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Biodegradable poly(lactic-co-glycolic acid) based tacrolimus microspheres prepared by using single jet electrospraying method could be potential drug delivery system for long term immune suppressive effects

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Tacrolimus-loaded poly (lactic-co-glycolic acid) microspheres (TAC-PLGA-M) can be used for the long term survival of transplanted organs, owing to immunosuppressive activity [1], mediated through the inhibition of calcineurin, and the subsequent blockage of interleukin-2 production, leading to decrease in T cell proliferation [2].

The purpose of our study was to optimize the parameters of electrospraying method, and to prepare TAC-PLGA-M with a high payload and desirable release properties. TAC-PLGA-M was prepared by using electrospraying method, which has been found to be an attractive method for preparation of micro-particles that are suitable for drug delivery. *In vitro* characterization and evaluation were performed using scanning electron microscopy (SEM), X-ray powder diffraction (XRD), differential scanning calorimetry (DSC), and Fourier transforms infra-red spectroscopy (FTIR). Drug loading efficiency was found to be above 80% in all the formulations with a maximum loading capacity of 16.81 ± 0.37%. XRD and DSC studies suggested that the drug was incorporated in amorphous state or was molecularly dispersed in the microspheres. The *in vitro* release study showed prolonged release patterns, following zero order release patterns. Cytotoxicity assay indicated that there was no significant cytotoxicity or adverse effects on proliferation of INS-1 cells in comparison to control. TAC-PLGA-M with enhanced drug loading and prolonged release patterns were

successfully prepared using electrospraying method. Owing to its reproducibility [3], electrospraying has potential to be scaled up to industrial level for the preparation of various formulations that could be applied in clinical settings in near future.

Keywords: Electrospraying, microsphere, PLGA, Prolonged release, Tacrolimus

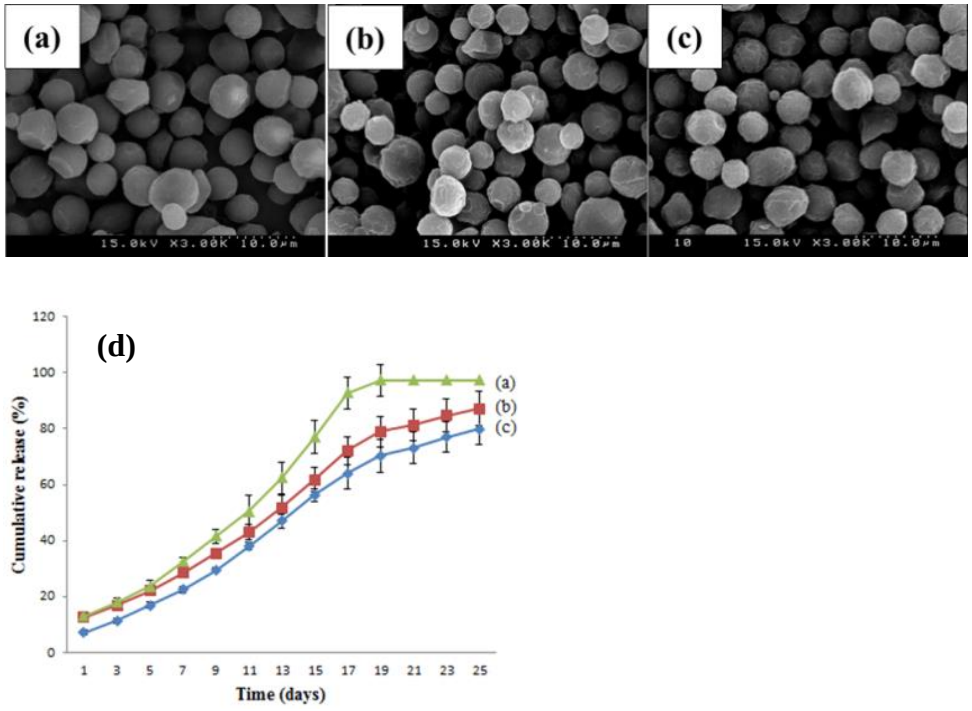

Fig.1. Scanning electron microscopic images of various formulations (a,b,c), and (d) in vitro release profile of the formulations.

References

[1] Shin S.B., et al. Preparation and evaluation of tacrolimus-loaded nanoparticles for lymphatic delivery. Eur J Pharm Biopharm 2010; 74(2):164-71.

[2] Brazelton T.R. and R.E. Morris, Molecular mechanisms of action of new xenobiotic immunosuppressive drugs: tacrolimus (FK506), sirolimus (rapamycin), mycophenolate mofetil and leflunomide. Curr Opin Immunol 1996; 8(5):710-20.

[3] Bock N., et al. Electrospraying, a reproducible method for production of polymeric microspheres for biomedical applications. Polymer 2011; 3(1):131-149.