A RECOMMENDED PROCEDURE FOR SLAUGHTERING EXPERIMENTAL CATTLE

R. J. Deans
OHIO STATE UNIVERSITY

An accurate evaluation of carcasses produced from experimental cattle requires that uniform, efficient methods of slaughter be employed.

The control of variables which might be introduced in the slaughter process is of utmost importance if chemical and physical changes in tissue are to be investigated. The comparison of experimental carcass data from various experiment stations and colleges is of little value unless slaughter methods and data collection are standardized. Standard slaughter methods must be applicable to various situations where available equipment and personnel are not alike.

Suggestive details of slaughter procedure and data collection as recommended by the beef carcass evaluation committees are as given in the following report:

Pre-slaughter Planning:

Pre-slaughter planning is of utmost importance if an efficient rapid operation is to be carried out. Personnel assigned to various phases of data collection and slaughtering should be familiar with the job they are to perform. In event inexperienced personnel are to be used, a pre-experimental beef slaughtering session should be held to familiarize the workers with their jobs and iron out difficulties in procedure and technique.

Data sheets, balanced scales, both platform and bench type, weighed receptacles, viscera carts, sharp knives--skinning and boning, and oil stones and steels for keeping knives sharp, saws and scribing saws should be at immediate hand. In considering data to be collected, it is suggested that spaces be provided on data sheets for noting the following items:

- Time taken off feed.
- Date and time of slaughter.
- Breed of cattle - if known.
- Live grade.
- Sex of cattle.
- Age of cattle - if available.
- Weight at end of feeding trial.
- Kill or live weight at slaughter.
- Total weight of contents of alimentary canal and urine.
- Edible organs and glands: Liver, heart, tongue, sweetbreads, (neck and heart,) (weights of spleen and other visceral parts might also be noted.)
- Pluck.
- Caul fat.
- Ruffle fat.
- Hide.
- Head weight (untrimmed).
Weights of shanks, fore and hind. (hind off at hoof head and metatarsal joints.)
Empty paunch and intestine weights.
Hot carcass weight.
Cold carcass weight.
Carcass grade.
Color of fat.

It is suggested that the animals be taken off of feed twenty-four hours before test. It is particularly important that the time off feed be constant when animals from one experiment are being compared. When possible, it is best to have the animal in conveniently located holding pens so there will be no chance of the animal being over heated from being driven some distance to slaughter. An abundance of clean, fresh water should be at the disposal of the slaughter animals during the pre-slaughter holding period to avoid restlessness.

Stunning:
The animal should be weighted immediately before slaughter and then led to a slaughtering spot. Efforts should be made to catch and weigh dung and urine excreted after kill weight is taken.

The animal should be secured by use of a knocking pen or by another suitable method such as a halter, the halter rope being snubbed to a ring in the floor. The animal may then be stunned with a stunning hammer or ax. The blow should be directed at the spot where imaginary lines from the base of each horn, or slightly above the base of the ears to the opposite eye cross. A sharp sudden blow on this spot should be sufficient to drop the animal. The animal should then be hoisted by means of a chain or inch rope encircling both hind feet. A power hoist is recommended which will hoist the cattle high enough to clear the head from the floor. If this equipment is not available, the animal may be bled in a lying position on the slaughter floor.

Bleeding:
Efforts should be made to bleed experimental animals as soon after stunning as possible. This can be accomplished by making a vertical incision in the neck in front of the brisket and down the center of the neck to the base of the head. The cut should be deep enough to expose the windpipe. The point of bleeding should be at the carotid artery just outside of the chest cavity.

The blood should be collected in a weighed container. It is advisable that the container have a wide opening in order to catch as much blood as possible in cases of cattle thrashing about. "Pumping" the fore legs up and down will stimulate more rapid bleeding. Before proceeding any farther the blood which may have been splashed on the floor should be scraped up with such equipment as a rubber squeegee, and the weight recorded of the blood.

Blood to be saved for laboratory analysis should be saved in clean containers such as large beakers or glass jugs and oxalate may be added to prevent coagulation.

Provision should be made to catch any "Vomit,"
Skinning:

As soon as the animal appears to be well bled, the process of skinning may be begun.

