Use of Starters in Swiss Cheese Making.

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During the past year the farmers, cheese makers and cheese dealers of Southern Wisconsin have found themselves face to face with an economic condition that is very naturally causing them considerable worry. With the price of farm products in general, and the price of feed in particular, constantly going up, the price of your Swiss cheese has, in the last year, gone off fully 25 per cent. I do not think that any of you felt or have felt in the past that, all things considered, the price of cheese was any too high and you very naturally feel that at the present time the price is much too low.

This condition has come from two causes: You had an unusual flow of milk in this section of the country the past summer. At the same time there was an unusually heavy make of cheese in Switzerland. Added to this the fact that the tariff on imported cheese has been reduced more than half allowing the very finest of the foreign product to be laid down in interior cities at a cost of 21 cents and you have a good explanation of the reason why our Swiss cheese is very low at the present time, as owing to the prejudice of consumers and the inferiority of our own product compared to the best of the imported, there is usually a difference of five cents or more per pound in the price which consumers are willing to pay.

It is not likely that the heavy make of cheese will continue in Switzerland, and you will not probably have as heavy a flow of milk for any succession of years as you had in Southern Wisconsin this year, but the low tariff has very likely come to stay and it is up to the men connected with the industry in the United States to put themselves on a little better basis than they have been
in the past. There are two things or two main points in which a very marked improvement in the industry can be made. The average quality of the product should be raised; in fact, we should look towards the time when a cheese as good as the best imported can be made every day in the year. At the present time a very small percentage of our product is as good as the imported and what is much worse cheese can be made in this country apparently only 4 or 5 months in the year. During the spring and fall most of our factories make a cheaper product such as brick and limburger and in winter are closed entirely. This has led to a short milking season and the quality of the cows has probably gone backward; certainly they have not improved under this system.

We understand very well, of course, that with our present knowledge and our present equipment, we can not hope to make fine cheese all of the time and for the entire year, but we believe that the intelligent use of starters will help very materially to bring about this condition. The Dairy Division of the Department of Agriculture has been working with starters for Swiss cheese for three years and we think that we have about gotten the problem solved. I have brought with me on this occasion pieces of six different cheeses for your inspection as we believe that you will be much more impressed with what I have to say if you can actually see what has been accomplished. You will note at once that these cheeses have too many eyes due probably to the fact that too heavy starters have been used, but I am assured by judges of good cheese in this audience that this is practically the only fault aside from the fact that they do not have enough salt, that would keep these particular cheeses from being classed with the best imported. These are winter-made cheeses and as you will see are made in very small sizes. They are made in a locality where absolutely nothing could be done towards making a Swiss cheese without the use of starters. Some of them are made from milk so gassy that starters were necessary to keep from making a pressler or nissler cheese. We
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believe thoroughly that with milk of average quality such as is delivered to the Swiss cheese factories, we could make cheese as good as these every day in the year.

As was stated, these cheeses were made with starters. I know that the subject of starters is not a very familiar one or well understood by Swiss cheese makers because the use of starters in Swiss cheese making has never been talked about. Most of you have undoubtedly heard about their use in the making of butter and in the making of Cheddar cheese, but the few that have been tried with Swiss cheese making have been made up with ordinary lactic acid-forming bacteria and have made a poorer instead of a better cheese, and because of this largely it has been assumed that starters could not be successfully used in the making of Swiss cheese. To give you a better understanding of how starters may help, a short explanation is desirable. As far as we are concerned three kinds of bacteria are present or should be present in milk intended for Swiss cheese; first the bacteria which give the eyes and flavor must be there or we can not have good cheese; second, the bacteria which cause gas, and if not overcome give a presslor or a nissler cheese, are always present in the milk from different herds of cattle; third, to overcome these gas-forming bacteria another kind must be present or poor cheese is the result. It happens in many localities that the bacteria which gives the eyes and the flavor are not present naturally in the milk; therefore, people have come to the conclusion that Swiss cheese can be manufactured in a few localities only in the United States. Under winter conditions the bacteria which suppress or kill out the gas-forming bacteria, do not grow very well; therefore, you find it very difficult for most of the year to make a perfectly sound Swiss cheese. It is about these bacteria which suppress the bad gas-forming kind that I want to talk today.

