Guidelines on Neuromuscular Blocking Agents

The use of neuromuscular blocking agents may be approved for research procedures where scientific justification is provided for paralysis of the animal. Few indications exist for the use of neuromuscular blocking agents in research involving animals. Therefore, their proposed use will be reviewed on a case by case basis. These drugs must not be used alone to provide restraint and immobilization and may only be used in conjunction with drugs producing surgical anesthesia, and hence, unawareness of the paralytic state. Due to the inherent difficulties in assessing the level of surgical anesthesia in paralyzed animals, the use of these drugs will be approved only if it is clearly established that (1) neuromuscular blockers are essential for the proposed research, and (2) that the investigator is able to monitor the animals appropriately for signs of pain and distress.

Procedures

A surgical plane of anesthesia must be induced and the animal intubated prior to administration of the neuromuscular blocking drug; furthermore, a surgical plane of anesthesia must be maintained during the entire time the neuromuscular blocking drug is present and active in vivo. Neuromuscular blockers must not be administered until after the initiation of the surgical procedure (i.e. the skin incision) to ensure that the depth of anesthesia is adequate and the animal does not feel pain. Use of neuromuscular blocking agents should be confined solely to that phase of the procedure for which they are indicated. Neuromuscular blocking agents must not be used as a matter of convenience or to substitute for poor control of anesthesia.

Nitrous oxide in most animal species is not an anesthetic and cannot provide a surgical plane of anesthesia. As a result, it must not be used alone with neuromuscular blocking agents during surgical procedures.

The use of a pre-operative analgesic is recommended in addition to the general anesthetic during surgical procedures where neuromuscular blockers are being used.

Controlled ventilation must be initiated prior to administration of the neuromuscular blocking drug.

During the period of paralysis, signs of reaction to pain and stress must be continuously monitored as appropriate to the species (e.g., heart rate, blood pressure). If these parameters increase by 20% or more without other explanation, pain/stress may be assumed to be present, and the anesthetic level should be deepened. Baseline measurements must be established at the initiation of anesthesia for comparison. If a surgical procedure is being performed, baseline measurements should be made at the initiation of the surgery (skin incision) to determine that the depth of anesthesia is adequate. Monitoring of electroencephalography (EEG) may also be helpful. However, the normal EEG appearance differs with different types of anesthetics, and confirmation of an anesthetized state may not always be possible based on the EEG.

Therefore, the investigator should be thoroughly familiar with the expected EEG pattern for the particular anesthetic used.
Core temperature, blood gases, and fluid and electrolyte balance must be maintained within normal levels during the period of paralysis. If animals have to be paralyzed for long periods of time (e.g. greater than 4 hours), provision must be made for periodic voiding of the urinary bladder.

**Prior to using neuromuscular blocking drugs in a procedure, investigators must be prepared to demonstrate the proposed procedure, at the request of the IACUC, in the absence of the paralyzing drug.** This will assure that the anesthetic technique is sufficient to prevent pain and distress associated with the procedure, and to confirm that escape behavior does not occur in the absence of the neuromuscular blocking agent.

**References:**


