

# Production of Zinc Tablets and Zinc Oral Solutions

Guidelines for Programme Managers and Pharmaceutical Manufacturers

For further information please contact:

**Department of Child and Adolescent Health and Development (CAH)**  
**World Health Organization**

20 Avenue Appia  
1211 Geneva 27  
Switzerland

fax + 41 22 791 48 53  
email [cah@who.int](mailto:cah@who.int)  
web site <http://www.who.int/child-adolescent-health/>

ISBN 92 4 159494 2



World Health  
Organization



World Health  
Organization

# Production of Zinc Tablets and Zinc Oral Solutions

Guidelines for Programme Managers and Pharmaceutical Manufacturers



WHO Library Cataloguing-in-Publication Data

Production of zinc tablets and zinc oral solutions: guidelines for programme managers and pharmaceutical manufacturers.

Produced by the World Health Organization ... [et al.].

1.Zinc - standards. 2.Zinc - therapeutic use. 3.Diarrhea - drug therapy. 4.Child. 5.Guidelines.  
I.World Health Organization.

ISBN 92 4 159494 2

(NLM classification: WS 312)

ISBN 978 92 4 159494 3

© World Health Organization 2007

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 2476; fax: +41 22 791 4857; email: [bookorders@who.int](mailto: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](mailto: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 express 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.

Printed by the WHO Document Production Services, Geneva, Switzerland.

---

# Acknowledgement

These guidelines were developed by Dr Abdelkrim Smine and Dr Joyce Primo-Carpenter of the United States Pharmacopeia Drug Quality and Information Program (USP DQI) and Dr Olivier Fontaine of the Child and Adolescent Health and Development (CAH) of the World Health Organization, in collaboration with the Zinc Task Force (ZTF). The Zinc Task Force comprised representatives from the United Nations Children's Fund (UNICEF), the United States Agency for International Development (USAID), the World Health Organization (WHO), the Johns Hopkins Bloomberg School of Public Health, and is supported by the Bill and Melinda Gates Foundation.

Special thanks to Mr PS Jakobsen (UNICEF, Copenhagen), Mrs ML Rabouhans (WHO, Geneva), and Mr MM Sesay (UNICEF, Copenhagen) for their important contributions in the development of this document and for reviewing and commenting on various drafts. Also the support of the USP DQI is acknowledged in the editing of the document.

---

# Definitions

<b>Dehydration</b>	Loss of water and dissolved salts from the body, occurring, for instance, as a result of diarrhoea.
<b>Rehydration</b>	The correction of dehydration.
<b>Oral Rehydration Therapy (ORT)</b>	The administration of fluid by mouth to prevent or correct the dehydration that is a consequence of diarrhoea.
<b>Oral Rehydration Salt (ORS) solution</b>	Specifically, the complete, new WHO/UNICEF formula.

---

# Table of contents

<b>1. Introduction .....</b>	<b>1</b>
<b>2. Specifications common to tablets and oral solutions .....</b>	<b>2</b>
2.1 Ingredients and process .....	2
2.1.1 Starting materials .....	2
2.1.2 Zinc .....	2
2.1.3 Sweetening and flavouring agents .....	3
2.2 Strength .....	3
2.3 Identification .....	3
2.3.1 Solutions .....	4
2.3.2 Identification tests .....	4
2.4 Assay .....	4
2.4.1 Assay for tablets .....	4
2.4.2 Assay for oral solutions .....	5
2.5 Packaging and storage .....	5
2.6 Labelling .....	5
<b>3. Additional specifications for zinc tablets .....</b>	<b>6</b>
3.1 Dispersibility of zinc tablets .....	6
3.2 Uniformity of content .....	6
<b>4. Additional specifications for zinc oral solutions .....</b>	<b>8</b>
4.1 pH .....	8
4.2 Specific gravity .....	8
<b>5. Acceptability of zinc tablet and zinc oral solutions .....</b>	<b>9</b>
5.1 Evaluation of taste masking .....	9
5.2 Evaluation of acceptability and adherence to treatment .....	9
<b>6. Other considerations .....</b>	<b>10</b>
6.1 Product formulation and production .....	10
6.2 Product registration .....	10
6.3 Inclusion of zinc in the National Essential Medicines List .....	11
6.4 Postmarketing surveillance and adverse drug reaction (ADR) monitoring .....	11
6.4.1 Adverse drug reactions .....	11
6.4.2 Reporting of adverse drug reactions .....	12
6.5 Quality assurance for the procurement of zinc tablets and oral solutions .....	12

---

ANNEX 1:	Specifications of zinc products for use in the management of diarrhoea .....	13
ANNEX 2:	USP monograph for zinc sulfate tablets .....	14
ANNEX 3:	USP monograph for zinc sulfate oral solution .....	16
ANNEX 4:	Disintegration .....	17
ANNEX 5:	pH .....	19
ANNEX 6:	Specific gravity .....	22
ANNEX 7:	Qualitative evaluation of the taste by a taste panel .....	23
ANNEX 8:	Design of the acceptability study .....	27

# Introduction

WHO and UNICEF have released revised recommendations for the management of diarrhoea aimed at dramatically reducing the number of deaths due to diarrhoea. These new recommendations take into account two significant recent advances: demonstration of the increased efficacy of a new formulation for ORS containing lower concentrations of glucose and salt, and success in using zinc supplementation in addition to rehydration therapy in the management of diarrhoeal diseases<sup>1</sup>.

In order to ensure that these recommendations become effective, it is essential that the industry be encouraged to prepare zinc formulations which contain only zinc as active ingredient. Many vitamin products and other nutritional supplements containing zinc are available commercially. However, it is uncommon for these products to have the recommended dosage of zinc. Therefore a product containing only zinc is required. The product should be formulated in such a way as to mask the strong metallic aftertaste of zinc to enhance acceptability to children. Zinc salt formulations for administration to children could take the form of oral solution or tablets. The specifications of zinc products for use in the management of diarrhoea are listed in Annex 1.

For all organizations involved in the procurement of zinc tablets or zinc oral solutions, the procurement should be made from trusted sources, such as those companies pre-qualified for zinc tablets and oral solutions in the UNICEF suppliers list and those with a proven record of quality products. When organizations make a tender to purchase zinc products, the tender should clearly

预览已结束，完整报告链接和二维码如

[https://www.yunbaogao.cn/report/index/report?reportId=5\\_290](https://www.yunbaogao.cn/report/index/report?reportId=5_290)