Advance Journal of Food Science and Technology 15(SPL): 218-224, 2018
DOI:10.19026/ajfst.15.5898
ISSN: 2042-4868; e-ISSN: 2042-4876
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Submitted: September 14, 2017 Accepted: December 26, 2017 Published: July 10, 2018

Research Article

Nutritional Comparison of Beef, Pork and Chicken Meat from Maracaibo City (Venezuela)

[1]Alba P. Montalvo-Puente, [2]Ramiro Torres-Gallo, [3]Diofanor Acevedo-Correa,
[3]Piedad M. Montero-Castillo and [4]Diego F. Tirado
[1]Department of Chemistry, School of Basic Sciences, Universidad de Cordoba, Via a Cereté, Córdoba,
[2]Department of Agroindustrial Engineering, School of Engineering, Universidad del Atlántico, Via a to Puerto Colombia, Atlántico,
[3]Group Nutrición, Salud y Calidad Alimentaria (NUSCA), Universidad de Cartagena, Avenida Consulado, Calle 30 No. 48-152, P.O. Box 130015, Cartagena de Indias, Colombia
[4]Department of Chemical Engineering, School of Chemistry, Universidad Complutense de Madrid, Av. Complutense s/n, P.O. Box 28040, Madrid, Spain

Abstract: This study aimed to evaluate the proximate composition, minerals and cholesterol content of cuts of Chicken Breast (CB), *Longissimus Dorsi* of Beef (LDB) and *Longissimus Dorsi* of Pork (LDP) to provide information that allows elucidating nutritional differences among these three meat cuts. The analysis was carried out for 150 samples, 50 per species, obtained from meat markets from Maracaibo (Venezuela). The highest concentration of lipids was found in CB (6.87 g/100 g fresh tissue), followed by LDP (4.76 g/100 g fresh tissue) and LDB (2.83 g/100 g fresh tissue). The same behaviour was found for moisture content, where CB, LDP and LDB had 75.05 g/100 g fresh tissue, 74.40 g/100 g fresh tissue and 73.29 g/100 g fresh tissue, respectively. On the other hand, the protein concentration in LDB (21.76 g/100 g fresh tissue) exceeded to LDP (20.94 g/100 g fresh tissue) and CB (20.50 g/100 g fresh tissue). The highest cholesterol content was observed in CB (73.42 mg/100 g), followed by LDB (70.22 mg/100 g) and LDP (65.42 mg/100 g). Iron (Fe) was lower in CB compared to LDB and LDP. LDP exceeded in calcium (Ca) content to LDB and CB. Species had an influence on the nutritional content of meat. The results of this research indicated that CB was not a recommendable option in low-fat dietary regimens due to its high content of total lipids and cholesterol; these results contrast with those obtained in LDP.

Keywords: Cholesterol, *Longissimus dorsi*, minerals, nutritional composition, proximate composition

INTRODUCTION

Beef has been traditionally the protein source of higher consumption, being part of the western culture (Owusu-Sekyere *et al*., 2014; Roseland *et al*., 2015; Colle *et al*., 2015). Countries like Ireland, Australia, Brazil and Argentina have based their economies on meat production, becoming their main income source (Belaunzaran *et al*., 2015; Zbrun *et al*., 2015). Its nutritional benefits and organoleptic qualities have been shown in international research (Xu *et al*., 2014; Kim *et al*., 2015; Corliss *et al*., 2015).

Beef is highlighted by its singular importance on Venezuelan economy. Besides having a meaning in terms of the generation of national agricultural product (Albornoz-Gotera and Segovia-López, 2014; Segovia-López *et al*., 2007), it occupies a prominent place in diet of the population and it is a source of 18% of the protein in the basic food basket, ensuring the absorption of certain vitamins and minerals, inaccessible from other foods (Segovia-López *et al*., 2007).

