



Letter to Editor Article

Calculation of 95% confidence interval of the median lethal dose determined by the up-and-down procedure: a letter to editor

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Dear Editor;

Acute toxicity of chemicals can be detected by the widely advocated up-and-down procedure (UDP) used to measure the median lethal dose (LD₅₀) in laboratory animals [1,2]. A recent article by Zhang et al. [3] reliably introduced an improved UPD (iUDP) to measure the LD₅₀ values of substances in animals. In an innovative way, the iUDP procedure was presented in a suitable manner to include the 95% confidence intervals (CI) for the LD₅₀ values using the equation:

95% confidence interval = LD₅₀ ± the standard error (SE)

SE = SD x √2/N

SD is the standard deviation of all dosages in N trials in animals. However, not all the reports using the UDP report 95% CI;

some studies use elaborate software programming to calculate the CI [1,3,4]. Others have tried calculating the CI with the arithmetic means (as an LD₅₀) ± standard error of the doses used in the UDP [5]. To further benefit from the iUDP and its simple way of calculating the CI [3], here we suggest an additional input for researchers in toxicology by using the above-mentioned equations to calculate the 95% CI for UDP using the table of the maximum likelihood estimation of LD₅₀-the section with a standard error of 0.61 of Dixon [2]. This is because this version of UDP is still being used, and reports are still being published without mentioning the CI. In this context and for demonstration purposes, we recalculated selected LD₅₀ examples from published literature [6-9] and included their 95% CI (Table 1) according to Zhang et al. [3].

Table 1: Acute (24 h) median lethal doses (LD₅₀) and their 95% confidence intervals (C.I.) of drugs or toxicants administered in laboratory animals

Reference	Animal	Drug/ Toxicant doses	Dose interval	Response X: dead O: alive	LD ₅₀	Mean ± SD	C.I. = LD ₅₀ ± SE
Naser and Mohammad [6]	Chicks	Propofol 100, 80, 60, 80, 60, 40, i.p.	20	XXOXXO	57.22	70.0 ± 20.98	45.11, 69.33
Mohammad et al. [7]	Chicks	Diazinon 15, 10, 5, 10, 5, 10, orally	5	XXOXOX	6.32	9.17 ± 3.76	4.15, 8.49
Al-Baggou and Mohammad [8]	Mice	Cadmium chloride 10, 8, 10, 8, 10, i.p.	2	XOXOX	8.6	9.2 ± 1.1	7.9, 9.3
Mohammad et al. [9]	Mice	Tetramisole 50, 60, 50, 60, 50, s.c.	10	OXOXO	57.0	54.0 ± 5.48	53.5, 60.5

All doses are in mg/kg of body weight; i.p.: intraperitoneal injection; s.c.: subcutaneous injection; SD: standard deviation; SE: standard error (= SD x √2/number of animals) calculated for

the 95% C.I. (= LD₅₀ ± SE) [3]. LD₅₀ was determined by the up-and-down procedure, and the table of the maximum likelihood estimation of LD₅₀-the section with a standard error of 0.61 of Dixon [2] was used for this purpose.

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Abbreviations

UDP: Up-and-Down Procedure; LD₅₀: Median Lethal Dose; iUDP: improved UPD; CI: Confidence Intervals



Declarations

This is a correspondence, and no experimental work has been done for this letter.

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Availability of data and materials

Data will be available by emailing foudmohammad@yahoo.com.

Authors' contributions

Fouad Kasim Mohammad (FKM) is the principal investigator of this manuscript (Letter to Editor). FKM is responsible for the study concept, design, writing, reviewing, editing, and approving the manuscript in its final form. FKM read and approved the final manuscript.

Ethics approval and consent to participate

The corresponding Author conducted the research following the Declaration of Helsinki; however, Letter to Editor Article needs no ethics committee approval.

Consent for publication

Not applicable

Competing interest

The author declares that he has no competing interests.

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