Development of Beta-Galactosidase Reusable Micro-Capsules for Lactose Intolerant People

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Lactose intolerance affects millions of people worldwide. It is caused by the inability to produce a digestive enzyme called lactase or beta-galactosidase, responsible for the breakdown of lactose milk. People who have this kind of intolerance cannot eat food containing lactose because of the risks, such as a simple malaise or more serious complications. The objective of this research was to create a more viable method for hydrolysis of this molecule than current market alternatives. Using the encapsulation technique of beta-galactosidase enzyme, they maintained its activity. Sodium alginate encapsulated and calcium chloride solution were used to produce these micro-capsules. The best pH and temperature range was analyzed for the proper functioning of the enzyme. Analysis of the microcapsules´ potential lactose breakdown was performed by spectrophotometry. This point determined the required amount of micro-capsules to achieve hydrolysis of 100%. Determining the potential of beta-galactosidase reuse was defined through daily testing of the micro-capsules functioning. Thinking of their domestic reuse and handling, in order to develop a sachet, as well as to make the most practical product. A simulation has showed this sachet would work with high efficiency. The following tests found that the enzyme does not need any pH treatment to maintain its activity and its operation is efficient between 37°C and 4°C. The micro-capsules produced can be reused for 7 days. Fifty (50) capsules can perform 100% lactose hydrolysis in 150 minutes at 4°C temperature. This research shows the encapsulation method works for beta-galactosidase reuse process, and provides a practical and economically viable method that can reduce daily nutritional costs for lactose intolerant people.

Awards Won:
Fourth Award of $500