the chemical composition of foods is the first essential in dietary treatment of disease or in any quantitative study of human nutrition”

(McCance & Widdowson, 1940)

Why update the values for South African red meat?

Recent research, conducted by the University of Pretoria and the Agricultural Research Council, Irene, formed part of a first attempt to obtain own South African data on the nutrient content of sheep meat. No values for lamb have been available until now, although 85% of all sheep meat currently consumed in South Africa is lamb, with a fatness code 2 according to our national carcass classification system. The main aims of the projects were to determine the carcass and nutrient composition of South African sheep meat as mostly consumed and subsequently to update the National Food Composition Database with South African data.

This resource provides an overview of the findings of these studies, to be used by health professionals for:

- ✓ Nutritional advice and education
- ✓ Menu planning
- ✓ Dietary and recipe analysis

How was the analyses done?

The study was designed to be representative of South African sheep meat as produced and consumed. The carcasses included Dorper and Merino breeds from two different abattoirs, and represented three mayor production regions (Karoo, Kalahari and Ermelo districts), with a fat code of 2 (at least 1 but not more than 3 mm subcutaneous fat thickness layer in line with the Regulations Regarding the Classification and Marking of Meat Intended for Sale in the Republic of South Africa (Agricultural Product Standards Act No. 119 of 1990)).

Eighteen carcasses were analysed for each cut. Analyses were performed on a double-blind basis in SANAS (South African National Accreditation Services) accredited laboratories on both raw and cooked cuts, including two levels of trimming; untrimmed and trimmed of subcutaneous (external) fat.



Nutrient composition of lean lamb (cooked edible portion per 100g)

Nutrient	Unit	Shoulder	Loin	Leg	Carcass #	
Energy	kJ	757	761	715	738	
Protein	g	23.1	27.8	25.4	25.2	
Fats	Fat	g	9.86	7.80	7.67	8.37
	Total Fatty Acids	g	6.59	6.85	6.94	6.81
	Saturated Fatty Acids	g	3.57	3.60	3.68	3.63
	Monounsaturated Fatty Acids	g	2.84	2.96	2.97	2.93
	Polyunsaturated Fatty Acids	g	0.18	0.29	0.29	0.26
	Omega 3 Fatty Acids	g	0.02	0.05	0.04	0.04
	Omega 6 Fatty Acids	g	0.16	0.24	0.24	0.22
	Omega 9 Fatty Acids	g	2.54	2.70	2.73	2.67
Cholesterol	mg	85.0	95.0	91.7	90.3	
Minerals	Iron	mg	1.50*	1.60*	2.0*	2.28
	Zinc	mg	4.60*	2.20	3.38	3.51
	Magnesium	mg	18.0	24.2	22.9	21.7
	Phosphorus	mg	197*	205*	223*	211
	Potassium	mg	261	330	303	296
	Sodium	mg	71.2	83.3	61.9	69.2
	Calcium	mg	14.1*	7.60*	10.5*	11.0
	Copper	mg	1.14*	1.37*	1.50*	1.36
	Manganese	µg	8.70*	10.0*	10.0*	9.60
Vitamins	Vit A	µgRE	1.20*	4.80*	1.80*	2.25
	Vit B1	mg	0.08	0.12	0.14	0.12
	Vit B2	mg	0.23*	0.22*	0.15*	0.19
	Vit B3 / niacin	mg	4.20*	6.40*	6.40*	5.73
	Vit B6	mg	0.05*	0.06*	0.12*	0.09
	Vit B12	µg	2.70*	1.60*	2.30*	2.28

Calculated ; * Values borrowed from New Zealand Beef & Lamb, 2011

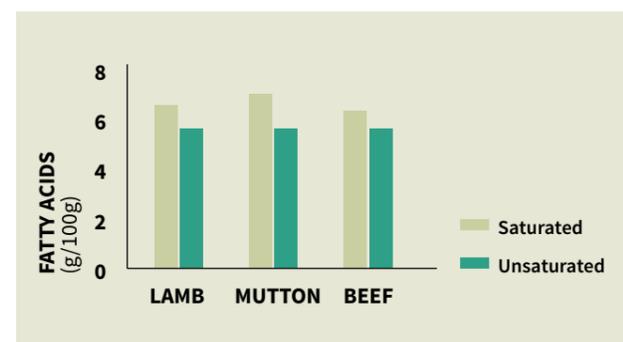
Lean South African lamb and mutton, trimmed of subcutaneous (external) fat, contains less than 10% fat and can be included as part of a healthy, well-balanced diet. Lean South African lamb and mutton compare favourably to other South African animal products, including lean white meat such as chicken without skin.

