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From Separation to Treatment: Development of a Microbead-based Extracorporeal CTC Capture Platform

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Summary

Tumor derived circulating cells (CTCs) play a key role in the forming of metastases, which process is majorly responsible for the death of cancer victims. Invasive diagnostic methods, like surgical manipulation, radiotherapy or systemic cancer treatments can cause the dissemination of CTCs and even promote the survival of malignant cells. To prevent further progression, metastatic cancer could be stopped from developing by eliminating circulating cells from the bloodstream. Based on existing extracorporeal treatments, we developed a platform technology, which is capable to specifically capture EpCAM-positive tumor cells by immobilizing anti-EpCAM (CD326) covalently onto the surface of chemically altered glass microbeads. A laboratory scale system has been designed and used for the investigation of the capture efficiency of the proposed technology by utilizing HTC116 cell spiked model media. Surface pretreatment was characterized by goniometry while the capture performance was monitored by flow cytometry and fluorescent microscopy. The demonstrated 30,000 circulating tumor cells per gram bead specific capture ability corresponds to the capture capacity of more than 15 million cells in case of an average volume hemoperfusion cartridge during a two-hour treatment. This capture efficiency and throughput allow the therapeutic utilization of the proposed technology and may be used for the mitigation of metastatic cancer death. After further developments, the presented platform technology could be an additional tool to existing treatments.