



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **ACMATE505A Carry out advanced breeding procedures**

**Revision Number: 1**

## ACMATE505A Carry out advanced breeding procedures

### Modification History

Not applicable.

### Unit Descriptor

<b>Unit descriptor</b>	<p>This unit of competency covers the process of establishing breeding programs for multiple generation production lines, selecting and preparing animals for breeding and implementing breeding and post-mating procedures.</p> <p>Licensing, legislative, regulatory or certification requirements may apply to this unit. Therefore, it will be necessary to check with the relevant state or territory regulators for current licensing, legislative or regulatory requirements before undertaking this unit.</p>
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## Application of the Unit

<b>Application of the unit</b>	<p>The unit has been specifically developed for animal technicians working in research and teaching facilities that are required to breed animals for scientific purposes. Work is performed in accordance with the institution's breeding program and standard operating procedures and requires a sound effective working knowledge of genetics. Animal technicians must comply with the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes, relevant state/territory legislative requirements as well as protocols, policies and procedures set down by the Animal Ethics Committee (AEC) within their institution.</p> <p>In addition to legal and ethical responsibilities, all units of competency in the ACM10 Animal Care and Management Training Package have the requirement for animals to be handled gently and calmly. The individual is required to exhibit appropriate care for animals so that stress and discomfort is minimised.</p> <p><i>Note: Scientific purposes refers to 'all those activities that require approval from an Animal Ethics Committee (AEC) and are performed to acquire, develop or demonstrate knowledge of techniques in any scientific discipline, including activities for the purposes of teaching, field trips, environmental studies, research, diagnosis, product testing and the production of biological products'.</i></p>
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## Licensing/Regulatory Information

Not applicable.

## Pre-Requisites

<b>Prerequisite units</b>	

## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
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## Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish breeding programs for production lines	<p>1.1. Institutional <i>policies, procedures</i> and protocols as set down by the AEC and <i>relevant legislative requirements</i> including, <i>occupational health and safety (OHS)</i>, are complied with at all times.</p> <p>1.2. <i>Genetic</i> diversity principles are identified and related to <i>breeding program</i> requirements.</p> <p>1.3. Differences between knock in, knock out, transgenic and genetic drift lines are defined.</p> <p>1.4. Breeding programs for multiple generation production lines are designed and established.</p> <p>1.5. Data collection record systems are confirmed and/or designed and developed if required.</p> <p>1.6. Institutional standard operating procedures for breeding programs are reviewed and modified if required.</p>
2. Select animals and prepare for breeding	<p>2.1. Breeding program for specific production line requirements and production schedules are identified and confirmed.</p> <p>2.2. <i>Animals</i> for mating are selected and monitored to determine the current stage of their reproductive cycle.</p> <p>2.3. Females are monitored and identification for <i>stages of oestrus cycle</i> and those that are ready for mating are identified.</p> <p>2.4. Animals selected for mating are placed in an <i>appropriate environment</i>.</p>
3. Implement breeding procedures	<p>3.1. Appropriate <i>mating systems and methods</i> are selected and applied in accordance with the breeding program.</p> <p>3.2. Animals are monitored during and after the mating period to determine whether mating has been successful.</p>
4. Perform post-mating procedures	<p>4.1. Animals are monitored for signs of hatching or parturition.</p> <p>4.2. Fostering arrangements or caesarean rederivations are planned as necessary.</p> <p>4.3. Quality of offspring is assessed in accordance with required quality parameters of the breeding program.</p> <p>4.4. Offspring are indentified, sexed and weaned in accordance with the breeding program.</p>

ELEMENT	PERFORMANCE CRITERIA
	<p>4.5. <i>Post-weaning management</i> is carried out in accordance with the breeding program.</p> <p>4.6. <i>Breeding records</i> are maintained according to the breeding program requirements and institutional policies and procedures.</p> <p>4.7. Breeding program outcomes are reviewed and modified for future production runs as required.</p>
5. Name and record animals	<p>5.1. Types of animals are <i>identified</i>.</p> <p>5.2. The correct genetic names of animals are established by gathering information and seeking guidance from the relevant nomenclature committee and scientists.</p> <p>5.3. Strain names are registered if appropriate.</p>

