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Analysis of bolus formation from the micropipette ejection systems DIWEN MENG, PARISA MIRBOD, Clarkson University — Ejection of drugs from micropipettes has significant applications in biomedical research and clinical studies, however little is known about the dynamics of the process involved. The experimental results show that micropipette ejection systems operate in a tip Reynolds number (Ret). A series of experiments was performed from a micropipette to visualize the shape of the droplet. The observations led to the following conclusions: a) A nearly spherical bolus, closely corresponding to Sampson flow through a circular orifice, could be achieved provided at Ret$<$0.05 b) Pear-like bolus distortions are observed at a Ret as small as 0.1. (d) Large distortions are observed at Ret = 0.5 and (e) for Ret $>$ 1 an axial jet develops. Consequently, the transition point between the flow domains represents an important operating point. In this research, laminar is demarcated from turbulent regime by studying the influence of the various material and process parameters on the transition point. Three-dimensional numerical simulations on bolus formation and growth with different tip diameter were investigated and the results were validated with the experimental observations. Effects of fluid physical properties, operation conditions and tip exit size on bolus behavior were also analyzed.

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