

# Alternate Red Meat Products: Nutrient Data, Cooking Yields and Nutrient Retention Values

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## ABSTRACT

Meat and poultry products, such as beef, pork, lamb, veal, chicken and turkey provide valuable nutrients to the diet, including large amounts of high quality protein, important minerals such as iron and zinc, and significant amounts of B-vitamins. During the 1990's, other sources of "red" meat emerged as alternatives in the meat supply, such as farm-raised bison, elk, deer, emu and ostrich. To date, little nutrient information has been available on the products of these species, even though they are raised in the U.S. A study was conducted to determine the nutrient values of alternate red meat (ARM) products, as well as cooking yields and nutrient retention values. The ARM products analyzed represent different geographic areas of production and processing, and methods of feeding/raising the animals. In most cases, 6 samples (or products of 6 animals) were included in the analyses (5 for elk). All ground meat products were analyzed raw and cooked; cooked products were pan-broiled to an internal temperature of 160°F. Nutrient analyses were conducted by a commercial analytical laboratory. Nutrients measured include proximates, cholesterol, iron, zinc, thiamin, niacin, riboflavin, and vitamins B<sub>6</sub> and B<sub>12</sub>. Nutrient data and weights were processed through the yields and retentions module of the USDA database system. ARM proved to be a relatively equal source of protein when compared with beef. Deer, elk, emu and ostrich were lower in fat and saturated fat than beef. ARM nutrient retentions of thiamin and the B vitamins were greater than for beef. This study indicates that these alternate red meat products can serve as a healthful substitute for red meat.

## INTRODUCTION

Alternative sources of red meat have emerged in the US meat supply. These sources include: bison, deer, elk, emu and ostrich. There is currently little nutrient information available for the majority of the alternate red meat products. While the USDA Standard Reference for Nutrient Data contains some nutrient data on deer, elk, and bison, the results from this study will expand our nutrient information to other forms and cuts of these products and add information on two new product sources: emu and ostrich. There is also a need for information on cooking yields and nutrient retention values for these alternate red meat products.

## OBJECTIVES

To examine the Nutrient Content of Alternate Red Meat (ARM) sources:

Bison  
Deer  
Elk  
Emu  
Ostrich

To determine the Cooking Yield and Nutrient Retention Values of Alternate Red Meat Products

## METHODS AND ANALYSES

### Sampling:

Varied geographic areas of production and processing  
Varied methods of feeding and raising animals  
n = 6 (elk: n = 5)

### Cooking Procedure:

Four ounce (4 oz) ground meat patties were pan-broiled to 160°F

### Nutrient Analysis:

Nutrient values for raw and cooked products were determined:

Moisture	Iron	Niacin
Protein	Zinc	Riboflavin
Total Fat	Sodium	Vitamin B <sub>6</sub>
Saturated Fat	Thiamin	Vitamin

## CALCULATIONS AND FORMULAS

### YIELD

$$\frac{\text{Cooked sample cooked weight}}{\text{Cooked sample raw weight}} \times 100$$

### RETENTION

$$100 \times \frac{N_c}{N_r} \times \text{Yield}$$

N<sub>c</sub> = nutrient value per 100 grams of cooked food  
N<sub>r</sub> = nutrient value per 100 grams of raw food

### MOISTURE GAIN/LOSS

$$\frac{(\%H_2O \text{ ckd sample} \times \text{wgt (g) ckd sample}) - (\%H_2O \text{ raw sample} \times \text{wgt (g) raw sample})}{\text{g raw food}} \times 100$$

### FAT GAIN/LOSS

$$\frac{(\%fat \text{ ckd sample} \times \text{wgt (g) ckd sample}) - (\%fat \text{ raw sample} \times \text{wgt (g) raw sample})}{\text{g raw food}} \times 100$$

## Proximate and Cholesterol Content of ARM Products and Beef, Raw and Cooked

Product (raw/ckd)	Moisture (g/100g)	Protein (g/100g)	Total Fat (g/100g)	Saturated Fat (g/100g)	Cholesterol (mg/100g)
Beef (R) <sup>1</sup>	64.25	18.67	15.93	6.802	70
Beef (C)	59.53	23.77	15.13	6.461	83
Bison (R)	63.19	18.70	17.06	6.810	69
Bison (C)	57.26	25.40	16.33	6.420	84
Deer (R)	71.15	21.78	7.13	3.361	80
Deer (C)	64.23	26.45	8.22	3.993	98
Elk (R) <sup>2</sup>	68.84	21.76	8.82	3.469	66
Elk (C)	64.14	26.64	8.74	4.002	78
Emu (R)	72.87	22.77	4.03	1.022	69
Emu (C)	65.83	28.43	4.65	1.242	87
Ostrich (R)	71.07	20.22	8.70	2.177	71
Ostrich (C)	67.12	26.15	7.07	1.793	83

n=6

<sup>1</sup>Previously released, USDA Nutrient Database for Standard Reference, Release 14

