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Thermorheology of living cells—impact of temperature variations on cell mechanics JOSEF KAS, TOBIAS KIESSLING, ANATOL FRITSCH, ROLAND STANGE, University of Leipzig — Upon temperature changes, we observe a systematic shift of creep compliance curves J(t) for single living breast epithelial cells. We use a dual-beam laser trap (optical stretcher) to induce temperature jumps within milliseconds, while simultaneously measuring the mechanical response of whole cells to optical force. The cellular mechanical response was found to differ between sudden temperature changes compared to slow, long-term changes implying adaptation of cytoskeletal structure. Interpreting optically induced cell deformation as a thermorheological experiment allows us to consistently explain data on the basis of time–temperature superposition, well known from classical polymer physics. Measured time shift factors give access to the activation energy of the viscous flow of MCF-10A breast cells, which was determined to be $\sim$ 80 kJ/mol. The presented measurements highlight the fundamental role that temperature plays for the deformability of cellular matter. We propose thermorheology as a powerful concept to assess the inherent material properties of living cells and to investigate cell regulatory responses upon environmental changes.

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