Australian Government

Department of Education, Employment and Workplace Relations

MSL974011A Prepare tissue and cell cultures

Revision Number: 1

MSL974011A Prepare tissue and cell cultures

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare primary tissue cultures for applications, such as maintenance of animal cell lines and propagation of plants by tissue culture and basic subculture procedures. Personnel are required to manipulate equipment and materials and samples to prevent contamination at all preparation stages. They will have ready access to enterprise procedures and will work under direct supervision.

Application of the Unit

Application of the unit	This unit of competency is applicable to technical assistants working in laboratories in the biomedical, environmental, biotechnology and education industry sectors. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These are found at the end of this unit of competency under the section 'This competency in practice'.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL973004A	*Perform aseptic techniques*

Employability Skills Information

Employability skills	This unit contains employability skills.

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.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Work safely according to the legal and regulatory framework	1.1. Ensure work practices and personal actions conform to regulations, codes, guidelines and enterprise quality assurance procedures 1.2. Identify hazards and enterprise controls associated with the sample, preparation methods, reagents and equipment 1.3. Select, fit and use personal protective clothing and safety equipment 1.4. Address hazards and incidents as they arise 1.5. Maintain a chain of custody, traceable to the worker, for all cells and tissues
2. Prepare and test cell and tissue culture media	2.1. Select and confirm media specifications and processes/methods 2.2. Prepare culture media to suit the application 2.3. Sterilise culture media and check for sterility 2.4. Perform quality control checks to ensure that culture media is fit for purpose 2.5. Store culture media in accordance with specifications
3. Prepare tissue or cell cultures	3.1. Select tissue/cell sample to optimise growth and prepare it for culture 3.2. Add specified growth agents and/or nutrients 3.3. Inoculate culture medium using aseptic techniques
4. Monitor tissue or cell culture	4.1. Incubate culture in specified conditions 4.2. Monitor growth of culture and record appearance and characteristics 4.3. Report presence or absence of contamination 4.4. Subculture the culture to continue the cell line 4.5. Dispose of biohazardous and other laboratory waste safely
5. Maintain records	5.1. Maintain records of batches of media and test data 5.2. Ensure records of tissue cultures are retrievable, legible and accurate 5.3. Ensure records conform to information management, records, quality system and legal requirements

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- working safely
- satisfying all legal and regulatory requirements, including the use and care of biohazard cabinets
- preparing, diluting and sterilising reagents and culture media that are fit for purpose
- growing cell lines and tissue to specifications without contaminating the original sample and the environment
- identifying expected cell types and recognising normal and abnormal cells using an inverted microscope
- counting cells (total and viable)
- monitoring cell growth and recognising problems such as contamination
- maintaining chain of custody, traceable to the worker, of all cell lines, tissues, logs of work completed and procedures/methods used

Required knowledge

Required knowledge includes:

- basic structure and function of cells and organelles
- basic classes and classification of culturable material, such as organisms, plants, animals, bacteria, viruses, tissues, cells and prions
- cell physiology and processes, such as simple and facilitated diffusion, plasmolysis, osmosis, tonicity, active transport, energy production, mitosis, motility, phagocytosis and pinocystosis
- concepts and principles of cell growth, such as need for nutrients, role of growth regulators and removal of wastes
- types and sources of contamination
- purposes and mechanisms of staining
- importance of strict aseptic techniques and cleaning procedures
- hazards and risks in biological laboratories
- relevant health, safety and environment requirements
- enterprise and/or legal traceability requirements
- relevant quality control checks and quality assurance procedures

