Tabletop training exercises

FAO/WHO Pre-CCASIA Workshop on
“Food recall/traceability within the risk analysis framework – Prevention of food safety emergencies”

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Introduction

- Food safety emergencies/crises occur worldwide.
- Emergency response (ER) would be conducted to prevent further illness and maintain public confidence in the food supply.
- It is important to ensure the ER plan functions or procedures in advance of an actual emergency situation.
When an incident occurs, you will

1. identify hazards, and assess the degree of risks quantitatively, with available information;
2. identify risk management options, taking into account the risk assessment results; and
3. consider risk communication with stakeholders in the framework of risk analysis, within a limitation of time and resources.
Today’s exercises

1\textsuperscript{st} session (Exercise 1: individual work)

[A case scenario will be provided.]
- Estimate the daily intake of a hazard (XYZ toxin)
- Conduct a risk characterization of the hazard

2\textsuperscript{nd} session (Exercise 2: group work)
- Consider what options the government of country A (or B) should take
- Consider what type of information should be released to the public

3\textsuperscript{rd} session (Group presentation)
**Scenario: Country A**

- Country A produces/exports grapes and grape products.
- Some moulds grow on grapes nationwide.
- The moulds produce XYZ toxin, and the toxin is detected both in grapes and grape products.
- Some children who ate grapes and their processed food showed toxic symptoms caused by XYZ toxin.
Scenario: Export to country B

Country A

Country B

Export
Scenario: Country B

• No domestic grape production
• Country B imports grapes and grape products. 70% of those imports are from country A.

• XYZ toxin is also detected in grapes and grape products imported from country A by food inspection at the port of entry.
• No health damage caused by XYZ toxin has been reported yet.
Exercise 1 (Table 1)

1) Estimate the daily intake of XYZ toxin, using the concentration data of XYZ toxin in each product, consumption data and human body weight
   (see the case scenario and the fact sheet)

2) Conduct a risk characterization of XYZ toxin by comparing the daily intake of the toxin with the tolerable daily intake (TDI) and the acute reference dose (ARfD) values
Preliminary Risk Assessment  
(Calculation of intake of hazardous substances)

Use for long term toxicity
- **ADI**  Acceptable Daily Intake  
  (chemicals used intentionally: e.g. pesticides, food additives, …)
- **TDI**  Tolerable Daily Intake  
  (contaminants, natural toxins: e.g. heavy metals, mycotoxins, …)

Use for short term toxicity
- **ARfD**  Acute Reference Dose
**ADI: Acceptable Daily Intake**  
(TDI: Tolerable Daily Intake)

- An estimate of the amount of a substance in food or drinking water, expressed on a body-weight basis, that can be ingested daily over a lifetime without appreciable risk (standard human = 60 kg bw)
- Usually expressed in milligrams of the substance per kilogram of body weight (e.g. mg/kg bw)
- ADI is applied to intentionally used chemicals (e.g. pesticides, food additives)
- TDI is applied to unintentional presence (e.g. contaminants, natural toxins)
Establishment of ADI

Toxicological studies in animal

NOAEL (mg/kg body weight)
(No Observable Adverse Effect Level)

× safety factor (usually 1/100)

ADI (mg/kg body weight)
[Case 1]
Pesticide exceeding the MRL detected in strawberry

Does the amount have adverse effect on health?
(Assuming the pesticide “ABC” is only applied to strawberry)

- **Pesticide “ABC”**
  - No acute toxicity
  - ADI: 0.01 mg/kg body weight
  - Concentration in the strawberry: 6 mg/kg

- **Strawberry**
  - Serving size: 20 g/day

- **Average national body weight**
  - 60 kg

MRL: maximum concentration of residue resulting from the use of a pesticide that is acceptable in a food
[Case 1] Pesticide exceeding the MRL detected in strawberry

I. Pesticide “ABC” content when eat of the strawberry
   → 6 mg/kg (detected level) x 0.020 kg (serving size)
   = 0.12 mg

