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Dairy Heat Treatment

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1. Executive Summary

MAF Standards MRD-Stan 3, “Standard for Pasteurisation Heat Treatment” and MRD-Stan 4, “Standard for Checking the Operation of Pasteurisers” contain specific requirements for pasteurisation. These Standards are due for review and revision in the “D-series” standard format. New Zealand requirements need to be included and importing country requirements, such as those for the EU, need to be separated out. They also need to be brought into the context of the current standards for product safety programmes (D101.2) and HACCP plans (D110.1). A single MAF Standard is needed to cover all heat treatments used as critical control points or control measures, and all dairy product manufacturers.

This discussion paper considers the background, legislation, importing country requirements and issues relating to heat treatments used in the manufacture of dairy products.

This paper proposes the following:

- That a MAF Standard relating to dairy heat treatments (D121.1) be drafted and provided for industry consultation.
- That this Standard requires:
 - that heat treatment requirements apply to all dairy product manufacturers using heat treatments as critical control points or control measures;
 - defined heat treatments for pasteurisation, UHT treatment and thermisation;
 - the heat treatment used as a critical control point or control measure reduces the number of harmful micro-organisms to a level, that together with other critical control points and control measures results in a safe dairy product;
 - revised tables of equivalent heat treatments for pasteurisation;
 - outcome-oriented criteria for heat treatment equipment and its operation;
 - validation of heat treatment as a subset of validation of HACCP plans. The exception is for heat treatments which are new, relocated or have undergone significant change. These are validated as part of the approval of plans and specifications in the construction of dairy premises;
 - that existing heat treatment equipment not complying with the criteria is operated under a PSP containing an interim control plan that identifies the non-compliances and hazards, the means to reduce the hazards to an acceptable level, and the date the non-compliance will be resolved.
- Assuming that the Standard is issued on or about 31 January 2002, that it come into force 18 months later, on or about 31 July 2003.

2. Purpose

This discussion document provides information, discusses issues and makes recommendations relating to the heat treatments UHT (ultra high temperature), pasteurisation and thermisation used to control microbial hazards in milk and other dairy products for human consumption.

3. Risk Assessment

An assessment of the hazards in raw milk and the associated risks for New Zealand has not yet been undertaken. It is anticipated that this assessment will be undertaken in 2002. The effectiveness of control of hazards by pasteurisation and UHT treatment is well established by historical data, though there is no recent scientific validation.

4. Background

4.1 HISTORY

Heat treatment is frequently used as a critical control point in the processing of dairy products. It has a long history as a public health measure in New Zealand, beginning with the pasteurisation of milk for cheesemaking in 1896 at the Waverley dairy factory. It is timely to re-examine the requirements for heat treatment, because of the development of new technologies that may provide alternatives to heat treatment, and because of new approaches to the management of risks associated with food.

The requirements for pasteurisation of dairy products sold on the New Zealand market are currently under review. The processing requirements (section 1.6.2) of the *Australia New Zealand Food Standards Code* do not apply in New Zealand. The heat treatment conditions for dairy products sold in New Zealand therefore need to be considered.

In 1996, the New Zealand-EU veterinary agreement was signed and covered standards for trade between New Zealand and the European Union. The agreement recognises the New Zealand regulatory system for pasteurised dairy products for human consumption, except colostrum and derivatives, as defined by the *Dairy Industry Act 1952*, the *Dairy Industry Regulations 1990* and the *Food Act 1981*, as being equivalent to the European Community's Milk and Milk Products Hygiene Directive (92/46/EEC).

In New Zealand, MAF Standards MRD-Stan 3 and 4, published in 1993, are due for review. The MAF-approved dairy industry code NZCP 7, "Pasteurisation Equipment and Instrumentation Code of Practice", published in 1996, upgraded the requirements for pasteurisation equipment for the Dairy Board-aligned sector of the dairy industry. It was intended to come into effect on 1 July 2001. Exemptions have been allowed in some cases. This discussion paper clarifies proposed requirements for all heat treatment equipment used as critical control points or control measures, for all dairy product manufacturers.

4.2 CURRENT STATUS

This section outlines the current requirements for heat treatment procedures and equipment as outlined in MAF Standards and other approved codes and standards, and the requirements for heat treatment of foods for sale in New Zealand.

4.2.1 MAF Standards and MAF-approved standards

MAF Standards apply to all manufacturers of dairy products, with the exception of those covered by the harmonisation project in 4.3.3 below.

4.2.1.1 D101, “Product Safety Programmes”

Manufacturers must operate in accordance with an approved product safety programme that provides adequately for the control of potentially pathogenic organisms. The acceptable criteria to achieve this are:

“Procedures for the operation, monitoring and recording of all critical control points in the manufacturing process, such as pasteurisation. The procedures for the operation, validation and evaluation of pasteurisation equipment in compliance with the requirements specified in:

- MAF Standard MRD-Stan 3, “Standard for Pasteurisation Heat Treatments,” and
- MAF Standard MRD-Stan 4, “Standard for Checking the Operation of Pasteurisers”, and
- MAF Standard D403, “Evaluation of Heat Treatment Equipment Plans” (once promulgated).”

Note that the Standard does not require pasteurisation, only the management of critical control points, and, where pasteurisation is used, compliance with other MAF Standards.

4.2.1.2 D110, “Dairy HACCP Plans”

From 23 December 2000 all product safety programmes must include validated HACCP analyses/plans of the processes covered by the PSP. This includes a hazard analysis to identify potential hazards, and identification of critical control points. This is considered further in 5.2 below.

4.2.1.3 D202, “Registration of Dairy Premises”

The requirements for heat treatment equipment in registered premises are:

“In addition to the general requirements in section 2.2 above [hygienic design and construction], equipment used to cook, heat treat, cool, store or freeze dairy produce/product is designed to achieve the required food temperatures as rapidly as necessary in the interests of food safety and suitability, and maintain them effectively. Such equipment is also designed to allow temperatures to be monitored and controlled. Where necessary, such equipment has effective means of controlling and monitoring humidity, air-flow and any other characteristic likely to have a detrimental effect on the safety or suitability of the dairy produce.

These requirements are intended to ensure that:

- harmful or undesirable micro-organisms or their toxins are eliminated or reduced to safe levels, or their survival and growth are effectively controlled;
- where appropriate, critical limits established in HACCP plans can be monitored; and
- temperatures and other conditions necessary to food safety and suitability can be rapidly achieved and maintained.

Depending on the nature of the food operations undertaken, adequate facilities are available for heating, cooling, cooking, refrigerating and freezing food, for storing

refrigerated or frozen foods, monitoring food temperatures, and when necessary, controlling ambient temperatures to ensure the safety and suitability of food.”

