Applied nutrition

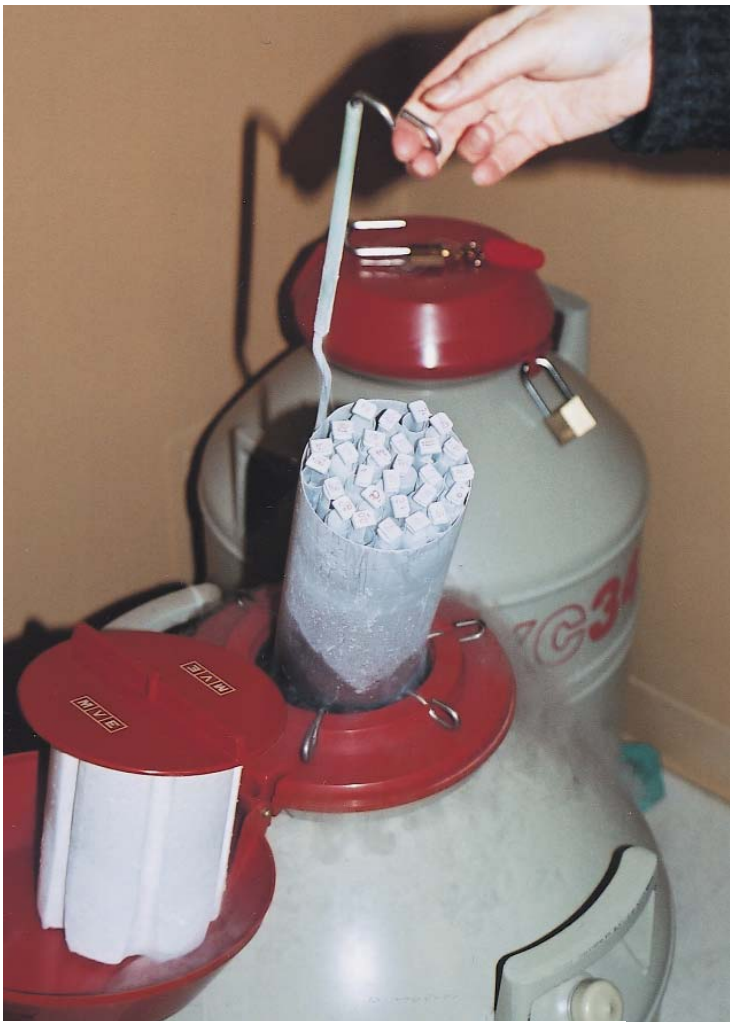
Lallemand: satisfying consum

Consumer whims make it difficult for companies to create long-term strategies. But certain trends in consumerism can be identified. One certain: antibiotics are out. Alternatives flood the market. For Lallemand it is yeasts and bacteria that they are building their future on.

By Dick Ziggers

The ban on antibiotic growth promoters in Europe and the recently introduced bill to phase out routine feeding of antibiotics to healthy animals in the US is grist to the mill of probiotic manufacturers. One such manufacturer is Lallemand. Based in Montreal, Canada they have dedicated their development, production and marketing of the animal nutrition and health division to yeast and bacteria for agricultural applications. Lallemand anticipates on these developments by providing innovative non-antibiotic products to the industry. To fulfil their corporate strategy "to be a leader in yeast, bacteria and their specific derivatives" new developments are backed by a strong emphasis on research. Richard Degré, vice president R&D explains. "Our total turnover is around CAN$300 million, of which two thirds comes from the bakers yeast divisions and CAN$100 million from the special yeast and bacteria divisions. Annually we invest close to ten percent in research. Each of our yeasts is fingerprinted for its DNA, so we know exactly what strain we are working with. We co-operate with different universities throughout the world. They select the yeast strains typical for particular application or specific to regional conditions."

