

ANNEXES

ANNEX 1

APPARATUS, SPECIAL CHEMICALS, AND GLASSWARE FOR LABORATORY CONTROL

The amount and type of apparatus necessary to ensure adequate laboratory control will depend on a number of factors. They will depend not only on the organization of the pasteurizing dairy itself and the character and number of the sources of supply of the incoming raw milk, but also on the type of control required and the official regulations in force in the particular country at a given time. For example, the type and number of tests to provide adequate control at a unit receiving its raw milk in bulk from distant sources will be very different from those at a unit receiving raw milk direct from producers within a limited radius. Intensity of testing may vary with the season of the year and the number of producers in difficulty or requiring advisory help.

In any case, provision must be made for regular tests on the milk in its raw state, at various stages of processing within the pasteurizing dairy, and during its distribution to the consumer, and for regular checks on the efficiency of plant cleaning and sterilization.

On these assumptions, the list of apparatus, special chemicals, and glassware for a pasteurizing dairy handling 15,000-30,000 litres (3,300-6,600 gallons) a day with about 150 different suppliers should be on the following lines, bearing always in mind the need to consider the specific requirements of each individual laboratory in relation to the peculiar local or national conditions which prevail. For example, in some countries or districts an intake of 15,000 litres (3,300 gallons) a day will entail far more than, and in other countries or districts far fewer than, 150 producers.

In the lists given below, consumable or expendable apparatus and chemicals are shown in quantity sufficient for not less than three months' supply for a pasteurizing dairy with an intake of 15,000-30,000 litres (3,300-6,600 gallons) per day. A short experience in any particular control laboratory will easily determine how frequently new supplies of individual items need to be ordered.

1. Apparatus for Preparation and Sterilization of Media and Glassware

- 1 Autoclave, 33-cm diameter
- 1 Hot-air sterilizer, 45 cm × 38 cm × 38 cm
- 1 Steam sterilizer, 50 cm × 40 cm × 40 cm
- 1 Incubator, 50 cm × 50 cm × 60 cm
- 1 Incubator, 38 cm × 38 cm × 45 cm
- 1 Still with glass or stainless-steel condenser
- 1 Automatic media filler
- 1 Vacuum pump
- 1 Balance—pan-scales capacity 200 g
- 3 Filter funnels (Buchner), 15-cm diameter
- 12 Filter funnels, 15-cm diameter
- 6 Filter flasks with tubulature, 2,000-ml capacity
- 6 Erlenmeyer flasks, 2,000-ml capacity

2. Chemicals for Media Preparation (a few months' supply)*Either*

5 kg	Peptone
3 kg	Sodium taurocholate (Bile salts)
3 kg	Lactose
1 kg	Sodium chloride
3 kg	Agar-agar
500 g	Yeast extract
10 g	Bromocresol purple
1	Phenol-red disc
500 ml	Phenol-red indicator

Or

5 kg	Complete dehydrated yeastrel milk agar
5 kg	Complete dehydrated MacConkey bile-salt broth

3. Equipment for Bacteria Counts*Using either**The conventional Petri-dish technique*

200	Petri dishes, 10-cm diameter
12	Copper Petri-dish-sterilizing cases
6	Copper pipette-sterilizing cases
2,000	Bacteriological test-tubes, 152/16 mm
2,000	Special bacteriological seals to fit test-tubes
100	1-ml bacteriological pipettes
5 kg	Cotton wool
2	Hand tally-counters
1	Colony-counting chamber—Hannay, Mattick & Hiscox, or Quebec type
1	Hand lens, 10 cm × 2½

*Or**The mechanized roll-tube technique*

1	Roll-tube spinner and accessories
500	Roll-tube bottles
1,000	Bacteriological test-tubes, 152/16 mm
1,500	Special bacteriological seals to fit test-tubes and roll-tube bottles
5 kg	Cotton wool
100	1-ml pipettes graduated at 0.5 and 1.0 ml
6	Copper pipette-sterilizing cases
2	Hand tally-counters

4. Equipment for Coliform Tests

2,000	Bacteriological test-tubes, 152/16 mm
1,000	Special bacteriological seals to fit test-tubes
2,000	Durham fermentation-tubes, 35/8 mm

5. Equipment for Methylene-Blue and Resazurin Tests

1	Controlled-temperature water-bath, 100-tube size
1	Controlled-temperature water-bath, 24-tube size
2,000	Bacteriological test-tubes, 152/16 mm with graduation mark at 10 ml
1,000	Rubber stoppers or special bacteriological seals to fit
100	1-ml bacteriological pipettes
2	Pipette-sterilizing cases
20	Methylene-blue tablets (1 tablet = 800 ml of solution)
3	800-ml graduated stoppered flasks
1	Comparator complete with stand and disc for resazurin test
500	Resazurin tablets (1 tablet = 50 ml of solution)
12	152/25 mm stoppered test-tubes with graduation mark at 50 ml

