MICROBIOLOGICAL RISK ASSESSMENT SERIES



Risk assessments of *Salmonella* in eggs and broiler chickens



Microbiological Risk Assessment Series 2

Risk assessments of Salmonella in eggs and broiler chickens

World Health Organization Food and Agriculture Organization of the United Nations

2002

For further information on the joint FAO/WHO activities on microbiological risk assessment, please contact:

Food Quality and Standards Service Food and Nutrition Division Food and Agriculture Organization of the United Nations Viale delle Terme di Caracalla I-00100 Rome, Italy

Fax: +39 06 57054593 E.mail: <u>nutrition@fao.org</u>

Web site: http://www.fao.org/es/esn

or

Food Safety Department World Health Organization 20, Avenue Appia CH-1211 Geneva 27 Switzerland

Fax: +41 22 7914807 E.mail: foodsafety@who.int

Web site: http://www.who.int/fsf

Cover design : Food and Agriculture Organization of the United Nations and the World Health Organization. Cover picture : © Dennis Kunkel Microscopy, Inc.

WHO Library Cataloguing-in-Publication Data

Risk assessments of Salmonella in eggs and broiler chickens.

(Microbiological risk assessment series; no. 2)

1.Salmonella - pathogenicity 2.Salmonella enteritidis - pathogenicity

3. Eggs - microbiology4.Chickens - microbiology5.Risk assessment - methods6.Risk management - methods7.GuidelinesI.World Health OrganizationII.Food andAgriculture Organization of the United NationsIII.SeriesIII.Series

ISBN 92 9 156229 3 (WHO) ISBN 92 5 104872 X (FAO) ISSN 1726-5274 (LC/NLM classification: QW 138.5.S2)

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders. Applications for such permission should be addressed to the Chief, Publishing Management Service, Information Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00100 Rome, Italy, or by e-mail to <copyright@fao.org> or to Publications, Marketing and Dissemination, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland, or by e-mail to <permissions@who.int>.

© WHO 2002 © FAO 2002

Publications of the World Health Organization can be obtained from Marketing and Dissemination, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel: +41 22 791 2476; fax: +41 22 791 4857; email: <u>bookorders@who.int</u> or on the internet from <<u>http://www.who.int/publications</u>).

Publications of the Food and Agriculture Organization of the United Nations can be ordered from Sales and Marketing Group, Information Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00100 Rome, Italy (fax: +39 06 5705 3360; email: publications-sales@fao.org or on the Internet from <<u>http://www.fao.org/icatalog/inter-e.htm</u>>)

CONTENTS

Acknowledgements	vii	
Risk Assessment Drafting Group	ix	
Reviewers	xi	
Abbreviations used in the text	xiv	
Foreword	XV	
EXECUTIVE SUMMARY		
1. INTRODUCTION	1	
1.1 Risk assessment	1	
1.2 Background to the FAO/WHO microbiological risk assessment work	2	
1.3 Scope of the risk assessment	4	
1.4 References cited in Chapter 1	6	
2. HAZARD IDENTIFICATION	7	
2.1 Summary	7	
2.2 Salmonella in foods and association with illness	7	
2.3 Public health outcomes	9	
2.4 Host-adapted Salmonella	12	
2.5 Defining the scope of the risk assessments	13	
2.6 References cited in Chapter 2	13	
3. HAZARD CHARACTERIZATION OF SALMONELLA	17	
3.1 Summary	17	
3.2 Organism, host and matrix characteristics	17	
3.2.1 Characteristics of the organism	17	
3.2.2 Host characteristics 3.2.3 Factors related to the conditions of ingestion	19 25	
3.3 Human feeding trials	27	
3.4 Dose-response assessment	36	
3.4.1 Dose-response models for <i>Salmonella</i>	36	
3.5 Epidemiological information	46	
3.5.1 Summary of epidemiological and outbreak information	47	
3.6. Discussion and conclusions	/6 00	
2.7 Pafaranaas aitad in Chantar 3	90 00	
5.7 References citeu in Chapter 5	90	

