Cell culture of viable Circulating Tumour Cells

Clearbridge BioMedics
Bringing clarity to cancer

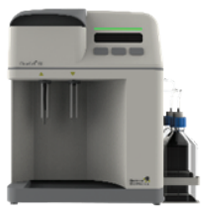
Application Notes

Overview

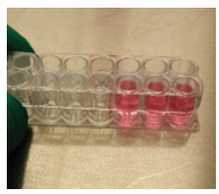
The emergence of novel technologies offers a new avenue to obtain circulating tumour cells (CTCs) for understanding metastasis. CTCs are extremely rare in circulation and the isolation of intact and viable cells is non-trivial. Use of affinity based methods and magnetic beads based methods could potentially impact cellular phenotypes and viability. Here we present the use of ClearCell® FX System to isolate wholly intact and viable cancer cells from whole blood based on physical properties of cancer cells.

Workflow

Blood collection



CTC enrichment with ClearCell® FX System



CTC culture

Results

1) ClearCell® FX System enables retrieval of cancer cells in their native state and cells retain viability and proliferative capacity. As a proof of concept, MCF-7 cells were spiked into healthy blood, enriched on ClearCell® FX System and cultured in 96-well plate (Figure 1A).
2) Blood samples from patients with metastatic breast cancer were enriched for CTCs and stained for apoptotic markers (cleaved caspase 3). Most CTCs (>98%) were stained negative for cleaved caspase 3

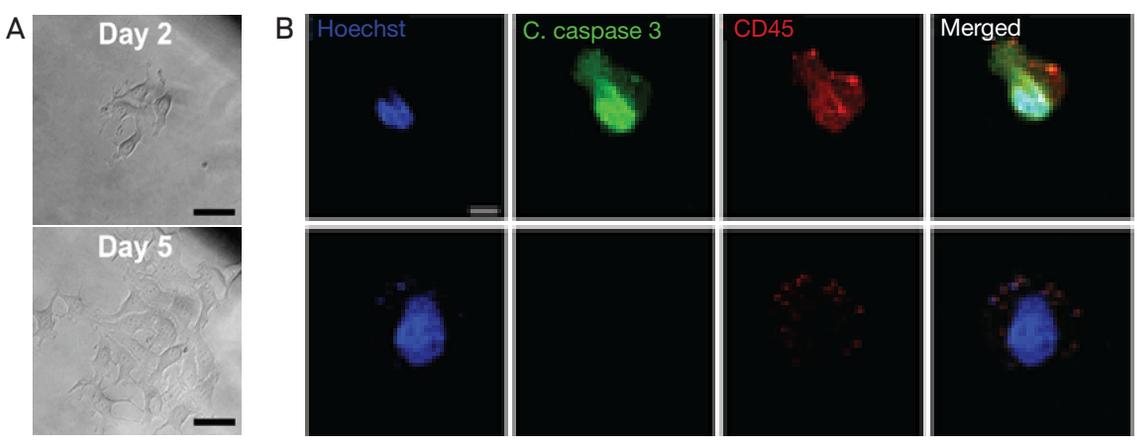


Figure 1. (A) Images showing MCF-7 cells attaching and spreading on culture substrate after processing through ClearCell® FX System at Day 2 (top) and Day 5 (bottom), cell population increases, indicating proliferation (Hou et al. 2013). (B) Staining for apoptotic cells with cleaved capase 3 markers. Cell viability was more than 98% for CTCs and majority of the cells (> 95%) expressing cleaved caspase 3 were also CD45+ (Warkiani et al. 2013).

Conclusion

ClearCell® FX System isolates CTCs without compromising cell viability and integrity. Here we show that retrieved CTC populations do not express apoptosis related biomarkers. They retain proliferative capacity and can be expanded by in vitro culture under optimal culture conditions. This could potentially pave the way for novel research and applications including creation of patient-derived tumour xenograft models for elucidating cancer metastasis and treatment selection.