Section 2

Executive Summary of the Project:

This should be limited to 200-250 words and include the scientific background and objectives, methodology and major findings

Encapsulation both at nano and microscale is a means of imparting improved properties to small molecules of interest. Enhanced solubility, bioavalability, reduced toxicity and targetability are some of the advantages of encapsulation. This project was based on the premise that procedures for encapsulation though known, were not established at a National level. Thus an attempt was made to use a variety of carriers and encapsulate drugs at the nanoparticle level.

Chitosan and alginate having biocompatibility, biodegradability and non toxicity were chosen as carrier material. Another lesser known polymer poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) was also selected as a carrier. The methodologies for encapsulation were ionotropic gellation, precipitaion coacervation and for PHBV, double emulsion technique with spraying. Liposomes were also tested in the free form as well as coated with chitosan. Known bioactive compounds- ascorbic acid, folic acid, amoxicillin and curcumin were encapsulated. The techniques all enabled the formation of nanoparticles which were characterized by FTIR, SEM, particle size analysis and zetapotential measurements. The drug loading capacities measured indicated that in the case of hydrophobic molecules such as curcumin, loading was very low.

The release of drugs were monitored in vitro using dialysis membranes. The release profiles indicated that liposomes, liposomes coated with chitosan and chitosan nanopartilces all released nearly 60 -70% of their cargo in 7 h. However, the chitosan-alginate composite NPs showed longer release with 60% release in 24 h. The PHBV nanoparticles released folic acid at pH 7.4 over a time frame of over 10 d but at pH 1.0 the cargo was unloaded within 1 h. These findings are of relevance for delivery applications.

Section 3

Report in detail: should contain the following (not less than 2000 words excluding Tables and Figures)

i) Introduction/background

Although many drugs and bioactive compounds are known and are in use in various applications, the full benefit of the compound may not be obtained due to factors such as poor solubility, reduced uptake, sensitivity to external media and degradation of compound. To overcome these difficulties, compounds have been encased in carrier matrices to improve drug properties. Drug companies have performed extensive research for encapsulation techniques using polymers and liposomes. Each drug requires its own method of encapsulation to produce optimum benefit and needs to be treated individually. Microencapsulation is widespread in the pharmaceutical arena, however, nanoencapsulation is more advantageous due to improved delivery, penetration and absorption.

Nanocarriers can increase the solubility of a drug and improve its bioavailability. They have the added advantage of being able to penetrate tumours and can be used as targeted delivery systems in cancer treatment as well as to reduce toxicity and side effects.

Nanoparticles of polymeric matrix systems in which the drug is uniformly dispersed in the former, or which encapsulates or surrounds the drug dissolved or entrapped in an oil or aqueous core in the latter have been formulated by several researchers. The matrix