



JMPR procedures for the estimation of MRLs



Workshop on MRL harmonization initiative

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JMPR procedures for the estimation of MRLs



Content

- General introduction
- Joint FAO/WHO Meeting on Pesticide Residues (JMPR)
- Components of JMPR assessment
- Outcomes of residue assessment
- Conclusions



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- Pesticide application leads to residue



Low volume over-the-row sprayer



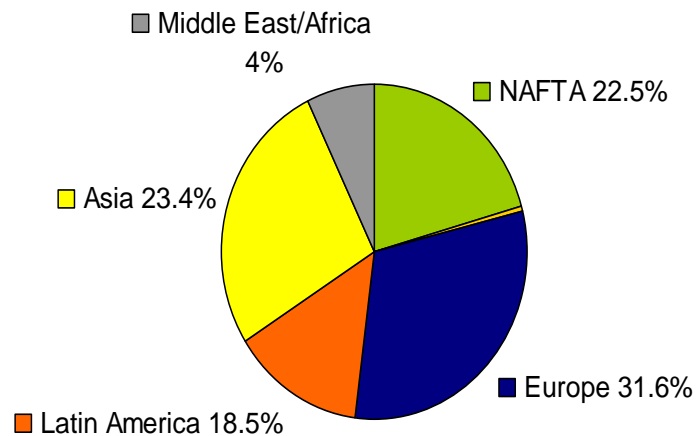


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Global Pesticide Market

- Estimated at \$33,390 million (2007) up by 9.7% (Phillips McDougall)
- NAFTA 22.5%
- Europe 31.6%
- Asia 23.4%
- Latin America 18.5%
- Middle East/Africa 4%





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Consumers: no pesticide residue

Producer: pesticides needed for increasing supply of food and economic development

Compromise

Pesticide use is acceptable if:

- residues are not harmful to human health
- no more pesticide is used than necessary to be effective





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- **Importance of pesticide residue issue in agricultural development and in International trade**

agro-products and food safety issues have drawn more and more attention all over the world. The importance of pesticide residues in food and feeds have been underlined.

- **--increasing of international trade of agro-products, especially high-value agro-products**

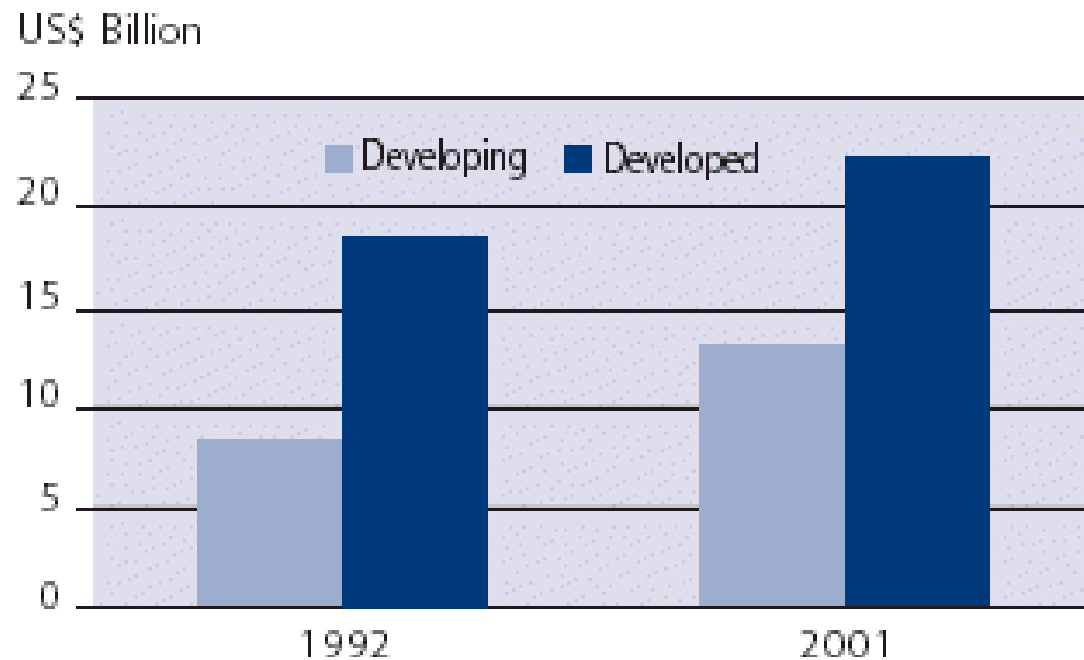
- about US\$500 billion international trade in food and agricultural products
- agricultural exports from developing to developed countries has expanded rapidly. Fresh fruit, vegetables and spices, etc. account for more than 50% of the total agro-product exports of developing countries (*Source: World Bank, 2005*)



