

## TECHNOLOGY PROFILE

### Probiotic Microencapsulation Eliminates Need for Refrigeration

#### Technology Overview:

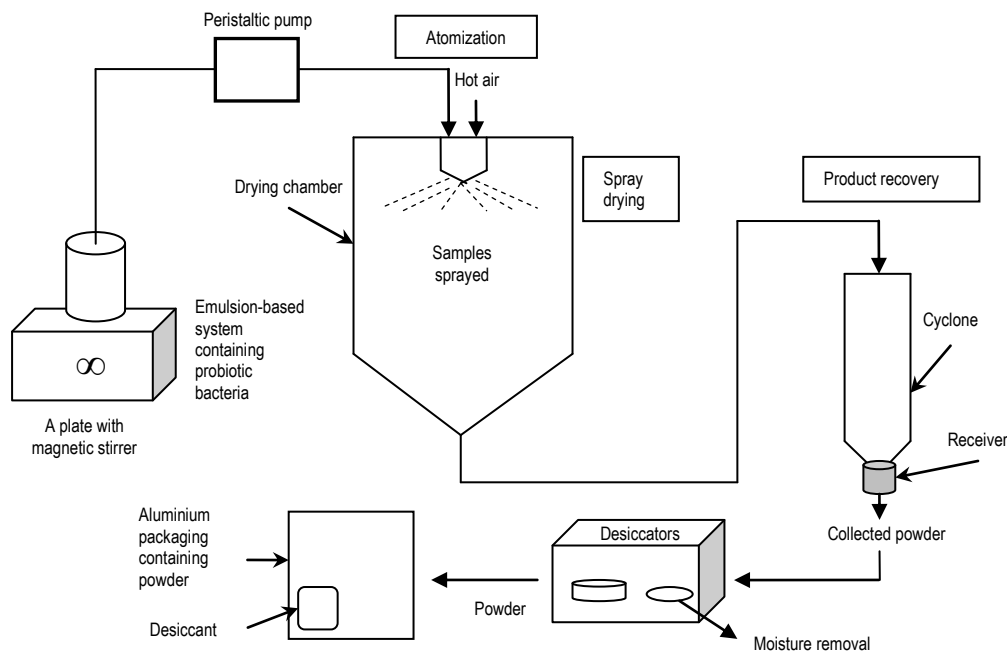
Researchers at Victoria University's School of Biomedical and Health Science in the Faculty of Health, Engineering and Science, led by Professor Nagendra P. Shah, have developed technology for microencapsulation of probiotic bacteria that enables prolonged viability and long term storage at room temperature, eliminating the need for refrigeration. This technology is simple to implement, has a low cost of production, and results in significantly reduced costs of shipping, handling and storage. A brief summary of the process is described below:

#### Stage 1- Microencapsulation

A unique emulsion-based formulation consisting of casein, glucose, mannitol, fructo-oligosaccharides, and vegetable oil is added to the probiotic bacterial suspension. The mixture is spray-dried through an atomizer with appropriate inlet and outlet parameters to achieve efficient microencapsulation. The product in powder form is collected ready for packaging.

#### Stage 2- Packaging

The probiotic bacteria powder is kept in desiccators with controlled humidity and temperature to achieve equilibrium. Once equilibrium has been achieved the powder is transferred into impermeable aluminium foil packaging (or similar) for long-term storage, shipping and distribution. Unlike most probiotics, no refrigeration is necessary to maintain viability.



**Fig. 1: Processing and storage process for microencapsulated probiotic bacteria**

### **State of Development:**

This patented process enables large-scale continuous production while maintaining low operational costs. This innovative microencapsulation process eliminates the need for refrigeration of the probiotic bacteria and enables storage for up to 40 weeks without loss of viability. The novel technology removes the costs and difficulties associated with freezing or refrigerating probiotic bacteria to maintain their viability and shelf-life, thereby enabling the product to be marketed not only in developed countries but also in developing countries.

Stage 1 and Stage 2 have been proven at a laboratory scale (10 g) and pilot scale (300 g), respectively, and can be readily scaled up as required. The microencapsulation formulation has been applied to two strains of probiotic bacteria and lactic acid bacteria, and can also be readily used with gram negative bacteria and yeasts.

### **Intellectual Property Position:**

The technology is protected by Australian Provisional Patent Application number 22012900478 titled **Preservation of Biological Materials** which was filed on 9 February 2012.

### **Market Overview:**

According to the report *Probiotics Market (2009-2014)* published by MarketsandMarkets, the global probiotic products market generated US\$15.9 billion in 2008 and is expected to be worth US\$32.6 billion by 2014, with Europe and Asia accounting for nearly 42% and 30% of the total revenues respectively. More than 500 probiotic food and beverage products have been introduced in the past decade and the global market is expected to record an annual growth rate of 12.6% from 2009 to 2014.

The report indicates that food and beverage segment is expected to command over 75% of the overall probiotics market. Probiotic dairy products are expected to command the highest market share among all the probiotic foodstuffs accounting for almost 70% in the year 2009 and reach a market size of almost \$24 billion by the end of 2014.

Frost & Sullivan's report *Strategic Analysis of the European Food and Beverage Probiotics Market* states that one of the main obstacles to the market is strain stability - the fact that bacterial strains must be protected against environmental conditions. The report goes on to say that "new technologies and bacterial protection systems" are playing an important role which would help the industry overcome this challenge.

*Probiotics Market (2009-2014)* states that the probiotics market offers plentiful opportunities for functional food suppliers and manufacturers. Product innovations are expected to play a major role in increasing the share of the market players. The leading developers and suppliers of probiotic strains include Chr. Hansen, DSM, Danisco, Morinaga, and BioGaia. The products of these companies are used by fast moving consumer goods companies such as Nestle and Attune. Europe is currently the largest probiotics market, owing to its high awareness of the benefits of probiotic yoghurts and fermented milk.

Applications for probiotics include:

- Probiotic therapy
- Dietary supplements - food supplements, nutritional supplements and specialty nutrients
- Functional foods and beverages - dairy products, non-dairy beverages, breakfast cereal, baked goods, fermented meat products, dry-food probiotics
- Animal feed probiotics

### **Opportunities for Technology Co-development:**

An opportunity exists for exclusive/non-exclusive licensing of the existing technology.

Opportunities also exist for investment and/or partnership agreements to further develop/expand the technology.

Industry sectors that may be interested in this novel microencapsulation technology include food industries manufacturing either dairy and non-dairy products, food supplement industries, or manufacturers of starter cultures and drug delivery of acid proteins sensitive proteins.

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