

# Wisconsin Meat Facts and Analysis

ME 01-03

## **Nutritive Content of Alternative Red Meat Products**

Ostrich – Emu – Venison – Elk – Bison

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Meat and poultry products provide valuable nutrients to the diet, including large amounts of high quality protein, important minerals such as iron and zinc, and significant amounts of five B-vitamins. Beef, pork, lamb, veal, chicken and turkey have traditionally been the primary meats consumed in the U.S. diet. 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. Because of their red color and the fact that most have not been traditionally consumed in the U.S., these products are sometimes collectively described as "alternative red meats" (ARM).

For some of these species, meat was initially a by-product of their production. Animal parts such as hide (skin), antlers, feathers, and oil were sometimes the most valuable parts of the animals. However, over time, the meat has become a significant part of their value and is offered for sale at some retail stores and restaurants nationwide.

To date, little nutrient information has been available on the products of these species, as they are raised in the U.S. An exception is bison (American buffalo), which is really one of the original meat sources on this continent, and for which some nutrient information exists. In 1998 the United States Department of Agriculture (USDA) funded a research project at the University of Wisconsin entitled "Alternative Red Meat: Marketing and Processing Improvement." This work was administered through the Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP), and carried out by the Meat Science Laboratory (Animal Sciences Department). An important aspect of this project was determination of the nutrient content of ARM meat products. This article summarizes the findings of that nutrient study and compares them to nutrient information on traditional meat sources.

### Source of ARM Products Tested

To assure that the nutrient information obtained was representative of products marketed across the U.S., ARM products were selected for analysis to represent different geographic areas of production and processing, methods of feeding/raising the animals, and organizations that are strongly involved in marketing products. In most cases, 6 samples (or products of 6 animals) were included in the analyses. For venison, bison and elk, several cuts and ground product were examined. For ostrich, only ground product was tested, since Texas A & M University had already done nutrient analyses on ostrich products. Likewise, Texas Tech University had earlier analyzed nutrients in some emu cuts, so this study only examined the nutrient content of ground emu and two selected cuts.



## ARM Product Preparation and Nutrient Analysis

Meat products were most often received as prepared cuts or patties, ready for cooking. Bison cuts were received as vacuum-packaged primal sections which were cut into steaks while still in the frozen state. When ground product was received in bulk form, four-ounce patties were formed prior to cooking. All ARM cuts reported here were broiled to a final internal temperature of 160°F, which corresponds to a medium degree of doneness. Ground products were pan-broiled to an internal temperature of 160°F, the minimum temperature recommended for ground meat patties to insure safety from pathogenic bacteria.

The nutrient content of the trimmed, cooked lean was determined by a commercial analytical laboratory. All procedures used in product preparation and nutrient analysis were approved by personnel at the USDA Nutrient Data Laboratory to insure that the results would be acceptable for later inclusion in their Nutrient Database for Standard Reference.

## Source of Nutrient Information on Traditional Meats

The most respected source of nutrient information on foods is the USDA Nutrient Data Laboratory's "Nutrient Database for Standard Reference." This is available to everyone via the internet at [www.nal.usda.gov/fnic/foodcomp](http://www.nal.usda.gov/fnic/foodcomp). Comparative nutrient values for beef, pork, lamb, veal, chicken and turkey products provided in this report were obtained from that web-based source.

## Nutrient Composition of Cooked Meat Cuts

Table 1 presents key nutrients present in selected ARM cuts and in comparable cuts of traditional meat and poultry. The information is based upon cooked, three-ounce servings, trimmed of external waste fat, or with skin-removed. Three ounces is the standard serving size designated by nutrition authorities for expressing the nutrient content of fresh meat and poultry products. A three-ounce cooked serving is the size of a quarter-pound hamburger (4 oz. raw = 3 oz. after cooking), or the size of a standard size deck of playing cards. The USDA's Food Guide Pyramid recommends two to three servings of meat, poultry, fish, beans, eggs and/or nuts daily.

