

## SOME OBSERVATIONS ON MILK SANITATION IN EUROPE<sup>1</sup>

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During a brief sojourn at Geneva in June, and later subsequent to the International Dairy Congress at Rome in September, 1956, I learned something about milk sanitation in several European countries. On the strength of these visits I am certainly not posing as an authority on European dairying! Nevertheless, some of the information gleaned may be of interest to those engaged in milk production, processing and control in North America.

As might be expected, considerable variation was encountered from country to country. However, one thing that struck me was the absence of the sharp distinction between fluid milk and milk for manufacturing purposes that is current here. Generally there is a single standard milk quality regardless of its ultimate destination. This is no doubt the chief reason that in the main dairying countries, the butter and cheese are of such excellent quality. Milk is not regarded as a beverage for adults - there are others widely consumed there that have much more appeal! Nevertheless, the total consumption of milk equivalents - principally as cheese and yoghurt - is high in Northern Europe, often higher than here in North America.

### ANIMAL HEALTH

Any discussion on milk sanitation should logically start with the health of the dairy cattle. Many European countries have lagged behind North America in eliminating bovine tuberculosis. One reason for this, no doubt, is that it has been traditional in many European countries to boil the milk as soon as it reaches the home. Therefore, the transmission of this disease has not resulted in the same problem there as it has in North America. However, bovine tuberculosis has been banished from Norway, Denmark and Holland and is practically gone from Sweden and Switzerland. In England and Wales, over 70% of the milk comes from tuberculosis free herds; in Scotland the figure is appreciably higher. Brucellosis has been eliminated in Sweden and is practically gone in Denmark, Holland and Switzerland. Mastitis is less of a problem in areas where the herds are small and milked by hand. Where herds are larger and are



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milked by machine, it is a serious problem. In most countries antibiotics to combat mastitis are available only through the veterinary profession. In Denmark and Sweden the law also requires the veterinarian who treats a cow for mastitis to notify the plant to which the milk is shipped. Denmark appeared to be attacking the mastitis problem most vigorously. The Federation of Danish Dairy Associations has established over 20 bacteriology laboratories for mastitis control, and 5 diagnostic laboratories for brucellosis. In addition, the Trifolium Dairy in Copenhagen is carrying on the most extensive campaign against mastitis I have encountered. Monthly checks are made on each producer's milk for mastitis. Samples from infected herds are taken by veterinarians and the causative organisms determined in the plant laboratory. Treatment is carried out by the veterinarians and advice given to the farmer. As a result of this program, *streptococcal mastitis had been eliminated from 60% of the herds*, some of which had been free for over six years.

<sup>1</sup>Presented at the Tri-Cities Dairy Technology Society Meeting, Louisville, Kentucky, October 8, 1957.

## DAIRY FARM SANITATION

Because facilities for adequate cooling below 50°F. are rare, more attention appeared to be given to *clean* milk production - to keeping bacteria *out* of the milk instead of relying on efficient cooling to keep down bacteria counts. This is an important lesson we in North America need to learn, for cooling, especially in farm bulk tanks, can cover up some undesirable production practices. A low bacteria count does not guarantee a cleanly-produced product. The milking barns I saw were not fancy (Figure 1) but were clean

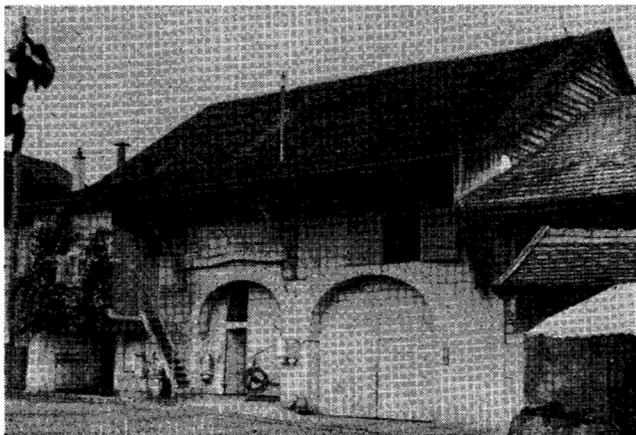


Figure 1. A dairy barn near Geneva, Switzerland.

and the cattle were very clean and well-bedded. Yards are generally paved, particularly in Britain. Inspection of farms varies in frequency. Copenhagen heads the list with monthly visits. On the Continent such work is generally done by veterinarians; Copenhagen employs 143 to cover their milk supply! An interesting development in Southern England is a mobile milking shed where six cows at a time are fed their concentrate and milked by machine (Figure 2). These



Figure 2. A mobile milking shed in the South of England.

sheds are moved once or twice a day to fresh ground to prevent churning up the mud in the fields. The cattle remain out-of-doors all year round. Over 500 of these units are now in use.