The Swiss cheesemakers have always in the past used a starter unknowingly; otherwise, a good cheese would have been uncommon while a presslor or nissler would have been the usual thing. This starter is usually found
in the whey rennet. The bacteria which are responsible for this go under the common name of Bulgaricus and in Europe is called casei epsilon. Cultures of this bacteria have been recommended by different investigators and teachers of Switzerland for the making of good rennet but they have never been considered as necessary for the suppression of bad gas-forming types of bacteria in the milk. While you have been using starters unknowingly and unsystematically we have been finding out how the best use of this starter can be made. We have found out a number of things in connection with its use. We have found that the small amount used in your whey rennet is not nearly enough to take care of the gas-forming bacteria in bad milk; therefore, because of this when your milk has become particularly bad you have had difficulty with your cheese. I believe that most of you use about 4 to 5 pounds of whey rennet to the kettle of milk, which may be as much as 2,000 pounds. This is less than one-fourth of one per cent. We have found that this starter can be used in amounts as high as 2 per cent or at the rate of 40 pounds to 2,000 pounds of milk without in any way injuring the quality of the cheese. This quantity of a good sour starter will thoroughly kill out the gas-forming bacteria in the worst milk that is probably delivered to any Swiss cheese factory.

Again we have found that the cultures of bacteria responsible for this good starter are sometimes lost or become so weak as to be of little help with the cheese. You can usually determine this for yourself because under these conditions the dried rennet put into the whey gets to smelling bad and when this is used instead of having a good starter which will help you make a good cheese, you are adding a bad starter that would spoil good milk. Some apparatus for determining the acidity of the whey is a very good thing to use in this connection. A good whey starter should not have less than seven-tenths to eight-tenths per cent of acid. Perhaps most of the cheesemakers could learn to distinguish by the taste whether their starter had enough acid to be of any help.
When this culture is lost or when the cheesemaker is having trouble with his rennet, it can be renewed in two or three different ways. Probably the best plan would be to secure pure cultures if these are ever put on the market. The Dairy Division is ready to supply a limited number of these to the cheesemakers who care to secure them. A very good way to renew these cultures is to go to a cheese factory where they are having no trouble and secure enough whey to make up rennet for two or three days. Another way would be to take a piece of good cheese, grind it thoroughly, and add it to some boiled whey which has been allowed to cool down to the proper temperature. Good cheese always has large numbers of the right kind of bacteria and where these are added to the whey and allowed to grow 2 or 3 days a very good starter can be secured.

Again we have found that the reason that the cheesemakers cannot make good cheese in early spring and late fall and during the winter, is because the temperature conditions for growing this starter are not right. In the summer you put your jar containing whey and rennet above the fireplace or boiler. In the winter you keep it in the same place. You can see very quickly that the temperatures will not be the same; in fact, during this season of the year you do not expect your whey rennet to give you good results. This whey must be cured at not less than 100 degrees F. (30 degrees R.) to secure good results and if you allow the temperature to fall below this this kind of bacteria will not grow but the gas-producing kind in the dried rennet will grow and you are very likely to have a bad rennet. A good way to maintain the proper temperature is to have a box something like a fireless cooker in which this rennet can be kept and where the temperature will stay uniform much better than in any other place. A box like this can be built by any one. It should have walls 4 or 5 inches thick, packed with cork board or granulated cork or some similar substance, (good dry sawdust will do very well) and then have a good thick cover made in the same way. A cheesemaker
can learn to use this so that he can hold his whey within 8 or 10 degrees. This whey could be put in this box at 110 degrees and at the end of 12 hours should not be below 100 degrees, but if the cheesemakers are going to make a good quality of product in the cold months or even in the warm months much more attention must be paid to this whey rennet than has been given to it in the past by the majority of cheese makers. We believe that if the cheesemakers would dip the whey after the cheese is cooked instead of before, they would have much better success than they do at the present time because the high temperature of cooking suppresses for a short time the growth of the undesirable bacteria but it has no such effect on the bulgaricous bacteria which form the acid and are the ones necessary for the making of good cheese. This will give the good bacteria a chance to get ahead of the other kind.

