Identification of Tunneling Nanotubes in *vivo*

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TNTs are thin, actin-rich membranous structures that, unlike other forms of cell-to-cell communication, allow long and direct inter-cellular contact and sharing of cargo, including organelles, electrical stimuli, viruses, and bacteria (Ariazi et al. 2017). Despite the milestones achieved in understanding the significance of TNTs in vitro over the last decade, which support their involvement in different processes including the spreading of amyloid proteins in neurodegenerative diseases and intercellular trafficking of mitochondria in cancer cells, the existence and physio/pathological role these seemingly critical biological structures play in living organisms remains unclear. Emerging evidence, however, has shown that TNT-like structures exist during the embryonic development of chickens (Teddy & Kulesa, 2004) and fish (Caneparo et al., 2011). These and other studies support the hypothesis that TNTs could play a fundamental role in proper mechanical and signaling processes during development. We therefore decided to investigate the formation and function of TNTs *in vivo* during early stages of development. To this aim, we developed a robust *in vivo* model to study the mechanism of TNT-mediated cell-to-cell communication by looking at the transport of mitochondria in the developing zebrafish (Danio rerio). Our preliminary experiments have confirmed the existence of TNT-like connections in the gastrula of zebrafish and more importantly, provided evidence that mitochondria move along these structures.