While this project analyzed many nutrients in ARM products (including all minerals, vitamins, amino acids and fatty acids), Table 1 reports only key nutrients for which meat provides significant amounts - protein, iron, vitamin B<sub>6</sub> and vitamin B<sub>12</sub>. Total fat, saturated fat (a part of the total fat), cholesterol and calories are also provided because of consumer interest in these components and their association with important dietary recommendations. Daily recommended intakes of nutrients, as provided by government agencies and health organizations, are included for comparison.

All meat and poultry cuts are excellent sources of high-quality protein, with a three-ounce cooked serving providing about one-half of most individuals' daily protein needs.



In general, cooked cuts from the ARM species were lower in fat and saturated fat than comparable beef, pork, and lamb cuts, and chicken thigh. However, the meat of all species was fairly similar in cholesterol content. Although cholesterol is a lipid material, it is not the same as fat and does not vary with fat content of the meat. For example, veal products are lower in fat, but relatively higher in cholesterol. Most of the cholesterol found in meat is associated with muscle and fat cell membranes.

ARM products are very good sources of iron, an important element required for red blood cell formation. Since much of the iron in meat is associated with the red meat pigment myoglobin, the strong red color of ARM products predicts higher iron contents.

Three-ounce servings of the ARM cuts provided from 18% to 35% of the daily Vitamin B<sub>6</sub> needs. Vitamin B<sub>12</sub>, required for the synthesis of DNA and for growth and development, is only found in animal products. Meat cuts varied substantially in vitamin B<sub>12</sub> content, ranging from 12% of the daily recommended intakes from a single serving of chicken or turkey to 130% of the recommended daily intake from one serving of venison tenderloin.

#### Nutrient Composition of Cooked Ground Meat

Producers of all ARM species market ground products. The fat content of ground products can vary widely and is determined by the types of raw materials used. For example, raw ground beef can range from 5 to 30% fat. In these analyses, ground ARM products represented what was commercially available from industry sources. The average fat content of raw products in this study was: ostrich - 8.7%; emu - 4.0%; venison - 7.1%; bison - 16.2%; and elk - 8.8%. The ground beef and ground turkey included in Table 2 for comparison purposes contained 17% fat (similar to ground chuck) and 8% fat, respectively, in the raw state.

Many of the observations noted above for cooked cuts likewise hold for cooked ground products. ARM ground products tended to be lower in fat and saturated fat, higher in iron, and similar in cholesterol content to ground beef or turkey. An exception was ground bison which was very similar to the ground beef. Ground emu and ostrich were substantially higher in vitamin B<sub>12</sub>.

#### Summary

This article summarizes determinations of the nutrient content of cooked products from Alternative Red Meat species (ostrich, emu, venison, bison and elk), and compares them to the nutrient content of traditional meat and poultry species. In general, ARM products tend to be lower in fat and saturated fat, higher in iron and similar in protein, vitamin B<sub>6</sub> and cholesterol when compared to most traditional meat products. Emu and ostrich were found to have higher levels of vitamin B<sub>12</sub>.

For a complete copy of the University of Wisconsin report, contact Dennis Buege (608-262-0463). Cost is \$5 to cover copying charges.

*This fact sheet has been peer-reviewed by Susan Nitzke and Sherry Tanumihardjo, Department of Nutritional Sciences, University of Wisconsin-Madison.*



