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Mapping force of interaction between PLGA nanoparticle with cell membrane using optical tweezers SUYASH CHHAJED, LING GU, HOMA HOMAYONI, KYTAI NGUYEN, SAMARENDRA MOHANTY, UT Arlington — Drug delivery using magnetic (Fe_3O_4) Poly Lactic-*co*-Glycolic Acid (PLGA) nanoparticles is finding increasing usage in therapeutic applications due to its biodegradability, biocompatibility and targeted localization. Since optical tweezers allow non-contact, highly sensitive force measurement, we utilized optical tweezers for studying interaction forces between the Fe_3O_4-PLGA nanoparticles with prostate cancer PC3 cells. Presence of Fe_3O_4 within the PLGA shell allowed efficient trapping of these nanoparticles in near-IR optical tweezers. The conglomerated PLGA nanoparticles could be dispersed by use of the optical tweezers. Calibration of trapping stiffness as a function of laser beam power was carried out using equipartition theorem method, where the mean square displacement was measured with high precision using time-lapse fluorescence imaging of the nanoparticles. After the trapped PLGA nanoparticle was brought in close vicinity of the PC3 cell membrane, displacement of the nanoparticle from trap center was measured as a function of time. In short time scale ($<$ 30sec), while the force of interaction was within 0.2 pN, the force increased beyond 1pN at longer time scales ($\sim$ 10 min). We will present the results of the time-varying force of interactions between PLGA nanoparticles with PC3 cells using optical tweezers.

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