letters

TO THE EDITOR

More on Calculation of Mean pH Values

To the Editor:

I note with interest the conjunction of Dr. Harris' excellent article on variation in statistical analysis (Anesth Analg 57:322-327, 1978) with the criticism of statistical analysis of pH data (Anesth Analg 57:380-381, 1978) by Drs. Giesecke, Beyer, and Kallus, and the reference to the letter from Dr. Krause (Anesth Analg 57:143-144) on a similar topic.

Dr. Harris clearly explained how the variability of data values can be assessed by the use of the coefficient of variation, which is the standard deviation of a number of values (assumed to be taken from a population that is normally distributed) divided by the mean of those values. He also illustrated the normal and other distributions.

Both of the letters suggest that in order to analyze pH data correctly, it is necessary to correct these values into [H+]. This is not necessarily so. This procedure would only be correct if the distribution of [H+] values were normal. If this were true, then the logarithmic transform (pH) would not be normally distributed. Unfortunately there seems to be no reason to suppose that this assumption is correct for gastric secretions. If Drs. Giesecke, Beyer, and Kallus were to plot a frequency histogram for the data they manipulated, they would find that neither pH nor [H+] appears normally distributed. In fact, the coefficient of variation for the pH values (less than 60 minutes) is 0.526, which is better than the coefficient of variation for the [H+] values, which is 1.258! Dr. Baraka and his coworkers were correct in their paper when they used the chi-square test, which does not assume normal distribution of pH

values (Anesth Analg 56:642-645, 1977).

Dr. Krause states that pH values will have a lognormal distribution. This is not correct. Gaddum[1] suggested that the term lognormal should be used to describe a quantity whose logarithm was normally distributed.

Dr. Krause means that [H+] is normally distributed and that pH values will be distributed logarithmically, but does not attempt to substantiate this possibility. From the Henderson equation, [H+] is the proportion of two variables that are also commonly assumed to be normally distributed:

$$[H+] = \text{constant} \cdot \frac{P_{CO_2}}{[HCO_3^-]}$$

Consequently [H+] will have the properties of a proportion, and its logarithm, pH, would be normally distributed.[2] The conversion of a measurement into its logarithm to allow statistical analysis is a well-known and accepted technic, and I can see no reason why this procedure should not be applied to [H+] if the resultant distribution of pH values is normal.

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REFERENCES

1. Gaddum JH: Lognormal distributions. Nature 156:463, 1945
2. Oldham PD: Measurement in Medicine. London, English Universities Press, 1968, p 17

Penicillin Neuropathy

To the Editor:

Much in the literature indicates that penicillin has a toxic effect on

nervous tissue. Convulsions occur following intraventricular administration[1] and its application directly to animal cerebral cortex has induced seizures.[2] Cerebral degeneration[3] and myeloradiculitis[4] have occurred from intrathecal administration. Although rare, peripheral neuritis has been reported as a complication of penicillin therapy.[5]

A 30-year-old physician received a penicillin injection in the right gluteal region for "strep throat" with subsequent negative throat culture. Five days later he began to have gluteal pain radiating to the posterior thigh to just below the popliteal fossa. Examination revealed a markedly restricted straight leg raising test (Lasègue's sign) with production of radiating pain. The right ankle reflex was depressed, but no motor or sensory loss was evident. Tenderness (Valleix's points) was present on palpation along the sciatic nerve. The injection site was clearly away from the nerve, and was slightly bruised.

Laboratory tests were normal; these included heterophile agglutination test ("Mono spot"), fluorescent treponemal antibody-absorption (FTA-ABS), and hepatitis-associated antigen (HAA). Sedimentation rate was 25 mm/hour (Westergren) (normal-less than 20 for males). The pain and symptoms resolved in 1 week with bed rest and analgesics; there was no recurrence in 18 months.

We believe this represents a sciatic neuritis associated with intramuscular penicillin therapy. This has been reported in a single case in 1946, but with other mononeuropathies also occurring.[5] It does not appear to be due to direct injury to the nerve by the injected material.

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