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Nutritional Content of Game Meat

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Hunting is a popular sport in Wyoming, and the antelope, deer, and elk harvested each fall greatly contribute to the meals eaten by many families. Bison (buffalo) meat has also become popular. Which nutrients do we get from game meat, and are there any health advantages to eating it? The answers to these questions become complex if one is confused by myths, misinformation, and the scientific jargon used in many publications. This bulletin is designed to provide straightforward nutrition information and discusses calories, protein, total fat, cholesterol, and various classes of fatty acids. Each nutrient is expressed in tabular form based on a 100-gram uncooked serving of game meat with all outside fat removed. In addition, Figure 1 illustrates the contribution a 100-gram trimmed, uncooked portion of antelope, deer, elk, bison, range-grazed beef, and grain-fed beef would make to the recommended daily intake levels for calories, protein, total fat, saturated fat, and cholesterol. Nutritionists recommend a two to three-ounce serving of meat twice a day. The three-ounce (eighty-five gram) cooked portion is also used in the meat nutrition information available in many grocery stores. This bulletin uses a standard of 100 grams for easier comparison between these data and those from other publications. One hundred grams is slightly less than the approximate 113 grams of raw meat one would prepare to have a three-ounce cooked portion.

Because the amount of most vitamins and minerals in meat does not vary greatly between species, these values are not reported. Information on the vitamin and mineral content of game meat is available in USDA Agriculture Handbook Number 8-17(2).

Fat composition not only varies among different animals but may also differ among the muscles in a single animal. Values for a common cut of meat that is generally tender (short





loin) and one that may require special preparation to ensure tenderness (bottom round) from several different animals were averaged. Beef is included in the tables for comparative purposes. All analyses were conducted at the University of Wyoming.

Calories

Table 1 indicates that game animals and range-grazed beef are slightly lower in calories than grain-fed beef. The difference between grain-fed beef and bison is only 32 calories, which is of little significance compared to the number of calories normally consumed in a day. (Figure 1 illustrates this point.) Two thousand calories per day is the midpoint for the recommendation by the National Academy of Sciences for women ages 23-50, for example. A 100-gram uncooked portion of these meats would only contribute from 5 to 7 percent of these 2,000 calories. Therefore, all of these meats can fit into a balanced diet or even a balanced weight-reduction diet.

Protein

Protein is an important component of our diet. All of the species reported below are excellent sources of high-quality protein (Table 1). A 100-gram uncooked portion will supply about 50 percent of a 23 to 50 year-old woman's daily protein requirement (Figure 1).

Total fat

A single number is generally reported for the fat composition of a food, but this one value is actually the sum of many different components. Each of these varies chemically and has different effects on health. These compounds include glycerol and cholesterol as well as saturated, mono-unsaturated, and poly-unsaturated fatty acids. The total fat values shown in table 1 are typical, but the fat content of meat from all species varies based on the age and diet of the animals. The total fat content of antelope, deer, elk, bison, and range-grazed beef is similar and is somewhat lower than for meat from grain-fed steers (Table 1). However, the fat content of all the species listed is low because outside fat was removed before analysis.

The American Heart Association recommends that no more than 30 percent of total calories be obtained from fat. If one consumes a 2,000-calorie diet, no more than 600 calories should come from fat. Of these 600 calories, the fat contained in 100 grams of the meats shown in Table 1 would account for only 2 to 7 percent (Figure 1). Even though grain-fed beef contains more calories from fat than the other meats, when the outside fat is removed all of these meats can easily be a part of the diet recommended by the American Heart Association.

