Australian Government

Department of Education, Employment and Workplace Relations

MSL973003A Prepare culture media

Revision Number: 1

MSL973003A Prepare culture media

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to prepare culture media which is free of contamination to facilitate optimal growth of organisms and cells. It includes the ability to organise the materials, equipment and work environment and follow standard methods.

Application of the Unit

Application of the unit	This unit of competency is applicable to laboratory assistants in the biomedical, biological, environmental, food processing and pharmaceutical 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		

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. Prepare culture media	1.1. Prepare mixture of media and solvent to ensure solution and even settling of heat soluble materials 1.2. Label media to allow tracking in subsequent processes 1.3. Use a vessel large enough to endure adequate mixing and heating of the media 1.4. Dispense media into vessels for sterilisation, leaving room for expansion during heating and cooling
2. Sterilise media	2.1. Load the steriliser in keeping with maximum permitted loads and appropriate positioning of materials 2.2. Ensure a sterilisation indicator is correctly placed with the load to monitor sterilisation process 2.3. Operate sterilisation cycle in accordance with manufacturer's requirements to achieve sterilisation at the required settings 2.4. Cool media to the temperature specified in the media formulation procedures
3. Pour, label and store media	3.1. Add labile constituents where necessary, under conditions that will not lead to their denaturation or contamination of media 3.2. Ensure even mixing of additives and media before dispensing 3.3. Aseptically dispense media to minimise occurrence of procedural contamination 3.4. Label media to allow for selection, avoiding areas of the culture vessel required for examination of colony growth 3.5. Store media to maximise shelf life and minimise contamination 3.6. Date batch media to ensure correct batch rotation 3.7. Incubate control plates as a sterility check
4. Perform quality control checks	4.1. Inspect media for any evidence of possible contamination or problems with structure or sterilisation 4.2. Check useability of selective media by growth of expected organism 4.3. Check stored stocks at regular intervals for conformance to required standards

ELEMENT	PERFORMANCE CRITERIA
5. Maintain work area and equipment to prevent cross-infection and contamination	5.1. Use personal protective equipment and safe work practices to ensure safety of self and others 5.2. Place disposable and reusable items into relevant receptacles 5.3. Clean and disinfect work area and equipment after use 5.4. Transport disposable and reusable contaminated materials to relevant areas for disinfection, sterilisation and cleaning or disposal

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Required skills include:

- calculating mass and volume
- measuring accurately
- making media to support growth of the relevant micro-organism or tissue
- preventing cross-contamination
- following enterprise procedures consistently
- labelling and storing culture media according to enterprise procedures
- accurately recording data
- reporting non-compliance, anomalies or out of specification results
- sorting, collecting, treating, recycling or disposing of waste
- using appropriate personal protective equipment

Required knowledge

Required knowledge includes:

- basic microbiological concepts and terminology such as growth rates in culture, production of gas and haemolysis of red cells in media
- growth requirements of micro-organisms (bacteria, fungi, protozoans, viruses and multi-cellular parasites) in terms of their laboratory culture
- the purpose, content and features of culture media and the relationship between the correct preparationof culture media and the optimal growth of organisms or cells
- nature, properties and use of a range of biological media
- the relationship between sterile practices, hygiene procedures and the ability to obtain growth free of contamination
- the importance of physical requirements, such as pH and temperature on optimal growth of organisms and cells
- the effect of inappropriate storage on culture media quality and performance
- cleaning and sanitising requirements of equipment and work area
- relevant health, safety and environment requirements

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 candidates can: • prepare culture media which is free of contamination to facilitate the optimal growth of organisms and cells • use appropriate sterilisation techniques, such as maintaining adequate space between containers • perform post-sterilisation procedures, such as dispensing or adding using aseptic technique • ensure the sterilised media has cooled down sufficiently to ensure that heat labile constituents, such as blood, hormones or antibodies are not inactivated when added to the media • consistently follow enterprise procedures • report non-compliances, anomalies or out of specification results.
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: • *MSL943002A Participate in laboratory/field workplace safety* • *MSL973004A Perform aseptic techniques*. Resources may include: • work schedule and enterprise procedures, including advice on safe work practices • relevant equipment and personal protective equipment • MSDS.
Method of assessment	The following assessment methods are suggested: • review of quality assurance results and examination of batches of media prepared by the candidate • observation of the candidate preparing culture media • written and/or oral questioning to assess underpinning knowledge.

