



Comparison of the nutrient content of commercially-prepared rotisserie chicken to roasted chicken

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ABSTRACT: Meat and meat products available in the market place are in a constant state of flux with the introduction of new products, preparations, and changes in livestock management. The USDA National Nutrient Database for Standard Reference (SR) is constantly updated to reflect these changes in products. The objectives of this study were: To determine the nutrient composition of commercially-prepared rotisserie chicken (RT) for entry into SR; To compare nutrient values of RT to those of roasted chicken (RS) reported in SR. RT was purchased from 12 retail outlets nationwide, using the USDA National Food and Nutrient Analysis Program sampling plan. Thigh, breast, drumstick and wing were analyzed without skin; skin was analyzed separately. Products were analyzed for proximates, minerals and B-vitamins by commercial laboratories. Analytical quality control was monitored through the use of duplicate sampling, in-house control and standard reference materials. Nutrient values for RT were compared statistically to RS using a two-tailed T-test (critical value = P<0.05). All results discussed below refer to values for RT as compared to RS. Wings and drumsticks were higher in total fat (P<0.0005) and ash (P<0.02), but lower in moisture (P<0.0002). Skin was lower in protein (P<0.05) and fat (P<0.007), but higher in ash (P<0.001) and moisture (P<0.03). All products (skin and pieces) were higher in cholesterol (113%-184%), sodium (P<0.0001), potassium (P<0.0002), and phosphorus (P<0.0001, except breast). Iron was decreased in thigh (27%), breast (54%), and skin (35%). Magnesium and niacin were lower in thigh (P<0.05) and breast (P<0.005); magnesium was higher in wing (P<0.0001) and skin (P<0.0001). Changes in nutrients such as phosphorus and sodium may have health implications for the consumer. Results from this study will be used by researchers, medical/health professionals, and government agencies for establishing nutrition policies and recommendations.

INTRODUCTION

- The USDA National Nutrient Database for Standard Reference (SR)¹ is the premier national nutrient database and is the basis for both commercial and international databases.
- New poultry products, such as rotisserie chicken (RT), have since become available in the marketplace.
- Current data for poultry products are critical to the assessment of dietary intake and its effects on health status.

OBJECTIVES

- To generate and compile nutrient data for a popular new product, rotisserie chicken.
- To evaluate differences in nutrient content of chicken products, rotisserie chicken values were compared to those for roasted chicken (RS) prepared from raw non-enhanced products.

METHODS

- Sampling:**
- 12 retail supermarkets nationwide were sampled for ready-to-eat rotisserie chicken using the USDA NFNAP sampling plan².
 - Nutrient values for fresh roasted chicken were analyzed in 1979 and are reported in SR.

- Nutrient Analyses:**
- Breast, drumstick, and thigh were each analyzed without skin.
 - Skin was analyzed separately.
 - Samples were sent to qualified commercial laboratories for analysis of proximate nutrients, minerals and B-vitamins. Laboratories used validated methods, especially AOAC methods.

- Quality Control:**
- Analytical quality control was performed through the use of duplicate sampling, in-house control and commercial reference materials.

- Statistics:**
- Sources of data in SR for comparison to rotisserie chicken were as follows:
 - Roasted chicken breast – NDB 05064
 - Roasted chicken drumstick – NDB 05073
 - Roasted chicken thigh – NDB 05098
 - Roasted chicken skin – NDB 05015
 - Statistical evaluation was performed using a two-tailed t-test. The critical value was set at P < 0.05. When standard errors were unavailable for roasted chicken values, equal variances were assumed.

