

International estimated short-term intake (IESTI)

(Last update 29/10/2014)

In recognizing that foodborne hazards can pose health risks after only a short period of exposure, GEMS/Food has assembled databases to allow for the estimation of one-day exposures to acutely toxic chemicals in food. For a pesticide residue with an established Acute Reference Dose (acute RfD), the International Estimated Short-term Intake (IESTI) may be used to estimate exposure based on the highest reported 97.5th percentile intake during a single day by consumers only that are reported by countries having such individual consumption data.

International Estimated Short-term Intakes (IESTIs) are assessed for a pesticide by the Joint FAO/WHO Meetings on Pesticide Residues (JMPR) when it has established (or intends to establish) an acute reference dose (acute RfD) for the pesticide.

JMPR must also have recommended:

- a proposed Maximum Residue Level (MRL) for one or more commodities

JMPR have estimated:

- Supervised Trials Median Residue values (STMRS) in those commodities that are bulked or blended.
- highest residues (HRs) in those commodities that can be traced back to single treatment sites (fields, storage facilities or livestock housings)

Data on the consumption of large portions of commodities by the general population and children ages 6 and under (Data set 1) were provided by 14 countries (*Australia, France, Germany, Denmark, Finland, The Netherlands, Japan, China, South Africa, Thailand, Brazil, the United Kingdom of Great Britain and Northern Ireland (UK) and the United States of America (USA)*) as well as the age distribution and mean body weights for the relevant groups (Data set 2).

In addition, data on unit weight and per cent edible portion (Data set 3) were provided by 11 countries (*Australia, Belgium, France, Germany, The Netherlands, Japan, Thailand, Sweden, Brazil, the UK and the USA*).

Depending on the data on consumption, the IESTI for each commodity is calculated from the equation defined for each case, as described below. The following definitions apply to all equations:

- **LP** = highest large portion provided (97.5th percentile of eaters), in kg of food per day
- **HR** = highest residue in composite sample of edible portion found in data from supervised trials data from which the MRL was derived, based on the residue definition for dietary risk assessment, in mg/kg
- **HR-P** = highest residue in the processed commodity, based on the residue definition for the dietary risk assessment, in mg/kg, calculated by multiplying the HR in the raw commodity by the processing factor, each based on the residue definition for dietary risk assessment
- **bw** = average body weight for a population age group, in kg, provided by the country for which the large portion, LP, was used
- **U_e** = edible portion of the unit weight, in kg, provided by the country for which the large portion, LP, was used
- **U_{RAC}** = unit weight of the raw agricultural commodity, in kg, provided by the country for which the large portion, LP, was used. If no unit weight was provided, the highest unit weight available in the database was used
- **v** = variability factor represents the ratio of the 97.5th percentile residue to the mean residue in single units. v=3 when U_{RAC} ≥ 25 g, otherwise not relevant
- **STMR** = supervised trials median residue, in composite sample of edible portion found in data from supervised trials data from which the MRL was derived, based on the residue definition for dietary risk assessment, in mg/kg
- **STMR-P** = supervised trials median residue in processed commodity, based on the residue definition for the dietary risk assessment, in mg/kg, calculated by multiplying the STMR in the raw commodity by the processing factor, each based on the residue definition for dietary risk assessment

Case 1

The concentration of residue in *a composite sample* (raw or processed) reflects that in the large portion size of the commodity. This is assumed to be the case when the unit weight (U_{RAC}) is < 25 g. This case also applies to *meat, liver, kidney, edible offal and eggs*.

$$\text{IESTI} = \frac{(\text{LP} \times (\text{HR or HR-P}))}{\text{bw}} \quad (\text{in mg/kg bw})$$

Case 2

Typical unit, such as a *single piece of fruit or vegetable*, might have a higher residue than the composite such as when a unit weight (U_{RAC}) of a commodity is ≥ 25 g. Variability factors are applied in the equations. When sufficient data are available on residues in single units to

calculate a more realistic variability factor for a commodity, the calculated value should replace the default value of 3 for all commodities.

Note that the 2003 JMPR has proposed to use a variability factor of 3 for all commodities.

2a. The unit weight of the edible portion (U_e) is lower than that of the large portion, LP.

$$\text{IESTI} = \frac{((U_e \times (\text{HR or HR-P}) \times v + (\text{LP} - U_e) \times (\text{HR or HR-P}))}{\text{bw}} \text{ in mg/kg bw}$$

2b. The unit weight of the edible portion (U_e) is higher than that of the large portion, LP.

$$\text{IESTI} = \frac{((\text{LP} \times (\text{HR or HR-P}) \times v))}{\text{bw}} \text{ in mg/kg bw}$$

Case 3

When a raw agricultural commodity or *processed commodity* is *bulk*ed or *blend*ed (e.g. *pre-harvestly treated cereal grains, oilseeds, pulses, industrially processed fruit juices*), the STMR-P value represents the probable highest concentration of residue. This case also applies to *milk*.

$$\text{IESTI} = \frac{(\text{LP} * \text{STMR-P})}{\text{bw}} \text{ in mg/kg bw}$$

A risk assessment for short-term dietary intake is conducted for each commodity-compound combination by expressing the IESTI as a percentage of the acute RfD.

When the maximum residue level is recommended for a Codex commodity group (i.e. citrus fruit), intakes are calculated for individual commodities within the group. The selected commodities should include the one(s) that will lead to the highest intake.

Specific case of fat soluble pesticides in meat

The calculation of the dietary intake of fat soluble pesticides in meat is slightly different for mammalian meat and poultry meat.

For *mammalian meat*, 20% of the meat large portion should be considered to contain residue at the concentration level in fat and 80% of the meat large portion should be considered to contain residue at the concentration level in the muscle with the trimable fat removed.

For *poultry*, the percentages are 10% and 90% of the meat large portion for fat and muscle residues respectively.

Significant figures

The percentage of the acute **RfD** for the general population and for children are rounded to one significant figure for values up to and including 100% and to two significant figures for values above 100%. If the percentage is greater than 100%, the information provided to the JMPR does not allow confirmation that the short-term dietary intake of the residue in that commodity would be below the acute **RfD**.

For more information:

- (1) FAO/WHO (2009). *Principles and methods for the risk assessment of chemicals in food*. Geneva, World Health Organization, (Environmental Health Criteria, No. 240;
<http://www.who.int/foodsafety/publications/chemical-food/en/>
- (2) For JMPR reports see the JMPR website:
<http://www.who.int/foodsafety/publications/jmpr-reports/en/>