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Rapid Determination of Log_{10} 50% Lethal Doses or 50% Infective Doses

RALPH W. KUEHNE

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

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A reference table is presented for rapid determination of 50% lethal doses or 50% infective doses after administering 10-fold serial dilutions of toxins, viruses, sera, etc., to six animals per dilution.

Although determination of a 50% lethal dose (LD_{50}) or 50% infective dose (ID_{50}) is neither complicated nor difficult (2), many laboratories continue to perform these calculations on each titration manually. In some areas of our laboratory where a computer is not readily available, the table presented below (Table 1) has been of great value in saving time, reducing errors, and enabling even untrained personnel to obtain LD_{50} values from titration results. Values shown are for titrations in which six animals, a number commonly used for titrating viruses or sera for antibody, are used per point (1). The method of Reed and Muench (2) "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 $\log_{10}$ of the highest dilution having the desired effect (mortality, infectivity, immunity, survival, etc.)

TABLE 1. Log_{10} LD_{50} or ID_{50} values for six animals per dilution

No. affected at indicated dilution					LD/ID$_{50}$	No. affected at indicated dilution					LD/ID$_{50}$
10^{-A}	10^{-B}	10^{-C}	10^{-D}	10^{-E}		10^{-A}	10^{-B}	10^{-C}	10^{-D}	10^{-E}	
6	5	5	5	0	D.20	6	4	3	1	0	B.84
6	5	5	4	0	D.00	6	4	3	0	0	B.69
6	5	5	3	0	C.71	6	4	2	2	0	B.75
6	5	5	2	0	C.53	6	4	2	1	0	B.63
6	5	5	1	0	C.40	6	4	2	0	0	B.50
6	5	5	0	0	C.30	6	4	1	1	0	B.47
6	5	4	4	0	C.80	6	4	1	0	0	B.36
6	5	4	3	0	C.55	6	4	0	0	0	B.25
6	5	4	2	0	C.38	6	3	3	3	0	C.00
6	5	4	1	0	C.24	6	3	3	2	0	B.83
6	5	4	0	0	C.13	6	3	3	1	0	B.67
6	5	3	3	0	C.33	6	3	3	0	0	B.50
6	5	3	2	0	C.16	6	3	2	2	0	B.59
6	5	3	1	0	C.00	6	3	2	1	0	B.45
6	5	3	0	0	B.84	6	3	2	0	0	B.31
6	5	2	2	0	B.88	6	3	1	1	0	B.29
6	5	2	1	0	B.76	6	3	1	0	0	B.16
6	5	2	0	0	B.64	6	3	0	0	0	B.00
6	5	1	1	0	B.60	6	2	2	2	0	B.37
6	5	1	0	0	B.50	6	2	2	1	0	B.20
6	5	0	0	0	B.40	6	2	2	0	0	B.00
6	4	4	4	0	C.63	6	2	1	1	0	B.00
6	4	4	3	0	C.41	6	2	1	0	0	A.88
6	4	4	2	0	C.25	6	2	0	0	0	A.75
6	4	4	1	0	C.12	6	1	1	1	0	A.80
6	4	4	0	0	C.00	6	1	1	0	0	A.70
6	4	3	3	0	C.17	6	1	0	0	0	A.60
6	4	3	2	0	C.00	6	0	0	0	0	A.50

TABLE 2. Examples of typical titration results for 10-fold dilutions

Example	No. affected at indicated dilution/no. tested								Value of A	LD/ID_{50} value from Table 1	Log_{10} LD/ID_{50}
	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}			
1	6/6	6/6[A]	5/6[B]	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	6/6[A]	4/6[B]	3/6[C]	1/6[D]	0/6[E]	4	B.84	5.84

on all six animals tested and B through E the log_{10} values of the next four consecutive 10-fold dilutions.

Typical titration examples are given in Table 2. In example 2, A = 3, B = 4, C = 5, etc. The value from Table 1, B.75, would be derived from the line showing 6, 4, 2, 2, 0 (italicized results in Table 2). Since B = 4 in this example, the log_{10} LD_{50} or ID_{50} would be 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

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