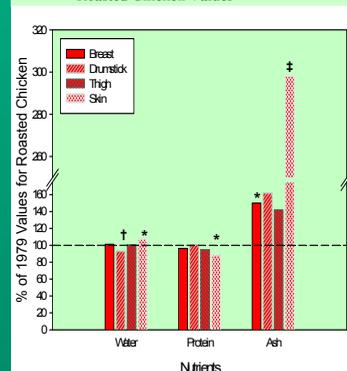
Food Item Treatment	Breast		Drumstick		Thigh		Skin	
	RS ²	RT	RS	RT	RS	RT	RS	RT
n	16	9	16	9	16	9	16	9
Nutrients								
Protein (g)	31.02 ± 0.37	29.86 ± 0.65	28.29 ± 0.30	28.44 ± 2.02	25.94 ± 0.32	24.65 ± 0.81	20.36 ± 0.69	17.99 ³ ± 1.33
Cholesterol (mg) ⁴	85 ± 2.70	95 ± 2.70	93 ± 6.55	165 ⁵ ± 6.55	95 ± 4.34	134 ⁵ ± 4.34	83 ± 5.52	147 ⁵ ± 5.52
Fat (g)	3.57 ± 0.213	3.57 ± 0.160	5.66 ± 0.126	7.16 ⁵ ± 0.260	10.88 ± 0.212	11.37 ± 0.264	40.68 ± 1.350	37.61 ⁵ ± 0.783
Ash (g)	1.06 ± 0.037	1.59* ± 0.092	1.05 ± 0.044	1.70 ± 0.133	0.95 ± 0.027	1.35 ± 0.115	0.50 ± 0.028	1.49 ⁵ ± 0.150
Water (g)	65.26 ± 0.34	66.05 ± 0.47	66.74 ± 0.41	62.13 ⁵ ± 1.42	62.87 ± 0.41	63.24 ± 0.65	40.29 ± 1.71	43.27* ± 0.90
Calcium (mg)	15 ± 0.8	13 ± 1.2	12 ± 0.8	20 ⁵ ± 2.5	12 ± 0.8	13 ± 0.8	14 ± 0.8	23 ⁵ ± 3.3
Iron (mg)	1.04 ± 0.061	0.48* ± 0.013	1.30 ± 0.039	1.12 ± 0.055	1.31 ± 0.051	0.97 ± 0.041	1.51 ± 0.099	0.99 ± 0.055
Magnesium (mg)	29 ± 0.5	27 ⁵ ± 0.8	24 ± 0.7	25 ± 1.7	24 ± 0.5	21 ⁵ ± 1.0	15 ± 0.4	25 ⁵ ± 2.5
Zinc (mg)	1.00 ± 0.026	0.93 ± 0.024	3.18 ± 0.062	3.09 ± 0.129	2.57 ± 0.039	2.09 ± 0.065	1.23 ± 0.067	1.11 ± 0.082
Copper (mg)	0.049 ± 0.002	0.044 ± 0.002	0.079 ± 0.002	0.096 ± 0.006	0.081 ± 0.002	0.080 ± 0.004	0.064 ± 0.006	0.045 ± 0.004
Manganese (mg)	0.017 ± 0.001	0.014 ± 0.001	0.021 ± 0.001	0.022 ± 0.001	0.021 ± 0.001	0.016 ± 0.001	0.022 ± 0.001	0.021 ± 0.002
Phosphorus (mg)	228 ± 7.6	245 ± 13.4	184 ± 5.0	248 ⁵ ± 17.8	183 ± 5.0	210 ⁵ ± 13.4	125 ± 3.0	234 ⁵ ± 30.4
Potassium (mg)	256 ± 7.7	292 ⁵ ± 13.8	246 ± 6.1	301 ⁵ ± 19.7	238 ± 6.0	264* ± 14.0	136 ± 7.9	245 ⁵ ± 18.6
Sodium (mg)	74 ± 3.1	268 ⁵ ± 56.2	95 ± 2.2	330 ⁵ ± 57.4	88 ± 1.7	258 ⁵ ± 52.0	65 ± 2.1	298 ⁵ ± 68.0

¹Values represent means ± S.E.M.
²RS=roasted chicken; RT=rotisserie chicken
³Rotisserie chicken values denoted in blue are significantly different from roasted chicken values (two-tailed t-test): *P<0.05; †P<0.01; ‡P<0.001
⁴When S.E.M. for roasted chicken was unavailable, equal variances were assumed for statistical purposes.

Food Item Treatment	Breast		Drumstick		Thigh		Skin	
	RS ²	RT	RS	RT	RS	RT	RS	RT
n	8	9	8	9	8	9	8	9
Nutrients								
Thiamin (mg)	0.070 ± 0.006	0.078 ± 0.009	0.076 ± 0.006	0.059 ± 0.008	0.074 ± 0.007	0.038 ± 0.010	0.036 ± 0.002	0.028 ± 0.004
Riboflavin (mg)	0.114 ± 0.009	0.144 ± 0.006	0.233 ± 0.007	0.292 ± 0.014	0.231 ± 0.010	0.274 ± 0.015	0.127 ± 0.013	0.389 ± 0.252
Niacin (mg)	13.712 ± 0.70	9.800 ³ ± 0.66	6.075 ± 0.36	5.811 ± 0.33	6.525 ± 0.58	5.356* ± 0.23	5.581 ± 0.37	5.578 ± 0.27
Vitamin B ₆ (mg) ⁴	0.600 ± 0.023	0.329 ± 0.023	0.390 ± 0.34	0.183 ± 0.12	0.350 ± 0.31	0.177 ± 0.10	0.100 ± 0.010	0.142 ± 0.010
Vitamin B ₁₂ (µg) ⁴	0.34 ± 0.023	0.27 ± 0.023	0.34 ± 0.032	0.52 ± 0.032	0.31 ± 0.044	0.46 ± 0.044	0.2 ± 0.050	0.61 ± 0.050

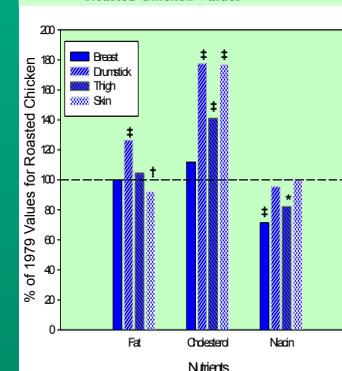
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²RS=roasted chicken; RT=rotisserie chicken
³Rotisserie chicken values denoted in blue are significantly different from roasted chicken (two-tailed t-test): *P < 0.05; †P < 0.01
⁴When S.E.M. for roasted chicken was unavailable, equal variances with minimum number of observations (n=1) were assumed for statistical purposes.

