Epidermal growth factor receptor (EGFR) signaling pathways have been implicated in playing an important role in cancer development and progression. However, therapeutics targeted against EGFR either have failed to reproduce promising preclinical model results in clinical settings or have only been successful in a cohort of cancer patients bearing somatic mutation in EGFR kinase domain. The failure can be partly attributed to inappropriate assessment of EGFR status in cancer and/or development of drug resistance during treatment. One way to address this problem is to develop a customized targeted treatment. Nonetheless, it requires mechanistic insight into the causes of cancer. Moreover, technical challenges in developing such a tool involved specific quantification of EGFR activity in the background of multiple tyrosine kinases present in cancer cellular extracts and obtaining accurate measurements from small biopsies. In this presentation I will discuss the development of a protein-acrylamide copolymer hydrogel array for profiling activity and inhibition of activity of EGFR tyrosine kinase in small number of cancer cells and the potential of this tool to screen for the most promising therapeutics for individual patients and monitor treatment progression. Cancer stem cells (CSCs), a rare population of cells within cancer with stem cell properties, have been implicated to play a major role in inducing resistances to chemo and radiotherapy and in eventual tumor relapse. However, not much is known about the role of CSCs in acquisition of resistance to EGFR kinase therapy. In this presentation I will also discuss detection and characterization of CSCs and their potential role in inducing resistance to EGFR kinase inhibitor therapy.