**Table 1. Nutrient Content of Alternative Red Meat, and Traditional Meat and Poultry Cuts**

- Based upon 3 oz. (85 gram) cooked, trimmed/skinless servings -

Product	Calories	Protein (gm)	Total Fat (gm)	Saturated Fat (gm)	Cholesterol (mg)	Iron (mg)	Vit B <sub>6</sub> (mg)	Vit B <sub>12</sub> (mcg)
Daily Dietary Recommendations*	1600-2800	50	<65	<20	<300	8 - M 18 - F	1.7	2.4
<b>Ostrich<sup>1</sup></b>								
Fan	114	22	2.3	0.7	65	2.4	NA	NA
Top loin	132	24	3.3	1.0	79	2.8	NA	NA
Inside strip	139	25	3.6	1.1	82	4.1	NA	NA
Tenderloin	113	20	3.2	1.0	81	2.4	NA	NA
<b>Emu</b>								
Fan	122	26	2.0	0.5	70	3.9	NA	NA
Loin	123	25	2.7	0.7	75	4.3	NA	NA
Full Rump <sup>2</sup>	143	29	2.3	0.7	NA	5.9	0.8	1.9
Inside drum <sup>2</sup>	133	28	1.7	0.6	NA	6.2	0.8	2.0
<b>Venison</b>								
Round	129	27	1.6	0.8	72	3.6	0.6	2.0
Loin	128	26	2.0	1.0	67	3.5	0.6	1.6
Tenderloin	127	25	2.0	1.0	75	3.6	0.5	3.1
<b>Bison</b>								
Round	146	26	3.9	1.7	71	3.0	0.5	1.6
Rib	151	25	4.8	2.1	67	2.5	0.4	1.1
Sirloin	146	24	4.8	2.1	73	3.0	0.5	2.4
<b>Elk</b>								
Round	131	26	2.2	1.1	66	3.5	0.4	1.3
Rib/loin	141	26	3.3	1.6	64	3.4	0.4	0.7
Tenderloin	137	26	2.9	1.4	61	3.5	NA	NA



Table 1 continued

Product	Calories	Protein (gm)	Total Fat (gm)	Saturated Fat (gm)	Cholesterol (mg)	Iron (mg)	Vit B <sub>6</sub> (mg)	Vit B <sub>12</sub> (mcg)
Daily Dietary Recommendations*	1600- 2800	50	<65	<20	<300	8 - M 18 - F	1.7	2.4
<b>Beef<sup>3</sup></b>								
Round	161	27	5.0	1.7	71	2.4	0.5	2.1
Loin	182	29	8.6	3.3	65	2.1	0.4	1.7
<b>Pork<sup>3</sup></b>								
Leg (fresh)	179	25	8.0	2.8	80	1.0	0.4	0.6
Loin	173	26	6.6	2.3	68	0.7	0.3	0.6
<b>Lamb<sup>3</sup></b>								
Leg	162	24	6.6	2.4	76	1.8	0.1	2.2
Loin	183	25	8.3	3.0	80	1.7	0.1	1.8
<b>Veal<sup>3</sup></b>								
Leg	128	24	2.9	1.0	88	0.8	0.3	1.0
Loin	149	26	5.9	2.2	90	0.7	0.3	1.1
<b>Chicken<sup>3</sup></b>								
Breast	140	26	3.0	0.9	72	0.9	0.5	0.3
Thigh	178	22	9.2	2.6	81	1.1	0.3	0.3
<b>Turkey<sup>3</sup></b>								
Breast	115	26	0.6	0.2	71	1.3	0.5	0.3
Dark meat	138	25	3.7	1.2	95	2.0	0.3	0.3

gm = grams; mg = milligrams; mcg = micrograms; M = males; F = females

<sup>1</sup>Source: Ostrich Meat Industry Development Final Reports (1993 and 1996), Texas A&M University.

<sup>2</sup>Source: Texas Tech University

<sup>3</sup>Source: USDA Nutrient Database for Standard Reference.

\*Based on FDA's Daily Values for a 2000-calorie diet, and the Institute of Medicine's Dietary Reference Intakes for iron, B<sub>6</sub> and B<sub>12</sub>.



**Table 2. Nutrient Content of Cooked Ground Product from Alternative Red Meat, and Traditional Meat and Poultry Species.**

- Based upon 3 oz. (85 grams) of cooked product -

Product	Calories (gm)	Protein (gm)	Total Fat (gm)	Saturated Fat (gm)	Cholesterol (mg)	Iron (mg)	Vit B <sub>6</sub> (mg)	Vit B <sub>12</sub> (mcg)
Daily Dietary Recommendations*	1600-2800	50	<65	<20	<300	8 - M 18 - F	1.7	2.4
Ground Ostrich	149	22	6.0	1.6	71	2.9	0.4	4.9
Ground Emu	139	24	4.0	1.1	74	4.3	0.7	7.2
Ground Venison	160	23	7.0	3.6	83	2.8	0.4	2.0
Ground Bison	202	20	12.9	5.7	70	2.6	0.3	1.9
Ground Elk	162	23	7.4	3.6	66	2.8	0.4	2.2
Ground Beef**	217	21	13.9	5.5	69	2.0	0.2	1.7
Ground Turkey**	200	23	11.2	2.9	87	1.6	0.3	0.3

Intakes for iron, B<sub>6</sub> and B<sub>12</sub>.

