Document 007: Animal Analgesia and Anaesthesia Standards V1.0

1. Background

Good Research Practices
It is important that the animals' normal physiological state is maintained during and after procedures. This will ensure the highest chance of research success and maintain high research quality as well as maintenance of animal welfare standards.

The University recognises that in some instances alterations to standard practice must be made for scientific reasoning however, where these alterations come with an increased risk to animal welfare they must be well justified and go beyond the argument that it is consistent with historical approaches or published data.

Definitions

AEEC: ANU Animal Experimentation Ethics Committee. This is a committee convened by the ANU as per the Australian code for the care and use of animals for scientific purposes, whose responsibilities include review, approval and monitoring of the use of animals for scientific purposes and assess the evidence that the use of animals is justified. The committee also review and approve procedures, guidelines and provide advice and recommendations to the institution on animal based research.

General Anaesthesia: Loss of consciousness, reducing or preventing the perception of pain while the animal is unconscious.

Local Anaesthesia: Loss of sensation and perception of pain in a local area as a result of blockage of the nerve endings by a local anaesthetic.

Analgesia: The use of medication to relieve pain

Terminal, acute, or non-survival surgery: Animal is humanely euthanased while still under anaesthesia.

2. Considerations

Species Differences
There are appreciable differences between drug metabolism, thermoregulation and pain perception across the different classes of animals, which affect will affect the selection and dosing of drugs in the provision and maintenance of anaesthesia and analgesia, as well as appropriate support and monitoring. These will
vary greatly in a mammal compared to an amphibian. The Primary Investigator and their team must be aware of the specific needs of the animal they will be undertaking anaesthesia in and must seek appropriate training if required.

**Timing**

Animals that undergo surgical procedures often require additional monitoring and the availability of research personnel and animal care staff to perform adequate checks and oversight must be taken into consideration. This can vary with the time of day, day of the week and the time of year. If procedures are undertaken late in the day or at the end of the week, it is the responsibility of the research team to ensure there is adequate monitoring after the procedure as per the approved ethics protocol.

The University requires that no high impact studies with significant risk are undertaken over holiday periods where support staff are limited, this includes the four-day weekend over Easter and the University Closure period at Christmas. Special approval for any such work must be sought from the ANU Research Ethics Team.

**Equipment Availability**

If a research group wishes to engage in a program of work that requires surgery they must ensure, in advance, that:

- A) They have adequate access to the required equipment to meet the standards listed above and;
- B) That the equipment is up to date with any service or maintenance requirements.

Please note that the ANU does not support work undertaken if there is a lack of suitable equipment as it may jeopardise animal welfare and research quality. A lack of suitable equipment to provide veterinary standard care pre, during and post-operative is not acceptable.

Advice on suitable equipment may be sought from the ANU Veterinary Services Team.

**Field Work**

The ANU recognises that some work is undertaken in the field and that delivery of anaesthesia can be more difficult. In this instance it is required that standards are similar to those that would be undertaken by a veterinarian in the field. Further advice and training on how to achieve these standards can be sought from the ANU Veterinary Services Team.

### 3. Monitoring, Intervention and Reporting

**Animal Welfare Risks**

Procedures that have the potential to cause pain and discomfort in animals by definition are considered to put animal welfare at risk. In addition, the incorrect use of anaesthesia and analgesia can also result in poor animal welfare and poor research outcomes. It is in the best interests of the Primary Investigator and the University to ensure these risks are adequately assessed and mitigated prior to and throughout any experimental programs.

Surgical procedures come with significant risk to the welfare of the individual animals. It is a requirement that these risks are recognised and minimised by all groups undertaking surgical practices. For standards on surgical procedures please refer to the ANU Animal Surgery Standards.
High Risk Anaesthesia

Animals that have compromised systems as a result of experimental intervention may respond to anaesthesia differently than expected. This must be taken into consideration when undertaking anaesthesia. For example, animals that may be at risk of compromised liver function (e.g. from tumour metastasis) will be at high risk from injectable anaesthesia and should be considered for inhalational anaesthesia. The Veterinary Services team are able to provide advice on selection of appropriate anaesthetics for experimental animals.