6. Equipment for Rinse and Swab Sterility Tests

500	Ringer-solution tablets (1 tablet = 500 ml of solution)
100	Stainless-steel swab wires
12	Rolls of unmedicated gauze
300	Bacteriological test-tubes, 250/25 mm
500 g	Sodium thiosulfate

7. Equipment and Chemicals for Kay & Graham Phosphatase Test

1	Incubator, to be kept at 37°C. (Either of those shown in section 1, or either of the controlled-temperature water-baths shown in section 5, may be used)
100	1-ml pipettes graduated at 0.5 and 1.0 ml
500	Bacteriological test-tubes, 152/16 mm with graduation mark at 10 ml
1	All-purpose Lovibond comparator complete with 25-mm glass cells and 9-standard phosphatase disc (or equivalent apparatus)
24	Pipettes graduated at 0, 4.5, and 9 ml
24	10-ml pipettes graduated at 2 ml
48	Filter funnels, 5-cm diameter
2,000	Circles of Whatman filter-paper No. 40; 9 cm
3,000 ml	Folin & Ciocalteu's phenol reagent
25 g	Disodium phenylphosphate
100 g	Sodium veronal (sodium diethyl barbiturate)
100 g	Chloroform (analytical reagent)
500 g	Sodium-hexametaphosphate flakes
500 g	Sodium carbonate, anhydrous (analytical reagent)

8. Microscope and Accessories

1	Microscope with built-in mechanical stage; rack-and-pinion focusing and centring substage; eyepieces $\times 6$ and $\times 10$; $\frac{1}{8}$ -inch objective and $\frac{1}{12}$ -inch oil-immersion N.A. 1.30 objective; Abbe condenser with iris diaphragm; double nose-piece
1	Microscope lamp
1,000	Microscope slides, 76 mm \times 25 mm
100	Microscope cover-slips, 16 mm \times 16 mm
500 ml	Newman's stain
500 ml	Methylene-blue stain
100 g	Cedarwood oil

9. Acidity and Detergent Titrations

- 6 Burettes with glass stopcocks, 25 × 0.1 ml
 - 30 Porcelain basins, 10 cm
 - 6 Stirring-rods
 - 30 Erlenmeyer flasks, 100-ml capacity
 - 30 Bulb pipettes, 10-ml capacity
- Supply of phenolphthalein and methyl-orange indicators ; standard sodium hydroxide and hydrochloric acid

10. Balance and Weights

- 1 Analytical balance—100 g, sensitivity 0.1 mg
- 1 Set of stainless-steel analytical weights ; Class A N.P.L.^h (or equivalent) 100 g to 10 mg

11. Miscellaneous Glassware, etc.

- 1 Cork-borer (set of 12)
- 10 Bunsen burners
- 1 Batswing burner
- 3 Retort stands with fittings
- 6 Tripods
- 10 Wire gauzes with asbestos centre
- 30 Erlenmeyer flasks—assorted sizes
- 30 Flat-bottomed boiling flasks—assorted sizes
- 30 Beakers—assorted sizes
- 6 Stoppered, 500-ml, graduated flasks
- 3 kg Assorted glass-tubing
- 6 Measuring cylinders, 100 × 1 ml
- 6 Measuring cylinders, 500 × 5 ml
- 30 Write-on-glass pencils
- 10 Mohr clips
- 20 Pipettes, 1 × 0.01 ml
- 20 Pipettes, 10 × 0.1 ml
- 10 Thermometers, 0°-110°C
- 2 Thermometers, 0°-110°C graduated at 0.2°, with N.P.L. (or equivalent) certificate
- 5 Thermometers, 0°-220°C
- 10 Incubator thermometers, 0°-60°C
- 2 Thermometers for checking temperature of pasteurization, *either* 60°-80°C graduated at 0.1°C *or* 140°-170°F graduated at 0.2°F, 4-inch (10-cm) immersion, in metal carrying-case, with N.P.L. (or equivalent) certificate
- 20 Metres of rubber tubing
- 5 Metres of surgical rubber tubing
- 5 Metres of pressure tubing
- 20 Wire baskets for test-tubes, 15 cm × 15 cm × 15 cm
- 4 Autoclave baskets divided to hold test-tubes
- 4 Autoclave baskets divided to hold roll-tube bottles

^h National Physical Laboratory, Teddington, Middlesex, England

30	Test-tube brushes
1	Automatic timing-clock, 0-60 minutes
100	Rubber stoppers—assorted sizes
5	Triangular files
20	Boxes (each 100 circles) of filter-paper—assorted sizes
5 kg	Filter-paper clippings
2	Desiccators—20-cm diameter
2	Forceps—stainless steel
10	Dropping bottles, T.K. pattern
10 cm	Platinum wire, 0.5-mm diameter
3	Platinum-wire holders
20	Milk-sampling dippers—stainless steel
10	Calcium-chloride tubes with single bulb
30	24-hole test-tube racks for 16-mm test-tubes
10	12-hole test-tube racks for 28-mm test-tubes

ANNEX 2

PASTEURIZATION LEGISLATION

Because of the public-health importance of a safe milk-supply, most countries where pasteurization or other forms of heat-treatment of milk are being carried out have already introduced legislation with the objects of prescribing satisfactory standards for the handling and treatment of such processed milk, and of regulating and controlling the methods used in the milk-processing industry. It is hoped that the information given in the foregoing pages will make it easier for countries which are either contemplating pasteurization legislation or are considering the revision of existing milk laws to frame, or re-frame, their legislation with an adequate technological background.

