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Large OMARS designs for microplate experimentation in biotech

Well microplates are used in several application areas, such as biotechnology, disease research, drug discovery and environmental biotechnology. Within these fields, optimizing bioassays such as CART-T, ELISA and CRISPR-Cas9 is commonplace. Microplates have a fixed size, and the most used ones have 24, 48, 64, 96, 384 or 1,536 wells, with each well representing an individual experiment. When designing an experiment for microplates, it is necessary to consider positional effects. These effects include row/column effects (due to dispensing or reading results) and edge effects (due to different thermal conditions at the edges). Additionally, factors that are difficult to change may be present when several microplates are used in one experiment. OMARS designs are a cost-efficient family of experimental designs that enable the study of a large number of factors at reduced cost. One example of a design in the OMARS family is the Definitive Screening Design. In this talk, we will explain how we devised an algorithm using an integer programming approach to concatenate OMARS designs that minimizes the correlation between effects, and how such a design can be blocked efficiently in the presence of several random effects. We will present results for 96, 384, and 1,534 wells, both with and without perimeter wells, and compare them with optimal design procedures and designs from the literature. We will demonstrate the application of these designs through examples of bioassay optimization.

Special/ Invited session

Classification

Both methodology and application

Keywords

Experimental design, OMARS design, biotech

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