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Export of fruits and vegetables by developing and developed countries



Source: FAOSTAT



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--increasing of consumer awareness of food safety

- Along with growth of the economy and improvement of the living standards, the requirement for the agro-products and food safety also increased,

-- increasing of number and stringency of standards

- 651 SPS notifications submitted by WTO member countries, more than 60% related to food safety (*Source: WTO, 2005*)
- Increasingly comprehensive and stringent food standards in developed country markets amplified the challenges for developing countries

-- increasing of trade disputes

- oftentimes events on ban and rejection of agro-products caused by pesticide residues in recent years ;



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Joint FAO/WHO Meeting on Pesticide Residues (JMPR)

- International expert scientific group administered jointly by FAO and WHO since 1963
- Members are invited by WHO and FAO as experts in their independent and personal capacity
- Agenda based on the priority list proposed by Codex Committee on Pesticide Residues (CCPR)
- Meetings are *ad hoc* (meet only when needed)
- Meetings are closed sessions to avoid external influences



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Joint FAO/WHO Meeting on Pesticide Residues (2)

The aim of JMPR:

- evaluating the safety of pesticide residues in food and establishing acceptable daily intake levels (ADIs) and acute reference doses (ARfDs)
- estimating maximum residue levels (MRLs) in food and feed
- assessing dietary risk from short and long term intake of pesticides





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Joint FAO/WHO Meeting on Pesticide Residues (3)

The aim of JMPR:

- recommendations as the basis for the establishment of Codex MRLs which are referenced by WTO under the SPS and TBT agreement as the international standards in food and feed moving in international trade;
- provide scientific advice on specific issues for FAO and WHO member countries, FAO and WHO governing bodies, Codex Alimentarius Commission and Codex Committee on Pesticide Residues (CCPR)



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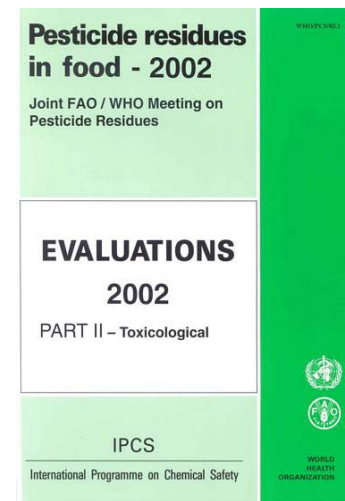
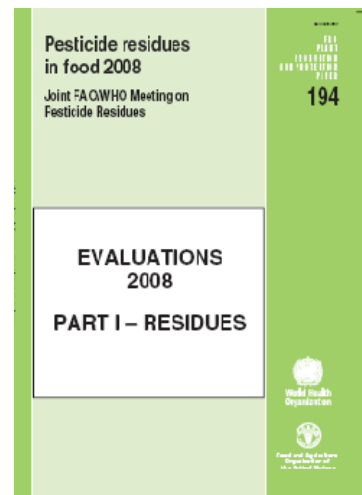
World Health Organization

JMPR Outputs

- Over 240 pesticides (new compounds and periodic reviews)
 - Has recommended >3000 MRLs; CODEX MRLs adopted: 2800
- Report and evaluation are available for public

