1. PURPOSE

1.1. The purpose of this Animal Care and Use Procedure (ACUP) is to describe procedures to be followed when placing ruminal cannulas and caring for the fistulated bovine. This ACUP is approved by the Cornell Institutional Animal Care and Use Committee (IACUC). Any deviation must be approved by the IACUC prior to its implementation.

2. SCOPE

2.1. This ACUP is intended for use by investigators and their staff who have received approval to place ruminal cannulas in research animals.

3. INTRODUCTION

3.1. This ACUP describes the materials and procedures that are used for the preparation and long term care of the fistulated bovine. Fistulated bovine are used for research, education, extension, and herd health management. Contact Center for Animal Resources and Education (CARE) at Cornell University at care@cornell.edu for more information or for assistance.

4. MATERIALS AND EQUIPMENT

4.1. Surgical supplies (e.g., antiseptic, sterile gloves and instruments, suture, etc.)
4.2. Rumen cannula
4.3. Bucket of fresh, warm water
4.4. Electric hair clippers
4.5. Perioperative medications and materials (e.g., antibiotic, analgesic, local anesthetic, needles, syringes, etc.)

5. PROCEDURE

NOTE: Following standard levels of care, cannulation surgery shall be performed by or under the direct supervision of an experienced licensed veterinarian. One acceptable surgical
protocol is the following, but the individual surgeon may modify the technique according to personal preferences.

5.1.  Pre-Operative Care

**NOTE:** Medications used in this procedure require milk withdrawal if administered to lactating cattle and have a meat withhold time. Consult the facility veterinarian for more details.

5.1.1. Fast the animal for 18 hours prior to surgery, but ensure *ad libitum* access to water.
5.1.2. Administer a prophylactic dose of an appropriate antibiotic (per veterinarian and researcher preferences) 24 hours prior to surgery.
5.1.3. 1–2 hours prior to surgery, place the cannula in a bucket of water that is hot to the touch for softening and lubrication. Assure that the water and cannula are not too hot as tissue trauma could result.
5.1.4. Administer analgesia (e.g., flunixin meglumine at 1-2 mg/kg IV) prior to surgery.
5.1.5. Gently restrain the animal in a restraint chute. If possible, perform surgery with the animal standing. Administration of sedation may be necessary for agitated cattle (e.g., xylazine at 0.02-0.03 mg/kg IV).
5.1.6. Identify the anatomical area where the fistula will be located, typically in the dorsal half of the left paralumbar fossa, approximately 4-5 inches ventral to the transverse spinous processes, and centered between the 13th rib and the tuber coxae.
5.1.7. Shave surgical area and remove hair.
5.1.8. Wash area with antiseptic scrub as per manufacturer’s instructions. Scrub the area starting at the incision site and work in a spiral motion progressively outward towards the edge of the shaved area; repeat this process at least two more times.
5.1.9. Remove antiseptic scrub by applying or spraying a non-soap antiseptic solution.
5.1.10. Administer 100–150 mL of 2% lidocaine subcutaneously in a paravertebral or an inverted L pattern (see References below for link on local anesthesia and analgesia).

5.2.  Surgical Procedure

5.2.1. Use aseptic technique:

5.2.1.1. Wash hands and perform a surgical scrub.
5.2.1.2. Wear sterile gloves and surgical garments
5.2.1.3. Do not touch non-sterile surfaces or objects

5.2.2. Confirm the levels of sedation and anesthesia are adequate.
5.2.3. Perform surgery to create the fistula as per accepted surgical protocols. One protocol is given in the appendix.
5.2.4. Move the animal to a recovery pen.
5.2.5. Document procedure details in the animal’s medical records as per ACUP 542 Maintaining Health and Procedure Records for Research and Teaching Models.

5.3. **Post-Operative Care**

5.3.1. Keep the animal separate from the group and maintain under close observation for several hours after surgery.

5.3.2. Allow access to some hay to stimulate rumen function.

5.3.3. Monitor the incision for infection and use antiseptic solution to gently clean the surgical site and outer rim of the cannula daily for 7 days. Notify the facility veterinarian if the wound develops excessive discharge. Some pressure necrosis is normal but will improve with time.

5.3.4. Administer an appropriate antibiotic (per veterinarian and researcher preferences) for an appropriate duration per label instructions.

5.3.5. Monitor feed intake and body temperature at least once a day for 1 week. Notify the facility veterinarian if appetite and/or temperature are not within normal limits.

