CONTENTS AND RETENTIONS OF PURINE BASES IN TURKEY BREAST

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Background

Concerns about the purine contents of muscle foods and their retentions upon cooking are warranted, since: 1) a number of diseases, traceable to an imbalance in the endogenous production or excretion of uric acid, can be exacerbated by diets high in fat, protein or nucleic acid, and the purine nucleic acid intake has the greatest dietary influence on serum uric acid levels (Sarwar and Brulé, 1991); 2) on the other hand, there is a growing body of scientific evidence that demonstrates the manifold protective roles of nucleosides and nucleotides, e.g. in the enhancement of the normal host defence system (both cellular and humoral immunity), and in the maintenance of intestinal integrity (Carver and Walker, 1995; Leleiko and Walsh, 1995; Abbracchio and Burnstock, 1998).

Objectives

The aim of this study was twofold: a) to quantify the content of purine bases in turkey breast roasts both raw and cooked by two methods; b) to determine and compare true and apparent retention values of these nutrients.

Methods

Ten boneless and skinless tom turkey breasts (4.41-4.78 kg) were obtained from an industrial abattoir after 72 h of maturation at 3°C (ultimate pH value ± s.e. = 5.73 ± 0.03). *Pectoralis superficialis* (PS) muscles were excised from both sides of each breast and trimmed of external fat and tendons. A roast about 1 kg weight was obtained as the centre section from each PS muscle, then rolled and wrapped in an elastic netting, while the two tapering ends were retained as the raw reference for each roast. Paired PS roasts from the left and right side of each breast were assigned in turn to a "conventional" oven or a microwave oven.

Conventional roasting was performed at 160°C in a preheated (180°C) forced air convection oven. An iron-constantan thermocouple inserted in the centre of the roast was used to determine when a core end-point temperature of 85°C was reached. Each roast had been turned halfway through cooking. For microwave roasting (2450 MHz, 1000 Watts variable power oven equipped with a revolving plate), the power control was set at "high" (750 W) for the first 22 min, then at "roast" (500 W) for the following 20 min. Such a cooking procedure was developed during preliminary tests to attain a final core temperature of 85°C, as checked with a digital thermometer upon removal from the oven. Each microwaved roast was allowed an uncovered 20-min standing period after cooking. Cooking losses (drip, evaporative, and total) were evaluated as outlined by Badiani *et al.* (1998).

Each roast and the adjacent raw reference were trimmed of surface browning if any, diced, homogenised and analysed for moisture, protein, and ash (AOAC, 1995), total lipids (Folch *et al.*, 1957), and individual purine bases (Brulé *et al.*, 1988). Percent true (TR) and apparent (AR) retentions of nutrients were calculated according to Murphy *et al.* (1975). Data were submitted to ANOVA (between-within design) and, whenever appropriate, to Scheffé *post hoc* test ($P \leq 0.05$).

Results and discussion

Proximate composition of raw turkey breast (Table 1) was fully comparable with figures from the most widespread food composition tables (Souci *et al.*, 1994; Chan *et al.*, 1995; USDA, 1999). Cooking progression in convection oven (CO) was remarkably different from that observed in microwave oven (MO) for evaporative loss (CO 31.1%; MO 40.9%), and consequently total losses (CO 31.6%; MO 41.5%), while being substantially similar for drip loss (CO 0.5%; MO 0.6%). As an outcome, cooked roasts were significantly different for moisture and protein contents, and, what counts most, for TR values of dry matter, protein, and ash (Table 1), the higher values coming from CO roasts due to their lower cooking losses. With the single exception of the figure for dry matter, AR values for CO and MO roasts were almost equivalent and considerably higher than their TR counterparts, as expected from previous work (Manfredini *et al.*, 1998; Badiani *et al.*, 2000).

