A. Purpose:

To provide guidance on when tribromoethanol (TBE) may be used in animal studies and to provide standardized methods for its preparation, storage and use.

B. Background:

In compliance with Federal Animal Welfare Regulations and guidance, the IACUC expects that investigators will use pharmaceutical grade medications whenever they are available, even in acute/terminal procedures.\textsuperscript{1,2} Non-pharmaceutical grade compounds should only be used after specific review and approval by the IACUC for reasons such as scientific necessity or non-availability of an acceptable veterinary or human pharmaceutical-grade product. Cost savings is not a justification for using non-pharmaceutical grade compounds in research animals. (see WSU IACUC policy #29, Use of Non-Pharmaceutical Grade Substances in Laboratory Animals)

Tribromoethanol is an injectable anesthetic previously manufactured under the trade name Avertin®; however, this product is no longer available in pharmaceutical grade.

In addition, TBE can cause a number of deleterious effects when administered to animals\textsuperscript{3-7}:

- TBE degrades in the presence of heat or light to produce the toxic byproducts, dibromoacetaldehyde and hydrobromic acid, which are nephrotoxic and hepatotoxic
- Administration of degraded TBE solutions has been associated with death, often 24 hours after injection
- Peritonitis and abdominal adhesions can occur following intraperitoneal (IP) administration. Adhesions are more likely with repeated administration or high doses
- Use of TBE can also result in intestinal ileus (reduced/absent gut motility), leading to death of the animal several weeks after administration

The time period of anesthesia has also been shown to be variable even when the dose is kept constant.\textsuperscript{8}
C. Policy

Due to the lack of a pharmaceutical grade drug and the potential for serious side effects, the IACUC does not recommend the use of TBE in animals. Therefore, the IACUC strongly encourages investigators to use alternate anesthetic agents, whenever possible. If the investigator is of the opinion that TBE is the anesthetic of choice, the following must be addressed in the protocol or amendment:

- The investigator must **scientifically** justify why the use of TBE is necessary, and why another pharmaceutical grade anesthetic cannot be used
  - Cost and/or familiarity with its use are not adequate justification for use of TBE
  - Lack of a controlled substances license is not adequate justification
  - Historical use of TBE may not be adequate justification for its continuing use
- The investigator must acknowledge that they are aware of the potential negative effects of TBE administration

The IACUC will carefully consider the scientific justification provided to decide if they can approve the use of TBE in animal studies. If the use of TBE can be justified on scientific grounds and is approved by the IACUC, the following conditions must be met as part of that approval:

- The TBE must be prepared, stored and disposed of in the manner described below
- The dose must not exceed those given below
- If approved for survival procedures, only a single dose must be administered
- When using TBE, any adverse or unexpected events must be immediately reported to the Office of the Campus Veterinarian

D. Preparation

**Stock Solution (1.6 g/ml):**

- Ensure that glassware and stirrers are clean by pre-treatment with 10% HCl to remove detergent residue and thoroughly rinsing with reagent grade H₂O.
- Prepare the stock solution in a chemical fume hood, wearing nitrile gloves, a lab coat and safety glasses.
- Add 6.2ml tertiary amyl alcohol (2 methyl-2-butanol) to 10g 2,2,2-tribromoethanol (TBE) in a capped container and stir until the TBE is dissolved. This may take several hours to overnight. Ensure the solution is kept away from light.
Label the bottle (stock solution) with the date of preparation and a use-by date. The stock solution is stable for 6 months (use-by date).

Aliquoting the stock solution into multiple, smaller containers will reduce the risk of contamination due to multiple draws from the same container.

Store the solution at 4°C, away from light and tightly capped, as the solution is photosensitive and hydroscopic.

A yellow discoloration indicates the presence of toxic products and the stock solution must be discarded, even if it is before the use-by date.

After 6 months, any unused solution must be appropriately discarded.

Working Solution (20 mg/ml):

- Ensure that glassware and stirrers are clean by pre-treatment with 10% HCl to remove detergent residue and thoroughly rinsing with reagent grade H2O.
- Prepare the working solution in a chemical fume hood, wearing nitrile gloves, a lab coat and safety glasses.
- Add 0.5ml stock solution to 39.5ml USP grade saline drop wise with stirring at 40°C to dissolve the TBE. Ensure the solution is kept away from light.
  - The stock solution must be diluted in USP grade diluent and the composition of the diluent must be suitable for injection into animals, i.e., do not use water.
- Filter the working solution through a 0.22μm sterile filter into a sterile bottle.
- Label the bottle with the concentration, the date of preparation and a use-by date. The working solution is stable for 2 weeks (use-by date).
- Store the solution at 4°C and away from light, as the solution is photosensitive. Warm to 40°C to dissolve precipitates, if necessary.
- If the solution changes in color from clear to yellow, the solution must be appropriately discarded.
- Dispose off any solution that is past 2-week expiration date.

Dose:
Mice: Use at maximum of 240mg/kg IP; approximately 5 minutes to induce anesthesia, 15-30 minutes of anesthesia, and 90 minutes to complete recovery.

Rats: Use at maximum of 300mg/kg IP; approximately 5 minutes to induce anesthesia, 15-30 minutes of anesthesia, and 90 minutes to complete recovery.

E. References

1. PHS Policy on the Humane Care and Use of Laboratory Animals, Frequently Asked Questions
2. USDA Animal Welfare Policy #3: Veterinary Care, Issue Date 3/25/11

WSU-IACUC Policy #32: Approved by the WSU-IACUC on: 11.16.16