Mechanics and Growth of tissues

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We present a mechanical model to describe the growth of healthy and cancerous tissues.

In a first step, we discuss the homeostatic pressure of a tissue which is the pressure of the tissue in a stationary growth state. We also discuss experiments that should allow the measurement of this pressure and show simulations of growing tissues in various conditions.

We then show that because of the coupling between cell division and the local stress, a tissue can be considered as a visco-elastic liquid with a relaxation time smaller than the cell division time. We give examples of the liquid behavior related to the competition for space between two tissues and discuss the stability of the interface between two tissues.

Finally, we present a stochastic model for the growth of metastases. We use the notion of interfacial tension between two tissues to show that metastases can only grow if its size is larger than a critical radius. We then calculate the growth probability of a metastase in a foreign tissue as a function of the critical radius. We show that this probability is very low corresponding to the known metastatic inefficiency.

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