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UNITED STATES PUBLIC HEALTH SERVICE

RUPERT BLUE, SURGEON GENERAL

DRIED MILK POWDER

A REVIEW OF BRITISH EXPERIENCE

REPRINT No. 473
FROM THE
PUBLIC HEALTH REPORTS

JUNE 28, 1918
(Pages 1052-1055)



WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

U. S. D.
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DRIED MILK POWDER.

A REVIEW OF BRITISH EXPERIENCE.¹

The local Government board of Great Britain has recently issued a series of reports under the general classification "Food Reports No. 24" upon the preparation, composition, and nutritive values of dried milk powders, with special reference to their use in infant feeding. It is stated that this article is coming into rather large use in the preparation of certain foodstuffs and in the feeding of infants. In view of these facts and of certain claims which have been made as to the advantages of this product over ordinary cow's milk, especially from the point of view of freedom from bacteria of a dangerous sort, a somewhat extensive inquiry into the entire subject has been deemed advisable.

History, Manufacture, and Uses.

The first branch of this inquiry related to the use of dried milk in infant feeding and was carried out by Dr. F. J. H. Coultts with the assistance of Prof. Delépine. A brief history of dried milk and of its methods of preparation is first given. It is stated that as early as 1868 "desiccated milk" was an article of commerce. Since that time, and especially during the past 20 years, considerable advance has been made in the methods of preparation, the general purpose being to secure a dry residue by evaporation at the lowest possible temperature and in the shortest time. Most of the processes employed use one or another form of revolving heated drum, upon the surface of which a thin milk layer is spread and from which the dried product is scraped. The most recent processes inject a stream of partially condensed milk into a heated chamber in the form of a fine spray, the evaporation taking place in the air and the dry powder falling to the floor. In the factories the conditions of manufacture, as regards general cleanliness, were found to be excellent. The author, however, does not agree with the commonly expressed view of the desirability of small-scale manufacture upon the farm. He found in many such cases that the most elementary precautions as to cleanliness were being neglected. The importance of placing this industry under the supervision and control of public health officials is emphasized. About 5,000,000 pounds of milk powder were imported into England during 1915 of which one-half came

¹ Reprint from the Public Health Reports, vol. 33, No. 26, June 28, 1918, pp. 1052-1055.

from the United States, and the importance of some form of guarantee as to the conditions of manufacture of imported products is also noted.

The market product is of three main varieties, namely, full-cream, half cream, and skimmed. Certain firms, however, make other preparations, including some with additional cream. Certain preparations also contain added cane sugar.

Dried milk is used as a basis of certain proprietary infant foods. It is also employed in admixture with cocoa and sugar, with egg powder and sugar as a custard powder, and in various other combinations. Dried milk is said to be used extensively in many of the industries, particularly in the baking and confectionery trades. Reference is also made to a so-called synthetic dried milk made entirely from vegetable materials. The use of the word milk in this connection is considered rather unfortunate. The ethics of labeling and advertisement are discussed, and the investigations showed on the whole a reasonable regard to accuracy, although in some instances advertisements were decidedly objectionable.

Physical and Chemical Characteristics.

The literature on the physical and chemical characteristics of milk powders is quoted at length. Dr. Monier-Williams reported in 1909 upon a sample of whole milk powder, dried upon a drum at $100^{\circ} +$, C. Upon mixing with a small amount of water, stirring until homogeneous, and then adding cold, previously boiled, distilled water to make a 12.5 per cent solution, a product was obtained which did not have the homogeneous appearance of fresh milk. It had a slight smell of boiled milk and the fat separated quickly as a yellow layer at the surface. The curd produced by rennet was flocculent and finely divided; that produced by acetic acid was similar to that produced from normal milk. The reconstituted milk did not contain the active enzymes of fresh milk as shown by the peroxydase reaction. The fat globules viewed under the microscope were in most cases larger than those in fresh milk and there was observed a considerable amount of undissolved proteid. A considerable proportion of the lactalbumen had been converted into a form insoluble in magnesium sulphate. The milk sugar had undergone no alteration. A somewhat extensive compilation of various analyses of milk powders is given. Among the foreign substances found are cane sugar, bicarbonate of soda, various preservatives, coloring matter, starch, foreign fat, dirt, and traces of certain metals.

