

Title	Explain general microbiology, routine testing and control of microorganisms in a dairy processing operation		
Level	5	Credits	5

Purpose	<p>This theory-based unit standard is for experienced people carrying out milk processing functions in a dairy processing operation.</p> <p>People credited with this unit standard are able to describe the general morphological features, structure and reproduction of microorganisms important to the dairy processing industry; explain the relationship of microorganisms to the dairy processing function; factors affecting microbial growth and the use of these factors to control microbial growth in dairy products; explain the microbiological control of dairy products; microbiological testing of dairy products; and explain microbes of significance in a dairy processing operation.</p>
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Classification	Dairy Processing > Milk Processing
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Available grade	Achieved
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Guidance Information

Legislation relevant to this unit standard includes but is not limited to the Animal Products Act 1999, Health and Safety in Employment Act 1992, and Animal Products (Dairy) Regulations 2005.

Outcomes and performance criteria

Outcome 1

Describe the general morphological features, structure and reproduction of microorganisms important to the dairy processing industry.

Performance criteria

1.1 Bacteria are described in terms of general morphological features and reproduction.

Range general morphological features and reproduction include but are not limited to – shape, size, cellular structure, motility, endospores, binary fission, bacterial growth curves.

1.2 Fungi are described in terms of morphology and reproduction.

Range yeasts features include but are not limited to – size, cellular structure, budding, binary fission, ascospores;
moulds features include but are not limited to – size, mycelia structure, fragmentation, conidia, spores.

1.3 Bacteriophages are described in terms of structure, reproduction, and control of growth.

Range structure, reproduction and control of growth includes but is not limited to – size, virion morphology, lytic life cycle, lysogenic life cycle, control of phage.

Outcome 2

Explain the factors affecting microbial growth and the use of these factors to control microbial growth in dairy products.

Performance criteria

2.1 Nutrition of microbes is explained in terms of extracellular microbial enzymes and by-products of microbial growth.

Range by-products of microbial growth include but are not limited to – lipolysis, proteolysis, fermentation, toxin production.

2.2 The effects of temperature on microbes are explained in terms of growth ranges, microbial classification by growth range, and effects of heat and cold on microbes in food.

Range microbial classification by growth range includes but is not limited to – psychrophiles, psychrotrophs, mesophiles, thermophiles.

2.3 The water activity scale, water activity growth ranges, and effect of osmotic pressure on microbes are explained in terms of effects on microbial growth.

2.4 The pH ranges are explained in terms of effects on microbial growth.

2.5 The classification of microbes is identified and explained in terms of oxygen requirement.

Range requirements include but are not limited to – aerobes, microaerophiles, anaerobes, facultative anaerobes.

Outcome 3

Explain the microbiological control of dairy products.

Performance criteria

- 3.1 The elimination of nutrients in dairy processing is explained in terms of process plant cleaning, and the design and maintenance of processing facilities.
- 3.2 The use of temperature to control microbes is explained in terms of resistance of vegetative cells, spores, and thermophilic biofilms to heat and cold.
- Range use of temperature includes but is not limited to – pasteurisation, thermalisation, ultra-high temperature processing, refrigeration, freezing.
- 3.3 The use of decreased water availability is explained in terms of sugared and dried foods.
- Range sugared and dried foods include but are not limited to – sweetened condensed milks, casein, powdered dairy products.
- 3.4 The use of decreased pH to preserve dairy products is explained in terms of cultured products.
- Range cultured products include but are not limited to – cheese, fresh cultured products.
- 3.5 The elimination of oxygen as a means to control microbial growth is explained in terms of vacuum packaging and canned products.
- Range vacuum packed and canned products include but are not limited to – cheese, canned, UHT products.

Outcome 4

Explain microbiological testing of dairy products.

Performance criteria

- 4.1 Classification of microbes is explained in terms of genera and species.
- 4.2 Microbiological testing of dairy products is explained in terms of general laboratory enumeration and isolation techniques.
- 4.3 Microbiological testing of the dairy process environment is explained in terms of general laboratory techniques.
- Range process environments include but are not limited to – swabs, air, water.

Outcome 5

Explain microbes of significance in a dairy processing operation.

Performance criteria

5.1 Pathogenic bacteria of importance in dairy processing are explained in terms of growth characteristics, target populations, type of illness, infective dose, mortality rates, sources, and basic testing characteristics.

Range pathogenic bacteria include but are not limited to – Salmonella species, Listeria monocytogenes, Escherichia coli, Staphylococcus aureus, Bacillus cereus, Clostridium perfringens, Cronobacter sakazakii, Campylobacter jejuni, Yersinia enterocolitica.

5.2 Spoilage organisms of importance to dairy processing are explained in terms of growth characteristics, types of spoilage, control methods, susceptible products, and basic testing characteristics.

Range spoilage organisms include but are not limited to – yeasts and moulds, pseudomonas, thermotolerant, sulphite reducing clostridia, spore-formers.

5.3 Indicator organisms of importance to dairy processing are explained in terms of growth characteristics, control methods, and basic testing characteristics.

Range indicator organisms include but are not limited to – coliforms, enterobacteriaceae, enterococci, aerobic plate count, thermophiles.

5.4 Beneficial microbes of importance to dairy processing are explained in terms of the effects of their growth on dairy products.

Range beneficial microbes include but are not limited to – starter bacteria, cheese moulds.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	18 June 2015	31 December 2024
Review	2	28 April 2022	31 December 2024

Consent and Moderation Requirements (CMR) reference	0022
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.