



# the Pronghorn Antelope Carcass

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The purpose of this bulletin is to present meat yield and composition data for the pronghorn antelope carcass and to discuss some factors which affect its flavor. This will add to the practical information already available on field care and cooking and on the general life history, ecology, and management of the species. Hopefully, this will result in better utilization of harvested antelope. The annual antelope harvest in Wyoming has averaged approximately 30,000 for the past two decades. Recently, harvest has decreased from 45,894 in 1994 to 26,864 in 2001, but hunter success statewide has remained at 85 percent or above.

## Antelope studied

Seven male and six female pronghorn antelope were brought to the University of Wyoming meat laboratory the day of harvest. The ages of the males varied from two to five years, and the females varied from two to eight years old. Field-dressed carcass weights included the head and the hide; the legs were removed at the knees and hocks, and all contents of the abdominal and thoracic cavities including the entire windpipe were removed. When the carcasses were delivered to the university laboratory, they were split, and one side was skinned immediately (Figure 1). The 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 that was removed for tenderness tests. Samples were taken the day after harvest from the skinned sides.

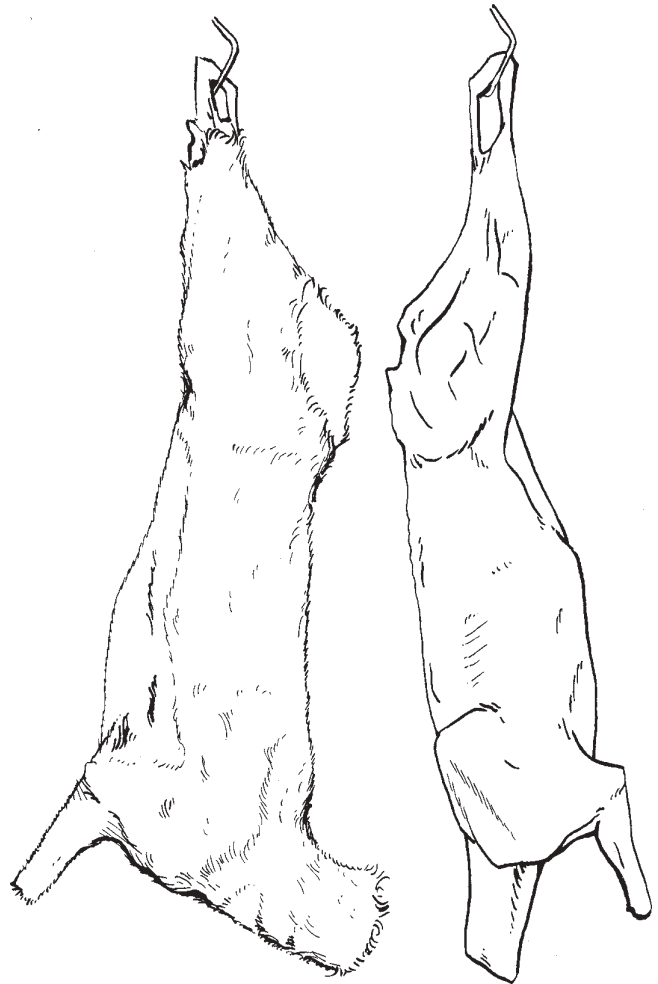


Figure 1. One side of each antelope carcass was skinned when the carcasses were delivered to the university laboratory five to 10 hours after the killings.

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

The following semi-boneless cutting method for one side of each carcass was used: (Figure 2)

1. The neck was removed from the shoulder and boned (A to B).
2. The shoulder was separated from the rib between the fifth and sixth ribs (C to D). The brisket and foreshank were removed just above the elbow joint (E to D). Arm and blade steaks were made and trimmed. Portions of the shoulder not suitable for steaks and the entire foreshank and brisket were boned.
3. The leg was cut from the loin, leaving one lumbar vertebrae on the leg (F to G). Sirloin steaks and leg roasts were made. The hind shank and trimmings not acceptable for cuts were boned.
4. To separate the rib and breast from the flank and short loin, a cut was made between the 12<sup>th</sup> and 13<sup>th</sup> ribs (H to I). The ribs were separated from the breast by cutting a 12-inch ventral to the blade bone to a line parallel to the back (J to K). The flank was removed from the short loin by cutting next to the tenderloin (K to L). The flank and breast were boned and ground. The rib was cut into steaks, and the loin was trimmed for a roast.

