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Pesticide residues in food 2011

Joint FAO/WHO Meeting on Pesticide Residues

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Report of the 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
Geneva, Switzerland, 20–29 September 2011

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GENEVA, 20–29 SEPTEMBER 2011

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ABBREVIATIONS

AChE	acetylcholinesterase
ACTH	adrenocorticotropic hormone
ADI	acceptable daily intake
ae	acid equivalent
ai	active ingredient
ALT	alanine aminotransferase
AMPA	aminomethylphosphonic acid
AP	alkaline phosphatase
AR	applied radioactivity
ARe	androgen receptor
ARfD	acute reference dose
asp gr fn	aspirated grain fraction
AST	aspartate aminotransferase
AU	Australia
BBCH	**B**iologischen Bundesanstalt, **B**undessortenamt und **CH**emische Industrie
BMD	benchmark dose
BMDL	lower limit on the benchmark dose
BROD	benzyloxyresorufin-*O*-dealkylase
bw	body weight
CAC	Codex Alimentarius Commission
CAR	constitutive androstane receptor
CAS	Chemical Abstracts Service
CCN	Codex classification number (for compounds or commodities)
CCPR	Codex Committee on Pesticide Residues
ChE	cholinesterase
C_{max}	maximum concentration
CXL	Codex MRL
CYP	cytochrome P450
DAP	days after planting
DAT	days after treatment
DCSA	3,6-dichlorosalicylic acid
DDT	dichlorodiphenyltrichloroethane
DM	dry matter

DM-PCA	3-trifluoromethyl-1H-pyrazole-4-carboxylic acid
DNA	deoxyribonucleic acid
DT_{50}	time required for 50% dissipation of the initial concentration
dw	dry weight
ECD	electron capture detector
EC_{50}	the concentration of agonist that elicits a response that is 50% of the possible maximum
EPO	early post-emergence
EPSPS	5-enolpyruvylshikimate-3-phosphate synthase
ER	estrogen receptor
EROD	ethoxyresorufin-*O*-deethylase
EtOAc	ethyl acetate
EU	European Union
F_0	parental generation
F_1	first filial generation
F_2	second filial generation
FAO	Food and Agriculture Organization of the United Nations
FPD	flame photometric detector
fw	fresh weight
GAP	good agricultural practice
GAT	glyphosate-N-acetyltransferase
GC	gas chromatography
GC-ECD	gas chromatography with electron capture detection
GC-FPD	gas chromatography with flame photometric detection
GC/MS	gas chromatography/mass spectrometry
GC/TSD	gas chromatography with thermionic sensitive detection
GD	gestation day
GEMS/Food	Global Environment Monitoring System – Food Contamination Monitoring and Assessment Programme
GLC	gas liquid chromatography
GLP	good laboratory practice
GPC	gel permeation chromatography
HPLC	high performance liquid chromatography
HR	highest residue in the edible portion of a commodity found in trials used to estimate a maximum residue level in the commodity
HR-P	highest residue in a processed commodity calculated by multiplying the HR of the raw commodity by the corresponding processing factor
IEDI	international estimated daily intake

IESTI	international estimate of short-term dietary intake
IPCS	International Programme on Chemical Safety
ISO	International Organization for Standardization
IUPAC	International Union of Pure and Applied Chemistry
JECFA	Joint FAO/WHO Expert Committee on Food Additives
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
JMPS	Joint FAO/WHO Meeting on Pesticide Specifications
JP	Japan
LC	liquid chromatography
LC_{50}	median lethal concentration
LD_{50}	median lethal dose
LH	luteinizing hormone
LHR	luteinizing hormone receptor
LOAEC	lowest-observed-adverse-effect concentration
LOAEL	lowest-observed-adverse-effect level
LOD	limit of detection
LOQ	limit of quantification
LPO	late post-emergence
MFO	mixed-function oxidase
MG	methylguanidine
MOA	mode of action
MRL	maximum residue limit; maximum residue level
MS	mass spectrometry
MS/MS	tandem mass spectrometry
nAChR	nicotinic acetylcholine receptor
NOAEC	no-observed-adverse-effect concentration
NOAEL	no-observed-adverse-effect level
NOEL	no-observed-effect level
NPD	nitrogen phosphorus detector
NTE	neuropathy target esterase
OECD	Organisation for Economic Co-operation and Development
PAM	1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide
PBI	plant back interval
PCA	1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxylic acid
Pf	processing factor
PH	pre-harvest

PHI	pre-harvest interval
ppm	parts per million
PRE	pre-emergence
PROD	pentoxyresorufin-*O*-deethylase
PXR	pregnane X receptor
RAC	raw agricultural commodity
RSD	relative standard deviation
RTI	re-treatment interval
SC	suspension concentrate
STMR	supervised trials median residue
STMR-P	supervised trials median residue in a processed commodity calculated by multiplying the STMR of the raw commodity by the corresponding processing factor
T_3	triiodothyronine
T_4	thyroxine
T_{max}	time to reach maximum concentration
TAR	total administered radioactivity
TF	transfer factor
TLC	thin-layer chromatography
TRIS	tris(hydroxymethyl)aminomethane
TRR	total radioactive residues
UGT	uridine diphosphate glucuronosyltransferase
UK	United Kingdom
USA	United States of America
US/CAN	United States and Canada
US-FDA	USA – Food and Drug Administration
WG	wettable granule
WHO	World Health Organization

