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Changes in nutrient levels for three fresh pork loin cuts between 1992 and 2010

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Abstract

Since nutrient composition of pork has changed over the past two decades, a collaborative study was conducted by scientists at the US Department of Agriculture (USDA), Texas Tech University and the National Pork Board to determine current nutrient values. The purpose was to obtain analytical nutrient data for three highly consumed fresh pork products in the USDA National Nutrient Database for Standard Reference (SR) and to compare the results to data obtained in 1992. Bone-in baby back ribs (BKR), boneless sirloin roast (SRB), and bone-in blade chops (BCB) were purchased from 12 retail outlets using a nationwide sampling plan developed for USDA's National Food and Nutrient Analysis Program. Nutrient values for proximate, cholesterol, and minerals were determined by commercial laboratories using validated methodology including quality control procedures. The 1992 data used for comparison were derived from analyses of samples of raw fresh pork retail cuts which were obtained from supermarkets in 15 cities across the US in a nation-wide market basket study. Nutrient values from 1992 and 2010 for equivalent cuts were statistically evaluated using a paired two-tailed T-test (critical value $p<0.05$). Comparing 2010 values to 1992 values, moisture was significantly higher ($p<0.001$) while total fat was lower ($p<0.001$) in all three cuts. Cholesterol was significantly less in two of the three cuts. Sodium values for 2010 were higher in all three cuts by 7-24% but still below 90 mg/100 g. Phosphorus was higher ($p<0.05$) in 2010 whereas iron was lower ($p<0.001$). Values for potassium, calcium, and zinc varied between the two data sets. This research updates the values in SR and provides current and accurate data for use in nutrition monitoring and policy.

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1. Introduction

The pork industry has introduced changes in breeding practices and swine nutrition to improve attributes of the meat such as muscle color, water holding capacity and palatability [1]. Since the early 1990's, changes in animal husbandry practices and industry procedures led to the availability of leaner cuts. Studies initiated in 2010 were the first updates to nutrient values for fresh pork products in the USDA National Nutrient Database for Standard Reference (SR) since 1992. To update these values a collaborative study was conducted by scientists at ARS/USDA, Texas Tech University, and the National Pork Board to determine current nutrient content in three highly consumed fresh pork products and to compare the new data to values reported in 1992. The cuts chosen for evaluation were baby back ribs, sirloin roast, and blade chops. They were analyzed in the raw state. The information obtained from this study was used to update the USDA National Nutrient Database for Standard Reference (SR).

Nomenclature	
BKR	Baby back ribs, bone-in
SRB	Sirloin roast, boneless
BCB	Blade chops, bone-in
Separable lean only	Lean meat after external trim fat and seam fat have been removed, prior to analysis
Separable lean and fat	Combination of external trim fat, seam fat, and meat
Separable fat	External trim fat and seam fat
Refuse	Weights of connective tissue and bone, which are combined and reported as "refuse"
Proximates	Ash, moisture, total fat, and protein

1.1. Objectives

- To update the nutrient profiles of 3 popular fresh, pork loin cuts in the USDA National Nutrient Database for Standard Reference (SR): Baby back ribs, bone-in (BKR); sirloin roast, boneless (SRB); and blade chops, bone-in (BCB).
- To compare the nutrient values for three cuts analyzed in 2010 to values reported in 1992.

2. Methods

2.1. Sampling

Three fresh pork cuts were pre-ordered and purchased from 12 retail outlets (4 regions, 3 outlets per region) using the nationwide sampling plan developed for the USDA National Food and Nutrient Analysis Program (NFNAP) [2] and shipped frozen to Texas Tech University for trimming and preparation. These samples were used for obtaining the 2010 data. The 1992 data were derived from analyses of 11 fresh retail cuts obtained from a nation-wide basket survey consisting of retail supermarket meat cases in 15 cities across the US [3].

2.2. Preparation of raw sample composites

Only raw popular pork loin cuts such as BKR, SRB, and BCB were used for this study. Separable fat, bone and connective tissue were removed from each raw cut prior to analysis. The lean tissues from each of these cuts were used for individual composites, which were homogenized and then analyzed for nutrient content. Analyses of proximates, minerals, cholesterol, thiamin, niacin, and riboflavin were

conducted on samples from each individual outlet (n = 12). For other nutrients, sample material from several locations was combined to create composites for analysis. To obtain nutrient profiles for separable fat, composite samples derived from all the locations were analyzed.

