Development of an improved model for worker exposure assessment within the BROWSE project

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Introduction

• General outline of the BROWSE project
• Basic concept of the worker model
• Overview and software
• Survey data as model input
The BROWSE project

- **browse** = Bystanders, Residents, Operators and WorkerS Exposure models for plant protection products (PPPs)

- Supported by:

- **Timeline:**

- **Partners involved:**
Goals of BROWSE

• To develop improved exposure models to assess the risks from exposure to PPPs:
  – Operators (WP1)
  – Workers (WP2)
  – Bystanders and residents (WP3)
Goals of BROWSE (cont’d)

- To take account of relevant gender issues (WP4)
- To contribute to the implementation of:
  - Regulation 1107/2009 on authorisation of PPPs (WP5)
  - Sustainable Use Directive (SUD) (WP6)
- To involve representatives of all relevant stakeholders and end-users (WP4)
Priority exposure scenarios

exposure scenario = combination of crop and task

**OUTDOOR**
- Harvesting orchard fruit
- Harvesting grapes

**INDOOR**
- Harvesting fruiting vegetables
- Harvesting ornamentals
Exposure routes

- Dermal Exposure
- Inhalation Exposure
- Oral Exposure

hand-to-mouth contact
Dermal exposure: the basics

\[ DE = DFR \times TC \times T \]

**DFR**
Dislodgeable Foliar Residue (\( \mu g/cm^2 \))

**TC**
Transfer coefficient (\( cm^2/h \))

**T**
Duration of Exposure (hr/d)
Dermal exposure: the basics

DFR
Dislodgeable Foliar Residue

DE
Dermal exposure

Transfer Coefficient: \( TC \ (cm^2/hr) = \frac{DE \ (\mu g/hr)}{DFR \ (\mu g/cm^2)} \)
Dermal exposure: examples

Harvesting cucumbers

- Need to take **clothing and PPE** into account
- Need for appropriate **penetration factors**

PPE = Personal Protective Equipment
Inhalation exposure (IE)

\[ IE = \text{AirC}_t \times \text{BR} \times T \times \text{PF}_{\text{RPE}} \]

- \( \text{AirC}_t \) = concentration in air at re-entry (\( \mu g/m^3 \))
- \( \text{BR} \) = breathing rate (m\(^3\)/h)
- \( T \) = duration of exposure (h/d)
- \( \text{PF}_{\text{RPE}} \) = penetration factor (%)
Oral exposure (OE)

OE = DE_{\text{hands}} \times F_{\text{hand}} \times TE \times n

results from hand-to-mouth contact

- DE_{\text{hands}} = dermal exposure hands (\mu g/d)
- F_{\text{hand}} = proportion of hand involved in contact (%)
- TE = transfer efficiency from hand to mouth (%)
- n = number of hand-to-mouth contacts (-)
Overview of model

- PEARL
  - % on crop canopy
  - % volatilisation
  - OPS
    - concentration in air

- BROWSE ingestion
  - oral exposure
  - hand exposure

- DFR
- BROWSE dermal
  - dermal exposure
  - transfer coefficients, duration of exposure, clothing and PPE
- BROWSE inhalation
  - inhalation exposure
  - breathing rate, duration of exposure
Preliminary software

• Developed by FERA
• Work in progress!!

• Software workshop: Tuesday October 8th
• Stakeholder workshop: Wednesday October 9th
  → At OPERA offices in Brussels
### BROWSE and CAPEX surveys

**BROWSE surveys**
- As part of BROWSE project
- To collect information on exposure determinants and risk perceptions
- B, R, O, W
- 3 countries (UK, IT, GR)

**CAPEX surveys**
- EFSA project
- To collect data on non-dietary cumulative exposure
- O, W
- 6 countries (UK, BE, ES, GR, PL, IT)

_used to propose defaults and populate drop-down menus_
Greenhouse vegetable workers in Greece

- Types of clothing worn

<table>
<thead>
<tr>
<th>TYPE OF CLOTHING</th>
<th>Number of workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COLD SEASON</td>
</tr>
<tr>
<td>Long-sleeved shirt</td>
<td>100% (n = 23)</td>
</tr>
<tr>
<td>T-shirt</td>
<td>74% (n = 17)</td>
</tr>
<tr>
<td>Shorts</td>
<td>/</td>
</tr>
<tr>
<td>Full length trousers</td>
<td>91% (n = 21)</td>
</tr>
<tr>
<td>Hat/cap</td>
<td>70% (n = 16)</td>
</tr>
<tr>
<td>Leather/fabric boots</td>
<td>61% (n = 14)</td>
</tr>
<tr>
<td>Rubber Boots</td>
<td>74% (n = 17)</td>
</tr>
</tbody>
</table>
CAPEX surveys: output examples
Fruiting vegetable workers in Spain and Greece
• Re-entry interval
• Thank you for your attention!
• Any questions?

• For more information about the BROWSE project, please visit our website: www.browseproject.eu