The Milky Way

THE MILKY WAY
WESTERN ELECTRIC RECORDING

DIRECTION
DONALD RAWLINGS
CAMERA
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SUPERVISION
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SOUND
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PRODUCED FOR UNITED DAIRIES LIMITED
BY WALLACE PRODUCTIONS LIMITED

The milky way flows from the breeding of fine cattle through the hygienic and scientific treatment of the milk to the daily delivery by the milk roundsman. And even he has his problems.
"Windecott one pint, Wandred-Haye one pint, Mrs. Arch-Howards, her kid's home from school, that's a pint and a half extra.

- Milkman!
- Oh, good morning, Mrs. Harris. I wonder what the old battle-axe wants this morning. She's the one square peg in the whole round, and I'll bear that. I'm coming.
- Well, how's the cow behaved today?
- Perfectly, Madam. Here we are. One pint of full-cream milk fully tested for butterfat and adulteration, pasteurised to kill all dangerous bacteria, and delivered to your doorstep in an airtight, sterilised bottle.
- When I lived in the country, we had just honest-to-goodness milk from cow to bucket and bucket to jug and none of this nonsense with machines.
- Times change, Mrs. Harris. Can't take risks with the people's milk these days. 'nother pint tomorrow.
- Pasteurisation. Sterilisation."

So often, milk is just accepted for what it is: a clean, wholesome product. So seldom, however, is it realised how much is done to ensure that healthy state of affairs.
Every day, the British public drinks between three and four million gallons of fresh cow's milk: one of the richest and most nourishing of all our daily foods. The very richness of milk was once a danger, for milk will nourish germs, which would not thrive in foods of lesser value. The problem was to kill the harmful bacteria in milk without destroying the milk's food value. In the laboratories, this problem was solved by pasteurisation, which was introduced at the beginning of the century. Infant mortality rates tell an amazing story.

INFANT MORTALITY IN LONDON 1911 ONWARDS RATE PER 1,000 LIVE BIRTHS

Taking a period of 30 years from 1911, the annual infant mortality rates show impressive declines. In 1911, of children born in the London area, the annual infant mortality rate was 129. A steady fall then took place: the result of improvements in housing, sanitation, post-natal care, and food hygiene. This fall continued and 30 years later, the rate was down to 59.

In 1911, in the summer quarter, infantile diarrhoea carried off babies at the rate of 203 per thousand. Raw cow's milk was blamed. Again, a fall took place. Pasteurisation, which was safeguarding London's milk supply, completely changed the position. And by 1921, the rate had fallen to 90. Since then, the summer quarter has been the healthiest for babies and the mortality rate is still falling.
Now, pasteurised milk, accepted as the guarantee of safety was of vital importance to children's health during the late war. A government report stated that school milk was one of the main factors in Britain's schoolchildren gaining an average of half an inch in height and two pounds in weight during those war years.
But, to maintain a steady supply of safe pure milk demands an intricate and highly skilled organisation, in which farmer, scientist, and dairyman all play their part. For the milky way from cow to consumer is a ceaseless vigil of inspection, testing and control every hour of every day. Without the farmer, there would be no milky way.

ACCREDITED MILK

This label is the seal of a good dairy farmer. For like every other high-grade commodity, milk must have good beginnings. And these take place on the farm. All the pasteurising plant in the world would be useless without healthy dairy herds milked under the best, hygienic conditions.
And that's a farmer's job.
He gets expert advice from the Ministry of Agriculture and his County Committee, and every help and encouragement from the advisors appointed by the dairies who are going to take his milk. These advisors are often men with wide local knowledge. And they've modern research organisations to back them. But valuable as their help is, in the long run, only the farmer himself can improve his herd. He must use his sound instinct and long experience in selecting a bull to sire his calves, choosing one whose dame and grand dame gave high yields of good quality milk.
After the cows are born, they must be reared and looked after for 2 to 3 years until they in turn calve and come into production. Then, the health of the grown herd must be constantly watched. Cattle are passive and on the whole very hardy. They like the open life in field and meadow, and only in severe weather seek the shelter of enclosed yards and sheds. Much depends, not only on the type of country where they are situated but on the farm facilities and the clean, airy sheds. But, inside or out, cattle, like human beings are liable to become ill, and if the complaint's infectious, may pass it on. So on every farm, the veterinary surgeon is a regular visitor.
The most common diseases among cattle are tuberculosis, contagious abortion, and mastitis: a disease of the udder, which affects the compositional quality of the milk. Cattle which fail the veterinary surgeon's tests must be isolated until they get well or removed from the herd altogether. Normally, the life of the cow is centred on its food: the raw material, which the cow's factory in her stomach will process into precious milk. In summer, this is the lush grass of meadow and pasture.
Because of this, the cow has always said: "Go west young woman, go west," for the generally heavier rainfall on our western counties means richer pasture and a heavier yield of milk.
So it's in settings such as these in the West that many of our finest dairy herds will be found such as Guernseys and Jerseys which give the richest milk. Shorthorns, Frisians, and Ayrshires. Here too is a concentration of country depots where the milk is collected from the farms, tested and cooled before dispatch to London and provincial towns.
But, to return to food, grass is not the whole of the cow's diet. In winter, she eats hay, turnips, mangles, kale, oats, and other foods, which may amount to as much as a hundredweight a