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

#### Required skills

- apply AEC classification system to determine procedures that require approval
- check animals' physical conditions and vital signs and monitor for signs of progress or deterioration in condition or health of animals
- employ safe and environmentally responsible organisational systems and procedures when handling animals, materials and equipment
- identify health, congenital reproductive and parturition problems in breeding animals and respond in compliance with animal welfare and workplace project protocols
- identify the sex, age and reproductive status of male and female animals
- interpret and establish a breeding program consisting of multiple generations
- maintain the highest standards of hygiene and infection control at all times to reduce the risk of infection and cross-infection
- prepare and maintain appropriate records relevant to breeding and technical procedures using relevant institutional electronic and/or manual systems
- prepare and use equipment and materials correctly and in accordance with manufacturers' specifications
- prepare facilities and appropriate environments for breeding animals, embryo development, hatching or parturition and nursing animals
- literacy skills to read, interpret and apply institution policies and procedures, including OHS, infection control, containment and exclusion and waste management; critically analyse material and record information collected accurately and legibly
- oral communication skills/language to fulfil the job role as specified by the institution, including questioning, active listening, asking for clarification and consulting with or seeking advice from research group team members, senior or more experienced staff or other relevant persons
- numeracy skills to estimate, calculate and record routine and more complex workplace measures relative to the establishing and designing of breeding procedures
- interpersonal skills to work with others and relate to people from a range of cultural, social and religious backgrounds and with a range of physical and mental abilities
- problem-solving skills to use available information and resources and carry out breeding procedures
- use personal protective clothing and equipment correctly
- use safe manual handling techniques and/or equipment
- use safe waste handling and disposal procedures.

**REQUIRED SKILLS AND KNOWLEDGE****Required knowledge**

- anatomical and physiological structures and functions related to animal reproductive health and wellbeing of commonly held animals
- anatomical and physiological terminology, and glossary of terms and nomenclature related to animal reproduction
- artificial insemination procedures, including cryopreservation techniques
- common diseases, ailments, injuries and other impacts on animal health and wellbeing and characteristics of healthy, sick or distressed animals
- common pedigrees
- effective knowledge of genetics including principles, common terminology and nomenclature
- functions and requirements of a breeding colony
- knockout and transgenic technology
- organisational policies and safe operating procedures, including OHS and emergency procedures
- oestrus cycles of a range of species, including representative polyoestrus, mono-oestrus and induced ovulation species
- principles of animal welfare and ethics
- principles of post-weaning management
- range of mating systems, behaviour and methods appropriate to the species
- recordkeeping requirements including types of information that needs to be kept on birthing and fostering processes
- relevant codes of practice, such as the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes
- relevant state or territory legislation and regulations relating to the practice of veterinary science, OHS and animal welfare and research, including the Office of the Gene Technology Regulator and the National Health and Medical Research Council (NHMRC)
- reproductive cycles
- safe animal handling techniques, including approved handling methods during mating and breeding programs
- workplace hygiene standards, disinfectants, cleaning agents, cleaning techniques and cleaning equipment and materials.



## Evidence Guide

### EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

#### Overview of assessment

#### Critical aspects for assessment and evidence required to demonstrate competency in this unit

The evidence required to demonstrate competence in this unit must be relevant to workplace operations and satisfy all of the requirements of the performance criteria, required skills and knowledge and the range statement of this unit. Assessors should ensure that candidates can:

- establish breeding programs for multiple generation production lines in accordance with institutional policies and procedures, including AEC and legislative requirements
- select animals for breeding and apply appropriate breeding systems and mating methods and perform appropriate post-mating procedures in accordance with the breeding program and institutional standard operating procedures
- identify and record animal type and genetic and strain names where appropriate
- review, revise, maintain and update records in accordance with regulatory and project documentation requirements.

The skills and knowledge required to carry out advanced breeding procedures must be transferable to a range of work environments and contexts and include the ability to deal with unplanned events.

#### Context of and specific resources for assessment

Assessment of this unit is to be practical in nature and will be most appropriately assessed in an animal research facility or an environment that reproduces normal work conditions that has a scientific establishment licence and access to an approved AEC.

