



## **HACCP FOR TABLE BUTTER**

*This bulletin includes technical information, latest development on products, systems, techniques etc. reported in journals, companies' leaflets, books and based on studies and experience. The technical information would be on different areas of plant operation in different issues. It is hoped that the information contained herein, if employed in the factory, will help in making dairy plant operations more efficient.*

*Your contributions and suggestions will make the bulletin more useful and are welcomed.*

*The theme of information in this issue is HACCP for Table Butter. It may be understood that the information given here is by no means complete.*

### **In This Issue**

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## 1. INTRODUCTION

Table butter is one of those milk products which are common on the dining table of the Indian consumer. More than 25 dairy plants in cooperative sector alone produced approximately 30,000 tonnes of table butter during 1997-98.

Butter making is comparatively a simple process, and batch butter churns are still very commonly used. Butter has comparatively long shelf life if made from good quality cream under excellent sanitary conditions and stored at low temperatures. However, post-pasteurization environmental contamination of cream or butter presents the greatest risk to butter contamination and spoilage. There have been incidences of food poisoning associated with butter consumption.

The pathogenic microorganisms that have been shown able to grow in butter are *Listeria monocytogenes*, *Staphylococcus aureus*, *Salmonel-*

*la* spp. *Streptococcus* spp., *Mycobacterium* spp., and *Yersinia enterocolitica*. Microbiological spoilage of butter is caused by *Pseudomonas* spp., moulds and yeasts.

Thus, the quality of butter depends on the microflora present in cream from which it is made, water used to wash it, salt used, sanitary conditions of process equipment, manufacturing environment, process hurdles that limit microbial growth and survival, and conditions under which the product is stored.

Most important intrinsic and extrinsic factors to control the microflora of butter are

- (a) fine and uniform dispersion of the moisture phase,
- (b) addition and uniform dispersion of salt,
- (c) low temperature,
- (d) high quality cream, its pasteurization,
- (e) wash water of high microbial quality,

- (f) effective sanitation of equipment, and
- (g) effective control of microflora in processing and packaging environment.

A hazard analysis critical control point (HACCP) plan will address these issues effectively. Principles of HACCP and HACCP plans for pasteurized milk and skimmed milk powder were presented in 11th (November-December 1997), 12th (January-February 1998) and 17th (November-December, 1998) issues of the 'Technews'. A HACCP plan for butter is presented in this issue in items 2 to 5. The detailed and elaborate process required to arrive at the results is not detailed here, only the results are presented.

## 2. TERMS OF REFERENCE

The application of HACCP to table butter considers biological, chemical and physical

hazards throughout the entire process and till the product distribution. All the hazards throughout the entire process till the distribution have been controlled.

The product is considered to be safe to consume up till the 'use by' date taking into account the storage temperature.

The packaged table butter needs to be stored at or below  $-20^{\circ}\text{C}$  as the product is perishable and could potentially be rendered unsafe by improper handling/storage. The product should remain under refrigeration, i.e., at or below  $-20^{\circ}\text{C}$  till it reaches the consumer.

The HACCP plan presented here includes steps from cream to product storage only. The HACCP plan for the earlier process steps, i.e., from milk reception to cream separation is detailed in Technews issue 12 on 'HACCP for Pasteurized Milk', and hence is not repeated here.

### 3. DESCRIPTION OF THE PRODUCT

Table 1 describes the product.