<sup>2</sup>n=5

## Cooking Yields of ARM Products and Beef

Product	Yield (Range)	Moisture +/-	Fat +/-
Beef <sup>1</sup>	73.00 (64-85)	-20.12	-4.78
Bison	77.42 (76-79)	-18.15	-4.21
Deer	83.30 (81-85)	-17.71	-0.05
Elk <sup>2</sup>	84.54 (80-89)	-4.43	-0.44
Emu	80.03 (71-86)	-20.23	-0.20
Ostrich	85.75 (81-88)	-13.47	-2.68

n=6

<sup>1</sup>AH-102: Food Yields Summarized by Different Stages of Preparation

<sup>2</sup>n=4

## RESULTS

Alternate Red Meats are equally good sources of protein as beef

Deer, elk, emu and ostrich are lower in fat and saturated fat than beef or bison

All ARM products provide more iron than beef

All ARM products have higher cooking yields than beef

ARM products provided twice as much thiamin as beef

Thiamin retention after cooking is higher in emu and ostrich compared to beef, bison, deer and elk

Retention of vitamins B<sub>6</sub> and B<sub>12</sub> after cooking is greater in all ARM products when compared to beef

Of the ARM products studied, emu provides the most iron, niacin, riboflavin, vitamins B<sub>6</sub> and B<sub>12</sub>, and is lowest in total fat and saturated fat

## Mineral and Vitamin Content of ARM Products and Beef, Raw and Cooked

Product (raw/ckd)	Iron (mg/100g)	Zinc (mg/100g)	Sodium (mg/100g)	Thiamin (mg/100g)	Niacin (mg/100g)	Riboflavin (mg/100g)	B <sub>6</sub> (mg/100g)	B <sub>12</sub> (mcg/100g)
Beef (R) <sup>1</sup>	1.95	4.14	66	.060	4.530	250	260	2.06
Beef (C)	2.35	5.45	70	.060	4.960	270	270	2.17
Bison (R)	2.60	4.29	66	.130	4.910	227	353	1.79
Bison (C)	3.08	5.14	73	.130	5.570	247	375	2.28
Deer (R)	2.92	4.20	75	.547	5.700	287	464	1.87
Deer (C)	3.35	5.20	78	.503	9.257	327	468	2.32
Elk (R) <sup>2</sup>	2.75	5.40	79	.125	4.890	260	336	2.13
Elk (C)	3.34	6.56	85	.125	5.320	320	420	2.57
Emu (R)	4.02	3.48	56	.270	7.485	457	642	6.75
Emu (C)	5.01	4.56	65	.318	8.925	545	833	8.52
Ostrich (R)	2.91	3.51	72	.182	4.377	267	475	4.61
Ostrich (C)	3.43	4.33	80	.213	6.557	268	501	5.74

n=6

<sup>1</sup>Previously released, USDA Nutrient Database for Standard Reference, Release 14

<sup>2</sup>n=5

## Nutrient Retention Values of ARM Products and Beef

Product	Iron (%)	Zinc (%)	Sodium (%)	Thiamin (%)	Niacin (%)	Riboflavin (%)	B <sub>6</sub> (%)	B <sub>12</sub> (%)
Beef <sup>1</sup>	95	100	85	80	90	95	60	80
Bison	92	92	87	79	86	85	83	96
Deer	95	100	86	85	100	91	97	100
Elk <sup>2</sup>	100	100	96	83	89	100	95	99
Emu	97	98	91	91	92	95	100	95
Ostrich	99	99	95	95	98	86	89	97

n=6

<sup>1</sup>Previously released, USDA Table of Nutrient Retention Factors, Release 4 (1998)

<sup>2</sup>n=4

## SUMMARY

Alternate red meats are a good source of protein and are lower in total fat and saturated fat than beef.

- Emu and ostrich have higher retentions of thiamin.
- ARM products generally have higher retentions of the B vitamins.
- Alternate red meat products can serve as a healthful replacement for red meat.