Tissue Competition: Coexistence and Tumor Heterogeneity

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Cells grow and divide, i.e. they change their volume. The conjugate force to a change in volume is pressure. Thus, growing cells exert a mechanical pressure onto their surroundings. Vice versa, mechanical forces feed back onto growth. This leads to a mechanical contribution when tissues compete for space. Typically, the tissue with the higher homeostatic pressure, the pressure at which cell division and death balance, overwhelms the weaker one [1,2,3].
Computer simulations reveal that homeostatic pressure is not the only determining quantity, but that adhesive properties play an important role in tissue competition as well. Small adhesion between the competing tissues leads to coexistence between them in a variety of segregated structures, even when one tissue has a lower homeostatic pressure [4]. These structures break apart when the adhesion between the tissues increases, but coexistence can still be found, given the right adhesive properties of the individual tissues.
Starting from there, we employ a dynamic setup in which cells can mutate and change their mechanical properties dynamically. The obtained results yield a mechanical explanation how intra-tumor heterogeneity may arise.

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[3] Podewitz *et al*, 2016, *New J. Physics* **18**, 083020

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