Pesticide residues in food — 2019

Extra Joint FAO/WHO Meeting on Pesticide Residues

EVALUATIONS 2019

Part II — Toxicological

Food and Agriculture Organization of the United Nations

World Health Organization

Pesticide residues in food – 2019

Toxicological evaluations

Sponsored jointly by FAO and WHO

Extra Joint Meeting of the
FAO Panel of Experts on Pesticide Residues
in Food and the Environment
and the
WHO Core Assessment Group on Pesticide Residues

Gatineau, Canada, 7–17 May 2019

Food and Agriculture Organization of the United Nations

World Health Organization

Pesticide residues in food - 2019: toxicological evaluations / Extra Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group on Pesticide Residues, Gatineau, Canada, 7–17 May 2019

ISBN (WHO) 978-92-4-165534-7 (electronic version)
ISBN (WHO) 978-92-4-002945-3 (print version)
ISBN (FAO) 978-92-5-134619-8

Suggested citation. Pesticide residues in food - 2019: toxicological evaluations / Extra Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group on Pesticide Residues, Gatineau, Canada, 7–17 May 2019. Geneva: World Health Organization and Food and Agriculture Organization of the United Nations; 2019. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at http://apps.who.int/iris.

Sales, rights and licensing. To purchase WHO publications, see http://apps.who.int/bookorders. To submit requests for commercial use and queries on rights and licensing, see http://www.who.int/about/licensing.

TABLE OF CONTENTS

2019 Extra Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group on Pesticide Residues

Gatineau, Canada, 7–17 May 2019

List of participants

Dr Christos Anagnostopoulos, Laboratory of Pesticide Residues, Benaki Phytopathological Institute, 8 Stefanou Delta Street, Kifisia, Athens 14561, Greece *(FAO Expert)*

Professor Eloisa Dutra Caldas, Pharmaceutical Sciences Department, College of Health Sciences, University of Brasilia, Campus Universitário Darci Ribeiro, 70910-900 Brasília/DF, Brazil *(FAO Expert)*

Dr Ian Dewhurst, Sunnycroft, Leavening, North Yorkshire Y017 9SA, United Kingdom *(WHO Expert)*

Dr Michael Doherty, Office of Pesticide Programs, Health Effects Division, Risk Assessment Branch II, United States Environmental Protection Agency, MS 7509C, Washington, DC 20460, USA *(FAO Expert)*

Dr Ngan Chai Keong, Soil Science and Water Programme, Soil Science, Water and Fertilizer Research Centre, Malaysian Agricultural Research and Development Institute, PO Box 12301, 50774 Kuala Lumpur, Malaysia *(FAO Expert)*

Dr Hidetaka Kobayashi, Food Safety and Consumer Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8950, Japan *(FAO Expert)*

Mr David Lunn, Plants & Pathways Directorate, Ministry for Primary Industries, PO Box 2526, Wellington, New Zealand *(FAO Expert)*

Mr Peter Rembischevski, Toxicology Division, Brazilian Health Regulatory Agency – Anvisa, SIA Trecho 5 Area Especial 57, 71205-050 Brasília/DF, Brazil *(FAO Expert)*

Dr Rebecca Scrivens, Chemicals Regulation Division, Health & Safety Executive, Mallard House, Kings Pool, 3 Peasholme Green, York YO1 7PX, United Kingdom *(FAO Expert)*

Dr Prakashchandra V. Shah, Brookeville, MD 20833, United States of America *(WHO Expert)*

Mr Christian Sieke, Residues and Analytical Methods Unit, Department of Pesticide Safety, Federal Institute for Risk Assessment, Max-Dohrn-Strasse 8-10, 10589 Berlin, Germany *(FAO Expert)*

Dr Yukiko Yamada, Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8950, Japan *(FAO Expert)*

Dr Guibiao Ye, Institute for the Control of Agrochemicals, Ministry of Agriculture and Rural Affairs, Maizidian 22, Chaoyang District, Beijing 100125, China *(FAO Expert)*