day. To obtain maximum milk yields, diets must be balanced between proteins, fats, and carbohydrates. And to help balance a ration, concentrated foods such as cow cake is given. The quantity each cow receives depends upon the weight of milk she is giving at the time. A cow in full milk giving 5 gallons per day, will drink as much as 25 gallons of water, and in modern sheds, automatic bowls maintain a constant supply.
This then is the dairy cow: a heavy eater and drinker too, but still a quiet stay-at-home. From now on, the milky way is man-made: and it starts with the milking.

"Milking. As I was saying to that milkman this morning, I don't hold with all them fancy notions. Machines is all right for some things, but they ain't good enough for nature. Now, in my days, it was straight from the cow to the bucket, and no nonsense. There were no busybodies in and out to see whether you'd sterilised the utensils. Well… and what's wrong with good honest dirt, I want to know? The cow didn't mind, I'm sure. As for the cowman, what was good enough for his father, was good enough for him. And what the public don't see, they don't worry about. A cow, a pair of hands, a bucket, and somewhere to keep the milk out of the sun. That's all we bothered about."

In modern dairy farms, whether small or large like this, clean cows, sterile utensils, clean hands, and immediate cooling: these are the four rules of modern safe milking whether by machine or hand. Hand milking usually takes place in the cows' winter quarters and plenty of light and air are essential for good health. For easy cleaning, mangers should be low, standings short, and dung channels deep.
But even more important than the buildings are the methods: cows must be clean. Flanks and tail must be washed and the hair on these parts should be kept short by periodical clipping. Particular attention is paid to the udder. Herdsmen must be clean too and after washing down the cows, they scrub their own hands and put on clean overalls. When the actual milking starts, the first drop of milk from each teat, called foremilk, is examined in a strip cup and discarded. Any clutch found would indicate mastitis. Abnormal milk need not necessarily be wasted, but after boiling, could be fed to cows or pigs. Practised herdsmen are quite high-speed workers, they can deal with 8 or 10 cows an hour. The cattle themselves are usually fed at this time with a balanced diet of concentrated food.
The milk from each cow is weighed immediately and the yield entered on to the official record. This is how Minnie weighs in for the championship.

MILK MARKETING BOARD

Then, the milk is taken to the cooler in pails with tight-fitting lids to keep out dust. The temperature is quickly reduced over the cooler, and the milk flows into a sterilised churn. Immediately after milking, utensils from buckets to cooler are rinsed in cold water and have a thorough scouring with hot water and a detergent. They are then given a further rinsing in clean water, before they are put into a steam chest for sterilising, where they remain to dry until the next milking.
Automatic milking is often carried out in what is called "the parlour". The udders are washed and the foremilk discarded as for hand milking before the teat cups are fixed and the milking begins. The milk is sucked into a glass container above each cow, thence it flows to another container. These are immediately above the cooler. Here, the temperature is reduced by 30 to 40 degrees Fahrenheit in a few moments and the cold milk flows into the sterilised churns below.
But sometimes cattle are too far afield for them to be brought in for milking, so the milking parlour is taken to the cow instead. This portable parlour has the odd cricketing name of

