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**Flow and rupture of vesicles in narrow channels** ALISON HARMAN, MARTIN BERTRAND, BELA JOOS, University of Ottawa, Ontario, Canada — Small lipid bilayer vesicles, also known as liposomes, are used for drug delivery systems in vasculature. Consequently how they deform and when they become unstable and rupture (lose their inner contents) under capillary flow is of great interest. In addition vesicles with a filling fraction of 0.6 can be considered as a simple mechanical model of red blood cells. We use coarse-grained molecular dynamics (CGMD) simulations with explicit solvent to study lipid bilayer vesicles in 3D capillary flow with filling fractions of 1.0 and 0.6. The shapes of the vesicles obtained in these simulations compare well to other experimental and theoretical studies. Using CGMD allows the study of rupture. This is in contrast to the majority of other approaches which model the bilayer as a purely elastic surface and only allow the investigation of deformation. We look at the stress profiles of these vesicles as measured by the area expansion per lipid along the membrane, and determine the location and pressure of rupture for a given confinement ratio (diameter of the vesicle divided by diameter of the channel). We also discuss the subsequent loss of inner fluid content.

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