3. **Nutrient analysis**

Nutrients selected for analysis were proximates, cholesterol and minerals. Standard AOAC procedures were used to analyze for moisture (AOAC 950.46), nitrogen/protein (AOAC 968.06), total fat (AOAC 954.02), ash (AOAC 923.03), cholesterol (AOAC 994.10) and minerals were determined by inductively coupled plasma (ICP) methodology (AOAC 985.01 and 984.27) [4]. Quality assurance was monitored through the use of commercial reference materials, in-house control materials, and random blind duplicate sampling.

4. **Statistical analysis**

Means and frequencies were used to describe the samples and to identify potential patterns in the data. To ascertain if any differences in values between the 2010 and 1992 data were present, independent sample T-tests were conducted with α=0.05 [5]. Data were tested to ensure applicability for parametric analysis.

5. Results

5.1. Comparison of moisture, total fat and cholesterol

Moisture concentration was higher ($p<0.05$) and total fat levels lower ($p<0.001$) in all three cuts in 2010 when compared to the 1992 cuts. Cholesterol was significantly lower in 2010 ($p<0.001$) in BKR and BCB, but unchanged in SRB (Figure 1).

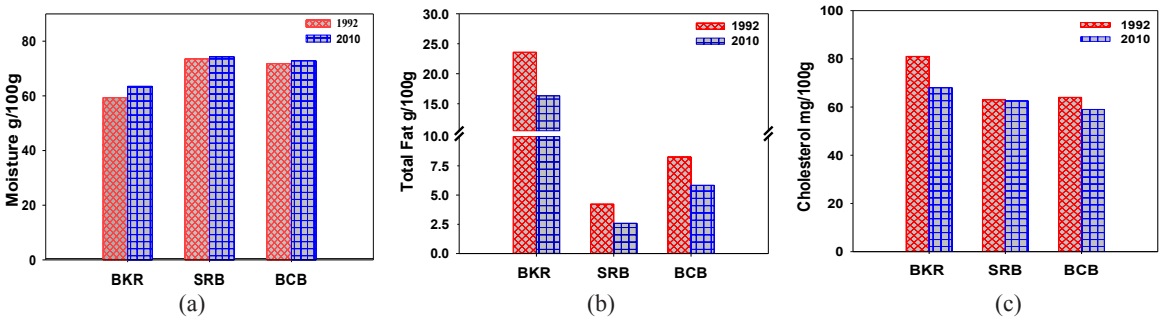

Fig.1.Comparison of moisture (a), total fat (b) and cholesterol (c) levels between 1992 and 2010 in three pork cuts, bone-in baby back ribs (BKR), boneless sirloin roast (SRB) and bone-in blade chops (BCB).

5.2. Comparison of sodium and potassium

Sodium values were significantly higher ($p<0.001$) in all three cuts. Potassium values were higher ($p<0.05$) in BKR and significantly lower ($p<0.001$) in BCB but not significantly different in SRB (Figure 2).

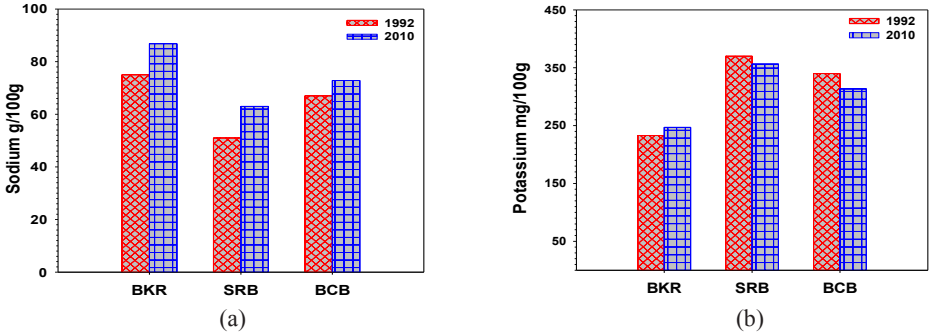

Figure 2. Comparison of sodium (a) and potassium (b) levels between 1992 and 2010 in three pork cuts, bone-in baby back ribs (BKR), boneless sirloin roast (SRB) and bone-in blade chops (BCB).

5.3. Comparison of phosphorous and calcium

Phosphorus values were significantly higher ($p<0.05$) in 2010 in all 3 cuts. Calcium values were significantly higher ($p<0.01$) in BCB but significantly lower ($p<0.001$) in SRB and not significantly different in BKR (Figure 3).

