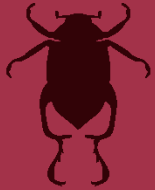


# Overview of Residue Evaluation



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- Residue definition



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- Consumer Risk Assessment

- Way forward for Ethiopian situation



# Residue definition

1. Why
2. Studies required
3. Crops
4. Criteria for setting a residue definition





# Residue definition – why?



*Definition: Remaining parts of a PPP after application on crops according to a certain use:*

- Parent and/or one of more metabolites
- All metabolites which are toxicologically relevant')
- For approval: risk assessment for authorisation
- After approval: for enforcement/monitoring by food safety authority



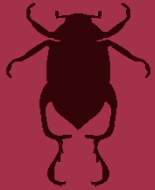


# Studies required



Metabolism studies with  $^{14}\text{C}$ -labelled active substance in:

- Leafy crop
- Root/tuber crop
- Fruit
- Cereal
- Pulses/oilseeds



Way of application (foliar spray, soil or seed treatment)

If metabolism is similar in 3 different plant groups investigated, metabolism is assumed similar in all plants





# Criteria for setting Residue Definition



Metabolites are relevant when:

- > 0.05 mg/kg
- >10% total residue
- Toxicological relevant ('toxic')



Two types of residue definitions:

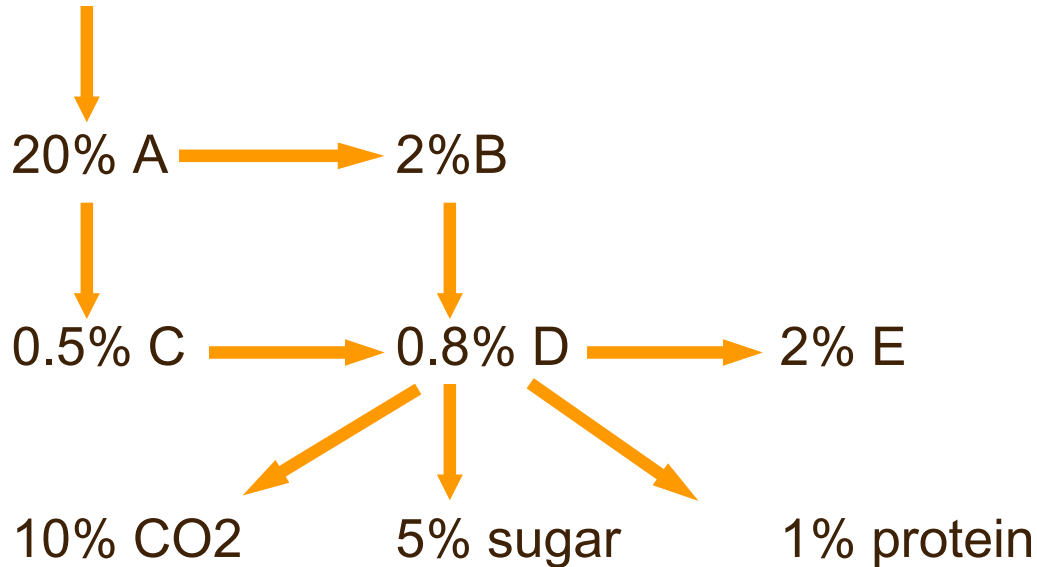
- *Monitoring*: as simple as possible
- *Risk Assessment*: all toxic relevant components





# Example of metabolic profile

30% parent



28.7% of residue non extractable ('bound residue')



# Residue level

- Each crop has own legally allowed level for each active substance: maximum residue level (MRL)
- For each crop a set of representative residue trials is needed or should be extrapolated from an closely related crop



