**Encapsulation of lactase enzymes *from different microorganisms* in silicate gels. Study of the catalytic activity and yield on lactose hydrolysis.**

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RESUMEN

Protein encapsulation in a solid matrix is of interest for biotechnological purposes and it also serves as a model of molecular crowding. The immobilization of enzymes is a process in which the protein is confined in a nanometric environment in which the encapsulated enzyme`s behaviour does not necessarily resemble the dilute solution condition. We have successfully entrapped the enzyme β-Galactosidase (β -Gal) of *Escherichia coli* and *Kluyveromyces lactis* in silicate gels via a sol-gel reaction and, in previous studies, we determined that the encapsulated β-Galactosidase enzyme (Eβ-Gal) from *E. coli* had the same or greater catalytic activity than the soluble enzyme for the artificial substrates ONPG and PNPG, and we proposed that the structuring of the water molecules in the nanopores of the gel would have significant importance in the differences observed for the hydrolysis of ONPG in fresh and aged gels at different time periods*.* In the present work, we studied the catalytic activity of β-Gal and Eβ-Gal on the hydrolysis of lactose, due to the potential use in dairy industries for the production of free lactose food. Preliminary results of the catalytic activity and efficiency of the hydrolysis of lactose catalyzed by β-Gal and Eβ-Gal, are presented. First of all, we determined the amount of glucose formed after different times (10, 20, 30, 40 and 60 min), employing the soluble and encapsulated enzyme forms; it could be set that the reaction is in initial rate conditions up to 40 minutes for both β-Gal and Eβ-Gal in the case of the enzyme produced by *E. coli;* and 20 minutes for *K. lactis*. Then, saturation curves were conducted using different initial concentrations of lactose in fresh and aged gels, and we obtained the catalytic parameters Vmax and Km. In the case of β-Gal and Eβ-Gal from *E. coli*, we observed that the values of Vmax did not vary significantly between the soluble and encapsulated enzyme; on the contrary, Km values for Eβ-Gal double the values for the soluble enzyme. In the case of β-Gal and Eβ-Gal from *K. lactis*, we observed that the encapsulation process diminishes the catalytic activity by just 50% compared to other immobilization processes. Finally, the efficiency of hydrolysis was analyzed through tests done at 6ºC and 37ºC. It was observed that at 6ºC the encapsulated enzyme is more efficient while at 37ºC the soluble β-Gal is the more efficient one for both enzymes.

Palabras Clave: immobilization, catalityc activity, β-Galactosidase, silicate gel