— iii —

4.	EXPOSURE ASSESSMENT OF SALMONELLA ENTERITIDIS IN EGGS	97
	4.1 Summary	97
	4.2 Review of literature, data and existing models	97
	4.2.1 Introduction	97
	4.2.2 Production	103
	4.2.3 Distribution and storage	123
	4.2.4 Egg products processing	139
	4.2.5 Preparation and consumption	150
	4.2.0 Summary	161
	4.3.1 Introduction	161
	4.3.2 Model overview	162
	4.3.3 Production	162
	4.3.4 Shell egg processing and distribution	166
	4.3.5 Egg products processing	169
	4.3.6 Preparation and consumption	170
	4.4 References cited in Chapter 4	172
5.	RISK CHARACTERIZATION OF SALMONELLA ENTERITIDIS IN EGGS	177
	5.1 Summary	177
	5.2 Risk estimation for S. Enteritidis in eggs	177
	5.2.1 Model overview	177
	5.2.2 Results	177
	5.2.3 Uncertainty	179
	5.2.4 Discussion	181
	5.3 Risk management options for <i>S</i> . Enteritidis in eggs	181
	5.3.1 Estimation of the risk of illness from S. Enteritidis in eggs in the	
	general population at different prevalence and concentration levels	101
	01 contamination 5.3.2 Estimation of the change in risk likely to occur from reducing the	181
	prevalence of infected flocks and destroying breeding or laying	
	flocks, and estimation of the change in risk likely to occur from	
	reducing the prevalence of S. Enteritidis-positive eggs through	
	testing of flocks and diversion of their eggs to pasteurization, and	
	including the effect of pasteurization	184
	5.3.3 Estimation of the change in risk likely to occur from the use of	100
	competitive exclusion or vaccinating flocks against S. Entertitidis	189
	5.5.4 Estimation of the change in fisk fixery to occur from minimizing the number of S. Enteritidis organisms in eggs through refrigeration of	
	eggs after lay and during distribution, or requiring a specific shelf	
	life for eggs stored at ambient temperatures	191
	5.4 Discussion	192
	5.5 References cited in Chapter 5	103
	5.5 References encu in enupler 5	175

6.	EXPOSURE ASSESSMENT OF SALMONELLA IN BROILER CHICKENS	195
	6.1 Summary	195
	6.2 Review of literature, data and existing models	195
	6.2.1 Introduction	195
	6.2.2 Production-to-consumption pathways	196
	6.2.3 Primary production	201
	6.2.4 Transport and processing	208
	6.2.5 Retail, distribution and storage	218
	6.2.6 Preparation	232
	6.2.7 Consumption	243
	6.2.8 Review of models available	245
	6.2.9 Recommendations	249
	6.3 Exposure assessment model, model parameters and assumptions	250
	6.3.1 Introduction	250
	6.3.2 Model overview	250
	6.3.3 Processing	251
	6.3.4 Distribution and storage	254
	6.3.6 Calculation of the number of salmonellae consumed	238
	6.4 Model description and parameters	200
		201
	6.5 References cited in Chapter 6	265
7.	RISK CHARACTERIZATION OF SALMONELLA IN BROILER CHICKENS	277
	7.1 Summary	277
	7.2 Risk estimation	277
	7.2.1 Results	277
	7.2.2 Validation of model results	280
	7.2.3 Impact of uncertain parameters on risk estimates	280
	7.3 Risk management options using alternative assumptions	283
	7.3.1 Reducing prevalence	283
	7.3.2 Reduction in numbers of Salmonella on contaminated carcasses	284
	7.3.3 Change in consumer behaviour and the impact on risk	286
	7.3.4 Intervention methods for controlling <i>Salmonella</i> on poultry	288
	7.4 References cited in Chapter 7	293

v -

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_30309