Differential microrheological properties of actin isoforms

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Actin is one of the most abundant proteins in cells and is the backbone behind a manifold of integral cellular structures, such as stressfibers, sarcomeres and the cortex. As such, actin has become a major research interest and a plenitude of dedicated in-vitro experiments have been conducted in the last few decades to elucidate its properties. However, potential differences between the distinct actin isoforms themselves have only been addressed scarcely.
The presented work focuses on the different microrheological properties of actin networks made out of distinct actin isoforms measured via VPT (video particle tracking). While skeletal α-actin has been rigorously studied in the last decades, the properties of such networks constituted of cytoplasmic actins remains scarce. To that end, we conducted experiments with commercially available cytoplasmic actin as well as with purified β- and γ-actins extracted from modified yeast [1].
Surprisingly, we found striking differences regarding the microrheological properties of said bulk networks. For instance, the bulk networks constituted of muscular α-actin displayed a greater stiffness than networks of their cytoplasmic counterparts. Interestingly, the cytoplasmic β- and γ-actins displayed differential microrheological properties. These results may indicate further differences regarding the functional identity of each isoform.

[1] T. Hatano et al. Journal of Cell Science 133, 2 (2020)