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Salmonella detection in a microfluidic channel using orbiting magnetic beads[1] MATT BALLARD, ZACHARY MILLS, DREW OWEN, SRINIVAS HANASOGE, PETER HESKETH, ALEXANDER ALEXEEV, Georgia Institute of Technology — We use three-dimensional simulations to model the detection of salmonella in a complex fluid sample in a microfluidic channel. Salmonella is captured using magnetic microbeads orbiting around soft ferromagnetic discs at the microchannel bottom subjected to a rotating external magnetic field. Numerical simulations are used to model the dynamics of salmonella and microbeads throughout the detection process. We examine the effect of the channel geometry on the salmonella capture, and the forces applied to the salmonella as it is dragged through the fluid after capture. Our findings guide the design of a lab-on-a-chip device to be used for detection of salmonella in food samples in a way that ensures that salmonella captured by orbiting microbeads are preserved until they can be extracted from the system for testing, and are not washed away by the fluid flow or damaged due to the experience of excessive stresses. Such a device is needed to detect bacteria at the food source and prevention of consumption of contaminated food, and also can be used for the detection of a variety of biomaterials of interest from complex fluid samples.

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