**Table 1**  
**Description of pasteurized table butter**

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product description : Pasteurized Table Butter</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Facility</b>                                       | The dairy factory produces a variety of dairy products including pasteurized packaged table butter for sale to consumer.                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>The Product</b>                                    | <p>The product is pasteurized table butter packaged in 100 gm, dry vegetable parchment paper (treated 24 hr with 0.5% sorbic acid) cartons. The main component of the product is the cream which is pasteurized. However, it contains unpasteurized components like food colour and salt. The packaged product is kept under refrigeration at -20°C till it reaches the consumer. Consumer can keep it for about 3 months at -6°C.</p> <p>All packages are marked with batch number and date of manufacture.</p> |
| <b>Manufacture</b>                                    | The product is standardized to minimum 80% fat, maximum 16% moisture and 2 to 2.5% salt. Pasteurized cream is aged, churned in a stainless steel batch churn at about 9°C.                                                                                                                                                                                                                                                                                                                                       |
| <b>Intended use</b>                                   | The product is fit for consumption by normal, healthy consumer, upto 'use by' date.                                                                                                                                                                                                                                                                                                                                                                                                                              |

#### 4. FLOW DIAGRAM FOR MANUFACTURE OF TABLE BUTTER

Fig 1 presents the simplified flow diagram for the manufacture of table butter.

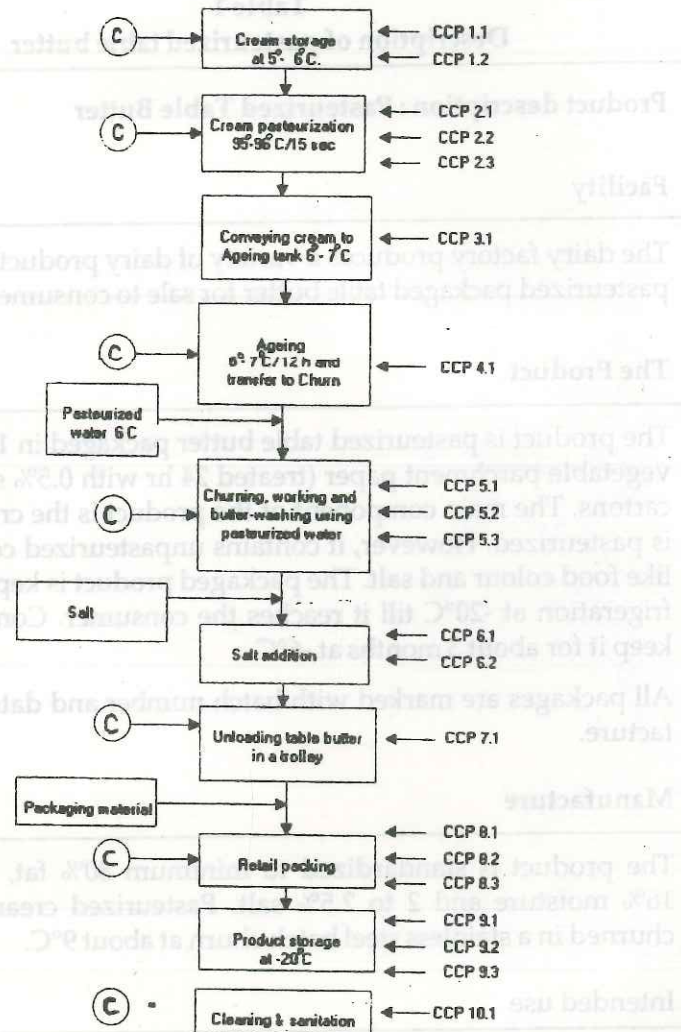


Fig. 1 Flow diagram for manufacturing table butter

## 5. HACCP CHART FOR TABLE BUTTER

The HACCP chart for table butter is given in Table 2.

