Initial cell spreading investigated by a deformable cell model with mechanistic contact interactions

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\textit{ABSTRACT}

Initial cell spreading as a first step to investigate how a cell interacts with its microenvironment is an important research topic. It has been found \cite{1} that across a wide variety of cell types, initial spreading behavior seems to universally follow the same power laws. The simplest cell type providing this scaling are modified red blood cells (RBCs), whose elastic responses are well known \cite{2}. Adding a mechanistic description of the contact interaction for such a deformable RBC model, we are now able to investigate in detail (see Figure 1) the causes of this universal power law: The presented model suggests that the initial slope results from a purely geometrical effect facilitated mainly by dissipation upon contact. Shortly later, the second slope might be more related to tensions and dissipation in the cell's cortex which are building up as the cell spreads more and more. To reproduce this observed initial spreading, no plastic deformations were needed. Since the model created in this effort is extensible to more complex cell types and can cope with arbitrarily shaped, smooth microenvironments, it should be useful for a wide range of investigations, where forces at the cell boundary play a determining role.

\textbf{Figure 1:} Forces in the cortex (color scale) of an RBC spreading on polylysine substrate at 100 ms, 350 ms and 900 ms.

\textbf{REFERENCES}
