



the Mule Deer Carcass

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A hunter who wants to know how to prepare and cut a deer carcass for the freezer or who wants to know how much meat to expect when someone else cuts the deer may find this bulletin useful. Factors affecting tenderness and flavor of venison are also discussed. The bulletin was written to help resident and non-resident hunters better utilize the meat they obtain. In 2001, a total of 47,943 Wyoming deer were harvested by 77,082 active hunters, resulting in a 62.2 percent success ratio. Because many sportsmen hunt to obtain meat for economic purposes and because they enjoy eating wild meat, the average amount of venison available per successful resident hunter has been calculated. The information may also be of value to nutritionists and to those interested in conducting risk assessments for venison consumption.

Mule Deer Weights

The field-dressed carcass weights of six bucks and six does used in this study averaged 114 pounds and 93 pounds, respectively. The deer, shot by hunters in October prior to the rutting period, were brought to the University of Wyoming meat laboratory the day they were harvested. Field-dressed weights, sometimes referred to as hog-dressed weights, were taken on arrival at the laboratory. The weight included the head and hide. The legs were removed at the knees and hocks and all contents of the abdominal and thoracic cavities, including the entire gullet and windpipe, were removed.

The ages of the six bucks, as determined by the wear of their mandibular cheek teeth, ranged from 1.5 to 6.5 years. Four of the bucks were 1.5 or 2.5 years old. Three of the six does were 2.5 years old, two were 3.5 years old, and one was 4.5 years old.

Methods Used

As soon as the carcasses used in this study were delivered to the university meat laboratory, they were split. One side was skinned immediately, and both sides were placed in a 38-degree-Fahrenheit cooler at 70 percent relative humidity. Both sides were aged two weeks except for a loin sample which was removed for tenderness tests. Samples were taken the day after harvest from the skinned side of each carcass.

Weight losses and bacterial growth on the carcasses during aging were recorded. After aging, one side of each carcass was processed into cuts, and the other side was separated into bone, fat, and lean. Loin roasts from both sides were saved for flavor and tenderness determinations. Lean and fat from the boned side were ground together and sampled to determine moisture, fat, protein, and ash content. In addition, ground meat samples were taken for bacterial analysis.

The calculations for deer meat consumed per successful hunter in Wyoming were based on weights listed by Hay *et al.* (1961) and on boneless meat yields from additional deer delivered to the university meat laboratory. Since this bulletin was first published,

numerous cutting tests have substantiated the boneless meat yields reported here.

Cutting a mule deer carcass

The cutting method for boneless retail-cut yield followed that described in University of Wyoming Cooperative Extension Service Bulletin B884R.

The shoulder was removed at the natural seam and boned. All remaining muscles were removed from a hanging carcass. The knife was kept close to the bone so that large muscles could be used as steaks and roasts. Natural seams were followed when removing muscles from the round. Major lymph nodes, like the prescapular at the point of the shoulder, the prefemoral at the flank and round junction, and the popliteal embedded in seam fat between the major round muscles, were removed. Steaks and roasts were wrapped and immediately frozen. Lean trimmings were also frozen the day they were removed from a carcass. Frozen trimmings can be thawed and ground or processed into sausage up to eight months after packaging if they are frozen rapidly and then thawed under refrigeration (<40-degree-Fahrenheit) or in plastic bags submerged in cold 40 to 50-degree-Fahrenheit running water.

Previous printings of this bulletin listed weights of semiboneless retail cuts, but this printing lists boneless weights only. The boneless method of cutting is recommended for deer harvested in areas where chronic wasting disease (CWD) exists and is commonly used by game meat processors. Additional advice regarding CWD includes avoiding the harvest or consumption of sick deer; wearing latex or rubber gloves when dressing a deer from CWD areas; avoiding contact with the brain, spinal cord, lymph nodes, spleen, tonsils, and eyes because these organs may contain the greatest amount of CWD agent in infected animals; and thoroughly washing knives and other implements (Williams *et al.* 2002). These precautions are recommended even though CWD has not been linked to any human illness.