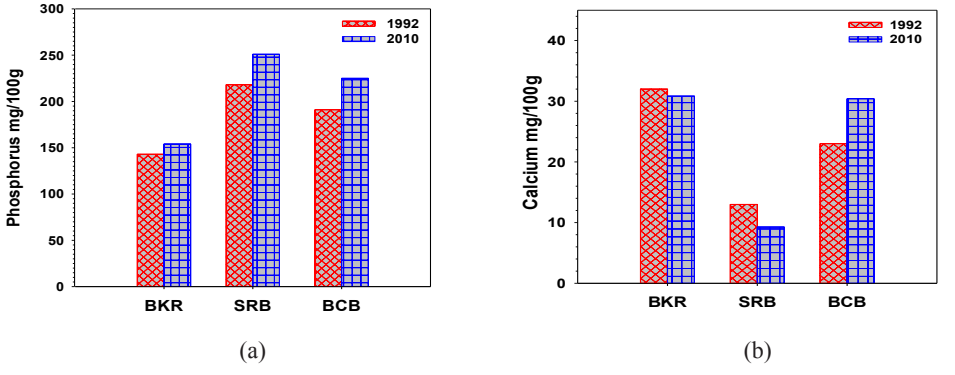

Fig.3.Comparisons of phosphorus (a) and calcium (b) levels between 1992 and 2010 in three pork cuts , bone-in baby back ribs (BKR), boneless sirloin roast (SRB), and bone-in blade chops (BCB).

There were no differences in nutrient levels in iron, zinc and protein between 1992 and 2010, except for zinc in BKR (Table 1).

Table 1.Nutrient content for proximates and minerals in three fresh pork loin cuts from 1992 to 2010[1]

Cuts	Nutrients	2010 data	SE	N	1992 data	SE	N
Baby back ribs, bone-in (BKR)	Water (g/100g)	63.4	0.18	12	59.3	0.88	12
	Total Fat (g/100g)	16.3	0.28	12	23.5	0.95	5
	Cholesterol (mg/100g)	68.0	0.83	12	81.0	0.91	5
	Protein (mg/100g)	19.0	0.10	12	16.1		*1*
	Sodium (mg/100g)	86.8	1.46	12	75.0	2.02	5
	Potassium (mg/100g)	247	7.16	12	233	2.29	5
	Phosphorus (mg/100g)	154	4.55	12	143	8.51	5
	Calcium (mg/100g)	30.8	1.04	12	32	0.36	5
	Iron (mg/100g)	0.7	0.32	12	0.9	0.05	5
	Zinc (mg/100g)	2.5	0.05	12	2.3	0.09	5
Sirloin roast, boneless (SRB)	Water (g/100g)	74.3	0.29	12	73.5	0.24	14
	Total Fat (g/100g)	2.5	0.17	12	4.2	0.20	14
	Cholesterol (mg/100g)	62.5	1.43	12	63	62.51	11
	Protein (mg/100g)	22.8	0.24	12	21.0	0.35	11
	Sodium (mg/100g)	63	0.66	12	51	1.31	36
	Potassium (mg/100g)	356	4.85	12	370	5.05	36
	Phosphorus (mg/100g)	251	4.95	12	218	2.01	13
	Calcium (mg/100g)	9.2	0.18	12	13	2.30	5
	Iron (mg/100g)	0.56	0.01	12	0.87	0.04	16
	Zinc (mg/100g)	1.7	0.03	12	1.8	0.05	16
Blade chops, bone-in (BCB)	Water (g/100g)	72.8	0.29	12	71.	0.33	15
	Total Fat (g/100g)	5.8	0.44	12	8.2	0.46	15
	Cholesterol (mg/100g)	59	0.78	12	64	0.28	11
	Protein (mg/100g)	21.2	0.24	12	19	0.34	17
	Sodium (mg/100g)	72.8	1.55	12	67		*1*
	Potassium (mg/100g)	313	10.22	12	340	0.60	5
	Phosphorus (mg/100g)	226	6.41	12	191	3.36	16
	Calcium (mg/100g)	30.4	3.14	12	23	0.92	5
	Iron (mg/100g)	0.7	0.05	12	1.0	0.04	17
	Zinc (mg/100g)	2.7	0.12	12	2.9	0.07	16

[1]Where SEM were unavailable for 1992 data, equal variances and a minimum number of observations (n=1) were assumed for statistical purposes and are denoted above in italics.

6. **Conclusion**

These new data developed in 2010 indicated that all three pork loin cuts are significantly leaner than in 1992. Data also indicated that sodium levels increased by 7-24% among the three cuts. This increase may be a result of possible changes in pork feed for providing more taste and tenderness in pork cuts since 1992. Phosphorus was higher and iron was lower in the 2010 values for all three cuts, compared to 1992 data. Nutrient changes in potassium, calcium, and zinc varied among the cuts. The release of these data in the USDA National Nutrient Database for Standard Reference at http://ndb.nal.usda.gov provides consumers, restaurant associations, researchers and dietitians with complete nutrient profiles, including information to identify and select leaner pork cuts.

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