4.2.1.4 MRD-Stan 3, “Standard for Pasteurisation Heat Treatments”

This Standard defines heat treatment conditions for the pasteurisation of dairy products.

It specifies the heat treatment conditions for the batch holding method ("low temperature, long time"), the "high temperature, short time" (HTST) method, and the "higher heat, shorter time" (HHST) method. It does not include ultra pasteurisation or ultra high temperature (UHT) treatment.

The Standard specifies a range of alternative time/temperature combinations for HTST and HHST pasteurisation, and heat treatments equivalent to pasteurisation for products with greater than 10% milkfat content, and sweetened and concentrated dairy products. It also allows for heat treatment as part of the manufacturing process, rather than as a separate pasteurisation step, provided the heat treatment and control procedures are equivalent to those required for pasteurisation.

The heat treatment conditions have been reviewed by the NZCP 7 Working Group and the MAF Heat Treatment Working Group, and amendments have been recommended.

The phosphatase test is used to detect unpasteurised cows' milk.

4.2.1.5 MRD-Stan 4, “Standard for Checking the Operation of Pasteurisers”

This Standard defines the checks that need to be carried out, and their frequency, to ensure that HTST and batch pasteurisers operate correctly and that no unpasteurised product goes forward for further processing. It requires an annual independent evaluation of the checking programme.

MRD-Stan 4:

- requires that pasteurisers be installed to comply with either MQD 1A or MQD 12, “Market Milk Code of Practice” both of which are no longer MAF-approved codes;
- refers to IDF Bulletin 200 (1986), “Monograph on Pasteurised Milk”, Chapter IX, and MQD 1B, Section 5.2.5 for pasteuriser commissioning;
- requires that records be kept to demonstrate that no unpasteurised milk passes forward for further processing. Records of pasteuriser operation must be kept as required by MQD 1B, Section 5, and they must be available for inspection;
- describes the checks that must be carried out.

4.2.1.6 NZCP 7, “Pasteurisation Equipment and Instrumentation Code of Practice”

Dairy industry code NZCP 7, together with AS 3993.1, “Equipment for the Pasteurisation of Milk and Other Liquid Dairy Products; Part 1: Continuous-flow Systems” and 3-A Accepted Practice 603-06, “Sanitary Construction, Installation, Testing and Operation of High-temperature Short-time and Higher-temperature Shorter-time Pasteuriser Systems”, were approved as standards for pasteurisation equipment by Dairy Circulars 27 and 28.

NZCP 7 covers design and operation of equipment, including control and recording instrumentation, for pasteurisation from 69° C to 100° C of milk and other liquid dairy produce, for batch, HTST and HHST heat treatment. It contains significant additional

requirements compared to the older standards MQD 1B (see below), in order to provide greater assurance of correct pasteurisation. The standard also provides for computer control of pasteurisers. The new requirements add significantly to the cost of pasteurisation equipment.

NZCP 7 is also approved as a standard for the assessment of pasteurisers during validation.

It is stated, in Circulars 27 and 28 and NZCP 7, that “all dairy industry pasteurisers shall comply with NZCP 7 by 1 July 2001”. This statement has been misunderstood because, read in isolation, it appears to make NZCP 7 the sole mandatory code of practice. However it is clear from the approval statement for NZCP 7 that pasteurisers may comply with other MAF-approved standards. These include AS 3993.1 and 3-A Accepted Practice 603-06, which have been specifically approved. Therefore as far as MAF is concerned, the implementation deadline applies only to those companies that include NZCP 7 in their approved product safety programme.

The dairy industry parties who were involved in the development of NZCP 7 made a form of agreement that this code should apply to all pasteurisers, at least for the part of the industry they represented, i.e. the co-operative dairy companies and the Dairy Board. The industry is free to make such an agreement, but MAF cannot enforce it except in accordance with the law it administers. The *Dairy Industry Regulations 1990* do not specify a single standard for pasteurisation equipment, but instead specify the outcomes that such equipment must achieve to satisfy MAF, i.e. that it:

- is in all respects suitable for, and capable of, the manufacture of safe dairy products; and
- controls potentially pathogenic organisms.

Transition arrangements for those who are complying with NZCP 7 are given in Circulars 27 and 28 and NZCP 7. These specify that companies may continue to comply with the older standard MQD 1B until 1 July 2001, but the relevant parts, as follows, of NZCP 7 must be complied with:

- when major alterations are carried out;
- when new pasteurisation equipment is installed.

Computer control systems and electronic data recording for pasteurisers must comply immediately.

Two planned sections of NZCP 7 have not been completed: requirements for UHT treatment and requirements for other forms of heat treatments. The latter was intended to cover heat treatment in equipment such as evaporator pre-heaters. NZCP 7 has been revised by the Working Group, but the revision has not been issued.

4.2.1.7 AS 3993.1: 1992. “Equipment for the pasteurisation of milk and other liquid dairy products. Part 1: Continuous-flow systems”

This Standard sets out the requirements for the design and operation of equipment, including control and recording instrumentation, used for continuous-flow pasteurisation at temperatures between 60° C and 100° C of milk and other liquid dairy products.

4.2.1.8 3-A, “ Accepted Practices for the Sanitary Construction, Installation, Testing and Operation of High-temperature Short-time and Higher-heat Shorter-time Pasteuriser Systems, Revised, Number 603-06”

This document includes criteria for design, material, fabrication, installation, testing and operation of HTST and HHST pasteurisers.

4.2.1.9 MQD 1: Code of Practice. “Part B, Dairy Food Manufacturing Equipment” (also known as DDM 1) and MQD 12: “Market Milk Code of Practice”

These codes contain sections on the design of heat treatment and pasteurisation equipment, and procedures for checking their operation and keeping records. They are no longer approved codes, but are sometimes referred to in product safety programmes.

4.3 NEW ZEALAND’S LEGAL REQUIREMENTS

4.3.1 Dairy products for sale in New Zealand

Under the provisions of the *Trans-Tasman Mutual Recognition Act 1997*, matters relating to health and safety of persons in New Zealand (such as heat treatment) may differ from those applying in Australia.

Foods sold in New Zealand must comply with the heat treatment provisions of the *New Zealand Food Regulations 1984*. The heat treatment provisions of the *Australian Food Standards Code* and the joint *Australia New Zealand Food Standards Code* do not apply in New Zealand.

The requirements of the *Food Regulations 1984* are given in Annex A. The requirements of the joint code are included in Annex A for information.

4.3.2 Labelling of heat treatments

When dairy products are labelled as being heat treated or made from heat treated milk, the declaration must not be misleading or deceptive. The milk or the product must be heat treated as stated on the label and the product safety programme must describe the means to deliver this heat treatment. Concerning labelling of heat treatments, foods sold in New Zealand must comply with the requirements of the *New Zealand Food Regulations 1984*.