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	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 show its relevance in a workplace setting. **Food processing** A laboratory assistant's task was to prepare and pour agar plates in readiness for milk sampling. The assistant collected all the equipment and material needed to make an agar plate and ensured the working area was suitably prepared. The agar solution was carefully prepared and poured into a large conical flask prior to sterilisation in the autoclave. On completion of the sterilisation cycle, the agar was cooled to 42ºC in a water bath. It was then poured into the plates after flaming the neck of the flask. The lids were quickly replaced on the plates to minimise contamination. The plates were then stored. Any excess plates were bagged in a laminar flow unit and then placed in the fridge. The equipment was hot washed and the benches swabbed with 70% ethanol solution. **Biomedical** Media preparation is a routine task of the technical assistant. The methods and standard procedures are all documented but common working knowledge and standard 'don'ts' are not always written into the methods. Some ingredients, such as labile nutrients and antibiotics must be added under sterile conditions after the basic ingredients have been mixed and autoclaved. In one laboratory there is a list of ingredients not to be

EVIDENCE GUIDE	
	autoclaved posted on the notice board, in the media recipe book and for good measure, on the autoclave itself. One day, a technical assistant who was preparing media added all the ingredients, including the glucose, then autoclaved all 20L of it. The technical assistant learned the consequences of not paying full attention to the procedure the hard way and spent most of the day removing the 'toffee' residue from inside the autoclave!

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/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 sterilising 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
	• Australia New Zealand Food Standards (ANZFS) Code
	• Australian code of good manufacturing practice for medicinal products (GMP)
	• Australian Dangerous Goods Code
	• client and product specifications
	• HB 9-1994 Occupational personal protection
	• 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

RANGE STATEMENT	
	automated media preparation equipment • principles of good laboratory practice (GLP) • production schedules and instructions • standard operating procedures (SOPs)
Equipment	Equipment may include: • balance • pH meter • hot plate stirrer and Bunsen burners • autoclave and Arnold steamer • membrane filtration equipment • measuring cylinders, flasks and glassware and Petri dishes • distilled water apparatus • automatic agar pourers • labelling equipment • refrigerators • sterilisation indicators • self-refilling syringes • Falcon dishes • media storage bottles and tissue culture bottles
Media	Media maybe prepared from: • formulated powders obtained from microbiological companies • first principles under supervision of a technical officer or scientist
Cell and tissue culture media	Cell and tissue culture media may include: • agars • broths • solutions • slopes • basic balanced salt solutions, such as Hank's or Kreb-Ringer's • deeps • enriched media, such as blood sugar, chocolate agar, tetrathionate broth and selenite broth • control media • differential media, such as eosin-methylene blue agar and MacConkey's agar • selective media, such as deoxycholate-citrate

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	agar, Lowenstein-Jensen medium • tissue culture media • labile constituents, such as blood, hormones or antibodies
Sterilisation techniques	Sterilisation techniques may include: • autoclaving • steam and membrane filtration • boiling • microwaving • radiation • high temperature • high pressure steam • gas • chemical treatments
Quality control checks	Quality control checks may include: • streaking out of cultures to a single colony • lawn cultures
Hazards	Hazards may include: • micro-organisms and agents associated with soil, air, water, blood and blood products, and human or animal tissue and fluids • sources of heat, such as ovens, burners and autoclaves • sharps and broken glassware • fluids under pressure and such as steam • radiation used for sterilisation
Safe work practices	Safe work practices may include: • use of MSDS • use of personal protective equipment, such as safety glasses, gloves and coveralls • use of biohazard containers and laminar flow cabinets • correct labelling of reagents and hazardous materials • handling and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • allowing the chamber pressure of the autoclave

RANGE STATEMENT	
	to return to zero and temperature to cool to 80-90ÂºC before opening autoclave door to prevent boil over or plugs/caps being blown off flasks or tubes • regular cleaning and/or decontaminating equipment and work areas
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		