Manual for Quality Control of Diphtheria, Tetanus and Pertussis Vaccines

Immunization, Vaccines and Biologicals



Manual for Quality Control of Diphtheria, Tetanus and Pertussis Vaccines

Immunization, Vaccines and Biologicals



The Department of Immunization, Vaccines and Biologicals thanks the donors whose unspecified financial support has made the production of this document possible.

This document was published by the Expanded Programme on Immunization (EPI) of the Department of Immunization, Vaccines and Biologicals

> Ordering code: WHO/IVB/11.11 Printed: April 2013

This publication is available on the Internet at:

www.who.int/vaccines-documents/

Copies of this document as well as additional materials on immunization, vaccines and biologicals may be requested from:

World Health Organization
Department of Immunization, Vaccines and Biologicals
CH-1211 Geneva 27, Switzerland
• Fax: + 41 22 791 4227 • Email: vaccines@who.int •

© World Health Organization 2013

All rights reserved. Publications of the World Health Organization can be obtained from WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel: +41 22 791 3264; fax: +41 22 791 4857; email: bookorders@who.int). Requests for permission to reproduce or translate WHO publications – whether for sale or for noncommercial distribution – should be addressed to WHO Press, at the above address (fax: +41 22 791 4806; email: permissions@who.int).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use

The named authors alone are responsible for the views expressed in this publication.

Printed by the WHO Document Production Services, Geneva, Switzerland

Contents

Prețac	e	VII
Chap	ter I: General	3
I.1	General introduction	3
<i>I.1.1</i>	Scope	3
<i>I.1.2</i>	Quality assurance	3
I.1.3	References	6
I.2.	Standardization in vaccine testing	7
I.2.1	Introduction	7
<i>I.2.2</i>	Quality control charts	7
I.3.	Role of Biostatistics in Vaccine Potency Testing	9
I.4.	The use of laboratory animals in the quality control of vaccines	10
<i>I.4.1</i>	Environment	10
<i>I.4.2</i>	Nutrition	11
<i>I.4.3</i>	Choice of animals	11
<i>I.4.4</i>	Microbiological quality	12
I.4.5	References	14
I.4.6	Selected further reading	14
I.5.	General laboratory procedures	15
I.5.1	The laboratory environment	15
I.6.	Laboratory safety	15
I.6.1	Protection for staff	16
<i>I.6.2</i>	Protection of the environment	17
I.6.3	Selected further reading	18

Chapte	Chapter II. Testing for Diphtheria Vaccines21				
II . 1	Potency21				
II.1.1	General introduction				
II.1.2	Potency in guinea pigs by challenge24				
II.1.3	Potency in guinea pigs by serology30				
II.1.4	Potency in mouse by Vero cell assay52				
II.1.5	In vivo toxin neutralisation test				
II.2	Specific toxicity60				
II.2.1	In vivo test for absence of toxin and reversion to toxicity in guinea pigs60				
II.2.2	Vero cell test for absence of toxin and reversion to toxicity				
II.3	Lf and identity73				
II.3.1	Flocculation test (Ramon and laser light scattering)73				
II.3.2	Radial Immunodiffusion				
II.3.3	Rocket immunoelectrophoresis86				
II.4	Antigen content and degree of adsorption91				
II.4.1	Capture and direct ELISA91				
Chapte	er III: Testing for Tetanus vaccines103				
III.1	Potency:				
III.1.1	General introduction				
III.1.2	Potency in guinea pigs and mice by challenge (lethal and paralysis)106				
III.1.3	Potency in guinea pigs by serology				
III.1.4	Potency in mice by serology (ToBI)				
III.1.5	In vivo toxin neutralisation test in mice				
III.2	Specific toxicity				
III.2.1	In vivo test for absence of toxin and reversion to toxicity in guinea pigs144				
III.3	Lf and identity147				
III.3.1	Flocculation test (Ramon and laser light scattering)147				
<i>III.3.2</i>	Radial immunodiffusion				
III.3.3	Rocket immunoelectrophoresis				
III.4	Antigen content and degree of adsorption165				
III.4.1	Capture ELISA				