WHO: <http://www.who.int/ipcs/food/jmpr.en>

FAO: <http://www.fao.org/ag/agp/agpp/Pesticid/Default.htm>





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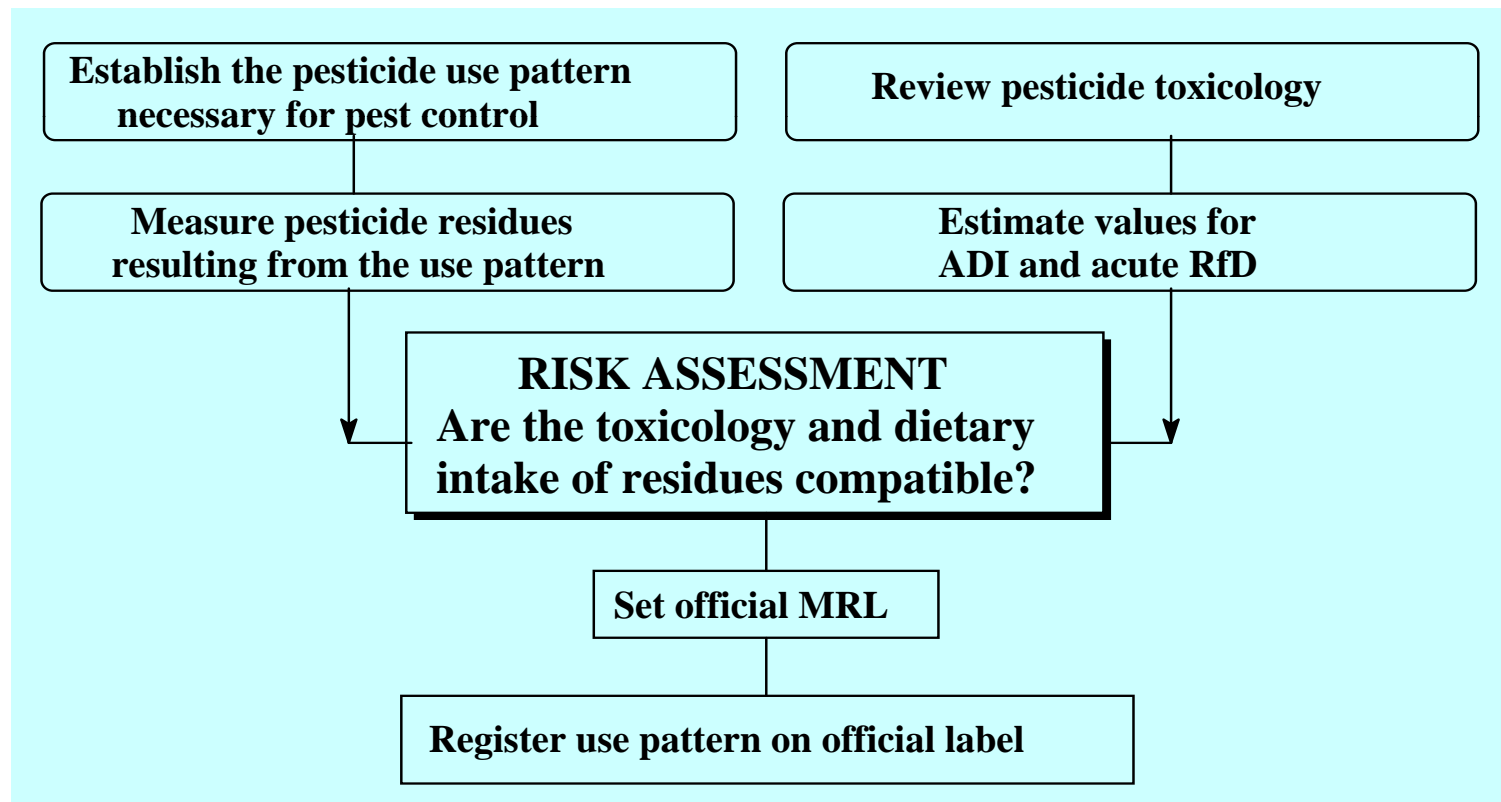
- **Safety assessment of pesticide residues in food**
 - The idea for safety assessment of pesticide residue is to ensure that consumers are not exposed to residue intakes that would exceed the Acute Reference dose (ARfD) in the short term or the Acceptable Daily Intake (ADI) in the long term



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Evaluation process for national registration