Amount of meat to expect

The mule deer weight conversion figures are shown in Table 1. The whole weight to field-dressed weight conversion figures are those of Hay *et al.* (1961). All other conversion figures were obtained in this study.

Boneless retail cuts averaged 48 percent of the field-dressed weight.

Loss due to gunshot causes packaged-cut weight to vary. Deer shot once in the head or ribs will have slightly higher yields of packaged cuts than the 48 percent average. Deer shot once in the hind leg or shoulder will have 1.9 or 3.1 percentage points, respectively, lower yields. All edible meat was included in the packaged-cut weights. If some cuts such as the flank or ribs are discarded because of dirt or dehydration, the packaged-cut yield will be lower. Inedible trim listed in University of Wyoming Cooperative Extension Service Poster AS-102 varied from one to 13 pounds per carcass. If the "Alaskan method" or "Indian method" of removing muscles from a freshly harvested skinned carcass without gutting is followed, the meat yield will be lower because, with few exceptions, more meat is left on the carcass.

A more detailed account of the weight loss from the field-dressed carcass to packaged cuts is found in Table 2. Carcass weight loss due to head, skin, and aging are listed. On the average, 54.6 and 44.4 pounds of boneless retail cuts from the bucks and does, respectively, were packaged for the hunter.

The weight of boneless meat to expect from mule deer is shown in Table 3, but variations exist within each group of animals. For example, the field-dressed weight of 1½ to 2½-year-old bucks averaged 102 pounds and ranged from 70 to 132 pounds. Three out of four bucks harvested (75.7 percent) in 2001 were 2½ years old or younger.

Buck mule deer harvested at the Sybille Unit from 1956 to 1971 averaged 91 pounds for yearlings, 120 pounds for 2 year olds, 145 pounds for 3 to 5 year olds, and 175 pounds for bucks more than 6 years old (W. G. Hepworth, personal communication). The Sybille weights are lower than those for older bucks studied by Hay *et al.* (1961) in Colorado. It is well established that mule deer weights vary by area. Buck deer that average 207 pounds or are 7½ years or older only make up 2 percent of the harvest (Table 3).

According to Wyoming Game and Fish Department data, resident hunters harvested 25,900 mule and white-tailed deer in Wyoming in 2001. Bucks, does, and fawns made up 81.3, 16, and 2.7 percent of the harvest, respectively. Based on mule deer weights in Table 3, on 2001 field-check station data from 3,541

Table 1. Weight conversion figures for mule deer.

Weight Example	Factor
Whole weight = 142 pounds ^a	1.42 x field-dressed weight
Field-dressed weight = 100 pounds (<i>viscera and feet removed</i>)	0.704 x whole weight
Skinned carcass weight = 84 pounds (<i>skin and head removed</i>)	0.84 x field-dressed weight
Boneless lean = 48 pounds	0.48 x field-dressed weight

^a Whole weight is used in place of live weight. Whole weight is slightly less than live weight because it does not include blood loss at the time of harvest.

Table 2. Mule deer weight loss from carcass to cuts.

	Buck (N=6) <i>pounds</i>	Does (N=6) <i>pounds</i>
Field-dressed weight ^a	113.7	92.6
Losses:		
Head	8.4	5.7
Skin	9.3	8.0
Boneless lean, pounds ^b	5.1	5.7
Boneless cuts, pounds ²	54.6	44.4
Boneless cuts, percentages	48.0	48.0

^a The weight includes the eviscerated carcass with head and hide attached but with the legs cut off at the knees and hocks.

^b This includes boneless lean from the ribs and flank which often is discarded. If this lean, which is often dry or contaminated, is discarded, boneless cuts will make up 43 to 44 percent of the field-dressed weight.

deer in 107 different hunt areas throughout Wyoming, and on Wyoming Game and Fish Laboratory tooth data, it was calculated that average field-dressed weights adjusted for harvest percentages in each age class were 117.4, 89.3, and 53 pounds for bucks, does, and fawns, respectively. The weighted average for all field-dressed deer including fawns was 111.1 pounds. Because 48 percent of the field-dressed weight is boneless meat, the average yield for all deer harvested was 53.3 pounds.

