Johns Hopkins University
Animal Care and Use Committee

Use of Neuromuscular Blocking Agents[1]

BACKGROUND: Federal regulations and policies state that: a) "Procedures that may cause momentary or slight pain or distress to the animal will not include the use of paralytics without anesthesia"[2]. b) "Procedures with animals that may cause more than momentary or slight pain or distress should be performed with appropriate sedation, analgesia, or anesthesia. Surgical or other painful procedures should not be performed on unanesthetized animals paralyzed by chemical agents." [3].

POLICY: Neuromuscular blocking agents such as succinyl choline, gallamine, and pancuronium are not to be used alone for surgical restraint or in painful procedures. They can be used for surgery or painful procedures only in conjunction with drugs known to produce adequate anesthesia/analgesia.

The use of a neuromuscular blocking agent in an animal manipulation will require a justification with extensive detail on the instrumentation/procedures used for determining that adequate analgesia is maintained. Some ways to determine that animals are adequately anesthetized include performing the procedure in absence of the neuromuscular blocker to determine appropriate anesthetic dosages and monitoring blood pressure and heart rate. Both the upper and lower range of acceptable blood pressure and heart rate values should be specified in the proposal. The parameters of any other signs (e.g. pupil size) that might be used for anesthetic depth assessment also should be specified. These values should be determined before the neuromuscular blocking agent is administered[4] (e.g. during pre-surgical period, in pilot studies, from previous experimental procedures not involving neuromuscular blocking agents or from the literature). Study records should document maintenance of adequate levels of anesthesia and analgesia during the use of neuromuscular blocking agents.

When neuromuscular blocking agents are used for experimental procedures involving more than a single short event, peripheral nerve stimulation tests are recommended to document recovery of neuromuscular function during the non-paralyzed periods of the anesthesia depth assessment.

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[1] Approved by the Animal Care and Use Committee: September 19, 2002, reviewed and refs. updated September 25, 2012; reviewed 1/31/18, 1/15/21

[2] 9 CFR Chapter 1 Subchapter A Part 2 § 2.31 (d)(iv)(C)

[3] U.S. Government Principles for the Utilization and Care of Vertebrate Animal Used in Testing, Research and Training. Principle V. As cited in the Public Health Service Policy on Humane Care and Use of Laboratory Animals.

[4] Guide for the Care and Use of Laboratory Animals. NRC. National Academy Press, 8th ed., 2011. p123.

If animal subjects are to recover from the experimental procedures clinical signs of neuromuscular recovery should complement the nerve stimulation tests (e.g. normal breathing pattern, sustained head lift, or ability to stand).

Veterinary consultation is required in preparation of protocols requiring use of neuromuscular blocking agents[5].

A useful editorial article was published in *Anesthesiology* 85: 697-699; 1996.

[5] The use of neurotoxins may be subject to additional regulations by Departments of Health and Human Services (HHS) and Agriculture (USDA) and will require approval by the Biosafety Officer.