Cancer research tools from GE Healthcare

The GE Healthcare Life Sciences portfolio of technologies provides tools to help researchers build a foundation to better understand cancer from expression to function and to use these findings to develop and improve treatments. The technologies we provide include: electrophoresis products for biomarker discovery; chromatography systems and media for target protein purification; high-content imaging systems for the study of cells and their components. In addition, our cell technology portfolio offers innovative solutions for production of cell lines. And of course, we also provide technical expertise and support in all these areas.

Expression analysis using 2-D DIGE

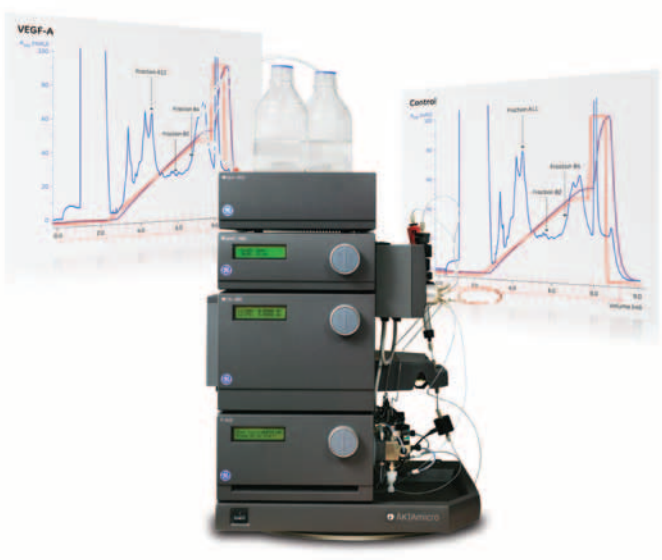
The novel 2-D electrophoresis application 2-D DIGE (Difference Gel Electrophoresis) has allowed researchers to achieve more reliable and quantitative results for differentially expressed proteins. In cancer research, these putative biomarkers can be a key factor to determining the disturbance of pathways leading to the disease as well as be used for diagnostic purposes and to ascertain drug targets. Case scenarios in which 2-D DIGE has been used successfully include the analysis of HER-2 growth factors in breast cancer research and analysis of differentially expressed proteins in multicellular tumor spheroids after drug treatment (1).

For more information, visit www.gelifesciences.com/2D

Purifying potential target proteins

ÄKTA™ chromatography systems combined with a full range of media and columns allow for research-scale purification to large-scale manufacturing of biopharmaceuticals. Systems such as ÄKTA avant are widely used in big pharma, CRMs, academia, and small drug development companies due to their consistency, reliability, and flexibility.

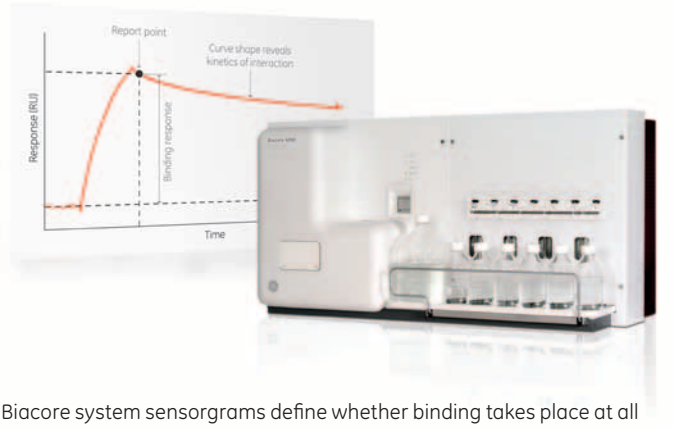
If potential target proteins for inhibitors are in fact determined, overexpression and purification of these proteins is the next logical next step. Chromatography systems such as ÄKTAmicro™ are used for micropreparative purification and prefractionation of proteins (2), which can be used to facilitate identification of differentially expressed proteins as a result of drug treatment.



