Wetting of living drops

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Résumé

Tissue spreading is a fundamental process in embryonic developement, wound healing, and cancer invasion and propagation. A tumor is not malignant if it remains cohesive. The first step of cancer propagation (invasion) is characterized by a loss of cell adhesion associated to an increase in cell motility. The loss of cell adhesion characteristic of aggressive metastatic cancer is analogous to that of the epithelial-mesenchymal transition (EMT) during embryonic development. Here we study the role of E-cadherin expression in the wetting behaviour of tissues. We use as a model system cellular aggregates of variable cohesivity, spreading on glass substrates of variable adhesivity. We study the spreading of spheroidal aggregates of cells, expressing a tunable level of Ecadherin molecules, on glass substrates decorated with mixed fibronectin and polyethylene glycol. We observe the contact area by optical interferometry and the profile by sideview microscopy. We find a universal law of aggregate spreading at short times, which we interpret through an analogy with the spreading of viscoelastic droplets. At long times, we observe either partial wetting or complete wetting, with a precursor film of cells spreading around the aggregate with two possible states. In strongly cohesive aggregates this film is a cellular monolayer in the liquid state, while in weakly cohesive aggregates, cells escape from the aggregate, forming a 2D gas. The escape of isolated cells is a physical mechanism that appears also to be present in the progression of a noninvasive tumor into a metastatic malignant carcinoma, known as the EMT.

Mots-Clés: wetting, agregate, liquid, gas, EMT

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