\*Source: USDA Nutrient Database for Standard Reference

- ground beef is 17% fat in raw state (similar to ground chuck). Pan-fried.
- ground turkey is 8% fat in raw state. Cooked.

\*Based on FDA's Daily Values for a 2000-calorie diet, and the Institute of Medicine's Dietary Reference

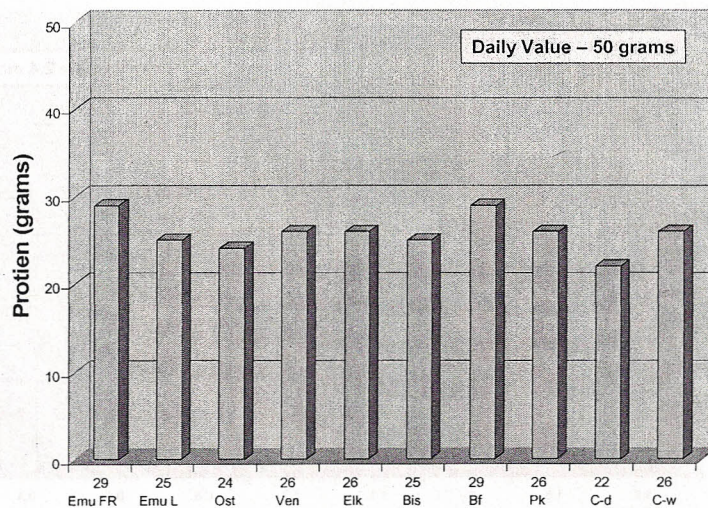
"NutritiveContent", HD-Arm & Misc. #8, 11-12-01



## Product Key

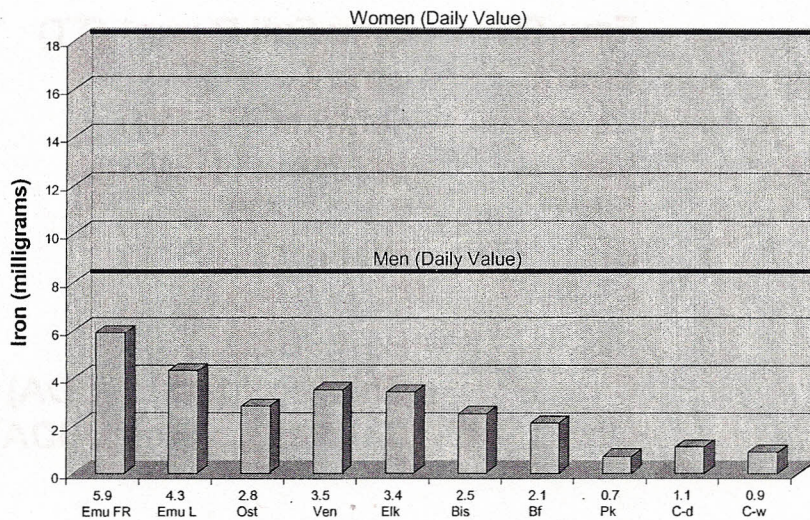
Emu FR	-- Emu Full Rump* (TT)
Emu L	-- Emu Loin* (TT)
Ost	-- Ostrich* (TAMU)
Ven	-- Venison** (UW)
Elk	-- Elk** (UW)
Bis	-- Bison** (UW)
Bf	-- Beef (USDA)
Pk	-- Pork (USDA)
C-d	-- Chicken (dark) (USDA)
C-w	-- Chicken (white) (USDA)