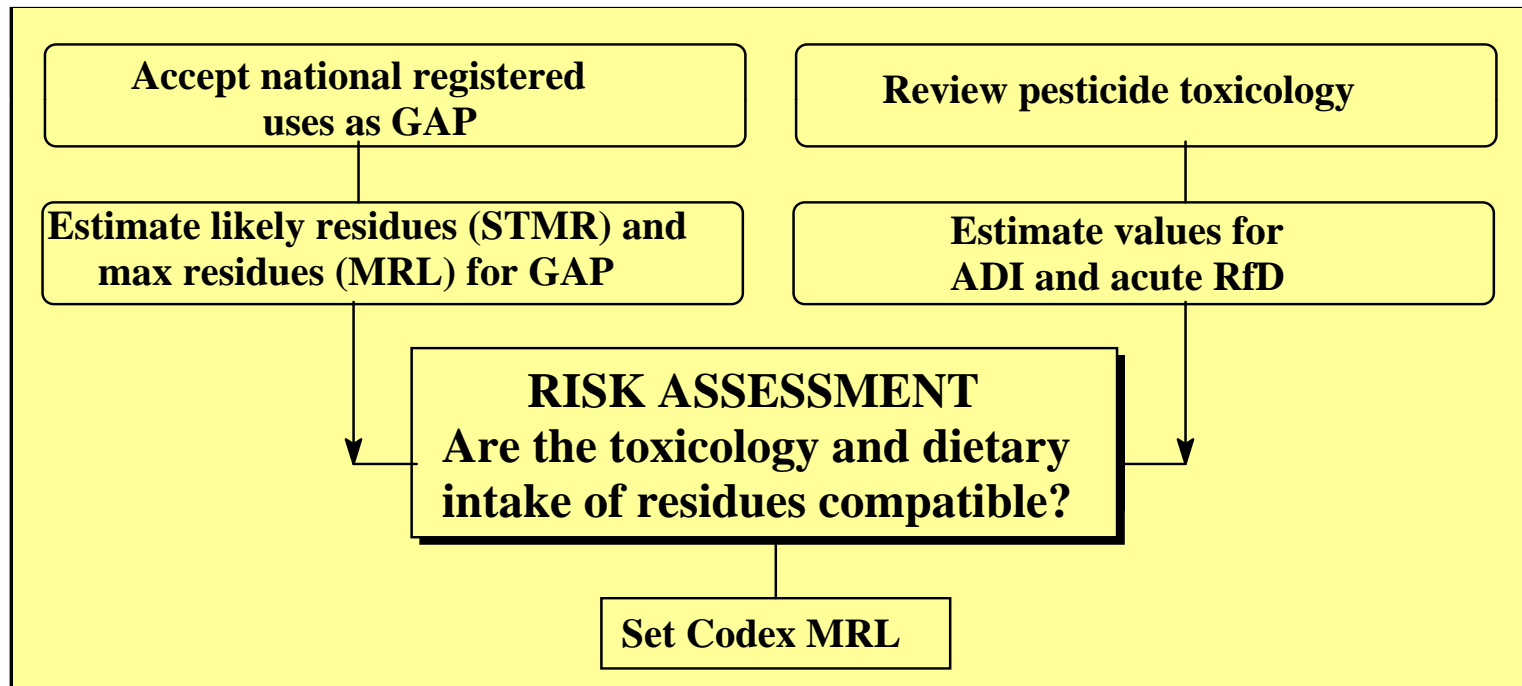




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Evaluation process for JMPR



GAP—Good Agricultural Practice
STMR--supervised trials mean residue



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- **Components of JMPR assessment**
 - toxicological assessment
 - residue assessment
 - diets or food consumption data
 - dietary risk assessment - long term
 - dietary risk assessment - short term



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Toxicological Assessment (1)

- **Toxicological data**

- Acute, short--term, long--term toxicity & carcinogenicity
- Genotoxicity
- Reproductive
- Special studies (e.g. immunotoxicity, neurotoxicity, etc)

- **Studies on metabolites**

- **Observations in humans**



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Toxicological Assessment (2) Assessment

- Identification of critical endpoint and critical study
- Identification of the No Observed Adverse Effect Level (NOAEL)
- Identification of uncertainty/safety factors
- Taking overall database into account

Outcome --- Acceptable Daily Intake (ADI)
Acute Reference Dose (ARfD)



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Residue assessment

- Chemistry
- Metabolism
- Analytical methods and freezer storage stability
- Residue definition
- Good agricultural practice (GAP)
- Supervised residue trials
- Food processing
- Livestock feeding studies and external animal treatments
- Residues in animal commodities
- Risk assessment of residues in food



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■ Chemistry

Physical and chemical properties

- water solubility
- vapour pressure
- octanol-water partition coefficient
- hydrolysis
- photolysis



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■ Metabolism-- in plant

- nature of the metabolites (and photolysis products);
- plant metabolites not appearing in animals;
- composition of residue at normal harvest;
- surface or absorbed residue;
- foliar absorption;
- root absorption;
- translocation to seeds, fruits or other edible portion;
- absorption of soil metabolites; and
- differences in metabolism in transgenic crops.



