# Time-dependence in Red blood cell mechanics

Marta Gironella[1] and Felix Ritort [1 2]

*[1] Physics School, Condensed Matter Physics Department, University of Barcelona, C/ Marti i Franques s/n, 08028 Barcelona*

*[2] Ciber-BBN Center for Bioengineering, Biomaterials and Nanomedicine, Instituto de Salud Carlos III, Madrid*

The Red blood cells (RBC) are one of the most abundant and simplest cells in human body. They are only composed of a lipid bilayer and an spectrin cytoskeleton. However, their shape, mechanics and aging are fundamental to understand and treat the majority of blood diseases. In this project we study the mechanics of RBC and how it evolves in time using our optical tweezers device. We use two different approaches in order to understand the viscoelastic response of the RBC: 1) Pulling experiments where we pull and push the RBC at different maximum forces and different pulling velocities to extract information of the force-distance curves and 2) Relaxation experiments where we apply a sudden jump force to the RBC to observe how the force relaxes in time. From these two kind of experiments we are able to characterize 4 different time-scales, 3 of them related with the interaction between the membrane and the cortex and the other one (which is the longest) shows a stiffening of the RBC linked with the cell aging. The correlation of these time-scales allows us to globally understand the temporal evolution of RBC and infer novel information about RBC physical and biological aging.