ABSTRACT

Metabolic, Bioenergetic, and Mitochondrial Analysis by Live Cell Assays with Phenotype MicroArrays

Phenotype MicroArray™ (PM) technology is a live cell assay technology that allows scientists to scan cell metabolic and energetic pathways in a detailed and comprehensive manner. Changes in cell energetics are of broad importance as they underlie metabolic disorders (diabetes, obesity, nutrition, cachexia), drug toxicology, neurological disorders, mitochondrial disorders, aging, and cancer (the Warburg Effect). The advent of genetic methodologies such as CRISPR, which enable engineering of model cell lines with specific genetic alterations, is opening up many new exciting research avenues and novel questions. The technology consists of a suite of testing panels with hundreds of ready-to-use assays dried into microplate wells. The assays are performed by simply inoculating with cells and a novel redox dye. The redox dye gives a universal colorimetric readout of cell energy production in each well. A companion instrument, the OmniLog™, incubates the microplates and automatically records the kinetics of energy production in each assay well. The PM technology platform provides a powerful tool for genotype-phenotype studies. It can be used for (1) analyzing the active and inactive energy pathways in model cell lines or in primary cells, (2) determining important genotype/phenotype relationships by analyzing the metabolic reprogramming that occurs consequent to mutations, (3) understanding the interplay of nutritional environment and hormonal signals on cell metabolism, (4) examining the effects on cellular pathways of drugs.

Moreover, a novel assay based on the use of the abovementioned redox dye, called Mitoplate™ has been recently developed to target and study mitochondria. In Eukaryotes, mitochondria produce the greatest amount of energy and allow cells performing all the functions they are capable of. This presentation will provide an overview of the newest Biolog application to study the metabolisms of this very important organelles and access key insights in both healthy and pathological conditions.