Protein from Rib/Loin – 3 Ounce Cooked,  
Trimmed/Skinless Serving

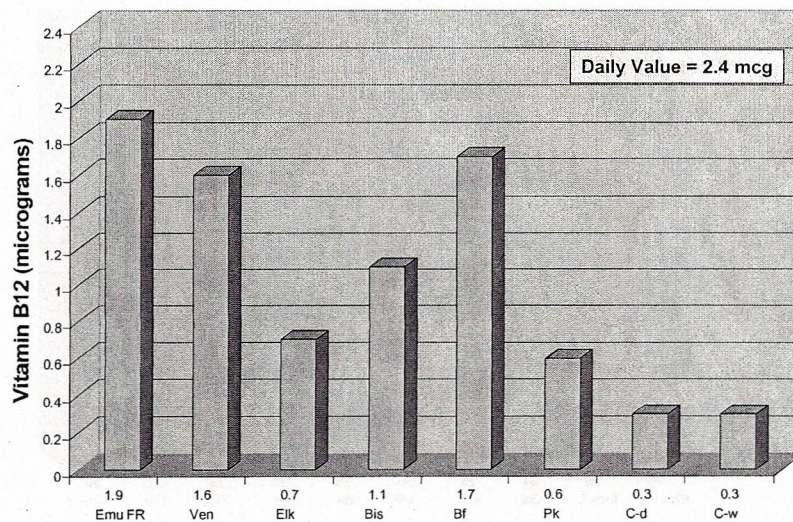




**Iron Content of Rib/Loin  
3 Ounce Cooked, Trimmed/Skinless Serving**

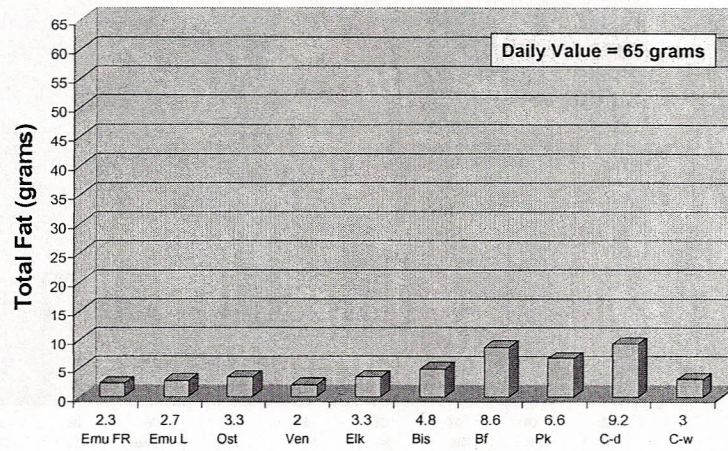


**Vitamin B<sub>12</sub> from Rib/Loin – 3 Ounce Cooked,  
Trimmed/Skinless Serving**

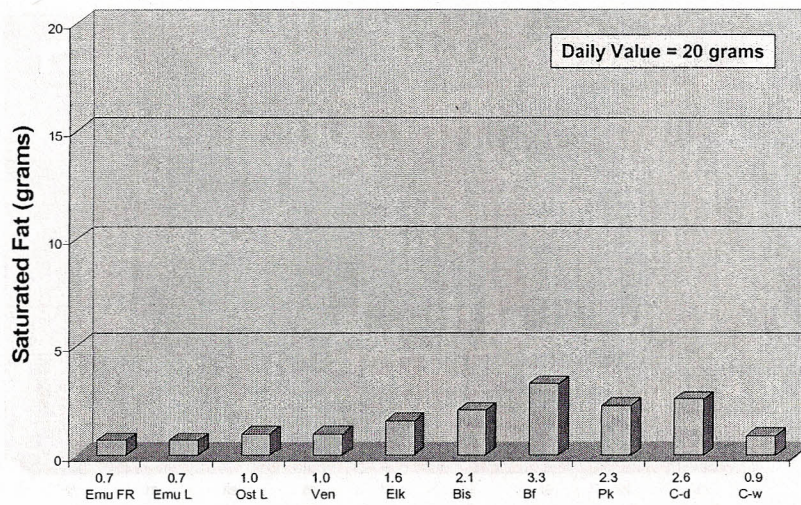




**Total Fat From Rib/Loin – 3 Ounce Cooked,  
Trimmed/Skinless Servings**

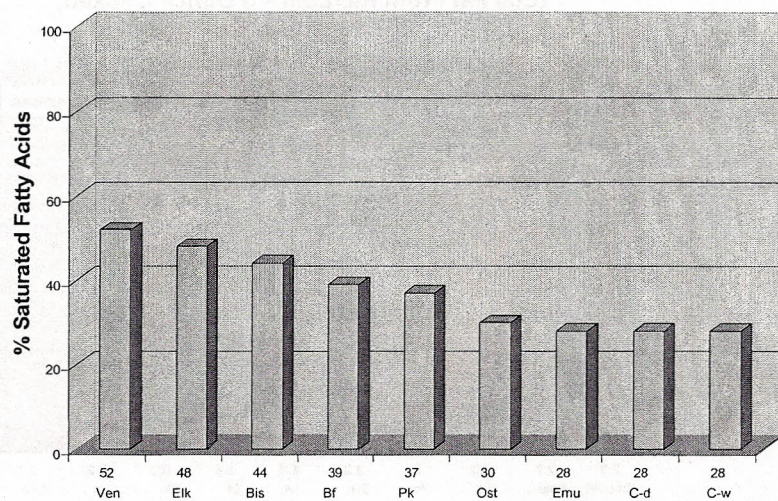


**Saturated Fat from Rib/Loin  
3 Ounce Cooked, Trimmed/Skinless Servings**

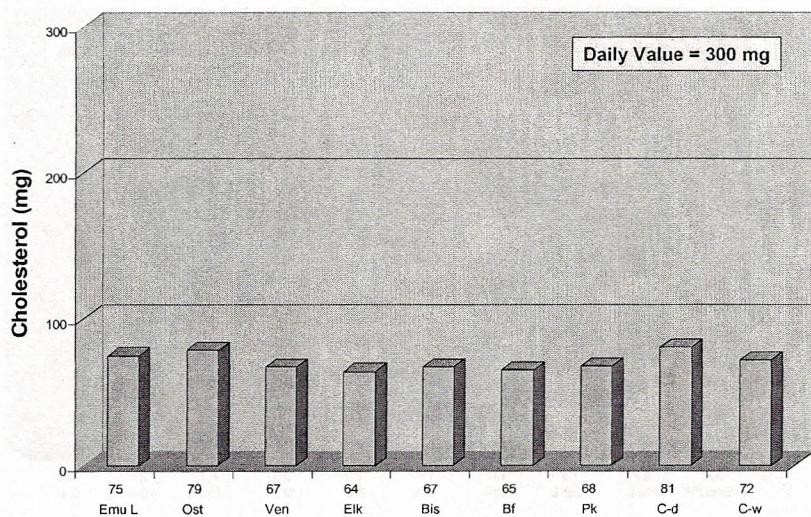




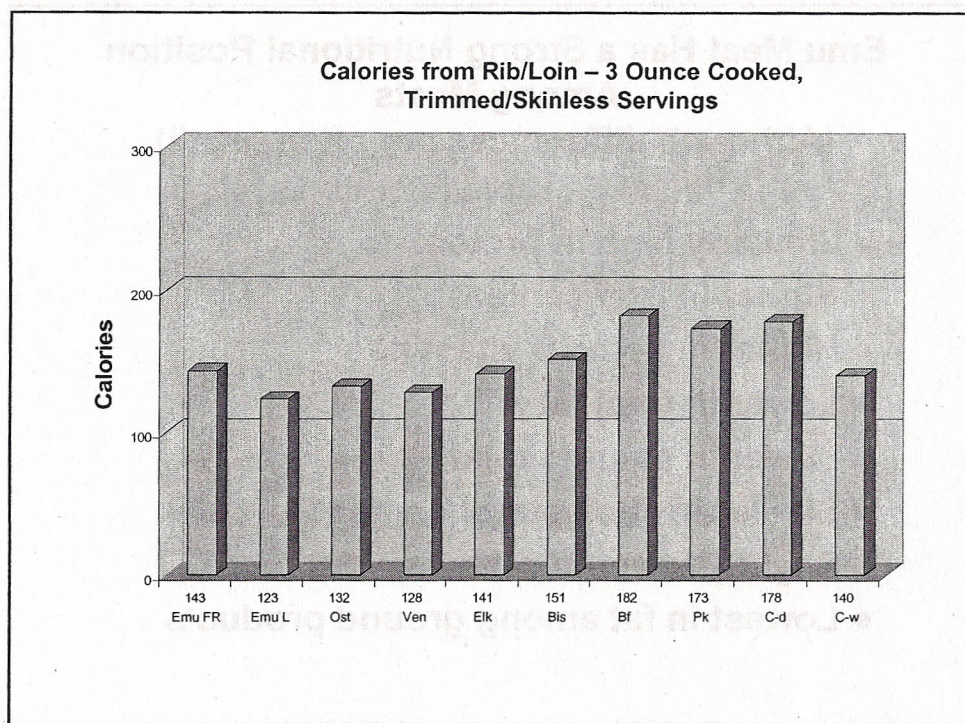
**% Saturated Fatty Acids in Fat**



**Cholesterol Content from Rib/Loin – 3 Ounce Cooked, Trimmed/Skinless Servings**







### **Total Fat – Ground Product 3 Ounce Cooked Servings**

<b>Emu</b>	<b>-- 4.0 grams</b>	<b>(4.7%)</b>
<b>Ost</b>	<b>-- 6.0</b>	<b>(7.1%)</b>
<b>Ven</b>	<b>-- 7.0</b>	<b>(8.2%)</b>
<b>Elk</b>	<b>-- 7.4</b>	<b>(8.7%)</b>