The content of purine bases in raw turkey breast (Table 2) was rather higher than the only set of data available in literature for turkey meat, i.e. that given by Sarwar *et al.* (1985) for a mixture of light and dark flesh, who reported the following figures (mg/100 g): adenine (ADE) 13.05, guanine (GUA) 11.60, xanthine (XAN) 0, hypoxanthine (HYP) 71.34. A more informative comparison (at least from the nutritional standpoint) could be made with data deriving from exactly the same analytical procedure applied to several beef cuts (Manfredini *et al.*, 1998), or to pig loin (Badiani *et al.*, 2000). The raw turkey breast presently considered compared fairly well with pork for ADE and HYP, while being richer in GUA and XAN. Compared with the purine contents of beef cuts, the present data were higher for all bases except for XAN. The turkey meat presently analysed was therefore rather rich in purine bases, a sort of two-edged nutritional feature.

Upon cooking, a sheer effect of concentration was evident only for ADE and GUA, while XAN and HYP underwent much more moderate, though still significant, changes. CO and MO cooked roasts did not differ as to the content in purine bases. The same applied to purine TR values (Table 2), with the single exception of GUA, though CO figures were generally higher than MO ones. By and large, TR values for purine bases in turkey meat were fairly comparable to those found by Manfredini *et al.* (1998) in oven roasted or microwaved beef, especially for ADE, XAN, and HYP, while being lower than the values reported by Badiani *et al.* (2000) for ADE and GUA in oven roasted or microwaved pork.

As in beef and pork, also in turkey breast meat HYP proved to be the purine basis more prone to leaching.

Conclusions

Compared to the most common meat (beef and pork), turkey breast meat proved to be rather rich in purine bases. True retention values of purine bases in turkey breast meat were slightly higher following convection oven roasting than microwaving, though significantly so only for guanine.

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Table 1 - Proximate composition and retention values of turkey roasts both raw and cooked in convection and microwave ovens[1]
(see relevant notes at the foot of the page)

Nutrient[2, 3]	State	Content (g/100 g lean)			Type	Retention (%)		
		Convection	Microwave	MSE[6]		Convection	Microwave	MSE
Moisture[5]	RW	74.02 a	74.02 a	0.20	TR	90.3 a	80.0 b	3.4
	CK	65.56 a	64.29 b		AR	133 b	137 a	
Protein	RW	23.65 a	23.72 a	0.16	TR	92.3 a	82.2 b	2.5
	CK	32.01 b	33.51 a		AR	102 a	103 a	
Lipids	RW	1.36 a	1.24 a	0.04	TR	90.2 a	81.4 a	3.7
	CK	1.87 a	1.80 a		AR	100 a	102 a	
Ash	RW	1.11 a	1.11 a	0.002	TR	72.6 a	64.1 b	1.2
	CK	1.18 a	1.23 a		AR	80.3 a	80.1 a	

Table 2 - Purine content and retention values of turkey roasts both raw and cooked in convection and microwave ovens[1]
(see relevant notes at the foot of the page)

Nutrient[2, 4]	State	Content (mg/100 g lean)			Type	Retention (%)		
		Convection	Microwave	MSE[6]		Convection	Microwave	MSE
Adenine	RW	17.03	17.00	0.55	TR	78.4	71.1	2.3
	CK	19.62	20.81		AR	86.9	89.0	
Guanine	RW	23.51	23.39	0.92	TR	88.0 a	76.8 b	2.3
	CK	30.34	30.93		AR	97.4	96.1	
Xanthine	RW	1.08	1.13	0.03	TR	79.1	66.1	7.0
	CK	1.26	1.27		AR	87.7	82.5	
Hypoxanthine	RW	90.20	90.30	14.8	TR	66.0	58.9	1.6
	CK	87.16	91.33		AR	73.0	73.7	

1 State: RW = raw; CK = cooked - Type: TR = true retention; AR = apparent retention.
2 Under each heading, means within a column and trait were always significantly different ($P \leq 0.05$).
3 Under each heading, means on the same row followed by different letters differ significantly ($P \leq 0.05$).
4 Under each heading, no statistically significant difference emerged between means on the same row, with the single exception of TR for guanine ($P \leq 0.05$).
5 For this trait, retention values refer to dry matter.
6 MSE = mean square error.