Comparison of the fat content of trimmed (lean) and untrimmed animal products (Schönfeldt et al., 2012; Wolmarans et al., 2010; Schönfeldt et al., 1998).

Food (100g, cooked)	Fat (g)
Trimmed	
Lamb, leg, roasted, lean	7.7
Lamb, loin, roasted, lean	7.8
Lamb, shoulder, braised, lean	9.9
Mutton, leg, roasted, lean	7.2
Mutton, loin, roasted, lean	9.8
Mutton, shoulder, braised, lean	8.7
Chicken, dark meat, roasted, without skin	9.8
Chicken, dark meat, boiled, without skin	9.7
Chicken, white meat, roasted, without skin	3.6
Chicken, white meat, boiled, without skin	4.1
Pork, loin, braised, lean	8.3
Untrimmed	
Lamb, leg, roasted, untrimmed	11.7
Lamb, loin, roasted, untrimmed	20.9
Lamb, shoulder, braised, untrimmed	15.8
Mutton, leg, roasted, untrimmed	10.1
Mutton, loin, roasted, untrimmed	25.4
Mutton, shoulder, braised, untrimmed	11.3
Beef, rump, roasted, untrimmed	14.4
Beef, prime rib, roasted, untrimmed	18.0
Beef, shoulder, braised, untrimmed	8.2
Chicken, meat and skin, boiled	12.6
Chicken, meat and skin, roasted	13.0
Pork, loin, grilled, untrimmed	13.9
Pork, thick rib/breast, braised, untrimmed	25.4

What about the type of fat?

- ✓ Despite common reference to animal fats as 'saturated', red meat contains both saturated and mono- and polyunsaturated fats.
- ✓ Nearly half of the fats in untrimmed South African lamb and mutton are healthy mono- and polyunsaturated fatty acids.
- ✓ South African lamb and mutton (more than 80% of these animals are raised naturally on the veld) are natural sources of Conjugated Linoleic Acid (CLA). Research suggests that CLA may protect the body against cancer and heart diseases and reduce cholesterol levels (Riserus et al, 2001).



Comparison of the saturated and unsaturated fatty acid content of untrimmed South African lamb, mutton and beef (Schönfeldt et al., 2012; Schönfeldt & Welgemoed, 1996).

Trimming has a major impact on the fat content of both raw and cooked meat cuts.

The updated nutrient values (presented on page 7) provide us with an indication of the result trimming has on the composition, specifically the fat content, of a portion of South African lamb.

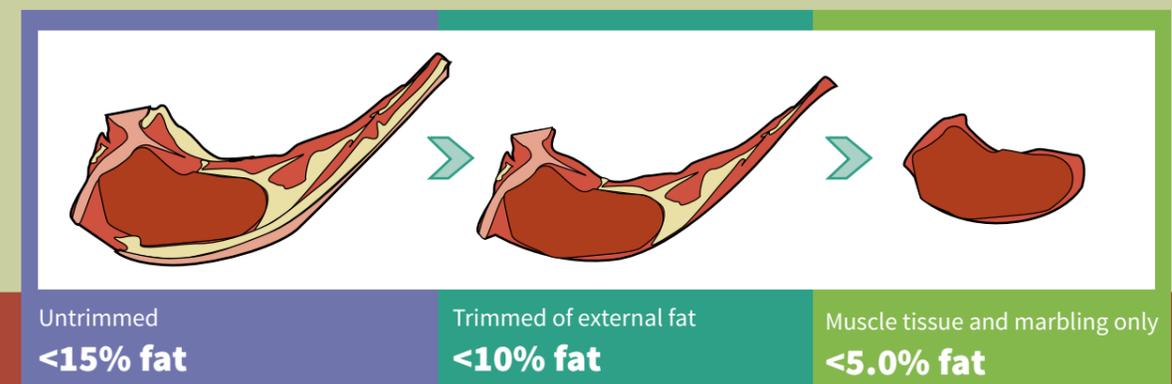
- ✓ Many butchers trim the subcutaneous fat layer from the cut before selling it to the consumer.
- ✓ Many consumers trim the subcutaneous fat layer at home prior or after cooking.
- ✓ If consumers choose not to eat any visible fat, only the muscle tissue is consumed.

Similar to the removal of the skin from chicken, removal of the subcutaneous fat layer of meat cuts significantly reduces the fat content of red meat.

Recommendation:

Treat subcutaneous fat on meat in the same way as peeling an orange.

