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## EFFECT OF VACUUM PASTEURIZATION ON THE QUALITY OF CREAM PRODUCED IN SOUTHERN ILLINOIS

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One of the basic solutions to the land use problem of southern Illinois is grassland farming which implies extensive pasturage with livestock, particularly dairy cattle, beef cattle, and sheep. Dairying is beset with a particularly serious problem because of the widespread presence of wild garlic in pastures in southern Illinois. Milk produced from pastures infested with garlic absorbs objectionable odors which persist through all the regular processing into commercial products.

In addition to wild garlic, pepper grass also causes objectionable odors in milk and cream products. Poor care of cream before it reaches the processing plants also contributes to the high percent of low scoring butter produced in southern Illinois. "Poor care" might include carelessness on the farm, delays and lack of refrigeration in transit to market, and ineffective processing techniques or any combination of these factors. The remedy for this kind of defect in butter as an end-product of milk and cream is a methodical program of quality improvement beginning with the milk as it comes from the cow and ending with the cream as it enters the churn. In

other words, improvement in this category involves management practices under the control of the human element.

This paper deals largely with the defect caused by the carry-over of absorbed weed and feed flavors into manufactured butter and how this defect may be corrected once these odors are absorbed.

It is a well known scientific fact that flavors of weeds and feeds eaten by cows a few hours prior to milking are absorbed on the surface of the fat globules and thus are carried into the milk. One practical suggestion is to take cows off pastures infested with objectionable weeds four or five hours before they are milked. Since this is a management factor difficult to control, sometimes making an extra chore and possibly discouraging the very enterprise itself, much "garlicky" cream will undoubtedly find its way to the creameries. The principal problem in handling such cream is to remove these flavors from the butter fat, thus rendering the products more salable without impairing the physical or chemical properties.

Early experimental work to rid cream of weed flavors was along

chemical and physical treatments. The chemical methods, particularly with chlorine compounds, were never highly acceptable because of certain violations of the Pure Food and Drug Act. A few cases of litigation and adverse publicity followed the early trials with these chemical methods. The ultimate product appeared to be no improvement over the original. Most chemical methods involve the use of very exacting amounts of reagents, with the ever present hazard of using either too little or too much. Because of this hazard, disastrous financial losses have been encountered among dairy manufacturers.

Mechanical methods designed to release absorbed flavors involve both applied pressure and vacuum treatment. Although some pressure systems are known to have had a marked effect in improving the quality in cream, none are apparently capable of completely freeing the fat globules of absorbed odors and flavors.

The first vacuum type units used in the United States were essentially improvised vacuum pans or tanks, some equipped with nozzles for spraying the cream into a vacuum chamber. Others were equipped with steam jets to agitate or "steam wash" the cream while under reduced pressure. Most of these units employed a high pasteurizing temperature, some as high as 240°F, just previous to the reduced pressure treatment. These early attempts resulted in a definite improvement in flavor but in many cases the physical structure was usually impaired—specifically a breakdown in the "body" of the butter occurred and was difficult to overcome.

Simultaneous to this early work in this country, Mr. F. S. Board, an internationally eminent authority in dairy technology, and his associates were carrying on experimental work

along the same line in Australia and New Zealand. One product of their research was a triple-stage vacuum pasteurizer and deodorizer which was called "Vacreator". Small experimental units were installed by the Dairy Departments of Iowa State College and Oregon State College in 1940. It appeared that this equipment when properly handled could eliminate the objectionable flavor without impairing the physical quality of butter. The work at these two institutions gave the dairy industry of this country their first opportunity to observe new equipment which promised to revolutionize cream processing techniques.

By a cooperative arrangement with Iowa State College, this organization early in 1941 was permitted to scrutinize and evaluate the new equipment and its operation. The results were immediate and highly satisfactory. Negotiations with Mr. Board were made and the third machine to be installed in a commercial plant in this country was purchased by the farmer-cooperative with which the author is affiliated.

Since 1942 this organization has built its quality program around the new "Vacreator". Striking results have been obtained in producing higher quality butter; for example, all cream received at the plant in April 1943 testing 0.40 percent acidity or lower made 92 score butter. Most of the cream was unquestionably "garlicky" when it was received. In 1944 less than four percent of all the butter churned was below 90 score, as compared with 47 percent below 90 score in 1939. The quality of butter and the percent of 92 score butter produced in 1945 indicates an improvement over that of 1944. It is hoped that butter scoring less than 90, commonly referred to as "under grade", may be reduced to two percent for 1945

This small percentage represents deterioration in quality and the production of objectionable flavors due to decomposition and cannot be remedied by the vacuum—high-temperature method. Only by an aggressive educational program directed at the source of trouble, the farm itself with its management factors, can this defect be eliminated.

#### CONCLUSIONS

This farmer-cooperative organization has gone beyond the purely commercial motives in trying to produce high quality butter from low quality cream. It is clearly demonstrated that the problem of low scoring butter for which southern Illinois has long been notorious can be handled successfully. Essentially all the objectionable feed and weed flavors common to the

cream of this area have been removed mechanically by the new "Vaerator" process.

The final stage in the improvement program to put southern Illinois in the 92-93 score butter class involves education of the producers in handling milk and cream on the farm. Hazards can be eliminated all along the way from the time the milk is taken from the cow until the cream is on its way to the market. Reducing the time in transit to the processing plant will be a post-war problem easily solved.

The dairymen of southern Illinois should be encouraged to know that an old "mill stone" is being removed and that in time this area may become much more important as a dairy-producing region because of improved methods of processing as described herein.