Phenotype MicroArrays™ for Genomic Scale Phenotypic Testing of Microbial Cells

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Phenotype MicroArray (PM) technology allows a biologist to simultaneously test 2,000 properties (phenotypes) of a cell. Testing involves about 30 minutes of actual labor and 24 to 48 hours of incubation. The phenotypic assays are designed from a physiological perspective to survey *in vivo*, the function of diverse biological pathways, including both metabolic and regulatory pathways. Included in the phenotypes are basic cellular nutritional pathways for C, N, P, and S metabolism (800 tests), pH growth range and regulation of pH control (100 tests), sensitivity to NaCl and various other ions (100 tests), and sensitivity to chemical agents that disrupt various biological pathways (1,000 tests). PM technology can be used to complement genetics and genomics. A change in genotype of a cell should lead to one or more changes in phenotype, if the gene has a real function. PMs allow testing of knockout or overexpression mutants to discern the biological changes that occur consequent to genetic changes. Examples will be discussed from a variety of model microbial cells. We have varying degrees of experience with *Escherichia coli, Salmonella typhimurium, Pseudomonas aeruginosa, Burkholderia cepacia, Vibrio cholerae, Helicobacter pylori, Staphylococcus aureus, Streptococcus pyogenes, Enterococcus faecalis, Listeria monocytogenes, Bacillus subtilis, Bacillus cereus, Corynebacterium striatum, Saccharomyces cerevisiae, Candida albicans, Ustilago maydis,* and *Aspergillus nidulans*. Prototype PMs have also been developed for human cells.