

FUNCTIONAL EFFECTS OF MEAT PRODUCTS WITH ADDED WALNUT

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Introduction

Observational epidemiological studies show an inverse association between walnut consumption frequency and risk of coronary heart disease (CHD) (Fraser *et al.*, 1992). Walnuts, as part of a heart-healthy diet may reduce cholesterol concentrations in humans and animals (Sabaté, 1993; Iwamoto *et al.*, 2000). Recently, the FDA authorised a qualified health claim indicating that eating 42.5g of walnuts per day as part of a low-saturated-fat and low-cholesterol diet with no increase in the caloric intake may reduce the risk of CHD (FDA, 2003). Moreover the WHO (2003) recommends consuming at least 400g of fruit and vegetables a day, of which at least 30g must be walnuts, pulses and seeds. However, the consumption of walnuts is generally below the recommended consumption, since very few people are able to consume walnuts in sufficient amounts on a regular basis and for long periods of time. One way of encouraging their intake would be to incorporate them as an ingredient in commonly consumed food, such as meat products, to which different bioactive compounds could be added to make them better for the heart. Restructured beef steaks and frankfurters with added walnuts have been formulated resulting in products with acceptable physicochemical and sensory properties (Jiménez Colmenero *et al.*, 2003, 2005; Serrano *et al.*, 2006). Meat products with added walnut could be considered potential functional foods in that they incorporate several biologically active components that have the potential to produce functional effects (Nus *et al.*, 2004; Serrano *et al.*, 2005). However, for a food to be considered functional it must be satisfactorily shown that its consumption has a beneficial effect on certain groups of the population. Tests are therefore necessary to support this effect, preferably in humans and using appropriate intermediary biomarkers, important for early detection and diagnosis of the disease. This research focuses on evaluating the functional effect of meat products (restructured beef steak and frankfurter sausages) formulated with 20% walnut. The evaluation of the functional effect was carried out in an intervention study on subjects with cardiovascular risk to observe the effect of meat product consumption on exposure, effect and risk biomarkers in quantities the same as in a balanced diet.

Materials and Methods

Restructured beef steak and frankfurters, without walnut (control) and with 20% added walnut were prepared as reported by Serrano *et al.*, (2005, 2006) and Jiménez Colmenero *et al.*, (2005).

The functional effect was evaluated in an intervention study with men and women who had some cardiovascular risk in accordance with WHO/FAO considerations in their report on diet, nutrition and the prevention of chronic diseases (WHO, 2003). Men 45-70 years and women 50-70 years (without any substitute hormonal therapy) and who had no known illness or did not take medicines that interfered with absorption or lipid metabolism were selected, and among the modifiable factors, excess weight, dislipemia, smoking habit and blood pressure, establishing the following criteria: overweight (IMC >25 y <34.90 kg/m²), hypercholesterolemia (>220 mg/dl y < 300 mg/dl), and at least one of the following: blood pressure (close to 140 / 90 mm Hg) or smoking habit. An assay protocol was used similar to normal diet conditions as a sustainable long-term medium. A cross-intervention study was carried out for 5 weeks, in which the consumption of meat and meat products were substituted with the consumption of 5 meat products (4 beef steaks and 1 sausage with and without walnut) a week (150 g meat/ration). In consumption terms, this would be 30 g walnut / beef steak and 16 g walnut / ration of sausages which implies a consumption of 136 g of walnuts a week, representing a mean intake of 19.4 g walnuts/day. The consumption of 150 g of any of these products provides ca. 70% of the daily amount of walnut suggested as appropriate for decreasing the risk of cardiovascular diseases (FDA, 2003).

Serum γ -tocopherol was used as a consumption marker (exposure biomarker) of this food in the subjects, since the consumption of the meat product with walnut provides an amount of γ -tocopherol significantly greater than that habitually present in the diet (Olmedilla Alonso *et al.*, 2005). Total cholesterol, low-density lipoprotein (LDL) cholesterol and high-density lipoprotein (HDL) cholesterol, triglycerides, homocysteine and blood pressure were used as function biomarkers. The CVD risk factors of recognised analytical and biological validation which we considered were: total cholesterol, LDL-cholesterol and blood pressure.

Results and Discussion

The composition, physicochemical and sensory properties of meat products with added walnut and their potential health benefits have already been reported (Jiménez Colmenero *et al.*, 2005; Serrano *et al.*, 2005 and 2006).

The evaluation results of the functional effect after the consumption of meat product with walnut were: a) the exposure biomarker response, the serum γ -tocopherol, increased after the consumption of meat with walnut, and b) the decrease

in effect biomarkers, with clinical importance (risk markers), total cholesterol and LDL-cholesterol after the intervention period of the potentially functional meat product (Table 1); these biomarkers did not vary when the study was done using the same meat products but without added walnut (Olmedilla Alonso *et al.*, 2006); c) even in the study phase, the results suggested that the consumption of meat with walnuts improved the antioxidant status of the consumers by modifying the concentration of some enzymes of the glutation and paraoxonase systems.

Table 1: Variation in the cholesterol and γ -tocopherol in blood after the consumption of meat products with walnut.

	Variation	Confidence interval (95%)	P
Total cholesterol (mg/dl)	↓ 10.7	4.1 -17.1	0.002
LDL-cholesterol (mg/dl)	↓ 7.6	2.2 -13.0	0.007
γ -tocopherol (μ g/dl)	↑ 8.9	1.0 - 16.8	0.03

Conclusion

Meat products with walnut can be considered as functional foods in subjects with the same characteristics as in this study (men and women between 45 and 70 years, mildly hypercholesterolemic, overweight, smokers or with slight hypertension), since the decrease in the total and LDL-cholesterol mentioned earlier was significant. However, to make declarations on these meat products regarding their cardiovascular risk, the same kind of study would have to be done on subjects with the same characteristics.

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