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■ **Metabolism-- in Livestock**

- rates of residue accumulation in milk and eggs;
- residue distribution in tissues, milk and eggs;
- metabolite identity;
- nature of the residue in tissues, milk and eggs; and
- residue fat solubility

■ **Metabolism-- in soils and sediments**

- persistence, soil metabolite, root crops, seed treatments, crop rotation, soil dissipation



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Analytical methods

- include relevant metabolites
- validation data
- recoveries 70-130%

Enforcement

- apply to enforcement residue definition
- prefer inclusion in multi-residue method

■ Supervised residue trials

- Cover range of conditions occurring in practice
- Accept data from trials that match registered uses (with allowances around application rate, pre-harvest interval, etc)
- Adequate number of trials
- Obtain maximum residue level, STMR, HR



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■ Residue definition

For Dietary intake

- include metabolites and photolysis products of toxicity similar to or greater than that of parent

For Enforcement

- it is not desirable to include metabolites of which they are present only a small part of the residue or it is difficult and expensive to analysis; it is needed to be simple and inexpensive to test if possible
- fat solubility –should indicate whether the residue is fat-soluble or not



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■ **Good Agricultural Practice (GAP)**

- the nationally authorized safe uses of pesticides under actual conditions necessary for effective pest control.
- encompasses a range of levels of pesticide applications up to the highest authorized use, applied in a manner which leaves a smallest and practicable amount of residue

In JMPR assessment

- Accept national registered uses as GAP
- Labels provide details of use



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- **Food processing**

- Nature of the residue in processed commodities
- Change in residue levels from Raw Agriculture Commodities (RAC) to processed commodity, important when concentrate may occur

$$\text{Processing factor} = \frac{\text{residue level in processed commodity}}{\text{residue level in raw commodity}}$$



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Outcomes of residue assessment

- **Residue Definition**
 - Relevant for risk assessment
 - Relevant for monitoring
- **Maximum Residue Level (MRL)**
 - Proposed standard for agricultural commodity
- **Standard Trial Median Residue (STMR) :**
 - Used in chronic dietary exposure assessment
- **Highest Residue in the edible portion (HR):**
 - Used in short-term dietary exposure assessment



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Risk assessment (1)

Exposure = chemical concentration x food consumption

Elements of Dietary Exposure Assessment

- Diets or food consumption data (average diets, food balance sheets)-- 13 GEMS/Food Consumption Cluster Diets introduced in 2006
- Sum of exposures for each food commodity (STMR × food consumption)
- ADI



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Dietary Exposure Assessment – Chronic (Long term)

- Dietary intake of residue = residue concentration X food consumption
- Estimated daily intake for the pesticide = sum of intakes for all foods where the residue occurs, divide this value (mg/person) by body weight and compare with ADI

Elements of Dietary Exposure Assessment – Acute (Short-term)

- GEMS/Food short term diets (13 GEMS/Food Consumption Cluster Diets introduced in 2006)
- High residue (HR)
- ARfD



