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Abstract The relative ability of the NOEC (no-observed-effect concentration) and ECx (the effect concentration corresponding to x-percent response) to determine benchmark toxicant concentrations, which are expected to ensure environmental safety, when there are large uncertainties in data was investigated with Monte Carlo simulations. We assumed a hypothetical true concentration-response function, and examined how random fluctuations of responses around the true responses affected the NOEC and ECx values. For assessment of the relative performances of these endpoints, we adopted two criteria: how large uncertainties were allowed for the minimum requirement for safety to be met, and the probability with which the estimated endpoints exceeded the minimum requirement for safety. The results of simulations indicated that, when there were small uncertainties in the data, performance of the NOEC was comparable with or slightly better than the ECx (EC5 and EC10) in providing benchmark concentrations that satisfied the minimum requirement for safety. With larger random variation of data (the coefficient of variation in responses between replicates within treatments or in the control was noticeably larger than 10 percent), the NOEC performed considerably worse than the ECx in terms of the frequency of simulated runs in which the endpoints exceeded the minimum requirement of safety. We conclude that the NOEC is as relevant as the ECx for risk assessment of chemicals under limited situations.