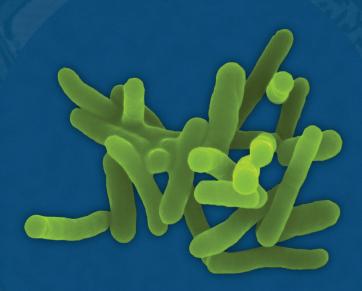




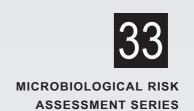
Safety and Quality of Water Used in Food Production and Processing

MEETING REPORT



33

MICROBIOLOGICAL RISK
ASSESSMENT SERIES



Safety and Quality of Water Used in Food Production and Processing

MEETING REPORT

Required citation:

FAO and WHO. 2019. Safety and Quality of Water Used in Food Production and Processing – Meeting report. Microbiological Risk Assessment Series no. 33. Rome.

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) or the World Health Organization (WHO) 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 mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO or WHO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO or WHO.

ISBN 978-92-5-131808-9 [FAO] ISBN 978-92-4-151640-2 [WHO]

© FAO and WHO, 2019



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

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO or WHO endorses any specific organization, products or services. The use of the FAO or WHO logo is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons license. If a translation of this work is created, it must include the following disclaimer along with the required citation: "This translation was not created by the Food and Agriculture Organization of the United Nations (FAO) or the World Health Organization (WHO). Neither FAO nor WHO is responsible for the content or accuracy of this translation. The original [Language] edition shall be the authoritative edition.

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization http://www.wipo.int/amc/en/mediation/rules and any arbitration will be conducted in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL).

Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining 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.

FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org. Requests for commercial use should be submitted via: www.fao.org/contact-us/licence-request. Queries regarding rights and licensing should be submitted to: copyright@fao.org.

Contents

	Acknowledgements	vi
	List of participants	vii
	Declarations of interest	ix
	Abbreviations	X
	Executive summary	xi
	Introduction	1
1	Key elements relevant for safe water use as part of a food safety management programme in food production	5
2	Water use in different sectors: Fresh produce	7
	2.1 Pre-harvest	7
	2.1.1 Map of where and how water is used	7
	2.1.2 Decision support systems that are relevant to food safety	8
	2.1.3 Water quality targets	9
	2.1.4 Potential intervention strategies	10
	2.1.5 Effects and challenges of water quality on end products	10
	2.2 Post-harvest	11
	2.2.1 Map of where water is used	11
	$2.2.2 \ \ Review \ of \ decision \ support \ systems \ that \ are \ relevant \ to \ food \ safety$	12
	2.2.3 Water quality targets	13
	2.2.4 Potential intervention strategies	13
	2.2.5 Effects of water quality on end products	14
3	Water use in different sectors: Fishery products	16
	3.1 Map of where water is used	16
	${\bf 3.2}\;$ Review of decision support systems that are relevant to food safety	17
	3.3 Water safety/quality targets	17
	3.4 Effects of water quality on end products	17
	3.5 Risk reduction options (sector-specific)	18

establishment	19
4.1 Water reuse in the food processing industry	20
4.2 Gaps and challenges in developing guidance on water reuse	21
Risk assessment	23
Decision trees: Reports from the meeting breakout groups	25
6.1 Fresh produce pre- and post-harvest	25
6.1.1 Key gaps and challenges in current guidance	25
6.1.2 Approach to development of decision trees	26
6.1.3 Overview of the decision tree constructed	29
6.1.4 Discussion	38
6.1.5 Conclusion and recommendations	40
6.1.6 References for fresh produce decision trees	41
6.2 Fishery products	43
6.2.1 Approach to development of decision trees	43
6.2.2 Fish-borne pathogens and epidemiological data	44
6.2.3 Two cases - scenarios for fish and crustaceans eaten raw or undercooked	45
6.2.4 Overview of the decision tree developed, diagram	46
6.2.5 Identified critical control points	52
6.2.6 Conclusions and recommendations	53
6.2.7 References for fishery product decision trees	54
6.3 Reuse of water in a food establishment	55
6.3.1 Not-for-food-contact applications	55
6.3.2 Food contact applications	56
6.3.3 Approach to development of decision trees	57
6.3.4 Treatment	62
6.3.5 Examples applying the risk-based framework for water reuse	62
6.3.6 Conclusions and recommendations	62
6.3.7 References for water reuse decision trees	63

