SANITARY MILK PRODUCTION IN SCANDINAVIA AND BRITAIN

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While there is general agreement that milk should be produced hygienically, different countries have different ideas as to methods, standards, tests, etc. In this article I shall attempt to indicate some of the differences noted during visits to Scandinavia and Britain following the International Dairy Congress last September.

In North America we have developed quite an elaborate set of standards and regulations concerning the production and control of fluid milk, but with rare exceptions milk for manufacturing purposes has been practically ignored. Not so in Scandinavia or Britain; there milk for manufacturing is expected to come up to a high standard, which is certainly reflected in the excellent butter, cheese and other dairy products they produce.

On this continent the Standard Plate Count is most commonly used to measure bacteriological quality. This is also true in Scotland, but other countries consider it too expensive and mainly rely on either the methylene blue (Scandinavia) or resazurin (England and Wales) test. With bulk cooling coming into the picture, however there is general acceptance of the idea that if any test is to be meaningful when applied to well-cooled milk, it is desirable to pre-incubate the sample in order to encourage contaminating bacteria to grow. Incidentally, in Scandinavia this same principle is widely employed with finished products, these being held at around 63°F for 24 hours before testing for coliforms, keeping quality, etc. This demands a very high standard of plant sanitation.

Veterinarians play a big part in sanitary milk control in Scandinavia. Usually they work under the health department (Copenhagen has about 40) although in Finland the Department of Agriculture oversees the program. In Denmark, Sweden and Norway I gained the impression that much was left to the industry itself. In these countries the producers and processors generally wear the same hat — they are in co-operatives. In Scotland control is exercised by sanitary inspectors from the Department of Health, while in England and Wales it is the Ministry of Agriculture, Fisheries and Food that has the responsibility. In Scotland advisory work is carried out by bacteriologists from the three agricultural colleges, in England and Wales by bacteriologists employed by the Ministry. A high proportion are women, well-trained and fully capable of assisting producers who may be in trouble. I did not learn of any organization similar to the IAMFS where-in all those interested in milk sanitation could meet together regularly to discuss their problems, and with their own Journal to keep them informed of new developments in their field. Neither is there anything strictly comparable to the 3A Sanitary Standards Committee, although approval of new equipment by the National Institute for Research in Dairying serves a somewhat similar purpose. However, there does not seem to be the same close co-operation between regulatory authorities, research and advisory workers and equipment manufacturers as there is on this continent. There was also some criticism of lack of co-operation between the trade and the Milk Marketing Board, which acts as the agent for all milk producers in England and Wales.

While it is always dangerous to generalize, I would say that the farms I visited created a much more favorable impression on the visitor than do most of ours in North America. The buildings are substantial, often of brick or stone, well lighted and even with concrete ceilings in some countries. Even more impressive is the way the yards are paved. Milk houses were generally well-laid out and equipped; small stainless steel wash tanks are common in

![Fig. 1. Dairy farm shipping to Copenhagen. Note cow ties and wide radius bends in pipeline.](http://meridian.allenpress.com/jfp/article-pdf/26/6/188/2396457/0022-2747-26_6_188.pdf)
Scandinavia. Bulk tanks in Britain are bulky indeed! Cold wall tanks with very thick walls and often so tall as to be difficult to clean. Cows were always very clean, and with chain ties looked more comfortable than ours in stanchions. Many of the older stables, with thick stone walls, were not designed for labor-saving, and even demolishing them to convert to loose housing is quite a task. Slatted floors are coming into the picture, especially in Norway, as one answer to keeping cattle clean where bedding is at a premium. Wood chips were also seen in use in Wales.

The Simontorp Farm in South Sweden probably holds the world's record for producing milk with the lowest bacteria count, having run for long periods consistently below 1,000 per ml. Here the cows recline on rubber matting and are kept unbelievably clean. Unfortunately their market for a superior raw milk has diminished with compulsory pasteurization; now they make twice as much money out of dried cow manure as they do out of the milk. This farm, which had 15,000 visitors in 1961, milks 320 cows; it is owned by the man who developed the Tetra-Pak package. The ultimate in "cow heavens" was seen near Stirling, in Scotland, where 120 cows reclined on sponge rubber mattresses encased in tough plastic in a new stable with fluorescent lighting, flowers in pots, infra-red lamps, mechanized feeding, etc. Thrice a day the cows were moved to one of two milking parlors, then back to their stalls in the tile-walled stable.