There must be access to a range of research animals and the relevant information, materials and documentation to enable one to demonstrate competence.

<b>EVIDENCE GUIDE</b>	
<b>Method of assessment</b>	<p>To ensure consistency in one's performance, competency should be demonstrated, to industry defined standards, on more than two occasions over a period of time in order to cover a variety of circumstances, cases and responsibilities and over a number of assessment activities.</p> <p>The assessment strategy must include practical skills assessment. Suggested strategies for this unit are:</p> <ul style="list-style-type: none"> <li>• written and/or oral assessment of candidate's required knowledge</li> <li>• observed, documented and first-hand testimonial evidence of candidate's application of practical tasks</li> <li>• practical simulation exercises that reproduce normal breeding work-related conditions</li> <li>• case study analysis</li> <li>• third-party evidence</li> <li>• workplace documentation</li> <li>• portfolio.</li> </ul> <p>This unit may be assessed in a holistic way with other units of competency relevant to the industry sector, workplace and job role.</p>
<b>Guidance information for assessment</b>	<p>Assessment methods should reflect workplace demands (e.g. literacy and numeracy demands) and the needs of particular target groups (e.g. people with disabilities, Aboriginal and Torres Strait Islander people, women, people with a language background other than English, youth and people from low socioeconomic backgrounds).</p>

## Range Statement

### RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

<p>Institutional <i>policies and procedures</i> may include:</p>	<ul style="list-style-type: none"> <li>• institution's quality assurance manual and procedures:             <ul style="list-style-type: none"> <li>• biosecurity</li> <li>• breeding processes</li> <li>• OHS</li> <li>• recycling and re-use guidelines</li> <li>• restraint, handling, euthanasing and disposal of animals</li> <li>• safe handling, storage and thawing of frozen genetic material</li> <li>• standard operating procedures</li> <li>• use, storage and transport of equipment and drugs used during procedures</li> <li>• waste disposal</li> </ul> </li> <li>• project objectives and production schedules.</li> </ul>
<p><i>Relative legislative requirements</i> may include:</p>	<ul style="list-style-type: none"> <li>• Australian Code of Practice for the Care and Use of Animals for Scientific Purposes</li> <li>• Federal Gene Technology Act 2000</li> <li>• NHMRC guidelines</li> <li>• relevant state or territory legislation and regulations such as those relating to:             <ul style="list-style-type: none"> <li>• animal research</li> <li>• animal welfare</li> <li>• prevention of cruelty to animals</li> <li>• quarantine</li> <li>• the practice of veterinary surgery</li> <li>• the administration and storage of therapeutic and controlled substances.</li> </ul> </li> </ul>
<p><i>OHS</i> risks associated with animal technician procedures include:</p>	<ul style="list-style-type: none"> <li>• animal bites, kicks or scratches</li> <li>• biological hazardous waste and sharps disposal</li> <li>• handling of chemicals and medicines</li> <li>• gas leakage</li> </ul>

<b>RANGE STATEMENT</b>	
	<ul style="list-style-type: none"> <li>• inhalation of aerosol particles</li> <li>• intraocular contamination</li> <li>• manual handling, including carrying, lifting and shifting</li> <li>• needle pricks and cuts from other sharps</li> <li>• release of infective agents (animal and human)</li> <li>• zoonoses.</li> </ul>
<b>Genetics</b> may include:	<ul style="list-style-type: none"> <li>• genetic concepts: <ul style="list-style-type: none"> <li>• advanced punnet squares</li> <li>• allele</li> <li>• autosomes</li> <li>• cell differentiation and genetic integrity</li> <li>• creation of transgenic, knock in and knockout lines</li> <li>• chromosomes and inheritance</li> <li>• coefficient of inbreeding</li> <li>• defining the differences between knock in, knock out, transgenic and genetic drift</li> <li>• genotype</li> <li>• heterozygosity</li> <li>• homozygosity</li> <li>• locus</li> <li>• nomenclature</li> <li>• phenotype</li> <li>• polygenic</li> <li>• recessive and recombinant genes</li> <li>• segregation</li> <li>• sex-linked genes.</li> </ul> </li> </ul>
<b>Breeding program</b> may include:	<ul style="list-style-type: none"> <li>• information about: <ul style="list-style-type: none"> <li>• number of breeders required</li> <li>• selection criteria for breeders and retiring breeders</li> <li>• breeding system to be used: <ul style="list-style-type: none"> <li>• backcross</li> <li>• inbred</li> <li>• outbred</li> </ul> </li> <li>• mating system to be used</li> <li>• fostering requirements</li> <li>• identification system to be used</li> </ul> </li> </ul>