Table 2 HACCP Chart for table butter

| Process Step | Potential Hazard     | Preventive Measure                                                                                                                                      | CCP No.    | Critical Control Point                                               | Critical Limits                                                                         | Monitoring Procedure & Frequency         | Responsibility        | Corrective Action                     | Verification                                      | Record                  |
|--------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------|-----------------------|---------------------------------------|---------------------------------------------------|-------------------------|
| 1            | 2                    | 3                                                                                                                                                       | 4          | 5                                                                    | 6                                                                                       | 7                                        | 8                     | 9                                     | 10                                                | 11                      |
| 1            | Cream storage        | Microbial contamination in cream storage tank.<br>Chemical residues<br>Growth of pathogens due to temperature abuse                                     | 1.1<br>1.2 | Cleaning and sanitation<br>Cream temperature                         | Refer to cleaning and sanitation procedures.<br>Store at 5-6°C, not more than 24 hours. | Log-sheet<br>Butter-churn operator       | Butter-churn operator | Re-clean & sanitize as necessary      | CIP Register, Microbial testing, Section Incharge | Cleaning-In-place (CIP) |
| 2            | Cream pasteurization | Survival of pathogenic organisms, cross bacterial contamination.<br>Operation according to conformed sterilizing, start, processing and stop procedure. | 2.1        | Pasteurization time-temperature combination and cooling temperature. | 95°C + 1°C for 15 seconds & cooling temp. 6°C.                                          | -Thermograph and log sheet<br>-Flow rate | Pasteurizer operator  | Re-pasteurize the cream, if required. | Phosphates test and log-sheet                     | Logsheet                |

| Process Step | Potential Hazard       | Preventive Measure                                                                                         | CCP No. | Critical Control Point     | Critical Limits                                                                   | Monitoring Procedure & Frequency                                         | Responsibility         | Corrective Action                        | Verification                                                                                   | Record               |
|--------------|------------------------|------------------------------------------------------------------------------------------------------------|---------|----------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------|------------------------------------------|------------------------------------------------------------------------------------------------|----------------------|
| 1            | 2                      | 3                                                                                                          | 4       | 5                          | 6                                                                                 | 7                                                                        | 8                      | 9                                        | 10                                                                                             | 11                   |
|              | Lipase enzyme activity | Ensure automatic safety system to maintain desired temp. range of the hot water and in turn temp. of milk. | 2.2     | Flow-Diversion Valve (FDV) | FDV to operate to divert the milk back to balance tank at temperature below 95°C. | Check diversion valve operation before starting the pasteurizer          |                        | Re-set the FDV for diversion below 95°C. | Section In-charge to ensure correct FDV operation at start of each run is monitored every day. | Logsheets            |
|              |                        | Ensure periodic inspection of the plate for cleaning and to observe holes of the plates, if any.           |         |                            |                                                                                   | Check accuracy of temp. gauges before starting.                          |                        |                                          | Periodic specialist examination and maintenance of plant manufacturers/ experts                |                      |
|              |                        | Ensure use of fat resistant gaskets.                                                                       |         |                            |                                                                                   | Check condition of equipment (worn gaskets, etc.) regular once in a year | Pasteurizer operator   |                                          | Calibration/ validation records.                                                               |                      |
|              |                        | CIP after every 8 hours of running                                                                         |         |                            |                                                                                   | Ensure adequately trained operators available at all times               |                        |                                          | Stamping of the pasteurizer with the date of inspection                                        |                      |
|              |                        |                                                                                                            |         |                            |                                                                                   | Temp. after holding tube & cooling.                                      |                        |                                          | Examination of thermograph records                                                             |                      |
|              |                        | Periodic calibration of all the instruments.                                                               | 2.3     | Instrument calibration     | Temp. device accuracy of +0.5°C                                                   | Calibrating the instruments every 3 months.                              | Maintenance technician | Arrange for calibration immediately.     | Calibration record.                                                                            | Calibration records. |

