BODY COMPOSITION CHANGES AND LIPID PROFILE IN YOUNG PEOPLE CONSUMING TERNASCO DE ARAGÓN OR CHICKEN

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Abstract— **To assess the effect of consuming *Ternasco de Aragón* (young lamb of Aragón, Spain) in health indicators (body composition and lipid profile) in a young population we examined changes in body composition and lipid profile in a two periods of 8 weeks, randomized, crossed and controlled trial, in which 50 young people aged 16 to 25 years followed a normocaloric diet with *Ternasco de Aragón* or chicken. Healthy males (n = 22), aged 19.88 ± 1.00 years and healthy females (n = 28), aged 19.53 ± 0.74 years (means ± standard deviation) followed normocaloric diets and were randomly assigned to the *Ternasco de Aragón*-consumption or chicken-consumption dietary group. Body composition with anthropometric measures (weight, height, skinfolds and circumferences) and blood lipid profiles were measured at baseline and after consuming *Ternasco de Aragón* and after consuming chicken. The group consuming *Ternasco de Aragón* showed significant reductions in triacylglycerol levels ($p < 0.05$). Body composition (body mass index) did not change significantly in either group. These findings demonstrated that a regular consume of *Ternasco de Aragón* can take place into a healthy, varied and well-balanced diet, because body composition changes and improved lipid profiles are similar through *Ternasco de Aragón*-diet or chicken-diet.**

Index Terms— **adolescents, lipids, nutrition, lamb**

I. INTRODUCTION

Obesity is one of the greatest health problems in Westernized societies. There are more than 97 million people categorized as obese or overweight only in the United States (National Institutes of Health, Heart, Lung, and Blood Institute (1998)). In Spain, this is an increasing concern, specially among children and young people. Studies like AVENA show that prevalence of overweight and obesity among adolescents has increased from 13 and 16% in 1985 to 35 and 32% in 2000-2002, respectively (Moreno, Mesana, Fleta, Ruiz, González-Gross and Sarría (2005)).

One factor that has been linked to obesity is dietary fat intake. As a result, many diets designed for weight control or reduction are low-fat diets. And red meat, in particular lamb (including *Ternasco de Aragón*) is associated with high-total fat diet and saturated fat; therefore, it is suggested that red meat should be eliminated or reduced as part of a hypocaloric and low-fat diet. Apart from this, many people believe that consumption of red meat (including *Ternasco de Aragón*) is not compatible with a healthy and balanced diet.

Two studies have shown that plasma lipid profiles can be improved with low-cholesterol diets including lean red meat as the major protein source; these studies compared lean red meat with fish and lean chicken in hypercholesterolemic men (Scott, Dunn, and Pownhall, (1994) and Davidson, Hunninghake and Maki, (1999)).

Another study (Melanson, Gootman, Myrdal, Kline and Rippe, (2003)) demonstrated that weight loss and improved lipid profile can be accomplished through diet and exercise, whether the dietary protein source is lean beef or chicken.

The major objective of the present study was to compare the consumption of *Ternasco de Aragón* versus chicken as part of a normal diet in terms of body composition changes and lipid profile changes, due to the lack of existing studies comparing the consume of lamb meat versus chicken meat.

II. MATERIALS AND METHODS

A. Sample

Subjects recruited for this study were young people between the ages of 16 and 25 years (total: 50 subjects, 22 males and 28 females). For the recruitment of these subjects we selected three halls of residence, two of them in the city of Teruel (Spain) and one of them in the city of Zaragoza (Spain). A letter about the nature and purpose of the study informed all subjects and supervisors. After receiving their written consent, the participants were considered for inclusion in the study. Subjects were required to be free of any known chronic, metabolic, endocrine or nutrition-related disease.

B. Ethics

The study was performed in accordance with the Helsinki Declaration 1961 (revision of Edinburgh 2000) and the study was approved by the Research Ethics Committee of the Government of Aragón (Spain). A written informed consent was obtained from all participants.

C. Experimental design

The study consisted in a two periods of 8 weeks, randomized, crossed and controlled trial, in which enrolled participants followed a normocaloric diet and were randomly assigned to a *Ternasco de Aragón*-based diet or a chicken-based diet. Both diets were nutritionally similar. By design, other sources of dietary protein and fats were the same in both groups. The only significant difference between the diets was the primary source of meat. Subjects in the chicken-group ate 150 gr of chicken, three times per week, and subjects in the *Ternasco de Aragón*-group ate 200 gr of *Ternasco de Aragón* with bones (150 gr whithout bones). This consumption of *Ternasco de Aragón* is comparable as the consumption of chicken in most of Spanish homes. As the subjects were recruited in a student community (three different halls of residence), the consumption of *Ternasco de Aragón*-diet or chicken-diet 3 times per week (always at lunch time) was guaranteed. The consumption of the same piece-part of *Ternasco de Aragón* or chicken was also guaranteed: the cooking methods were the same in both cases and the chefs of the three halls of residence were instructed to cook the diets in the same way. Each subject first performed one qualifying visit (QV1). It was scheduled in the morning after a 12-h overnight fast, consisted of obtaining informed consent, medical history, the first blood draw for assessment of total lipid profile and the first anthropometric measurements. There was a 5-weeks blood cleaning period between both 8-weeks treatment.

