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Sperm Cell Dynamics in Shallow Chambers CARLOS CONDAT, VERONICA MARCONI, IFEG-CONICET and FaMAF-Universidad Nacional de Cordoba, Cordoba, Argentina, ALEJANDRO GUIDOBALDI, LAURA GIOJALAS, IIByT - CONICET and FCEFyN -Universidad Nacional de Cordoba, Cordoba, Argentina, ALEJANDRO SILHANEK, Department of Physics, University of Liege, Liege, Belgium, YOGESH JEYARAM, VICTOR MOSHCHALKOV, Institute of Nanoscale Physics and Chemistry, Katholieke Universiteit Leuven, Leuven, Belgium — Self-propelled microorganisms are attracted to surfaces. This makes their dynamic behavior in restricted geometries very different from that observed in the bulk. Here we analyze the motion of spermatozoids confined to shallow chambers, investigating the nature of the cell trajectories and their accumulation near the side boundaries. Observed cell trajectories are composed of a succession of quasi-circular and quasi-linear segments. This suggests that the cells follow a path of intermittent trappings near the top and down surfaces separated by stretches of quasi-free motion near the center of the gap. Use of microstructured petal-shaped edges limits accumulation near the borders and contributes to increase the concentration in the chamber interior. System stabilization occurs over times of the order of minutes, which agrees well with a theoretical estimate that assumes that the cell mean-square displacement is largely due to the quasi-linear segments. Pure quasi-circular trajectories would require several hours to stabilize. Our estimates also indicate that stabilization proceeds 2.5 times faster in the rosette geometries than in the smooth-edged chambers, which is another practical reason to prefer the former.

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