Bacteriology.

A similar comprehensive review of the literature of the bacteriology of dried milk is given. In view of the small amount of information

available, a further investigation was made by the author and 42 samples of commercial preparations were submitted to the Lister Institute. Ten per cent solutions of the powder showed aërobic bacteria growing at 22° C., ranging in numbers from 100 to 757,000 per cc. and at 37° C., from 100 to 892,000 per cc. The results for the most part, however, ranged under 10,000 per cc. in each case. The presence of streptococci, enteriditis, and *B. coli* was recorded in many of the samples. There was no evidence of tuberculosis in guinea pigs inoculated from these samples.

Investigations made at the factory indicated an enormous reduction in bacteria during the process of drying and a subsequent recontamination during handling and packing. The experiment was tried of running through the drying process a specimen of milk from a tubercular cow and one heavily inoculated with a potato culture of tubercle bacilli. Subsequent inoculations of guinea pigs indicated that living tubercle bacilli may survive the process of manufacture of dried milk, but "the course of the disease produced by the bacteria was very much slower than that of the disease produced in guinea pigs inoculated with the same amount of untreated tubercular milk." No evidence of tubercular infection was obtained by feeding experiments upon four young rabbits.

Infant Feeding.

Upon the basis of a review of the experience of many authorities and of information obtained by personal visits to several large infant feedings stations, the opinion is expressed that when breast feeding is impossible dried milk is a very valuable food for infant feeding. This statement applies, however, only to milk of recent manufacture, made from a good quality of cow's milk under hygienic conditions. It is probably no better than and perhaps slightly inferior to fresh cow's milk, but under the present conditions in cities, and especially in hot weather, it is often desirable to use it in preference to the latter, and this can be safely done without fear of prejudicing the health and progress of the infant. Many infants suffering from digestive troubles show excellent progress on dried milk. Scurvy and rickets are rare in infants fed on this preparation, although the occasional use of fruit juice is desirable.

Increasingly large quantities of milk powder are being used in maternity and child welfare stations supported by public health authorities and voluntary agencies in England and Wales. A list is given of some 75 districts, including some of the principal cities of Great Britain, in which this is the case. At Leicester a dried-milk depot is open every day and consultations are held twice each week. The milk powder is supplied in packages with directions and in three grades, namely, full cream, three-quarters cream, and half cream. The very poor obtain

this material at less than cost or even free, while the average purchaser pays a slight margin of profit. Similar details of the operation of some of the other large welfare stations are given.

For administrative purposes, under the "Sale of food and drugs act," milk powders are classed with condensed milk. An extensive bibliography closes the section.