However, the increment of the production costs of beef, urbanisation and the changing consumption habits in the population have led to extending the meat production from other species to satisfy the nutritional and dietetic needs of the consumer, increasingly more informed and demanding (Albornoz-Gotera and Segovia-López, 2014). Thus, chicken and pork meat (Albornoz-Gotera and Segovia-López, 2014; Acevedo *et al*., 2015) and even buffalo meat (Naveena *et al*., 2013; Sakaridis *et al*., 2013) have become food alternatives for the population. Besides these factors, some research reveal that the consumption of beef represents a high risk to health, due to the presence of nutritional components that increments the contraction of coronary diseases, which have produced changes in

Corresponding Author: Diego F. Tirado, Department of Chemical Engineering, School of Chemistry, Universidad Complutense de Madrid, Av. Complutense s/n, P.O. Box 28040, Madrid, Spain, Tel.: +34 913 94 8510
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the feeding pattern of the population (Scollan *et al*., 2014; Kamihiro *et al*., 2015).

In Venezuela and other tropical countries, dietary recommendations made by health professionals, have been based on foreign information, where meat production systems are different (Scollan *et al*., 2014). Furthermore, public data regarding proximate and mineral composition from the meat of the species of major consumption in Venezuela (beef, pork and chicken) include neither the content of all minerals important from a biological and nutritionally point of view, nor the cholesterol content (Albornoz-Gotera and Segovia-López 2014; Segovia-López *et al*., 2007).

Given the several controversies, unfounded or not, regarding the recommendations of type of meat or other in healthy dietetic regimes, the aim of this research was to compare proximate composition, mineral and cholesterol content in beef, pork and chicken meat, which were distributed in meat outlets and supermarkets of Maracaibo City, located at Zulia State (Venezuela), in order to provide information that allows elucidating nutritional differences between three meat species and can be used to amplify data referred in the Food Composition Tables for Venezuelan practical use (National Institute of Nutrition, 2016), focused on the guidance of health professionals and consumers.

MATERIALS AND METHODS

Meat samples: To carry out this research, 150 samples of chicken, beef and pork meat (50 samples per species) were collected. These samples were randomly obtained from some meat outlets in different zones of Maracaibo City (Venezuela). It was used the commercial cuts preferred by consumers: Chicken Breast (CB), *Longissimus Dorsi* Beef (LDB) and *Longissimus Dorsi* of Pork meat (LDP).

Sample preparation: To obtain lean cuts, it was removed the adipose tissue in LDB and LDP. For another hand, skin and visible external fat were taken away from CB. Once visible or subcutaneous fat was devoid, each sample was milled separately using a food processor Braun® Multiquick MR 4000. Ground meats were packaged in vacuum packaged, appropriately labelled and stored under freezing at 253.15 K until analysis.

Proximate composition: The physicochemical analyses were carried out based on the official methods of analysis approved by the A.O.A.C. (2005). Meat samples were submitted to analysis of fat content (A.O.A.C. 920.39), total proteins (A.O.A.C. 955.04), moisture content (A.O.A.C. 930.15) and ash content (A.O.A.C. 942.05). All samples were analysed by triplicate.

Cholesterol content: Cholesterol content in meat was determined by triplicate using the colourimetric method described by Searcy and Bergquist (1960) and by other authors (Brugiapaglia *et al*., 2014; Giuffrida-Mendoza *et al*., 2015). The measurement was based on the saponification of lipid ether extract alkaline to remove non-specific chromogenic solutions as fatty acids. Sterols as unsaponifiable material were extracted by using hexane. 3 mL lipid extract was evaporated in a test tube with nitrogen in a water bath between 328.15 K and 333.15 K. It was added 5 mL KOH 15% and 2.0 mL pyrogallol 15% in a water bath at 353.15 K and stirring for 20 min. Then, 5 mL distilled water was added to the mixture and transferred to a separatory funnel to remove unsaponifiable material twice with 10 mL hexane. It was filtered and collected in a 25 mL volumetric flask. For the determination, an aliquot of the hexane extract was evaporated with nitrogen and 3 mL of colour reagent (ferrous sulphate heptahydrate in acetic acid) was added plus 1 mL sulfuric acid concentrated. Then, the mixture was strongly mixed and cooled for 10 min. Absorbance was read in a spectrophotometer Spectronic 20 Genesis® at 490 nm, previously calibrated. The standard curve of cholesterol was made using purified cholesterol solutions (Cholesterol S.C.W. Nutritional Biochemicals Corporation®, Cleveland-Ohio-EUA) at different concentrations (0.25 mg/mL, 0.50 mg/mL, 0.75 mg/mL and 1.0 mg/mL).