While most farms are still small there is a definite trend toward larger herds in all countries. In England and Wales the herd size has increased from 15 cows in 1942 to 21 in 1960. In the main dairying areas of Scotland herds will average over 60 cows. In Denmark, a country of small farms, some 50% of the farms supplying Trifolium Dairy in Copenhagen have over 100 cows. At the other end of the scale, in Bergen, Norway, 6,500 producers are required to supply 130,000 people. One glance at the mountainous terrain surrounding the city is enough to explain why many herds are of two or three cows only. The fjord country is scenically most impressive but furnishes very limited pasture or arable land.

Milk handling equipment naturally varies with the size of herd. Farm bulk cooling tanks are slowly increasing in Britain, but not at anything like the rate they did in North America. Tanks are much more expensive because of the extraordinarily fast cooling specifications laid down. Also milk is collected every day, rather than every-other-day as in Scandinavia and North America. Stockholm is getting around 20% of its milk by bulk tanker direct from farms, although not all these farms have bulk tanks. On the smaller farms the milk is cooled by spraying refrigerated water over the outside of the can, then at the next milking the can is placed under an insulated cover to keep it cold. Cans are then taken to the roadside every other day and the milk pumped from the cans and metered into the tank truck.

Incidentally, 30% of the volume of milk received goes back to the farms as skim milk; this is metered from the tank truck into the farmer's tank when the tank truck calls to pick up the milk from the last four milkings. Copenhagen and Malmo, across the Sound in Sweden, are also venturing into bulk handling, with the larger herds.

Presumably to keep down the cost, pipeline milkers in Scandinavia and in Britain use smaller piping—about 1 inch in diameter. This reduces the area to be cleaned and sterilized; nevertheless, with few exceptions counts on the milk are appreciably higher than they were with bucket milkers. This may be due to the need for improved design of fittings, better detergents or better washing procedures. Undoubtedly these points will be worked out as they have been on this continent. The wide radius elbows noted in pipelines in Scandinavia are a feature
we could well adopt, making for less foaming and better cleaning. On the other hand, in Britain rubber slip joints are widely used; these are hard to keep clean without taking off and brushing. Even more astonishing was their use of galvanized return lines for in-place cleaning. This looks to be a dangerous practice.

On the credit side is the development by Dr. C. C. Thiel of the National Institute for Research in Dairying in England of two useful aids to in-place cleaning of pipeline milkers in parlors. One is a spreader disc inside the weigh jar which deflects the detergent solution down the sides of the jar; the other is a "jetter", a clawpiece to which are fitted four rubber cups into which the ends of the teatcups are inserted to permit them to be cleaned in place also. A rigidly mounted pinch valve is used to shut off the feed tube during milking. With this arrangement little time is spent preparing for either milking or cleaning.

Exposed copper on equipment is still common. Even on comparatively new pipeline installations, tinned copper-bearing fittings were seen, while older surface coolers and milker pailheads often showed bare copper or copper alloy. This must certainly contribute to oxidized flavors, particularly when bottled milk is exposed to light as freely as it is in Britain. (The Scandinavians have gone over to amber glass bottles or Tetra-Pak largely to avoid oxidized flavor). Aluminum milker buckets were seen in England which were cracked and badly pitted. Curiously enough, in England and Wales nothing can be done to make the farmer correct such faulty conditions unless his milk fails to meet the requirements of the statutory test, which since October 1, 1962 only requires a resazurin reduction time (to complete decolorization) of 2 hours in summer, or 3 hours in winter.

