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Fatty acid compositions of selected varieties of Spanish dry ham related to their nutritional implications

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Abstract

Five varieties of Spanish dry cured ham were studied to assess their nutritional value in relation to fatty acids. Ten hams of the Traditional Speciality Guaranteed (TSG) ''Jamón Serrano'', and the Protected Designations of Origin (PDO) ''Jamón de Teruel'', ''Dehesa de Extremadura'', ''Jamón de Huelva'' and ''Guijuelo'', were analysed. Iberian hams (''Dehesa de Extremadura'', ''Jamón de Huelva'' and ''Guijuelo'') were characterised by a lower proportion of saturated fatty acids (SFA) and a significantly higher percentage of monounsaturated fatty acids (MUFA) than white hams (''Jamón Serrano'' and ''Jamón de Teruel''). The Iberian varieties also showed a high proportion (approximately 50%) of C18:1 $n-9$, while ''Jamón Serrano'' showed the highest percentage of C18:2$n-6$. The PUFA/SFA (P/S) ratio of the five varieties was $\geqslant 0.19$, with the highest ratio corresponding to ''Jamón Serrano'' (0.3). The $n-6/n-3$ ratio was in the order of 13/1 in ''Jamón Serrano'' and ''Jamón de Huelva'', and ranged from 9.3/1 to 10.3/1 in the other varieties. The most favourable hypocholesterolemic/Hypercholesterolemic (h/H) ratio ($\geqslant 2.5$) was found in the Iberian varieties. TSG ''Serrano'' was shown to supply the lowest percentage of the recommended daily intake of MUFA, the Iberian varieties showed the highest percentage of the daily intake of long-chain PUFA, and PDO ''Dehesa de Extremadura'' showed the highest percentage of the intake of C18:3$n-3$. The higher MUFA proportion and h/H ratio observed in the Iberian hams, together with their contribution to the recommended daily intake of fatty acids, would make these products more suitable for healthier diets, although consumption must be recommended in moderation.

Keywords: Spanish dry cured ham; Fatty acids; $n-6$; $n-3$; Hypocholesterolemic; Hypercholesterolemic

1. Introduction

Current human diet in Western countries is characterised, among other facts, by a high intake of fats, especially saturated and $n-6$ polyunsaturated fatty acids (PUFA) (Bengmark, 1998; Simopoulos, 2004). Saturated fatty acids are correlated with increased risk of cardiovascular disease while a high intake of monounsaturated and $n-3$ polyunsaturated fatty acids has been shown to have an inverse effect (Alexander, 1998; FAO, 1994; Kris-Etherton, 1999; Mattson & Grundy, 1985; Schaefer, 1997). On the other hand, a diet rich in $n-6$ polyunsaturated fatty acids is not considered as balanced. Clinical studies, in patients with cardiovascular disease, arthritis, asthma, cancer and mental illness, clearly indicate the need to balance the $n-6/n-3$ fatty acid intake for prevention, and during treatment, of chronic diseases (Simopoulos, 2004). There is strong scientific evidence for decreasing the $n-6$ and increasing the $n-3$ intake to improve health throughout the life cycle (Simopoulos & Cleland, 2003). For this reason, researchers are now emphasising the importance of

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the $n-6/n-3$ PUFA ratio rather than the absolute content of each family of fatty acids in the diet (British Nutrition Foundation, 1992; Simonsen et al., 1998; Simopoulos, 2004). Today, in Western diets, the ratio of n-6/$n-3$ fatty acids ranges from approximately 15/1 to 16.7/1, instead of the optimal ratio recommendations, which vary from 1/1 to 4/1 (Simopoulos, 2004).

Fat from meat and meat products, such as dry cured ham, is not considered among the "healthy" fats, since it contains cholesterol and large amounts of saturated fatty acids and very low levels of $n-3$ PUFA (Rhee, 1992). However, the composition of meat fat depends on many factors, such as animal species, genetics and feeding and every product has to be considered separately. In this way, the increasing awareness of the need for diets to contain higher levels of "healthy" fats has focussed on the importance of the characterisation of fat from different meat products from a nutritional point of view.

