ASSESSING DIETARY INTAKE OF CADMIUM IN THE BELGIAN POPULATION BY THE XTRAFOOD EXPOSURE MODEL

M. Van Holderbeke¹, C. Cornelis², V. Vromman², L. Pussemier², A. Huyghebaert²
¹ VITO – Flemish Institute for Technological Research, Mol, Belgium
² Federal Agency for the Safety of the Food Chain, Scientific Committee, Brussels, Belgium

Dietary intake of contaminants like cadmium (Cd) is merely assessed on the basis of monitoring campaigns in food on the market. However, these surveys are limited due to time and budget constraints of the authorities involved. Moreover, lower levels in food can often not be reported accurately due to analytical limitations. These limitations may be overcome by introducing predicted food concentrations in the exposure assessment. As Cd enters the food chain mainly from environmental sources, levels in primary foods can be predicted from levels in the environment by food transfer models. Processing factors can be included in the models, thus enabling the prediction of concentrations in final food products. Moreover, the use of food chain models allows simulations to be run, enabling to support governments in defining their policies.

As an illustration, we therefore present the assessment of the intake of Cd by the Belgian population on the basis of predicted food concentrations. Results are compared with measured data and discussed.

MATERIALS AND METHODS

Predicted Cd dietary exposure: XtraFood model

• Calculates concentrations of Cd in primary foods of vegetable and animal origin
  • Input and outputs at the farm
  • Connected to contaminant levels
  • Transfers to primary food products
  • Model input data for transfer calculations:

<table>
<thead>
<tr>
<th></th>
<th>Cadmium (µg Cd/kg)</th>
<th>Cadmium (µg Cd/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain</td>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Total</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Non-crop</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Crop</td>
<td>0.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Background</td>
<td>0.0</td>
<td>0.0</td>
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</tbody>
</table>

Cd exposure for different scenario:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Mean</th>
<th>Median</th>
<th>P5</th>
<th>P95</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2.17</td>
<td>2.10</td>
<td>1.38</td>
<td>3.29</td>
</tr>
<tr>
<td>2</td>
<td>3.12</td>
<td>7.31</td>
<td>3.10</td>
<td>6.30</td>
</tr>
<tr>
<td>3</td>
<td>3.76</td>
<td>5.64</td>
<td>1.17</td>
<td>6.02</td>
</tr>
</tbody>
</table>

Table 1: Predicted weekly Cd intake for different scenarios (µg/kg b.w.)

• Potential consumption of homegrown crops results in an almost doubling of the dietary Cd intake.
• Measured and predicted mean intake (scenario 1) are below the TWI of 2.5 µg/kg b.w. (EFSA, 2009)
• Difference measured and predicted intake (scenario 1):
  • measured intake may be underestimated due to the absence of data for some food products due to analytical limitations, time and budget constraints;
  • predicted intake may be overestimated due to the lack of some processing factors (e.g. grain ➔ bread)

RESULTS AND DISCUSSIONS

Comparison of measured and predicted food concentration data for the contaminated Campine region:

Good prediction for Cd accumulating crops, meat
Underprediction for other crops

Figure 1: Comparison of measured and predicted primary food concentration data for the contaminated Campine region in Belgium.

Figure 2: Contribution of the different food groups to the predicted total dietary Cd exposure in Belgium (scenario 1):

Consumption of cereals (pasta, bread,...) and potatoes dominate exposure

Figure 3: Relative contribution of different food categories to the predicted total average daily intake of Cd in the Campine region (scenario 2).

CONCLUSIONS

• Food contamination monitoring: real levels in food but restricted due to time and budget constraints;
• Prediction of levels in food results in a broader range of concentrations and is not restricted by analytical limitations, but levels are not always representative due to the potential influence of processing on Cd levels;
• Predictive models can be used to support policies by simulating the impact of measures.