**PE9.31 Cooking and endpoint temperature effects on the nutritional values of pork loin 201.00**

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**Abstract— Nutritional values of fresh pork retail cuts have been recently updated in a national program. Experimental design was set up to estimate the domestic cooking impact on nutritional content of pork loins, and target cooking temperature influence was also tested. Analysis were conducted on 36 loin samples distributed in 4 treatment group that applied endpoint temperature from 70°c to 80°c, including control samples (raw). Cooking induce an increasing content for a majority of minerals (from +12% to +55% for total iron, zinc, magnesium, phosphorus and magnesium) as for proteins, total fat, cholesterol, SFA, ash, B2 and B12 vitamins. Our results describe PUFA, MUFA, B3 and B6 vitamins as heat sensitive nutrients (from -3% to -39%). Endpoint temperature had no critical effects on nutrient composition of pork loins except for MUFA and PUFA levels that showed a 75°c threshold for significant decrease.**

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**Index Terms— pork, meat, nutritional values, cooking, endpoint temperature.**

## I. INTRODUCTION

THE recent nutritional labeling regulation (CE 1924/2006) in Europe links labeling with analysis of products ready to eat according producer recommendations. For fresh meat cuts it means nutritional values have to be set up on meat as cooked in a domestic way. Following a national program that aims to product new data set of nutritional values for raw and cooked pork meat, the effect of cooking and endpoint temperature on the nutritional stability has been studied. Some papers focused on single muscles (beef and pork) response to cooking treatment [1] [2] [3] [4], but as done in the USDA Nutrient Data Set For Fresh Pork program [5], retail meat cuts were analyzed in this study. The cooking techniques [1] [2] and the internal endpoint temperature [3] have a significant effect on several nutrient level of muscles. On beef Semitendinosus, high temperature endpoint produce PUFA reduction [3], and Vitamin B12 content of beef muscles decrease after cooking due to heat destruction [2]. The main objective of this analysis campaign was to produce representative nutritional profiles of meat cuts after domestic cooking. This study was also conduct with a second objective: to quantify the variations that occur while increasing the endpoint temperature during domestic cooking of retail cuts. This data analysis brings back significant information on critical cooking temperatures for each nutrient type.

## II. MATERIALS AND METHODS

Pork meat cuts (boneless and defatted loin pieces, from the last rib to the last lumbar vertebra, 1400 gr. average) were sampled from selected LargeWhite x Piétrain sire crossbreed carcasses. Those samples were selected from among several breeds that used the same type of industrial finish feedstuff (75% lowest rate of cereals, pea and soybean; 1.7% maximal rate of linoleic acid). Pork carcasses were selected on weight (from 83kg to 97 kg) and lean yield (from 56% to 62% TMP). Loins were randomly distributed in four treatments (n=9 per treatment): Control (raw), Low (70°c endpoint temperature), Medium (75°c endpoint temperature) and High (80°c endpoint temperature). Cooking was done in a dry rotating heat oven at 200°c, meat samples were removed when they achieved target temperature. Nutrients analyzed: proteins, lipids (total content and fatty acids profile), glucids, cholesterol, minerals (sodium, potassium, magnesium, calcium, total and heme iron, phosphorus, zinc, selenium) and B group vitamins (B1, B2, B3, B6, B12). Variance analysis and adjusted means comparison was carried out with the 8.02 SAS software version (SAS Institute, USA), GLM and LSMeans procedures.

## III. RESULTS AND DISCUSSION

A. Minerals: Figure 1: minerals part 1 Figure 2: minerals part 2 The overview of figures 1 and 2 indicates no significant action of cooking (Control vs Low) on heme iron, calcium and sodium

content. On the other hand, total iron, zinc, magnesium, phosphorus and potassium level increase after cooking (+55%, +42%, +22%, +23%, +12% and +55% respectively).These cooking effects agree with Howe [5] reports (except heme iron content not available): cooking increase the content of a majority of minerals. Endpoint temperature shows no significant effect on minerals levels.

B. Proteins, total lipids, ash and cholesterol (Figure 3) Figure 3 As for minerals, cooking increase proteins, lipids, ash and cholesterol contents (+49%, +47%, +25%, and +51%, respectively). Howe [5] showed same but less important effect, that agrees with the target internal temperature (65°c) of his work. Turner [4] noted the same influence of cooking on cholesterol level (beef). Endpoint temperature shows no significant effect.

C. Fatty acids profile: Figure 4: fatty acids – general profile There is not any modification of fatty acids profile when samples were Low cooked, but Medium and High cooked loins show higher SFA content (+9% and +7%, respectively) and lower MUFA and PUFA content (-3% and -20% respectively for Medium samples). This effect was reported too in Chen [3] and Hernandez [6] investigations: cooking means oxidation of unsaturated fatty acids (but Chen [3] didn't notice MUFA content modifications). Regarding our results, endpoint temperature has no significant effect on fatty acids content from 75°c to 80°c variation. Figure 5: fatty acids – omega3 As shown on total unsaturated fatty acids content, omega3 fatty acids content is sensible to treatments (-39%, Control vs Medium) when endpoint temperature is 75°c over. This agrees with Chen [3] study: a 47% decline of alphalinolenic acid content was reported after a 80°c treatment. DPA content after cooking indicates a higher sensitivity for long chain omega3 fatty acids (-41% from 70°c treatment).

D. Vitamins: Figure 6: B-group vitamins B2 and B12 vitamins mean levels were increased after cooking (+23% to +40% for Control and Low, respectively). Theses observations indicate high cooking stability for B2 and B12 (from 70°c/80°c range), their content must be linked to cooking losses. In the same way, Ortigues-Marty [2] and Howe [5] found higher B12 content after cooking (+15.5% to +37% on beef cuts; +11% on pork, respectively). B3 and B6 vitamins are cooking sensitive: B6 content decrease from 70°c treatment (-25%, Control vs Low) and B3 content is lower for 80°c treatment (-25%, Control vs High). Our results present no significant variation of the B1 content, that could means temperature destruction and water cooking loss neutralize each other. According to Howe [5] 65°c treatment induce very low B1, B3 and B6 content variations. Endpoint temperature show no significant influence on B group vitamins content (B6 vitamins content except).  notice: some units may sound quite unusual but chosen for the sake of making figures more readable

## IV. CONCLUSION

Cooking effects on nutrient content of fresh pork loins could be separated in a two way action: on one hand, nutrients are concentrated by water losses that occur while cooking. Most of nutrients showed increased content due to this action of cooking. This was observed for minerals (except heme iron, calcium and sodium), proteins, total fat, SFA, cholesterol, ash, B2 and B12 vitamins. On the other hand, cooking induce degradation and oxidation. Theses antagonistic actions produce more or less balanced effect that reduce PUFA, MUFA, B3 and B6 vitamins content but has no global effect on B1 vitamins. Endpoint temperature in the range tested (70°c/80°c) showed only MUFA and PUFA content variations: degradations were noticed for 75°c and 80°c but not for 70°c cooking.

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