"bale", which is understandable since the idea came from Australia. The parlour can follow the cows as they move to fresh pastures. It's certainly a great advance in out-field milking and automatic milking is employed. Automatic ejection of the cow simplifies traffic arrangements too.
The cooler in the adjacent trailer is operated by circulating the water through a large outside tank to reduce temperature so that once again the now-cooled milk flows into the sterilised churn beneath.
From shed, parlour or bale, the milk is taken to farm collecting points. It does not remain there very long before the lorry from the depot collects the churns. These lorries have a regular collection service and as the full churns are loaded, clean, empty churns are left in their place. Yes, the seal of a good dairy farmer means that the milk in these churns has been obtained from healthy cows under the best hygienic conditions. The farmer has done his job, and a good job it is. Yes, and he's proud of his herd too.
Now, it is up to the dairyman to deliver that milk safely and quickly. So, from collecting points dotted all over the countryside, the lorries, on their regular service convey the milk from the dairy farms to the country depots. The dairyman has now taken over. The job of the country depots is the immediate testing of the milk, its cooling and then its transfer in bulk to rail or road tankers. To ensure a constant check, the churns are unloaded in groups from each farm. As they are taken off the lorry, dairymen with long experience smell each churn. These smellers acquire a highly developed sense: one able to detect the slightest variation in aroma. Doubtful churns are marked to be set aside for further tests before being accepted or rejected. The accepted milk is poured into a tipping tank to begin its quick journey through the depot. The milk is pumped through the cooler which reduces its temperature to just above freezing point. From the cooler, the milk flows along pipes out of the building to the adjacent sidings. Here, sterilised glass-lined or stainless steel tanks are ready to receive it. Each of these tanks hold 3,000 gallons of cooled, fresh milk, and soon, they will be on their way to the town processing depots.
But what has happened to those doubtful churns?
A sample is taken so that tests can be made of the temperature, probable keeping quality, and acidity. Country depots have their own laboratories for these tests. Will the milk keep? This depends upon the number, type, and activity of the organisms present in it. A quantity of the milk sample is put into a test tube. It is going to be submitted to the resazurin test.
One millilitre of violet resazurin is drawn and added to the milk in the test tube. This is held in a heater at blood temperature for ten minutes. During this ten-minute incubation period, a colour change takes place. The extent of the colour change can be measured, and after the milk and resazurin solution has been taken out of the heater, it is put in a comparator so that its colour can be matched with one of a number of differently tinted glass disks. The result of this matching will indicate whether the milk will keep or whether it must be rejected and returned to the supplier.

FARMERS' MILK REPEAT INSPECTION

Is the milk beginning to sour? 10 millilitres of milk sample are put into a white basin, and a small quantity of phenolphthalein is added. Then, into the mixture, a standard solution of caustic soda is run until the phenolphthalein changes colour. The amount of soda solution required to neutralise the acid in the milk is read on a graduated scale, and tells us the degree of acidity. But not only doubtful milk is tested. For instance, every farmer's milk is examined once a fortnight for butterfat content. Again, 10 millilitres of the milk sample are added to some sulphuric acid in a special Gerber tube. This, by the way is known as the Gerber test after the man who originated it. Into the tube is mixed 1 millilitre of amyl alcohol. After

shaking, to enable the acid to dissolve the milk solids and free the fat, the tube is placed in a centrifuge. The action of the spinning for 5 minutes separates the fat from the remainder of the liquid. When the Gerber tubes are taken out, they are placed in warm water for 3 minutes to ensure the fat remains liquid, and so can be measured. The quantity of fat is indicated on the graduated scale of the tube as a percentage of the total milk.
Other routine checks are also carried out, all of them to ensure that there is very little chance of milk below standard leaving the depot. But it is not only the milk which must be watched like this. The churns too must be above reproach, so off they go for washing and sterilising. You will remember that when the milk is collected from the farmer, his full churns are replaced by empties. These must be thoroughly clean and dry, so that the farmer can use them without further treatment. So they come from the machine ready to be taken to the farm collecting point.
Even the efficiency of the churn washer is continually checked and at regular intervals churns are tested. A sterile solution is introduced, and the churn rolled to swill the solution round inside.
This solution is subsequently tested in the laboratory to determine the efficiency of the churn washing. The same care is taken with every piece of equipment. It is thorough washing and sterilisation all the time. So the quality and cleanliness of the milk is ensured before the tankers, whether rail or road, commence their journey to the processing depots.

"And I had another word to say to that roundsman again this morning. Him, with his pasteurisation."

It even took officialdom a long time to recognise the value of pasteurisation. It was in the 1870s that Louis Pasteur made his discovery leading to the processing of milk which bears his name. He found that micro-organisms, yeasts and bacteria brought about fermentation, which is the cause of the souring of milk. Even more important, he discovered that these could be killed by holding liquids in which they live at temperatures intermediate between blood heat and boiling point: pasteurisation was born. Later experiments established the fact that the time of holding is as important as the temperature.
It was a long struggle before pasteurisation received official recognition. But today the most modern plant for the pasteurisation of milk is to be found in all big processing depots.
From the moment the milk arrives at the processing depot, the handling of it is a triumph of industrial organisation. Because of the insulation of the tank and the large volume of milk, the temperature seldom rises more than 2 or 3 degrees during the journey, so the milk remains sweet and fresh. After the temperature has been checked and the milk agitated, samples are taken for tests in the laboratory. They are similar to those you have already seen in the country depots. When results of these tests are known, the milk is pumped straight into storage tanks. But any tank which has failed on the laboratory tests is returned unemptied to the country depot from which it came. Such an occurrence is naturally rare in view of the care taken at the country depots.
The storage tanks are also of 3,000 gallons capacity. It is easy therefore, for the technical controller to keep track of any specific tank of milk right up to the time it reaches its final container: the milk bottle. But these tanks act only as a balance between rail or road tanker and the pasteurising plant. There are two methods of pasteurisation officially recognised. In one, the milk is held at a high temperature for a short time. The principle is easy to understand, but its application may appear a little involved. So we'll try to explain it by a simple diagram of the HTST or High Temperature Short Time pasteurising plant.
It has 3 basic parts: the heater, the holder, the cooler. Let us start with the raw milk. This is fed from the storage tanks, which you have already seen, into the balance tank and thence to

the milk pump. It is from this point that the processes leading to pasteurisation begin, and a continuous flow of milk is obtained. From the pump, the raw milk flows through the regenerator, which has a double purpose. To explain this, we'll glance at the real thing. The regenerator, like the heater and cooler, consists of thin corrugated plates clamped together. Double lines of channels are thus formed. In this way, the cold, untreated milk flows on one side of the plates and is warmed by the hot milk returning on the other side. The hot milk is, in its term, partially cooled by the cold raw milk. From the regenerator, the warmed milk passes to the heater where its temperature is raised by hot water running through adjacent channels to 162 degrees Fahrenheit: well below boiling point. The hot milk then passes to the holder. Actually, the hot milk goes through in a continuous flow, its passage taking 15 seconds, during which its temperature remains constant. Above is the temperature controller. This temperature controller ensures that, should a drop in temperature occur, a flow diversion valve comes into operation. A drop in temperature of even less than one degree is sufficient to bring the flow diversion into operation. This directs the milk back to the balance tank to start its journey all over again. The flow of raw milk from the storage tank is, of course, immediately stopped. With the regaining of temperature, the diversion valve closes, and the flow of hot milk continues to the regenerator where it is partially cooled by the raw milk passing through. The last phase of its journey is through the cooler, where its temperature is reduced to about 40 degrees Fahrenheit by brine or chilled water and out towards the bottling plant.

The second method of pasteurisation, known as the "holder system", is still widely used. This time, the milk is heated to 145 instead of 162 degrees Fahrenheit, but it is held for 30 minutes at this temperature. Where in the HTST method, the milk flowed continuously during its 15 seconds holding, in this system, it is held stationary for 30 minutes in these tanks, which are automatically filled and emptied in rotation. Whichever method is used, the milk from the pasteuriser is tested every half hour to ensure the pasteurisation has been efficiently carried out.

The test used is the phosphatase test, which is based on the fact that phosphatase, one of the minor constituents of milk, is destroyed by the pasteurisation process. The object therefore is to find out how much phosphatase remains in the milk after pasteurisation. The test is highly sensitive and somewhat complicated. But briefly, the milk sample is treated with various chemicals to obtain a blue-coloured solution. This solution is matched against several coloured glass disks in a comparator, and it should not be deeper in colour than a pre-determined standard.

Efficient pasteurisation is the only way to make certain that all pathogenic organisms have been killed and the milk made safe. Equal care must be taken to check that all equipment is up to standard too. Every piece is taken apart and cleaned and sterilised daily. To make certain that this work is properly carried out, swabbings are taken regularly for bacteriological examination in the laboratory.

UNITED DAIRIES
CENTRAL LABORATORY

The Central Laboratory is responsible for the supervision of the control laboratories at each depot. The examination of independent samples taken to check the working of these control laboratories is also carried out. Then, it's the centre for research and advice and information for scientists, farmers, dairymen, and everyone engaged in milk production.