Figure 1. Water, Protein, and Ash Content of Rotisserie Chicken as a Percentage of Roasted Chicken Values



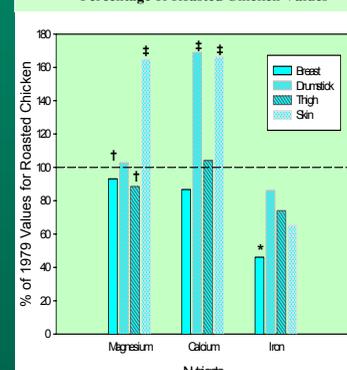
Statistically significant differences between roasted chicken values and rotisserie chicken values (two-tailed t-test) are denoted as follows: *P<0.05, †P<0.01, ‡P<0.001

Figure 2. Fat, Cholesterol, and Niacin Content of Rotisserie Chicken as a Percentage of Roasted Chicken Values



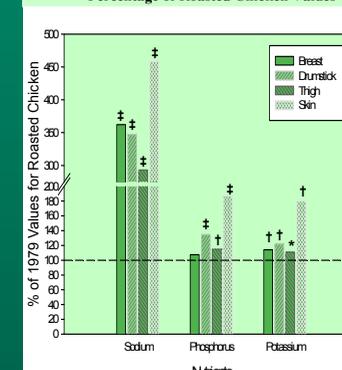
Statistically significant differences between roasted chicken values and rotisserie chicken values (two-tailed t-test) are denoted as follows: *P<0.05, †P<0.01, ‡P<0.001

Figure 3. Magnesium, Calcium, and Iron Content of Rotisserie Chicken as a Percentage of Roasted Chicken Values



Statistically significant differences between roasted chicken values and rotisserie chicken values (two-tailed t-test) are denoted as follows: *P<0.05, †P<0.01, ‡P<0.001

Figure 4. Sodium, Phosphorus, and Potassium Content of Rotisserie Chicken as a Percentage of Roasted Chicken Values



Statistically significant differences between roasted chicken values and rotisserie chicken values (two-tailed t-test) are denoted as follows: *P<0.05, †P<0.01, ‡P<0.001

RESULTS

- Compared to SR values for roasted chicken:
- All dark meat products and skin from rotisserie chicken were significantly higher in cholesterol (Fig. 2), sodium, potassium, and phosphorus (Fig. 4).
 - Breast meat from rotisserie chicken had significantly greater sodium and potassium content (Fig. 4), but was significantly lower in magnesium (Fig. 3).
 - Rotisserie chicken skin was lower in protein and fat (Fig. 1, Fig. 2).
 - Iron tended to be lower in all rotisserie chicken products and was significantly lower in rotisserie breast (Fig. 3).
 - Ash was significantly higher in breast (P<0.05) and skin (P<0.001) (Fig. 1).
 - Niacin was significantly lower in breast and thigh meat from rotisserie chicken (Table 2).

CONCLUSIONS

- The higher levels of potassium, phosphorus, and sodium contribute to the increase in ash content and reflect the addition of ingredients through chemical enhancement or marinades added to rotisserie chicken products.
- Increased levels of potassium, phosphorus, and sodium consumed via rotisserie chicken products may play a role, albeit different, in maintaining health in consumers.
- Decreases in iron content of rotisserie chicken may reflect dilution effects of pre-cooking treatment applied (i.e. chemical enhancement or marinades).
- There may be changes in poultry composition since 1979 when last analyzed; for example, increases in the cholesterol level of rotisserie chicken may signify a change in the product rather than treatment or cooking preparation. Plans are underway to re-evaluate non-enhanced chicken to determine if there has been appreciable change in nutrient composition.

REFERENCES

- U.S. Department of Agriculture, Agricultural Research Service. 2005. USDA National Nutrient Database for Standard Reference, Release 18. Nutrient Data Laboratory Home Page. <http://www.ars.usda.gov/nutrientdata>.
- Perry, CR, Pehrsson, PR, Holden, J. 2003. A Revised Sampling Plan for Obtaining Food Products for Nutrient Analysis for the USDA National Nutrient Database. 2003. Proceedings of the American Statistical Association, Section on Survey Research Methods [CD-ROM], Alexandria, VA: American Statistical Association, San Francisco, CA.