Chapter IV: Testing for whole cell pertussis vaccine		
IV.1	Kendrick test	175
IV.2	Specific toxicity tests	187
IV.2.1	Mouse weight gain test (MWGT)	
IV.2.2	Other tests for monitoring pertussis toxicity	
IV.3	Methods used for strain characterization and identity tests	219
IV.3.1	Slide agglutination test for detection of fimbriae 2 and 3 (also refer as AGG 2 and 3)	219
IV.3.2	ELISA test for detection of agglutinogens (also refer as fimbriaes)	
IV.3.3	Immunodiffusion assay	
Chapt	er V: Statistical analysis of results	231
V.1	The use of biostatistics in vaccine testing	231
V.1.1	Introduction	
V.1.2	Experimental design and randomization	234
V.1.3	Variation	
V.1.4	Principles of bioassay validation	236
V.1.5	Consistency of assay parameters	237
V.1.6	Retesting and combination of estimates	
V.1.7	3Rs in bioassays	
V.1.8	Statistical software	
V.1.9	Further reading	
V.2	Parallel line analysis, quantitative responses	241
V.2.1	Introduction	241
V.2.2	Assay design	241
V.2.3	Analysis of variance	242
V.2.4	Potency estimation	
V.2.5	Examples	248
V.2.6	References	262
V.3	Parallel line assay analysis, quantal responses (Probit analysis)	263
V.3.1	Introduction	263
V.3.2	Assay design	264
V.3.3	Analysis of variance	265
V.3.4	Potency estimation	268
V.3.5	Estimation of LD ₅₀	268
V.3.6	Examples	269
V.3.7	References	281

V.4	Comparison of two independent groups	282
V.4.1	Introduction	
V.4.2	Student's t test	282
V.4.3	Mann-Whitney U test	285
V.4.4	Fisher's exact test	285
V.4.5	Examples	286
V.4.5	References	288
V.5	Combination of estimates	289
V.5.1	Introduction	289
V.5.2	Notation	289
V.5.3	Homogeneity of estimates	289
V.5.4	Weighted mean of homogeneous estimates	290
V.5.5	Combination of heterogeneous estimates	290
V.5.6	Examples	291
V.6	Assay validation	293
V.6.1	Introduction	293
V.6.2	In house validation of official methods	293
V.6.3	Validation of in house specific procedures and 'transferability' of IU	294
V.6.4	Validation for dilution assays with reduced numbers of dilutions	295
V.6.5	References	297
V.7	Consistency of calculated parameters	298
V.7.1	Introduction	298
V.7.2	Trend analysis and validity evaluation of an assay	298

Preface

In 1982, with the aim of providing guidance for the standardization of tests needed to ensure the safety and efficacy of vaccines, the World Health Organization (WHO) issued a document entitled Manual of details of tests required on final vaccines used in the WHO Expanded Programme on Immunization (unpublished document BLG/UNDP/82.1 Rev.1). This document was updated in 1985 (unpublished document BLG/UNDP/82.1 Rev. 1 Corr. 1). As a result of changes in some of the potency tests and the development of alternative techniques for testing the potency of bacterial vaccines, and in an attempt to present the information in a more useful way for testing laboratories, details of the potency tests for live viral vaccines and bacterial vaccines were revised and reissued provisionally in two documents, Laboratory methods for the titration of live virus vaccines using cell culture techniques (unpublished document BLG/EPI/89.1) and Laboratory methods for the testing for potency of diphtheria (D), tetanus (T), pertussis (P) and combined vaccines (unpublished document BLG/92.1). These two documents were field tested in workshops worldwide. They were revised in the light of comments received and combined to produce the manual, WHO/BLG/95.1. With the establishment of the Global Training Network, the document was revised in light of its relevance as a curriculum material for quality control test methodologies. In 1997, WHO publish the Manual of laboratory methods-For testing vaccines used in the WHO Expanded Programme on Immunization (WHO/VSQ/97.04) with the contribution of the following scientists: JH Bruning, F van Nimwegen, JW van der Gun and JL di Fabio, R Dobbelaer, P Knight, J Lyng, CFM Hendriksen, FR Marsman, HJM van de Donk, JG Kreeftenberg, P Knight, G Nyerges, M Weiz Bentzon, F Marsman. This Manual was widely used by the National Control Laboratories and vaccine manufacturers and has served as a training material in WHO Global Training Network programme since its establishment.

Recently, the amendment on potency testing of diphtheria vaccine and tetanus vaccine (TRS 927), and revised recommendations for whole cell pertussis vaccines

预览已结束,完整报告链接和二维码如下:

https://www.yunbaogao.cn/report/index/report?reportId=5_28277

