Tail Biopsy of Mice[1]

PURPOSE: This guideline describes the ACUC-approved procedures for performing tail biopsies for genotyping in mice.

INTRODUCTION: To determine if mice carry a gene of interest, tail biopsies or "snips" are commonly performed to obtain DNA. Obtaining tissue from a mouse for DNA analysis via tail biopsy is a safe, effective and humane procedure when performed properly and is the preferred method for obtaining sufficient amounts of DNA for Southern Blot analysis. DNA for Polymerase Chain Reaction (PCR) requires the least amount of DNA and can be obtained from ear punches, blood, oral swabs, hair and fecal samples (1-4). Investigators are strongly encouraged to use the least invasive method for acquiring samples for genotyping.

The optimal age for genotyping is between 10-21 days old. Tail biopsies at this age give the highest yield of DNA per mm. In general, tail vertebrae in pre-weaning age mice are not fully ossified and removing the tail tip produces minimal pain and distress (5). Prompt analysis of tail tissue allows mice to be identified prior to weaning which facilitates more efficient use of cage space and optimizes colony management.

Although there are no definite criteria established for the ideal age to achieve a balance between maximizing DNA quantity while minimizing pain and distress, there is the potential in mice > 21 days of age for tail biopsy to produce more than transient pain due to increased neural, vascular and vertebral development (6). Thus, the use of a local or general anesthetic is required in mice >21 days of age prior to collection of tissue from the tail.

PROCEDURE:

1. Procedures for performing tail biopsies for genotyping and/or DNA analysis must be described in the protocol if they differ from these guidelines.

   Mice ≤ 21 days of age: Local anesthetics are recommended but not required. Local anesthesia can be achieved by spraying the tip of the tail with ethyl chloride or immersion in ice cold ethanol for ~10 sec.

   Mice > 21 days of age: Local (e.g., ethyl chloride spray for ~5 sec) or general anesthesia (e.g., isoflurane) is required.

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Restrain, or grasp, the mouse between thumb and forefinger. This is a convenient time to identify the animals using the appropriate method (i.e. ear punch, ear tag, toe tattoo, transponder etc.). Clean the tip of the tail with 70% ethanol.

2. With a sterile razor blade, scalpel, or sharp scissors, cleanly excise up to 5 mm of the tail. Less tail may be taken, however more than 5 mm requires justification in the protocol. If you prefer, the tail may be placed on a disinfected work surface for performing this procedure. When executed properly, a 5 mm segment of tail should yield over 50 micrograms of DNA, enough for multiple analyses. Note: the yield of DNA does not proportionally increase with the use of tail fragments larger than 5 mm. When performing snips on more than one animal at a time, care should be taken to remove all tissue from the instruments between animals.

3. Following the procedure, bleeding should be controlled using local pressure, applying styptic powder or silver nitrate to the tail tip, or cauterization by heating the razor blade or scalpel in the flame of a small alcohol burner before cutting. Keep in mind that heating dulls the blade and may not be appropriate when cutting with non-disposable scissors. Note: cauterizing agents are toxic to mice if ingested; use with caution. After ensuring that the bleeding is stopped, the mice must be monitored after release back into their cages to ensure bleeding does not re-start.

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