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Measuring the mechanical properties of cell monolayers

Cell monolayers are continuously exposed to mechanical stresses in development and normal physiological function. Mutations in cytoskeletal and cell-cell adhesion proteins lead to patient symptoms associated with increased tissue fragility, however a method for characterizing monolayer mechanics is lacking. We have developed a novel system for tensile testing of monolayers which are suspended between two test rods. One of the rods is rigid acting as a reference whilst the other is flexible to allow for force measurement. Analysis of stress-strain curves during monolayer extension enables the determination of a monolayer in plane elastic modulus. The contribution of different cytoskeletal filaments to monolayer elasticity is ascertained by treatment with inhibitors. By depolymerising the actin cytoskeleton with Latrunculin B a substantial decrease in the elastic modulus can be observed.