

Emerging Science

abstr 0829

Circulating Tumor Cells: A Promising Biomarker in GI Cancers

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Rare epithelial cells shed from solid tumors can be found in the bloodstream, and various technologies have been developed to detect these circulating tumor cells (CTCs). Several studies have demonstrated that increased numbers of CTCs found in patients with metastatic breast, prostate, and colorectal cancers correlated with poorer outcomes. For example, using the CellSearch System, technology based on enrichment for cells expressing epithelial-cell adhesion molecule using antibody-coated magnetic beads, metastatic breast cancer patients who had greater than 5 cells per 7.5 mL of whole blood prior to initiating a new therapy, were found to have a shorter median progression-free survival and shorter overall survival than did patients who had fewer than 5 circulating tumor cells per 7.5 mL of blood. Furthermore, the numbers of CTCs found after initiating therapy predicted response to treatment as measured by conventional means (Cristofanilli M, et al, *N Engl J Med* 351:8, 2004). Therefore, CTCs measured using the CellSearch System allowed stratification of patients into high- and low-risk groups.

Recently, new technology using a microfluidic chip containing an array of microposts coated with epithelial-cell adhesion molecule antibody has demonstrated improved efficiency of circulating tumor cell capture directly from the peripheral blood of metastatic lung, prostate, pancreatic, breast, and colon cancer patients. The number of cells captured from patients with cancer ranged from tens to hundreds, with ~50% purity and 99% yield, while CTCs were not detected from healthy control subjects.

Furthermore, microfluidic technology allowed the capture of viable tumor cells, enabling not only improved sensitivity of cell enumeration, but also offering the potential for use of CTCs in the molecular analyses of tumors.