WG8 Biota modelling: Further development of transfer and exposure models and application to scenarios
Address the uncertainty in biota modelling results (indicated in EMRAS), and build more confidence in simple modelling approaches as used for regulatory purposes.
Estimating soil contamination in home ranges of different species

Modelling spatially heterogeneous environments

- Typically simplistic
  - Point of capture media concentrations
  - Average over likely home-range

- Is that good enough?
Modelling spatially heterogeneous environments

- Typically simplistic
  - Point of capture media concentrations
  - Average over likely home-range
- Is that good enough?
- Two scenarios designed and process agreed
Area: Vågå reindeer herd
From 2011:
10-15 animals with GPS
Selected “representative” animals
Positions every 3 h

Aerial $^{137}$Cs survey

<table>
<thead>
<tr>
<th>Reindeer ID</th>
<th>Cs-137 conc., Bq/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>56315 Rinda</td>
<td>5700</td>
</tr>
<tr>
<td>56915 Scibjørg</td>
<td>2660</td>
</tr>
<tr>
<td>61305 Kue</td>
<td>4610</td>
</tr>
<tr>
<td>61758 Linn</td>
<td>5530</td>
</tr>
<tr>
<td>89165 Anna</td>
<td>2700</td>
</tr>
<tr>
<td>100210 Sigrid Matilde</td>
<td>3720</td>
</tr>
<tr>
<td>103263 Tea</td>
<td>2920</td>
</tr>
<tr>
<td>103382 Torild</td>
<td>4430</td>
</tr>
<tr>
<td>103613 Silje</td>
<td>2380</td>
</tr>
<tr>
<td>103743 Snerla</td>
<td>1630</td>
</tr>
<tr>
<td>112914 Viddas datter</td>
<td>2270</td>
</tr>
</tbody>
</table>
• Required datasets largely compiled
• ‘Rules’ agreed for moose & nearly developed for reindeer
• Stepped approach to simple dose estimates agreed
• Likely three ecological/ecotox. models used
Wildlife biological half-life database

- Approximately 2000 values
- Final stages of QC and then merge various files
- Publish dataset with DOI and accompanying data paper (submit April 2015)
Fukushima scenario

• Water & sediment inputs supplied by WG10 (predictions to end July 2011)
  – Cs-137, Sr-90, I-131

Inter-comparison of dynamic models for radionuclide transfer to marine biota in a Fukushima accident scenario
Fukushima scenario

Activity concentration (Bq/kg) vs. Time (days)

- **137Cs Pelagic fish Daiichi North**

- Graph showing the activity concentration over time for various models:
  - BURN-P
  - ECOMOD
  - NRPA
  - IRSN
  - K-BIOTA
  - ERICA
Fukushima scenario

137Cs Pelagic fish Daiichi North

90Sr Benthic fish Daiichi North

Activity concentration (Bq/kg)

Time (days)

BURN-P
ECOMOD
NRPA
IRSN
K-BIOTA
ERICA
D-DAT
Mean (dynamic)
ANL
Voxel phantoms


Conclusions

- Not suggesting voxel models be used for regulatory purposes – Ruedig et al. paper demonstrates that simple models are generally conservative. But that doesn’t mean that voxel models don’t have a place in pushing the boundaries of our capabilities as scientists and researchers.

- Allow researchers/scientists to look at things like hot particles in the GI tract or lungs
‘Lessons learnt’ document

- Introduction (to set context) by mid-term
- Capabilities of openly available models
  - Tabulated draft by mid-term
- How you ‘make’ model do what you need
- Parameter values
- Dosimetry
- Coping with heterogeneous media distributions
- Radionuclide specific issues

Some progress made
• **Next meeting:**

weeks 20 or 27 April in Vienna with WG4 and STAR ‘radioecology data workshop’
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  weeks 20 or 27 April in Vienna with WG4 and STAR
  ‘radioecology data workshop’

• **Next programme:**
  – Are simple models fit for purpose (inc. animal-environment), new approaches (‘SRS-19’ and ICRP RAP), new transfer models, new ways to use existing data ...........
  – Suggest IAEA consider merging WG8 & WG9