5. Steaks, roasts, and edible lean trimmings were weighed as retail cuts.

The following boneless cutting method was used for additional carcasses:

All hair and contamination were trimmed from additional skinned hanging carcasses before making boneless cuts. The steps outlined in University of Wyoming Bulletin B-884R on skinning and boning big game were followed. The shoulder was removed at the natural seam and boned. All remaining cuts were removed from the 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 popliteus embedded in seam fat between the major round muscles were removed. Steaks and roasts were wrapped and frozen immediately. Lean trimmings were also frozen the day they were removed from the carcasses. 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 in a cooler or in plastic bags immersed in cold (40 to 50 degrees F), running water.

### Carcass and cut weights

Field-dressed weights of the male and female antelope carcasses studied averaged 76.7 pounds (range 65 to 86 pounds) and 68.5 pounds (range 64 to 72 pounds), respectively (Table 1). These weights are close to average for pronghorn antelope killed in Wyoming. Data kept at the Wyoming Game and Fish Commission Research Laboratory indicates that average field-dressed weights are 80.0 pounds for males and 73.4 pounds for females.

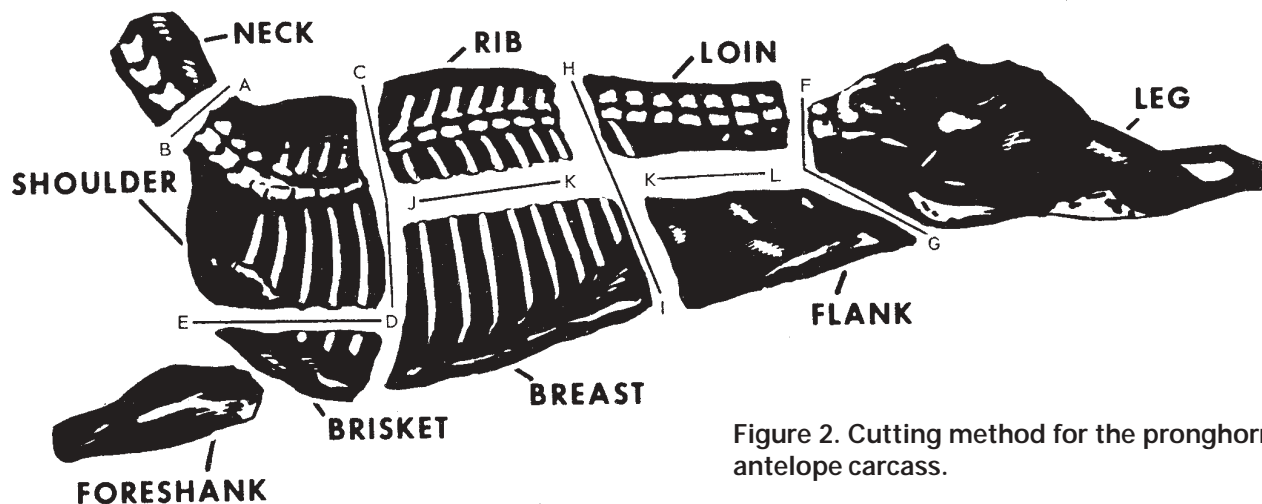


Figure 2. Cutting method for the pronghorn antelope carcass.

Table 1. Antelope weight loss from carcass to cuts.

|  | Males (N=7)<br>pounds | Females (N=6)<br>pounds |
|--|-----------------------|-------------------------|
| Field-dressed weight <sup>a</sup>              | 76.7                  | 68.5                    |
| Losses:  |                       |                         |
| Head   | 7.1                   | 5.3                     |
| Skin   | 5.9                   | 5.1                     |
| Loss due to aging, 2 weeks                     | 7.0                   | 6.7                     |
| Cutting and trimming loss                      | 12.5                  | 12.6                    |
| Semi-boneless retail cuts, pounds <sup>b</sup> | 44.2                  | 38.8                    |
| Semi-boneless retail cuts, percentages         | 57.6                  | 56.6                    |

<sup>a</sup>Weight includes the eviscerated carcass with head and hide but with the legs cut off at the knees and hocks.

<sup>b</sup>This includes 3.0 pounds of boneless lean from the breast and flank which often is discarded. Retail-cut weights from one side were doubled for these figures.