We have given this bulgaricous starter the very hardest kind of tests to prove its value. We have used it in factories where every sample of milk delivered by the patrons was badly gassy. We have used it in milk to which we had added cows' manure in large quantities to insure the milk being completely filled with gas-forming bacteria and it has done the work every time. We feel confident that if this starter is used intelligently and in sufficient quantities that there need never be another nissler or pressler cheese. We have used this rennet in a factory near Brodhead early in the spring and before it was thought possible to make a good cheese. We found in these tests that where the farmers delivered the milk once a day they allowed the night's milk to stand at such a warm temperature that it had begun to develop acid and because of this we could not make good cheese, but when we took this milk in twice a day and held the night's milk in a kettle with a slight cooling so that it had not started to form acid, we found no difficulty in making a thoroughly sound cheese. During this time the farmers were delivering milk that was badly gassy but our starter entirely overcame the gas-producing bacteria.
Our only trouble in the use of this starter is the danger of getting yeast into it which, of course, is likely to happen in any cheese factory with the whey rennet as it is now handled. We have thought best, because of this, to use a little can for our mother starter so made that it was impossible for the yeast to get into it. This can consists of two parts. The boiling whey is poured into the upper part and thoroughly kills out all yeast which may be present. After this is cooled to about 100 degrees it is allowed to run into the bottom part of the can which contains the pure cultures of acid-forming bacteria where it is thoroughly protected from all contact with the air. After standing 24 hours this can be drawn off in the proper quantity of whey which has been sterilized by boiling either with steam or by setting in a kettle of boiling water and which has been cooled to about 100 degrees. The rennet can then be added and this mother starter will insure the proper kind of whey rennet.

You probably would like to know how we get the eyes in these cheeses which I have with me and which I told you are winter made. We are working now on the problem of securing eyes in Swiss cheese and while we have not learned how to control the number of eyes we have learned how to secure them in any or every cheese made. The eyes are secured by grinding up a small piece of good cheese, not too old (3 to 4 months old) in whey, allowing it to grow at room temperature for 24 hours and adding this to the milk at the same time that the rennet starter is added. In the cheese I made at Brodhead and in a cheese made by the cheesemaker at the Five Corners factory, too much cheese starter was used and because of this it had to be run into cold storage to keep from bursting open from too rapid fermentation. This cheese all had good eyes but they had too many eyes which grew too fast. I do not like to advise you, with our present knowledge, on just how this starter for making eyes should be made up. I suggest that one-quarter of a pound of cheese in five pounds of whey for 2000 pounds of milk would be sufficient at least to start with and if I
were running a factory even with what little I know at the present time, I would certainly use this ground cheese starter in the spring and use it in lesser quantities in the summer. It is probable that in most of your factories you have the eye-forming bacteria already present but there are very few cheese comparatively which get enough eyes though I have seen cheese made in this locality without the use of any starter which had too many eyes. It is possible and even probable that it will be found to be necessary to control the temperatures during the first few days of the cheese ripening to secure a proper number of eyes. Most of your factories are not provided with cold rooms and I am not sure but that sometime it will be found very desirable to collect the cheese from each factory every day as soon as it is pressed and take it to a central curing room where temperatures can be properly controlled. This may seem like a radical change from your present method of doing business, but if it will add five cents a pound to the value of your product by making it equal to the imported cheese, it certainly would be worth while to at least consider the proposition. I think that when a large portion of the product of our American factories equals the best of the imported cheese, there will be very little prejudice remaining on the part of our consumers and our domestic cheese will sell fully as well as the imported.