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Single-cell molecular analysis reveals a possibility of epithelial to circulating tumor cell transition when a tumor cell enters into the bloodstream

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Circulating tumor cells are important biomarkers function as liquid biopsies for cancer diagnostics and therapeutics. However, traditional analyses of tumor cells and tissues are not suitable for circulating tumor cells due to the limited number of circulating tumor cells and the molecular analyses of a population of tumor cells that may miss crucial information such as single-cell heterogeneity. Therefore, we have developed an automatic device that isolates live circulating tumor cells from a breast cancer patient's blood sample and performs a range of single-cell molecular analyses to determine tumor cell characteristics. The developed automatic device isolates live circulating tumor cells from patients' blood samples. This device is useful for the positive enrichment, negative enrichment or different combinations of negative and positive enrichment of circulating tumor cells. Up to 100 gene expression analyses were performed on the isolated single circulating tumor cells with the profile of the 100 genes showing great heterogeneity at the single-cell level on housekeeping genes expression and the molecular signatures of apoptosis, stem cell, transition, etc. About 1/3 of the analyzed CTCs lost housekeeping genes, suggests that these CTCs were already dead or lost the ability to continue growing. There is also a large portion of CTCs that either does not express or have low levels of mesenchymal cell signatures, suggesting the current EMT hypothesis only happened in limited numbers of CTCs. Our single-cell molecular analysis results on breast cancer patients' CTCs reveals that there is a strong possibility that when an epithelial cell enters the bloodstream, its first transition will be epithelial to circulating tumor cell transition (ECT), followed by the CTCs performing the circulating to mesenchymal cell transition (CMT) and finally the mesenchymal to epithelial cell transition (MET). Our results also suggest that the ECT transition may be very important for the survival of early CTCs in the bloodstream and may lead to more investigations about the survival ability and metastatic possibility of tumor cells at the DNA and RNA level.

Biography

Glenn Deng has completed his PhD from Tokyo University in Marine Science and Technology and Postdoctoral studies from Stanford University. He is the Professor of China Three Gorges University School of Medicine and the Senior Scientist of Stanford University School of Medicine. He has published more than 30 papers in reputed journals.

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