Dr Midori Yoshida, Commissioner, Food Safety Commission, Cabinet Office, Akasaka Park Building, 22nd Floor, 5-2-20 Akasaka Minato-ku, Tokyo 107-6122, Japan *(WHO Expert)*

Ms GuangYan Zhu, Residue Division, Institute for the Control of Agrochemicals, Ministry of Agriculture and Rural Affairs, Maizidian 22, Chaoyang District, Beijing 100125, China *(FAO Expert)*

Secretariat

Mr Kevin Bodnaruk, West Pymble, NSW 2073, Australia *(FAO Editor)*

Dr Jeevan Khurana, Lyneham, ACT 2602, Australia *(FAO Editor)*

Mr Soren Madsen, Department of Food Safety and Zoonoses, World Health Organization, 1211 Geneva 27, Switzerland *(WHO JMPR Secretariat)*

Ms Marla Sheffer, Orleans, Ontario, Canada K1E 2K5 *(WHO Editor)*

Ms Yong Zhen Yang, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Rome, Italy *(FAO JMPR Secretariat)*

Abbreviations used

4-HPPD	4-hydroxyphenylpyruvate dioxygenase
5-OH-dicamba	2,5-dichloro-3-hydroxy-6-methoxybenzoic acid
ADI	acceptable daily intake
AFC	antibody-forming cell
AMBA	2-amino-4-methylsulfonylbenzoic acid
AR	applied radioactivity
ARfD	acute reference dose
AUC	area under the concentration–time curve
bw	body weight
CHO	Chinese hamster ovary
C_{max}	maximum concentration
CMC	carboxymethylcellulose
CYP	cytochrome P450
DCGA	3,6-dichlorogentisic acid
DCSA	3,6-dichlorosalicylic acid
DMBA	7,12-dimethylbenz[*a*]anthracene
DMSO	dimethyl sulfoxide
DNA	deoxyribonucleic acid
EC_{50}	median effective dose
EMS	ethyl methanesulfonate
equiv	equivalent
EU	European Union
Exp.	experiment
FAO	Food and Agriculture Organization of the United Nations
FOB	functional observational battery
GLP	good laboratory practice
HPLC	high-performance liquid chromatography
Hprt	hypoxanthine–guanine phosphoribosyltransferase
IC_{50}	median inhibitory concentration
IgM	immunoglobulin M
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
LC	liquid chromatography
LD_{50}	median lethal dose
LMA	locomotor activity
LOAEL	lowest-observed-adverse-effect level
MNBA	2-nitro-4-methylsulfonylbenzoic acid
MS	mass spectrometry
MS/MS	tandem mass spectrometry
m/*z*	mass-to-charge ratio
NADPH	nicotinamide adenine dinucleotide phosphate (reduced)
nd	not detected
NE	not examined
NOAEC	no-observed-adverse-effect concentration
NOAEL	no-observed-adverse-effect level
NRU	neutral red uptake
NS	not specified
NZW	New Zealand white
OECD	Organisation for Economic Co-operation and Development
PCE	polychromatic erythrocytes
PEG	polyethylene glycol
PIF	photoirritation factor

PND	postnatal day
ppm	parts per million
QSAR	quantitative structure–activity relationship
ROI	region of interest
RRT	relative retention time
S9	9000 × *g* supernatant fraction from rat liver homogenate
SD	standard deviation; Sprague Dawley
SN	scheduled necropsy
T_3	triiodothyronine
T_4	thyroxine
TK	thymidine kinase
T_{max}	time to reach maximum concentration
TSH	thyroid stimulating hormone
TTC	threshold of toxicological concern
U	uniformly labelled
UD	unscheduled death
USA	United States of America
UVA	ultraviolet A
WHO	World Health Organization
WI	Wistar
w/v	weight per volume
w/w	weight per weight