4.3.3 MAF/MoH Harmonisation Project for Ice Cream Manufacturers and Specialist Cheesemakers

As a general rule, manufacturers of dairy products must comply with the *Dairy Industry Act 1952* and the regulations and standards under that Act administered by MAF; and manufacturers of foods for sale on the domestic market must comply with the *Food Act 1981* and regulations and standards under that Act administered by the Ministry of Health (MoH). To simplify the complications caused by this dual administration, MAF and MoH are moving towards harmonised food safety requirements. For this purpose, codes of practice for ice cream manufacture and specialist cheesemaking are being developed that will be acceptable for both regulatory systems. The proposed requirements of these codes that are known at this stage are consistent with D121. The codes should be available in early 2002.

Manufacturers who supply only the New Zealand and Australian markets have been invited to join the development project. For these manufacturers, the status quo applies for the duration of the project.

For manufacturers in this group who are registered and operating under the *Food Hygiene Regulations 1974* or who have an approved Food Safety Programme, the standards listed in 4.2.1 above do not apply. The longer term objective of harmonisation is that the requirements for food safety programmes, product safety programmes and risk management programmes (established under the *Animal Products Act 1999*) should be consistent and achieve the same objectives.

4.4 INTERNATIONAL STANDARDS AND GUIDELINES

4.4.1 Codex

The Codex Alimentarius Commission uses four principles relating to the role of food safety risk assessment¹. These state, among other things, that health and safety aspects of Codex decisions and recommendations should be based on a risk assessment, as appropriate to the circumstances, and that food safety risk assessment should be soundly based on science.

Consistent with this approach, the Codex Committee on Food Hygiene (CCFH) has drafted a statement concerning the hygiene of dairy products as follows²:

- “It is recommended that the products covered by the provisions of this Standard be prepared and handled in accordance with the appropriate Sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 3-1997), and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.
- From raw material production to the point of consumption, the products covered by this Standard should be subject to a combination of control measures, which may include, for example, pasteurisation and these should be shown to achieve the appropriate level of public health protection.
- The products should comply with any microbiological criteria established in accordance with the Principles for the Establishment and Application of Microbiological Criteria for Foods (CAC/GL 21-1997).”

A drafting group established by the Codex Committee on Food Hygiene is developing a “Code of Hygienic Practice for Milk and Milk Products”³ (Milk Hygiene Code). This code is intended to develop and apply the General Principles of Food Hygiene⁴, with particular reference to milk and milk products. The code is currently at step 3 of the eight-step Codex procedure, and could be adopted in 2003.

The General Principles of Food Hygiene recommend a HACCP-based approach wherever possible to enhance food safety, and make the following general points relating to heat treatment:

- “Equipment used to heat treat food should be designed to achieve the required temperatures as rapidly as necessary in the interests of food safety and suitability, and maintain them effectively, and such equipment should be designed to allow temperatures to be monitored and controlled.

¹ Codex Alimentarius Commission, Procedural Manual. FAO and WHO, Rome, 2000. Page 181.
<http://www.fao.org/es/esn/codex/manual/decide.htm>

² Codex Standard for Butter, CODEX STAN A-1-1971, Rev.1-1999, and other standards for milk products.

³ CX/FH 01/8

⁴ ftp://ftp.fao.org/codex/standard/fh_basic.pdf

- Systems should be in place to ensure that temperature is controlled effectively where it is critical to the safety and suitability of food.”

The draft “Milk Hygiene Code” takes this a little further with the statement:

“Control measures should be selected, implemented, and validated for the manufacturing of products covered by this code which will prevent, eliminate or reduce to acceptable levels, hazards that are reasonably likely to occur.”

A wide range of processing control measures can be used during the manufacturing phase that can be effective in producing safe and suitable products. Examples of microbiological control measures are provided in Annex II, Parts A and B.

Guidance to validation of food safety control measures is given in “Guidelines for the Validation of Food Hygiene Control Measures” (CCFH document in preparation).

Supplemental guidance on the validation of individual control measures and combinations thereof is provided in Annex II, Part 4.”

The US has prepared a discussion paper⁵ on guidelines for validation. This will be considered by the next meeting of the Codex Committee on Food Hygiene. Material from this paper has been incorporated into the draft “Milk Hygiene Code”.

4.4.2 International Dairy Federation

IDF has been heavily involved in work relating to heat treatment, and works closely with Codex. Their work includes definitions of heat treatments, codes of hygienic practice, technical information on pasteurisation and other heat treatments, and methods of testing heat treated milk.

4.5 IMPORTING COUNTRY REQUIREMENTS

Many countries that import New Zealand dairy products require that the milk must be pasteurised. The European Community and USA have agreements with New Zealand that include requirements for heat treatment.

4.5.1.1 European Community

The EC/NZ Veterinary Agreement⁶ covers pasteurised dairy products, and recognises that New Zealand requirements for pasteurisation, established under the *Dairy Industry Act 1952* and the *Food Act 1981*, are equivalent to the requirements of the Milk and Milk Products Hygiene Directive⁷. The requirements of this directive are included in Annex A for information.

The audit of New Zealand's dairy systems by the European Commission, and the preliminary audit by the MAF Food: Compliance and Investigation Group, did not raise any concerns regarding heat treatment.

⁵ CX/FH 01/13. ftp://ftp.fao.org/codex/ccfh34/fh01_13e.pdf

⁶ Agreement between the European Community and New Zealand on sanitary measures applicable to trade in live animals and animal products. Agreement 297A0226(02), Official Journal L 057, 26/02/1997, p. 0005 - 0059. http://europa.eu.int/eur-lex/en/lif/dat/1997/en_297A0226_02.html

⁷ Council Directive 92/46/EEC of 16 June 1992 laying down the health rules for the production and placing on the market of raw milk, heat-treated milk and milk-based products. http://europa.eu.int/eur-lex/en/lif/dat/1992/en_392L0046.html

4.5.1.2 USA

The Memorandum of Understanding between FDA and MAF⁸ accepts the New Zealand regulatory system for dry milk products as being equivalent to, and meeting USA importing country requirements. Dry milk products must be phosphatase negative, defined as “No indication of under-pasteurisation or contamination with raw milk when tested by one of the methods in AOAC methods, 12th edition, section 16.101, et al”.

There is no agreement between New Zealand and the US covering other dairy products. Information on the US requirements is included in the Annex. The Working Group recommended that these requirements should be included in the Importing Country requirements on the MAF website.

