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Optimization of β -Cyclodextrin Production: A Excipient used for Kidney Disease

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Objectives: Beta cyclodextrin is a seven glucopyranose cyclic natural product. Its external part is hydrophilic whereas the inner part is hydrophobic, due to this form inclusion complex with many hydrophobic molecules. The β -CD and its derivatives are used as a key molecule in lipid-lowering therapy. Treatment of mice with Alport Syndrome and Diet-Induced Obesity with hydroxypropyl- β -cyclodextrin (HP β CD) reduced phospholipids and cholesterol content in the kidneys and protected from the development of renal failure. The present study deals with the optimization of microbial production of this novel compound.

Methods: β -CD is produced by the action of CGTase on starch. For this purpose, a culture of *Bacillus spp.* was inoculated in the production medium kept in the gyratory shaker (121rpm and 30°C). After incubation, the appropriately diluted enzyme was used for the production of β -CD. The effect of different starches, incubation temperature, buffers, and incubation time were studied. The parameters were optimized by changing one factor at a time.

Results: The crude CGTase from *Bacillus lehensis* NCIM 155 was employed for bioconversion of starch to β -cyclodextrin. The maximum activity of CGTase (161 U/ml) was observed at 96h of fermentation. Soluble starch was found to be the best substrate for β -CD production (183 μ g/ml). The best activity was observed at pH 7 in phosphate buffer, incubation temperature 60°C. The β -CD yield was found to increase with the increase in incubation period at pH 7.

Conclusions: *Bacillus lehensis* NCIM 155 could be utilized for industrial-scale production of β -CD. The β -CD thus produced in its native form or as derivatized (hydroxylated, hydroxy propylated, etc) form has been indicated to be used for removal of hydrophobic lipids from food as pre-treatment, as a sequestering agent in vivo and as drug delivery system.