<b>RANGE STATEMENT</b>	
	<ul style="list-style-type: none"> <li>• record systems to be used:               <ul style="list-style-type: none"> <li>• books</li> <li>• cards</li> <li>• computer</li> </ul> </li> <li>• data to be collected about:               <ul style="list-style-type: none"> <li>• parent information</li> <li>• generation development (e.g. litter numbers, numbers born and sex ratios)</li> <li>• sex and weaning rates.</li> </ul> </li> </ul>
Subject to research requirements <i>animals</i> may include:	<ul style="list-style-type: none"> <li>• on most occasions the animal species will be common laboratory animals:               <ul style="list-style-type: none"> <li>• guinea pigs</li> <li>• mice</li> <li>• rabbits</li> <li>• rats</li> </ul> </li> <li>• on some occasions animal species may include:               <ul style="list-style-type: none"> <li>• amphibians, fish and reptiles</li> <li>• dogs and cats</li> <li>• fish</li> <li>• invertebrates</li> <li>• livestock (e.g. sheep, cattle and pigs)</li> <li>• native wildlife (e.g. marsupials and birds)</li> <li>• primates</li> <li>• poultry.</li> </ul> </li> <li>• animals may be housed in an experimental or teaching facility and typically, but not always, in a laboratory setting.</li> </ul>
<i>Stages of oestrus cycle</i> may include:	<ul style="list-style-type: none"> <li>• induced ovulation species</li> <li>• mono-oestrus</li> <li>• representative polyoestrus.</li> </ul>
<i>Appropriate environment</i> may consider:	<ul style="list-style-type: none"> <li>• the species involved</li> <li>• the specific requirements of the breeding program:               <ul style="list-style-type: none"> <li>• day or night cycle</li> <li>• humidity</li> <li>• seasonal effects</li> <li>• special dietary requirements</li> <li>• temperature.</li> </ul> </li> </ul>

<b>RANGE STATEMENT</b>	
<b><i>Mating systems and methods</i></b> may include:	<ul style="list-style-type: none"> <li>• mating systems:               <ul style="list-style-type: none"> <li>• breeding of mutant and transgenic strains</li> <li>• controlled outbreeding</li> <li>• cross breeding</li> <li>• hybrid breeding</li> <li>• inbreeding</li> </ul> </li> <li>• mating methods:               <ul style="list-style-type: none"> <li>• artificial insemination</li> <li>• dominant mutant</li> <li>• hand mating</li> <li>• paired mating</li> <li>• stud mating</li> <li>• the harem system.</li> </ul> </li> </ul>
<b><i>Post-weaning management</i></b> may include:	<ul style="list-style-type: none"> <li>• phenotype care and the selection of future breeding animals or research stock based on:               <ul style="list-style-type: none"> <li>• genotyping</li> <li>• health or history</li> </ul> </li> <li>• supplement feeding.</li> </ul>
<b><i>Breeding records</i></b> should include:	<ul style="list-style-type: none"> <li>• breeding history</li> <li>• parents information</li> <li>• date of birth</li> <li>• numbers born</li> <li>• stillborn</li> <li>• missing or found dead</li> <li>• sexes born</li> <li>• number weaned</li> <li>• strain, genotype and phenotype information.</li> </ul>
Types of animals that may be <b><i>identified</i></b> include:	<ul style="list-style-type: none"> <li>• chromosomal aberration</li> <li>• congenic</li> <li>• genetically modified</li> <li>• hybrid</li> <li>• inbred</li> <li>• recombinant.</li> </ul>

## Unit Sector(s)

<b>Unit sector</b>	Animal technology
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## Competency field

<b>Competency field</b>	
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## Co-requisite units

<b>Co-requisite units</b>		