4.6 CERTIFICATION OF HEAT TREATMENTS

Importing countries often require that dairy products are certified by MAF as having been made from pasteurised milk or milk that has been heated sufficiently to destroy pathogenic organisms. When this is the case, MAF requires that the milk has been heat treated by heat treatment equipment operated in accordance with an approved product safety programme. A statement to this effect is included in the summary of records supplied to MAF.

4.7 SUMMARY OF THE CURRENT NEW ZEALAND SITUATION

The current situation may be summarised as follows:

- All dairy manufacturers, except those some ice cream manufacturers and specialist cheesemakers participating in the harmonisation project, must register their factories and operate their product safety programmes in accordance with MAF Standards.
- Pasteurisation is required by some importing countries.
- If export product is to be certified or labelled as pasteurised, it must be heat treated by heat treatment equipment operated in accordance with an approved product safety programme.
- Dairy products sold on the domestic market must comply with the requirements of the *New Zealand Food Regulations 1984*. Pasteurisation or other heat treatments are required in the manufacture of most dairy products, and they must be labelled as specified in the *New Zealand Food Regulations 1984*.
- Product safety programmes must include a hazard analysis to identify potential hazards, identification of critical control points, and procedures for the operation, monitoring and recording of all critical control points.
- Where pasteurisation is used as a critical control point, the following apply:
 - Pasteurisation heat treatment conditions must comply with MRD-Stan 3 (repeated in NZCP 7).
 - Pasteuriser equipment must comply with NZCP 7, AS 3993.1:1992, or 3-A Accepted Practices 603-06:1992, or, until 30 June 2001 and with certain limitations, comply with MQD 1B.
 - Pasteurisers must be checked and validated according to MRD-Stan 4 (repeated in NZCP 7).

⁸ Memorandum of Understanding between the Ministry of Agriculture and Fisheries and the Food and Drug Administration relative to Exporting Dry Milk Products to the United States (Federal Register, 3 October 1974. 39 FR 35697)

- Pasteuriser records must be kept as required by MRD-Stan 4 and NZCP 7.

5. Issues

5.1 SCOPE

The Working Group considered that the scope of the new Standard should cover all heat treatments that are used as critical control points or control measures, and should cover all dairy product manufacturers. The heat treatments to be defined should be pasteurisation, UHT treatment and thermisation. The requirements for design and operation of heat treatment equipment should apply generically to all types of equipment and manufacturing operations.

5.2 HACCP AND CRITICAL CONTROL POINTS

As mentioned in 4.2.1.2, all product safety programmes must include validated HACCP analyses/plans of the processes covered by the PSP.

The Working Group agreed that heat treatments should be established in the framework of HACCP, and the outcome of the Standards should be:

“The heat treatment used as a critical control point or control measure reduces the number of harmful micro-organisms to a level, that together with other critical control points and control measures results in a safe dairy product in accordance with regulations 6(2), 9(b, d, e, f, g, j, k, l, and m) and 17(f, g, i) of the *Dairy Industry Regulations 1990*.”

The Working Group agreed that validation of heat treatments should be considered a subset of validation of HACCP plans.

5.3 HAZOP

HAZOP (hazard and operability analysis) is a technique that is used to assess the possible causes of failure of equipment. When it is used it is likely to reduce the likelihood of failure. At present it is not a well-known technique in New Zealand, and it does not relate directly to food hazards. It therefore is not intended that HAZOP be a requirement of the Standard.

5.4 PASTEURISATION

The heat treatment conditions for pasteurisation have been reviewed by the Working Group. The tables of equivalent treatments have been revised, and extended to cover products with particle sizes up to 1000 microns. The temperatures for pasteurisation of particles in milk and ice cream mix are based on calculations of heat transfer in particles to achieve a 10-log reduction in the number of viable organisms, by Pat J Jordan and Ken R Morison, Department of Chemical and Process Engineering, University of Canterbury⁹.

In each case a minimum temperature is included, below which pathogens are not effectively destroyed.

The minimum holding time listed in the tables is 1 second, because this is the minimum measurable time. Shorter holding times may be used provided they can be validated.

⁹ Unpublished data.

In addition a table of heat treatments for ice-cream mixes has been included, based on the requirements of the *New Zealand Food Regulations 1984* which are consistent with industry practice. The performance of these heat treatments is supported by historical evidence rather than scientific validation.

A requirement is included for cooling after pasteurisation, either to a temperature that is appropriate for further processing, or to a storage temperature that maintains the milk or dairy produce in a wholesome condition until the best-before date. Cooling determines the subsequent survival of organisms, and was part of the pasteurisation process in the laboratory validation work. For direct consumption, the *New Zealand Food Regulations 1984* requires that fluid milk is cooled to 5° C and cream to 7° C.

5.5 UHT TREATMENT

The temperature and time conditions for UHT treatment are expressed in terms of equivalence to the so-called "botulinum" process ($F_0 = 3$ minutes). In cases where the raw materials may contain large numbers of heat resistant spores (e.g. in cocoa), the F_0 value may need to be increased.

5.6 DEFINING OTHER HEAT TREATMENTS

Thermisation is a term which, in common use, refers to a range of sub-pasteurisation heat treatments. For the purposes of this Standard it is defined as heating to a temperature of no less than 64.4° C for a period of no less than 16 seconds, or an equivalent treatment. This is slightly more stringent than the heat treatment (62° C for 15 seconds) currently permitted for cheese manufacture, in conjunction with defined storage conditions.

Thermisation has been shown to give a 2-log or greater kill in milk, particularly gram negative bacteria such as *E. coli* and *Salmonella*. It should not therefore be regarded as a critical control point, but rather it is a control measure that must be used in conjunction with other control measures to assure product safety. It is recognised that thermisation is used for other purposes, such as prolonging the storage life of raw milk before processing begins.

Thermisation is therefore included in this Standard, with requirements that are the same as for pasteurisation apart from the temperature and time conditions. The Working Group recommended that:

- Thermisation should be referred to as a control measure.
- Further research work is needed to establish the microbial kill of thermisation.
- Thermisation should be included in the recommendations on heat treatment in the (yet to be developed) *New Zealand Food Standard*.

5.7 HEAT TREATMENT EQUIPMENT AND OPERATION

The requirements for heat treatment equipment and operation are intended to be outcome-oriented, rather than prescriptive, because it is not possible to cover every situation, and also in order to allow for future development. Further details can be found in industry codes or published standards. These sections are also intended to provide guidance for Third Party Agencies (TPAs) in their validation and evaluation activities, in order to ensure that these assessments are as consistent as possible. The criteria are detailed in Annexes A and B, which are consistent with the (unpublished) revision of NZCP 7.

