DRUG DEVELOPMENT AND INDUSTRIAL PHARMACY, 19(3), 395-396 (1993)

GEOMETRIC STANDARD DEVIATION - REPLY TO BOHIDAR

T.B.L. Kirkwood

National Institute for Medical Research
London NW7 1AA, U.K.

Bohidar (1) comments that a formula I proposed (2) for geometric standard deviation (GSD) is "absolutely incorrect". This comment is based on erroneous interpretation of my proposal and to avoid further confusion it may be helpful to point this out. The issue addressed in ref(2) was how to summarize the extent of statistical variation in a sample of data drawn from the lognormal distribution, for which the underlying variation is multiplicative. This situation was contrasted with the normal, or Gaussian, distribution for which the underlying variation is additive. Normally distributed data are conveniently summarized by a mean plus or minus a standard deviation (SD) (or standard error, SE). For lognormal data the geometric mean was available as replacement for the ordinary mean, but no direct analogue existed for SD (or SE).

The new measures I defined, geometric standard deviation (GSD) and geometric standard error (GSE), are direct counterparts of the familiar SD and SE, except that in keeping with the basic difference between lognormal and normal distributions, they are multiplicative instead of additive terms. Therefore,

"mean plus or minus SD" for normal data becomes "geometric mean times or divide by GSD" for lognormal data (2). Bohidar (1) appears to have misunderstood this concept. If all data are the same, Bohidar noted, my formula gives the GSD a value of one, and "therefore this is a contradiction, and the formula is incorrect and should not be used in practice" (1). Of course, a GSD of one is exactly what we require if all data are the same, since multiplication or division by one produces no change. If we transform scales by taking logarithms, the GSD of one becomes a SD of zero, just as it ought.

Once the basic difference between multiplicative and additive terms is recognized, the measures I proposed are simple to use. They have the further advantages that (i) they are direct analogues on a multiplicative scale of the conventional measures defined for normal data on an additive scale, and (ii) they are true to the skew form of the underlying lognormal distribution. These advantages are not shared by Bohidar's alternative definition of GSD.

ACKNOWLEDGEMENT

I thank Dr R.E. Gaines Das for drawing Bohidar's paper to my notice.

REFERENCES

1. N.R. Bohidar, Determination of geometric standard deviation for dissolution. Drug Development and Pharmaceutical Industry, 17, 1381-1387, 1991.

2. T.B.L. Kirkwood, Geometric means and measures of dispersion. Biometrics, 35, 908-909, 1979.