

EBRI Genomics Facility

The EBRI Genomics Facility provides resources for investigating gene expression and functions with a focus on applying RNA/DNA microarray technologies. The facility combines state of the art technology and expertise in genomics and bioinformatics, is equipped with cutting edge instrumentation and is staffed by researchers who have extensive expertise in this field, with the aim of promoting biology and biomedical research. The Facility provides services, collaborations and scientific support to research community both in public institutions and industries.

As a service facility, the Facility provides expertise and equipment for all phases of array-based services, ranging from sample preparation through data analysis and management for investigators as well as qualified external users.

As a research facility, the Facility pursues various research and development projects, including a comprehensive microarray reproducibility study and optimization of protocols for Agilent array hybridization.

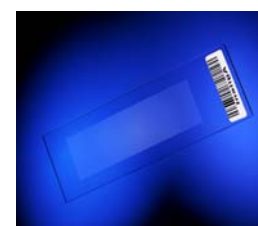
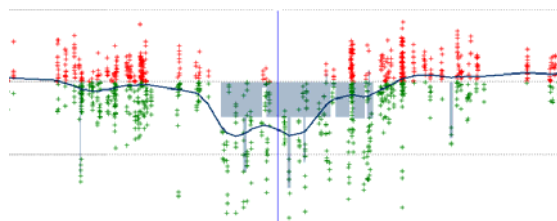
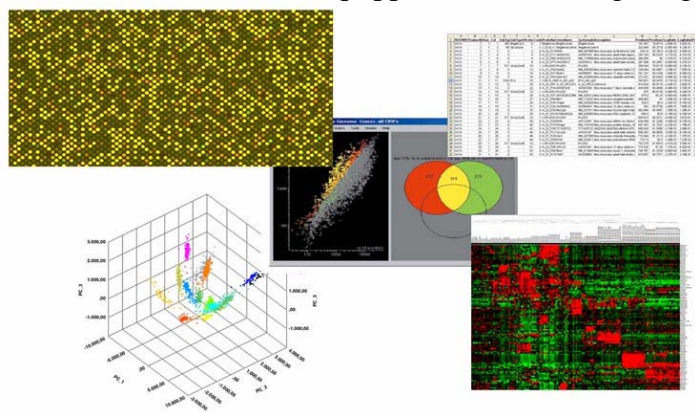
Using these new technologies for probing polymorphisms and gene expression, neurogenomics aims to understand the molecular basis of nervous system function and dysfunction. The technological advances in genotyping and expression profiling offer exciting and promising advances in biomedicine, both in understanding the basis of common diseases as well as in improved diagnosis and therapy. The application of genomic technology at EBRI might allow early and more accurate prediction and diagnosis of disease and disease progression and the redefinition of disease subtypes (typical application cancer) to optimize

differential therapies (pharmacogenomics) and understand the individual responses (personalised medicine) to drugs with crucial implications for their development by the pharmaceutical industry.

The microarray technology of the EBRI Facility is based on the Agilent platform, that provides high-density microarrays chips with 60-mer oligos synthesized in-situ, that allows to analyze gene expression profiles, with the analysis of mRNA and microRNA, genomic aberrations on DNA samples (CGH, Comparative Genomic Hybridization), methylation and promoter profiles of DNA (ChIP-on-chip). Agilent Technologies Inc., an international leader in life science research and partner of EBRI, generously donated a two-lasers microarray scanner, that has recently been upgraded by increasing the resolution of the laser beam from 5 microns to 2 microns, allowing to use the new 1-million spots chips. The same technology is both highly reliable and flexible, since it offers the chance to design completely customized microarray chips.

RNA and DNA samples are processed, extracted from cell cultures and any animal or human tissue, including blood and tumor samples, labelled and hybridized to microarray chips.

RNA or DNA samples are first quality checked using the microfluidic platform Agilent Bioanalyzer 2100, that can also be used to analyze proteins and cells. Post labeling efficiency is quantified by Nanodrop ND-1000 prior to hybridization of samples to the chips. Post-hybridization image acquisition is accomplished using the Agilent scanner, equipped with two lasers (532 nm and 635 nm) and a 48 slide auto-sampler carousel. Real-Time PCR is used both for investigation purposes



and validation of microarray analysis. Data extraction from the images is accomplished using Agilent Feature Extraction software and Bioinformatics analysis is performed using Agilent GeneSpring and Genomic WorkBench, R Bioconductor, MeV, Microsoft Excel VB macros, SAM, other online tools.

We offer several types of data and Bioinformatics analysis:

gene expression profiles of mRNA:

- ✓ list of differentially expressed mRNA genes: SAM, ANOVA, other algorithms
- ✓ functional analysis of gene lists: Gene Ontology, DAVID, Panther DB, ..

gene expression profiles of microRNA:

- ✓ list of differentially expressed microRNA genes: SAM, ANOVA, other algorithms
- ✓ target predictions: combinations of multiple predictions using TargetScan, mirDB, Diana,...
- ✓ functional analysis of target lists: Gene Ontology, DAVID, Panther DB, ...
- ✓ combination of gene expression profiles of microRNA and mRNA

DNA aberration profiles:

- ✓ List of aberrations, their genomic location and predicted break points
- ✓ Copy number analysis
- ✓ Alignment with UCSC browser known genes

Examples of projects currently ongoing at EBRI Facility:

- *Alzheimer's Disease project*: mRNA and microRNA gene expression profiles in animal models and human samples of Alzheimer's Disease for identification of early biomarkers of the disease. Large-scale analysis of gene expression in human postmortem brain will allow to identify molecular changes that occur in disease and lead to the identification of genes and proteins specifically associated also with other neurodegenerative disorders (Alzheimer's disease).
- *Spinocerebellar Ataxia*: high-density genomic aberration profiles in the DNA sequence of specific genes

Personnel

Head: Dr. Mara D'Onofrio

Bioinformatics: Dr. Ivan Arisi

Experimental activity: Dr. Rossella Brandi

Main equipment



Microarray scanner: Agilent Scanner G2505C, laser a 532 nm e 635 nm, 2 micron resolution

Bio-Rad iQ5 Real-Time PCR Detection System





Applied Biosystems 7900HT Fast Real-Time PCR System, with Eppendorf epMotion 5075 Workstation

Microfluidic: Agilent Bioanalyzer 2100



Spectrophotometer: Nanodrop ND-1000

Ozone detector: Aeroqual S500, range 5-20 ppm



Software

Agilent GeneSpring GX ver. 7.3
Agilent GeneSpring GX ver. 11.0
Agilent Feature Extraction ver. 10.5
R Bioconductor
MeV, TM4 Microarray Software Suite

Main experimental protocols

RNA and DNA extraction from any tissue, including blood (serum, plasma or mononuclear cells)
Agilent two-color microarray for gene expression analysis of mRNA
Agilent one-color microarray for gene expression analysis of microRNA
Agilent one-color microarray for CGH analysis of DNA
Special microarray analysis for non poly-adenylated mRNA samples
Taq-man Real-Time PCR

Contact details



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