The Working Group agreed that validation of heat treatment equipment may be carried out internally or externally, on the same basis as other HACCP validation, i.e. the validator should be appropriately qualified, and conflicts of interest managed. There is one important exception, which is that validation must be external when the heat treatment is new, relocated or has undergone a significant change. This requirement is intended to avoid the possible situation that an unsatisfactory internal validation might not be detected until the annual external evaluation takes place.

The Working Group recognised that this proposal could lead to a diminishing pool of qualified heat treatment validators. It was suggested that this important area could be addressed by the New Zealand Industry Training Organisation.

The Working Group considered the situation of smaller operators who would find it difficult to meet the expense of upgrading equipment to satisfy the criteria. The proposal therefore includes provision for validating such equipment, providing that hazards are controlled and equipment is brought into compliance within a specified time.

The equipment design criteria (Annex A) are intended to ensure that no untreated or partially treated produce passes forward. The design requirements for any heat treatment equipment used in a critical control point are similar. The Working Group recognised that, in the case of some heat treatment processes, these criteria can be difficult to satisfy and may require equipment modification. In some cases it may be impossible. For example in casein manufacture, it is very difficult to ensure that the hot wash is at the required temperature and that all curd particles pass through the wash.

The Working Group also agreed it is important that both dairy companies and equipment supply companies understand the rules for heat treatment equipment and the possible solutions. It would be necessary to develop industry guidance material and suppliers should attend and be included in MAF workshops.

5.8 HEAT TREATMENT REQUIREMENTS FOR THE NEW ZEALAND FOOD STANDARDS

When the joint *Australia New Zealand Food Standards Code* is fully implemented, in December 2002, the *New Zealand Food Regulations 1984* will be revoked. It is anticipated that heat treatment requirements in the regulations will be replaced by a new document incorporated in the *New Zealand Food Standards*. It is timely therefore to review the *New Zealand Food Regulations 1984*, and consider what requirements should replace them.

The Working Group will make a recommendation for this purpose.

5.9 STANDARDS FOR ICE CREAM MANUFACTURERS AND SPECIALIST CHEESEMAKERS

The codes of practice that are being developed for ice cream manufacture and specialist cheesemaking (4.3.3 above) should be consistent with the new Standard. The Working Group is maintaining contact with the groups developing the codes to ensure this occurs.

6. Implementation

6.1 MECHANISM FOR IMPLEMENTING

The changes proposed above would be implemented by preparing MAF D-series Standard for dairy heat treatments. The Standard would outline the requirements for all heat treatments used as critical control points or control measures in a dairy manufacturing operation.

6.2 CHANGES REQUIRED FOR IMPLEMENTATION

6.2.1 By MAF Dairy and Plant Products

- Approval of standards or codes of practice, e.g. NZCP7, that provide detailed guidance on the means to comply with the proposed Standard.
- Development with the New Zealand Industry Training Organisation of a unit standard for training heat treatment validators

6.2.2 By manufacturers

- Application for approval by MAF of standards or codes of practice, e.g. NZCP7, that provide detailed guidance on the means to comply with the proposed Standard.
- Review and revision of HACCP plans and PSPs to comply with the proposed Standard.
- Identification of non-compliant equipment and either making it compliant or having a interim control plan approved as part of the Product Safety Programme.

6.2.3 By MAF Compliance and Investigation and Third Party Agencies

- Upgrading of PSP evaluation and verification systems to include the requirements of the proposed Standard.

6.3 PROPOSED IMPLEMENTATION PERIOD

Given the amount of work that will need to be completed in order to approve standards and codes of practice, revise HACCP plans and PSPs and bring equipment into compliance, an 18-month implementation period is proposed for this Standard. Assuming that the Standard is issued on or about the 31 January 2002, then the Standard would come into force on or about 31 July 2003.

Any non-compliances after this period will be managed in a systematic manner using the existing procedures for the management of non-compliances.

It is envisaged that MAF may approve, as part of the PSP, interim control plans for existing non-complying equipment, provided it can be demonstrated that the hazards can be effectively managed.

7. Proposal

With regards to the dairy heat treatment, the following are proposed:

- That a MAF Standard relating to dairy heat treatment (D121.1) be drafted and provided for industry consultation.
- That this Standard requires:
 - that heat treatment requirements apply to all dairy product manufacturers using heat treatments as critical control points or control measures;
 - defined heat treatments for pasteurisation, UHT treatment and thermisation;
 - the heat treatment used as a critical control point or control measure reduces the number of harmful micro-organisms to a level, that together with other critical control points and control measures results in a safe dairy product;
 - revised tables of equivalent heat treatments for pasteurisation;
 - outcome-oriented criteria for heat treatment equipment and its operation;
 - validation of heat treatment as a subset of validation of HACCP plans. The exception is for heat treatments which are new, relocated or have undergone significant change. These are validated as part of the approval of plans and specifications in the construction of dairy premises;
 - that existing heat treatment equipment not complying with the criteria is operated under a PSP containing an interim control plan that identifies the non-compliances and hazards, the means to reduce the hazards to an acceptable level, and the date the non-compliance will be resolved.
- Assuming that the Standard is issued on or about 31 January 2002, that it come into force 18 months later, on or about 31 July 2003.

8. Draft Standard

Draft MAF Standard D121.1, “Dairy Heat Treatment”, has been drafted based on the findings and recommendations of this discussion document. Copies of the draft Standard can be obtained from MAF’s website (www.maf.govt.nz/Dairy) or by contacting MAF Food: Dairy and Plant Products.

9. Consultation

The draft Standard is of concern to the New Zealand dairy industry, specifically dairy product manufacturers and dairy equipment suppliers.

Internal and external consultation will be conducted according to the MAF Food: Dairy & Plants Consultation Policy. The deadline for submissions is **2 November 2001**. Instructions for making submissions are provided with the draft Standard.

10. References

- MAF Standard MRD-Stan 3, “Standard for Pasteurisation Heat Treatments”. Regulatory Authority, New Zealand Ministry of Agriculture and Forestry, 1993.
- MAF Standard MRD-Stan 4, “Standard for Checking the Operation of Pasteurisers”. Regulatory Authority, New Zealand Ministry of Agriculture and Forestry, 1993.
- NZCP 7, “Pasteurisation Equipment and Instrumentation Code of Practice”. NZ Dairy Board, Quality Section, 1996.
- AS 39931.1: 1992. “Equipment for the pasteurisation of milk and other liquid dairy products. Part 1: Continuous-flow systems”. Standards Australia.
- 3-A, “Accepted Practices for the Sanitary Construction, Installation, Testing and Operation of High-temperature Short-time and Higher-heat Shorter-time Pasteuriser Systems, Revised, Number 603-06”. *Dairy, Food and Environmental Sanitation*, 12 (7), 423-477 (June 1992/3-A Issue).
- MQD 1: Code of Practice. “Part B, Dairy Food Manufacturing Equipment” (also known as DDM 1). MAF Quality Management.
- *Food Act 1981*.
- *New Zealand Food Regulations 1984*.
- *Dairy Industry Act 1952*.
- *Dairy Industry Regulations 1990*.
- IDF Bulletin 200 (1986), “Monograph on Pasteurised Milk”.