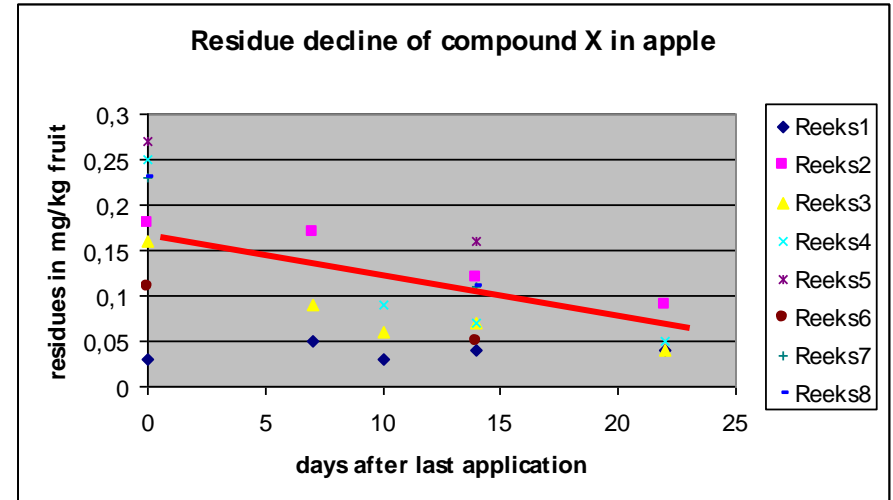
# Establishing MRLs (plant)

(Maximum Residue Level in mg/kg)



## Residue trials:

- according to intended use
- Intended crop
- region (N-EU)
- definition of residue



## Requirements:

- per crop 8 trials (4 for minor crop)
- 4 different locations, at least 2 seasons
- quality of studies (guidelines, GLP)

## ALARA principle:

As Low As Reasonably Achievable





# Pesticide label



*A Maximum Residue Level (MRL) is coupled to a well defined use:*

- Active substance
- Crop
- Way of application (foliar, soil, post-harvest)
- Dose level
- Repetitions
- Pre harvest interval (PHI, Safety interval) or growth stage (BBCH scale)
- Sometimes climatic conditions are also of influence, for instance if the first step of metabolism is photo-oxidation.

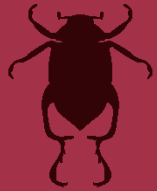




## Information on label



### *Example*



Fungicide on strawberries: foliar application of 2x800g/ha, interval 7-10d and PHI 14d.

Herbicide on teff: foliar application of 2x650 g/ha, interval 7-10d, BBCH 50-69.





# Extrapolation of residue data (MRL)



In EU an 'extrapolation document' is in use. The document allows to make extrapolation between closely related crops in order to prevent the performance of too many studies.

## *Examples*

- Apple => pear
- Black currants => all other small berries
- Tomato => aubergine
- Cucumber => courgette
- Beans => peas
- Onion => garlic, shallot
- Maize => teff, millet



*<http://ec.europa.eu/food/plant/protection/pesticides/docs/app-d.pdf>*



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# Consumer risk assessment



When a pesticide is authorised there might be life lasting, permanent exposure = chronic exposure



How to act if residue is found higher than MRL?  
One time, occasional exposure = acute exposure

