

# Abstract

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Bio-fluid mechanics is a broad area of research that includes the study of blood flow in human circulatory system. The investigation of solute dispersion is most interesting topic of research owing to its outspread applications in various fields such as biomedical engineering, physiological fluid dynamics, etc. The aim of the present study is to know the different physiological processes involved in the solute dispersion in blood flow by assuming the relevant non-Newtonian fluid models. The axial solute dispersion process in steady/unsteady non-Newtonian fluid flow in a straight tube is analyzed in the presence and absence of absorption at the tube wall. The pulsatile nature of the blood is considered for unsteady flow. Owing to non-Newtonian nature of blood at low shear rate in small vessels, non-Newtonian Casson, Herschel-Bulkley, Carreau and Carreau-Yasuda fluid models which are most relevant for blood flow analysis, are considered. The generalized dispersion model is adopted to analyze the solute dispersion phenomenon at small and large time. The three transport coefficients i.e., exchange, convection and dispersion coefficients which describe the whole dispersion process in the system are determined. Also, the mean concentration of solute is analyzed at all time. The effect of yield stress of the fluid, wall absorption parameter, amplitude of fluctuating pressure component, Womersley frequency parameter, Weissenberg number, power-law index, Yasuda parameter, Schmidt number and Peclet number on the dispersion process is analyzed. A comparative study of the solute dispersion is made among the Newtonian, Herschel-Bulkley, power-law, Bingham and Casson fluid models at all time, and with non-Newtonian Carreau and Carreau-Yasuda fluid models at large time. Single and two phase Casson modeling is assumed for blood flow in small vessels. Also, the comparison of solute dispersion between single phase and two-phase models is made at all time for different radius of micro blood vessels.

**Keywords:** Solute dispersion, Non-Newtonian fluid, Blood rheology, Pulsatile flow, Small vessels, Two-phase model, Wall absorption and Generalized dispersion model