Assessment

All subjects were measured before and at the end of their 2 periods of 8 weeks intervention (total: 4 measurements). Body mass index (BMI) was also determined before and after the 2 periods of 8 weeks intervention. BMI was calculated as body weight (kg) without shoes and with light clothing, divided by height (m) squared.

-Anthropometric measurements

International guidelines for anthropometry in young population were applied (Moreno, Joyanes, Mesana, Gonzalez-Gross, Gil, Sarria, Gutierrez, Garaulet, Perez-Prieto, Bueno, and Marcos (2003) and Moreno, Rodriguez, Guillen, Rabanaque, Leon, Ariño, (2002)).

Body weight (kg): Body weight was measured with an electronic scale (SECA 861), precision 100 g, range 0 – 150 kg. The instrument was calibrated and needed no further calibration. The adolescent stands on the platform of the scale without support, with the body weight evenly distributed between both feet. Light indoor clothing is worn, excluding shoes, long trousers and sweater. The weight of the clothing was not subtracted from the observed weight.

Height (cm): The mean of three measurements using a precision stadiometer (Seca 225), precision 0.1 cm, range 70 – 200 cm was calculated. The adolescent stands straight in an upright position; the feet together, knees straight, heels, buttocks and back must touch the back part of the stadiometer. The head must be positioned in the Frankfurt plane. The arms have to hang relaxed on the side of the body, the inner part of the hand facing the thigh. The mobile, horizontal part of the stadiometer must touch the head of the subject, with a light pressure on the hair.

-Blood lipid profiles

Blood samples were drawn via venipuncture by a registered nurse before and after the two periods of 8 weeks intervention (total: 4 blood samples), after a 12 hours overnight fast. Samples were immediately shipped to the Servicio de Análisis Clínicos, Laboratorio de Bioquímica of the Hospital General de Teruel. Standardized hospital laboratory procedures were used to analyze samples for total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triacylglycerols.

D. Statistics

Outcome measures of particular interest were body mass index and blood lipid profile. Comparisons between *Ternasco de Aragón* and chicken were done with the parametric *t*-test for paired samples in quantitative variables showing a gaussian distribution, and the non-parametric Wilcoxon test was used in quantitative variables showing a non-gaussian distribution. Findings were considered statistically significant at $p < 0.05$. Means and standard deviations were used to describe the magnitude and variability of outcomes

III. RESULTS AND DISCUSSION

Body composition (body mass index) did not change significantly in either group. Body mass index change of 0.088 ± 0.517 in the chicken-consumption group was not significant different from the body mass change of 0.040 ± 0.470 in the *Ternasco de Aragón*-consumption group (Figure 1).

Regarding lipid profile changes, the plasma total cholesterol level change of 2.085 ± 19.269 mg/dL in the chicken-consumption group was not significant different from the plasma total cholesterol level change of 0.319 ± 21.777 mg/dL in the *Ternasco de Aragón*-consumption group (Figure 2.) The HDL cholesterol level change of -0.596 ± 8.890

mg/dL in the chicken-consumption group was not significant different from the HDL cholesterol level change of 1.191 ± 8.316 mg/dL in the *Ternasco de Aragón*-consumption group (Figure 4). The LDL cholesterol level change of 1.532 ± 16.913 mg/dL in the chicken-consumption group was not significant different from the LDL cholesterol level change of -3.936 ± 15.432 mg/dL in the *Ternasco de Aragón*-consumption group (Figure 5). However, the triacylglicerol levels significantly ($p= 0.015$) decreased after the *Ternasco de Aragón*-consumption group: the tryacilglicerol level change of 4.234 ± 43.223 mg/dL in the chicken-consumption group was significant different from the tryacilglicerol level change of -8.851 ± 20.431 mg/dL in the *Ternasco de Aragón*-consumption group (Figure 3).

The results of this study provide useful information regarding the role of two different diets in lipid profile changes.

Healthy young people consuming *Ternasco de Aragón* or chicken as part of a nutritionally balanced diet, don´t modify its body mass index: our data indicated that participants in both groups presented similar changes of body mass index after a chicken or *Ternasco de Aragón*-consumption diet. These findings are supporting our original hyphotesis that individuals consuming a *Ternasco de Aragón*-3days/week-diet don´t modify its body mass index, comparing with a chicken-3 days/week-diet.

Another important conclusion from the present study is that young people who consume *Ternasco de Aragón* as part of a nutritionally balanced diet can successfully maintain their lipid profiles. Our data showed that subjects who consume *Ternasco de Aragón* as primary protein source can maintain their plasma total cholesterol, LDL cholesterol, HDL cholesterol and successfully reduce their tryacilglicerol levels.

The results of this study supported data from previously published studies (Scott et al. (1994), Davidson et al (1999), and Melanson (2003). Those investigators concluded than red meat (rumiant meat) and chicken could be interchangeable in a healthy and balanced diet, as well as in a lowering-fat diet in hypercholesterolemic men and obese women.