Neonatal animals present unique challenges for anaesthesia including their size, thermoregulation and drug metabolism, all affecting their ability to be safely and reliably anaesthetised. It is expected that such anaesthesia will be undertaken after consultation with the Veterinary Services team to current best practice.

Anaesthesia and Analgesia Complications

The ANU recognises that some experiments come with a known element of risk and complication. Such risks must be identified in the approved animal ethics protocol, with measures to mitigate these risks also included.

If any complications occur that are not identified and approved or at a rate higher than expected then these must be reported to the ANU Research Ethics Team, RSD via the Unexpected Adverse Events Procedure. In addition, all complications, whether expected or not, must be recorded and included in your annual review documentation and available to the ANU Veterinarians for review at any time. This allows for review of common practices and complications and to assist the University in its continual improvement of animal experimentation.

Complications that have been known to occur in the past include:

- Poor preparation of substances leading to inaccurate dosing or contamination
- Insufficient delivery of anaesthesia
- Overdose of anaesthesia
- Poor understanding of anaesthesia equipment
- Poor communication to group members regarding the requirements for analgesia.
- Poor thermal support provision during anaesthesia leading to hypothermia and related complications
- Poor monitoring of animals
- Inadequate support and monitoring of animals post-anaesthesia

Please ensure these items are adequately addressed before starting experiments to reduce risks to animal welfare and research quality. For advice on suitable preparation please contact the ANU Veterinary Services Team.

4. Minimum Requirements

The use of all substances in animals must have appropriate AEEC approval.

Procedures must be undertaken with the objective to minimise the potential for pain and discomfort in the animal.

Where any procedure can potentially cause pain to the animal, it is expected that appropriate pain management practices will be undertaken to ensure good animal welfare practices and high quality research outcomes. As per the NHMRC Guidelines "the underlying presumption in the selection and use of pain management protocol is that, while pain and distress cannot be evaluated easily in animals,
investigators and teachers must assume that animals experience these in a manner similar to humans unless there is evidence to the contrary.”

Standards for delivery of anaesthesia must be undertaken consistent with current veterinary practice. This includes the use of dose adjusting equipment, appropriate delivery methods and the use of pharmaceutical grade compounds for survival procedures. For information on the use of non-pharmaceutical grade chemicals refer to the university’s position papers:

- Use of Non-Pharmaceutical Grade Discovery Compounds in Animals
- Use of Non-Pharmaceutical Grade Compounds for Anaesthetising & Euthanasing Animals

Monitoring of animals for pain and discomfort after procedures is a requirement and must be completed as per the appropriate AEEC approval. There are a number of useful references for assessing pain in animals.

Animals under anaesthesia must be monitored during the anaesthetic and until they are mobile and able to self-regulate their body temperature e.g. by moving around the cage and reaching nesting.

5. References and Resources

**ANU Training and Support for Anaesthesia and Analgesia**
The ANU Veterinary Services Team - Research Services Division, are available to provide advice in the assessment of pain and the use of a variety of methods for anaesthesia and analgesia in different species. This can often be combined with surgical training or approaches to animal care and monitoring.

**References**
- The Australian code for the care and use of animals for scientific purposes 8th edition. 2013
- Procedure for Managing & Reporting Unexpected Adverse Events.
- AEEC Approved Document 006: Animal Surgery Standards
- ANU Position Paper: Use of Non-Pharmaceutical Grade Discovery Compounds in Animals
- ANU Position Paper: Use of Non-Pharmaceutical Grade Compounds for Anaesthetising & Euthanasing Animals

Further information on managing analgesia and anaesthesia for animals in a research setting can be found in the NHMRC Guidelines to Promote the Wellbeing of Animals Used for Scientific Purposes.

*NB It is noted that these guidelines are listed as out of date but the information included is still relevant in many circumstances. Advice can be sought from the ANU Veterinary Services Team where required.*

Monitoring of pain in animals can be improved with the use of grimace scales as per the NC3Rs publications [https://www.nc3rs.org.uk/grimacescales](https://www.nc3rs.org.uk/grimacescales).