7 Con	nclusions	64
7.1	General conclusions and recommendations	64
7.2	Cross-cutting issues	6
Ref	ferences for sections 1-5	68
ANN	NEXES	
Ann	ex 1 Resource material	70
FIGURE	S	
Figure 1	Step 1: Context assessment for fresh produce to determine the level of action necessary	3
Figure 2	Matrix to support microbiological risk assessment of irrigation water used during pre-harvest of fresh produce	3
Figure 3	Step 2: Decision tree for selection of risk reduction measures for produce, based on the preliminary assessment in Step 1	3
Figure 4	Decision tree for production level of fish and fish products	4
Figure 5	Decision tree for processing and handling of freshwater fish/crustaceans which will potentially be eaten raw	4
Figure 6	Decision tree for on-board processing and handling of marine/estuarine fish	4
Figure 7	Decision tree for on-shore processing of marine/estuarine fish	5
Figure 8	Risk-based framework and logic to match fit-for-purpose applications of reuse water to either a food contact application or a not-for-food-contact application	6
TABLES Table 1	Qualitative effectiveness of selected control measures for produce,	
	with focus on a small-scale production context	3
Table 2	Fish-associated pathogens considered due to relevance in relation to water quality	4
Table 3	Definitions of various water types used in food operations	5

Acknowledgements

The Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) would like to express their appreciation to all those who contributed to the preparation of this document through the provision of their time, expertise and other relevant information before, during and after the meeting, as well as in preliminary meetings on this issue. In particular, appreciation is extended to Dr Ana Maria de Roda Husman for serving as chair of the meetings; Dr Rob de Jonge, Dr Ana Allende Prieto, Dr Anders Dalsgaard and Dr Susan Knøchel for preparation of the background papers; Dr Susan Petterson for leading the breakout session on water use in primary production; Dr Mark Sobsey for leading the breakout session on water use in fishery production and Dr Leon Gorris for leading the breakout session on water reuse. All contributors are listed on the following pages.

FAO and WHO would also like to acknowledge the financial resources provided by Canada, Japan and the United States of America to support this work.

List of participants

Dr Ana Allende, Centro de Edafología y Biología Aplicada del Segura - Consejo Superior de Investigaciones Científicas (CEBAS-CSIC), Spain.

Dr Philip Amoah, Senior Researcher, International Water Management Institute (IWMI), Ghana.

Dr Martijn Bouwknegt, Research Manager for Food Safety, Vion Food, The Netherlands.

Dr Anders Dalsgaard, Professor, Veterinary Public Health, Department of Veterinary and Animal Sciences, University of Copenhagen, Denmark.

Dr Rob de Jonge, Center for Zoonoses and Environmental Microbiology, National Institute for Public Health and the Environment (RIVM), The Netherlands.

Dr Ana Maria de Roda Husman, Center for Zoonoses and Environmental Microbiology, National Institute for Public Health and the Environment (RIVM), The Netherlands

Dr Patricia Desmarchelier, Director, Food Safety Principles, Australia.

Dr Pay Drechsel, International Water Management Institute (IWMI), Sri Lanka.

Dr Leon Gorris. Unilever R&D. The Netherlands.

Dr Susanne Knøchel, Professor, Department of Food Science, University of Copenhagen, Denmark.

Dr Elisabetta Lambertini, Principal Investigator, Food Safety and Environmental Health Risk, RTI International, United of States of America.

Dr Susan Petterson, Associate Professor, School of Medicine, Griffith University, Director, Water & Health Pty Ltd, Australia.

Dr Patrick Smeets, Senior Scientific Researcher, Microbial Water Quality and

预览已结束,完整报告链接和1

https://www.yunbaogao.cn/report/index/report?re