

High temperature-short time pasteurisation of milk

High temperature-short time (HTST) pasteurisation is a continuous flow process that heats the milk to a minimum temperature, holds it for the required time, followed by immediate cooling of the milk. The information in this note provides time and temperature parameters for milk heating treatment that will ensure effective pasteurisation.

The information is relevant to milk with a fat content of less than 10%, with no added sweeteners (e.g. sucrose or flavoured sugar syrups) or particles (e.g. fruit). Time and temperature combinations to pasteurise products containing high fat, sugar or solids products will need to be validated separately to ensure effective time and temperature combinations for heating are achieved. References are available to assist in calculating equivalent heating treatments.¹

The regulated minimum heat process for the holding time and temperature combination of milk pasteurisation in Australia is 72°C for 15 seconds as defined in Standard 4.2.4, clause 15 of the Australia New Zealand Food Standards Code.²

The Food Standards Code also provides allowance for:

- heating using any other time and temperature combination which has equal or greater lethal effect on any pathogenic microorganisms
- any other process that provides an equivalent or greater lethal effect on any pathogenic microorganisms.

The milk is to be immediately cooled after pasteurisation to ensure that the growth of microbial hazards is prevented or reduced. The *Code of Practice for Dairy Food Safety* requires that unless the milk is to be immediately further processed, the milk is to be cooled to a temperature of 5°C or below, or another temperature for which it can be demonstrated will not adversely affect the microbiological safety of the product.³

Milk can be HTST processed at temperatures higher than 72°C. To determine the minimum acceptable pasteurisation temperature for holding times of less than 15 seconds, the following equation can be used.^{1,4}

$$T = \frac{14885}{(\log_{10}t + 41.97)} - 273.1$$

Where: T = minimum temperature in °C

t = minimum holding time in seconds.

This equation only applies to temperatures above 72°C.

Using this equation, alternative minimum holding times and minimum temperatures for a HTST process are listed in Table 1.

Table 1 – Alternative minimum HTST treatments

Min. holding time (Seconds)	Min. temperature (°C)
1	81.6
2	79.0
3	77.6
4	76.5
5	75.7
6	75.1
7	74.6
8	74.1
9	73.7
10	73.3
11	73.0
12	72.7
13	72.4
14	72.1
15	72.0

Further details on how milk can be effectively pasteurised using HTST systems is described in *Guidelines for Food Safety – Validation and Verification of Heat Treatment Equipment and Processes*.⁵

Key points to consider

- HTST pasteurisation is a continuous flow process that heats the milk to a minimum temperature, holds it for the required time, followed by immediate cooling of the milk.
- The regulated minimum heat process for the holding time and temperature combination of milk pasteurisation in Australia is 72°C for 15 seconds.
- The Food Standards Code also allows for heating using any other time and temperature combination or process which has equal or greater lethal effect on any pathogenic bacteria.

References

1. New Zealand Ministry for Primary Industries, *Operational Guideline: Dairy Heat Treatments*, NZFSA, Wellington, 2003.
<http://www.foodsafety.govt.nz/elibrary/industry/Operational_Guideline-Provides_Product.pdf>
2. Food Standards Australia New Zealand, *Australia New Zealand Food Standards Code: Standard 4.2.4 clause 15 – Processing of milk and dairy products*, Commonwealth of Australia, Canberra, 2012.
<<http://www.foodstandards.gov.au/foodstandards/foodstandardscode.cfm>>
3. Dairy Food Safety Victoria. *Code of Practice for Dairy Food Safety, Section 5.2.3.2: Storage and Temperature Control*, DFSV, Melbourne, 2002.
<http://www.dairysafe.vic.gov.au/pdf/DFSV_CodeOfPractice2002.pdf>
4. HG Kessler, 'Considerations in relation to some technological and engineering aspects', *International Dairy Federation Bulletin*, no. 200, 1986.
5. Australian New Zealand Dairy Authorities' Committee, *Guidelines for Food Safety: Validation and Verification of Heat Treatment Equipment and Processes, Appendix B. Heat treatment equivalence to pasteurisation for common types of dairy produce*, ANZDAC, Melbourne 2007.
<http://www.dairysafe.vic.gov.au/component/docman/doc_download/82-anzdac-heat-treatment-equipment->>

Further information

Further food safety technical information is available at www.dairysafe.vic.gov.au

Or contact Dairy Food Safety Victoria on (03) 9810 5900 or info@dairysafe.vic.gov.au

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