Mineral composition: Quantitative determination of the concentration of minerals in the meat of the three species was performed according to the instrumental spectrophotometric methods described by A.O.A.C., (2003), at wavelengths characteristic for each element. Concentrations of calcium (Ca), magnesium (Mg), iron (Fe), copper (Cu), zinc (Zn) and manganese (Mn) were determined by atomic absorption spectrophotometry. Sodium (Na) and potassium (K) were quantified by an atomic emission spectrophotometer Perkin-Elmer® model called 3110 (USA). Phosphorus (P) was determined by using the colourimetric method molybdovanadate ammonium (Rueda-Sánchez *et al*., 2014) in a UV-VIS spectrophotometer Shimadzu®, PC-2101. For these determinations, a first stock solution from the ash was prepared, obtained from each meat sample to which, hydrochloric acid was added and subjected to heating to near dryness of the solvent. Then, the sample was filtered on free ash filter paper and it was carried 50 mL volume with distilled water and stored under refrigeration until spectrophotometric reading. All samples were analysed by triplicate.

Statistical analysis: Experimental data were subjected to exploratory testing the assumptions of normality and outliers with PROC NORMAL PLOT UNIVARIATE statistical package Statistical Analysis System, SAS. An Analysis of Variance (ANOVA) was performed. Upon detection of a significant ($p<0.05$), means were compared by the least squares method.

RESULTS AND DISCUSSION

Proximate composition: ANOVA revealed statistically significant differences ($p<0.05$) in the proximate composition of samples from the different studied species. These results are shown in Table 1. From Table 1, it can be said that the moisture content differed among the three species, being the CB, which had the highest moisture content, followed by LDP and LDB. Results obtained for chicken and beef were similar to those reported by Arenas de Moreno *et al*. (2000), who also claimed the highest moisture content in chicken meat when they compared it with the LDB (74.9% vs 73%).

Uzcátegui-Bracho *et al*. (2010) in a comparative study among pork, beef and chicken using similar commercial cuts, found no statistically significant differences ($p>0.05$) in moisture content among the chicken and beef (74.84% and 74.20% respectively), but these contents were higher than that observed in the pork loin (73.21%). The moisture content of chicken and pork meat of the study from Uzcátegui-Bracho *et al*. (2010) was lower than that obtained for the same species in this study. In contrast, moisture in beef samples of this study was lower than those observed by Uzcátegui-Bracho *et al*. (2010). Moisture contents obtained from the three species were similar to those shown in Venezuelan Food Composition Tables from the National Institute of Nutrition (2016) for beef, chicken and pork meat (75.1, 74.7 and 72.1%, respectively).

Regarding ash content, ANOVA revealed significant effect for the studied species. As can be seen in Table 1, the ash content of LDB was higher than in CB and LDP and between these, no statistically significant differences ($p>0.05$) were observed. Arenas de Moreno *et al*. (2000) also found the highest ash content in chicken meat when compared to beef (1.28% against 0.97%, respectively).

On the other hand, results from Uzcátegui-Bracho *et al*. (2010) contrast with the present results. These authors did not observe statistically significant differences ($p>0.05$) in ash content in the three species. Food Composition Tables from the National Institute of Nutrition (2016) reported an ash value of 1% for CB without skin, 1.1% for lean pork (without visible fat) and beef tenderloin. These values were slightly below those recorded in the current work.

The ANOVA revealed an effect of the species on the content of crude protein. It was observed that protein content of beef is higher than that shown by CB. The protein content of LDP did not differ from that shown by the other species. Arenas de Moreno *et al*. (2000) also obtained the highest percentage of protein in LDB when it was compared with a mixture of chicken meat (23.3% against 19.7%). On the other hand, Uzcátegui-Bracho *et al*. (2010) had a higher protein content in CB (23.68%) compared with the contents observed in the LDB (22.43%) and pork meat (22.65%), between which no statistically significant differences ($p>0.05$) were found. That, because in both works, history of breeding of the species is unknown and it is difficult to determine causes of such discrepancies.

