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Utilizing Optical Tweezers for Measuring the Elasticity and ζ-potential of Red Blood Cells

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Optical trapping, achieved using optical tweezers, is an advanced and highly sensitive technique capable of measuring forces in the femto-Newton range. This sensitivity allows it to detect minute variations in biological properties [1]. With this method, microscopic objects such as living cells, bacteria, and viruses can be captured at the focus of a laser beam, without physical contact, enabling the study of their fundamental physical properties, such as elasticity and membrane viscosity [2].

Using optical tweezers developed at the National Hellenic Research Foundation, we measured the elasticity of red blood cells (RBCs) in plasma, to simulate human body conditions. Additionally, the ζ-potential of RBCs was determined using the electrophoresis method in a custom-built chamber. These measurements provide a foundation for further investigation into the physical properties of RBCs and how they are influenced by medication or diseases, such as Mediterranean anemia (thalassemia).

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