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Review

An overview of the nutritional value of beef and lamb meat from South America

M.C. Cabrera [a,b,*], A. Saadoun [b]

[a] Depto. Producción Animal & Pasturas, Laboratorio Nutrición & Calidad de Alimentos, Facultad de Agronomía, Universidad de la República, Garzón 809, Montevideo, Uruguay
[b] Fisiología & Nutrición, Facultad de Ciencias, Universidad de la República, Calle Igúa 4225, Montevideo, Uruguay

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ABSTRACT

The southern region of South America, a subtropical and temperate zone, is an important region for the production of beef and lamb meat, which is mainly produced in extensive pasture-based systems. Because of its content in highly valuable nutrients such as iron, zinc, selenium, fatty acids, and vitamins, meat is a unique and necessary food for the human diet in order to secure a long and healthy life, without nutritional deficiencies. Beef and lamb production systems based on temperate or tropical grasslands show interesting and, in some cases, a differential content in minerals, fatty acids and vitamins. This review deals with the distinctive aspects of the nutritional quality of beef and lamb meat produced in this region in terms of nutritional composition and the bioavailability of key nutrients related to its contribution for a healthy diet for all ages.

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1. Introduction

Beef and lamb meat is a major source of high quality dietary proteins for human metabolic processes due to its constituent amino acids. In addition, the peptides derivate during the digestion process in human were found to possess known biological functions as well as potential health-promoting functions (Bauchart et al., 2007; Chibuike & Ashton, 2013). This meat is also rich in microminerals such as iron, selenium, zinc, copper and manganese. All of them are essential, because of their role in key metabolism pathways and in the antioxidative enzymatic system. As for the lipid content in meat, fat provides indispensable dietary energy and essential nutrients such as essential fatty acids and fat-soluble vitamins. The lipid content of meat contributes to its cooking characteristics, palatability and overall organoleptic properties (Wood et al., 2008). However, the cholesterol levels and saturated fatty acid composition determine the grade of acceptance of meat by consumers, and condition its nutritional value in accordance with the usual dietary recommendations (United States Department of Agriculture, Agricultural Marketing Service, 2007; Vannice & Rasmussen, 2014). Meat from beef or lamb also offers additional nutritional advantages,

* Corresponding author at: Depto. Producción Animal & Pasturas, Laboratorio Nutrición & Calidad de Alimentos, Facultad de Agronomía, Garzón 809, Montevideo, Uruguay.
E-mail address: mcab@fagro.edu.uy (M.C. Cabrera).

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particularly a high content in B vitamins, especially B12, B2, PP and B6. Vitamins provided by red meat constitute the main contribution to the dietary requirements for all ages (Bourre, 2006).

The content of most of these nutrients present in beef meat can be modified by the production system, muscle type, breed or age at slaughter of the animals (Ammerman, Loaiza, Blue, Gamble, & Martin, 1974; Cabrera, Ramos, Saadoun, & Brito, 2010; Duckett, Wagner, Yates, Dolezal, & May, 1993; Realini, Duckett, Brito, Dalla Rizza, & De Mattos, 2004). A good example could be the fatty acid composition when meat from grain-finished animals is compared to pasture-finished animals (Realini et al., 2004). Furthermore, the geographic site of rearing (Hintze, Lardy, Marchello, & Finley, 2001, 2002) and feeding practices (Purchas & Busboom, 2005) have an impact on the level content of the minerals, vitamins and fatty acids. The best example could be the selenium, when comparing the beef meat from America to that from Europe and Australia (Williamson, Foster, Stanner, & Buttriss, 2005).

South America is an important region for the production of beef and lamb meat, which is mainly produced in extensive pasture-based systems. This region of the world produces and exports food that is highly valuable for health and that has distinctive characteristics depending on the use of temperate or tropical grasslands (Cabrera et al., 2010; De la Fuente et al., 2009; del Campo et al., 2008; Oliver et al., 2006; Realini et al., 2004, 2009). The current review summarizes the nutritional characteristics of beef and lamb meat produced in subtropical and temperate regions of South America from studies conducted in pasture-based production systems. Updated data about the nutritional composition of key nutrients, such as minerals, fatty acids and vitamins in meat produced in different countries of the region will be discussed in relation to the contribution of essential nutrients for a healthy diet for all ages.

2. Minerals

Meat can be defined as a food that is low in calcium and high in K, P, Na, Zn and Fe. Meanwhile the Se, Cu and I contents can vary according to the pasture quality. Today, mineral deficiencies in humans are common worldwide and there are numerous pieces of evidence which suggest that these deficiencies may play a negative role in children's development, pregnancy and elderly health (Black, 2003; Failla, 2003; Grantham-McGregor & Ani, 2001; Hambridge & Krebs, 2007). Furthermore, minerals such as Se, Cu, Zn, Fe, and Mn are key to the enzymatic system which counteracts the free radicals in the organism (Black, 2003).