The straining of milk is being discouraged in many countries and in Switzerland it is prohibitel by law. More emphasis is placed on having cows' udders and teats properly cleaned before milking.

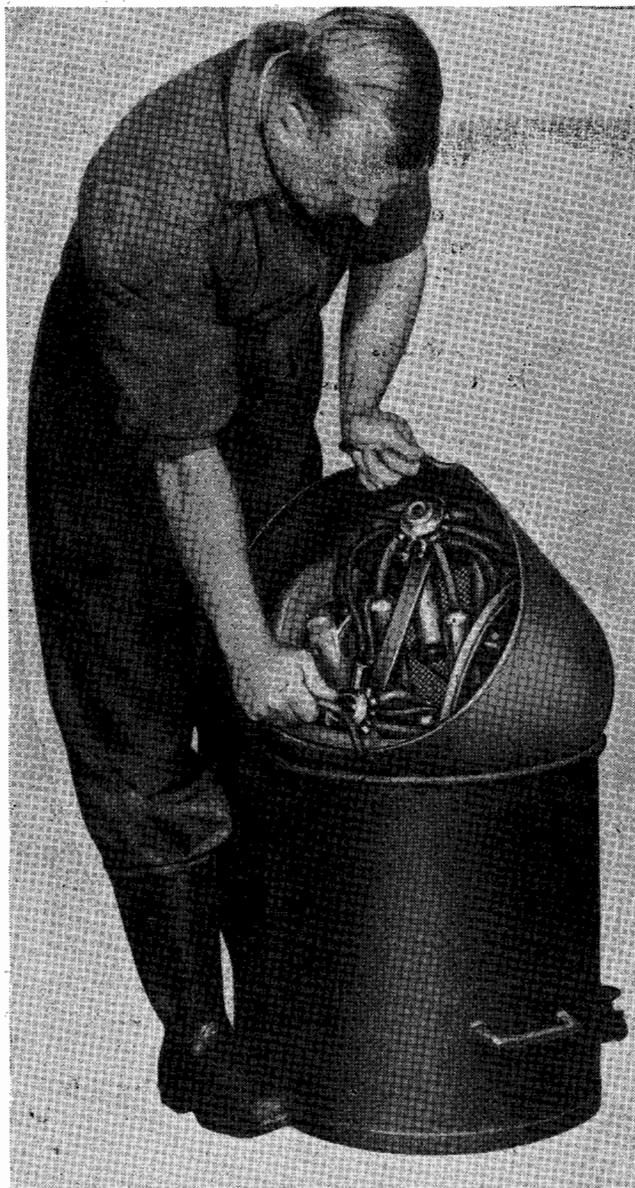


Figure 3. Apparatus used in the immersion cleaning method for direct-to-can milking machine equipment.

Although chemical germicides are coming into the picture in some countries, more emphasis appeared to be placed upon getting the utensils *CLEAN* by the old-fashioned method - a brush and plenty of "elbow-grease". Boiling water is still commonly used for sanitizing equipment, although steam chests are still

common in England. Immersion cleaning of direct-to-can milking machines is an interesting procedure developed by the National Institute for Research in Dairying in England. After each milking the milk is rinsed off the milking equipment. The pailhead, milk hose and cluster are carefully placed inside a container which is lowered into a larger container (Figure 3) filled with 2% lye solution containing sufficient ethylene diamine tetra-acetic acid to act as a chelating agent. Immediately before the next milking, the equipment is removed from the container, rinsed to remove the solution and used for milking. The solution is discarded and replaced monthly. The results with this procedure have been so favorable that it is spreading rapidly, and similar equipment is being developed for bucket-type milkers.

#### COOLING

Because of the lack of mechanical refrigeration, natural ice or cold enough water, cooling is much more of a problem in most parts of Europe than in North America. In the Geneva area, milk is partly cooled in an open tank at the farm, then taken to the village collecting center after each milking where it is further cooled before being picked up by truck twice a day. In Britain, surface coolers are still in common use, although sometimes the shortage of water and its high temperature makes it difficult to cool milk adequately. Turbine coolers are also common there, and are readily maintained in a sanitary condition. Experimental bulk tank routes now are being operated in England and Scotland by the Milk Marketing Boards, but whether or not this method will become common remains to be seen. On the Continent, milk is transported mainly in 40-liter shipping cans. In Italy and Switzerland these are almost 100% aluminum alloy, and in Denmark around 95%. Collection is usually made in open trucks. In Britain milk is picked up on the highway at the farm entrance, and not at the milkhouse.