Classes of fatty acids

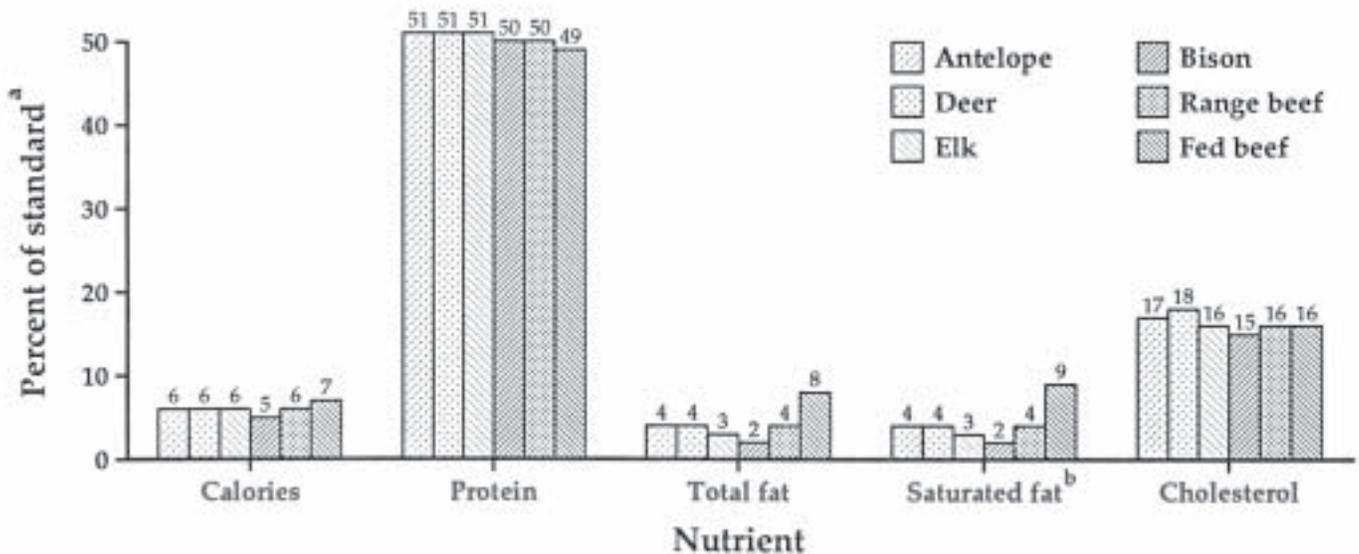
Various classes of fatty acids have distinct chemical structures and behave differently in human bodies with diverse effects on health. Each fatty acid class will be discussed. The amount in milligrams of each type of fatty acid in a 100-gram uncooked portion is shown in Table 2.

Saturated fat. Large amounts of dietary saturated fatty acids cause an increase in cholesterol in the

Table 1. Calories, protein, and fat in 100 grams of uncooked, lean meat

Item	Pronghorn antelope	Mule deer	Elk	Bison	Range-grazed beef	Grain-fed beef
Calories, Cal	117	119	112	104	112	136
Protein, g	22.4	22.6	22.4	21.9	21.8	21.7
Fat, g	2.5	2.7	2.0	1.4	2.4	5.0

Figure 1. Nutrient contribution of meats, profiles for fresh game meats and beef



^aThese are based on 100-gram uncooked, lean-only portions of 2,000 calories per day or the midpoint of the recommendation by the National Academy of Sciences for women ages 23-50 on the recommended daily dietary allowance of protein for women ages 23-50, and on American Heart Association guidelines of not more than 30% of calories from fat, less than 10% of calories from saturated fat, and not more than 300 mg of cholesterol per day. The numbers on top of the bars correspond to the actual value depicted by the bar.

^bMyristic, palmitic, and stearic acids.

blood and are associated with the development of cardiovascular diseases. Saturated fatty acids other than myristic, palmitic, and stearic acids are found in extremely small amounts in meats. Thus myristic, palmitic, and stearic acids are the only saturated fatty acids presented in Table 2.