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Conclusions

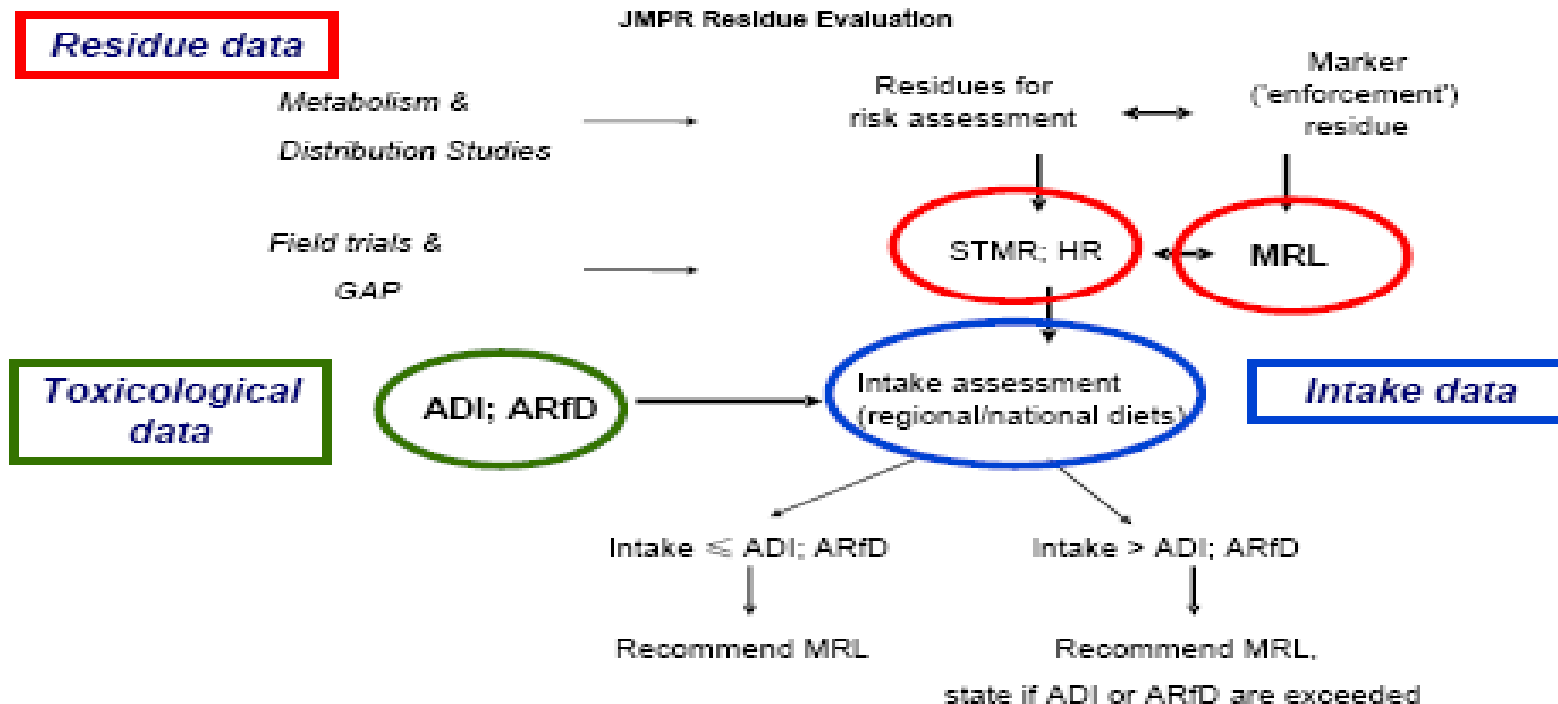
- the pesticide ADI and ARfD represent its hazard;
- consumer exposures are calculated from consumer diets and residue concentrations in the food;
- the risk is determined by comparing the dietary exposures with the pesticide ADI and ARfD;
- JMPR recommends the estimated maximum residue levels as MRLs (maximum residue limits) **only if the risk assessment passes both the chronic and short-term intake hurdles.**



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linking MRL to ADI/ARfD through exposure





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JMPR recommendations

CCN	Commodity	MRL, mg/kg	STMR, mg/kg	HR, mg/kg
AL 1020	Alfalfa fodder	60		
FP 0226	Apple	0.5	0.21	0.30
VB 0400	Broccoli	0.2	0.055	0.14
VB 0041	Cabbages, Head	3	0.435	2.7
FM 0812	Cattle milk fat	2	1.0	
VB 0404	Cauliflower	0.2	0.02	0.14



World Health
Organization

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JMPR 2009 -- Geneva, September 16-25

- **Tentative schedule:**

4 New compounds: Fluopicolide; Spirodiclofen; Ethaboxam; Metaflumizone

9 Periodical re-evaluation: toxicology 5, residue 4,

13 Evaluation

- **Possible general issues to be Considered**

- new OECD Guidelines

- draft of Updated FAO Manual

- issues from the 41th CCPR



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Challenges

Overall: Increasing demand for Codex MRLs, lacking in data submission

- ***Toxicological Assessment***

- Uncertainty factors
- Dose-response modeling

- ***Residue Assessment***

- Combination of data sets for estimation of MRLs
- Calculation methodology for the estimation of MRLs
- Selection of representative crops and corresponding commodities for particular crop and commodity groups, including Minor crops

- ***Dietary Exposure Assessment***

- Sensitive subpopulations
- Refinements



*Thank you very much for your
kind attention!*

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