EFFECT OF TRIMMING ON THE FAT CONTENT OF SOUTH AFRICAN LAMB AND MUTTON



30% reduction in fat

50% reduction in fat

Nearly 70% total reduction in fat content

Barrier	Reality
Overweight and obesity	Lean red meat, trimmed of external fat, is low in fat and energy and can be used in a weight-reducing diet. Evidence is accumulating that high-quality protein plays an important role in weight management. Protein also promotes satiety and protects lean body mass during energy restrictive diets. As a key source of quality protein, including lean red meat as part of a weight-reducing diet may thus promote weight loss.
Hypercholesterolaemia	A number of studies have shown that red meat can be included in cholesterol lowering diets. Because untrimmed South African lamb contains less than 15% total fat and external fat is usually trimmed at home, lean lamb can contain less than 10% fat. If only the muscle portion is consumed and all visible fat in the meat portion is avoided, then less than 5% of the actual consumption will be fat. In relation to hypercholesterolaemia, it is also important to note is that only half of the fat in meat consists of saturated fatty acids (SFA), the remainder consists of monounsaturated (MUFA) and polyunsaturated fats (PUFA). The PUFAs in red meat contain omega fatty acids, similar to those found in oily fish. Although the quantity in red meat is smaller than that found in oily fish, it may contribute significantly to South African omega fatty acid intake if we consider the relative amounts that our population consumes.
Cancer	There are no scientifically sound findings to conclude that the consumption of lean red meat may cause cancer. Some scientific studies have suggested a modest association between high levels of red meat consumption and colorectal cancer. It should always be kept in mind that the causes of cancer are many and complex. Overall eating and lifestyle habits are more important factors than individual foods. Obesity and physical inactivity are now acknowledged as the greatest risk factors for diet-related cancers. The most recent recommendation from the World Cancer Research Fund is to consume up to 500g cooked red meat per week.
Hypertension	Hypertension is a high-risk condition that is responsible for half the deaths associated with stroke and coronary heart disease. The incidence of hypertension is increasing globally, specifically in developing countries such as South Africa. Lifestyle changes, including healthier dietary habits, are imperative to improve hypertension. Increased consumption of vegetables and fruit, high-fibre foods and low-fat dairy products and decreased consumption of sodium (salt), fat and alcohol are recommended. Research further suggests that fresh lean red meat can be included as part of an antihypertensive diet, e.g. a DASH-type diet.

Unintended consequences of meatless diets

Nutrient shortfalls, not always visible in the short term, can lead to serious consequences and chronic disease in the long term. A meatless diet can be nutritionally adequate, but needs careful planning to ensure that all nutritional requirements are met. Iron, zinc, protein and the B vitamins (especially Vitamin B12) demand particular attention. Replacing meat with plant-based proteins

will increase the consumption of iron and zinc inhibitors such as phytates. Up to 80% more iron and 50% more zinc is required by persons on strict vegetarian or vegan diets.

Sarcopenia is the progressive, degenerative decline in muscle mass and strength associated with aging. It is becoming more of a health concern as our population continues to age. Red meat is considered a significant source of good quality protein and consumption can help to prevent sarcopenia.

Red meat consumption – is it environmentally sustainable?

Reducing the amount of food consumed, without compromising nutrition, is what matters most when it comes to reducing the environmental impact of the food supply. Essentially, the more you eat, the greater your carbon footprint (Vieux, 2012).

Dietary advice for health and the environment:

- ✓ Choose foods according to their nutritional and eating quality, rather than the quantity of food that can be purchased.
- ✓ Reduce food waste by carefully storing food and matching servings to individual needs.
- ✓ Reduce overconsumption of nutrient-poor, energy dense foods.
- ✓ Eat adequate amounts of nutrient-rich foods according to the national food-based dietary guidelines.

In terms of environmental impact, a study in France found that when fruits and vegetables were iso-energetically (similar energy content) substituted for meat, either null or greater effects on greenhouse gasses were observed as significantly more fruits and vegetables were needed to maintain the energy and nutrient content of the diet (Vieux, 2012).

In terms of nutrient adequacy, a 75kg male needs to obtain an average of 0.66g protein per kg bodyweight (±50g protein per day). Consuming 50g dietary protein from lamb or mutton meat would produce 2kg CO2 equivalents during the production process. Obtaining the same amount of protein (50g) from apples for instance, would produce more than double this amount at 4.5kg CO2 equivalents (Dolle, 2012).

Further research on this relevant topic is required to inform dietary choice. It is important to consider the principles of a balanced diet.

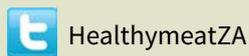


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Meat is often the most expensive component in the diet and the component which evokes the widest array of comments and international debate. Yet, it should be remembered that meat is very seldom consumed on its own but forms part of a whole meal. The composition of the rest of the plate should not be neglected when healthy food choices are made. Certain nutritional considerations, such as nutrient delivery, nutrient-density and portion size, should be applied to all foods included in the diet.



Lamb & Mutton South Africa:

An educational campaign translating current science into consumer friendly messages

