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Pattern formation of Dictystelium discoideum in the presence of laminar flow and cAMP pulses AZAM GHOLAMI, Max Planck Institute for Dynamics and Self-Organization, Am Fassberg 17, 37077 Goetingen, Germany, OLIVER STEINBOCK, Department of Chemistry and Biochemistry, Florida State University, Tallahassee, Florida 32306-4390, USA, VLADIMIR ZYKOV, EBERHARD BODENSCHATZ, Max Planck Institute for Dynamics and Self-Organization, Am Fassberg 17, 37077 Goetingen, Germany — Dictyostelium discoideum (D.d) amobae undergo starvation-induced multicellular development in which single cells aggregate chemotactically towards cAMP signals emitted periodically from an aggregation center. We are investigating spatiotemporal pattern formation of D.d. cells under the presence of a laminar flow. Starved cells are loaded into a straight millifluidic device with an external flow and cell response to the signaling molecule cAMP is monitored indirectly using dark-field microscopy. The observed contraction waves develop simultaneously over the entire channel, are propagating only in flow direction, and have curved wave fronts resembling the parabolic flow profile. The wave dynamics analysis shows that the wave velocity is locked to the flow velocity and yields a wave period of T0 6 min, which matches the typical oscillation period of extracellular cAMP in spatial homogeneous, well-stirred systems. We apply a small cAMP perturbation at the inlet region of the channel and observe the spatiotemporal response of the cells as the pulse is propagating down the channel. The results show that D.d. cells are in the oscillatory regime and the system can be forced within resonance tongue. We compared our results with analytical and numerical analysis of Goldbeter model.

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