

COMPARATIVE STUDY OF MASS TRANSFER THROUGH TWO-LAYER POROUS MEDIA: AN APPLICATION TO DRUG-ELUTING STENT

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Drug Eluting Stents contribute a major breakthrough through interventional cardiology which is used for the prevention and cure of restenosis. We develop a mathematical model for drug transport through diffusion process using drug-coated stents. Drug release depends on many factors such as coating geometry and physical-chemical properties and drug characteristics such as diffusivity and solubility. An analytical treatment is made through the variable separable method to solve the diffusion mass transport equation. The drug concentration has been computed for different parameters like the diffusion equation and advection-diffusion equation and related boundary initial conditions. A method of transformation and separation of variables give an exact analytical solution for local concentration is obtained. Drug concentration profiles at various time levels suggest that convective made of drug transfer is more effective than diffusive transfer in a first order reaction rate.

REFERENCE

- [1] C W Hwang, D. Wu, E.R. Edelman, Physiological transport forces govern drug distribution for stent-based delivery. *Circulation*, 104(5), 600-605, (2001).
- [2] T. F. Luscher, J. Steffel, F. R. Eberli, M. Joner, G. Nakazawa, F.C. Tanner, R. Virmani, Drug-eluting stent and coronary thrombosis: biological mechanisms and clinical implications, *Circulation*, 115(8), 1051-1058, (2007).
- [3] Vijay B. Kolachalamma, Abraham R Tzafiriri, Davis Y Arifin, Elazer R Edelman, Luminal flow patterns dictate arterial drug deposition in stent based delivery, *Journal of control release*, 133, 24-30, (2009).