Dry-cured hams are manufactured in many countries, but production is mainly located in the Mediterranean area (Álvarez de la Puente, 2003). There is a great variety of dry-cured hams in this area, some of the most important being Spanish Iberian and Serrano, Italian Parma and San Daniele, and French Bayonne hams. These varieties differ in the pig breed, type of feed, meat weight, type of cut and processing conditions (Martín-Bejarano, 2001; Ockerman, Basu, León Crespo, & Céspedes, 2002; Toldrá, 1998; Ventanas, Ruiz, & Córdoba, 2001).

The Spanish population consume approximately 4.5 kg of dry-cured ham per capita per year (Ministerio de Agricultura, 2004). Spanish hams are dry salted, air dried and aged during 7–24 months and they are not smoked (Martín-Bejarano, 2001; Ventanas et al., 2001). "Jamón" is produced throughout the entire country, but certain differences exist in production, depending on the zone and according to the production techniques. Basically, there are two distinct types of Spanish "jamón" related to the breed used: white and Iberian hams. In order to maintain quality and to avoid imitations, most of the Spanish production of ham is covered by different quality designations, according to the European Union systems for developing and protecting regional foods (European Commission, 1996, 1999).

Iberian ham production is today restricted to Southwestern Spain. These hams are produced from Iberian pigs (an indigenous, black footed, fine skeleton and long legged breed with a great adipogenic ability) and sometimes from Iberian pigs cross-bred with Duroc or Duroc-Jersey pigs (Ministerio de la Presidencia, 2001). There are three quality categories of hams, depending on feeding: "pienso" or "cebo" (the pigs are fed and fattened with commercial feed), "recebo" (the hogs are fed in the Mediterranean forest -"dehesa"- with acorns and pasture complemented with grains) and "montanera" or "bellota" (the hogs are exclusively fed and fattened in the "dehesa" with acorns and pasture). Iberian pigs are slaughtered at about 18 months and approximately at 160 kg weight (Ventanas et al., 2001). They give high quality products characterised by much infiltration of fat in meat, which provides a high degree of marbling, a firm texture and an intense, delicate and very special flavour. These hams are dried in ambient air during 18–24 months and are the most appreciated by consumers, especially the "bellota" (acorn) type. There are three Protected Designations of Origin (PDO) of Iberian hams: "Dehesa de Extremadura", "Jamón de Huelva" and-the main producer of Iberian hams- "Guijuelo", varying in the geographical area of production, which implies differences in the hog line, the leg size, the ripening time and conditions, etc. (Ministerio de Agricultura, 1986, 1990, 1995; Ministerio de la Presidencia, 2001, 2003). Fig. 1 shows the geographical areas where the different types of Iberian hams are manufactured.

White pigs have taken a great part of the Spanish ham market from the Iberian hogs during recents decades due to their precocity, higher yielding and better adaptation to intensive farming, although Iberian ham production is recovering at the present moment. White hams show certain fat infiltration, although much lower than that of Iberian hams. Ripening usually takes 7–12 months and it is normally carried out in drying rooms (Ockerman et al., 2002). An important part of the Spanish white ham production comes under the Traditional Speciality Guaranteed (TSG) "Jamón Serrano", a European Union standard that, since 2000, protects the processing method of this product (European Commission, 1999), although it does not make reference to a specific processing area or the origin of the raw material. However, there also exists a PDO of Spanish white ham, "Jamón de Teruel" (Ministerio de Agricultura, 1993), which is produced in the Northeast of Spain (Fig. 1) from white pigs fed with commercial feeding, by a minimum of 9 months of air-curing at more than 800 meters above sea level.

Fig. 1. Geographic areas of production of Spanish dry cured hams with protected designation of origin (PDO). ■ PDO "Jamón de Teruel"; ▢ PDO "Guijuelo"; ⊡ PDO "Dehesa de Extremadura"; ▧ PDO "Jamón de Huelva".