| Process Step | Potential Hazard                                     | Preventive Measure                                                                          | CCP No. | Critical Control Point                            | Critical Limits                                                                   | Monitoring Procedure & Frequency                             | Responsibility        | Corrective Action                                                                   | Verification                                                             | Record            |
|--------------|------------------------------------------------------|---------------------------------------------------------------------------------------------|---------|---------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------|
| 1            | 2                                                    | 3                                                                                           | 4       | 5                                                 | 6                                                                                 | 7                                                            | 8                     | 9                                                                                   | 10                                                                       | 11                |
| 3            | Conveying cream to aging tank                        | Post-pasteurization contamination                                                           | 3.1     | Cleaning and sanitation                           | Refer to cleaning and sanitation procedures.                                      | Log-sheet                                                    | Butter-churn operator | Re-clean & sanitize as necessary                                                    | Cleaning & sanitation register. Physical inspection by Section In-charge | CIP register      |
| 4            | Ageing and transfer                                  | Microbial growth                                                                            | 4.1     | Cleaning & sanitation of transfer pump, and tank. | Refer to approved cleaning and sanitation procedures.                             | Cleaning records, operator daily.                            | Butter-churn operator | Re-clean & sanitize as necessary                                                    | Log-sheet- sheet and SPC test result records                             | Cleaning records. |
|              | Contamination from transfer pump.                    | Ensure transfer pump (+ve displacement) in cleaned & sanitized, especially its back plates. | 4.2     | Cream temperature and ageing period               | Inspection of thermograph by operator during and at the end of the ageing period. | Butter-churn operator Sec-tion In-charge                     | Butter-churn operator | Adjust the cream temp. by adjusting chilled water temp and/or flow rate as desired. | Thermograph inspection by Section Incharge                               | Log-sheet         |
|              | Ensure required time-temp, combination applied.      | Fit holding tank with thermograph.                                                          |         |                                                   | 6-7°C for maximum 12 hours.                                                       | Temperature gauge on the tank and log-sheet, time of ageing. | Butter-churn operator |                                                                                     | Temperature measure-ment records                                         | Log-sheet         |
|              | Personnel responsible to be trained and experienced. |                                                                                             |         |                                                   |                                                                                   |                                                              |                       |                                                                                     |                                                                          |                   |

| Process Step | Potential Hazard                                                    | Preventive Measure                                                              | CCP No. | Critical Control Point                    | Critical Limits                                           | Monitoring Procedure & Frequency                                                      | Responsibility        | Corrective Action                     | Verification                                                                  | Record                                     |
|--------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------|---------|-------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------|---------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------|
| 1            | 2                                                                   | 3                                                                               | 4       | 5                                         | 6                                                         | 7                                                                                     | 8                     | 9                                     | 10                                                                            | 11                                         |
| 5            | Churning, Microbial working & contamination in butter churn washing | Cleaning & sanitation according to conformed procedures.                        | 5.1     | Cleaning and sanitation procedures.       | Refer to cleaning and sanitation procedures.              | Log-sheet and periodic swab test.                                                     | Butter-churn operator | Re-clean & sanitize as necessary      | Log-sheet and periodic swab test by section in-charge, daily                  | Log-sheet                                  |
|              | Chemical residues                                                   |                                                                                 |         |                                           |                                                           |                                                                                       |                       |                                       |                                                                               |                                            |
|              | Microbiologic al contamination through wash-water                   | Cleaning & sanitation of the wash water tank according to conformed procedures. | 5.2     | Time-temp. combination for pasteurization | Refer to cleaning and sanitation procedures               | Log-sheet and periodic swab test.                                                     | Butter-churn operator | Re-clean & sanitize as necessary      | Log-sheet inspection daily by section in-charge                               | Logsheets, QA records, Calibration records |
|              |                                                                     | Use of pasteurized water                                                        | 5.3     | Wash water storage temperature            | Pasteurization of wash water at 75°C+1°C for min. 15 sec. | Thermograph indicating past temperatures.                                             | Pasteurizer operator  | Repasteurize the water, if necessary. | Calibration of automatic moisture control equipment.                          |                                            |
|              |                                                                     | Butter must be correctly textured and homogenous with no free moisture          |         |                                           | Water storage at 5-6°C.                                   | Temperature gauge on the wash water tank and log-sheet.                               | Pasteurifier operator | Re-chill, if necessary                | Microbiologic al analysis of water used for washing.                          |                                            |
|              |                                                                     |                                                                                 |         |                                           |                                                           | Ensure churn correctly filled, drained at correct time and worked for correct period. |                       |                                       | Examination of plant records daily and records on the above at least monthly. |                                            |

