# FORTIFICATION OF RICE WITH VITAMINS AND MINERALS AS A PUBLIC HEALTH STRATEGY







# FORTIFICATION OF RICE WITH VITAMINS AND MINERALS AS A PUBLIC HEALTH STRATEGY



Guideline: fortification of rice with vitamins and minerals as a public health strategy ISBN 978-92-4-155029-1

### © World Health Organization 2018

Some rights reserved. This work is available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <a href="https://creativecommons.org/licenses/by-nc-sa/3.0/igo">https://creativecommons.org/licenses/by-nc-sa/3.0/igo</a>).

Under the terms of this licence, you may copy, redistribute and adapt the work for non-commercial purposes, provided the work is appropriately cited, as indicated below. In any use of this work, there should be no suggestion that WHO endorses any specific organization, products or services. The use of the WHO logo is not permitted. If you adapt the work, then you must license your work under the same or equivalent Creative Commons licence. If you create a translation of this work, you should add the following disclaimer along with the suggested citation: "This translation was not created by the World Health Organization (WHO). WHO is not responsible for the content or accuracy of this translation. The original English edition shall be the binding and authentic edition".

Any mediation relating to disputes arising under the licence shall be conducted in accordance with the mediation rules of the World Intellectual Property Organization (<a href="http://www.wipo.int/amc/en/mediation/rules">http://www.wipo.int/amc/en/mediation/rules</a>).

**Suggested citation**. Guideline: fortification of rice with vitamins and minerals as a public health strategy. Geneva: World Health Organization; 2018. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at <a href="http://apps.who.int/iris.">http://apps.who.int/iris.</a>

**Sales, rights and licensing.** To purchase WHO publications, see <a href="http://apps.who.int/bookorders">http://apps.who.int/bookorders</a>. To submit requests for commercial use and queries on rights and licensing, see <a href="http://www.who.int/about/licensing">http://www.who.int/about/licensing</a>.

**Third-party materials.** If you wish to reuse material from this work that is attributed to a third party, such as tables, figures or images, it is your responsibility to determine whether permission is needed for that reuse and to obtain permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

**General disclaimers.** 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 WHO 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 and dashed 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 WHO 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 WHO 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 WHO be liable for damages arising from its use.

Printed in Switzerland Design and cover: Alberto March (Barcelona, Spain)

# **CONTENTS**

Publication history	vii
Acknowledgements	vii
Financial support	viii
Executive summary	1
Purpose of the guideline	1
Summary of the evidence	2
Recommendations	3
Remarks	3
Research priorities	4
Guideline development methodology	5
Plans for updating the guideline	6
Scope and purpose	7
Background	7
Objectives	10
Summary of the evidence	10
Effects of rice fortification with vitamins and minerals (iron, vitamin A, zinc or folic acide on micronutrient status and health-related outcomes in the general population	d) <b>10</b>
Nutrient stability in fortified rice	14
Recommendations	15
Remarks	15
Research priorities	16
Dissemination, implementation and ethical considerations	17
Dissemination	17
Equity, human rights and implementation considerations	18
Regulatory considerations	20
Ethical considerations	21
Monitoring and evaluation of guideline implementation	23
Guideline development process	24
Advisory groups	24
Scope of the guideline, evidence appraisal and decision-making	25
Management of competing interests	26
Plans for updating the guideline	27
References	28

Annex 1.	GRADE summary of findings tables	34
Annex 2.	Questions in population, intervention, control, outcomes (PICO) format	39
Annex 3.	Summary of the considerations of the members of the guideline development group – nutrition actions 2013–2014 for determining the strength of the recommendations	43
Annex 4.	World Health Organization/United States Centers for Disease Control and Prevention logic model for micronutrient interventions in public health	44
Annex 5.	WHO steering committee for food fortification	45
Annex 6.	WHO guideline development groups	46
Annex 7.	External resource experts	49
Annex 8.	Peer-reviewers	50
Annex 9.	WHO Secretariat	51

