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Taylor dispersion in peristaltic pumping DAVID SAINTILLAN, BRATO CHAKRABARTI, Mechanical and Aerospace Engineering, University of California San Diego — The diffusivity of a Brownian tracer in unidirectional flow is generally enhanced due to shear by the classic phenomenon of Taylor dispersion. At long times, the average concentration of the tracer follows a simplified advection-diffusion equation with an effective shear-dependent dispersivity. In this work, we make use of Brenner's generalized Taylor theory for periodic domains to study dispersion in peristaltic pumping. In channels with small aspect ratios, asymptotic expansions are employed to obtain analytical expressions for the dispersivity at both small and high Peclet numbers. Channels of arbitrary aspect ratios are also considered using a boundary integral formulation for the flow coupled to a hyperbolic conservation equation for the effective dispersivity, which is solved by the finite-volume method. Our numerical results show good agreement with theoretical predictions and provide a basis for understanding passive scalar transport in peristaltic flow, for instance in the ureter or in microfluidic peristaltic pumps.

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