Cut the hide and tendon of the fore legs by making a cut deep across the posterior side of the foot just above the hoof line. To insure accurate shank weights always remove the hide exactly at the hoof line. Next, remove the dew claws from the hide with the point of the skinning knife held at a slant with respect to the fore leg split the hide from the hoof head to a point about six inches above the upper end of the cannon bone. Skin down each side of the cannon bone and cut across the joint of the metacarpal and carpal bones. The fore shank may be removed by applying sufficient lever force on it to further the break started by the knife cut, and then by cutting it away from the small strip of hide still holding fast. It is not necessary to skin the fore leg any further at this time; in fact, the hide will help protect the fore shanks.

Removing the Head:

Before removing the head a clean weighed container should be available to catch any blood which has accumulated in the head and neck below the level of sticking.

To remove the head, cut through the hide just back of the horns or the poll and then continue the cut down the side of the face just below the eye. The hide can then be skinned from the face. Extend the cut made by sticking to the lower lip and then separate the hide from the neck and around the cheeks, leaving the ears on the hide.

Sever the jugular vein on each side of the neck being sure to keep the hide held away when cutting the vein. Open the throat to expose the windpipe the entire length and also cut along the windpipe to free the esophagus being careful not to cut it. (At this point it may be wise to tie a string or cord securely around the esophagus to prevent vomitus, etc. from being lost or the carcass contaminated by the same. It may also be smart to insert a skewer or similar object through the esophagus below the tie to prevent the string from slipping off.) Cut through both the trachea and esophagus below the tie leaving three rings of the trachea or windpipe on the larynx.

When dropping the head from the carcass a convenient method to hold the head is to open the windpipe or trachea between the first ring of the trachea and the larynx. By holding the head in this way, the muscles of the neck just back of the jawbones and back of the poll or horns may be severed leaving as much muscle on the neck as possible and the junction of the atlas and axis vertebrae exposed. The head may be dropped by cutting through the spinal cord and then continuing to separate the atlas and vertebrae. It is suggested that the head then be weighed. In event that the veterinary or lay inspector cannot be present at this time, the head should be left intact until the inspector or pathologist can make his examination of it. However, if the situation permits, the edible portions of the head may be removed at this time.

Removing the Edible Parts of the Head:

The tongue may be taken out by cutting along each jaw and severing the tissue in the point of the lower jaw. The hyoid bones should be unjointed at the point they join the skull. If any feed or stomach contents are present in the head they should be removed and weighed.
The cheek meat, both on the outside, and inside of the jawbone, next to the tongue may be removed by cutting free with a boning knife.

The brains may be removed by splitting the skull open with a cleaver or sharp hatchet on a horizontal line just above the eyes. The pituitary may also be saved at this time. The edible parts of the head may then be weighed and placed in suitable clean containers.

The skull may then be split accurately in half and following this all lean and fat tissue removed. The teeth and horns may then be removed, to get head minus teeth and horn weights.

After the head has been removed and the carcass has stopped all noticeable bleeding, any blood which has collected on the slaughter room floor may be scraped up and weighed.

**Siding:**

At this point there may be various methods available for supporting the carcass when on its back. A pritch plate and pritch may be used. This is done by placing one end of the pritch in the floor plate and other end just behind the fore leg of the carcass. Another method is to use a rectangular wooden skinning rack which is placed on the floor before the animal is lowered, or, if not suspended, the carcass can be rolled onto it from the floor.

**Removing Hind Shanks:**

The hide may be removed from the hind legs in a manner similar to that employed in skinning the fore legs. Care should be taken to leave as little hide as possible on the cannon bones at the hoof heads. The hook and Achilles tendon should be exposed just enough so that a beef hook can be inserted into the Achilles tendon. The hind leg should be removed at the upper end of the cannon bone at the tarsal metatarsal joint and this joint may be broken by forcing downward and outward from the carcass. If the project requires data in skeleton composition and weight, the hooves—right hooves has been the past practice—can be separated—the bones and tendons being considered as skeleton.

**Opening the Hide and Siding:**

The following method of skinning is suggested: With the sharp skinning knife held at a slight angle with respect to the carcass and using the point of the knife, open the hide from the cut portion in the neck along the center line of the brisket and the belly to the cod. If the animal is a steer remove the pizzle from the abdominal surface and cut off at the posterior edge of the pelvic bone. If the animal is a mature female that has been in lactation the entire udder should be removed by cutting around the functional udder tissue and lifting it off. The removed udder should be weighed and held for inspection. If a heifer and the udder has not functioned in the life of the animal the hide and teats should be cut off from the udder fat and the udder fat left remaining on the carcass. This cut may be continued through the cod or udder to the anus or bung, or if female, to the vagina. With strokes as long and sweeping as skill will warrant, lay open the brisket and belly. In skinning the brisket, caution should be employed so as not to cut through the superficial pectoral muscles which function to hold the fore leg to the body. The hide should be separated from the belly down to the point where the thin outer muscle adheres persistently to the hide.
The cod should then be skinned out and the cod fat left on the carcass. Then it is suggested that the skinner cut from the hock along the "twist" of the hind legs to a point midway between the cod and bung and joining the cut made when opening the hide from the cod to the bung.

At this point the hide may be dropped from the flank and round far enough so that it does not cause difficulty in skinning when the beef tree is in place and the carcass partially hoisted. Following this the hide should be separated from the posterior position of the round starting with the hock to cod cut and stopping on a plane at the level of the bung or anus. It may be wise at this point to wash off any manure or dirt which may have gotten on the exposed areas of the carcass in order to prevent its getting into the abdominal cavity.

Opening the Carcass:

The abdominal cavity should be then opened from the posterior end of the sternum to the muscles of the round. (A suggested method of doing this is to keep the handle of the knife foremost in the abdominal cavity with the blade slanting backwards against the hide and cutting toward the posterior of the carcass. This method helps to prevent cutting the paunch or other parts of the viscera.) After the abdominal cavity has been opened, the caul fat or omentum can be stripped off the paunch. The caul fat may then be put in a weighed container and the weight recorded.

Saw the brisket as nearly in the middle of the sternum as possible, being careful not to have the saw in too horizontal a position as it may damage some of the internal organs. When the breast bone or sternum has been split, the worker is in a convenient position to open the throat and loosen the esophagus and trachea from the neck so that they can be easily removed when the carcass is eviscerated.

Splitting the Aitch Bone:

After the muscles which join at the center of the rounds have been cut, exposing the aitch or pelvic bones, these bones can be separated at the pelvic symphysis with a boning knife if the animal was a young one. However if the animal was comparatively older, it may be necessary to saw through the aitch bone as the cartilage in the pelvic symphysis has become ossified. When sawing through the aitch bone, caution should be exercised not to cut into the bung.

Removing the Tail:

The carcass should now be partially elevated to a height that is convenient to the worker. The tail may be exposed by inserting a sharp boning knife at the tip of the tail at an angle with the hide and cutting toward the base of the tail and then on each side of the anus or bung. After completely encircling the bung with the skinning knife, the bung may be tied off to prevent soiling the carcass. After the bones of the tail have been exposed, a clamp may be applied to these bones to hold the tail secure. The hide may then be pulled from the rest of the tail with little trouble or knife work.

The hide may then be removed from around the tail head of the carcass and from the top portion of the round, skinning cut to a level of the points of the hip bones. The tail may then be unjointed from the carcass at the base and weighed. If desired, the tail may later be separated into its component physical parts.
Pulling the Hide:

It is difficult to separate with a skinning knife the hide from the white "fell" tissue which is found on the outside surface of the round. After a small area has been started near the hock where the hide and fell have been separated, the hide can be pulled away from the "fell" with a downward force. The hide may be pulled down to an area at about the beginning of the external "red" tissues of the flank. At this point it may be wise to loosen the tied bung from the pelvic region. The hide should be dropped from the back and flank, the skinner being careful to leave as little muscle and fat on the hide as is practically possible. As the hide is dropped down the back of the carcass, the carcass should be hoisted to make the skinners job as convenient as possible.

Eviscerating the Carcass:

While the shoulders and forelegs of the carcass are still protected by the hide, it is advisable to eviscerate the carcass.

Before removing the viscera, a viscera cart or tray should be available.

The bladder should be first tied off, then removed and weighed. When removing the bladder, caution must be exercised so as not to cut into the small intestine which lies relatively close by. The large and small intestines should be dropped away from the kidney and pelvic fat. In doing this, as little kidney fat as possible should be removed with the viscera.

To avoid tearing the liver, it should be "fisted" away from the kidney fat as the viscera is dropped. The rumen should also be separated from the back in a similar manner. Caution should be taken not to cut or rupture the gall bladder while removing the liver. As soon as the liver has been removed, the gall bladder should be taken off. It is suggested that this be done by removing the bile canal first, closing it off by pressure of the fingers, and then gently pulling the rest of the gall bladder free.

The diaphragm should next be opened by cutting the white serous tissue at a point where it joins the red diaphragm muscle. The pillar or hanging tenderloin should be left on the carcass, finally being attached to the open side after the carcass has been split.