To draw up a model pasteurization enactment which would be applicable to all such countries would be impossible; even if it were possible, few countries would wish or agree to shape their legislation on a standard templet. There are, nevertheless, general principles, some of them set forth earlier in this monograph, which may be briefly outlined here and which may be found helpful when pasteurization laws are being drafted.

Licensing

Designation of milk. Any milk, to be sold to the public, which has been processed or which has some specific quality (e.g., pasteurized, sterilized, tuberculin-tested) should be given some suitable designation readily understandable by the consumer and acceptable to the licensing authority. No similar private designation likely to be confused with one of the official designations should be allowed.

Only persons licensed by a competent authority should be allowed to process milk for sale or to sell such milk to the public, and both the premises and plant they propose to use should be approved beforehand by that authority.

There should be a statement, either in the legislation itself or in an explanatory pamphlet accompanying it, as to who the licensing authority is and how a licence may be applied for. There should similarly be a statement of requirements both as to premises (e.g., type of construction, lighting, ventilation, water-supply, drainage, cleanliness, absence of pests, etc.) and also as to the personnel (e.g., training or qualifications, periodic medical inspection, etc.) who are to be given responsibility for running pasteurization plants or other plants where milk is handled or processed.

It would also be desirable to stipulate what records are required to be kept by the licensee—records of purchase and sale of milk, and other data that might be needed by the licensing or by the inspecting authority.

Other duties of the holder of a licence (e.g., the granting of permission to any person duly authorized by the licensing authority to inspect his premises and methods) should be stated.

Methods

Pasteurization. The legislation should state clearly what methods of pasteurization are approved, giving times and temperatures of exposure of the milk to heat and the temperature to which the milk should be cooled immediately after pasteurization.

Certain details as to the pasteurization plant itself (e.g., presence of indicating- and recording-thermometers, flow-diversion valves, precautions to prevent atmospheric contamination of the milk) could be stipulated. The laws should provide room for approved new techniques for the heat-treatment of milk. A clause as to methods of cleaning and sterilization of plant might well be inserted.

Distribution of pasteurized milk. The legislation should include a statement as to the type of container, and the method of sealing and labelling of all containers, in which pasteurized milk is to be transported or sold. Precautions (since more than one type of milk is handled in a pasteurizing dairy) to prevent mistakes in identity of milk might be specified. Types of vehicles to be used for transporting pasteurized milk, and methods for keeping them clean, could be defined.

Inspection. Legislation, or regulations accompanying the pasteurization law, should outline the methods which will be used either by the public-health authority or the sanitary authority (*a*) in the inspection of premises where milk is being pasteurized, or stored, or from which it is being sold, and (*b*) in the official control of plant, operation, and product. The methods to be applied in the taking of milk samples, in the transport and identification of such samples, in testing for the efficiency of pasteurization (e.g., in checking holding-time in HTST plant; in carrying out the phosphatase test), and in testing for the keeping quality of the pasteurized milk, would probably have to be outlined. The action to be taken if a sample of pasteurized milk reveals faulty methods should also be indicated.

Suspension and Revocation of Licence, and Other Penalties

A clear statement of the action to be taken by the licensing authority in case of offences against the pasteurization laws would be needed. Suspension of a licence for a period, following a serious offence, or revocation, following persistent offences—with possibly additional financial or other penalties—would doubtless be imposed; but a statement as to right, and conditions, of appeal to some superior authority against the decision of a local licensing authority before the implementation of the decision would doubtless find a place in the pasteurization law.

Miscellaneous

Scheduled areas. In some countries, the pasteurization legislation (or regulations made under some general enactment) would possibly outline arrangements for prescribing or scheduling areas within which only pasteurized milk (or other approved type of heat-treated milk) might be sold to the public.

Code of practice. Somewhat outside the realm of ordinary legislation, it might be found possible, by consultation between the industry, the sanitary professional organization, and perhaps the government authority concerned with milk legislation and control, to devise an agreed code of practice for the milk-distribution industry which, without the force of law behind it, might lead to agreed improvements in practice throughout the pasteurizing (or milk-processing) firms who voluntarily accepted the code. The main objects of the code would be to apply to the industry the best-known methods of improving the efficiency of the plant, the quality of the product, the conditions of labour, and the effectiveness with which the needs of the consumer are met.



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