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	Assessors should ensure that candidates can: • work safely and satisfy all legal and regulatory requirements, including the use and care of biohazard cabinets • prepare, dilute and sterilise reagents and culture media that are fit for purpose • grow cell lines and tissue to specifications without contaminating the original sample and the environment • identify expected cell types and recognise normal and abnormal cells using an inverted microscope • count cells (total and viable) • monitor cell growth and recognises problems, such as contamination • maintain chain of custody, traceable to the worker, of all cell lines, tissues, logs of work completed and procedures/methods used.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. This unit of competency may be assessed with: • *MSL933001A Maintain the laboratory/field workplace fit for purpose* • *MSL973003A Prepare culture media* • *MSL973007A Perform microscopic examination*. Resources may include: • laboratory equipped with appropriate equipment, samples, cell lines and reagents • enterprise procedures and standard methods.
Method of assessment	The following assessment methods are suggested: • examination of tissue and cell cultures prepared by the candidate • observation of the candidate preparing a range of tissue and cell cultures

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	• review of work records and results obtained by candidate • feedback from supervisors and peers on adherence to enterprise/technical procedures • questioning to assess underpinning knowledge. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case studies below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. **Biotechnology** A laboratory assistant maintains a leucocyte cell line which is used to routinely produce monoclonal antibodies which have been ordered by researchers. The assistant's job is to ensure that the cell line's growth is optimised to ensure a regular supply of high quality product. Every day, she/he checks for growth and contamination by aseptically removing a sample for microscopic examination. She/he also checks the colour of the pH indicator in the media and records cell line characteristics, such as its appearance, number of cells and any evidence of contamination in her/his laboratory notebook. She/he also checks the incubator temperature and atmosphere together with the labelling and possible leakage of flasks. **Education** A laboratory assistant at a regional university is instructed to prepare 95 flasks of Vero (African green

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	monkey kidney) cells for a practical class in three weeks time. She/he routinely passages the cells once per week and usually splits the flasks into six. She/he has three flasks routinely subcultured from last week and calculates that these can be subcultured to produce the required number of flasks while holding back some flasks from each subculture as a back up in case of contamination and for routine passaging after the practical class. She/he prepares the 95 flasks in the third week and checks them for obvious bacterial or fungal contamination and for Mycoplasma contamination. She/he labels all the flasks with the required information, records all the steps in the laboratory cell culture log and puts the flasks out in the teaching laboratory just prior to the class.

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.	
Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, **codes**, **procedures and/or enterprise requirements**	Standards, codes, procedures and/or enterprise requirements may include:
	• Australian and international standards, such as:
	  • AS 1678 Emergency procedure guide -Transport
	  • AS 2252 Biological safety cabinets
	  • AS ISO 17025-2005 General requirements for the competence of testing and calibration laboratories
	  • AS/NZS 2243 Set:2006 Safety in laboratories set
	  • AS/NZS 2982.1:1997 Laboratory design and construction - General requirements
	  • AS/NZS 4187:2003 Cleaning, disinfecting and sterilizing reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care facilities
	  • AS/NZS ISO 14000 Set:2005 Environmental management standards set
	  • AS/NZS ISO 9000 Set:2008 Quality management systems set
	  • HB 9-1994 Occupational personal protection
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• client and product specifications
	• enterprise procedures, standard operating procedures (SOPs) and quality assurance

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	procedures • gene technology regulations • Guide to physical containment levels and facility types • manufacturer's instructions or verbal direction from laboratory manager, supervisor or senior technician • material safety data sheets (MSDS) • National Code of Practice for the labelling of workplace substances [NOHSC:2012 (1994)] • occupational health and safety (OHS) national standards and codes of practice • operation and maintenance manuals for automated media preparation equipment • principles of good laboratory practice (GLP) • production schedules and instructions • Therapeutic Goods Regulations 1009 • verified test methods
Applications of plant tissue/cell culture	Applications of plant tissue/cell culture may include: • mass propagation of commercial species • production of disease free plants by meristem tip culture • conservation of rare plants • haploid plant production by anther/pollen culture • 'sports' produced by somaclonal variation • development of resistant plants by directed cell selection • protoplast fusion to produce novel plant hybrids
Applications of animal tissue/cell culture	Applications of animal tissue/cell culture may include: • establishment and maintenance of animal cell lines, such as liver, epidermal and fibroblastic • maintenance of continuous cell lines • preparation of cell cultures for commercial sale • growth and enumeration of viruses • extraction of DNA • extraction of antigens for use in diagnostic tests

