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Enhanced oral bioavailability and efficacy of recombinant human insulin entrapped in solid lipid nanoparticles

M J Ansari, M K Anwer, S Jamil, R I Al-Shdefat, B E Ali and M N Ansari
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Colloidal drug delivery systems have shown to enhance oral bioavailability of proteins and peptides. The aim of this work was to develop and evaluate an efficient solid lipid nanoparticle (SLN) carrier for oral delivery of insulin. Insulin loaded SLN were prepared by double emulsion technique, employing Dynasan 114 as lipid phase and soy lecithin and polyvinyl alcohol as primary and secondary emulsifier respectively. The particle size and zeta potential measured by photon correlation spectroscopy (PCS) were 91 ± 6.12 nm, $-36 \text{ mV} \pm 2.3 \text{ mV}$ respectively. SLN observed by scanning electron microscopy (SEM) showed extremely spherical shape. The entrapment efficiency (EE%) and drug loading capacity (DL%) determined with high performance liquid chromatogram (HPLC) were $86.53 \pm 0.7\%$ and $6.11 \pm 0.8\%$, respectively. Insulin loaded SLN exhibited sustained release in pH 7.4 phosphate buffer and shown to protect insulin from enzymatic degradation *in vitro* in presence of pepsin and trypsin. The biological activity of insulin loaded SLN was estimated by enzyme-linked immunosorbent assay and *in vivo* using Wistar diabetic rats after oral administration of insulin-loaded SLN to diabetic rats, and a considerable hypoglycemic effect was observed as compared to pure insulin. Insulin loaded SLN showed better protection of insulin from harsh gastro intestinal environment than the insulin solution as evident from C_{max} and AUC $196.4 \mu\text{IUml}^{-1}$ and $236.5 \mu\text{IU} \cdot \text{hr} \cdot \text{ml}^{-1}$ versus $16.4 \mu\text{IUml}^{-1}$ and $36.6 \mu\text{IU} \cdot \text{hr} \cdot \text{ml}^{-1}$ only). The relative pharmacokinetic bioavailability of insulin was enhanced approximately 7 times of pure insulin solution when loaded in SLN (11.4% versus 1.7% only).

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Biodegradation performance of phenol by free and alginate entrapped cells of *Haloarcula* strain D21, an extremely halophilic bacterium isolated from a solar saltern (Ain Salah, Algeria)

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Immobilization is a general term that describes many different forms of cell attachment or entrapment. These different forms include encapsulation of cells in a polymer-gel and entrapment in a matrix. The Advantages of these techniques are to reduced possibility of inoculum contamination during storage, transport and application. So, beads are non toxic, biodegradable and non-polluting and can be produced in large quantities, stored for extended periods. Moreover, phenols and phenolic compounds are widely distributed as environmental pollutants due to their common presence in the effluents of many industrial processes, including oil refineries, ceramic plants, coal conversion process, phenolic resins, pharmaceutical and food Industries. The aim of this study was to compare the biodegradation performance of phenol by using free and encapsulated cells of *Haloarcula* strain D21 isolated from crude oil contaminated saline water collected at Ain Salah in Algeria. Batch experiments were carried out in order to obtain the maximum phenol degradation rates by analyzing the influence of the immobilization in calcium-alginate gel beads on biodegradation performance.

Biography

Kebbouche-Gana S has obtained PhD from Polytechnic National School University and postdoctoral studies from University of Sciences and Technologies, Houari Boumediene, Algiers (Algeria). She is the Head of team in Laboratory: Microbial biodiversity and biotechnology of saline and oil watery ecosystems (Brnbeap). She has published more than 8 papers in reputed journals.

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