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A Table for Rapid Determination of Log_{10} LD_{50} or ID_{50} Values

RALPH W. KUEHNE

U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, Frederick,
Maryland 21701

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of the Army or the Department of Defense

Phone No. (301) 663-7373

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ABSTRACT

A reference table is presented for rapid determination of LD₅₀⁷ or ID₅₀^M values when administering 10-fold serial dilutions to six animals per dilution.

While the determination of an LD₅₀ or ID₅₀ is neither a complicated nor a difficult procedure (1), many laboratories continue to perform these calculations on each titration manually. In some of our laboratory areas where access to a computer is not readily available, the table (Table 1) presented below has been of great value in saving time, reducing errors, and enabling even untrained personnel to record LD₅₀ values from titration results. Values shown are for titrations utilizing six animals per point, a commonly used number for titrating viruses or sera for antibody (2). The method of Reed and Muench (1) "utilizes, at least in part, the large, total number of animals involved. The effect is that of using, at the two critical dilutions between which the endpoint lies, larger groups of animals than were actually included at these dilutions."

To use the table, let A represent the log₁₀ of the highest dilution showing the desired effect (mortality, infectivity, immunity, survival, etc.) in 6/6 animals, and B through E the log₁₀ of the four next consecutive 10-fold dilutions.

Typical titration examples are given in Table 2. Example number 2 shows a titration giving the following results: $10^{-2} = 6/6$, $10^{-3} = 6/6$, $10^{-4} = 4/6$, $10^{-5} = 2/6$, $10^{-6} = 2/6$ and $10^{-7} = 0/6$. In this instance, A = 3 (the log₁₀ of the highest dilution showing the effect in all animals), B = 4, C = 5, etc. The value from Table 1 would be derived from the line showing 6, 4, 2, 2, 0 (bracketed results in Table 2), or B.75. Since B = 4 in this example, the log₁₀ LD₅₀ would equal 4.75.

The table assumes that no more than five dilutions are required to accomplish 100 to 0% response, and that an orderly dose-response relationship exists. Since the mantissa of each value shown represents the proportionate distance between two adjacent dilutions, this number can also be applied to calculate the 50% endpoint when dilutions other than 10-fold are used, i.e., to other log bases.

LITERATURE CITED

1. Reed, L. J., and H. Muench. 1938. A simple method of estimating fifty per cent endpoints. Am. J. Hyg. 27:493-497.
2. Lennette, E.H. 1964. General principles underlying laboratory diagnosis of viral and rickettsial infections, p. 1-66. In E. H. Lennette and N. J. Schmidt (ed.), Diagnostic procedures for viral and rickettsial diseases, 3rd ed. American Public Health Association, New York.

TABLE 1. Log_{10} LD₅₀ or ID₅₀ Values for 6 Animals/Dilution

*10 ^{-A} 10 ^{-B} 10 ^{-C} 10 ^{-D} 10 ^{-E} LD ₅₀						*10 ^{-A} 10 ^{-B} 10 ^{-C} 10 ^{-D} 10 ^{-E} LD ₅₀						
6	5	5	5	5	0	D.20	6	4	3	1	0	B.84
6	5	5	4	0	0	D.00	6	4	3	0	0	B.69
6	5	5	3	0	0	C.71	6	4	2	2	0	B.75
6	5	5	2	0	0	C.53	6	4	2	1	0	B.63
6	5	5	1	0	0	C.40	6	4	2	0	0	B.50
6	5	5	0	0	0	C.30	6	4	1	1	0	B.47
6	5	4	4	0	0	C.80	6	4	1	0	0	B.36
6	5	4	3	0	0	C.55	6	4	0	0	0	B.25
6	5	4	2	0	0	C.38	6	3	3	3	0	C.00
6	5	4	1	0	0	C.24	6	3	3	2	0	B.83
6	5	4	0	0	0	C.13	6	3	3	1	0	B.67
6	5	3	3	0	0	C.33	6	3	3	0	0	B.50
6	5	3	2	0	0	C.16	6	3	2	2	0	B.59
6	5	3	1	0	0	C.00	6	3	2	1	0	B.45
6	5	3	0	0	0	B.84	6	3	2	0	0	B.31
6	5	2	2	0	0	B.88	6	3	1	1	0	B.29
6	5	2	1	0	0	B.76	6	3	1	0	0	B.16
6	5	2	0	0	0	B.64	6	3	0	0	0	B.00
6	5	1	1	0	0	B.60	6	2	2	2	0	B.38
6	5	1	0	0	0	B.50	6	2	2	1	0	B.20
6	5	0	0	0	0	B.40	6	2	2	0	0	B.00
6	4	4	4	0	0	C.63	6	2	1	1	0	B.00
6	4	4	3	0	0	C.41	6	2	1	0	0	A.88
6	4	4	2	0	0	C.25	6	2	0	0	0	A.75
6	4	4	1	0	0	C.12	6	1	1	1	0	A.80
6	4	4	0	0	0	C.00	6	1	1	0	0	A.70
6	4	3	3	0	0	C.17	6	1	0	0	0	A.60
6	4	3	2	0	0	C.00	6	0	0	0	0	A.50

* Serial Log Dilutions.

TABLE 2. Examples of Typical Titration Results

Example	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	Value of A	LD ₅₀ Value From Table 1	Log ₁₀ LD ₅₀
1.	6/6	6/6 ^A	5/6 ^A	4/6 ^C	2/6 ^D	0/6 ^E	0/6		2	C.38	4.38
2.		6/6	6/6 ^A	4/6 ^B	2/6 ^C	2/6 ^D	0/6 ^E		3	B.75	4.75
3.		6/6	6/6	5/6 ^A	4/6 ^B	3/6 ^C	1/6 ^D	0/6 ^E	4	B.84	5.84

* 10-Fold Dilutions.