Sufferers of the debilitating coeliac disease are tasting freshly baked bread for the first time as a result of an innovative partnership between a university and a family-run dietary foods firm. Using the baking technology expertise of staff at South Bank University, Ultrapharm Ltd, of Henley-on-Thames, has produced a range of bread, biscuits, cakes and pastries especially for coeliacs, who have an intolerance to dietary gluten and are unable to digest food made from flour. These products, which are made from gluten-free alternatives but still look, taste and smell like regular food, are being supplied to homes and pharmacies across the UK. Some have been specially designed to suit the tastes of coeliacs in Continental Europe.

The development of these new products, which have had a significant impact on Ultrapharm’s sales, is just one example of how small and medium-sized businesses in the food industry can benefit from collaboration with higher education institutions. Ultrapharm and South Bank worked together under TCS (formerly known as the Teaching Company Scheme), a highly-regarded government initiative which promotes innovation in industry by supporting partnerships between companies and the UK's "knowledge base", including universities and research institutions. TCS covers a wide range of industrial sectors, but as the food-processing industry swings towards the more efficient production of safe, high-quality products in the face of UK and EC legislation, more companies are taking advantage of the scheme.

Exploring novel ingredients and developing new products requires heavy investment of time, resources and personnel. Many small and medium-sized food-processing companies lack the resources necessary to carry out such strategic projects. TCS is a highly successful government scheme that stimulates innovation and facilitates technology and knowledge transfer in most business and industry sectors, including the food industry, by supporting partnerships between companies and the UK’s knowledge base (universities and research organisations and institutions). It also enables companies to recruit and train high-calibre graduates seeking careers in industry.
companies, with the balance met by the participating companies.

TCS Programmes usually last for two or three years and involve the introduction of knowledge or techniques into the company to enable it to improve its management or manufacturing processes, develop new products, implement new technology, develop new skills or open up new markets. This “knowledge transfer” is carried out in the company by able graduates, or TCS Associates, who are supervised by senior staff from the company and the university or research organisation.

The Associates gain valuable industrial experience and, through on the job learning and a series of training courses in managerial, communication and technical skills, are prepared for long-term careers in industry. TCS provides business with a valuable source of future senior managers, as most Associates are offered permanent employment by their host companies at the end of their Projects. Associates also have an opportunity to study for a higher degree during a TCS Programme.

TCS is a three-way process, benefiting not only companies and graduates but also researchers from the knowledge base who are able to apply their expertise to real business problems, refine their knowledge and keep up to date with the latest industrial and business practices in the food industry which they can pass on to undergraduates.

Some 700 Associates working in about 650 companies, and virtually every higher education institution in the UK, are currently involved in TCS Programmes. The food and drink sectors accounted for about 7 per cent of Programmes in 1997-98 during which MAFF committed funding of over £800,000.

Coeliacs receive their daily bread

Ultrapharm, which has been involved in the dietary foods business since 1985, previously imported most of its products from major producers on the Continent, but decided that for its long-term future it should start producing its own foodstuffs, particularly baked products. However, the company needed more expertise in-house to develop new products and needed some technical input.

The company joined forces with South Bank University’s School of Hospitality, Food and Product Management, which incorporates the renowned International Centre for Baking Technology (ICBT). Head of the ICBT, Professor Mike Whieldon, has extensive research and industrial experience in baking technology, plant, raw materials and new product development in the bread and bakery manufacturing industries, and Principal Lecturer Ken Spears is a specialist in food analysis, food chemistry and product development.

These academics supported the work of TCS Associate Karen Kirk, a South Bank graduate in Baking Technology and Process Management, who had previously worked for an ingredients manufacturer. Karen helped to develop new products using gluten-free ingredients and introduced Hazard Analysis Critical Control Points (HACCP), quality analysis and traceability systems, into the business.

The two-year collaboration resulted in a number of new additions to Ultrapharm’s range of gluten-free products. The firm now makes 11 different breads and rolls, two pizza bases, nine cakes, six biscuits and three steamed puddings. Eight savoury and sweet puff pastry products, such as sausage rolls, pasties and turnovers, have also been produced – the first time this has been achieved in the UK.

Up until now, coeliacs have been restricted to gluten-free bread which is preserved in gas to sterilise it and is toasted before being eaten. Ultrapharm asked 2,000 coeliacs to list the products they missed most since being diagnosed. Ninety-eight per cent of respondents listed fresh bread and placed puff pastry products high on their list. The gluten-free bread is made in Ultrapharm’s bakery and is supplied fresh the next day to pharmacies and coeliacs who require it as the only means of managing their life-long medical condition.

Ultrapharm’s Chairman Don Lewis reported that South Bank’s expertise had been invaluable to the company, making it more aware of the chemistry and ingredients involved in baking gluten-free products. The firm now has a larger share of the UK market and a presence in most European countries where the coeliac condition is recognised.

There are around 50,000 coeliacs in the UK, with 4,000 new sufferers currently being diagnosed each year. New medical evidence suggests that certain neurological disorders such as epilepsy may also be caused by gluten...
in many patients. South Bank University gained many benefits during the TCS Programme and has incorporated knowledge of gluten-free ingredients into its BSc degree course in Baking Technology.

**Quality drive tastes success**

Another TCS participant, Thomas Morel Foods Ltd, benefited from a £2.2 million increase in sales, a number of high-profile awards and credibility as a “safe” manufacturer of high-quality convenience foods through its Programme with the Faculty of Cultural and Education Studies at Leeds Metropolitan University.

The company, based in Redditch, is involved in the manufacture of *sous vide* food – high-quality convenience foods for restaurants and national hotel chains produced through a vacuum pack process in which raw ingredients are packaged into plastic pouches, vacuum sealed and then gently pasteurised and chilled to 3°C.