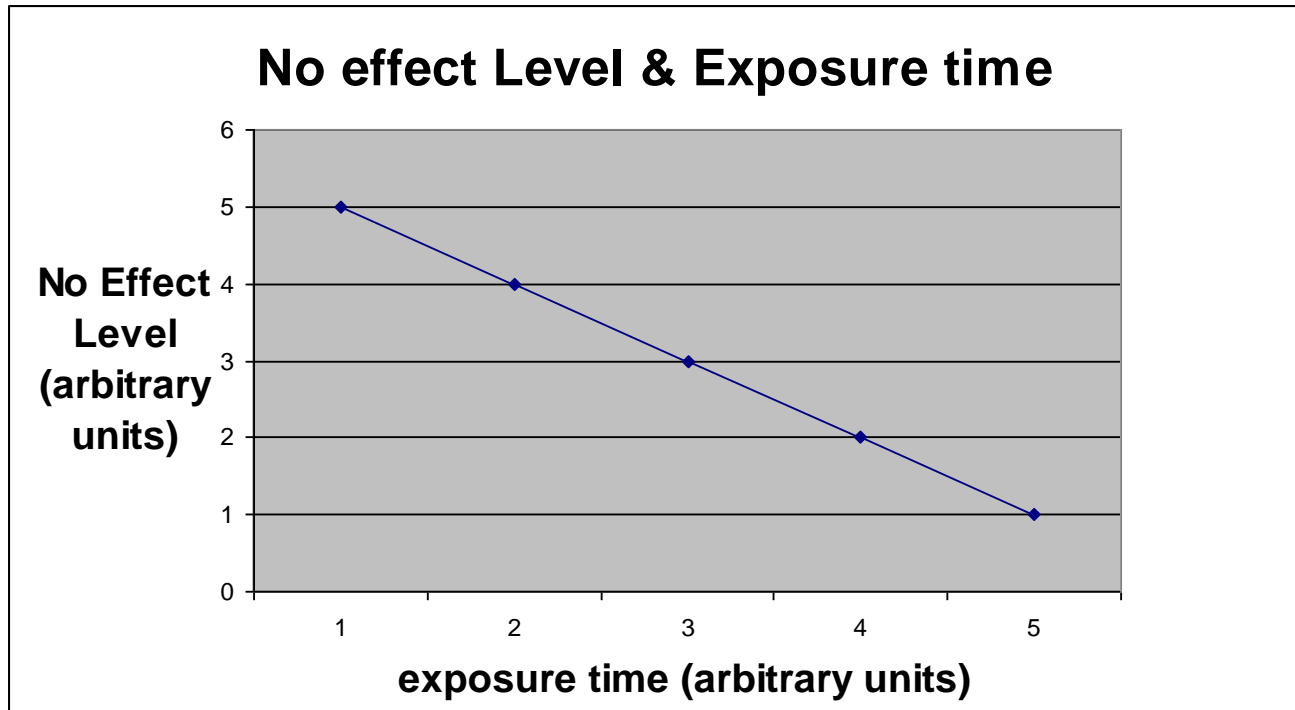
How to act to residues  $>$  MRL:

- Exceeding MRL: grower might be fined (financial penalty)
- Exceeding MRL and risk: rapid alert, withdrawal of product from market





# General principle of toxicology



## *Conclusion*

long term acceptable exposure level is lower, short-term acceptable exposure level is higher



# Reference values

= *ADI*

Acceptable Daily Intake: no effect level derived from long term animal study, divided by 100



*ARfD*

= Acute Reference Dose: no effect level from a short term of reproduction animal study, divided by 100