Weights would be even more comparable if the portion of the legs that were left on for the game and fish figures but removed for this study, were included. Additional evidence that the antelope weights were typical is found in the *Journal of Wildlife Management*, Volume 35, Page 76. Mean field-dressed weights of 320 mature males and 191 mature female antelope shot during the fall in Alberta, Canada, were 85.0 pounds and 76.6 pounds, respectively. Since these were hunter-dressed antelope, the legs, windpipe, and organs such as the heart were often included. These items could easily account for the 3 to 5-pound-heavier weights of the Alberta antelope.

Weight changes from field-dressed carcasses to semi-boneless retail cuts are presented in Table 1. Carcass weight loss due to removal of the head and skin while aging the animal and the trimming of bones, fat, and inedible lean are listed. On the average, 44.2 pounds and 38.8 pounds of semi-boneless retail cuts from males and females, respectively, were packaged for the hunter. Semi-boneless retail cuts averaged 57.1 percent of the field-dressed weight.

After two weeks, the sides aged with the hide on were skinned and physically separated into bone, fat, and lean. The percent of lean, bone, and fat in males was 76.6 percent lean, 18.6 percent bone, and 4.8 percent fat from a skinned carcass (Table 2). While antelope contain about 76.6 percent separable lean, 18.6 percent

separable bone, and 4.8 percent separable fat, choice lambs contain 54, 17, and 29 percent, and choice steers contain 57, 14, and 29 percent lean, bone, and fat, respectively. Many conditions can alter the percentage figures. For example, range cows have leaner composition figures than those mentioned above for choice-grade steers.

Chemical analysis of the fat and lean combined are given in Table 2. The males were slightly fatter as judged by the ether extract determination. Males also had slightly higher amounts of collagen (the major connective tissue) than females. The data indicate that antelope meat is high in protein and low in fat. Other data collected at the meat laboratory indicate that antelope meat, like other lean meat, is high in the essential amino acids upon which the nutritional value of protein is based. Antelope meat is higher in thiamine and riboflavin than beef, lamb, or venison (*USDA Handbook 8-17*, published in 1989). The high lean and low fat in an antelope carcass are partially responsible for the increased vitamin B content.

Typical yields of antelope carcasses completely boned under commercial conditions are found in Table 3. Under such conditions, some lean is left on the bones. Hunters cutting their own antelope often leave even more meat on the bones, especially when entire cuts like the breast are discarded. Two to three percent

Table 2. Composition of the skinned antelope carcass<sup>a</sup>.

|  | Males (N=7) | Females (N=6) |
|--|-------------|---------------|
| <b>Physically separated:</b>                       |             |               |
| Percent lean                                       | 76.6        | 77.5          |
| Percent bone                                       | 18.6        | 19.1          |
| Percent fat  | 4.8         | 3.9           |
| <b>Chemical analysis of fat and lean combined:</b> |             |               |
| Percent crude protein                              | 22.1        | 22.4          |
| Percent ether extract <sup>b</sup>                 | 6.2         | 4.8           |
| Percent moisture <sup>b</sup>                      | 70.0        | 71.2          |
| Percent ash  | 1.2         | 1.2           |
| Percent energy (K calories per gram)               | 1.8         | 1.7           |
| Percent collagen                                   | 1.7         | 1.4           |
| pH of muscle                                       | 5.7         | 6.0           |

<sup>a</sup> Figures are based on the side which was aged two weeks with the hide left on.

<sup>b</sup> According to *USDA Handbook 8-17* on Composition of Foods, antelope lean trimmed of most fat contains 2.0 percent ether extract and 74.1 percent moisture. The mineral and amino acid content of antelope lean in *Handbook 8-17* are similar to those reported for beef.

Table 3. Relationship between field-dressed weight and boneless or semi-boneless retail-cut weight.

| Field-dressed weight<br><i>pounds</i> | Boneless retail weight<br><i>pounds</i> | Semi-boneless retail weight<br><i>pounds</i> |
|---------------------------------------|---|--|
| 30.0                                  | 14.4                                    | 17.0   |
| 40.0                                  | 19.2                                    | 22.8   |
| 50.0                                  | 24.0                                    | 28.5   |
| 60.0                                  | 28.8                                    | 34.2   |
| 70.0                                  | 33.6                                    | 39.9   |
| 80.0                                  | 38.4                                    | 45.7   |
| 90.0                                  | 43.2                                    | 51.4   |
| 100.0                                 | 48.0                                    | 57.1   |

lower retail yields should be expected for carcasses shot in the legs or shoulders.

