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# **MILK PASTEURIZATION**

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# MILK PASTEURIZATION

## Planning, Plant, Operation, and Control

**H. D. KAY, C.B.E., Ph.D., D.Sc., F.R.S.**

*Director,  
National Institute for Research in Dairying,  
Shinfield, Berkshire, England*

**J. R. CUTTELL, A.M.I.Mech.E.**

*Engineer, A. P. V. Co., Ltd, London, England*

**H. S. HALL, B.Sc.**

*Head, Dairy Engineering Department,  
National Institute for Research in Dairying,  
Shinfield, Berkshire, England*

**A. T. R. MATTICK, B.Sc., Ph.D.**

*Deputy Director,  
National Institute for Research in Dairying,  
Shinfield, Berkshire, England*

**A. ROWLANDS, B.Sc., M.S.**

*Managing Director,  
Astell Laboratory Service Co., Ltd, London, England*

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## INTRODUCTION

To provide any but the smallest centres of population with liquid milk of satisfactory hygienic and keeping quality, and in adequate quantity, the following elements are required :

(1) a sufficient farm production, as constant as possible throughout the year, of wholesome raw milk of good keeping quality ;

(2) a system, particularly important in the warmer seasons, of farm or depot cooling, combined with an adequate transport system, so that at all seasons of the year sweet milk of good keeping quality can arrive at the pasteurization plants (which should normally be situated in or very close to population centres) with the minimum of delay ;

(3) properly designed and equipped pasteurization plants, housed in suitable buildings and provided with the necessary services, capable of effective processing and automatic packaging of the milk at every season of the year ;

(4) a staff of trained operators under scrupulous and competent management ;

(5) adequate technical and laboratory control of both plant and product ;

(6) a well-planned distribution system ;

(7) constant and knowledgeable supervision from an outside health authority (sanitary, public-health, or special service).

To these may, perhaps, be added (8) the wherewithal among the general population, or the requisite funds in the hands of special organizations, to purchase sufficient pasteurized milk to meet the nutritional requirements of the population or of special groups of it. The minimum quantity per head per day for an average population has been variously set at 0.3-0.5 litre ( $\frac{1}{2}$ -1 pint),<sup>a</sup> but even smaller quantities have been demonstrated to be of importance for the growth and health of children.

The main objects of the present monograph are to bring together, for the use of those persons in ministries of health or agriculture or other government departments concerned with health and nutrition (particularly of children) and of similar individuals elsewhere in countries where milk-pasteurization schemes are being, or likely to be, officially or unofficially

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<sup>a</sup> Throughout the text, approximations only are given for units in parentheses, and the expression "gallon" represents Imperial gallons.—ED.

considered, essential modern information on (3), (4), and (5) above. It is also hoped that the monograph may be not without value for those mentioned in (7) above. If the health aspects of modern pasteurization projects are to be properly safeguarded during the operational phase, it is necessary that due regard be given to the health implications during the planning phase. Space considerations prevent the monograph from being extended so widely as to include a detailed discussion of (1); despite its importance in relation to the processing of milk, only a few paragraphs can be devoted to farm production (see chapter 2, pages 24-29).

While the information given on (3), (4), and (5) is fairly detailed, and is concerned in the main with medium- or large-scale modern processing, it must not be concluded that quite small pasteurization units, dealing with as little as 500 litres (110 gallons) of milk per day, should be excluded from consideration by authorities or organizations who wish to meet the requirements for safe milk of quite small centres of population. Such small pasteurization units can be, and are, effectively used in many parts of the world. The same principles apply to their use as to that of the larger plants, and it is no less necessary for the small plants to be properly designed and equipped, and for those concerned in the operation of the small plants to be properly trained and supervised, than it is for the larger plants.

Milk drying—for example, the conservation of the “summer flush” of milk for use in the winter season when, in so many countries, fresh milk supplies fall off—is not specifically dealt with in these pages. For milk drying to be efficiently carried out, the requirements under (1) to (7) above, with small modifications, apply almost equally. In some countries which have recently undertaken the drying of summer supplies, distribution systems for dried milk raise additional difficulties of reconstitution which do not occur with pasteurized milk; storage of large quantities of dried milk for the six to eight months between drying and consumption is also a specialized problem outside the scope of a monograph dealing with pasteurization.

Nor is the process which results in the so-called “sterilized milk” dealt with in this monograph. Though this process is being used on a limited scale in the heat-treatment of liquid milk in a few countries, it requires very different apparatus and technique from those to be described in the following pages. It would lengthen the monograph unduly to consider in detail a process which, for several reasons, is less well-suited than modern pasteurization to the purpose of supplying safe milk to consumers in the majority of countries engaged in implementing a heat-treatment policy.

It is assumed that most of the readers of this monograph will already have some scientific or technical background, but may have only a very

general acquaintance with up-to-date pasteurization plants, operational methods, and laboratory control. Nevertheless, these individuals may have the duty of taking part in the inception and planning of pasteurization schemes, or in legislation concerned with pasteurization. Their duties may, indeed, include the presentation of modern concepts of pasteurization methods and material requirements both to non-technical colleagues within their organizations or ministries and to others outside those organizations who may be entirely unacquainted with what up-to-date pasteurization of milk for sizeable centres of population really involves. This monograph may be helpful in such cases. It is, of course, not intended to serve as a textbook, nor as a manual for plant operatives, but it may possibly prove useful at an intermediate stage in the training of the plant foreman or under-manager, or the milk-laboratory worker.

“’Tis not in mortals to command success” and no human activity can ever be above the risk of occasional error. Experience has shown, however, that pasteurization is a reliable shield and safeguard for all milk consumers if, to adequate planning at the outset, is added sound modern plant and equipment, skilled and conscientious management, and thorough laboratory control, regularly exercised from the farm to the ultimate consumer.

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