

Using a microcomputer to convert percent response values to probits

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Abstract

Certain relationships between dose/concentration and percent response/binding in various biochemical systems are sigmoidal rather than linear. This sigmoid relationship is considered linear only over the 20–80 percent range. Appropriate analysis of such data over nearly the entire response/binding range requires the conversion of the percent response data to probits or probability units, producing a linear relationship. While tables of probits are available, the author has incorporated the probability function for probit conversion into a commercially available spreadsheet program. Also included is the Rohlf and Sokal approximation for the area under the normal distribution curve (conversion of probits to cumulative percent). These functions allow use of a spreadsheet to automate the creation of dose-response curves, or standard curves as part of chemical assays (i.e., radioimmunoassay).

Introduction

In the study of drugs such as muscle relaxants, evaluation of the log dose-response curve is essential in determining the response of a study population to the drug. In this type of analysis the measured response would be the percent diminution in muscle strength resulting from a given dose of the study drug. The resulting log dose-response relationship is sigmoidal and considered linear only over the 20–80 percent response range.

A similar relationship exists when analyzing plasma concentrations of a substance by radioimmunoassay (RIA). With RIA, there is a sigmoid relationship between the log concentration of the substance and the percent binding of the substance, or its radio-tagged equivalent, to the antibody.

Appropriate analysis of such data over nearly the entire response/binding range requires the conversion of the percent response data to probits or probability units. The resulting log dose-probit re-

sponse or log concentration-probit percent binding relationships are linear. The subsequent analysis of this linear relationship, using the least squares linear regression equation, permits calculation of values for the ED50 or ED95 of the muscle relaxant or, for drug analysis by RIA, construction of a standard curve.

One example of this type of quantal dose-response analysis and an accompanying computer program written in basic has been published [1]. The probit conversion section of this very complete but lengthy program doesn't arithmetically convert percent to probit but rather assigns a probit value from a table of probit transformations. The probit values from an appended table [1] are sequentially loaded into a one-dimensional array and the percent response, after being rounded to the nearest integer value, is assigned the probit value occupying that sequential location in the array.

In our work with RIA, we were particularly interested in automating the calculations necessary

