Glioblastoma Tunneling Nanotubes as potential targets for nanomedicine: an in vitro investigation on advanced cellular model

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Over the past decade, increasing evidence suggested that cells are capable of establishing long distance communication routes with unique function defined as Tunneling Nanotubes (TNTs). TNTs are thin, dynamic, long membrane protrusions that allow the intercellular exchanges of signal clues, molecules, organelles and pathogens. The presence of TNTs has been observed in several types of cancer, glioblastoma (GBM) included, where they emerge to steer a more malignant phenotype. Therefore, we are studying TNTs in GBM, the most devastating brain neoplasm with high grade of recurrence, to deepen both their structural and genesis features in order to exploit them to improve the intercellular distribution of nanomedicines. The results showed that a single ΔEGFR2 GBM cell is able to form more than one TNT and that TNTs are dynamic structures. They are composed for 70% of actin and for 30% of actin and α-tubulin, they can have a length between 20-100 µm with a thickness of 200-300 nm. Moreover, GBM TNTs are efficient in allowing the intercellular transport of different types of nanomedicines in a bidirectional way, and the nanoparticle shape affects the speed of exchange. These preliminary results showed make TNTs promising tools for the delivery of drug-loaded nanoparticles between distant cancer cells.