Case Study

Gene expression microarrays applied to obesity research: INNOPSYS system for quickly and efficient microarray quality control evaluation

Background
Omic technologies arise as useful tools in obesity research\(^1\). Due to its high metabolic activity and its ability of secretion, adipose tissue is no longer considered as a passive energy keeper but as a critical component in the regulation of energy balance\(^2\). The Obesity Research Laboratory at the institute of Molecular Medicine (INSERM-Paul Sabatier University) in Toulouse (Dr. Nathalie Viguerie, Pr. Dominique Langin) uses gene expression microarrays for deciphering adipose tissue transcriptome modifications face to nutritional challenges such as low calorie diets and other clinical investigation protocols\(^3,4\).

Issue
High quality microarray data is essential to allow the comparison of global expression changes in thousand of genes between different conditions. A rapid and easy quality control (QC) evaluation of microarrays was then desirable. Region Midi-Pyrenees funded the joint effort between INNOPSYS and the Obesity Research Laboratory to set up such QC.

Solution
\textbf{InnoScan\textsuperscript{®}} microarray scanners from \textbf{INNOPSYS} are a line of low cost- high resolution-microarray scanners compatible with a wide range of both commercial and in-home made microarrays. Together with MAPIX\textsuperscript{®}, a friendly image analysis software, microarray image acquisition and analysis are easily performed.

Results
A Quality Control plugIn in MAPIX was developed to evaluate QC based on external RNA control spiking\(^5\) (Figure 1). By clicking on the Quality control plugIn, a QC report is displayed in a pdf format for each of the analyzed slides. This helps researchers in evaluating eventual problems in microarray experiments.

Using Agilent\textsuperscript{®} gene expression microarrays, two-color microarray QC yielded similar results as obtained by other image analysis (Figure 2). In a simple step, researchers are now able to evaluate data quality immediately after slide scanning leading to more efficient, time- and money-saving experiments.

\textbf{Conclusion}
\textbf{InnoScan\textsuperscript{®}} and MAPIX\textsuperscript{®} are low-cost highly efficient technologies for microarray slide scan and image analysis. With the advantage of faster and easier QC evaluation, data extracted from these technologies were of similar quality as those extracted by other technologies. The QC plugIn in MAPIX\textsuperscript{®} is only an example of the flexibility of INNOPSYS solutions for microarray analysis. Using pangenomic cDNA arrays analyzed by \textbf{InnoScan\textsuperscript{®}} and MAPIX\textsuperscript{®}, the Obesity Research Laboratory and the Diogenes project (http://www.diogenes-eu.org/) work on the definition of adipose tissue transcriptome differences between subjects.
Figure 2. Correlation between SpikeIns (QC) results obtained by either InnoScan700 scanner or by other microarray scan system. QC was measured by using the correlation coefficient between the expected logRatio vs the observed logRatio for each spike present in the array as established by Agilent's two-color SpikeIns protocol. A good correlation between both image analysis systems were found (Spearman’s Rho = 0.681, P = 5.2e-8).

able to maintain and subjects regaining weight 6 months after an energy restriction period of 8 weeks. This research contributes to advance the knowledge in the field of obesity with the perspective of conceiving new preventive and therapeutic strategies of obesity and its associated pathologies.

References

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