If one assumes that each successful hunter lives in an average Wyoming household of 2.48 persons (U.S.

Census Bureau, 2000), .059 pounds or about one ounce of boneless deer meat per person per day for 365 days would be available for consumption. In 2001 a total of 25,990 successful resident hunters out of the state's 493,754 people harvested a deer. If the deer was shared with 2.48 persons per household, 64,455 persons or 13 percent of the state had available approximately one ounce of deer meat per day during the year. However, cooking loss, plate waste, and meat given to friends or pets would reduce the amount eaten. Because approximately 20 percent of all deer harvested were whitetails and because whitetails are lighter than

Table 3. Average field-dressed weight and boneless meat yield of mule deer in relation to age and proportion of harvest¹.

Age class (years)	Males			Females		
	Field Dressed Weight ² , lb	Boneless meat ³ , lb	Harvest percent ⁴	Field Dressed Weight ² , lb	Boneless meat ³ , lb	Harvest percent ⁴
1½ to 2½	102	49	75.7	85	41	74.5
3½ to 4½	150	72	16.1	93	45	13.6
5½ to 6½	192	92	6.2	102	49	6.4
7½ or more	207	99	2.0	130	62	5.5
Age-weighted average	117.4			89.3		

¹ According to the Wyoming Game and Fish Department, the proportion of bucks, does, and fawns harvested in Wyoming in 2001 was 81.3, 16, and 2.7 percent, respectively.

² From Hay, et al. (1961)

³ The field-dressed weight times 48 percent is equal to the weight of boneless meat.

⁴ The percentage of 1½ to 2½-year-old hunter-harvested mule deer from 107 hunt areas throughout Wyoming in 2001 is based on the age structure of 3,541 field-checked animals. Wyoming Game and Fish Laboratory tooth-ring data for hunter-harvested animals 3½ years old and older was used to calculate the percentage of animals in each age class over 2½ years.

mule deer, the amount eaten would be reduced even further. Violations of game meat regulations which resulted in an excessive amount of meat left on a carcass could also reduce the amount of meat actually consumed. For example, hunters violate the law when they take only the back strap and hind quarters.

Composition and nutritional value of venison

One side of each mule deer carcass was boned. The lean and fat were ground and thoroughly mixed together prior to sampling for chemical analysis. The results are found in Table 4. Venison is high in protein and moisture and low in ether extract (fat), calories, and collagen (connective tissue) when compared to domestic meat. Venison from does and bucks, respectively, averaged 206 and 222 calories per 100 grams of meat. If all fat had been removed, calories would have been reduced to 120 per 100 grams (USDA, 1989).

Venison, like other lean meat, is high in the essential amino acids upon which the nutritional value of protein is based. In addition, venison is high in thiamine,

riboflavin, niacin, iron, and zinc (USDA, 1989) More detail on the nutritional content of deer can be found in University of Wyoming Cooperative Extension Service Bulletin B920R.

Muscle pH is one measure of the amount of running or stress an animal undergoes prior to slaughter. The figures of 5.8 and 5.9 for buck and doe deer, respectively, are slightly higher than those of 5.5 for domestic meat, indicating that at least some deer were stressed prior to harvest. Carcasses of stressed animals should not be aged after harvest because the meat is much more susceptible to bacterial growth. High bacterial counts on the venison aged for two weeks in this study were partially due to the elevated pH values and partially a result of high initial contamination during field dressing.

Evaluation of skinned and hide-on sides

On the average, four hours and 50 minutes elapsed between the time of harvest and the time of delivery of carcasses to the laboratory. The internal temperature in the thickest portion of the hind leg averaged 82 degrees Fahrenheit at the time of delivery (Figure 1). The

Table 4. Boneless mule deer carcass composition¹.

Chemical analysis of fat and lean combined	Bucks (N=6) ¹	Does (N=6) ¹	Lean only ²
Crude protein percent	22.3	22.6	23.0
Fat percent	10.6	9.2	2.4
Moisture percent	66.7	68.0	73.6
Ash percent	1.0	1.0	1.2
Calories (per 100 grams)	222	206	120
Collagen percent	2.0	2.2	
Muscle pH	5.8	5.9	

¹ Figures are based on all fat and lean from the side aged with the hide left on.

