

## End of Project Report

A cost effective integrated process for production of probiotic  
cells as poultry antibiotic substitute  
(SCF0030-IND-2007)

**PERPUSTAKAAN  
UNIVERSITI MALAYSIA SABAH**

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## **Abstract**

The overall aim of this project was to develop a cost-effective probiotic cell production system for poultry use by integrating encapsulation technology to existing process technologies. The research focused on three areas 1) to study the effect of process parameters on encapsulation process 2) to study the effect of capsule designs, materials and fermentation conditions on cell production in repetitive batch fermentation 3) to study the effect of process parameters on drying of encapsulated cells and their stability. A detailed study on the effect of process variables on size and shape of capsules for encapsulation applications has been conducted. The prediction models for shape and size of beads or capsules produced through the extrusion method were developed. They could be used for optimization and to evaluate process limitations. The effect of different encapsulation materials (i.e. alginate, pectin, chitosan) were used for cell production in repetitive batch fermentations. Coated pectin-core capsules were found to be more stable than the alginate and alginate/pectin core capsules. However, alginate was preferred as it is more economical. Subsequent studies focused on improving the stability of alginate capsules during repetitive batch fermentations. Encapsulation cell fermentation was found to improve productivity of cell production by 40% which could give significant economic advantage to manufacturer. The effect of drying method and condition on the cell survival and stability were investigated next. Incorporation of suitable additives was found to be critical in stabilizing the cells which may also give significant economic advantage manufacturers. In addition, packed-bed drying has been shown to be a potential drying method to replace freeze-drying as the method involves lower capital and operating cost.