Lallemand was one of the first companies to take advantage of the research facilities of the Biotechnical Research Institute in Montreal. This institute was founded in 1989 and is owned by the Canadian government with the aim to bridge the gap between fundamental and applied research. Here Lallemand established their DNA fingerprinting techniques for yeast. From this location, Ann Dumont co-ordinates some 100 research projects going on all over the world. Her laboratory has a collection of 850 strains of *Saccharomyces cerevisiae* of which 260 strains are directly available for production. The latest techniques used to identify the different strains are the so-called micro-arrays, which are one step beyond DNA fingerprinting.



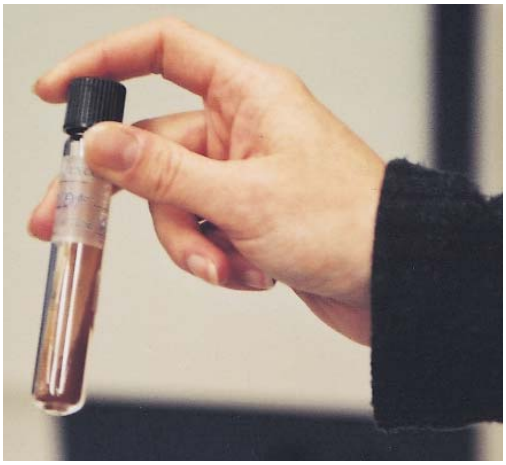
The yeast 'embryos' of Lallemand are stored in liquid nitrogen.

Yeasts and bacteria

Lallemand's animal nutrition and health activities began in 1988 with the acquisition of the Equilait/Equipharm bacteria plant in Aurillac, France. North American activities began in 1993 with the acquisition of the direct fed microbials and silage inoculants business of Quali Tec in Chaska, Minnesota. The business has grown rapidly through a combination of acquisitions and internal development to become a major supplier of probiotics, silage inoculants and yeast derivatives in Europe and North America.

Lyophilised (freeze-dried) bacteria are produced at plants in Aurillac (France), Milwaukee, Wisconsin (USA) and Montreal (Canada). Active dry yeast is produced in Montreal and Grenaa (Denmark) Yeast and bacteria are micro-encapsulated for enhanced thermo stability in Toulouse. Inactive yeast is produced in Montreal and Tal-

ers with yeasts and bacteria



Basic volume to produce 50 tonnes of fresh yeast.

Fermentation and harvesting of fresh yeast at plant in Montreal.

Vice president Richard Degré: "We have a strong focus on research and development. Annually we invest close to ten percent of turnover for this goal."

inn (Estonia). Blending, packaging and warehousing facilities are located in Milwaukee and Louverné (France).

Where Lallemand's Rosell Institut focuses on bacteria products for the human sector, the company conducts its R&D for the animal sector through a combination of internal projects and external collaborations. More basic genetics and fermentation research is done in Lallemand's laboratory at the Biotechnology Research Institute in Montreal. Process development and scale-up is done at the Toulouse laboratory in France and the Montreal pilot plant. More basic animal nutrition work is done by Lallemand researchers working at the INRA (French National Research Institute) facility in Clermond-Ferrand.

Applied work for animal nutrition and silage inoculants in Europe is done in collaboration with several research institutes in France, UK, Germany and Spain.

The Animal Nutrition and Health group is dedicated to the development, production, and marketing of yeast and bacteria for agricultural applications. Core products are lyophilised (freeze dried) bacteria for probiotics and silage inoculants, active dry yeast for probiotics and inactive yeast mineral supplements. The division also supplies a range of related animal health and nutrition products, including yeast cell fractions, diet acidifiers and nutritional gels.

Commercial bacteria production varies between aerobic fermentation to the opposite end of the scale, total anaerobiosis, depending on the type of organism used. Bacterial cell biomass is enlarged in the laboratory, then transferred to the plant where it is grown under fully aseptic conditions. The growth media can either be synthetic based or dairy based. After growth the cells are concentrated through centrifugation, then either frozen of lyophilised for packaging and sale. Dry bacteria can be sold as a powder or in capsule form.