#### EXAMINATION AT PLANT

The milk is commonly checked for odor on the arrival at the plant or receiving station while in some countries such as Denmark it is also tasted. Sediment testing would not appear to be as common as in North America, except in Holland, but there appears to be more emphasis on keeping dirt out of the milk, as indicated by the prohibition of farm straining in Switzerland. Bacteriological quality is most commonly determined by the methylene blue test. While this test in North America is currently regarded as more lenient than the plate count, this is not necessarily

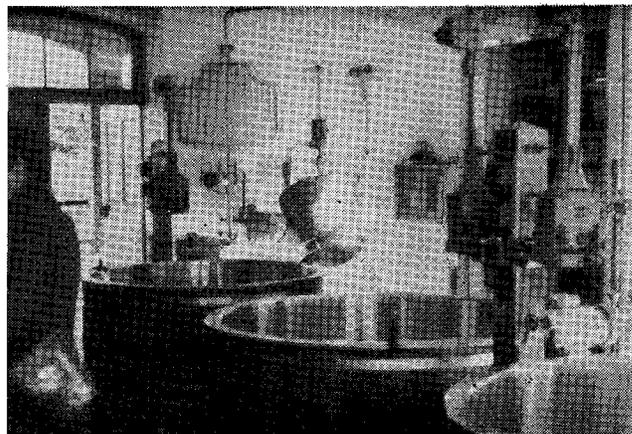


Figure 4. Interior of a small Emmentaler cheese factory near Berne, Switzerland.

the case where the bacteria are less dormant as a result of less efficient cooling. The general feeling there is that the plate count is much too expensive for routine control and that the methylene blue test gives them adequate information. However, the Trifolium Dairy at Copenhagen have reduced the bacteria count on their milk to such a low level that they have to rely on the plate count to supplement the methylene blue test. In Switzerland, the methylene blue test is run daily, and in Denmark and England weekly. In Scotland a temperature-compensated resazurin test is employed, while in England a 10-minute resazurin test is used as a rejection test on suspected samples. On the Continent the dye reduction test is run on the freshly taken sample, but in Britain the sample, usually taken at the farm, is held at atmospheric shade temperature for approximately one-half day before running the test. Milk that will not reduce in  $4\frac{1}{2}$  hours after such treatment in the summer is certainly good milk! This type of methylene blue test, with inversion of the tube every 30 minutes, replaced the plate count in England and Wales in 1937.

The coliform test for raw milk is rarely employed in North America except for "certified" milk. However, several persons in Europe regarded it as the best indicator of clean milking conditions, particularly where farm bulk tanks are used. This test is run regularly by the Trifolium Dairy at Copenhagen. At a Milk Marketing Board plant in Ayrshire, Scotland, only 2 of 16 samples had shown coliforms in 0.1 ml. portions, and this in milk cooled only with water! No wonder cheese from this plant regularly wins top honors at the shows. The Gerber test for fat is commonly used in Europe. In Britain a good deal of time is devoted to testing for solids-not-fat, which have gone down during the last ten years, even though the fat content has remained the same. This

appears to follow quite naturally as a result of their practice of buying milk at so much per gallon without any reference to the fat content above the 3% minimum. Holstein-Freisians have largely replaced the higher-testing breeds.

#### PAYMENT ON QUALITY BASIS

Except in Britain, milk is generally paid for on the basis of the butterfat content. Where there is a market for it in England, milk containing more than 4% fat may receive a premium of 50c per cwt. There is some interest in using solids-not-fat as a basis of payment along with the fat, and in Friesland, in Holland, they are now paying for milk on this basis. A bonus is sometimes paid for the absence of pathogenic bacteria. In England a bonus of 23 cents per cwt. is paid for milk from either "T.B. tested" or "accredited" herds. If the herd is both "tuberculin-tested" and "accredited" the double premium of 46 cents per cwt. can be obtained. About 70% of the milk gets this double premium. In France a test and slaughter policy for tuberculosis is being adopted and some dealers offer premiums for milk from tuberculosis free herds. The same is true in Belgium. France is setting up regulations for payment according to the methylene blue reduction time while in Belgium 20% of the plants pay on a quality basis. In Switzerland, if over 40% of the milk reaching a collecting center goes for bottling, then payment according to quality is required by law. In Denmark the producer is penalized if there is more than one weekly methylene blue test in the year reduced in less than 4½ hours! As an incentive to quality milk production, the Trifolium Dairy at Copenhagen gives a prize to the herdsman where the yearly average count is under 15,000 and a smaller sum where it is from 15,000 to 30,000 per ml.