When an antelope carcass is boned and ground or made into salami or cooked sausage, pork or beef fat should be added to improve juiciness and flavor. When fat is added, the total weight of boneless meat is often slightly higher than the boneless figures listed in Table 3.

### Aging and tenderness

Warner-Bratzler shear values, which measure tenderness, show that meat which is aged two weeks at 38 degrees Fahrenheit becomes more tender (Table 4). Nevertheless, increased tenderness in antelope may not always be desirable. The extremely low shear value after 14 days aging and six months frozen storage at -10 degrees Fahrenheit were associated with meat which lacked consistency.

When a trained laboratory panel scored flavor, they often commented on the "liver-like" or "mushy" texture of antelope roasts. Shear values of seven pounds on beef or lamb reflect acceptable tenderness scores. Therefore, shear values for antelope loin roasts frozen the day after slaughter of 5.43 and 4.63 pounds for males and females, respectively, were very tender (Table 4). These data indicate that antelope meat need not be aged 14 days. It is questionable whether an antelope carcass should be aged at all after chilling is completed.

University of Wyoming Agricultural Experiment Station Bulletin 513R entitled *Aging Big Game* points out that animals shot during warm weather and chilled slowly, as most antelope are, become tender without aging. When the antelope used in this study were delivered to the university meat laboratory five to ten hours after harvest, temperatures of the leg muscles averaged 78.6 degrees Fahrenheit, indicating that chilling rates were slow.

Other reasons for not aging antelope carcasses exist. During the two-week aging period at 38 degrees Fahrenheit and 70 percent relative humidity, antelope carcasses lost 2.9 and 3.9 pounds from their hide on sides and skinned sides, respectively. Most of these losses were from the lean. The lean also required additional trimming because of the dried, darkened meat and microbial growth that resulted from aging. Antelope carcasses that are cut without aging will yield up to five pounds more retail cuts per carcass than those aged two weeks.

The surface growth of bacteria and the total bacteria in the meat (based upon the hide-on side) increased rapidly during aging. Bacteria, molds, and yeast averaged 32 million per gram of ground meat after two weeks of aging. Bacterial growth during aging was particularly high in gunshot areas. High bacterial populations can be prevented by chilling a carcass immediately after evisceration and by cutting and freezing the meat within two to three days after harvest. If a hunter finds that some cuts are tough, moist-heat methods of cooking should be followed for those cuts. (See the University of Wyoming Cooperative Extension Bulletin 613R entitled *You and Your Wild Game*). In general, all cuts except those from the loin, rib, and leg should be ground or moist-heat cooked to tenderize connective tissue.

### Flavor evaluations

The influence of skinning on the flavor of antelope meat is shown in Table 5. The averages show a slight preference for roast from the side skinned the day of kill. However, differences between animals were not consistent. The evidence indicated that skinning antelope five to ten hours after harvest does not improve the meat flavor to a very large extent. It should be noted that flavor scores for roasts from both sides were low. Further research is needed to determine if skinning immediately after harvest has a beneficial effect upon flavor. However, research with lamb flavor and the data which follow make it seem unlikely that immediate skinning would have a beneficial effect upon flavor. In addition it is unlikely that flavor differences between boneless and semi-boneless cuts exist for properly chilled and trimmed carcasses. Nevertheless, blood left next to the bones of semi-boneless cuts could result in objectionable flavor, especially in slowly chilled carcasses.

Several attempts were made to associate the odor which is present on antelope hides with flavor. Beef roasts which were aged next to antelope hides and beef roasts that were wrapped in antelope hides overnight did not possess antelope flavor after cooking. In addition, beef roasts cooked with sawdust from antelope bones, beef roasts cooked in the presence of antelope fat, and beef roasts cooked in the presence of antelope lean did not possess flavor different from control roasts. The odor associated with antelope hides during aging and with antelope fat, bone, or lean during cooking was not

Table 4. Tenderness differences due to aging.

| Aging time | Warner-Bratzler shear values, pounds <sup>a</sup> |               |
|------------|---|---------------|
|            | Males (N=7)                                       | Females (N=6) |
| 1 day      | 5.43  | 4.63          |
| 14 days    | 2.81  | 2.82          |

<sup>a</sup> Lower values mean more tender meat. Values are in the pounds of force necessary to shear ½-inch diameter cores of rib-eye muscle roasted to an internal temperature of 160 degrees Fahrenheit.