The amount of crude protein in beef of this study was similar to that reported by Huerta-Montauti *et al*. (2007) for commercial cuts of LDB. These authors found values of 21.87% and 21.48% for meat with quality A and AA, respectively. In the same way, protein concentrations found in this study for CB and LDP were lower than those reported in the Food Composition Tables (National Institute of Nutrition, 2016) in which, 23.1% was reported for chicken breast and 24.4% for lean pork.

ANOVA determined statistically significant differences ($p<0.05$) in the total lipid content of the meat from the studied species. The highest concentration was observed in CB (6.87%), followed by LDP (4.76%) and LDB (2.83%). These results were quite surprising, considering that the cut of meat selected for the study was skinless CB, one of the most recommended low-fat meat cuts from some dietary regimes. Arenas de Moreno *et al*. (2000) reported an increased lipid concentration in chicken meat (CB and thigh mixture) compared with LDB (7.75% and 2.57% respectively). On the other hand, findings from Uzcátegui-Bracho *et al*. (2010) contrast with those found in the aforementioned research, reporting a highest percentage of lipids in LDB than CB (3.61% and 1.59% respectively) and they did not find statistically significant differences ($p>0.05$) in lipid content of LDB and LDP. The Food Balance Sheet claimed by the National Institute of Nutrition (2016) reported a fat content of 4.2 g/100 g for beef, 8.1 g/100 g for chicken and 1.6 g/100 g for pork meat, numbers that also placed the chicken as the least suitable option for low-fat diets.

On the other hand, different works around the world (Huerta-Montauti *et al*., 2007; Uzcátegui-Bracho

Table 1: Proximate composition (g/100 g fresh tissue) according to the species

	Animal			
Analysis	Chicken	Pork	Beef	p-value
Moisture	75.05±0.16^{a}	74.40±0.16^{b}	73.29±0.16^{c}	0.00
Ash	1.16±0.02^{a}	1.15±0.02^{a}	1.27±0.02^{b}	0.00
Raw protein	20.50±0.34^{a}	20.94±0.34^{ab}	21.76±0.34^{b}	0.04
Totals lipids	6.87±0.15^{a}	4.76±0.15^{b}	2.83±0.15^{c}	0.00

*Different letters (a, b, c) represent statistically significant differences at a 5% significance

Table 2: Mineral content (mg/100 g of raw meat) according to species

Mineral	Animal Chicken	Pork	Beef	p-value
Ca	4.76±0.17[a]	9.50±0.17[b]	8.70±0.17[c]	0.00
Mg	1.92±0.22[a]	23.03±0.22[b]	20.96±0.22[c]	0.00
P	189.68±3.57[a]	177.11±3.57[b]	191.75±3.57[a]	0.01
Na	50.10±0.52[a]	50.94±0.52[a]	53.29±0.52[b]	0.00
K	253.70±2.35[a]	368.15±2.35[b]	339.86±2.35[c]	0.00
Zn	0.66±0.01[a]	1.16±0.01[b]	3.22±0.01[c]	0.00
Mn	0.02±0.00[a]	0.02±0.00[a]	0.02±0.00[b]	0.05
Fe	0.87±0.03[a]	1.91±0.03[b]	1.81±0.03[b]	0.00
Cu	0.15±0.00[a]	0.11±0.00[b]	0.12±0.00[b]	0.00
Na/K	0.20±0.00[a]	0.14±0.00[b]	0.16±0.00[c]	0.00

