A comprehensive comparison study: Capturing of CTCs by different technologies followed by molecular analysis

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Abstract

The future of cancer therapy will be characterized by molecular analysis of the patients tumor followed by the decision for the right drug targeting the individual properties of the tumor. However, obtaining tumor tissue is challenging and alternative tumor sources are needed. Circulating tumor cells (CTCs) may represent an attractive alternative as a "liquid biopsy" providing real-time information about the patient's current disease state by a routine blood draw. But capturing these rare cells from whole blood is a major challenge that still needs significant improvement.

Here we present preliminary data of an ongoing study comparing different CTC capturing technologies. For optimal comparison, CTC preparations from the same patient were used. The required high amounts of sample aliquots and CTCs were obtained by leukapheresis. Breast and pancreatic cancer patients (non- and metastatic) were enrolled. In two sites, the same patient was used for comparison. CTC preparations from the same patient were used. The required high amounts of sample aliquots and CTCs were obtained, as well as buffy coat by leukapheresis, usually pre-OP. Second recruitment post-OP was done for patient #4 and #8. Samples were shipped within 48 h to partner companies for CTC analysis. Significantly higher CTC amounts were detected in buffy coats compared to blood. The novel EpCAM-dependent approach IsoFlux™ shows the highest CTC counts in breast cancer, whereas the antigen-independent ApoStream™ technique shows the best results in the indication pancreatic cancer.

Results

Figure 1 Establishment of a collaboration network

A collaboration network between Bayer Pharma AG, the University of Düsseldorf as clinical partner and providers of CTC capture methods was established. In addition, logistics were organised to guarantee a fast and reliable sample transfer. For downstream analysis the isolated CTCs were transferred to the diagnostic company Prometheus Laboratories, a partner from Bayer.

Table 1 CTC counts in blood and buffy coat isolated by three different methods

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Ten pancreatic cancer patients and eight breast cancer patients (non- and metastatic) were enrolled. In addition, the first colon cancer patient was recruited. Blood samples were obtained, as well as buffy coat by leukapheresis, usually pre-OP. Second recruitment post-OP was done for patient #4 and #8. Samples were shipped within 48 h to partner companies for CTC analysis. Significantly higher CTC amounts were detected in buffy coats compared to blood. The novel EpCAM-dependent approach IsoFlux™ shows the highest CTC counts in breast cancer, whereas the antigen-independent ApoStream™ technique shows the best results in the indication pancreatic cancer.

Conclusion

- Leukapheresis is a suitable procedure to capture high amounts of CTCs and therefore to enable an optimal technology comparison
- Novel approaches for CTC isolation show an improvement in yield of CTCs in comparison to the standard CellSearch®
- Pathway profiling in CTCs can be used as a tool to stratify patients for targeted therapies in oncology