Each country has its own ideas with regard to cleaning and sanitizing equipment. Britain resisted chemical "sterilization" until wartime fuel shortages forced its adoption. The authorities then recommended washing and sterilizing in one operation, using 250-300 ppm (available chlorine) of hypochlorite. Only products approved by the Ministry of Agriculture can be sold, and any sanitizer is tested as a combined cleaner-sterilizer. So far there is no provision for testing a hypochlorite, for example, purely as a bactericide. Milkstone causes little concern. However, they are ahead of us in the general recognition that the bacteriological condition of the milk-handling equipment cannot be assessed by making counts on the milk itself. Their advisory officers resort to swabs and rinses of the equipment, and get a much more adequate picture of its condition. Such a procedure, however, is much too time-consuming and expensive for routine testing; it is used only where a producer is in trouble.

Although experience in North America has shown that with properly designed fittings, and properly formulated detergents used according to directions, a properly installed pipeline milker can be kept in excellent sanitary condition without resort to heat sterilization, various authorities in Britain still insist that periodical heat sterilization is essential. They extend this also to bucket type milkers and other utensils, which suggests inadequacies in their cleaning procedure. On the other hand, extensive farm studies by workers at the West of Scotland Agricultural College have shown that their pipeline milkers can be kept in excellent sanitary condition without resort to heat; possibly the softer water there is a factor, as they were using the same proprietary detergents and equipment as are used in England.

The Scandinavian countries have varied ideas concerning cleaning and sanitizing. Denmark is promoting the use of a nitric acid sterilizing rinse for farm pipelines, much as they have used in dairy plants.
for a number of years. Finland and Norway are still keen on hot water or steam, especially for milker rubberware. All of them shy away from lye solution for wet storage of milker clusters, and generally use chloramine for this purpose. The SMR, the big cooperative organization which supplies milk for Stockholm, has developed its own formulations for detergents for manual and circulation cleaning. They looked good, but some of the milker inflations seen were not too clean.

One useful practice was noted in Britain which is much commoner there than in North America. This is the "defatting" of inflations by soaking one set for a week in 5% lye solution while the alternate set is in use. There is ample evidence that this not only increases the useful lifetime of the rubber but also helps limit bacterial buildup, especially as the inflations become older and the rubber deteriorates.

One great advantage most British producers have is in obtaining water from a municipal water supply. Even in Wales, which is particularly rugged, with many small hill farms, over half of them enjoy this advantage.

While stanchion barns are still the most common, parlor milking is coming into the picture in all these countries, usually with loose housing but sometimes with stanchion barns. In all these countries, farmers are sharp men with a pencil, and they are out to cut production costs wherever they can.

It was a bit of a shock to find raw milk still being bottled in Finland and in Britain. Around Helsinki there are 50 "elite" farms producing what is in essence certified milk; farms are under close veterinary supervision and milk is shipped to the city for bottling in two of the most modern plants I have seen. In Britain, on the other hand, milk is still being bottled on the farm — in fact, in Scotland, one out of every four farms was doing this. This would seem a rather risky procedure even if all cattle were free from tuberculosis and brucellosis, but this is not the case. Although Scotland is now free of bovine tuberculosis, England and Wales have some distance to go before this goal is reached. As to brucellosis, no one there seemed greatly concerned over it. The veterinarians said the medical men refused to recognize any health hazard there; the medical men claimed the veterinarians refused to take it seriously. Although in England and Wales around 98% of milk is now pasteurized, the amount of raw milk sold still presents a public health problem. Incidentally, Finland was clear of bovine tuberculosis 20 years ago, and of brucellosis 10 years ago. Denmark is also clear of both diseases. Mastitis received keen attention, especially in Denmark, but in Britain interest is spotty.

Attitudes toward quality improvement also varied from one country to another. Denmark, Norway and

Finland are keen to get counts down as low as is reasonably possible. Sweden seemed less concerned, although SMR shippers received a progressively lower price as the bacterial content increased. Scotland, proud of the fact that their milk quality is superior to that south of the border, seeks stiffer standards, especially for bulk milk. (Aberdeen was considering limits of 10,000/ml total count, no coliforms in 1 ml.) In England and Wales, neither the trade nor the powerful Milk Marketing Board, which represents all milk producers, shows interest in stiffer standards, although a penalty for high count milk is to come into effect on October 1st, 1963. Several authorities estimated that so long as the cows and equipment were reasonably clean, and the pasteurized product had sufficient shelf life to satisfy the consumer, they could see no justification for asking the farmer to spend additional money on better equipment or more thorough cleaning. However, British authorities place much more emphasis on the non-bacterial aspects of milk production, while we perhaps tend to go too far in the opposite direction. Both might advant-

Fig. 5. Old-style "byre" in Ayrshire, Scotland. Note the good lighting and ventilation.