<b>Bis</b>	<b>-- 12.9</b>	<b>(15.2)</b>
<b>Bf</b>	<b>-- 13.9</b>	<b>(16.4%)</b>
<b>Turk</b>	<b>-- 11.2</b>	<b>(13.2%)</b>



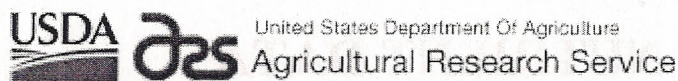
**Emu Meat Has a Strong Nutritional Position  
Among Meats**  
(Although differences are often small)

- Similarly high in protein
- Higher in iron content
- Higher in some B vitamins
- Lower in total fat
- Lower in saturated fat
- Similar in cholesterol content
- Slightly lower in calories
- Lowest in fat among ground products

**Total Fat - Ground Products**  
3 Ounce Cooked Servings

Emu - 4.0 grams (4.7%)	Emu - 4.0 grams (4.7%)
Oat - 8.6 (7.1%)	Oat - 8.6 (7.1%)
Ven - 7.0 (8.3%)	Ven - 7.0 (8.3%)
Eik - 7.4 (8.7%)	Eik - 7.4 (8.7%)
Bir - 12.9 (15.2%)	Bir - 12.9 (15.2%)
BT - 13.9 (16.4%)	BT - 13.9 (16.4%)
Turk - 17.3 (19.3%)	Turk - 17.3 (19.3%)





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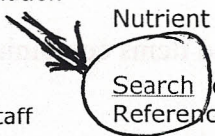
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Service

## NUTRIENT DATA LABORATORY

### Search the USDA National Nutrient Database for Standard Reference

This interface allows simple searches. Enter up to 5 keywords which best describe your food item. Select a Food Group. Then click on the Submit button. If you don't get a match, check your spelling or try a related keyword. If you get too many food items, try a more specific keyword. If you enter two or more keywords, the program will search for food items which contain all of the keywords. Keywords do not have to be adjacent or in the same order as they appear in the food item. You can exclude food items by placing the word "not" in front of a keyword.

For Example: Entering "apples not canned" will produce a list of food items containing the keyword "apples" but not the keyword "canned".

If you want to view reports on foods by single nutrients, such as calcium or niacin, view our [Nutrient Lists](#).

For more [information](#), including [documentation](#) and files for downloading, on SR18.