USE OF JMPR REPORTS AND EVALUATIONS BY REGISTRATION AUTHORITIES

Most of the summaries and evaluations contained in this report are based on unpublished proprietary data submitted for use by JMPR in making its assessments. A registration authority should not grant a registration on the basis of an evaluation unless it has first received authorization for such use from the owner of the data submitted for the JMPR review or has received the data on which the summaries are based, either from the owner of the data or from a second party that has obtained permission from the owner of the data for this purpose.

CONTENTS

R, residue and analytical aspects; T, toxicological evaluation

* New compound

** Evaluated within the periodic review programme of the Codex Committee on Pesticide Residues

PESTICIDE RESIDUES IN FOOD

REPORT OF THE 2011 JOINT FAO/WHO MEETING OF EXPERTS

1. INTRODUCTION

The Joint FAO/WHO Meeting on Pesticide Residues (JMPR) met at the headquarters of the World Health Organization (WHO) in Geneva, Switzerland, from 20 to 29 September 2011. The meeting was opened by Dr Maged Younes, Director, Department of Food Safety and Zoonoses, WHO, on behalf of the Directors General of WHO and the Food and Agriculture Organization of the United Nations (FAO). Dr Younes acknowledged the impressive and successful work of this programme for the past 50 years and the important role that the work of the Meeting plays in the establishment of international food safety standards, thereby contributing to the improvement of public health. The provision of independent scientific advice as the basis for public health decision-making is at the core of WHO's work, and, as such, the experts attending the meeting are contributing directly to the goals of the Organization. In closing, Dr Younes noted the challenging task ahead for this Meeting and gratefully acknowledged the invaluable contribution of the experts, including the tremendous efforts put into the preparation of the meeting.

During the meeting, the FAO Panel of Experts on Pesticide Residues in Food was responsible for reviewing residue and analytical aspects of the pesticides under consideration, including data on their metabolism, fate in the environment and use patterns, and for estimating the maximum levels of residues that might occur as a result of use of the pesticides according to good agricultural practice. The WHO Core Assessment Group on Pesticide Residues was responsible for reviewing toxicological and related data in order to establish acceptable daily intakes (ADIs) and acute reference doses (ARfDs), where necessary and possible.

The Meeting evaluated 26 pesticides, including eight new compounds and four compounds that were re-evaluated for toxicity or residues, or both, within the periodic review programme of the Codex Committee on Pesticide Residues (CCPR). The Meeting established ADIs and ARfDs, estimated maximum residue levels and recommended them for use by CCPR, and estimated supervised trials median residue (STMR) and highest residue (HR) levels as a basis for estimating dietary intakes.

The Meeting also estimated the dietary intakes (both short term and long term) of the pesticides reviewed and, on this basis, performed a dietary risk assessment in relation to their ADIs or ARfDs. Cases in which ADIs or ARfDs may be exceeded were clearly indicated in order to facilitate the decision-making process by CCPR. The rationale for methodologies for long- and short-term dietary risk assessment are described in detail in the FAO Manual on the submission and evaluation of pesticide residue data for the estimation of MRLs in food and feed (2009).

The Meeting considered a number of general issues addressing current procedures for the risk assessment of chemicals, the evaluation of pesticide residues and the procedures used to recommend maximum residue levels.

1.1 DECLARATION OF INTERESTS

The Secretariat informed the Committee that all experts participating in the 2011 JMPR had completed declaration-of-interest forms and that no conflicts had been identified.

Dr McGregor had prepared, in 2006, an opinion on the carcinogenicity and mutagenicity of dichlorvos for the sponsor. Dr Kanungo, as an official of the Government of India, participated in the preparation of the dossier submitted to the JMPR on dicofol.

The JMPR confirmed that these declarations should not be considered as conflicts of interest and that the considered experts should not participate in the discussion about the respective compounds.

2. GENERAL CONSIDERATIONS

2.1 GENERAL DISCUSSIONS RELATED TO THE TOXICOLOGICAL EVALUATION OF COMPOUNDS

The World Health Organization (WHO) Core Assessment Group on Pesticide Residues discussed several items relevant to the toxicological evaluation of agricultural pesticides.

The group agreed on the need to update the guidance for monographers, to take account of changes in process since it was last published and to use the opportunity to improve and harmonize the monograph format to facilitate data submission and exchange of evaluations.

Current practices in rounding when expressing health-based guidance values (acceptable daily intake [ADI], acute reference dose [ARfD]) were also discussed, and the current Joint FAO/WHO Meeting on Pesticide Residues (JMPR) practice was confirmed.

