Correspondence

VACCRaksha Calc: A computer program for the calculation of vaccine potency

Assessment of vaccine potency is often carried out by veterinarians in animal house in biological units. The more reliable method used for this assessment is Spearman and Karber. The calculations involved in the assessment are complex, confusing, time consuming and not easily reproducible. Spreadsheet is a computer application in which data are arranged in rows and columns of a grid and can be manipulated and used in calculations. In today's era of smart phones, tablet PCs and netbooks, where a spreadsheet program in the form of Microsoft Excel is readily accessible by most veterinarians, it should be possible to adapt the various laborious steps involved in the said method to a spreadsheet program by writing simple logical codes in the spreadsheets to do the calculations in a simple, clear, faster, reproducible, accurate and user-friendly manner. This article describes a spreadsheet program (VACCRaksha Calc) to calculate the vaccine potency based on the steps involved in Spearman and Karber [Figure 1].

Vaccine potency calculation

The spreadsheet program is based on the various steps for evaluation of vaccine potency by Spearman^[1] and Karber^[2] method.

According to them \log_{10} of end point dilution of vaccine is given by the formula

- $[X_{o} - D/2 + D (\Sigma R/N)]$ Where:

 $X_{o} = \log_{10}$ of the reciprocal of the lower dilution at which all animals are protected

 $D = \log_{10}$ of the dilution factor

R = number of mice died due to specific symptoms

N = number of animals used at each individual dilution (after discounting accidental or nonspecific deaths)

The spreadsheet program used is Microsoft Excel version 2013.^[3]

Coding and logical data used in this program are as follows; For D11 cell (mice alive)

=D9-D10 (also applied for E, F and G11 cells) For D13 cell (sum of r/n) it's been, =IF (E12 < 1, D12 + E12 + F12 + G12)

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For E13 cell,

=IF (E12 = 1, E12 + F12 + G12)

For D14 cell (multiplication with log of dilution factor)

=0.7*D13

For D15 cell (deletion of 0.35)

=IF (E12 < 1, D14-0.35)

For E15 cell (addition of 0.35)

=IF (E12 = 1, E14 + 0.35)

For Antilog calculation i.e. E15 cell,

=IF (E12 < 1, 10^D15)

For D17 cell (relative potency)

=IF (E12 < 1, D16/18)
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One representative study is presented to help and understand the usefulness of the program. The findings of the experiment along with the calculation are presented as a screenshot of the program [Figure 2].



Figure 1: Calculation sheet used in the laboratory (conventional method)

Avula and Avula: A program for vaccine potency

Vaccine potency calculation By Spearman and Karber method							
1. Enter the dilution used:			initial dilution:	1			
2. Enter the dilution factor:			dilution factor:	5			
		Group 1	Group 2	Group 3	Group A		
This is your calculated dilution series:		Undiluted/NEAT	5	5^2	5^3		
3. Enter the total # of mice examined per dilution	total mice:	10	9	10	9		
	mice died:	0	0	2	7		
	mice alive:	10	9	8	2		
	r/n	1	1.000	0.8	0.222		
4. Sum of r/n	SUM of r/n	FALSE	2.022222222				
5. Multiplication with log of dilution factor	multiplication with 0.7	0.000	1.415555556				
6. Addition or deletion of 0.35	addition /deletion	FALSE	1.765555556				
7. Antilog value		FALSE	58.28483288				
8. Relative potency	Relative potency	FALSE	3.238046271				
	Relative potency (U/ml)	FALSE				
	Relative potency (U/ml)	3.238046271				
Created on Dec 12, 2014 by Dr. SaiMahesh Reddy, A. M.V.S	С.						
Feedback and suggestions							

Figure 2: Snapshot taken from the actual spreadsheet of potency calculation

The difficulty which usually concerns veterinarians in biological units is the virus titer or end point dilution assessment. They often encounter the following problems:

- The calculations involved in the assessment are time consuming
- •. The calculations appear confusing when reviewed at a later date
- It is often difficult to explain in a report or communication how the final figure was arrived at.

The program described here can easily solve the above problems. It can be used to store, process, analyze and graphically represent data. A formula entered in a cell in the spreadsheet defines how the content of that cell is to be calculated from the contents of any other cell(s) each time the content of the other cell(s) is updated.

The program was thoroughly tested for the entire range of possible values. As the spreadsheet makes the whole process of assessment faster and user friendly, the program will be useful to veterinary professionals who are working in biological units.

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> Received: 22-12-2014 Revised: 18-01-2015 Accepted: 19-03-2015

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Access this article online				
Quick Response Code:	Website: www.jpharmacol.com			
	DOI: 10.4103/0976-500X.155495			