Mathematical model of solute transfer in a permeable channel with effect of variable viscosity

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Abstract

This paper describes a mathematical model of solute transfer in fluid flow across a permeable channel with variable viscosity, with applications to glomerular capillary blood flow. Solute transfer through the glomerular capillary wall is controlled by the difference in transcapillary hydrostatic pressure and the analogous difference in colloid osmotic pressure (Starling's law). Using appropriate analytical and numerical approaches, the solutions of coupled equations regulating fluid flow and solute transport are found. The current study's hydrostatic and osmotic pressure curves are qualitatively in excellent agreement with the experimental data. The effects of variable viscosity on velocity profiles, concentration profiles, and total solute clearance are seen to be substantial, and the findings are graphically depicted.

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