Of the four independent variables in Eq. 11 for the thickness of the diffusion layer, only two are highly sensitive to changes in temperature. They are the viscosity of the medium, η, which was corrected for by a modification of Hess' rule, and the velocity of flow of the biological medium, v, as a result of body movement or stirring. In biological systems body movement is often temperature dependent. Crozier and Stier (31) have shown that the pharyngeal respiratory rhythm of frogs (*Rana pipiens*) was temperature dependent and followed the Arrhenius equation

$$k = A \exp[-E/RT] \qquad \text{(Eq. 19)}$$

where k is the reaction rate, A is a constant, E is the activation energy, and R and T have the same meanings as before. Crozier and Stier (31) found that the experimental activation energy for the rate of frog pharyngeal movement was 8.8 Kcal. In this experiment, it was important that animal body movement should be controlled so that the influence of temperature on drug absorption rate could be readily estimated. The method chosen here was that of paralyzing the frog with large doses of *d*-tubocurarine chloride, so that the velocity of stirring or movement of body fluids was biologically nearly zero. Body movement never can be reduced to zero, since heart function must be maintained. The isolated frog (*Rana temporaria*) heart rate has been shown to be temperature dependent (14). Little could be done to control this variable in body movement, except to note that *d*-tubocurarine in the frog was reported to cause slowing of heart rate in addition to its other effects (11).

The fact that the slopes of the lines in Figs. 1 and 2 are slightly greater than unity indicates that the term Kr might not be completely temperature independent. If experimental errors are ignored, there are at least three reasons why the slope should be greater than unity. First, the value for Dr as calculated from Eq. 17 is always slightly smaller than Dr observed, excepting the 1° C. value. Second, the density of water (and presumably body fluids saturated with drug) decreases at temperatures below and above 4° C. In Eq. 12 at temperatures a little greater than 8° C., ρ° for water is slightly greater than ρ. And third, heart rate, a source of body movement even in curarized animals, is probably greater at higher temperatures.

REFERENCES

(1) Ballard, B. E., and Nelson, E., This Journal, **51**, 915(1962).
(2) Ballard, B. E., and Nelson, E., *J. Pharmacol. Exptl. Therap.*, **135**, 120(1962).
(3) Nelson, E., This Journal, **46**, 607(1957).
(4) Robinson, R. A., and Stokes, R. H., "Electrolyte Solutions," 2nd ed., Academic Press, Inc., New York, N. Y., 1959, p. 44.
(5) Bingham, E. C., and Roepke, R. R., *J. Gen. Physiol.*, **28**, 79(1944–1945).
(6) Frey-Wyssling, A., ed., "Deformation and Flow in Biological Systems," Interscience Publishing Co., New York, N. Y., 1952, p. 384.
(7) Jost, W., "Diffusion in Solids, Liquids, Gases," Academic Press, Inc., New York, N. Y., 1952, p. 78.
(8) Sollmann, T., "A Laboratory Guide in Pharmacology," W. B. Saunders Co., Philadelphia, Pa., 1922, p. 143.
(9) King, H., *J. Chem. Soc.*, **1935**, 1381.
(10) Kensler, C. J., *J. Pharmacol. Exptl. Therap.*, **95**, 28 (1949).
(11) Wright, E. B., and Taylor, R. E., *J. Cell. Comp. Physiol.*, **34**, 327(1949).
(12) Parker, G. H., *Proc. Soc. Exptl. Biol. Med.*, **42**, 186 (1939).
(13) Ballard, B. E., and Nelson, E., *Am. J. Vet. Res.*, **23**, 678(1962).
(14) Clark, A. J., *J. Physiol.*, **54**, 275(1920–1921).
(15) Longsworth, L. G., *J. Phys. Chem.*, **58**, 770(1954).
(16) Wright, R., *J. Chem. Soc.*, **1927**, 1334.
(17) Bradfield, A. E., and Williams, A. F., *ibid.*, **1929**, 2542.
(18) Logan, T. S., *J. Am. Chem. Soc.*, **67**, 1182(1945).
(19) *Ibid.*, **68**, 1660(1946).
(20) Ballard, B. E., Doctor of Philosophy Thesis, University of California, Berkeley, 1961.
(21) Laug, E. P., and Morris, H. J., *Proc. Soc. Exptl. Biol. Med.*, **42**, 541(1939).
(22) Krüger-Thiemer, E., "Handbuch der Haut-und Geschlechtskrankheiten," Ergänzungswerk, Band V/1, Therapie der Hautkrankheiten, Springer-Verlag, Berlin, 1962, p. 962.
(23) Derick, C. G., and Bornmann, J. H., *J. Am. Chem. Soc.*, **35**, 1269(1913).
(24) Arnall, F., *J. Chem. Soc.*, **117**, 835(1920).
(25) Shore, P. A., Brodie, B. B., and Hogben, C. A. M., *J. Pharmacol. Exptl. Therap.*, **119**, 361(1957).
(26) Maren, T. H., Robinson, B., Palmer, R. F., and Griffith, M. E., *Biochem. Pharmacol.*, **6**, 21(1960).
(27) Robinson, E. J., and Pekrul, L. F., *J. Am. Chem. Soc.*, **67**, 1186(1945).
(28) Cook, A. H., Heilbron, I. M., Reed, K. J., and Strachan, M. N., *J. Chem. Soc.*, **1945**, 861.
(29) Clark, W. G., Strakosch, E. A., and Levitan, N. I., *J. Lab. Clin. Med.*, **28**, 188(1942).
(30) Kienle, R. H., and Sayward, J. M., *J. Am. Chem. Soc.*, **64**, 2464(1942).
(31) Crozier, W. J., and Stier, T. B., *J. Gen. Physiol.*, **7**, 571(1924).
(32) Klotz, I. M., and Urquhart, J. M., *J. Am. Chem. Soc.*, **71**, 847(1949).

ERRATUM

In the paper titled "Production of Pyridoxine and Niacin by *Chlorella vulgaris* and *C. pyrenoidosa*" (1), Table III at page 152 should be clarified to read:

Table III.—Value of *C. vulgaris* Relative to *C. pyrenoidosa* as a Source of Vitamin B_6 and Niacin at Different Harvest Times

Vitamin	mmcg. per mg. Dry Wt. 2 wks.	mmcg. per mg. Dry Wt. 3 wks.	mmcg. per ml. Culture 2 wks.	mmcg. per ml. Culture 3 wks.
	1	*2*	*3*	*4*
B_6	0.66	0.90	0.57	0.75
Niacin	1.06	1.18	0.93	1.07

(1) Pratt, R., and Johnson, E., This Journal, **53**, 151 (1964).