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Mass and viscoelasticity of single cells

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In recent years, there has been a growing interest in understanding the mechanical behavior of cells. To gain an in-depth understanding of the physical properties of cells, such as their mass, elasticity, and viscosity, we developed and improved novel techniques allowing to perform single cell measurements for these quantities. These techniques involve the use of micro-mechanical oscillators, which are brought in contact with the cells. These advances have been made possible by the rigorous control over the actuation and detection of the sensors, which allows for highly accurate measurements. By comparing the oscillation characteristics of the sensor before and after contact with the cells, one can infer the mechanical properties of the cells with high precision.

One exciting application of this technology is the measurement of cell mass during the cell cycle. By measuring the cell mass of budding yeast cells during the G2 phase, insights into the fundamentals of cell growth can be gained.

Another important application is the measurement of the viscoelastic properties of cells. This technique enables researchers to measure the local-scale viscoelastic dynamics of cells stemming from fast molecular processes, as well as the slow, more global viscoelastic dynamics of cells. This allows for a more comprehensive understanding of the physical properties of cells and their behavior under different conditions.

Overall, these innovative techniques represent a significant advancement in the field of cell mechanics and have the potential to unlock new insights into the workings of living systems at the cellular level.

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