Fig. 6. New 100-cow stable near Stirling, Scotland. This is being equipped with plastic covered sponge rubber mattresses.
gageously move to occupy a common ground somewhere in between.

During the day spent visiting farms south of Copenhagen with Dr. S. J. Olsen, technical director of the famous Trifolium Dairy, I was quite disturbed at the evidence of discouragement among the producers. Because most of Denmark's milk goes into butter for export, and because prices have been low, the returns to the farmer, even when shipping to a pasteurizing plant, have been much lower than for other farm products, and farmers are going out of dairying. On one of the large estate farms, a fine barn built to hold 120 cows was half filled with bacon hogs. Farmers also find it very hard to get competent help. Denmark has no unemployment problem, and the lure of well-paid city jobs is causing many to desert the farms. The small farmer who cannot expand his operations enough to warrant going into bulk handling is, in many cases, selling off his cattle and devoting his efforts to other lines. The Trifolium Dairy has been the leader in milk quality improvement in Denmark, and does a great deal to help combat mastitis. Producers are paid on the basis of Standard Plate Count, (3 per month), thermorufic count (monthly), leucocyte count and sediment (weekly).

It must be remembered that these are one man's observations on a limited number of farms, nearly all of which were selected and the farmer notified of our impending visit. While this had its advantages in having the farmer there to talk with, to say nothing of the very tasty refreshments we enjoyed as a consequence, I might have obtained a somewhat different impression on some of the farms had I been able to make surprise visits. On the few occasions where I was able to do this I saw more unclean equipment and other faults than I did on the "official" visits. However, apparently it is not the custom over there to make a farm inspection without warning, so we were merely following traditional practice.

In retrospect, I believe the biggest difference between the thinking in Northern Europe and on this continent regarding milk production is that we tend to emphasize the bacteriological quality of the milk and to place less emphasis on the esthetic aspects such as the general attractiveness of the farmstead, cleanliness of stable and cows, paving of yards, etc. Perhaps we have been remiss here from a public relations standpoint. There is no question in my mind that the consumer or casual visitor would get a much more favorable impression of dairy farming from the farms I visited than they would from an equivalent number in many parts of North America. With a heavy surplus of milk, we should be doing all we can to increase consumption of milk and its products. If we can encourage producers to make their farmsteads more attractive, this should help improve the consumer's image of dairy farming. As long as there are dairy farms, whether they are producing milk for fluid or manufacturing purposes, which create a bad impression, just so long will the dairy industry be in an unenviable position. Let's all do what we can to bring about the necessary improvements.

SPECIAL FEATURE

OUR HERITAGE — 50 YEARS IN RETROSPECT

The Fifth Decade

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Dr. Kenneth G. Weckel was born in Canton, Ohio, where he attended public school and had his first experience with the dairy industry. He was "raised" in small milk business operations in Canton and Massillon during the period from 1911 to 1923. The following two years ended his ties with the Buckeye State after having worked in the southern portion around Portsmouth in the brick plants.

What has turned out to be a very satisfying relation-ship with the University of Wisconsin began in 1926 when Dr. Weckel first entered as a student. He received his Bachelor of Science degree in dairy industry in 1931; his Master’s of Science and Ph.D. degrees in 1932 and 1935 respectively from that same institution. Upon earning his Ph.D., Dr. Weckel became associated with the University of Wisconsin in another role — that of professor. He joined the staff of the Department of Dairy and Food Industries in 1936 and has remained with the school since that time.

Dr. Weckel has served as an officer of various organizations allied with the dairy industry and has worked very closely with them. He has been: President (1951), International Association of Milk and Food Sanitarians; President (1935-37), Wisconsin Milk and Food Sanitarians;