BAYESIAN APPROACHES TO DOSE-RESPONSE CALIBRATION MODELS

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The statistical analysis of dose-response experiments typically models observed responses as a function of an applied dosage series. The estimated does-response curve may be used to predict future responses or derive biologically useful metrics such as the half-life of a compound. In some situations, however, the dose-response curve may be expressed in an inverted form where dose becomes a function of the response. This type of modification is useful where observed responses are available, but their associated dosages are unknown. Traditional statistical techniques for the dose-response calibration model are problematic, usually involving approximate solutions. As an alternative, the problem can be naturally stated from a Bayesian viewpoint. That is, one would like to estimate the probability of an unknown dose given an observed response and some degree of information regarding the dose-response relationship. This paper examines potential Bayesian solutions to the dose-response calibration model under various assumptive conditions. The required methodology in each case will be outlined for a dichotomous response variable and a logistic dose-response function. Empirical results will be demonstrated using data taken from an organic pesticide dose-response experiment.