The consumption of meat can be an effective way to respond qualitatively and quantitatively to the mineral requirements of human nutrition. Beef or lamb meat can be used in a varied diet in order to counteract the mineral deficiencies in human diet.

There is an increasing need to valorize meat produced on pastures in South America in the international meat market. Achieving this will be useful both for regional farmers as well as for consumers around the world (Oliver et al., 2006). As a consequence, in recent years we have witnessed an increase of information generated about the mineral composition of meat (Cabrera et al., 2010; Farfan & Samman, 2003; Giuffrida-Mendoza, Arenas de Moreno, Uzcátegui-Bracho, Rincón-Villalobos, & Huerta-Leidenz, 2007; Huerta-Leidenz, Arenas de Moreno, Moron-Fuenmayor, & Uzcátegui-Bracho, 2003; Ramos, Cabrera, & Saadoun, 2012). Likewise, generating information related to the bioaccessibility of trace minerals in meat, which is obtained from pasture finished animals, is essential in order to ascertain their nutritional efficiency in maintaining and improving human health (Ramos et al., 2012).

2.1. Iron

Meat is a major source of total iron and heme iron, which consist primarily of myoglobin and hemoglobin, a protein essential for respiratory process and tissue oxygenation (Benito & Miller, 1998; Cabrera et al., 2010; Santaella, Martínez, Ros, & Periago, 1997). However, iron deficiency, which causes anemia, is prevalent worldwide, particularly in women, and is linked to apathy, depression and rapid fatigue during exercising (Bourre, 2006). Likewise, anemia causes low productivity and lower well-being in adults (Haas & Brownlie, 2001). Iron concentrations in the umbilical artery are critical during the development of the fetus, and are strongly related to the child's IQ (O'Brien, Zavaleta, Abrams, & Caulfield, 2003). Infantile anemia, with its associated iron deficiency, is linked to a disturbance of the development of cognitive functions (Grantham-McGregor & Ani, 2001). In addition, iron deficiency is found in children with attention-deficit and hyperactivity disorder (Konofal, Lecendreux, Arnulf, & Mouren, 2004). In France, the SU.VI.MAX study (Hercberg et al., 2004) showed that 93% of women of childbearing age ingest less iron than is advised by the RDA, 56.2% consume less than two-thirds of the suggested amounts (Galan et al., 1998), 23% have totally depleted iron reserves, and 4.4% have a sufficiently severe deficit that can

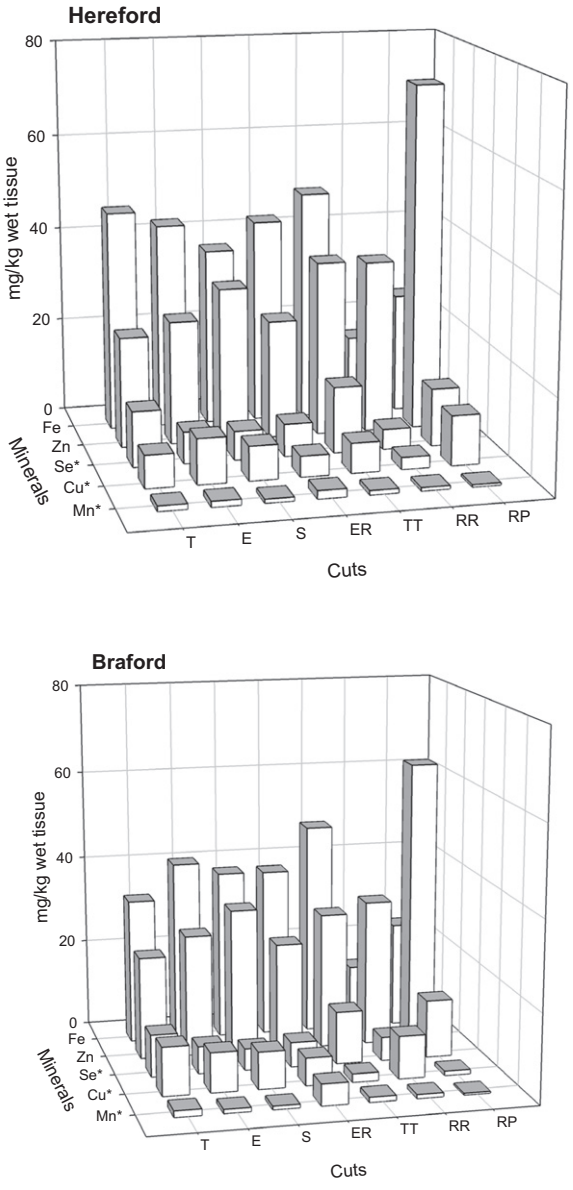

Fig. 1. Composition of Fe, Zn, Se, Cu and Mn of seven meat cuts from Hereford and Braford steers fed on pasture. Bars are means (n = 10–15). For clarity, error bars and significations were omitted in this figure. T = tenderloin. E = eye of rump. S = striploin. ER = eye round. TT = tri-tip. RR = rib eye roll. RP = 3 rib plate-flank on.
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