Sometimes routine tests have indicated the possibility of adulteration, and samples are submitted to the central laboratory for a freezing point determination. To obtain the exact freezing point, a thermometer graded down to one thousandth of a degree centigrade is

necessary. A freezing point higher than normal by even a fraction of a degree is definite proof that water has been added.
Besides the many routine tests carried out by this organisation, milk samples are sent regularly to an independent hospital for a tubercle test. These regular and independent tests pay a remarkable tribute to pasteurisation, for in 12 years, not one single sample of pasteurised milk has given a positive reaction. Local authorities also carry out tests on samples taken by their inspectors from depots and roundsmen. This is a valuable independent check on the working of the dairy.

CERTIFICATE
METROPOLITAN BOROUGH OF HAMMERSMITH
PHOSPHATASE TESTS
SATISFACTORY

When pasteurised milk goes into the bottle therefore, it is absolutely free from any disease-producing organisms. The safest and most valuable food for everybody. In the great bottling rooms, the various filling machines handle any size of bottle from 1/3 of a pint for schools, to a quart. The machines are entirely automatic. Bottle caps are stamped out from an aluminium strip. They are air and dust tight, and cover the lip of the bottle. The bottles are crated by hand and pass along the conveyor belt to the loading dock.
Here, the large capacity trucks and trailers are waiting. One big Scammell can carry 9,000 pint bottles. Processing depots may bottle for 16 hours a day, and many deliveries to distribution depots take place at night.

At these depots, the milk is often received only an hour or two before the roundsmen set out. But whatever the time, the milk goes immediately into the cold store. From here, the roundsman will soon be loading it onto his van for quick delivery to the housewife.

Van design has varied frequently during the past few years. The aim is to ease the tasks of the roundsman without sacrificing carrying capacity. While many vans are still horse-drawn, the electrically propelled truck is being increasingly used. Soon, the roundsman will be on his way to deliver the mornings' milk and collect the empty bottles.

"Bottles? Farmer, scientist and dairyman have played their parts in delivering fresh, safe milk. What about the consumer? What about the bottles? In this house we can tell the housewife is sensible. Keeps her milk in the refrigerator or uses the simple device of standing the milk bottle in a large bowl half-filled with water and surrounded by a piece of wet flannel. This makes quite an efficient home-made refrigerator. These bottles tell another story. You wonder why nobody even rinsed them, and you can imagine what sort of a housewife lives inside.

MON REPOS

She means well, but is of the aimless type. Puts the milk down anywhere, just doesn't use her common sense. Picks it up hours later and wonders why the heat has made it go off so soon. But bottles like these are not only unrinsed, they're stained and dirty. That residue of milk will breed dangerous germs. You might ask: who would return bottles in this state?"

"Well…

- I'll have to put these on one side, Mrs. Harris. Can't mix these with ordinary empties.

- Oh, indeed.
- Back at the depot, they'll be specially washed, sterilised, checked and tested for bacteria, and then we'll see if they can be used again.
- So, just because my old man takes an odd milk bottle to his workshop, and little Alfred takes one tadpole fishing, I suppose the whole of London's blooming milk's going to stop.
- Mrs. Harris, chaps like me are collecting and delivering several million bottles every day. All we ask you to do is, please, to rinse the bottle as soon as it's empty. Look, here's something that tells you all about it. My job, and the chemists', and the farmers'. It's a film show called *The Milky Way*. It's on at the hall this afternoon. Now, if you've got a moment to spare, I...
- Well, who would have thought I'd have to go the pictures to see what cows on a farm look like. Still, it is something for nothing."
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Unfortunately, Mrs. Harris is not alone. Too many bottles are still returned almost unusable. Others come like this, with straws and caps pushed in by schoolchildren. Even horse chestnuts have been forced in. Some people, like Mr. Harris, keep oil and paint in their milk bottles. Others use them as flower vases: clean perhaps, but out of circulation. To keep the milk supply going, bottles must be rinsed and returned promptly.

While the roundsman puts Mrs. Harris's bottles on one side for special treatment, let us follow the ordinary empties on their journey through the normal washing machine. The machines are fully automatic and work wonders with the bottles. So that after thorough washing and sterilising, they emerge the other end clean and sparkling. Skilled examiners watch for any damaged or improperly washed bottles. As this machine is part of a production line, it is impossible for any bottle to go to the filling room without having passed through the bottle washer. So every hour of every day, the milky way flows on.
From the healthy herd, milked under ideal conditions, to the collecting points, through the country depot, on its journey to town, through the pasteurising plant, and the laboratory test, through the great bottling rooms to the retail distributing depots, and finally to the prompt and courteous delivery of a new day's milk.

THE END

A WALLACE PRODUCTION

Transcript: Thibault Riegert & Michael Craig