

in the ripening of cheese to these bacteria. Since these investigations, the general tendency has been to study the phenomena of the ripening of cheese solely from the bacteriological point of view. Professors Babcock and Russell now hold that they should be studied from both points of view, chemical and biological; their researches lead them to conclude that there is an inorganic ferment present, and here are the conclusions arrived at in their last publication:

"Nowadays, the phenomena of the ripening of cheese are explained by the sole action, direct or indirect, of bacteria that, present in the milk, become incorporated in the cheese. These phenomena are both physical and chemical in order. Physically, the green cheese is hard, elastic, and insoluble, presenting in thin slices an especially opaque appearance. In ripening, it softens, becomes more soluble and semi-transparent. Chemically speaking, the changes are almost entirely limited to the nitrogenous constituents, which are rendered more soluble and, consequently more digestible. Resulting from the decomposition of its proteids, the cheese contains albuminoids, albumoses, peptones, starchy products (tyrosin, leucin) and ammonia.

"The enormous development of the lactic acid bacteria in hard cheese, and the elimination, from the starting of the ripening, of the organisms of digestion and peptonisation, led Lloyd in his labours on English Cheddar, and Freudenreich, in his researches on Gruyère, to attribute the principal part in these changes to the ferments of sour milk.

"As far as they depend upon the bacteriological changes, we have been able to confirm these results; but, from the beginning of our work, we observed facts that do not agree with their theories.

"Two independent series of experiments showed us that very great changes, in both physical and chemical order, are produced in milk from which bacterial ferments have been excluded. In these experiments, the casein of the milk underwent practically the same phenomena of decomposition that are produced in the ripening of cheese, that is, all the insoluble casein was converted into soluble nitrogenous matters, as was observed before.

"Parallel experiments with cheese gave like results, qualitative and quantitative, the products obtained being in no wise different from those of a cheese ripened normally.

"Having eliminated the effects of the organised ferments (bacteria) by means of chemical agents, such as ether, chloroform, benzol, &c., which do not affect the action of non organised ferments, we arrived at the conclusion that the changes produced were not due to the living organisms, but without the slightest doubt, to enzymes. (1)

"As to the origin of these enzymes, two hypotheses offer themselves: either they are produced by the bacteria which were developed in the milk before the application of the anaesthetics; or they are inherent in the milk itself. The possibility of the work of the bacteria may be got rid of by taking milk, very carefully drawn from the cow, and treated at once with antiseptics. Milk, tested immediately after milking, undergoes the same changes as the rest, thus proving that enzymes exist in milk. By the use of the ordinary physiological methods, the enzymes that act on nitrogenous matters, and which, applied to milk, have coagulating as well as digestive powers, were isolated. The recent efforts to explain the peptonisation of the casein by a digestive function of the bacteria of the lactic acid type, have eliminated that factor, because the milk employed in these experiments had been sterilised by heat, a process which weakened, if not destroyed, the natural ferments of the milk. It is, then, our conviction, at present that the ripening of hard cheese, instead of being due solely to bacterial action, is caused by the united action of organic ferments (bacteria) and inorganic ferments (enzymes). To the action of the enzymes on the cheese is undoubtedly due in great part the softening of the casein; as regards the production of the characteristic aromas, our knowledge is, as yet, too vague to allow of our affirming anything positively, as to their origin. According to all probability, the bacteria, in this point, play a much more important part.

(To be continued)

(Trans. by the Editor).

PACKING DAIRY BUTTER

A problem which puzzles many of our good dairy butter makers today, is how to put up their butter for market in such a way that it will bring the price its merits.

The style and size of package depend upon the market. Where one is obliged to take their butter

(1) *Zymè* is Greek for yeast. Ed.