Relative Potency Functions for Dose-Response Studies

Gregg Dinse[*], National Institute of Environmental Health Sciences

David Umbach, National Institute of Environmental Health Sciences

Abstract

In toxicology, estimates of relative potency are used to rank chemicals by their effects, to calculate equivalent doses of test chemicals compared to a standard, and to weight contributions of constituent chemicals when evaluating mixtures. Typically relative potency is characterized by a constant dilution factor, even when dose-response curves indicate that constancy is inappropriate. Improperly regarding relative potency as constant may distort conclusions and mislead investigators or policymakers. We consider a more general approach that allows relative potency to vary as a function of dose, response, or response quantile. We define distinct functions, each generalizing different but equivalent descriptions of constant relative potency. When two chemicals have identical response limits, these functions all carry fundamentally equivalent information; otherwise, relative potency as a function of response quantile is distinct and embodies a modified definition of relative potency. Which definition is preferable depends on the application and whether one views differences in response limits as intrinsic to the chemicals or as extrinsic, arising from idiosyncrasies of data sources.

Keywords: Dose conversion; Dose-response; ED50; Hill model; Non-similar; Relative potency.

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[*] Presenting author