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Multiple equilibrium states for blood flow in microvascular networks HALLEY POLLOCK-MUSKIN, CECILIA DIEHL, NORA MOHAMED, Olin College, NATHAN KARST, Babson College, JOHN GEDDES, BRIAN STOREY, Olin College — When blood flows through a vessel bifurcation at the microvascular scale, the hematocrits in the downstream daughter vessels are generally not equal. This phenomenon, known as plasma skimming, can cause heterogeneity in the distribution of red blood cells inside a vessel network. Using established models for plasma skimming, we investigate the equilibrium states in a microvascular network with simple topologies. We find that even simple networks can have multiple equilibrium states for the flow rates and distributions of red blood cells inside the network for fixed inlet conditions. In a ladder network, we find that for certain inlet conditions the network can have 2^N observable equilibrium states where N is the number of rungs in the ladder. For ladders with even just a few rungs, the complex equilibrium curves make it seemingly impossible to set the internal state of the network by controlling the inlet flows. Microfluidic experiments are being used to confirm the model predictions.

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