*Different letters (a, b, c) represent statistically significant differences at a 5% significance

et al., 2008; Arenas de Moreno *et al*., 2008) have reported fat content intramuscularly in beef that differs from those found in this study and it showed that factors such as age, diet, production system and classification by degree of carcass quality were responsible for these differences. Lipid concentrations indicated for the three species could be determined by various extrinsic factors (food, fatigue, fear, pre-slaughter handling, environmental conditions during slaughter, the period immediately *post-mortem*, storage) or intrinsic (species, breed, sex, sexual orientation, age) (Giuffrida-Mendoza *et al*., 2007). The fact that LDB and LDP used on this study showed a fat content less than that of the CB lipids, suggested that consumption of strip loins and a pork chop may become an acceptable option for a healthy diet low fat. It should be taken into account considering that according to FAO studies, many experimental data have shown that eating fatty meals increases susceptibility to breast, skin, colon, pancreas and prostate cancer (Giuffrida-Mendoza *et al*., 2007).

Cholesterol content: ANOVA showed a statistically significant difference ($p<0.05$) in cholesterol content among the species studied. The highest content of cholesterol was observed in CB (73.42 mg/100 g) followed by LDB (70.22 mg/100 g). LDP had the lowest cholesterol content (65.42 mg/100 g).

Similar research was done by Uzcátegui-Bracho *et al*. (2010), where the same behaviour on this work was observed, namely CB with the highest cholesterol content (72.7 mg/100 g fresh meat), followed by LDB (70.87 mg/100 g) and LDP (65.83 mg/100 g). These results claimed for pork meat as a good option for a healthy dietary regimen. Uzcátegui-Bracho *et al*. (2008) in Venezuela reported lower concentrations of cholesterol (65.33 mg/100 g) in LDB samples than those observed in the present study. Regarding chicken meat, the Food Composition Tables from the National Institute of Nutrition (2016) do not include information about the content of cholesterol in the CB without skin, so there is a lack information regarding the cholesterol content in the specific cut of LDP. Differences observed between concentrations of cholesterol in pork meat of this research and those reported by the authors aforementioned possibly was due to the kind of nutrition that has had these animals, which have been able to improve his nutritional profile. It has become clear that the pork has a low cholesterol level, similar to other meats that are considered with low content in this component. This low concentration makes the pork meat suitable. In fact, it has been shown that consumption of pork (as ham), rather than other foods, reduces plasma cholesterol levels (Owusu-Sekyere *et al*., 2014).

The determination of cholesterol in the food for human consumption is of utmost importance taking into account the maximum daily quantity of cholesterol that should be eaten is between 300 mg and 400 mg (Owusu-Sekyere *et al*., 2014). Excessive consumption of foods with high cholesterol content is associated with atherosclerotic plaque formation and the development of cardiovascular disease. Thus it must be controlled its blood content to prevent possible diseases (Xu *et al*., 2014).

Mineral content: ANOVA revealed a statistically significant difference ($p<0.05$) in most minerals evaluated in meat from animals of the three species (beef, pork and chicken meat), as is recorded in Table 2. In most macrominerals (Ca, Mg and K) there was a statistically significant difference ($p<0.05$) among the three species. No statistically significant difference ($p>0.05$) for P between CB and LDB was found; no statistically significant difference ($p>0.05$) were observed in the Na content in CB and LDP. Statistically significant difference ($p<0.05$) among species were observed in the content of Zn, Mn, Fe and Cu. Fe and Cu were in the highest concentration in LDB and LDP, while Mn was highest in CB and LDP. Zn showed the highest concentration in LDB, followed by LDP and CB. Variations in the concentrations of Ca, K, Zn, Fe and Cu between LDB and CB were similar to those observed by Arenas de Moreno *et al*. (2000).

Table 2 shows that pork meat had the highest concentration of Ca, followed by beef and chicken meat. FAO recommendation for daily intake of Ca is 1000 mg for adult men and women. The current study showed that LDP had the highest content of Mg, which constitutes a daily intake of approximately 10% Ca (~ 200 g). Although it was not an outstanding contribution, it placed the pig as the best option. Mg is an essential mineral in the body that helps cells to expel sodium (Huerta-Montauti *et al*., 2007), among other functions (it is involved in energetic metabolism, over 300 enzyme systems require Mg, acts as a muscle relaxant, etc.). According to the tables of Dietary Reference Intakes (DRI) (Institute of Medicine, 2011), the recommended daily intake in men between 19 and 30 years is 400 mg (Giuffrida-Mendoza *et al*., 2007).

