Journal of Dairy Science Vol. 76 No. 10 2856-2867

Development of a Spiral Mesh Bioreactor with Immobilized Lactococci for Continuous Inoculation and Acidification of Milk

Flavia M. L. Passos [1] and Harold E. Swaisgood [1]

[1] Southeast Dairy Foods Research Center, North Carolina State University, Raleigh 27695-7624

A laboratory-scale bioreactor with lactococci immobilized in calcium alginate gel was developed for continuous acidification and inoculation of milk. Cells were entrapped in a calcium alginate film coating a spiral mesh and placed in a column through which milk was recirculated from a reservoir. Steady-state conditions were achieved by addition of fresh milk using a pH controller to maintain the pH at 5.7 and acidified milk was continuously removed during operation periods up to 5 d. Immobilized and free cell bioreactors were compared using both proteinase-positive and proteinase-negative strains of *Lactococcus lactis* ssp. *lactis* C2. Productivities were 1.5- to 3.5-fold larger with immobilized cell bioreactors than with free cell bioreactors because of higher cell densities, although specific productivities were lower for immobilized cells. Productivity increase was larger for proteinase-negative cells, which do not grow as well as free cells in milk. However, high densities can be immobilized, resulting in productivities of immobilized proteinase-negative cells that were similar to those of proteinase-positive cells. Free proteinase-negative cells responded to amino acid and peptide supplementation by increasing productivity (5-fold), but the immobilized cells did not respond proportionally, suggesting that free cell activity was limited by substrate availability but that immobilized cells were limited by product inhibition.

Key Words: immobilized lactococci • continuous acidification • immobilized cell bioreactor • continuous inoculation

Submitted on November 23, 1992
Accepted on June 4, 1993

This article has been cited by other articles: