IAEA EMRAS II
Biota Effects Group
(in collaboration with IUR)

Advances of the Multiple Stressor group

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SCK•CEN, Biosphere Impact Studies

SCK•CEN
STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

Objectives

- Review literature for multiple stressor data in which radiation was among the mix
- Query ecotoxicologists from the chemical industry to see what their most recent conclusions are relative to the need for multiple stressor analyses
- Report to the IAEA on whether this should be a topic requiring further exploration in the future
- If sufficient interest and resources, collaborate on a common, multi-stressor, radiological experiment

Multiple Stressor database

- Scope: multiple stressor exposure with one of stressors external radiation or uptake of radionuclides
  - Including natural stressors (t°, pH, ...)
- Aim: Get an overview of what has been done so far, how it has been done, generalities on outcome
  - Status of the research in this area
- Approach
  - Literature review
  - Data compiling
    - Description of exp set-up, summary of results, limited QA/QC
    - In later stage, data compilation can be more detailed, if this has additional value

QA/QC (1)

- Define QA/QC approach (Almudena!)
  - Based largely on ERICA QA/QC approach
- Result QA/QC analysis (Almudena!)
  - 52 references analysed (after deleting those which were duplicated):
  - 8 Refs: No pdf available or only abstract available (QC = 0)
  - 6 Refs with QC< 35 points
  - **38 Refs with QC> 35 points**

QA/QC (2)

- 22 references for Terrestrial animals, but:
  - 1 Ref No pdf available
  - 3 with QC< 35 points
  - 18 with QC> 35 points, but:
    - 3 refs for radiation + chemotherapeutic agents
    - 4 refs for radiation + alkylating agents
    - 1 ref makes studies with transgenic mice

- **Only 10 refs for terrestrial animals with QC> 35 that are relevant**

QA/QC (3)

- **Terrestrial plants**
  - Before QC analysis: 6
  - After QC analysis: **5**
- **Aquatic plants**
  - Before QC analysis: 1
  - After QC analysis: **1**
- **Terrestrial animals**
  - Before QC analysis: 22
  - After QC analysis: **10**
- **Aquatic animals**
  - Before QC analysis: 4
  - After QC analysis: **4**
- **Freshwater microcosm**
  - Before QC analysis: 1
  - After QC analysis: **0**
- **Marine estuarine**
  - Before QC analysis: 19
  - After QC analysis: **13**

MS-paper (1)

- 1. Introduction
  - *Multiple stressor environment* (0.5-1 page HV or other volunteer?)
  - *Environmental standards and their requirements* (1-2 pages HV or other volunteer ?)
  - *Approaches to evaluate combined effects of stressors (Nathalie)*
  - *Combined effect of substances (1-2 pages* who???)
    - ♣ Different exposure modes/diff modes of action/diff target organs
    - ♣ Interaction can occur at all levels – adsorption, metabolisation, decontamination mechanisms, damage repair mechanisms
- *2. Approach (Almudena?)*
  - *Literature review, set up database, QA/QC*

MS-paper (2)

- *3. Presentation and discussion of literature data*
  - *3.1. Terrestrial and aquatic plants (Nathalie)*
  - *3.2. Terrestrial animals* (Almudena)
  - *3.3 Freshwater animals* (Karolina/Carmel and Rodolphe ?)
  - *3.4. Marine animals* (Clare ?)
- *4. Conclusions and recommendations for future research (all)*
- *Finalise draft by End Oct 2010*

Look what has been done for chemicals

- Contributors: Tom, Tamara, Nele, Carmel, a colleague of David, Hildegarde
- Learn from chemical ecotoxicology concentrating on NoMiracle
- Report: approach with chemicals and how it can be transferred to radiation protection
- Timing
  - Look at suitable reports from NoMiracle and their availability (March 2009)
  - End report: Dec 2010
- No Progress since last time

Workshop on Mixture Toxicity

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Workshop on Mixture toxicity

September 22-24, 2010

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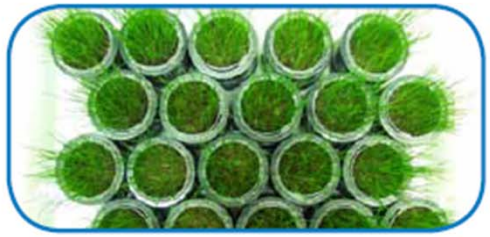
Venue

SCK•CEN, Mol, Belgium

Belgian Nuclear Research Centre, SCK•CEN
Club-House, Boeretang 201, 2400 Mol, Belgium



Objectives

Contaminants never occur in isolation, yet legislation is still largely based on effects of single compounds. In addition, more and more data are becoming available that suggest that compounds can exert effects in organisms when present in mixtures in concentration ranges at which the single contaminants do not induce effects.

