

SOP: Swine Intravenous Catheterization

These SOPs were developed by the Office of the University Veterinarian and reviewed by Virginia Tech IACUC to provide a reference and guidance to investigators during protocol preparation and IACUC reviewers during protocol review. They can be used as referenced descriptions for procedures on IACUC protocols. However, it is the sole responsibility of the Principal Investigator to ensure that the referenced SOPs adequately cover and accurately represent procedures to be undertaken in any research project. Any modification to procedure as described in the SOP must be outlined in each IACUC protocol application (e.g. if the Principal Investigator plans to use a needle size that is not referenced in the SOP, simply state that alteration in the IACUC protocol itself).

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Version: 1

Original date: 12/12/17

Version date: 12/12/17

I. Procedure Summary and Goal

Describes procedure for placing an indwelling catheter in the lateral auricular (ear) vein of swine.

Most common site for venous catheterization is the lateral ear vein; other sites include the anterior vena cava, jugular vein, cephalic vein, and coccygeal vein, but these sites are considerably more difficult to gain access and catheterize effectively without further preparation (e.g., surgical cutdown procedure).

Refer to SOP: *Swine Restraint*

II. Personal Protective Equipment (PPE) and Hygiene

- a. Ensure appropriate PPE is used to protect handler from accidental injury or exposure to blood and other body fluids, such as:
 - i. Scrubs or coveralls
 - ii. Steel-toed shoes or boots
 - iii. Optional
 - a. Disposable gloves (e.g., latex, nitrile)
 - b. Eye protection
 - iv. Other PPE as required by protocol/facility
- b. Hands should be washed and/or gloves changed between animals.
- c. Pigs are extremely vocal and volume can well exceed 85 decibels; therefore, it is recommended that ear protection be used when handling or working with pigs.
- d. Promptly dispose of used sharps in the provided leak-proof, puncture resistant sharps container.

III. Supply List

- a. Restraint (e.g., snare, sling, crowd board)
- b. Sterile gloves
- c. 18 to 20 gauge indwelling catheters; 2 inch
- d. Extension set and catheter endcap
- e. Heparinized saline
- f. Adhesive tape
- g. Scissors and needle holders
- h. Clippers
- i. Surgical scrub (e.g., betadine and isopropyl alcohol)
- j. Gauze

IV. Detailed Procedure

- a. Restrain animal with snare, securely contained against a wall or corner; alternatively swine can be placed in a sling (Figure 1).

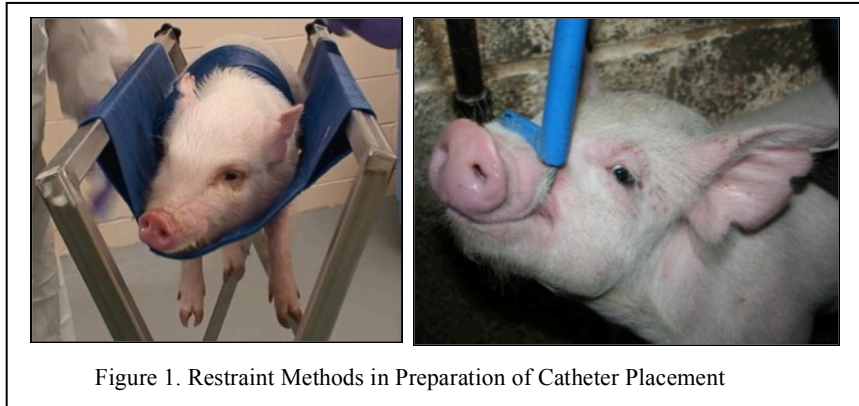


Figure 1. Restraint Methods in Preparation of Catheter Placement

- b. Clean ear with antiseptic gauze to remove superficial dirt and debris.
- c. Surgically scrub area using “clean hand, dirty hand” technique. Scrub in a circular motion, starting at the center and moving outward in a spiral. Scrub four times, alternating with betadine, then alcohol.
- d. Prepare “strut” by rolling several pieces of gauze and wrapping in adhesive tape – this will be used to place inside the ear for support.
- e. Flush catheter with heparinized saline, and prepare for securing/suturing by placing adhesive tape wings at base. Do not handle catheter itself. If used, flush extension set with heparinized saline.
- f. Don sterile gloves.
- g. Person restraining pig can occlude the vein by applying pressure at the base of the ear. Alternatively, a tourniquet can be used.
- h. Visualize raised vein and stabilize ear pinna. Remove plastic needle guard and introduce catheter needle into the vein (Figure 2).
- i. A flash of blood into the needle hub confirms correct placement. When using an over-the-needle catheter, advance needle and catheter a few millimeters. If no resistance and blood continues to flow, hold the needle stylet in place and gently advance the catheter forward into the vein. Blood should flow freely from catheter if in place.



Figure 2. Butterfly Catheter Placement

NOTE: If resistance is felt, catheter may not be in the vein. Attempt to reposition if stylet is still in place. Do not attempt to re-thread catheter with stylet once stylet removed.

- j. Withdraw needle, holding catheter in place. Dispose of needle in approved sharps container.
- k. Place endcap on catheter and secure in place by taping the tape wings to the skin. Surgical glue can also be used.

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- l. Extension set, prefilled with heparinized saline, can be attached to the catheter and taped in place to allow for multiple day access. Flush catheter set-up with heparinized saline to maintain patency.
- m. Secure catheter and extension set by placing the “strut” in the pig’s ear, curling ear around it and gently wrapping entire ear, catheter and extension set with adhesive tape. The end cap should be secured so that it can be accessed without removing tape.
- n. Catheter maintenance - flush catheters twice daily with heparinized saline. Auricular catheters may be maintained for up to three days.
- o. In order to ensure adequate hemostasis upon removal of catheter, apply pressure with gauze for one to two minutes.

V. Variations

Alternate locations that can be used for intravenous catheterization include anterior vena cava, jugular vein, cephalic vein, and coccygeal vein, but these sites are considerably more difficult to gain access and catheterize effectively without further preparation (e.g., surgical cutdown procedure).

VI. Potential Adverse Effects, Mitigation, or Treatment

- a. Hematoma
 - i. Apply pressure
- b. Thrombosis/Thromboembolism/Thrombophlebitis/Septic Thrombophlebitis
 - i. Inspect catheter at least twice daily and if any indication of infection/thrombosis is noted, remove the catheter immediately.
 - ii. Contact a qualified veterinarian for treatment recommendations if any of the following are noted.
 - a. Heat, pain, swelling first noted at the insertion site of the catheter, purulent material draining from the insertion site.
 - b. Induration (hardening) of the vessel
 - c. Stiff, swollen neck
 - d. Pyrexia, local or systemic infections, septic shock
 - iii. Inspect the catheter for evidence of movement in or out of the vein or kinking.
 - iv. Thromboembolism may occur secondarily to thrombosis
 - a. Pulmonary, brain, cardiac, and renal signs
- c. Catheter Misplacement
 - i. Extravascular placement
- d. Catheter Occlusion

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- i. Periodic flushing with heparinized saline
- ii. Replace catheter
- e. Air Embolism/Catheter Embolism
 - i. Air embolisms do not usually cause problems in swine
 - ii. Catheter embolism occurs when a fragment of the catheter becomes free and is carried by blood flow until it lodges in the heart or a pulmonary artery
 - a. Occlude the vein proximal to the catheter site to trap the embolus.
 - b. Contact veterinary staff immediately.

VII. **References**

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