² USDA (1989)

temperature of the side lying next to another object such as a truck bed often had a 3 to 8 degrees Fahrenheit higher temperature than the side exposed to more air circulation. One side of each carcass (chosen at random) was skinned immediately when the field-dressed mule deer carcasses were brought to the University of Wyoming meat laboratory. Chilling curves for the thickest portion of the leg from each side are given in Figure 1. The internal temperature of the thickest portion of the leg from the skinned side dropped to the temperature of the cooler (38 degrees Fahrenheit) within 10 hours. The hide-on side cooled at a slower rate. The average internal temperature was 45 degrees Fahrenheit after 10 hours and 38 degrees Fahrenheit after 14 hours.

Surface bacteria on the skinned and hide-on sides were low initially, but surface slime developed after two weeks of aging, and bacterial counts averaged 3,600,000 per 0.39 square inches. No large differences in bacterial numbers between the hide and skinned sides were noted.

There were no flavor differences between roasts from the hide-on and skinned sides when these roasts were evaluated by a trained panel. In addition, no differences in flavor between meat from bucks and does were noted. The metatarsal glands were left on both sides of the deer carcasses until the deer reached the meat laboratory. Therefore, removing these glands while the

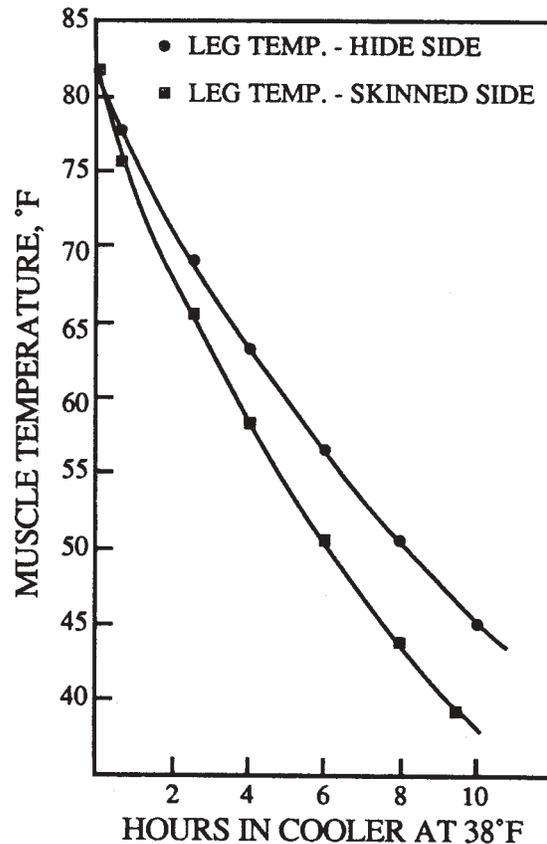


Figure 1. Chilling curves for the skinned and hide-on sides of mule deer carcasses.

carcasses were still warm (four hours and 50 minutes average time after harvest) had no effect on meat flavor.

To confirm this finding, metatarsal glands were saved from the deer and placed on top of beef roasts during cooking. Although a distinct odor was present during cooking, no differences between the flavor of the beef roasts cooked with metatarsal glands and the control beef roasts cooked in separate ovens were noted. It is possible that the volatile substances, which could have contributed to flavor, escaped during dry-heat cooking. Tests similar to those conducted with deer metatarsal glands were conducted on beef roast using mule deer fat and mule deer bone sawdust. Once again no flavor differences in treated or controlled beef roasts were noted. Therefore, any objectionable flavor found in fat or bonedust was not transferred to the beef during cooking.

It should be emphasized that the mule deer fat itself was not eaten. People often object to the “strong” taste of some deer fat. This taste can be partially eliminated by trimming fat from the meat when it is wrapped for the freezer.

