

NISIN BIOTECHNOLOGICAL PRODUCTION: EVALUATION AND PERSPECTIVES IN THE DEVELOPMENT OF NEW APPLICATIONS

Jozala, A.F.^{1,2}, Silva, D.P.¹, Vicente, A.A.¹, Pessoa-Jr, A.², Penna, T.C.V.² and Teixeira, J.A.¹

¹ IBB - Institute for Biotechnology and Bioengineering, Centre of Biological Engineering,
University of Minho, 4710-057 Braga, Portugal

² Department of Biochemical-Pharmaceutical Technology, School of Pharmaceutical Sciences,
University of São Paulo, São Paulo, Brazil

ABSTRACT

Nisin is a commercially available bacteriocin of the lantibiotic group produced by *Lactococcus lactis* ATCC 11454. The importance of nisin as an effective preservative is the fact that its spectrum of inhibitory activity includes almost all Gram-positive, Gram-negative and spoilage bacteria. With several favorable characteristics, this compound has been widely used as a natural food biopreservative. On the other hand, biotechnological production of fuel ethanol from different raw materials (sucrose-containing feedstocks - mainly sugar cane, starchy materials and lignocellulosic biomass) has led to the increase in the researches with trends for improving the bio-ethanol production. During these processes of bio-ethanol production antibiotic agents are added to the pre-fermented broth to prevent unwanted microbial growth. Thus, different questions have been made in relation to performance of the application of the nisin as a natural antibiotic to the ethanol production, as well as their beneficial effects about the yield and productivity in this process. However, the solution to this problematic depends firstly on how the development and implementation of technologies based on nisin production will be undertaken. Perspectives towards the development of modern procedures of nisin production are still needed. In this work the main proposal that has been discussed is the applicability of a novel micro-reactor operated under oscillatory flow mixing envisaged for parallel screening and/or development of industrial bioprocesses in the nisin production. For this reason, initially the objective of this study was to investigate the milk whey, a byproduct from dairy industries, in nisin production aiming to evaluate the growth conditions for *L. lactis*. In batch cultures, *L. lactis* was performed in raw milk whey and the nisin activity was assayed through agar diffusion utilizing *Lactobacillus sakei* ATCC 15521. The results showed that milk whey media is propitious to develop *L. lactis* cells and produce nisin, reaching activity around 105 AU.mL⁻¹. Biological processing of milk sub-products (milk whey) can be considered one of profitable utilization alternatives, generating high-value bioproducts and contributing to decrease rivers disposal. The use of these sub-products as substrate together with further studies related to application of batch or continuous oscillatory flow reactor would take the more efficient nisin production and finally to a possibility of its evaluation and use in bio-ethanol production.

Financial Support: FCT/Portugal, FAPESP/Brasil and CAPES/Brasil