Enriched eggs

An example of inactive yeast with fortifying properties is yeast that contains 2,000 ppm of selenium in an organic form (selenomethionine). In a test in Ireland layers were fed this product to improve the selenium concentration in the eggs. A feed containing 0.44-ppm selenomethionine was fed to one group next to a control feed for the other group containing 0.15-ppm selenite during a two-week period. The eggs from the selenomethionine fed hens contained almost a double concentration of selenium in the egg and on a dry matter basis.

In Ireland the Irish Free Range Producers Association has converted 35% of their flocks to this niche

market of fortified eggs (containing more omega 3 fatty acids, vitamin E and organic trace minerals, such as selenium, magnesium and zinc). The Irish Food Board has approved the eggs for 'healthy heart' claims. These so-called Mega Eggs are retailed to the consumers at around 20-25 pence per dozen dearer than regular free-range eggs.

Creamier milk

In the dairy and beef sector silage forms a major part of the diet of the animals. For quality reasons certain product can be added at harvesting to improve conservation. Lallemand produces forage inoculants that are mixtures of lyophilised bacteria that encourage the fermentation of forage to silage. They contain proprietary strains of lactic acid bacteria and propionic acid bacteria in combinations for grass silage preservation and corn silage aerobic stability.

Compared to traditional formic acid the inoculant improves the smell of the forage, which was defined as more intense and fruitier. Mushroom and paper smells are reduced. In a test cows preferred the inoculant treated silage. Silage dry matter intake increased and consequently the daily energy and efficient protein intake increased, resulting in an increase of daily milk production of 0.6 litres per cow per day. Protein and fat content of the milk were unaffected.

On a consumer level there was recognition and preference from milk coming from cows fed the inoculant treated silage. This difference was also observed on the cream due to a concentration of aroma. Consumers judged the cream as being thicker, more homogeneous and smoother. They found the taste sweeter, tastier and recognised the taste of plants.

Tastier ham

In France, Lallemand carried out an extensive test with a probiotic to improve the quality of pork. Several French companies active in the pig sector (*Figure 1*) participated in the test. The study was carried out to answer consumers' requirements and to create a model of quality improvement.

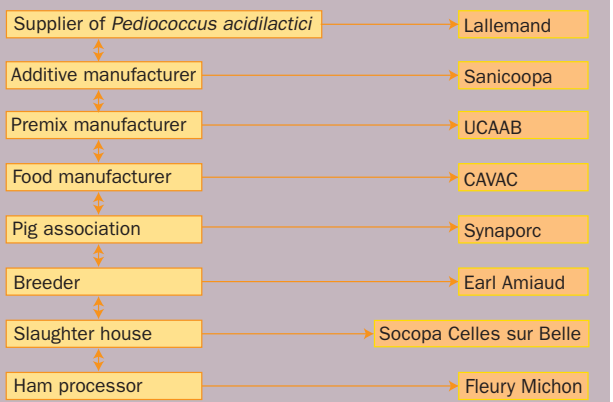
The product used is a lyophilised (freeze-dried) bacteria (commercial name: Bactocell) that either can be used as a probiotic or direct-fed microbial in feeds for monogastric animals. The probiotic contains the Pasteur Institute MA 18/5M strain of *Pediococcus acidilactici* in a concentrated form. The strain was selected specifically for monogastric feeding programs based on

Founded in Montreal by the end of the nineteenth century Fred Lallemand began importing bakers yeast from the US in 1921 and in 1923 started its own production of fresh bakers yeast. Fred Lallemand was a young immigrant who left his native Alsace province after the Franco-Prussian was of 1870-71. Until the end of World War I the Alsace belonged to Germany (now to France) and Fred had a German family name, which the French-speaking people of Quebec found difficult to pronounce. So they called him "L'Allemand", which is French for "the German". Fred adopted this nickname and named his company also Lallemand.