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	• research of cell structure and function, cancer and tumour biology • immunofluorescent techniques • testing of media efficacy • production of monoclonal antibodies • production of genetically modified cell cultures • secondary metabolite production
Hazards	Hazards may include: • biohazards, such as infectious agents and oncogenic DNA • chemical and radiation hazards • allergenic factors • cryogenic liquids, such as nitrogen • heat from burners and molten agar • ultraviolet (UV) light • sharps, broken glassware • contaminated clothing
Hazard control measures and safety procedures	Hazard control measures and safety procedures may include: • ensuring access to service shut-off points • recognising and observing hazard warnings and safety signs • labelling of samples, reagents, aliquoted samples and hazardous materials • handling and storage of hazardous materials and equipment in accordance with labelling, MSDS and manufacturer's instructions • identifying and reporting operating problems or equipment malfunctions • cleaning and decontaminating equipment and work areas regularly using enterprise procedures • using personal protective clothing and equipment, such as gloves, safety glasses, coveralls and gowns • using containment facilities (PCII, PCIII and PCIV physical containment laboratories), containment equipment (biohazard containers, laminar flow cabinets, Class I, II and III biohazard cabinets) and containment

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	procedures • following established manual handling procedures • reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/waste water, gases, smoke, vapour, fumes, odour and particulates to appropriate personnel
Tissue culture equipment and facilities	Tissue culture equipment and facilities may include: • growth cabinets • culture vessels, growth chambers, sterile containers, culture plates, flasks and bottles • autoclaves • positive filtration apparatus • auto pipettes and pipette pumps • cell counting chambers and haemocytometer • incubators, including specialised atmosphere carbon dioxide • light and binocular inverted microscopes • centrifuges
Pre-use checks	Pre-use checks include: • performing routine maintenance • checks on raw materials and consumables, including use by date, possible contamination and storage conditions
Sterilisation and disposal of biohazardous wastes	Sterilisation and disposal of biohazardous wastes may include: • steam and high pressure air or steam • boiling, microwaving and autoclaving • filtration • gas, chemical and radiation
Plant tissues and cells	Plant tissues and cells may include: • plant tissue, such as petioles, leaves, stems and petals • meristem tissue • special tissue, such as fern stolon, seed embryos and somatic embryoids • tissue for callus development to initiate cell

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	suspension cultures
Animal tissues and cells	Animal tissues and cells may include: • primary cells from animal tissue, such as heart, liver, kidney and epidermal • secondary cells, such as epithelial, endothelial and fibroblast • continuous cell lines, such as tumour lines, hybidomers and transformed lines (Epstein-Barr virus)
Preparing a primary culture	Preparing a primary culture may involve: • thawing of cryopreserved cells and monitoring of cell recovery • enzymatic disaggregation from tissue • mechanical disaggregation from tissue • primary explant technique • pre-treatment • disinfestation of explants using hypochlorite and water
Suitable culture conditions	Suitable culture conditions may include: • specified temperature and light intensity • appropriate atmosphere, such as carbon dioxide • shaking of cell suspensions or roller bottles • conditions for establishment, multiplication or planting out • special conditions for protoplast culture
Monitoring growth of tissue and cell lines	Monitoring growth of tissue and cell lines may include: • identification of normal and abnormal cells viewed by an inverted stereo microscope • recognition of contamination, such as bacteria (e.g. Mycoplasma), fungi and other plant or animal tissue in the media • checking growth rates • performing viable cell counts
Subculture	Subculture may include: • treatment of callus to multiply or regenerate shoots

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	• treatment to encourage adventitious bud • treatment to encourage rooting • subculture of embryoids • cell suspensions • preparation of protoplasts
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Testing

Competency field

Competency field	

Co-requisite units

Co-requisite units		

Co-requisite units		