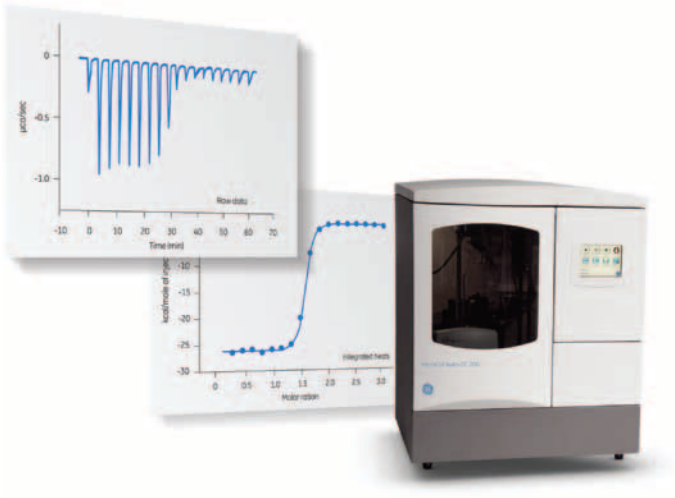
For more information, visit www.gelifesciences.com/akta

Label-free interaction tools for cancer research

Purified proteins are needed for further functional studies with platforms such as Biacore™ and MicroCal™ systems, both of which utilize label-free detection technologies to study binding interactions. Biacore sytems are used in cancer research to evaluate and rank potential drug or diagnostic targets, and to optimize new antibodies, affibodies, small peptides, or even small molecules for ideal binding (3). Performing early screening studies of potential drugs saves time and money in follow-up studies. For instance, if an identified target has shown promising binding to a particular small molecule, Biacore systems can be used to screen a library of related small molecules to select top binding partners. Then, by determining association and dissociation rates in addition to equilibrium constants, greater insight into structure-function relationships can be gained.



Biacore system sensorgrams define whether binding takes place at all and if so to what extent. The sensorgram also shows in real-time how fast the binding and dissociation takes place. Equations can than be fitted to the resulting curve to calculate on rates, off rates, and affinities.



With MicroCal systems, software, and consumables, molecular interactions can be investigated with isothermal titration calorimetry (ITC) to determine affinity and thermodynamic properties such as enthalpy, entropy, and Gibbs free energy. These factors help us to understand whether interactions are based on hydrophilic events, van der Waal interactions, or hydrophobicity (4). In cancer research, this can be used to rationally optimize drug structure. Moreover, MicroCal differential scanning calorimetry (DSC) can be used to study protein unfolding quickly and directly and can be used to rapidly identify the conditions that lead to optimum stability such as for liquid formulations of biomolecular pharmacueticals (5).

For more information, visit www.gelifesciences.com/biacore and www.gelifesciences.com/microcal

Cellular analysis using IN Cell Analyzer

To test insights gained from the previous technologies on a cellular level, the IN Cell Analyzer platform offers high content imaging and analysis of cell-based assays ranging from basic research to evaluating potential drug candidates. The system allows up to four fluorophores visualized in parallel, while extracting a massive amount of information for each condition. Such information includes fluorescent intensity, counting of cells and organelles, and changes in size or morphology of cells or organelles. For cancer research, these assays provide essential *in vivo* information. Examples are monitoring toxicology and effectiveness of cancer drugs by observing cell morphology (6), protein translocation, cell movement, and more.

For more information, visit www.gelifesciences.com/incell

Summary

GE Healthcare provides a wide range of tools, service, and support to help build effective and comprehensive cancer research programs. With the spirit of innovation, our goal is to partner with researchers to win the war on cancer, a disease that will impact one in three people in their lifetime.

References

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4. Application note: Revealing kinase inhibitor mechanisms, GE Healthcare, 28-9870-38, Edition AA (2010).
5. Application note: Applications of differential scanning calorimetry in the development of liquid formulations for protein biopharmaceuticals, GE Healthcare, 28-9870-37, Edition AA (2010).
6. Application note: Use of online cell counting for micronucleus and neurite outgrowth assays on IN Cell Analyzer 2000, GE Healthcare, 28-9673-96, Edition AA (2009).