Table 5. Flavor differences due to sex and skinning.

| Treatment                | Flavor scores on antelope roasts <sup>a</sup> |               |
|--------------------------|---|---------------|
|                          | Males (N=7)                                   | Females (N=6) |
| Side skinned day of kill | 4.06  | 4.07          |
| Side with hide left on   | 3.83  | 3.87          |

<sup>a</sup> An eight-member laboratory panel evaluated loin roasts from both sides of each antelope carcass on a nine-point hedonic scale, nine=like extremely and one=dislike extremely.

transferred to beef roasts. The finding that the odor associated with antelope hides is not in the odor of cooked antelope meat is partially supported by tests on domestic boar meat. The objectionable odor of cooked boar meat when it is warm is not the odor that arises from the contents of a preputial sac or that of an older boar immediately after death (*Journal of Animal Science* 32: 849).

Curing meat eliminates much of the objectionable antelope flavor. Antelope that was made into cooked sausage products such as salami or corned meat did not possess objectionable flavor characteristics when served cold. This finding again parallels that of boar meat. If cooked boar meat is eaten cold, it does not have an objectionable flavor.

The addition of 15 percent pork or beef fat in ground antelope meat and 35 percent pork or beef fat in antelope meat to be seasoned as fresh sausage is recommended for improving flavor. Pork fat is preferred because it has more unsaturated fat than other domestic animal fats. Therefore, pork fat is better suited to offset the highly saturated antelope fat which is within the muscle and cannot be trimmed. Overall rapid cooling, a shorter aging period, trimming all the antelope fat in addition to curing, and the addition of pork or beef fat are the best ways to avoid undesirable flavor.

## Summary

Antelope should be cooled as soon after evisceration as possible to prevent bacterial growth. Skinning in the field is not recommended unless it is necessary to aid in the rapid cooling of a carcass. The need for aging antelope carcasses beyond chilling is questionable. Eliminating aging will help prevent bacterial growth and make the texture of the lean more acceptable. Approximately 57 percent of the field-dressed carcass is semi-boneless trimmed retail cuts while 48 percent is boneless product. If an antelope is shot in the legs or shoulders or if more meat is left on discarded bones, the yield will be lower. The odor of antelope hide does not affect cooked meat flavor. Proper care and processing are the best ways to avoid objectionable flavor.

Consult the following publications for more information: *You and Your Wild Game*, B-613R; *Nutritional Content of Game Meat*, B-920R; *Skinning and Boning Big Game* B-884R; *The Mule Deer Carcass*, B-589R; *The Elk Carcass*, B-594R; *Deer and Antelope Yield*, AS-102; and *Aging Big Game*, B-513R. To obtain these publications, call the UW CES Resource Center at 307-766-2115 or view the bulletins free of charge at [www.uwyo.edu/ces/ansci.htm](http://www.uwyo.edu/ces/ansci.htm).

## **Recommended procedures for handling antelope carcasses from kill to freezer.**

- Eviscerate as soon as an antelope is dead.
- Hang to drain and wash inside with clean water.
- Skin the animal if the temperature is above 40 degrees Fahrenheit and the carcass cannot be taken directly to a cooler. Keep it in the shade.
- Use cheesecloth or light cotton bags to keep the carcass clean and to protect the meat from insects.
- Make sure the internal temperature of the lean is cooled to 40 degrees Fahrenheit or below within 24 hours. This will often require cooler facilities.
- Trim the fat and inedible areas from a carcass when it is cut.
- Cut a carcass within three days after harvest.
- Cure the meat or make a cooked sausage which can be eaten cold (salami, bologna, etc.) if there is an objection to antelope flavor. The use of marinades or recipes which alter flavor is also recommended.
- Mix 15 percent pork or beef fat with the lean in fresh ground antelope or 35 percent pork fat in fresh antelope sausage.
- Wrap all cuts (fresh or cured) in good-quality freezer paper and store them at 0 degrees Fahrenheit or below. Freeze cuts and trimmings the day they are removed from a carcass.
- Limit frozen fresh antelope to eight months of frozen storage and seasoned or cured antelope to four months of frozen storage.

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