Annex: Requirements for Heat Treatment of Milk and Milk Products

NEW ZEALAND

Processing requirements for milk and milk products are regulated under the *Dairy Industry Act 1952* and the *Food Act 1981*. Foods sold in New Zealand must comply with the heat treatment provisions of the *New Zealand Food Regulations 1984*.

New Zealand Food Regulations 1984

Pasteurised Milk and Pasteurised Milk Products

Regulation 93:

- (1) In these regulations "pasteurised", in relation to milk, [standardised] milk, recombined milk, flavoured milk, skim milk or non-fat milk, [or reduced-fat milk,] cream, whipping cream or whipped cream, reduced cream or pouring cream, sour cream, light cream, and recombined cream, and any other milk product for which no standard is prescribed in regulations 92 to 122 of these regulations, means milk or a milk product that has been efficiently heat-treated by one of the following methods:
 - (a) The holding method, by which the temperature of the milk or milk product is raised to not less than 63° C and not more than 66° C, retained at not less than 63° C and not more than 66° C for at least 30 minutes, and then-
 - (i) Immediately and rapidly reduced to 5° C or less in the case of milk or milk products other than cream, or to 7° C or less in the case of cream; and
 - (ii) Maintained at or below that temperature until the milk or milk product is removed from the premises for delivery:
 - (b) The high-temperature short-time method, by which the temperature of the milk or milk product is raised to not less than 72° C, retained at that temperature for at least 15 seconds, and then treated in accordance with subparagraphs (i) and (ii) of paragraph (a) of this subclause:
 - (c) Any other method by which the milk or milk product is raised to any temperature and retained at that temperature for such period as is as effective as the temperature and time combination specified in paragraph (a) or paragraph (b) of this subclause, and then treated in accordance with subparagraphs (i) and (ii) of that paragraph (a).
- [(2A) Subparagraphs (i) and (ii) of subclause (1)(a) of this regulation shall not apply to a milk or milk product that is to be used immediately for further processing (for example, in cheese making).]
- (3) No cows' milk, [standardised] cows' milk, recombined cows' milk, flavoured cows' milk, or skim cows' milk or non-fat cows' milk [or reduced-fat cows' milk] shall be deemed to be efficiently heat-treated for the purposes of subclause (1) of this regulation if, when it is subjected to the phosphatase test described in the Third Schedule to these regulations, it gives a reading exceeding 10 on the Lovibond Comparator APTW or APTW/7 discs.

- (a) The sample shall have a standard plate count not exceeding 50 000 colonies per ml of pasteurised product.
- (b) 3 out of 5 replicate portions of 0.1 ml shall not give evidence of acid formation and gas formation as described.

UHT (Ultra Heat Treated) Milk and UHT (Ultra Heat Treated) Milk Products-
Regulation 94:

- (1) In these regulations "ultra heat treated", in relation to milk, [standardised] milk, recombined milk, flavoured milk, skim milk or non-fat milk, cream, whipping cream or whipped cream, reduced cream or pouring cream, sour cream, light cream, and recombined cream, and any other milk product for which no standard is prescribed in regulations 92 to 122 of these regulations, means milk or a milk product that has been flow sterilised in properly operating equipment by a single uninterrupted continuous heating process to a temperature of not less than 133° C, either by direct heating with steam or indirect heating, to ensure preservation, treated in a manner to minimise loss of vitamins, and aseptically packed in containers that are hermetically sealed immediately thereafter.
- (2) UHT milk, UHT [standardised] milk, UHT recombined milk, UHT flavoured milk, UHT skim milk or UHT non-fat milk, UHT cream, UHT whipping cream or UHT whipped cream, UHT reduced cream or UHT pouring cream, UHT sour cream, UHT light cream, and UHT recombined cream, and any other UHT milk product for which no standard is prescribed in regulations 92 to 122 of these regulations, shall, when tested by the Sterility Test for UHT milk products described in these regulations, be reported as sterile.

Flavoured Milk

Regulation 97:

- (3) Flavoured milk shall be made from pasteurised milk, pasteurised [standardised] milk, pasteurised reduced-fat milk, pasteurised recombined milk, pasteurised recombined reduced-fat milk, pasteurised recombined non-fat milk, pasteurised skim milk, or pasteurised non-fat milk, or shall be pasteurised or shall be subjected to a method of heat treatment that is at least as effective as the process of pasteurisation.

Skim Milk or Non-Fat Milk

Regulation 98:

- (2) Skim milk or non-fat milk-
 - (b) Shall have been either pasteurised or ultra heat treated.

Reduced-Fat Milk

Regulation 98A:

- (2) Reduced-fat milk-
 - (c) Shall have been either pasteurised or ultra heat treated.

Cream or Raw Cream

Regulation 99:

- (4) Every reference in these regulations to "cream" as an ingredient that shall or may be included in a compounded food shall be deemed to include a reference to "pasteurised cream".

Whipping Cream or Whipped Cream

Regulation 100:

- (4) Whipping cream or whipped cream shall be pasteurised, ultra heat treated, or canned, or manufactured from pasteurised milk products.

Light Cream and Light Sour Cream

Regulation 101:

- (4) It shall be pasteurised, ultra heat treated, or canned, or manufactured from pasteurised milk products.

Reduced Cream, Pouring Cream, and Sour Cream

Regulation 102:

- (4) Reduced cream and pouring cream shall be pasteurised, ultra heat treated, or canned, or manufactured from pasteurised milk products.

Recombined Cream

Regulation 104:

- (1) Recombined cream shall be the product prepared from butter or milk fat, with drinking water and milk solids, which product has been either pasteurised or ultra heat treated.

Butter

Regulation 111:

- (1) Butter shall be a product in the form of a plastic emulsion, that is of the type water-in-oil, prepared from any one or more of the following:
 - (a) Pasteurised cream:
 - (b) Pasteurised milk:
 - (c) Butter oil, anhydrous butter oil, anhydrous milk fat:
 - (d) Whey.