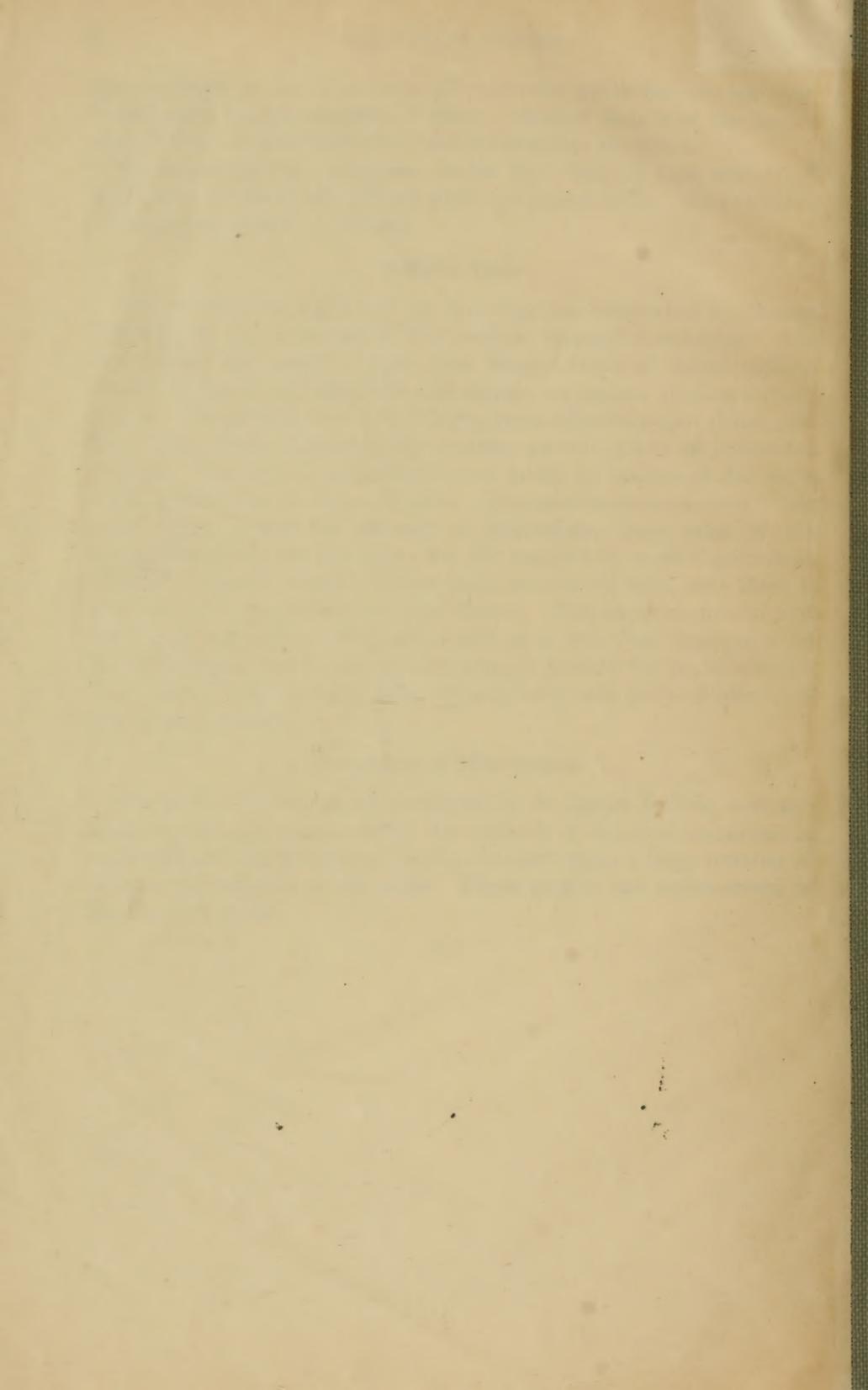
Nutritive Value.

This section is a report of the investigation conducted by George Winfield, M. A., on behalf of the medical research committee. The conclusions are based in part upon observations at infant welfare centers in Leeds and Sheffield and in part on animal feeding experiments. The growth curves of children fed exclusively upon dried milk from birth closely resemble the average growth curve of breast-fed children, although at somewhat lower levels by reason of the more delicate condition of these children. The conclusion is reached "that cow's milk, during the process of desiccation, loses none of the characters which are necessary for the support of normal growth in infants." Teething and walking begin at normal ages, and there is no greater liability of rickets and scurvy. The experiments on rats led to the conclusion that dried milk as a sole food maintains an animal in good health and permits normal growth for periods which long outlast those corresponding with infancy and early childhood in the human subject.

Examination of Milk Powders.

This section of the report, prepared by Sir James Dobbie, Government chemist, presents in detail the methods of chemical examination employed and the analytical results obtained upon a large number of commercial samples of all sorts. These results are summarized in Dr. Coutts's report.

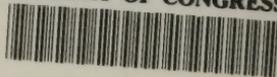




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