

# *Enterobacter sakazakii* and other microorganisms in powdered infant formula

MEETING REPORT



MICROBIOLOGICAL RISK ASSESSMENT SERIES

6

*Enterobacter sakazakii*  
and other microorganisms  
in powdered infant formula

---

MEETING REPORT

WORLD HEALTH ORGANIZATION  
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

2004

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 nor of the Food and Agriculture Organization of the United Nations concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The views expressed herein are those of the authors and do not necessarily represent those of the World Health Organization nor of the Food and Agriculture Organization of the United Nations nor of their affiliated organization(s).

The World Health Organization and the Food and Agriculture Organization of the United Nations do not warrant that the information contained in this publication is complete and shall not be liable for any damage incurred as a result of its use.

#### WHO Library Cataloguing-in-Publication Data

FAO/WHO Expert Meeting on *Enterobacter sakazakii* and Other Microorganisms in Powdered Infant Formula.

*Enterobacter sakazakii* and other microorganisms in powdered infant formula: meeting report.

(Microbiological Risk Assessment Series No. 6)

1. *Enterobacter sakazakii* - pathogenicity 2. Enterobacteriaceae - pathogenicity  
3. Infant formula 4. Infant food - microbiology 5. Food contamination 6. Risk assessment  
I. Title II. Series

ISBN 9789241562775 (WHO) (LC/NLM classification: QW 138.5.E5)

ISBN 92 5 105164 X (FAO)

ISSN 1726-5274

All rights reserved. Requests for permission to reproduce or translate the material contained in this publication - whether for sale or for non-commercial distribution - 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](mailto:copyright@fao.org) or to Publications, Marketing and Dissemination, World Health Organization, 20 Avenue Appia, CH-1211 Geneva 27, Switzerland, or by facsimile to +41 22 791 4806, or by email to [permissions@who.int](mailto:permissions@who.int).

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  
00100 Rome, Italy

Fax: (+39) 06 57054593  
E-mail: [jemra@fao.org](mailto:jemra@fao.org)

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](mailto:foodsafety@who.int)

Web site: <http://www.who.int/foodsafety>

Cover design:  
Food and Agriculture Organization of the United Nations  
and the World Health Organization

Cover picture:  
© Dennis Kunkel Microscopy, Inc.

Publications of the World Health Organization  
can be obtained from:

Marketing and Dissemination  
World Health Organization, 20 Avenue Appia  
CH-1211 Geneva 27, Switzerland  
Tel: (+41) 22 791 2476  
Fax: (+41) 22 791 4857  
E-mail: [bookorders@who.int](mailto:bookorders@who.int)

or

on the Internet from <http://www.who.int/publications>

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 57053360  
E-mail: [publications-sales@fao.org](mailto:publications-sales@fao.org)

or

on the Internet from <http://www.fao.org/icatalog/inter-e.htm>



## CONTENTS

Acknowledgements	vii
Contributors	ix
Foreword	xi
Abbreviations	xiii
EXECUTIVE SUMMARY	xv
1. INTRODUCTION	1
1.1 Background and objectives	1
2. EPIDEMIOLOGY AND PUBLIC HEALTH ASPECTS	5
2.1 Organisms of concern	5
2.1.1 <i>Enterobacter sakazakii</i>	5
2.1.2 Other relevant organisms of concern	7
2.2 Scope/Case description	7
2.2.1 Identification of products considered	7
2.2.2 Case definition	8
3. HAZARD IDENTIFICATION	11
3.1 Category “A” organisms – Clear evidence of causality	11
3.2 Category “B” organisms – Causality plausible, but not yet demonstrated	11
3.3 Category “C” organisms – Causality less plausible or not yet demonstrated	12
4. HAZARD CHARACTERIZATION	13
4.1 Populations at risk	13
4.2 Dose-response	13
5. EXPOSURE ASSESSMENT	15
5.1 Exposure to infant formula/breastfeeding rates	15
5.2 Developing countries	16
5.3 Microbial aspects of manufacture and use of powdered infant formula	16

5.3.1 Manufacture	17
5.3.2 Control of ingredient quality	17
5.3.3 Processing	18
5.3.4 Post-processing and packaging	20
5.3.5 Hazard Analysis Critical Control Point (HACCP) in the manufacture of powdered infant formula	21
5.3.6 Monitoring	22
5.3.7 Microbiological specifications	24
5.3.8 Reconstitution and use	25
5.3.9 Labelling and preparation	26
5.3.10 Storage and handling of prepared formula	28
5.3.11 Education	28
6. RISK CHARACTERIZATION	31
6.1 Approaches and outputs	31
6.2 Evaluation of potential risk reduction options for formula-fed infants	32
7. RISK REDUCTION STRATEGIES FOR FORMULA-FED INFANTS	35
7.1 Reducing the concentration/prevalence of intrinsic contamination of powdered infant formula by <i>E. sakazakii</i>	35
7.2 Reducing the level of contamination through heating reconstituted powdered infant formula prior to use	35
7.3 Minimizing the chance of contamination of reconstituted formula during preparation	36
7.4 Minimizing the growth of <i>E. sakazaki</i> following reconstitution prior to consumption	36
8. KEY FINDINGS AND RECOMMENDATIONS	37
8.1 Key findings	37
8.2 Recommendations	38
8.2.1 To member countries, NGOs, FAO and WHO	38
8.2.2 To Codex (e.g. CCFH)	39
8.2.3 To member countries, FAO, WHO, Codex and NGOs	39
8.2.4 To FAO, WHO and the scientific community	39

REFERENCES	41
APPENDIX A LIST OF BACKGROUND PAPERS	47
APPENDIX B DATA RECEIVED IN RESPONSE TO THE FAO/WHO CALL FOR DATA	49
APPENDIX C RISK ASSESSMENT	51

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\\_29669](https://www.yunbaogao.cn/report/index/report?reportId=5_29669)