Cheese

Regulation 113:

- (2) The milk or cream or mixture of milk and cream that is used in the manufacture of cheese-
 - (a) Shall be subjected to pasteurisation or an equivalent heat treatment; or
 - (b) Shall be subjected to heat treatment at a temperature of not less than 62° C for a period of not less than 15 seconds; and

- (i) The cheese shall be labelled with the date of commencement of manufacture; and
- (ii) The cheese shall be stored prior to sale at a temperature of not less than 2° C for a period of not less than 90 days from the date of commencement of manufacture; and
- (iii) The cheese shall contain not more than:
 - (aa) 100 *Esherichia coli* per gram; and
 - (bb) 100 *Staphylococcus aureus* (coagulase producing) per gram; and
- (iv) A 50 g sample of the cheese shall be free from *Salmonella*.

Processed Cheese (Regulation 115), Spreadable Processed Cheese (Regulation 116), Processed Cheese Food or Processed Cheese Spread (Regulation 117)

Heating to a temperature of at least 70° C for 30 seconds, or any other equivalent time and temperature combination.

General Standard for Cultured Milks and Fermented Milks

Regulation 118A

- (2) The milk products used in the manufacture of cultured milks and fermented milks shall be pasteurised in accordance with regulation 93 of these regulations, or shall be subjected to a method of heat treatment that is at least as effective as the process of pasteurisation.

Cultured Buttermilk

Regulation 118B

- (3) The milk products used in the manufacture of cultured buttermilk shall be pasteurised, or shall be subjected to a method of heat treatment that is at least as effective as the process of pasteurisation.

Yoghurt

Regulation 119

- (1) Yoghurt shall be a coagulated milk product obtained by fermenting pasteurised milk products, with or without dried milk products, with cultures of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, [or with other cultures] of suitable lactic acid producing bacteria, and shall have a pH value of not greater than 4.5.

Ice Cream

Regulation 121

- (4) The ice cream mix shall be efficiently heat-treated, either by being kept at a temperature of not less than 69° C for at least 20 minutes, or not less than 74° C for at least 10 minutes, or not less than 79.5° C for at least 15 seconds, or not less than 85.5° C for at least 10 seconds, or by an equivalent heat treatment, and then frozen.
- (5) After the ice cream mix has been subjected to heat treatment, no substance shall be added to it, except fruit, fruit syrup, fruit juice, or any other foodstuff that is pasteurised and is stored in a sealed, sterilised container.

- (6) Notwithstanding subclause (4) of this regulation, heat treatment shall not be required in respect of ice cream that is made from dry ingredients of the nature described in subclauses (1) and (2) of this regulation and drinking water, and that is sold only on the premises where it is manufactured.

IMPORTING COUNTRY REQUIREMENTS

USA

Dry Milk Products

Memorandum of Understanding (MoU) between the Ministry of Agriculture and Fisheries and the Food and Drug Administration relative to Exporting Dry Milk Products to the United States (Federal Register, 3 October 1974. 39 FR 35697).

- The MoU between MAF and the FDA accepts the New Zealand regulatory system for dry milk products as being equivalent to, and meeting USA importing country requirements.
- All dry milk products (including nonfat dry milk, whole milk powder, dried whey, buttermilk powder, casein and caseinates) must be phosphatase negative, defined as "No indication of under-pasteurisation or contamination with raw milk when tested by one of the methods in AOAC methods, 12th edition, section 16.101, et al".

Letter, Smucker, Acting Chief, Milk Safety Branch, CFSAN, to Haslam, Veterinary Counsellor, Australian Embassy, 13 September 1995:

- The Fluorophos and Charm II tests have been adopted for regulatory purposes as alternatives to the Scharer Rapid Method for the purpose of verifying proper pasteurisation of milk and dairy products. The pass fail standards are 500 milliunits/L.

Milks, creams (up to 40% milkfat) and cultured milks

There is no agreement between New Zealand and the US covering these products. It is understood that exports must comply with the requirements of the "Grade "A" Pasteurised Milk Ordinance" (PMO). Similar requirements appear in US Military Standards, and in 21CFR131.3, with some simplification. (CFR is the Code of Federal Regulations, available on-line at www.access.gpo.gov/nara/cfr/cfr-table-search.html.)

Pasteurised when used to describe a dairy product means that every particle of such product shall have been heated in properly operated equipment to one of the temperatures specified in the table of this paragraph and held continuously at or above that temperature for the specified time (or other time/temperature relationship which has been demonstrated to be equivalent thereto in microbial destruction):

Temperature	Time
63° C (145° F) ¹	30 minutes
72 °C (161° F) ¹	15 seconds
89° C (191° F)	1 second
90°C (194° F)	0.5 second
94° C (201° F)	0.1 second
96°C (204° F)	0.05 second
100° C (212° F)	0.01 second

¹ If the dairy ingredient has a milkfat content of 10 percent or more, or if it contains added sweeteners, the specified temperature shall be increased by 5° F.

Pasteurised milk must contain less than 350 milliunits/L for fluid products and less than 500 for other milk products by the Fluorometer or Charm ALP or equivalent, and must also meet standards for temperature, bacterial counts and antibiotic residues.

Ultra-pasteurised when used to describe a dairy product means that such product shall have been thermally processed at or above 138° C (280° F) for at least 2 seconds, either before or after packaging, so as to produce a product which has an extended shelf life under refrigerated conditions.

Aseptic processing means processing in accordance with the requirements for thermally processed low-acid foods packaged in hermetically sealed containers (21CFR113) and the PMO.

The PMO provides specific details for:

- batch pasteurisation;
- HTST pasteurisation;
- aseptic processing systems;
- regenerative heating;
- temperature recording charts and equipment tests and examinations.

There is no requirement to comply with 3-A standards. It is noted that such equipment which is manufactured in conformity with 3-A Sanitary Standards complies with the PMO.

The complete PMO (1999 revision) is available at <http://www.cfsan.fda.gov/~ear/p-nci.html>.

Frozen cream

It is believed that frozen cream (over 40% milkfat) is exported to the US under the provisions of the *Federal Milk Import Act 1927* (<http://www.fda.gov/opacom/laws/fimilkat.htm>). This Act mentions pasteurised milk but does not define pasteurisation. A maximum bacterial count is specified for pasteurised milk.

European Union

Pasteurised dairy products for human consumption except colostrum and derivatives

The European Community/New Zealand Veterinary Agreement on sanitary measures applicable to trade in live animals and animal products. Refer Directive 97/131/EC, Official Journal L 057, 26/02/1997, p. 0005 - 0059 (the EC/NZ Veterinary Agreement).