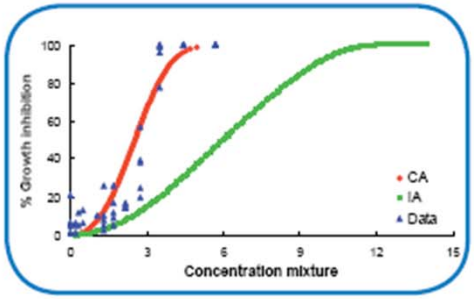
The examination of combined exposures, which corresponds much more realistically to exposure conditions in the environment than the analysis of single substances, entails major methodological difficulties in the experimentation and evaluation procedure.

This workshop intends to introduce you to some of the approaches and methodologies used in studying and predicting mixture toxicity effects. The workshop will be a mixture of lectures, exercises and open discussions.

More information
www.sckcen.be/en/Events/MIXTOX

Target audience

This workshop intends to attract PhD students and scientific researchers. As the general concepts discussed in this workshop apply to different fields of research, participants of all fields of (eco) toxicology are welcome.



Organisation

This workshop is organized by the unit Biosphere Impact Studies (BIS) from the Belgian Nuclear Research Centre (SCK•CEN).
It is organized in the framework of the IUR-IAEA Practical Arrangements for the exchange and dissemination of information within the EMRAS II project, Working Group 6 on Biota dose effects modelling - Multiple Stressors.

IUR International Union of Radioecology
IAEA International Atomic Energy Agency

Programme

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Wednesday September 22, 2010

08:30	Opening and registration
09:00	Introduction *Frank Hardeman, SCK•CEN, Belgian Nuclear Research Centre, Belgium*
09:30	Mixture toxicity concepts and Risk assessment *Thomas Backhaus, University of Göteborg, Sweden*
11:00	Break
11:15	Mixture toxicity concepts and Risk assessment *Thomas Backhaus*
13:00	Lunch
14:00	Mixture toxicity concepts and Risk assessment *Thomas Backhaus*
15:00	Break
15:15	Calculus session *Nele Horemans and Nathalie Vanhoudt, Biosphere Impact Studies, SCK•CEN, Belgium*
18:30	Welcome reception

~20 attendees from outside SCK!

Thursday September 23, 2010

09:00	Deviations from Concentration Addition and Independent Action *Claus Svendsen, Centre for Hydrology and Ecology, UK*
11:00	Break
11:15	Deviations from Concentration Addition and Independent Action *Claus Svendsen*
13:00	Lunch
14:00	Biology-based approaches for mixture ecotoxicology *Tjalling Jager, Free University of Amsterdam, Netherlands*
16:00	Break
16:15	Biology-based approaches for mixture ecotoxicology *Tjalling Jager*
18:00	Round-up and open discussion on day 1-2
18:30	Walking dinner

Friday September 24, 2010

09:00	Linear and generalized linear models in R *Stefan Van Dongen, University of Antwerp, Belgium*
11:00	Break
11:15	Linear and generalized linear models in R *Stefan Van Dongen*
13:00	Lunch
14:00	Round up on day 3 and closing remarks

Achievements vs Future
What additional to STAR?

- Review literature for multiple stressor data in which radiation was among the mix
- Query ecotoxicologists from the chemical industry to see what their most recent conclusions are relative to the need for multiple stressor analyses
  - **Mixture toxicity workshop**
  - Screen NoMiracle and provide limited synthesis ←→STAR
- Report to the IAEA on whether this should be a topic requiring further exploration in the future ←→STAR
- MS-experiment
  - Guidelines for experimental set-up:
    - Intended after Mixture Toxicity Course
    - Feasible/realistic? ←→STAR
  - If sufficient interest and resources, collaborate on a common, multi-stressor, radiological experiment:
    - Realistic?
    - Something from nothing?

TIME !!!