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Prospects for the use of biocatalytical systems based on *Lactobacillus paracasei* cells immobilized in polymer gels for lactic acid production

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Abstract

In this work the possibility of immobilized lactic acid bacteria cells use for lactic acid production was studied. Biocatalytic systems based on Lactobacillus paracasei cells embedded in the matrix of the gel-carrier were examined. Polymers of natural and synthetic origin such as calcium alginate hydrogel, polyvinyl alcohol cryogel and cross linked hydrogel of polyvinyl alcohol modified with glycidyl methacrylate were used as gel-carriers. For the carriers and obtained biocatalyst granules we defined mechanical strength, stability in lactic acid salts solutions, cell binding and retention strength, catalytical activity. Immobilization in calcium alginate gel does not have stressing impact on cells, cell activity does not decrease after immobilization. The gel matrix is destructed with the increase of lactic acid concentration due to Ca^{2+} ions elution and binding. Thus, the application of this method is limited by low lactic acid concentrations. For the biocatalyst based on cells embedded in polyvinyl alcohol cryogel we stated that immobilized culture activity decreases as compared to free cells activity, but it was partially recovered during the incubation of granules in the nutrient medium, rich with growth factors. Significant elution of cells from the gel was observed in durable process. The gel of modified polyvinyl alcohol showed better biomass retention but the biomass activity decrease after polymerization of the modified polyvinyl alcohol was observed. The obtained results testify that it is possible to use the microorganism cells immobilized in polymer gels for lactic acid production though it is necessary to minimize the decrease of cells activity in course of immobilization to increase the process efficiency.

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