The heart, lungs, and trachea, known as the pluck, are then dropped from the thoracic cavity by cutting through the connective tissue which attaches these organs to the lower chest cavity. The aorta should be removed and can be done so by inserting the finger in the cross section of the artery and pulling it free from the back of the carcass.

It is suggested that weights be recorded immediately after removing the viscera from the animal. In event several cattle are slaughtered at one time, it is imperative that absolute identification of the viscera and its parts from each animal be maintained. This is necessary not only for the inspectors, but also for experimental data.

In event the inspector insists on examining the viscera immediately on its removal from the carcass, weighing may be put off until he has finished his examination.
The small intestine should be tied off in two places near the aboma-
sum in order that it can be cut from the stomach without losing stomach or in-
testine contents. The fat may be stripped from the stomachs and placed in a
weighed container. The ruffle fat can be stripped from the intestines and al-
so should be weighed and saved for laboratory samples if need be.

To remove stomach contents, the stomachs can be opened with a knife
and the contents dumped into tared containers and weighed.

The weight of the actual stomach tissue can be obtained by washing
the stomachs with water and then drying them with a dry cloth.

The intestines may be stripped to remove and weigh the contents and
then should be washed and dried for weighing.

**Measurements:**

While the subject of carcass measurements will be discussed in de-
tail in another paper, it seems timely at this point to suggest that certain
measurements be made before the carcass is split. Those most directly con-
cerned are the circumference measurements. These may be made at the hook
bones, at the navel, and circumference at the fifth rib. Length may also be
measured from the tail bone to the lower portion of the neck.

**Splitting:**

The carcass may be split by the use of a hand saw. Some workers
prefer to use a knife and expose the tips of the spinous processes before
sawing in order to get a more accurate split.

There is usually less chance of the saw jumping from the flexible
regions around the tail head if the first sawing through the caudal vertebrae
is done from the belly side of the carcass. Then it is probably best to move
around to the back of the carcass to continue splitting as the spinous proces-
ses can be best observed from this side.

Some workers prefer to use a cleaver for splitting. This method re-
quires more skill and experience and unless the worker has such qualifications
the saw will probably be the safest most desirable tool to use.

It should be noted here that as the splitting progresses down the
back the hide should be dropped in order that it not be scored. As the car-
cass is raised from the floor, the hide should also be removed from the fore
shanks.

After the thoracic vertebrae and processes have been split, the
neck muscles and ligament should be split with a knife to expose the cervical
vertebrae. These vertebrae may then be split with either saw or cleaver.

The spinous processes of the thoracic vertebrae should be scribed
with a scribing saw to give the muscles of the chuck and rib a thicker ap-
pearance when these processes are broken back.

The flank muscle may also be dropped slightly with a knife at a
point where it joins with the round to allow the carcass to drop slightly on
the belly side.
Washing and Weighing:

The carcass should be washed with a clean brush or cloth and an abundance of cool water. Note should be taken to see that all blood has been removed from the underside of the skirt. The spinal cord should also be removed.

If the inspector finds the carcass acceptable, the beef may then be shrouded with "wetted" shroud. The wet shrouds should be secured tightly around the hind shanks and rounds of the carcass first. Clean metal shroud pins may be used to secure the shroud. Then the shroud should be pulled tightly over the surface of the fat progressively toward the neck so as to form a smooth surface when the carcass has chilled. The shroud may be secured at both the vertebra edge and belly edge of the carcass. The beef may then be weighed, with tare being allowed for trolleys, and put under refrigeration.

After hot carcass weights have been taken, both open and closed sides of each carcass should be positively identified. Various methods may be used for marking the carcasses. One method is to mark the rib and interior surfaces of the carcass with vegetable ink stamps or marks. Tags and metal clips attached to the carcass may also be used although there is danger of these being torn away. It is also suggested that both fore and hind quarter regions be marked to prevent loss of identity after the carcass has been ribbed.

The cooler facilities at various places will vary and this cannot be controlled; however, temperatures around 36°-38° should be available in most coolers for chilling the carcasses rapidly. Chilled carcass weights may be taken at twenty-four and forty-eight hour intervals.

CHAIRMAN MACKINTOSH: Thank you, Mr. Deans, an excellent presentation.

The next member of our committee, I know, has been at work a long time. He was like Mr. Deans. He was working long before he indicated how busy he had been. We are expecting a lot from Mr. H. D. Naumann of the University of Missouri, who is going to present, "A Recommended Procedure for Measuring and Grading Beef for Carcass Evaluation." Mr. Naumann.

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