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## Detecting structural variations between different concentration-response experiments

In toxicology, the same concentration-response experiment is often conducted in the same manner on different days. That might result in measured viabilities that differ noticeably across the days. However, in toxicology, it is common practice to calculate effective concentrations to a viability level  $p$  ( $EC_p$ ) and use it for further experimental days. We focus on the evaluation of the  $EC_p$  of one day and the corresponding viability of another day at this concentration and investigate under which circumstances this procedure is valid by embedding it within an appropriate mathematical framework. Reformulating the procedure as a nested function of the parameter estimator in a regression model, we derive its asymptotic distribution. We further construct confidence intervals (CIs) that can be used to test for day-to-day effects in concentration-response experiments.

Based on a simulation study, we illustrate the influence of different design choices in concentration-response experiments on the quality of the inference. In particular, we verify that, for small sample sizes, the (asymptotic) parametric test already performs well in terms of significance level and power when the locally D-optimal design is used. Finally, we consider a novel optimality criterion that directly maximizes the asymptotic power of the constructed test with respect to the design.