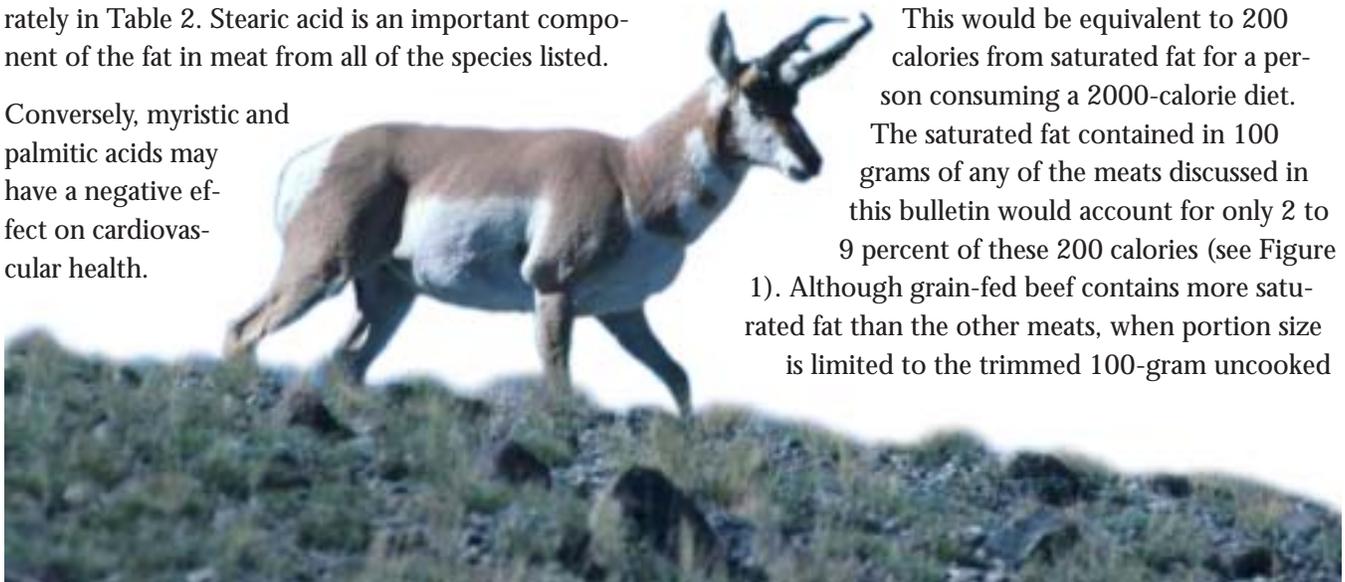
Research studies indicate that some saturated fatty acids do not have a negative effect on cardiovascular health. Stearic acid is one such fatty acid. Therefore, the stearic acid content of the meats is listed separately in Table 2. Stearic acid is an important component of the fat in meat from all of the species listed.

Conversely, myristic and palmitic acids may have a negative effect on cardiovascular health.

Individuals concerned about their serum cholesterol levels would be wise to limit their intake of these fatty acids. The myristic and palmitic acid content of the meats is also listed in Table 2.

Compared to the other meats, bison is lower in total saturated fatty acids, myristic, and palmitic acids, while grain-fed beef is higher. Figure 1 places this in perspective. The American Heart Association suggests people consume less than 10 percent of their daily calories as saturated fatty acids.

This would be equivalent to 200 calories from saturated fat for a person consuming a 2000-calorie diet. The saturated fat contained in 100 grams of any of the meats discussed in this bulletin would account for only 2 to 9 percent of these 200 calories (see Figure 1). Although grain-fed beef contains more saturated fat than the other meats, when portion size is limited to the trimmed 100-gram uncooked



portion, grain-fed beef is not a major contributor of saturated fatty acids to diets.

Mono-unsaturated fat. The mono-unsaturated fatty acids of significance in meat are palmitoleic and oleic acids. There is no evidence that these fatty acids exert a negative influence on blood cholesterol, and they may actually decrease the level of cholesterol in the blood. The saturated fatty acid content of meat is usually emphasized, but Table 2 demonstrates that game meats, bison, and beef have larger quantities of mono-unsaturated fatty acids than myristic and palmitic acids.

Omega-6 polyunsaturated fat. Research indicates that different types of polyunsaturated fat have different effects on health. The important Omega-6 polyunsaturated fatty acids in meat are linoleic and arachidonic acids. Game meats tend to be higher in these than bison and beef (Table 2). Omega-6 polyunsaturated fatty acids are common in diets, and researchers have noted that their inclusion helps lower blood cholesterol.

Omega-3 polyunsaturated fat. Omega-3 polyunsaturated fat consumption seems to protect the Greenland Eskimos from developing coronary heart disease. Fish and fish oils consumed by this population are the major source of these fatty acids. The fat in the muscle of game animals and range-grazed beef



also contains a small but possibly significant amount of Omega-3 fatty acids (Table 2). When beef animals are fed corn, they consume more of the Omega-6 fatty acids. As a result, less Omega-3 is present in the muscle. Future research may find advantages related to the consumption of meats containing Omega-3 polyunsaturated fatty acids.