The company further developed to a major supplier of bakers yeast and yeasts for use in fermented beverages. Over one hundred strains of the latter are documented and kept in store for the beverage industry. With the creation of Macco Organiques organic acids came into the portfolio of the company. In 1988 Lallemand cooperated with Institut Rosell of Montreal to develop lactic acid bacteria for Champagne production. As a result they purchased Equilat/Equipharm, a bacteria-producing laboratory in Aurillac, France. This facility also produces a wide range of bacteria used in food, bakery, human health, feed and animal health applications. Further acquisitions in the field of the silage and probiotics business followed by take overs of Quali Tec and Laporte Biochem International in the USA, and Institut Rosell in Canada. On the yeast side several companies in different parts of the world were acquired. The most recent acquisition is the take over of Biotal in the US and the UK. This company was bought because of its sales experience and comparative products. Biotal specialises in direct fed microbials and silage inoculants.

Today Jean Chagnon who took over from his father Roland runs the company. Although Chagnon senior is 92 years of age, he still visits the plant in Montreal several times a week.

Figure 1. Participating companies in probiotic study



At the Biotechnical Research Institute in Montreal Lallemand was one of the first to rent research facilities. Many others followed.

Table 1. Ham processing characteristics

Fresh ham	Ham from pigs fed blank feed	Ham from pigs fed probiotic in feed
Ham weight (kg)	10.65	10.74
Ham pH	5.86	5.91
Ham pH >5.7 (%)	86.67	88.44
Ham pH >5.6 (%)	98.84	99.13
Technological output (%)	97.4	99.22
Cutting output (%)	85.87	89.66
Overall output (%)	83.71	88.94
Fat >20 mm (%)	4.1	3.8
Dry matter (%)	25.75	29.5
Free lipids (%)	1.9	1.85
Proteins (%)	23.35	23.5
Collagen (%)	0.59	0.58
Iron (µg/g muscle)	2.86	3.07
Cooked ham		
Water content (%)	72.37	73.32
HPD protein content (%)	75.62	76.14
PCL collagen content	20.83	20.24
Soluble carbohydrates (%)	0.56	0.56
Phosphates (%)	0.43	0.47
Cooking loss (%)	19.76	18.84

its pH tolerance and ability to convert a wide variety of sugars to lactic acid.

Two groups of 220 pigs in independent rooms were either fed a blank feed or a feed containing the probiotic at 1.10^6 cfu/g feed. On a zootechnical level the probiotic fed pigs reached a daily weight gain of 849 grams versus 828 grams for the blank group. Total gain for the probiotic group was 66.2 kg and for the blank group 64.6 kg. The fatty meat rate for the blank group was 58.4 and for the probiotic group 59.1. All these differences were significant ($P<0.05$). Apart from that there was more ammonia detected the house of the blank group than in the probiotic fed group. The acidity of the manure showed no differences.

The most expensive part of the pig is the ham. Therefore it is important to see how the probiotic could affect the quality of the ham. The main characteristics are given in *Table 1*. The results show that the overall quality of the meat from the probiotic fed group outperforms that of the pigs fed the blank feed. In the cooked ham it was also found that there was a better maintain of the slice, the ham was less marbled and the smell was more intense. Cooking loss for the ham of the probiotic fed group was less (18.84% vs 19.76% for the blank fed group). Without changing the ?6/?3 fatty acid ratio the ham from probiotic fed group had a higher rate of long chain unsaturated fatty acids, although the total lipids rate were the same in both batches.

From this test the overall conclusion was that the probiotic could improve the technical and economical results at breeding level. It also could improve the meat quality in the slaughterhouse and in the final product after transformation.

Anticipating on trends

Companies in agriculture need to anticipate on the change of consumer behaviour. In the decision making process throughout the production chain up to around 1999 premix manufacturers and feed compounders decided for the farmers what products to feed. After the banning of antibiotic growth promoters this attitude changed. From around 2000 on the decision making process has turned around and now starts from the distributor of the food products, representing the consumer voice in the production chain. The distributor tells the processing plant what specifications the products need. The processing plant tells the slaughterhouse what the meat should or should not contain. The farmer has to produce according to the specifications of the slaughterhouse, so he tells his feed manufacturer what products he can or cannot put in the feed.

With these examples of using yeast derivatives or probiotics Lallemand tries to anticipate on the changing market and consumer behaviour that can be recognised in the last few years. It shows that on a producer level there definitely are opportunities to anticipate on consumer trends. ●