| Process Step | Potential Hazard                       | Preventive Measure                                                                                                                                                                                                                                                                                                                                  | CCP No. | Critical Control Point                | Critical Limits                                           | Monitoring Procedure & Frequency                                                                                                                                    | Responsibility          | Corrective Action                               | Verification                                                                                          | Record              |
|--------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------|
| 1            | 2                                      | 3                                                                                                                                                                                                                                                                                                                                                   | 4       | 5                                     | 6                                                         | 7                                                                                                                                                                   | 8                       | 9                                               | 10                                                                                                    | 11                  |
| 6            | Salt addition                          | Foreign material<br>Chemical residues<br>Suppliers' assurance<br>Proper storage<br>Use of finely ground salt.<br>Ensure butter of correct NaCl concentration and NaCl distributed evenly throughout butter.<br>Prevent microbiological contamination of butter from growth in butter-milk or from NaCl.<br>Ensure NaCl of suitable chemical purity. | 6.1     | Salt specifications                   | Salt conforming to specifications                         | Certifying every batch of salt for conforming to specifications and labeling the batch accordingly for its use.<br>Storage records and condition, at least monthly. | Quality Control Officer | Reject sub-standard material/batch of the salt. | Lab. results of salt and proper labeling of the batch indicating its use, by production manager, etc. | Lab-records of salt |
| 7            | Unloading of trolley-butter in trolley | Microbial contamination of the trolley according to conformed procedures<br>Chemical residues                                                                                                                                                                                                                                                       | 7.1     | Cleaning & sanitation of the trolley. | Cleaning and sanitation according to conformed procedures | Log-sheet and swab test                                                                                                                                             | Butter-churn operator   | Re-clean & sanitize as necessary                | Swab test by QA Officer, weekly.                                                                      | Log-sheet           |

| Process Step | Potential Hazard | Preventive Measure                                                                                                                                                                                                                                                                                                                                                          | CCP No.           | Critical Control Point                                                                                                                                              | Critical Limits                                                                                                                                                                                                                                       | Monitoring Procedure & Frequency                                                                                                                                                                                                                                                                                                                                                                                                                  | Responsibility                                                 | Corrective Action                                                                                                                                                                                                                    | Verification                                                                                                                                                                                                                                      | Record                                                                                                       |
|--------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| 1            | 2                | 3                                                                                                                                                                                                                                                                                                                                                                           | 4                 | 5                                                                                                                                                                   | 6                                                                                                                                                                                                                                                     | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8                                                              | 9                                                                                                                                                                                                                                    | 10                                                                                                                                                                                                                                                | 11                                                                                                           |
| 8            | Retail packing   | Suppliers' assurance<br>Ensure packaging used provides adequate protection and is not itself a source of taints or contamination.<br>Ensure packaging material is stored in storage maintained clean.<br>Ensure good environmental sanitation (clean air, no standing or stagnant water or trapped wet residues; dry) in packaging room, personnel hygiene, low temp., GMPs | 8.1<br>8.2<br>8.3 | Packaging material's specifications<br>Room Temp. & RH<br>Proper storage of the material<br>Room sanitation & personnel hygiene<br>Room air microbiologically free. | Packing material conforming to specifications<br>Storage of the material on the pellets with proper labeling regarding its use, in well maintained store.<br>Room temp. of <15°C and RH <60%.<br>Clean, dry room.<br>Room air microbiologically free. | Certifying every batch of packing material for conformance to specifications and labeling the batch, by the QA officer. Inspection of store records daily. Inspection of packing room continuously. Monitor butter handling equipment for correct operation. Thermograph and humidity-graph, records continuously. Ensure packaging material is obtained from reputed supplier (QA certified).<br>Packaging room air swab everyday by QA officer. | Quality Control Officer<br>Operator<br>Butter section incharge | Reject packaging materials not meeting specifications<br>Ensure proper storage of the packaging material.<br>Ensure correct packaging room temperature & RH before operation<br>Ensure clean, dry packaging room & personnel hygiene | Lab. results of packaging materials, labeling of the batch for its use.<br>In-use assessment of performance of packaging daily.<br>Examination of all records of plant (daily).<br>Packaging room air swab by Production Manager weekly, records. | Lab-records of packaging materials, Store records<br>Packing machine log sheets & other records, GMP records |

