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THE NANOSCOPIC BENDING RIGIDITY OF RED BLOOD CELL MEMBRANES

Wednesday 9 June 2021 17:05 (5 minutes)

Blood banks all around the world store blood for several weeks ensuring the availability of blood for transfusion medicine. Although the storage conditions have been optimized for decades it has become evident that red blood cells (RBC) undergo numerous changes when being stored.
We investigated the effect of storage on the nanoscopic bending rigidity of RBC membranes with a combination of Molecular Dynamics simulations, inelastic neutron scattering and diffuse X-ray scattering [1]. Coarse grained (CG) models of RBC membranes were created by matching experimental lipidomic analysis. It was found experimentally that the concentration of fatty acids and cholesterol changes during storage and aged membranes were mimicked by adjusting the lipid composition accordingly.
Solid supported membrane stacks of fresh and stored RBC samples were prepared. X-ray diffraction experiments were then conducted at high relative humidity allowing to reconstruct the membrane surface fluctuations from diffuse scattering signals using a GPU accelerated workstation. These experiments were complemented by Neutron Spin Echo measurements on RBC vesicles which probe the membrane fluctuations directly. Bending moduli of 1.8 kBT and 15.4 kBT were measured in excellent agreement with the simulation data.
[1] Himbert et al., "The Nanoscopic Bending Rigidity of Red Blood Cell Membranes", in preparation

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