Enzymatic Production of Ceramide from Sphingomyelin

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Ceramide is the key intermediate in the biosynthesis of all complex sphingolipids. Due to its major role in maintaining the water-retaining properties of the epidermis, ceramide is of great commercial potential in cosmetic and pharmaceuticals such as hair and skin care products. Currently, chemical synthesis of ceramide is a costly and time consuming process, and development of alternative cost-efficient, high yield production methods is of great interest. With this concern, the potential of producing ceramide through the enzymatic hydrolysis of sphingomyelin has been studied.

Sphingomyelin, which contains a ceramide moiety, is a ubiquitous component of animal cell membranes, and dairy products or by-products, is a rich source of sphingomyelin. Enzymatic modification of sphingomyelin is a feasible approach for production of ceramide. The reaction system has been optimized through system evaluation and the optimization of several important factors. Sphingomyelin hydrolysis is proved to be more efficient in two-phase (water: organic solvent) system than in one-phase (water-saturated organic solvent) system. Phospholipase C from *Clostridium perfringens* is the selected enzyme which has the most advantageous properties after screening. For reusing the enzyme, the immobilization of the phospholipase C and the properties of the immobilized enzyme have been studied. By screening nine different carriers, we found that the enzyme immobilized on Lewatit VP OC 1600 (Bayer AG) have the highest catalytic activity. After seven recycles, immobilized enzyme retains around 70% of its initial activity. Through the kinetic study, it has been found that the hydrolysis reactions catalyzed by both the soluble and immobilized enzyme follow the Michaelis-Menten equation. List of publications:

1. Long Zhang, Lars I. Hellgren and Xuebing Xu (2006) Enzymatic production of ceramide from sphingomyelin. Journal of Biotechnology. 123: 93–105
2. Long Zhang, Lars I. Hellgren and Xuebing Xu (2007) Immobilization of phospholipase C for the production of ceramide from sphingomyelin hydrolysis. Journal of the American Oil Chemists´ Society. online: http://www.springerlink.com/content/v32j7r5813515053/