Wetting transition and morphogenesis under flow of living drops

D. Cuvelier, S.Douezan, K. Guevorkian, D. Gonzalez-Rodriguez, S. Dufour, C.Clanet and F. Brochard-Wyart

Abstract:

We study the spreading of spheroidal aggregates of cells, expressing a tunable level of cadherins, on glass substrates decorated with fibronectin. Previously we used micropipette aspiration to measure the aggregate surface tension and viscosity and estimate the capillary velocity, which controls the dynamics of spreading. We observe the contact area by optical interferometry and the profile by side-view microscopy. At short times, the aggregate contact area increases as t^2/3. We interpret these results by modeling the aggregate as a viscoelastic droplet. At long times, we observe a precursor film with two possible states: in strongly cohesive aggregates this film is in liquid state, while in weakly cohesive aggregates the constitutive cells escape from the aggregate forming a 2D gas. The progression of a non-invasive tumor into a metastatic malignant carcinoma, known as the epithelial-mesenchymal transition, can be interpreted as a wetting (liquid-gas) transition. In parallel, we study the effect of a fluid flow on aggregate spreading.