Aging and tenderness

Mule deer loin roasts cut from a carcass one day after harvest were of acceptable tenderness in nine of the 12 deer studied. Only cooked meat from two bucks and one doe had Warner-Bratzler shear values over seven pounds on ½-inch cores. Shear values of seven pounds or less reflect acceptable tenderness scores. In general most deer shot in warm weather and chilled outdoors will be tender without aging. In addition, many muscles in deer are stretched during transportation of a carcass after harvest. It is well established that stretching muscles during rigor mortis contributes to more tender meat. More discussion on aging big game and on factors which contribute to tenderness can be found in University of Wyoming Cooperative Extension Service Bulletin B-513R.

After two weeks of aging at 38 degrees Fahrenheit, shear values were extremely low, indicating that the meat was overly tender. When the trained panel scored flavor, they often commented on the “liver-like” or

“mushy” texture of the mule-deer loin roasts. These comments were not as frequent as they were for Pronghorn antelope roasts (see Bulletin B-575R), but they still indicated that the venison would have been more acceptable with a shorter aging period.

In addition, a shorter aging period would have resulted in less weight loss due to carcass shrinkage, less trimming loss, and less bacterial growth on a carcass. Gunshot areas are especially susceptible to bacterial growth, and they spoil quickly.

Some hunters complain that venison fat turns rancid after a few months in frozen storage. A shorter aging period and proper wrapping of cuts will increase the time fat can remain in frozen storage without becoming rancid.

Summary

Deer should be eviscerated and hung to drain as soon after harvest as possible. Wearing latex or rubber gloves when dressing a deer is recommended. When boneless cuts are made as outlined, recommended precautions after dressing will have been followed. The precautions are recommended even though CWD has not been linked to any human illness. Approximately 48 percent of a field-dressed carcass is boneless meat. The amount of gunshot trim, the amount of meat left on discarded bones, and/or the length of the aging time can alter yield. Proper care and processing of meat, as recommended in this bulletin, is the best way to avoid objectionable flavor. In Wyoming, approximately one ounce of venison per person per day is available to the average successful deer hunter and to each person in the household.

Consult the following publications for more information: *You and Your Wild Game*, B-613R; *Nutritional Content of Game Meat*, B-920R; *The Pronghorn Antelope Carcass*, B-565R; *Skinning and Boning Big Game*, B-884R; *The Elk Carcass*, B-594R; *Deer and Antelope Yield*, AS-102; and *Aging Big Game*, B-513R. To obtain these publications, phone the UW CES Resource Center at 307-766-2115 or go online at www.uwo.edu/ces/ansci.htm to view the bulletins free of charge.

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Handling carcasses from harvest to freezer

- Be certain an animal is dead.
- Bleed an animal by cutting the throat or sticking it. Caution: Do not cut the throat when the head is to be mounted.
- Eviscerate an animal as soon as possible.
- Hang it (head up or head down) to drain and wash inside with clean water. Put the carcass on logs or rocks to allow for maximum air circulation if it cannot be hung.
- Transport an animal to camp and skin it if the temperature is expected to be above freezing the first night after harvest. Keep carcasses in the shade. In warm weather it is strongly recommended that a carcass be taken to a cooler the day of harvest.
- Use cheesecloth or light cotton bags to keep a carcass clean and to protect the meat from insects.
- Make sure the internal temperature of lean is cooled to 40 degrees Fahrenheit or below within 24 hours. This will often require cooler facilities.
- Trim fat, gunshot, and other inedible areas from a carcass when it is cut.
- Cut a carcass within seven days after harvest if it was chilled rapidly (see above) and sooner if warmer temperatures prevail.
- Cure the meat or make a cooked sausage which can be eaten cold (salami, bologna, etc.) if there is an objection to venison flavor. Uses of marinades or recipes which alter flavor are also recommended.
- Mix 15 percent pork or beef fat with lean in fresh ground venison or 35 percent pork fat in fresh venison sausage.
- Wrap all cuts (fresh or cured) in good-quality freezer paper and store them at 0 degrees Fahrenheit or below.
- For best flavor, limit fresh venison to eight months of frozen storage and season or cured venison to four months of frozen storage.

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