Revealing the ultra-structures and cargos transported inside tunneling nanotubes between pancreatic cancer cells

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Membrane tunneling nanotubes (TNTs), as shown in Fig. 1(a), have been suggested as a special structure for long-distance cell–cell communications[1]. Various intracellular substances can be transported through TNTs, including proteins, microRNAs, vesicles, and mitochondria[2]. In the present work, we found the macrophage conditioned medium (MaCM) significantly induced the TNT formation between pancreas ductal adenocarcinoma cells (PANC-1). We also revealed that the MaCM could decreased the proliferation rate, weaken the invasion capability, and enhance the sensitivity of PANC-1 to an anti-cancer drug 5-FU. These results implied that the TNT might be a feature of the stress responses of the PANC-1 cell. We further revealed the heavily packed cytoskeletal structures in TNTs using FIB/SEM, as shown in Fig. 1(b) to 1(d). Based on sequentially slicing a TNT between two PANC-1 cells treated with the MaCM, we found several voids across the TNT. These voids could be the spaces that allocated microvesicles. In addition, we observed that mitochondria could be transported within the TNTs bi-directionally [Fig. 2]. This observation suggested that the transportation should be an active flow and motor proteins could possibly be involved in the TNT transportation. These cargo transportation processes in TNTs could be related to the development of drug resistance in the cancer cells.

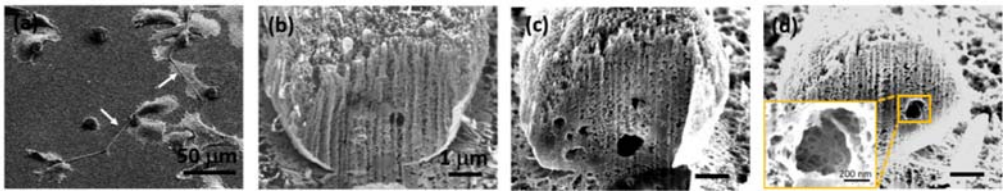

Figure 1. Images of SEM. Different cross sections of a TNT were revealed with FIB.

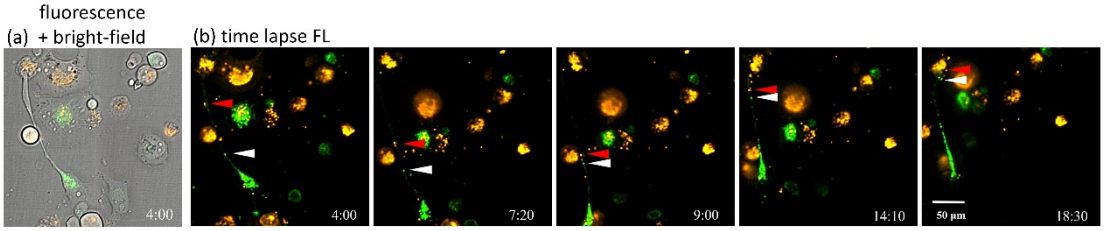

Figure 2. Fluorescence images of mitochondria bidirectionally transported within a TNT.

REFERENCE

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