P posted its highest concentration in the beef and chicken meat (191.75 mg/100 g and 189.68 mg/100 g, respectively). However, the three species were an excellent source of this mineral as they provide more than 50% of the daily diet if a chop is consumed or a portion of ~ 200 g. DRI (Institute of Medicine, 2011) recommends a daily intake of 700 mg/day of P. The most significant contribution to the consumption of P was posted in protein-rich foods; in this study, it was observed that the meat of the three species provides for over 70% of protein diet. It should be noted the importance of P in the body, which is part of the nucleic acids and phospholipids structure, also participates in the formation of compounds with high-energy (ATP) and phosphorylation of the compounds involved in the metabolism of carbohydrates or fats (Giuffrida-Mendoza *et al*., 2007; Xu *et al*., 2014).

As can be seen in Table 2, LDB exceeded in Na content to LDP and CB. The United States Department of Health and Human Services (HHS) affirms that the body uses Na to regulate blood pressure and blood volume as well as also is critical for the functioning of muscles and nerves (U.S. Department of Agriculture, 2005). However, high Na levels are a significant factor in the development of hypertension. Recent studies have shown that, in populations where less than 500 mg/day of salt is consumed, hypertension is virtually unknown. On the other hand, it is believed that a high level of this mineral can cause low blood sugar (Giuffrida-Mendoza *et al*., 2007). The low Na content found in this study for CB and LDP, with a small contribution of less than 7%, becomes these two samples the best alternative for low diets in this mineral.

Pork showed the highest level of K, followed by beef and chicken meat. If it is considered that in specific population groups, such as hypertension, blacks, the elderly and middle-aged, the recommended daily intake of K is 4700 mg (U.S. Department of Agriculture, 2005). Therefore, pork meat contributes only 16%, followed by beef with 14% and chicken meat with 11%. Pork meat seems to become the best choice among the three types of meat but does not provide significant amounts of this mineral. K is a mineral involved in electrical and cellular functions of the body and is classified as an electrolyte (U.S. Department of Agriculture, 2005) and contrary to what occurs with Na, to consume the recommended daily (or little more) could reduce blood pressure (U.S. Department of Agriculture, 2005). Low or high levels of K do not constitute in itself a health problem if they are accompanied by an adequate level of Na because the daily needs of both macro minerals are interdependent (Giuffrida-Mendoza *et al*., 2007).

In the current study, the Na/K ratio for the meat of the three species was evaluated, resulting in the lowest value for LDP, followed by LDB and CB (Table 2). When lower the Na/K ratio, the better the food, due to it is claimed that K is a desirable mineral for patients of hypertension and Na is an undesirable mineral for this type of patients. For these reasons, the pork meat seems to be the most suitable for people with this kind of condition (Giuffrida-Mendoza *et al*., 2007).

The highest concentration of Zn was reported for LDB, followed by LDP and CB. The Food and Nutrition Committee of the Institute of Medicine (Institute of Medicine, 2011) recommends eating between 8 mg and 11 mg of Zn daily. In this sense, the beef becomes a good source of Zn due it provides almost 60% of the daily requirement recommended by the DRI tables (Institute of Medicine, 2011); followed by LDP with an estimated contribution of 20%. CB has a poor intake of dietary Zn (12%). Despite being a trace element, Zn is necessary for the body defence system (immune system) to work properly, also plays a role in cell division and cell growth, as well as in wound healing and on carbohydrate metabolism.

Chicken meat showed the highest concentration of Mn, followed by beef and pork meat. Although its essence is well-established in biological systems, its deficiency has not been observed in the human population, also, to clear shortfalls or reduced availability, other cations such as Mg can replace their biochemical functions (Giuffrida-Mendoza *et al*., 2007).

