

Optical tweezers technology and its biomedical applications

School of Biomedical Engineering, Anhui Medical University, China

Jinhua Zhou

Email: zhoujinhua@ahmu.edu.cn

The deformability of red blood cells (RBCs) is important in blood circulation, which can be detected by optical tweezers (OT). The OT technology has non-contact, low-damage, and high-precision characteristics, but the efficiency of detecting deformability is still low for stored RBCs with handles stretching, and the deformability of RBCs in vivo in line with in vitro or not is still unclear. We investigated how to use OT to detect deformability of RBCs in vitro and in vivo. Our works include: (1) measuring RBC stiffness and regulating blood flow in the blood vessels of living mice. (2) the effects on deformability of RBCs in different dilution fluids. (3) improving detection efficiency using the rotating-glass-slide method and optofluidic-based deformability cytometry. (4) 3D surface imaging of RBCs with different morphologies using optical tweezers technology in microfluidic chip. Comparing with echinocytes and spherocytes, the discocytes have high deformability. Furthermore, the deformability can be affected by buffer solution, and its tendency can be denoted by spring stiffness, deformation strain or elastic modulus. OT technology can be used to detect single cells in various applications, such as sperm motility in clinical medicine.



Short Bio:

Jinhua Zhou received his Ph.D. degree in Optics from the University of Science and Technology of China (USTC). He is a professor of Anhui Medical University, serving as the associate dean of the school of biomedical engineering. His investigations focus on optical tweezers, computational microscopy imaging and their application in biomedicine. Over the past three years, he has published over 30 papers.