The relative percentage of fatty acid classes. Table 3 contains values depicting the classes of fatty acids expressed as a percentage of total fatty acids. The American Heart Association recommends reducing total dietary fat and consuming approximately equal amounts of saturated, monounsaturated, and polyunsaturated fatty acids. An “ideal” fat would contain about 33.3 percent of each class. Pronghorn antelope, mule deer, and elk come relatively close to that

Table 2. Fatty acids in 100 grams of meat^a

Fatty acid class	Pronghorn antelope	Mule deer	Elk	Bison	Range-grazed beef	Grain-fed beef
Saturated^b	875	972	664	421	933	2028
Stearic	441	401	172	197	327	651
Myristic, Palmitic	434	571	492	224	606	1377
Mono-unsaturated^c	582	732	508	444	754	2114
Polyunsaturated^d	530	463	399	182	191	291
Omega-6 ^e	442	359	343	156	139	275
Omega-3 ^f	88	104	56	26	52	16

^aUncooked, lean only

^bMyristic, palmitic, and stearic acids

^cPalmitoleic and oleic acids

^dLinoleic, arachidonic, and linolenic acids

^eLinoleic and arachidonic acids

^fLinolenic acid



ratio, while bison, range-grazed beef, and especially grain-fed beef are comparatively low in polyunsaturated fatty acids. Humans rarely eat only one type of fat such as beef fat but instead tend to consume a variety of foods high in polyunsaturated fatty acids such as corn oil, soybean oil, and fish.

It should again be noted that all meats listed in Table 3 are excellent sources of monounsaturated fatty acids which may reduce serum cholesterol levels.

Cholesterol

Cholesterol is contained in both muscle and fat, and the cholesterol content of meat from the different species is similar (Table 4). From the standpoint of dietary cholesterol, there is no nutritional advantage to consuming meat from any one species over another. A 100-gram uncooked portion of meat from any one of these species contributes only 15 to 18 percent of the American Heart Association's daily guideline of 300 milligrams of cholesterol (Figure 1).

Table 3. Fatty acid classes expressed as a percentage of total fatty acids in meat^a

Fatty acid class	Pronghorn antelope	Mule deer	Elk	Bison	Range-grazed beef	Grain-fed beef
Saturated^b	44.0	44.8	42.2	40.2	49.7	45.8
Stearic	22.2	18.5	10.9	18.8	17.4	14.7
Myristic, Palmitic	21.8	26.3	31.3	21.4	32.3	31.1
Mono-unsaturated^c	29.3	33.8	32.3	42.4	40.1	47.7
Polyunsaturated^d	26.6	21.4	25.4	17.4	10.2	6.6
Omega-6 ^e	22.2	16.6	21.8	14.9	7.4	6.2
Omega-3 ^f	4.4	4.8	3.6	2.5	2.8	0.4

^aUncooked, lean only

^bMyristic, palmitic, and stearic acids

^cPalmitoleic and oleic acids

^dLinoleic, arachidonic, and linolenic acids

^eLinoleic and arachidonic acids

^fLinolenic acid

Table 4. Cholesterol in 100 grams of uncooked, lean meat

Pronghorn antelope	Mule deer	Elk	Bison	Range-grazed beef	Grain-fed beef
52	54	48	45	49	48

A major misconception is that game meat contains the “good cholesterol” or HDL-cholesterol and that beef contains the “bad cholesterol” or LDL-cholesterol. This is not true. Cholesterol found in muscle is free cholesterol and is not associated with the “good” or “bad” cholesterol found in animal blood.

Conclusions

Overall, game meat and range-grazed beef are slightly lower in fat than grain-fed beef. However, when the outside fat is trimmed and portion size controlled, all of these meats can fit into a fat-reduced, balanced diet. With regard to polyunsaturated fatty acids, range-grazed beef and game meat contain more Omega-3 fatty acids than grain-fed beef. Further research may reveal that the level of Omega-3 fatty acids contained in these meats has a positive impact on health, but a definite statement cannot be made at this time. Finally, all of these meats are high in monounsaturated fatty acids, and excellent sources of protein with similar cholesterol contents.

Consult the following publications for more information: *You and Your Wild Game*, B-613R; *Skinning and Boning Big Game*, B884R; *The Pronghorn Antelope Carcass*, B-575; *The Mule Deer Carcass*, B589R; *The Elk Carcass*, B594; *Deer and Antelope Yield*, AS-102; and *Aging Big Game*, B513R. To obtain these publications phone the UW-CES Resource Center at 307-766-2115 or go on line at www.uwo.edu/ces/ceshome.htm

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