5.3.6. Remove the cannula 10 to 14 days after surgery. Inspect the surgery site to ensure that the rumen has completely adhered to the skin, and that no rumen contents are leaking into the peritoneal cavity. If the site has healed, remove the sutures carefully. Notify the facility veterinarian if the surgery site looks abnormal (e.g., foul smell, inflamed / infected tissue, or excessive discharge). Reinsert the cannula.

5.3.7. Document post-operative activities and any abnormal observations in the animal’s medical records.

5.4. **Long-Term Care**

5.4.1. Observe the presence and fit of the cannula weekly. If the cannula accidentally comes out, inspect the cannula and rinse off and reinsert it or replace it immediately to reduce the risk of dehydration. If leakage of rumen contents occurs, clean the animal’s skin with warm water, a mild detergent, and a soft scrub brush. In this case, also make certain to assess the integrity of the cannula.

5.4.2. Perform a more thorough examination of the cannula and fistula at least monthly. More frequent examination is required when the animal is actively used or during fly season. This examination should include an assessment of cannula integrity and the health of the surrounding skin.

5.4.3. Remove and clean the cannula annually. Take this opportunity to visually examine the internal surface of the rumen. Rinse the cannula and scrub it clean in warm water before reinsertion; if a detergent was used to clean the cannula, completely rinse the cannula before it is reinserted. Replace the cannula if it becomes inflexible or cracked. Document this activity in the animal’s record.

6. **PERSONNEL SAFETY**

6.1. Medical Emergencies: **CALL 911**.
6.2. When working with animals wear appropriate PPE, observe proper hygiene, and be aware of allergy, zoonosis, and injury risks. Refer to the CARE Occupational Health and Safety webpage for more information.

7. ANIMAL RELATED CONTINGENCIES

7.1. Post contact information for emergency assistance in a conspicuous location within the animal facility.

7.2. Emergency veterinary care is available at all times including after working hours and on weekends and holidays through Ambulatory and Production Medicine Service at (607) 253-3140.

7.3. Non-emergency veterinary questions and requests for animal care email CARE veterinary staff at care@cornell.edu.

7.4. Spare cannulas and cannula plugs should be available at all times, in the event that a plug is lost or the cannula / plug is found to be cracked or hardened.

8. REFERENCES

8.1. ACUP 542 Maintaining Health and Procedure Records for Research and Teaching Animals:
http://ras.research.cornell.edu/care/documents_k/ACUPs/ACUP542.pdf

8.2. Guidelines for Long-Term Care and Maintenance of Animals with Permanent Rumen Fistulas at the Pennsylvania State University. Revised December 13, 2010:
https://www.research.psu.edu/iacuc/guideline/12

8.3. Lee, Lyon (2007). Local Anesthesia and Analgesia. Oklahoma State University:


8.6. CARE Occupational Health and Safety webpage:
http://ras.research.cornell.edu/care/OHS.html

9. APPENDIX


9.1.1. Using a sterile scalpel blade, make either a 6-inch vertically oriented elliptical incision (for a 4-inch internal-diameter cannula) or a circular incision through the skin that is about ½ inch smaller in diameter than the inside diameter of the cannula. The dorsal aspect of the incision should be about 4 inches ventral to the transverse spinous processes.

9.1.2. Dissect the subcutaneous tissues to excise the elliptical piece of skin. Sharply dissect the muscle layers parallel to the long axis of the skin incision.

9.1.3. Using forceps to grasp and tent the peritoneum, make an incision into the peritoneal cavity with scissors to allow access to the rumen.

9.1.4. Apply atraumatic tissue forceps to grasp the rumen wall.
9.1.5. Suture the peritoneum and transversus abdominis to the dermis using a No.1 absorbable monofilament suture on a cutting needle in four segments to avoid a purse-string effect. Exteriorize the rumen through the incision and secure it to the dermis at 4 to 5 points with sutures taking special care not to penetrate the lumen of the rumen. Suture the seromuscular layer of the rumen to the dermis circumferentially in four overlapping suture lines.

9.1.6. Make a full-thickness incision through the exposed rumen mucosa and pass full-thickness sutures through the rumen and the skin with size #1 or 2 non-absorbable or slowly absorbing suture in an interrupted pattern.

9.1.7. Remove the cannula from the warm water and insert it into the fistula.

10. HISTORY

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