II. ADI for pesticide “ABC” per person
   → 0.01 mg/kg BW (ADI) x 60 kg (average national body weight) = 0.6 mg

III. Ratio of pesticide “ABC” residue to ADI
   → 0.12 mg(I) ÷ 0.6 mg(II) x 100 = 20%

Risk-based, not the presence of hazard
(up to 5 servings is okay → one serving contains ABC about 20% of ADI)
ARfD: Acute Reference Dose

- An estimate of the amount of a substance, normally expressed on a body weight basis, that can be ingested in a period of 24 h or less without appreciable health risks on the basis of all known facts at the time of the evaluation.

  e.g. Methamidophos  0.003 mg/kg body weight
  • Based on rats’ acute nervous toxicity
  • No observable adverse effect level (NOAEL) 0.3 mg/kg
  \[ ARfD = NOAEL \times \text{ safety factor}(1/100) = 0.03 \text{ mg/kg BW} \]
[Case 2]  
Short term toxicity of pesticide detected in spinach

Does this have adverse health effect?

- **Pesticide “methamidophos”**
  - ADI: 0.0006 mg/kg body weight
  - ARfD: 0.003 mg/kg body weight
  - Concentration detected in the spinach: 2.7 mg/kg

- **Spinach**
  - Serving size: 100 g/day

- **Average national body weight**
  - 60 kg

MRL: maximum concentration of residue resulting from the use of a pesticide that is acceptable in a food
[Case 2] Short term toxicity of pesticide detected in spinach

I. Intake of methamidophos when consuming the spinach
   → \(2.7 \text{ mg/kg} \times 0.1 \text{ kg} = 0.27 \text{ mg}\)

II. Acceptable intake for methamidophos per person
    → \(0.003 \text{ mg/kg BW} \times 60 \text{ kg} = 0.18 \text{ mg}\)

III. Ratio of residue to acceptable intake for methamidophos
     → \(\frac{0.27 \text{ mg}}{0.18 \text{ mg}} \times 100 = 150\%\)

Risk of adverse health effect
Call for immediate recall of all the spinach in question
<table>
<thead>
<tr>
<th>Food items</th>
<th>Age category</th>
<th>Concentration of XYZ in the food items (maximum)</th>
<th>Average daily intake of the food items per person</th>
<th>Average amount of XYZ intake per person</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(mg/kg)</td>
<td>(kg)</td>
<td>(mg)</td>
</tr>
<tr>
<td>Fresh grapes</td>
<td>Adult (mean)</td>
<td></td>
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<tr>
<td></td>
<td>Adult (99%ile)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Food items</th>
<th>Age category</th>
<th>Body weight (mean)</th>
<th>TDI</th>
<th>TDI per person</th>
<th>TDI ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(kg)</td>
<td>(mg/kg bw)</td>
<td>(mg)</td>
<td>(%)</td>
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<tr>
<td>Fresh grapes</td>
<td>Adult (mean)</td>
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<td>Adult (99%ile)</td>
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<td></td>
<td>Infant (mean)</td>
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</tbody>
</table>
Exercise 2 (Table 2)

1) Risk management options of country A (for groups A and B)

2) Risk management options of country B (for groups C and D)

3) Information to the public (all groups)
Identifying risk management options

Example

- Collect and analyse affected or potentially implicated product(s)
- Control imports
- Stop further production and distribution
- Remove product(s) from the market (voluntary, mandatory)
- Post public alerts and warnings
- Use active communication strategies
- Detain or seize product(s)
- Recondition product(s)
- Destroy product(s)
- Criminal prosecution

(2011, FAO/WHO guide for application of risk analysis principles and procedures during food safety emergencies, p.31)

>> Not taking any action should also be considered as a viable option.
Risk communication to the general public

Communication about a food safety emergency should not underestimate the gravity of the situation but indicate as clearly as possible to the public.

- What is known about the food safety emergency
- The food products involved
- What the risks are and whether they are known
- What levels of exposure could be harmful
- What the public should do if they have consumed or obtained affected products
- How to access additional information

(2011, FAO/WHO guide for application of risk analysis principles and procedures during food safety emergencies, p.38)
Thank you for your participation

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