Keyword(s):  [Help](#)

Select Food Group: All Food Groups ☐

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## Search result from the USDA National Nutrient Database for Standard Reference

Click on the round "button" next to the item of interest. Then click on the Submit button.  
Click [here](#) to enter a new query.

Found 12 items about : **emu**

- ☐ Emu, fan fillet, cooked, broiled
- ☐ Emu, fan fillet, raw
- ☐ Emu, flat fillet, raw
- ☐ Emu, full rump, cooked, broiled
- ☐ Emu, full rump, raw
- ☒ Emu, ground, cooked, pan-broiled
- ☐ Emu, ground, raw
- ☐ Emu, inside drum, raw
- ☐ Emu, inside drums, cooked, broiled
- ☐ Emu, outside drum, raw
- ☐ Emu, oyster, raw
- ☐ Emu, top loin, cooked, broiled

Submit

## Emu, ground, cooked, pan-broiled

NDB No: 05622

Scientific Name: *Dromaius novaehollandiae*

Click on the check boxes preceding the weights to be reported. If you select 100 grams, then standard error and number of data points will also be displayed. You may select up to 5 weights. Nutrient values can be calculated for any desired gram weight by clicking on the amount field for the weight to be reported and entering a decimal multiplier to calculate the desired weight. Then click on the Submit button. Click [here](#) to enter a new query.

For example: if the gram weight is 100 and you would like a report of the nutrient values for 75 grams, simply enter .75 in the amount field for 100 grams. For help with the decimal values for some common fractions click [here](#) for [tips on Fractions](#).

Select	Amount	Description	Gram Weight
<input checked="" type="checkbox"/>	1.00	100 grams	100
<input type="checkbox"/>	1.00	1 patty (yield from 135.8 g raw meat)	109
<input checked="" type="checkbox"/>	1.00	1 serving ( 3 oz )	85

Submit



# Emu, ground, cooked, pan-broiled

[New Search](#)

Refuse: 0%

Scientific Name: *Dromaius novaehollandiae*

NDB No: 05622 (Nutrient values and weights are for edible portion)

Nutrient	Units	Value per 100 grams	Number of Data Points	Std. Error	1.00 X 1 serving ( 3 oz ) ----- 85g
<b>Proximates</b>					
Water	g	65.83	6	0.525	55.96
Energy	kcal	163	0	0	139
Energy	kJ	683	0	0	581
Protein	g	28.43	6	0.592	24.17
Total lipid (fat)	g	4.65	6	0.884	3.95
Ash	g	1.17	6	0.033	0.99
Carbohydrate, by difference	g	0.00	0	0	0.00
Fiber, total dietary	g	0.0	0	0	0.0
Sugars, total	g	0.00	0	0	0.00
<b>Minerals</b>					
Calcium, Ca	mg	8	6	0.395	7
Iron, Fe	mg	5.01	6	0.152	4.26
Magnesium, Mg	mg	29	6	0.254	25
Phosphorus, P	mg	269	6	2.216	229
Potassium, K	mg	375	6	4.529	319
Sodium, Na	mg	65	6	2.842	55
Zinc, Zn	mg	4.56	6	0.23	3.88
Copper, Cu	mg	0.238	6	0.012	0.202
Manganese, Mn	mg	0.030	6	0.001	0.025
Selenium, Se	mcg	43.5	2	0	37.0
<b>Vitamins</b>					
Vitamin C, total ascorbic acid	mg	0.0	0	0	0.0
Thiamin	mg	0.318	6	0.009	0.270
Riboflavin	mg	0.545	6	0.019	0.463
Niacin	mg	8.925	6	0.4	7.586
Pantothenic acid	mg	3.080	1	0	2.618
Vitamin B-6	mg	0.833	6	0.022	0.708
Folate, total	mcg	9	1	0	8
Folic acid	mcg	0	0	0	0
Folate, food	mcg	9	1	0	8
Folate, DFE	mcg_DFE	9	0	0	8
Vitamin B-12	mcg	8.52	6	0.358	7.24

This is the first of 3 pages of nutrient information in the data base for:

"Emu, ground, cooked, pan-broiled"