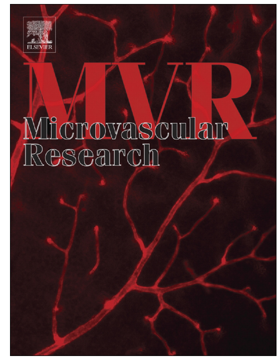
Accepted Manuscript



Numerical simulation of heat transfer in blood flow altered by electroosmosis through tapered micro-vessels

J. Prakash, K. Ramesh, D. Tripathi, R. Kumar

PII: S0026-2862(18)30014-1
DOI: doi:10.1016/j.mvr.2018.03.009
Reference: YMVRE 3776

To appear in: *Microvascular Research*

Numerical simulation of heat transfer in blood flow altered by electroosmosis through tapered micro-vessels

[1]J. Prakash, [2]K. Ramesh, [# 3]D Tripathi and [3]R Kumar

[1]*Department of Mathematics, Agni College of Technology, Thalambur, Chennai- 600120, Tamilnadu, India*

[2]*Department of Mathematics, Lovely Professional University, Jalandhar-144411, Punjab, India*

[3]*Department of Mechanical Engineering, Manipal University Jaipur-303007, Rajasthan, India*

Abstract:

A numerical simulation is presented to study the heat and flow characteristics of blood flow altered by electroosmosis through the tapered micro-vessels. Blood is assumed as non-Newtonian (micropolar) nanofluids. The flow regime is considered as asymmetric diverging (tapered) microchannel for more realistic micro-vessels which is produced by choosing the peristaltic wave train on the walls to have different amplitudes and phase. The Rosseland approximation is employed to model the radiation heat transfer and temperatures of the walls are presumed constants. The mathematical formulation of the present problem is simplified under the long-wavelength, low-Reynolds number and Debye-Hückel linearization approximations. The influence of various dominant physical parameters are discussed for axial velocity, microrotation distribution, thermal temperature distribution and nanoparticle volume fraction field. However, our foremost emphasis is to determine the effects of thermal radiation and coupling number on the axial velocity and microrotation distribution beneath electroosmotic environment. This analysis places a significant observation on the thermal radiation and coupling number which plays an influential role in hearten fluid velocity. This study is encouraged by exploring the nanofluid-dynamics in peristaltic transport as symbolized by heat transport in biological flows and also in novel pharmacodynamics pumps and gastro-intestinal motility enhancement.

Keywords: *Electroosmosis; Peristalsis; Hemodynamics; Nanofluids; Micropolar fluids; ND Mathematica Simulation.*

1. Introduction

Electroosmosis is a mechanism in which ions are transported with ionic liquids through the microchannel and capillary under the influence of applied electric field. With an emerging application of electroosmosis for biomicrofluidics (Edwards IV et al., 2007; Wang et al., 2009;