Laser Microdissection
A Key Technology for Targeted Therapy in Lung Cancer
Laser Microdissection
A Key Technology for Targeted Therapy in Lung Cancer

Author: Dr. Sigrid Schlieben, Dr. Michael Gögler
Carl Zeiss Microscopy GmbH, Germany

Date: June 2013

In the era of targeted therapy and personalized disease treatment, individual genetic mutations in the primary tumor drive patient selection and therapeutic strategies. In the special case of non-small-cell lung cancer loss or gain of functionally relevant genetic variations have to be analyzed, to provide a better predictive window for targeted therapy. Laser microdissection (LCM) of rare tumor cells and new sequencing technologies are invaluable tools to identify single molecular events that are highly specific to malignant cells. For patients with fatal lung cancer personalized medicine is now a reality. Testing for mutations in EGFR-gene and selection of special therapy for patients becomes now standard practice.

The following section summarizes the publication of Rosell et al. published in Lancet Oncology. Erlotinib versus standard chemotherapy as first-line treatment for European patients with advanced EGFR mutation positive non-small-cell lung cancer (EURTAC): a multicentre, open-label, randomised phase 3 trial.

The results of this study show that non-small-cell lung cancer (NSCLC) patients with EGFR mutation exhibited a significantly superior progression-free survival and toxicity profile with erlotinib versus chemotherapy as first-line treatment. More generally, recent findings show EGFR tyrosine-kinase inhibitors benefit europeans as well as asians.

As basis for this study, Rosell et al. used laser capture microdissection (LCM) from ZEISS to collect genomic DNA from lung tumour tissue. All isolated tissue samples were analysed with Sanger sequencing (exons 19 and 21) for EGFR mutations.

With this method, EGFR mutations can even be detected from separate, microscopic groups of cells within a tumour mass and in cytological samples containing as few as eight cancer cells. This widens the range of patients testable for EGFR mutations, thus providing the opportunity to select the optimal medical treatment.

The LCM-based method to detect EGFR mutations was developed and validated by Molina et al. and can be applied to different types of samples:*  
- fresh biopsies
- paraffin-embedded biopsies
- cytologic specimens

In summary, Rosell et al. recommend a LCM tissue-based screening for EGFR mutations for patients with NSCLC and a tyrosine-kinase inhibitor first-line treatment for mutation positives.

**How LCM works**
Collect ultrapure, selected material from heterogeneous regions with the well established precise and unique non-contact Laser Capture Microdissection (LCM). A defined laser pulse transports the selected specimen out of the object plane into a collection device – against gravity.

**Benefits for your application**
- Process fresh, paraffin-embedded biopsies and cytological specimens
- Analyse single target cells and pure cell populations

“*Our lab uses PALM MicroBeam, in combination with sensitive Molecular Biology techniques, to analyze somatic mutations and mRNA expression of relevant genes in tumor samples with low numbers of cells. We are able to determine mutations in formalin fixed and paraffin embedded biopsies or cytological specimens that contain as little as 8 cancer cells. This way, oncologists can select therapeutic options based on the molecular profile of the tumor even in those patients where the tissue available is scarce*”

Rafael Rosell  
*Catalan Institute of Oncology, Badalona, Spain; Pangaea Biotech USP Dexeus University Institute, Barcelona, Spain*

Miguel Molina  
*Pangaea Biotech, USP Dexeus University Institute, Barcelona, Spain*

PALM MicroBeam is not intended for diagnostic use.