#### ADVISORY SERVICES

In all the principal dairying countries, the need for an advisory service to assist the farmer in producing quality milk is clearly recognized. Sometimes this service is provided by the farmers' organization, as in Denmark and Holland, while sometimes it is a government agency. In England and Wales the National Agricultural Advisory Service, the successor to an agency established during the war, depends upon trained bacteriologists, mainly women, to visit farms in difficulty. They make swab and rinse tests on utensils, check the water supply and generally give advice. This is in addition to routine visits every six months. In Scotland a similar service is furnished through the agricultural colleges. On the Continent,

veterinarians are more commonly employed. The 143 veterinarians concerned primarily with animal health in the Copenhagen milk shed also advise the farmer on milk hygiene, and are entitled to much of the credit for the excellent milk supply there.

#### PROCESSING FLUID MILK

Processing fluid milk generally follows much the same lines as in North America except that homogenized milk is not nearly so general. Practices vary widely from one country to another; in Berne, Switzerland, 90% of the milk is delivered raw in 40 liter cans to the consumer and is then boiled in the home. This is done primarily to keep down the cost, and around 75% of the price paid by the consumer is returned to the farmer. In Paris on the other hand, practically all the milk is pasteurized and bottled. Much of this is pasteurized at the country receiving station, and then again pasteurized in the city. A high percentage of the milk is pasteurized and bottled in Holland, Denmark, Sweden and Belgium. In England about 5% of the milk is still delivered raw by producer-retailers. Glass bottles are still the standard package, a small necked bottle with an aluminum cap being commonest. In France, Belgium, Holland and in the Midlands of England "sterilized" milk makes up a fair percentage of the total. It has obvious advantages where refrigeration is lacking, and is used mainly in cooking and in beverages.

The visitor from North America is surprised at the extent to which bottled milk is exposed to sunlight. Apparently milk there is much more resistant to oxidized flavor; Dr. A. L. Provan, Chief Chemist of the Milk Marketing Board of England and Wales, said they had deliberately exposed milk to sunshine without developing this defect. It may be that the excellence of the pastures is a factor here.

#### QUALITY TESTS FOR BOTTLED MILKS

Because domestic refrigerators are still not very common, considerably more attention is paid to the keeping quality of bottled milk. Here post-pasteurization contamination is all-important. In Britain the plate count for pasteurized milk was discarded in 1944 and a keeping quality test - a methylene blue reduction test after holding samples for 24 hours at atmospheric temperature - substituted. If methylene blue is not reduced within one-half hour the milk will normally remain fit for use for at least 24 hours. In Copenhagen the Trifolium Dairy has found that tests on freshly bottled samples were of limited value. They therefore hold samples for 24 hours at 63°F., then subject them to the methylene blue, plate count,

coliform count, thermoduric count and flavor tests. As an indication of the good job they are doing, in 1955 82.4% of the samples were free from coliforms in 1 ml. portions and 56.3% had plate counts under 100,000 *after being exposed for 24 hours at 63°F*. The one plant in Amsterdam that I visited incubates their bottled samples for 48 hours at 63°F. and requires a methylene blue reduction time of more than 2 hours on milk so exposed - a very demanding standard. In England the official standard on pasteurized milks is freedom from coliforms in 1/100 of an ml. This is in striking contrast to Holland where a standard of no coliforms in 5 ml. was encountered. However, firms such as the United Dairies in England realize that a stiffer standard is desirable and require freedom from coliforms in 1 ml. portions.

#### TECHNICAL TRAINING

The excellent quality records in countries such as Denmark and Holland doubtless reflect the attention given to technical training and the high standards demanded of dairy workers. In Danish dairy plants there are roughly 4,000 trained workers as well as around 1200 apprentices. The latter spend three years in at least two plants, and also attend night classes. This practical training is followed by a six-months course at an approved dairy school before a certificate is granted. After a few years additional

experience, promising young men may take an additional eight-month course at a dairy school. Then, after further experience they can assume positions as foremen, plant superintendents and managers, or they may take a four-year degree course at the Royal Veterinary and Agricultural College. Somewhat similar requirements exist in Holland, where in addition classes of instruction in milking are given to farmers' daughters. Over 5000 may take such a class in a year. In England courses are being given for dairy plant workers at Reaseheath, in Cheshire. We in North America have a long way to go in this direction.

I have tried to pass on to you some of the impressions gained during my brief stays in Europe. With so much variation within some countries, as well as between countries, generalizations can be misleading. We think of Denmark as a country of small farms, yet those supplying Copenhagen run as large as 17,000 acres! While more hand-labor is frequently used on the farm, the Morden plant of Express Dairy Company in London is considered to be the most highly mechanized in the world! Certainly the quality of milk produced in some countries without the aid of mechanical refrigeration and other equipment might suggest that here in North America we have tended to rely too much on efficient cooling at the expense of cleanliness. Whether or not this is true, there is no doubt that we can still learn a thing or two from the dairymen across the Atlantic.