

(j) *Contamination from Milk-strainers.*—In order to determine the extent of contamination of one supplier's milk from that of another by the strainers used over the weighing-vat in cheese-factory practice a number of trials were made at the Institute factory using both cloth and metal strainers. The results showed that if good-quality milk followed inferior milk through a strainer the amount of contamination is so small as to be negligible and does not affect the grade of the good milk on the standards at present in force.

BUTTERMAKING INVESTIGATIONS.

(a) *Butter-flavour.*—Flavour in butter is considered to be due mainly to the presence of traces of diacetyl, derived from the natural oxidation of a flavourless precursor—carbinol—which is produced by the starter organisms. Starters in use in New Zealand dairy factories have been found to be similar to those used in the United States in regard to their production of these substances. The amount of carbinol and diacetyl found in butter is dependent on the amounts added in the starter, as very little is actually developed in the cream during the customary mild ripening-process used in this country. Diacetyl tends to disappear from butter held in cold storage at 150° F., and most of the loss occurs during the early part of storage. The precursor (carbinol) content remains unchanged during storage.

While the proportion of carbinol-diacetyl substances is dependent on the degree of development of acidity by starters, they are not acidic substances. It has therefore been found possible to produce butters containing relatively large amounts of carbinol, with otherwise the typical properties of a butter made from "low acid" cream. The flavour, however, is still mild, owing to the fact that but little of the carbinol has changed to the flavour-substance, diacetyl. Present work is mainly directed towards the possibility of inducing some of the carbinol present in cream or butter to change over to the diacetyl form. If this is found to be practicable it might be possible to manufacture highly flavoured butters of low acidity and consequent good-keeping quality.

(b) *Composition of Butter.*—Butterfats from Friesian and Jersey cows were collected at intervals during the 1933-34 seasons and some of their chemical characteristics have now been determined. There is a marked seasonal variation in composition and a slight consistent difference due to breed. There is also a difference in composition from day to day which may be due to either weather conditions or feed.

This work is preliminary to a more extended investigation which is to be made next season into the variations in the composition of butterfat in New Zealand in relation to feed, breed, and period of lactation. It is considered that the keeping-quality, spreadability, and vitamin-content are related to the composition of the fat, but little is known with regard to the relation of these factors to one another.

(c) *Neutralization of Cream and Flavour of Butter.*—In 1924 attention was drawn by Mr. Valentine to various anomalies encountered in the neutralization of acid cream for the manufacture of butter. Since that time there has been no attempt to explain these anomalies beyond a brief report from this Institute in the monthly report contributed to the *N.Z. Exporter*. It has been realized that a full explanation of the difficulties experienced would only be possible after a fundamental study of the nature of the reactions taking place. During the past five years attention has been devoted to the subject at intervals when time has permitted, and some information has been obtained on various aspects of the subject. A method of checking neutralization by determination of the pH of the resulting butter has been developed, and an investigation has been made of the relationship of butter to keeping-quality and the incidence of "flatness of flavour." Within recent months some work has been published by workers in other countries on related problems. It appears from a casual glance at these results that they do not agree in full with experience in New Zealand factory practice. It has not yet been found possible to relate the work of this Institute to these results in detail, but it is hoped that a report on the whole problem will be ready for presentation to the industry early in the coming season.

(d) *Timber-taint.*—A previous small-scale investigation on the treatment of *Pinus radiata* for the prevention of timber-taint in butter packed in this timber had indicated a measure of control. During the past year an investigation on a larger scale was made, and the opportunity was also taken to try out both tawa and rimu boxes. Two different systems of treatment were used:—

- (1) The Wiley double-spray treatment as used in Australia.
- (2) A proprietary single-spray treatment, developed in New Zealand.

The results may be stated briefly as follows.

(1) The taint from *Pinus radiata* boxes was not adequately controlled by either system of treatment, and boxes of this timber, even after the application of the surface-treatment, were not suitable containers for butter.

(2) Tawa boxes after treatment still imparted to the surface of the butter a certain distinctive flavour reminiscent of the odour of the wood.

(3) The tawa boxes were very heavy, and the miller in the Manawatu district experienced considerable difficulty in obtaining supplies of suitable tawa.

(4) Treated O.B. rimu boxes were without appreciable effect on the flavour of the surface of the butter. In this respect they were quite the equals of the white-pine boxes used as controls. They showed, however, a greater tendency to split at the ends.

(5) Untreated O.B. rimu appeared also to be satisfactory. This point is now being further tested out.

(6) Butter packed in boxes treated according to either of the above systems was contaminated with formalin on the surface, but only to a very slight extent. It is possible that kiln-drying of the shooks after treatment, as is practised in Australia, would eliminate this trouble.