IV. CONCLUSION

The regular consume of *Ternasco de Aragón* can take part of a healthy, varied and well-balanced diet, because the changes in lipid profile after a *Ternasco de Aragón*-based-diet are so favourables as changes in lipid profile after a chicken-based-diet. This study offers some unique applications for health professionals who make recommendations regarding the role of diet and meat consume.

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REFERENCES

National Institutes of Health, Heart, Lung, and Blood Institute (1998). Clinical Guidelines for the identification, evaluation and treatment of overweight and obesity in adults-the evidence report. *Obes Res*, 6 (Supl. 2), 51S.

Moreno, L. A., Mesana, M. I., Fleta, J., Ruiz, J. R., González-Gross, M. M., Sarría, A., and the AVENA Study Group. (2005). Overweight, obesity and body fat composition in Spanish adolescents. The AVENA Study. *Ann Nutr Metab*, 49, 71-6.

Scott, L.W., Dunn, J.K., and Pownhall, H.J. (1994). Effects of chicken and beef consumption on plasma lipid levels in hypercholesterolemic men. *Arch Intern Med,* 154 (11), 1261-1267.

Davidson, M.H., Hunninghake, D. and Maki, K.C. (1999). Comparison of the effects of lean red meat versus lean white meat on serum lipid levels among free living persons with hypercholesterolemia. *Arch Intern Med,* 159, 1331-1338.

Melanson, K., Gootman, J., Myrdal, A., Kline, G. and Rippe, J., M. (2003). Weight loss and total lipid profile changes in overweight women consuming beef or chicken as the primary protein source. *Nutrition*, 19, 409-414.

Moreno, L., A., Joyanes, M., Mesana, M.,I., Gonzalez-Gross, M., Gil, C., Sarria, A., Gutierrez, A., Garaulet, M., Perez-Prieto, R., Bueno, M. and Marcos, A. (2003). Harmonization of anthropometric measurements for a multicenter nutrition survey in Spanish adolescents. *Nutrition*, 19, 481-6.

Moreno, L., A., Rodriguez, G., Guillen, J., Rabanaque, M.,J, Leon, J., F., Ariño, A. (2002). Anthropometric measurements in both sides of the body in the assessment of nutritional status in prepubertal children. *Eur J Clin Nutr,* 56, 1208-15.

FIGURES

Figure 1. Body mass index after consumption of chicken or lamb

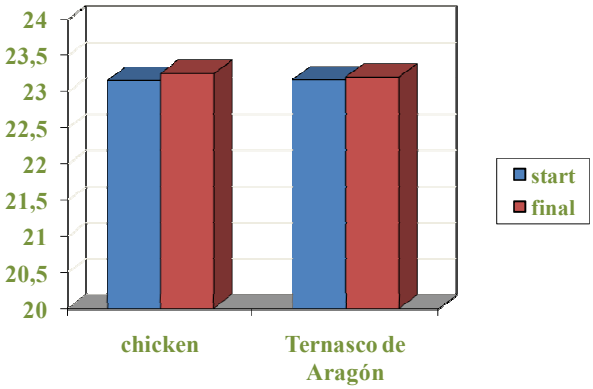

Figure 2. Cholesterol in people after consumption of chicken or lamb(mg/dL)

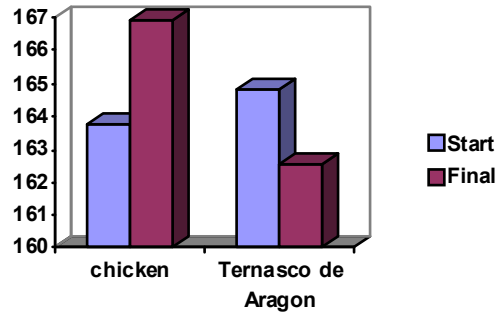

Figure 3. Tryacilglicerids in blood after consumption of chicken or lamb (mg/dL)

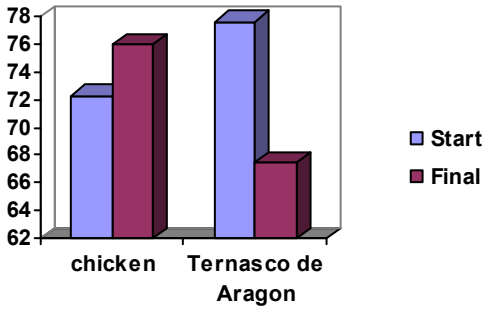

Figure 4. HDL-cholesterol in blood after consumption of chicken or lamb(mg/dL)

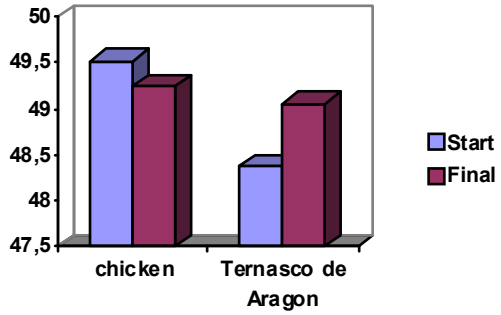

Figure 5. LDL- cholesterol in blood after consumption of chicken or lamb (mg/dL)