After a brief presentation by Dr Andy Hart on ongoing activities on how to more systematically express the uncertainty underlying hazard assessments, the group decided that it would be beneficial to explore ways to more systematically express underlying uncertainties. For this, it was recommended that one or two JMPR experts should participate in the ongoing activity within WHO/International Programme on Chemical Safety (IPCS). The group also recommended that the Joint FAO/WHO Expert Committee on Food Additives (JECFA) should consider this approach.

Following a brief presentation regarding ongoing activities in the United States of America on high-throughput screening assays (Tox21), the group decided to form a small working group to develop a draft position for JMPR on the use of such data in risk assessment, for discussion at the next meeting.

The group further agreed to form another small working group to define the scope of the need to develop further guidance on minor and adaptive effects, as a follow-up to previous discussions held at the 2006 meeting, for further discussion at the next meeting. Practical experience from the work of JMPR will serve as guidance when developing this scope.

2.2 UPDATE OF THE AUTOMATED SPREADSHEET APPLICATIONS FOR THE CALCULATION OF DIETARY INTAKE: NEW LARGE PORTION DATA

The 2003 Meeting of the JMPR agreed to adopt automated spreadsheet applications for the calculation of dietary intake in order to harmonize and facilitate the estimation process. The spreadsheet applications were constructed by RIVM (National Institute for Public Health and the Environment), of the Netherlands in cooperation with WHO/GEMS/Food incorporating available consumption data into Excel spreadsheets and, where possible, linking this consumption data to the Codex Commodities for which maximum residue levels, HR(-P)s and STMR(-P)s are estimated. The spreadsheets are used to calculate the IEDI and IESTI using the formulas as described in Chapter 7 of the 2009 FAO Manual[1]. To use the spreadsheets, estimates made by JMPR (ADI, ARfD, STMR(-P), HR(-P), and when necessary maximum residue level values) are entered according to the manual

[1] FAO Manual (2009), Submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed. 6.7 Estimation of group maximum residue levels STMR and HR values for plant commodities. FAO Plant Production and Protection paper 197, p 97–101

attached to the spreadsheets. The calculations and generation of a final table are then performed automatically.

In its 2010 Report, JMPR highlighted the importance of having contemporary consumption data to ensure reliable risk assessments (General Considerations 2.2 and 2.3). Some issues were identified with respect to the Large Portion (LP) database:

- In the current GEMS/Food LP database, several regions of the world are not, or not very well, represented.
- The GEMS/Food LP data are sometimes older than those used by the same country in national or regional assessments (e.g., Europe).

As a result WHO/GEMS/Food requested the provision of current national large portion data for acute dietary risk assessments (March 2011). The governments of Australia, France, Germany, Netherlands and Thailand provided new or updated information on large portion data and/or commodity unit weights and percent edible portions. Large portion data already available to JMPR and provided by the governments of Japan, South Africa, the UK and the USA were retained. Unit weight and edible portion data previously provided to the JMPR by the governments of Belgium, Japan, Sweden, the UK and the USA were retained.

The population age groups for which large portion data have been provided differed between countries. Large portion data are now available for general population (all, 1 years and above, 2 years and above, 3 years and above, 10 years and above, 16–64 years, 14–80 years), women of childbearing age (14–50 years), and children of various ages ranging from babies to teenagers (6 years and under, 8–20 months, 1–5 years, 1–6 years, 1.5–4.5 years, 2–4 years, 2–6 years, 3–6 years, 2–16 years). Given the availability of data sets for different population groups, the IESTI spreadsheet calculations are now based on the highest large portion (based on g/kg bw/d), for each commodity, chosen from all population groups. The data were accepted as received, i.e., no quality checking was done as the responsibility for the data lies with the respective national governments.

Large portion data provided were either expressed as raw agricultural commodity (e.g., orange with peel), as raw edible portion (e.g., peeled orange) or as processed product (e.g., orange juice). To enable the selection of the highest large portion, for a certain commodity, from different countries, all large portion data needs to be expressed in the same way. For this reason the submitted large portion data were modified so that the large portion data for raw consumed commodities and aggregated commodities are expressed as raw edible portion, while the large portion data for individual processed commodities are expressed as processed product.

Until recently the IESTI calculations were only done for aggregated large portion data (i.e., raw plus unspecified processed commodities). With the new data it is now possible to do IESTI calculations for individual raw and processed commodities (e.g., raw apples, apple juice, apple sauce, dried apples) as well as for aggregated large portion data (e.g., sum of raw apples, apple juice and dried apples). Large portion data for individual raw and individual processed commodities are listed separately from aggregate large portion data in the spreadsheet.

Generally the large portion data for the aggregated commodities will result in the highest IESTI for a certain commodity. When the ARfD is exceeded for the aggregated commodities, possibilities exist to refine the IESTI calculation by calculating the IESTI for all individual raw and processed commodities by making use of the processing factors derived from processing studies. However, since the aggregate large portion data and the large portion data for the individual commodities come from different countries, the outcome of such refinements, using individual commodities, may not be related to the outcome of the corresponding aggregated commodities. Conclusions on health concern should take this into account.

The spreadsheet applications will be available on the WHO website. http://www.who.int/foodsafety/chem/acute_data/en/index1.html. The call for data is still open and the spreadsheet will be updated when new data become available.