The company realised it had come to the limit of its in-house skills and needed outside help to keep moving forward. It contacted Dr Mike Sheard, Reader in Food Safety and Quality Assurance at LMU, who had expertise in food quality systems and interests in minimally processed food, and Dr Gugong Xie, a computer-modelling expert.

Plans were made to set up a HACCP system to bring greater efficiency and safety to Thomas Morel’s *sous vide* manufacturing process. Forming the TCS Programme gave the company access to a level of expertise in food safety and manufacturing that was difficult to match from the private sector. TCS Associate Karen Foster, a Human Ecology graduate, audited the firm’s cooking, pasteurising and chilling processes for the strengths and weaknesses of its existing controls and was actively involved in setting up the HACCP and a Total Quality Management system.

Of particular benefit to the company was the introduction of advanced computer modelling techniques developed by Dr Xie. The techniques were used to simulate the heat treatment step in the *sous vide* process and gave the company a better understanding of the whole *sous vide* process from the way heat moves through the pouched food to a justification of the pasteurisation pathway.

These techniques enabled the company to reduce by one million times the probability of the survival of spores of low-temperature tolerant *Clostridium botulinum* in *sous vide* products.

During the Programme, Thomas Morel also made use of the University’s services in analytical microbiology, nutritional analysis and shelf life studies. Validation of its unique processing techniques and the creation of a HACCP-based documented quality system proved key in maintaining the company’s position as a dynamic innovator in what is a very competitive market place.

Credibility as a “safe” manufacturer has never been more important in the food industry and the work covered during the Programme put the company in a position where it could confidently exploit existing markets as well as welcome increasing attention from new customers outside its core market, most significantly from the supermarket retail sector.

The results of the Programme were used in the design and utilisation of a new £80,000 pasteurisation and chilling plant which is unique to the company. The financial targets of the Programme were also exceeded with an increase in annual sales of £2.2 million and production savings of greater than £100,000. The resulting substantial increase in profits helped move the company forward to a point where it was able to commit to a £500,000 expansion programme and double its workforce.

For the University, the TCS Programme provided academic staff with experience of the direct application of research findings and technology and skills transfer into a small food business. It also provided an opportunity for the test application and further development of Dr Xie’s software package for the design and assessment of *sous vide* thermal processes. The Programme acted as the stimulus for the establishment of collaborative postgraduate research projects on the kinetics of food texture change and vitamin C destruction during *sous vide* thermal processing. The company also provided support for five undergraduate research projects per year. Karen Foster was able to enhance her technical and management skills and successfully complete a MSc in Food Quality Management based on her work during the Programme. She now holds a senior quality...
management post within a large multinational food company.

**Going Danish in Devon**

Abbey Vale Bakery in Devon started its two-year TCS Programme with the University of Plymouth in December 1995. At the time, the company made traditional frozen sweet and savoury pastry products and supplied them to a wide range of outlets, including schools. The company also had a developing business in on-site regeneration of baked goods for bakeries and snack food outlets.

The objectives of the TCS Programme were to establish a new product development facility, to develop products with improved tolerance to freezing and cooking conditions and to reduce quality costs by improving control of raw food ingredients. Early in the Programme, the company was faced with plummeting sales in the wake of the BSE revelations and the subsequent delisting of beef-based products from school menus in the region. Thus, the new product development aspect of the Programme was given greater emphasis than originally envisaged.

With the help of staff from the University’s Department of Agriculture and Food Studies and Food Technology Centre, a fundamentally new type of pastry product range to the company was developed — Danish pastries — involving the technology of yeast risen pastry manufacture.

The company had a portfolio of traditional recipes but needed a systematic approach to new product development. During the Programme, TCS Associate John Rowe, a graduate in Food Management, implemented the control of the generation of new ideas, sourcing and characterisation of ingredients using near infra-red spectroscopy and gas liquid chromatography, design and supervision of production trials, development of process and monitoring of yields and the final specification and costing of the product.

New product ranges were developed using conventional pastry methodology and yeast risen pastry methodology, which was a completely different area of technology for the company. John Rowe also researched the technology of freezing Danish pastry products, including the freezing tolerance of various forms of yeast.

As a direct result of the Programme, Abbey Vale’s knowledge and generation of new products increased significantly and its understanding of the technology and raw material characteristics of Danish pastry manufacture was considerably enhanced. The rate of new product development resulted in a portfolio increase from 30 to 80 products over the period of the Programme. The activity resulted in an annual turnover increase of around £200,000.

Research into the shelf life characteristics of the yeast-raising agent, a key ingredient, proved vital to the company. HACCP procedures were developed for new products, also new procedures for raw material acceptance and control, and procedures for sensory screening.

The company is now on its way to meeting its target of at least doubling its sales in the two years following the TCS Programme by means of new market opportunities arising from the Danish and traditional developments. It has also invested in larger premises and increased its workforce to cope with growing orders for the new range of products developed during the Programme.

Screening of wheatflour raw materials using the University’s near infra-red spectroscopy facility provided further useful experience for staff in the application of that technique to practical problem areas. Modules of the University’s BSc (Hons) Food Quality and Product Development benefited directly from case study material generated by the Programme.

John Rowe is now employed as Quality Assurance Manager at baked pastry products manufacturer Tamar Foods in Callington, Cornwall. These examples of successful collaborations between the food industry and academia are merely the tip of the iceberg.

For further information about TCS, companies can contact the Teaching Company Directorate, Hillside House, 79 London Street, Faringdon, Oxfordshire SN7 8AA. Tel: 01367 245200; Fax: 242831 or E-mail: office@tcd.co.uk

**Reference**