| Process Step       | Potential Hazard                                                                                       | Preventive Measure                                                                                                                                                                                                                                                                                                  | CCP No.           | Critical Control Point                                                                                | Critical Limits                                                                                                                                                                                                                                                                                                                                                           | Monitoring Procedure & Frequency                                                                                                                                                                                                                                                                                                  | Responsibility                                                                                                                                                   | Corrective Action | Verification | Record |
|--------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------|--------|
| 1                  | 2                                                                                                      | 3                                                                                                                                                                                                                                                                                                                   | 4                 | 5                                                                                                     | 6                                                                                                                                                                                                                                                                                                                                                                         | 7                                                                                                                                                                                                                                                                                                                                 | 8                                                                                                                                                                | 9                 | 10           | 11     |
| 9. Product storage | Off-flavour absorption by table-butter<br>Yeast and mold development<br>Psychrotrophic microbes growth | Proper cleaning of cold store<br>Proper periodic fumigation of butter cold store<br>Storage at low temp.<br>Ensure storage temp. correct throughout storage<br>Protect butter from any form of contamination during storage<br>Avoid excessive shear forces during handling<br>Store butter away from smelling food | 9.1<br>9.2<br>9.3 | Cleaning of cold-store<br>Fumigation of cold-store once in six months<br>Storage temp. of -20°C ± 1°C | Cleaning of cold store once in six months<br>Fumigation of cold store once in six months<br>Product temp. and cold store temp. using thermograph on a continuous basis, by operator.<br>Ensure butter is stored away from smelling food, butter section in-charge.<br>Butter in-charge/ operator to ensure butter packaging machine/handling equipment operate correctly. | Operator/butter section incharge<br>Have cold store cleaned and fumigated before use.<br>Have refrigeration system corrected, ensure correct temp. of cold store before use.<br>Inspection of cold store for stacking, cleanliness, etc. by manager weekly/monthly.<br>Quality assessment of end product by QA manager regularly. | Examination of thermograph & all records, by section in-charge/manager daily/weekly.<br>Store records, thermograph records, store cleaning & fumigation records. |                   |              |        |

| Process Step                                                                            | Potential Hazard                           | Preventive Measure            | CCP No. | Critical Control Point | Critical Limits                            | Monitoring Procedure & Frequency                                                    | Responsibility     | Corrective Action    | Verification                                                                            | Record           |
|-----------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------|---------|------------------------|--------------------------------------------|-------------------------------------------------------------------------------------|--------------------|----------------------|-----------------------------------------------------------------------------------------|------------------|
| 1                                                                                       | 2                                          | 3                             | 4       | 5                      | 6                                          | 7                                                                                   | 8                  | 9                    | 10                                                                                      | 11               |
| 10 All processes/ steps involving product in contact with production equipment cleaning | Microbial/ toxin contamination on cleaning | Effective cleaning procedures | 10.1    | Cleaning parameters    | Approved cleaning procedures, no residues. | Visual inspection, temp., solution concentration, time, frequency etc. as approved. | Operator in-charge | Reclean as necessary | Examination of cleaning and plant operation records by QA Manager and section-in-charge | Cleaning records |