Development of microtentacles in suspended cells upon weakening of the actin cortex

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Circulating Tumor Cells (CTCs) pose a significant threat due to their role in metastasis: It has been proposed that CTCs are able to escape the blood stream and reattach to the tissue by the formation of so-called microtentacles. Microtentacles are microtubule-based membrane protrusions with a diameter of less than 1 µm and a length of tens of µm. In this work we show that (and how) microtentacles can be generated in noncancer cells in suspension by weakening the actin cortex against the force of growing microtubules. We particularly analyzed the structure of the actin cortex and quantified the number and length of the generated microtentacles. To demonstrate the dynamics of microtubule-based protrusions against soft barriers we developed a stochastic model for growth of microtubules with length-dependent dynamics at their tips. This allows prediction of the influence of barrier stiffness on the microtentacle length distribution.