## PUBLICATION HISTORY

This Guideline: fortification of rice with vitamins and minerals as a public health strategy, is the first evidence-informed guideline from the World Health Organization (WHO) for this intervention with this specific food vehicle – rice. The focus of this document is on the use of this intervention as a public health strategy and not on market-driven fortification of rice.¹ Given the many types of rice consumed in various countries worldwide as food vehicles for fortification, as well as an update on the process currently used in fortification of rice kernels, a separate guideline for this food vehicle was deemed necessary. In order to produce this guideline, the rigorous procedures described in the WHO handbook for guideline development were followed. This guideline complements the WHO/FAO (Food and Agriculture Organization of the United Nations) Guidelines on food fortification with micronutrients (2006) and the Pan American Health Organization publication, Iron compounds for food fortification: guidelines for Latin America and the Caribbean 2002. This document expands the sections on dissemination and updates the summary of evidence used for the guideline, based on the most recent systematic and narrative reviews on the topic.

# **ACKNOWLEDGEMENTS**

This guideline was coordinated by the World Health Organization (WHO) Evidence and Programme Guidance Unit, Department of Nutrition for Health and Development. Dr Maria Nieves Garcia-Casal, Dr Juan Pablo Peña-Rosas and Dr Lisa Rogers oversaw the planning and development of this guideline. Dr Maria Nieves Garcia-Casal led the preparation of this document. WHO acknowledges the technical contributions of the following individuals (in alphabetical order): Mr Filiberto Beltran, Ms Evelyn Boy-Mena and Mr Gerardo Zamora.

We would like to express our gratitude to Dr Susan Norris from the WHO Guidelines Review Committee Secretariat, and members of the Guidelines Review Committee, for their technical support throughout the process. Thanks are also due to Ms Alma Alic and Marie-Sabine Bombin from the Department of Compliance and Risk Management and Ethics, for their support in the management of conflicts-of-interest procedures. Ms Jennifer Volonnino from the Evidence and Programme Guidance Unit, Department of Nutrition for Health and Development, provided logistic support.

Special thanks are extended to the authors of the systematic reviews used in this guideline, as well as the other commissioned literature reviews used to inform this process, for their assistance and collaboration in preparing or updating them. We appreciate the feedback provided by a large number of international stakeholders during the guideline development process.

WHO gratefully acknowledges the technical input of the members of the two WHO guideline development groups involved in this process, especially the chairs and co-chairs of the two meetings concerning this guideline, Dr Janet King (2010) and Ms Rusidah Selamat and Dr Rebecca Joyce Stoltzfus (2014). We thank the peer-reviewers for their thoughtful feedback on a preliminary version of this guideline. WHO is also grateful to the staff of the Cochrane Public Health Group for their support in developing and updating the Cochrane systematic review used to inform this guideline.

Market-driven fortification refers to the situation where the food manufacturer takes the initiative to add one or more micronutrients to processed foods, usually within regulatory limits, in order to increase sales and profitability. Fortification as a public health strategy refers to the practice of deliberately increasing the content of one or more micronutrients, i.e. vitamins and minerals (including trace elements), in a food, in order to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health.

# FINANCIAL SUPPORT

WHO thanks the Bill & Melinda Gates Foundation for providing financial support for the guideline development process. We would also like to acknowledge the technical and financial support of the United States Centers for Disease Control and Prevention, especially the International Micronutrient Malnutrition Prevention and Control Programme (IMMPaCt) at the National Center for Chronic Disease Prevention and Health Promotion, and the National Center on Birth Defects and Developmental Disabilities, for supporting the retrieval, summary and assessment of the evidence informing this guideline.

We would also like to thank the Global Alliance for Improved Nutrition (GAIN) for their partial financial support in a non-normative dialogue on technical considerations for rice fortification as a public health strategy, convened in Geneva, Switzerland, 8–9 October 2012, to discuss logistic aspects related to fortification programmes, including fortification technologies and current evidence on the bioavailability of micronutrients based on processing and cooking techniques.

Donors do not fund specific guidelines and do not participate in any decision related to the guideline development process, including the composition of research questions, membership of the guideline groups, conduct and interpretation of systematic reviews, or formulation of the recommendations.

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 25804