The EC/NZ Veterinary Agreement recognises the New Zealand regulatory system, as covered by the *Dairy Industry Act 1952*, the *Dairy Industry Regulations 1990* and the *Food Act 1981*, for pasteurised dairy products for human consumption, except colostrum and derivatives, as being equivalent to Council Directive 92/46/EEC (OJ No L268, 14.9.92,p.1) of 16 June 1992 laying down the health rules for the production and placing on the market of raw, heat-treated milk and milk based products (http://europa.eu.int/eur-lex/en/lif/dat/1992/en_392L0046.html).

The heat treatment requirements under this Directive, that apply in the EC, are:

Annex B

CHAPTER V Special requirements for the approval of treatment establishments and processing establishments

In addition to the general requirements laid down in Chapter I, treatment establishments and processing establishments must have at least:

- (e) if appropriate, centrifuges or any other suitable means for physically purifying milk;
- (f) heat-treatment equipment approved or authorized by the competent authority, fitted with:
 - an automatic temperature control;
 - a recording thermometer;
 - an automatic safety device preventing insufficient heating;
 - an adequate safety system preventing the mixture of pasteurized or sterilized milk with incompletely heated milk; and
 - an automatic recording device for the safety system referred to in the preceding indent.

Annex C

CHAPTER I Requirements for the manufacture of heat-treated milk and milk-based products

- 4. (a) Pasteurized milk must:
 - (i) have been obtained by means of a treatment involving a high temperature for a

short time (at least 71.7°C for 15 seconds or any equivalent combination) or a pasteurization process using different time and temperature combinations to obtain an equivalent effect;

- (ii) show a negative reaction to the phosphatase test and a positive reaction to the peroxidase test. However, the production of pasteurized milk which shows a negative reaction to the peroxidase test is authorized, provided that the milk is labelled as 'high-temperature pasteurized';
- (iii) immediately after pasteurization, have been cooled to a temperature not exceeding 6° C as soon as possible.

(b) UHT milk must:

- have been obtained by applying to the raw milk a continuous flow of heat entailing the application of a high temperature for a short time (not less than +135° C for not less than a second) - the aim being to destroy all residual spoilage micro-organisms and their spores - using aseptic opaque containers, or containers made opaque by the packaging, but so that the chemical, physical and organoleptic changes are minimal,
- be of preservability such that no deterioration can be observed by means of random sampling checks after it has spent 15 days in a closed container at a temperature of +30° C; where necessary, provision can also be made for a period of seven days in a closed container at a temperature of +55° C.

Where the 'ultra high temperature' milk treatment process is employed by direct contact of milk and steam, the steam must be obtained from potable water and must not leave deposits of foreign matter in the milk or affect it adversely. Moreover, the use of this process must not cause any change in the water content of the treated milk.

(c) Sterilized milk must:

- have been heated and sterilized in hermetically sealed wrappings or containers, the seal of which must remain intact,
- in the event of random sampling, be of preservability such that no deterioration can be observed after it has spent 15 days in a closed container at a temperature of +30° C; where necessary, provision can also be made for a period of seven days in a closed container at a temperature of +55° C.

(d) Pasteurized milk which has been subjected to high-temperature pasteurization, UHT milk and sterilized milk may be produced from raw milk which has undergone thermization or an initial heat treatment in another establishment. In this case the time-temperature set must be lower than or equivalent to pasteurization and the milk must show a positive reaction to the peroxidase test before the second treatment. Recourse to this practice must be brought to the attention of the competent authority. Mention of the first treatment must be made on the document provided for in Article 5 (8) of this Directive.

(e) Heating processes, the temperatures and duration of heating in respect of pasteurized, UHT and sterilized milk, the types of heating equipment, the flow-diversion valve and the types of temperature controlling and recording devices shall be approved or authorized by the competent authority of the Member States in accordance with Community or international standards.

(f) The data produced by recording thermometers must be dated and kept for two years so that they can be shown upon request to the officials appointed by the competent authority to inspect the establishment, save in the case of microbiologically perishable products, for which this period may be reduced to two months after the use-by or minimum durability date.

5. Heat-treated drinking milk must:
- (a) meet the microbiological standards laid down in Chapter II;
 - (b) not contain pharmacologically active substances in quantities higher than the limits laid down in Annexes I and III to Regulation (EEC) No 2377/90; the combined total of residues of all antibiotic residues may not exceed a value to be fixed in accordance with the procedure laid down in Regulation (EEC) No 2377/90.

Australia

Food sold in Australia must either:

- comply with the *Australian Food Standards Code* or the joint *Australia New Zealand Food Standards Code*, or
- be produced in New Zealand or imported into New Zealand and meet New Zealand's legal requirements. This applies under the provisions of the *Trans-Tasman Mutual Recognition Act 1997* (TTMRA).

The heat treatment provisions of the *Australian Food Standards Code* and the joint *Australia New Zealand Food Standards Code* do not apply in New Zealand. Therefore foods sold in New Zealand must comply with the heat treatment provisions of the *New Zealand Food Regulations 1984*. (See New Zealand requirements for milk and milk products).

The heat treatment requirements under the joint code, that apply in Australia, are:

1 Processing of milk and liquid milk products

(1) Milk must be pasteurised by -

- (a) heating to a temperature of no less than 72° C and retaining at such temperature for no less than 15 seconds and immediately shock cooling to a temperature of 4.5° C; or
- (b) heating using any other time and temperature combination of equal or greater lethal effect on bacteria; unless an applicable law of a State or Territory otherwise expressly provides.

(2) Liquid milk products must be heated using a combination of time and temperature of equal or greater lethal effect on the bacteria in liquid milk that would be achieved by pasteurisation or otherwise produced and processed in accordance with any applicable law of a State or Territory.

Editorial note:

For the purposes of clause 1 of this Standard, milk and liquid milk products includes milk and liquid milk products used in the production of any cream and cream products, fermented milks, yoghurt, dried, condensed and evaporated milks, butter and ice cream.

Editorial note for New Zealand:

For New Zealand purposes, processing requirements for milk and milk products are regulated under the *Dairy Industry Act 1952* and the *Food Act 1981*.

2 Processing of cheese and cheese products

Milk and milk products used to manufacture cheese or cheese products must -

- (a) be heat treated by being held at a temperature of no less than 72° C for a period of no less than 15 seconds, or by using a time and temperature combination providing an equivalent level of bacteria reduction; or
- (b) be heat treated by being held at a temperature of no less than 62° C, for a period of no less than 15 seconds, and the final product stored at a temperature of no less than 2° C for a period of 90 days from the date of manufacture of the cheese or cheese product.

Editorial note:

Processing requirements for milk and milk products used in the production of raw Swiss cheeses are contained in Standard 2.5.4.

Editorial note for New Zealand:

For New Zealand purposes, processing requirements for cheese and cheese products, other than raw Swiss cheese, are regulated under the *Dairy Industry Act 1952* and the *Food Act 1981*.