The DRI tables (Institute of Medicine, 2011) report an adequate intake level for men of 2.3 mg daily. The three types of meat tested in the current study, when they were compared with the above values, represent trace levels, indicating that none was itself, a great source of this mineral. Regarding Fe, results are remarkable, in generally higher in the pork and bovine and significantly low in chicken. Fe is part of many enzymes, but mainly the core of the haemoglobin and myoglobin, which are transport and oxygen storage proteins. The DRI tables (Institute of Medicine, 2011) registered as recommended 8 mg of this daily mineral intake for adult men; when reviewing the data obtained in this study, red meat (pork and beef), are still shown as the best options for a diet with adequate levels of Fe with a contribution of almost 50% of this mineral in the daily diet.

Table 2 shows the CB with the highest concentration of Cu, followed by LDB and LDP. Cu is a component of some enzymes related to the metabolism and transport of Fe (Giuffrida-Mendoza *et al*., 2007). The DRI tables (Institute of Medicine, 2011) shown a daily recommended intake of 0.9 mg for Cu, leading to the inference that 200 g of CB provides about 33% per day of this mineral in the diet. Thus, this placed it as the best option in this case. Lack of Cu may lead to anaemia and osteoporosis, but in large amounts it is toxic. The CB then must be considered in balanced diets, as a necessary complement recommended intakes of Cu component.

Except for Na, Zn, Mn and Cu, all minerals evaluated in chicken samples of this study showed higher concentrations than those posted by Arenas de Moreno *et al*. (2000), in the mixture of thigh and breast. Comparing the same study, the authors reported for LDB, higher values of Na, K and Mn to those found in the current investigation.

When the data from the current study were compared with the work made by Uzcátegui-Bracho *et al*. (2008), it was observed that, except for Mn, all minerals analysed by the latter, resulted in lower concentrations for the same cuts in steers subjected to different types of food; on the other hand, it draws attention the huge difference in the concentration of Na between reported data by Uzcátegui-Bracho *et al*. (2008) and the current work. These differences probably could be attributed to the treatment received for animals or the breeds used for the study. It is difficult to discuss the reasons for these differences because the analysed samples in this job are of unknown precedence.

Except for Cu, mineral contents recorded in the Food Composition Tables (National Institute of Nutrition, 2016) for skinless CB are higher than those found in the present work. The National Institute of Nutrition (2016) only reported Ca, P and Fe for beef tenderloin, which P reported a lower concentration when compared with this investigation. The Food Balance Sheet (National Institute of Nutrition, 2016) states only the contents of Ca, P and Fe, for chicken, beef and pork meat. The concentrations of these three minerals are superior in pork and beef to those found in this study. In the case of chicken meat, only P shows a lower value compared with the value obtained in the present study.

The differences observed in the meat mineral composition from three species (chicken, pork and beef) can be attributed to minerals necessary for the supply and development of each one, vary with the species, age, type and production levels well as in diet, which reflects the mineral content of water, soils and area crops where they developed (Huerta-Montauti *et al*., 2007).

CONCLUSION

Results from this study support studies which affirm that species influence the nutritional content of meat. A subject that is such importance in a country where it is a product covered by most individuals.

The beef evaluated showed an acceptable nutritional value in compared to the pork and chicken meat, because, it was an excellent source of bioavailable protein, had the lowest lipid content and was a good source of Fe, P and Zn; However, beef is still vetoing in dietary regimes considered as a rich source of cholesterol.

Despite myths about the harmful effects of pork meat on human health, pork loin evaluated in this study, it seems to be one of the least harmful to people with a risk of cardiovascular problems. Additionally, it presents the lowest ratio Na/K and the highest content of Mg, elements necessary for the blood pressure maintenance, along with the beef is a good source of Fe and P. However, the absence of local information on the type of fat (saturated and unsaturated) present in these cuts, does not allow to confirm it as the best option for a healthy diet. Still, it is recommended to disclose the nutritional benefits of the pork chop between health professionals, consumers and food industry.

Chicken breast, as desired by a large percentage of the population, among other virtues, for easy digestion, to be presented in this study with the highest fat content and high level of cholesterol, compared to the other two species, it seems to place it in a disadvantageous position from the nutritional point of view.

CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest.

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