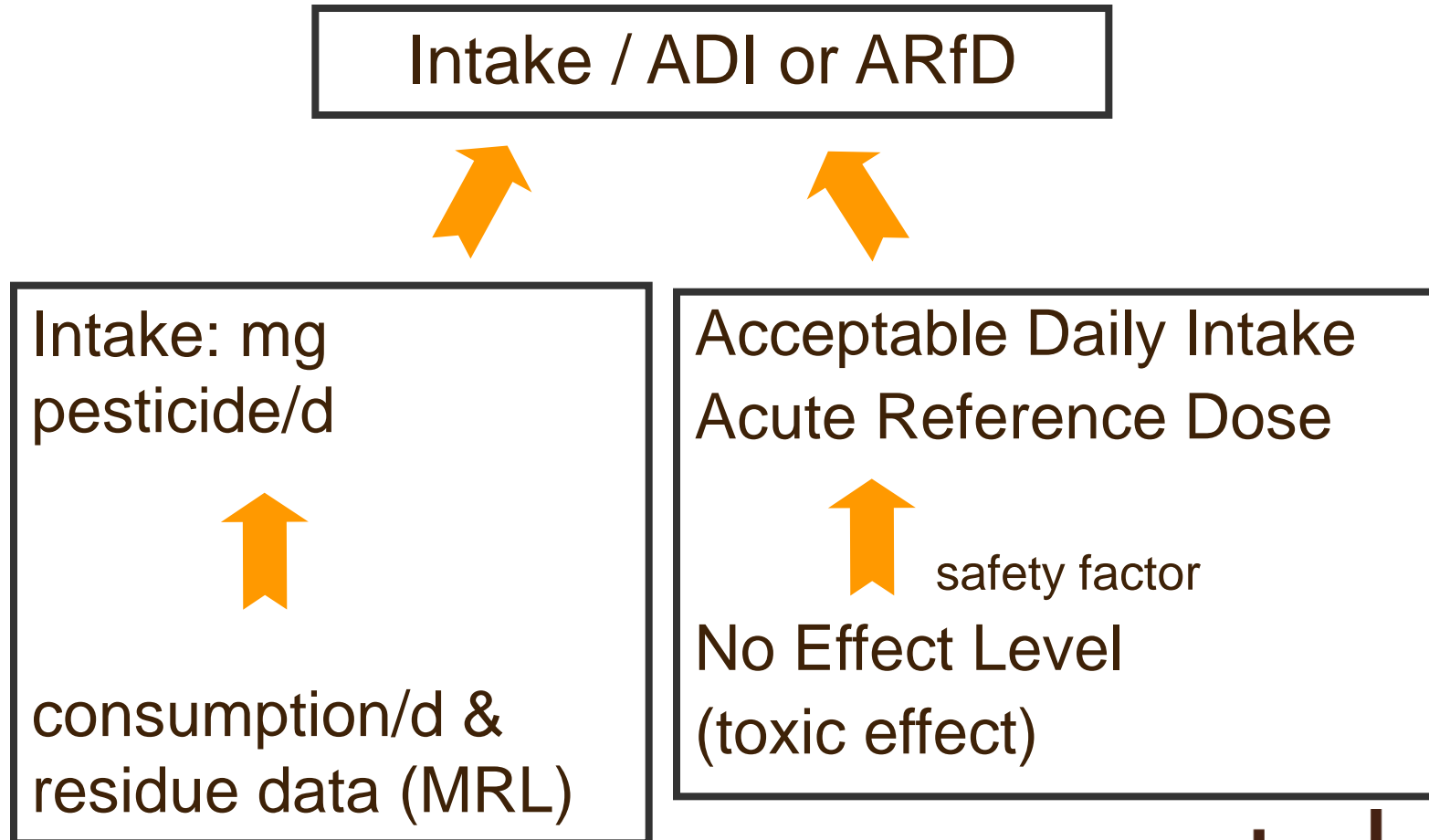


[workshop on operator exposure of Marloes Busschers, 23-26 April]





# Consumer risk assessment general



# Consumer risk assessment chronic exposure



## *Input parameters*

- MRLs
- *mean* dietary intake data
- during whole course of life

## *Calculation*

Theoretical Maximum Daily Intake, TMDI):

$$\Sigma x,y = (\text{MRL } x,y * \text{intake } x,y)$$

# Consumer risk assessment - chronic



- **Chronic intake (TMDI)  $\leq$  ADI**
  - Safe use
- **Chronic intake (TMDI)  $>$  ADI**
  - *Refinement* of calculation using processing data and median residue values
- **Refined chronic intake  $>$  ADI**
  - No safe use, restriction of application needed / authorisation cannot be granted.

# Consumer risk assessment acute exposure



Why is an acute consumer exposure calculation necessary

- Large portion instead of mean portion
- Variation in residue levels between different units while MRL has been based on composite sample.
- To decide whether a risk can be expected when consuming a large portion with a unit with a high residues level (eg one whole melon)

# Consumer risk assessment acute, tiered approach



- **Acute intake  $\leq$  ARfD**
  - Safe use



- **Acute intake  $>$  ARfD**

Refinement of calculation using:

  - New toxicity studies
  - New residue trials according to less critical GAP
  - Specific variability factor
  - New/other processing data
  - Other statistical methods also describing  $>97.5$ -percentile



- **Refined acute intake  $>$  ARfD**
  - No safe use, restriction of application needed / authorisation cannot be granted.



# Consumer risk assessment acute exposure



## Input:

- Residue data (MRL)
- Large Portion Dietary Intake data (LP, related to children, adults, ....)
- Unit weight of the particular crop
- Standard variability factor for particular crop (v)
- one time/occasional intake

ESTI = Estimate of Short-Term Intake

## Calculation:

$$\text{ESTI} = [U \times \text{MRL} \times v] + [\text{LP-U} \times \text{MRL}]$$

## Workshop participants:

*Which information is already in the dossier and which should be evaluated and/or developed?*

- Residue definition and MRLs
- Ethiopian diet (food basket)
- Pesticide label which defines the authorised uses (crop, way of application, dose, interval, PHI).
- Goals: protection of consumers and/or to guarantee export of fruits & vegetables

