

EMRAS II, Working Group 6

Biota “Dose Effects Modelling”

Tom Hinton; IRSN

BROAD OBJECTIVES

- Dose – Effect Modelling to assist Risk Assessments
 - Mathematical Derivation of Screening Level Values / Protection Thresholds
- Reach Consensus; Document Methods; Publish Guidance

First Year Progress Report

1) UPDATE Dose-Effect DATABASE (**Almudena Real**; Spain)
(UNSCEAR; post 2006; Russian/Ukrainian)

D. Coplestone, S. Geras´kin, N. Horemnas, L. Newsome,, K. Stark, S.
Sundell-Bergman, H. Vandenhove, C. Willrodt, S. Yoshida

FREDERICA Radiation Effects Database

www.frederica-online.org

- References found: English (405), Russian (255), Japanese (7), French (2), Chinese (1)

- References included: 141 (FREDERICA= 1,509 Refs; Aprox 10% increase)

Wildlife groups: Mammals (36%); Amphibians (11%); Insects (8%); Protozoa (8%), Others (microorganisms, fish, crustacean, mollusc, aq. plants, soil fauna, fungi) (37%)

Type of exposure: Acute (75%); Chronic (25%)

Umbrella effects: Mortality (30%); Reproduction (28%); Morbidity (27%); Genetic (11%); Others (4%)

- Quality Control: Dose-Response Analysis

134 Refs analysed

41 QC<35

93 QC>35

85 Refs analysed

19 No Dose-Response (single dose)

66 Potentially useful for Dose-Response

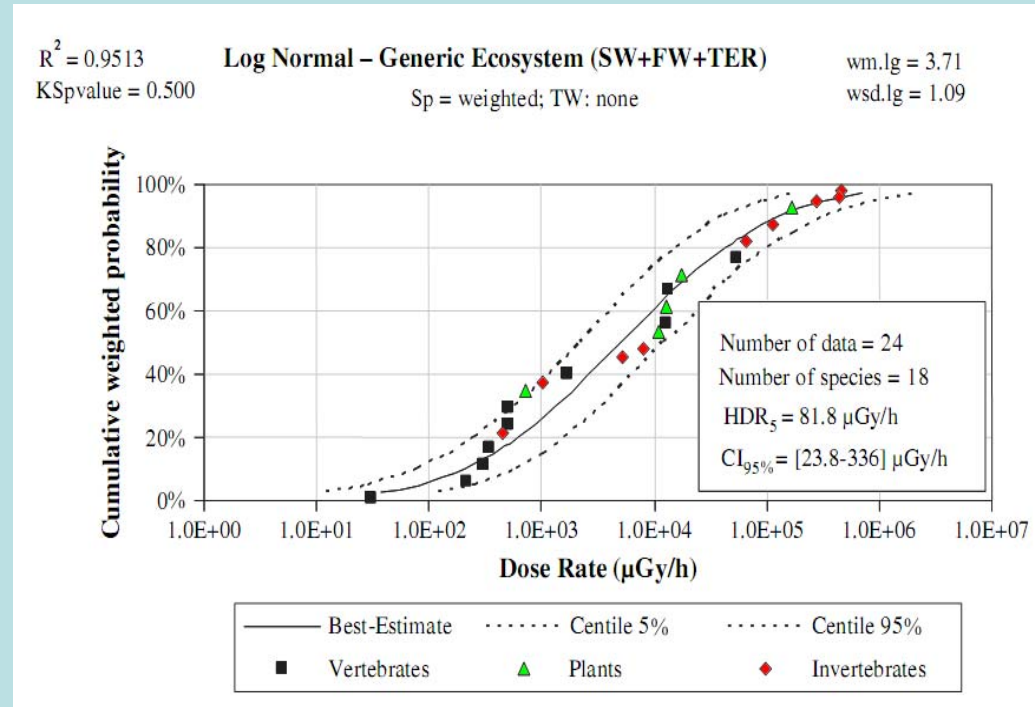
First Year Progress Report

1) UPDATE Dose-Effect DATABASE (**A. Real**; Spain)
(UNSCEAR; post 2006; Russian/Ukrainian)

2) DOSE – RESPONSE Relationships (**J. Garnier-Laplace**; IRSN)
Species Sensitivity Distributions

C. Della-Vedova, R. Gilbin, T. Hinton, A. Lorentzon A. Real, S.
Sundell-Bergman, H. Vandenhove, C. Willrodt, T. Yankovich

DOSE – RESPONSE Relationships



$$PNEV = HDR_{5\%} / SF$$

- PNEV used as the screening value at the ERA should be highly conservative
- $SF = 5$
- $PNEV \approx 10 \mu\text{Gy/h}$

DOSE – RESPONSE Relationships (July 2009)

J. Garnier-Laplace and C. Della Vedova conducted a **TRAINING COURSE**

how to use FREDERICA data base and develop dose-response curves

- **how to determine if data meet appropriate criteria to be included**
- **how to enter data in a “R-package” statistical software program**
- **how to use software to derive sigmoidal & hormetic dose-response curves**

ERICA and PROTECT: SSDs derived from acute, gamma, laboratory data

EMRAS-ii: SSDs: field vs lab; acute vs chronic; for specific taxonomic groups

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- 2) DOSE – RESPONSE Relationships (**J. Garnier-Laplace**; IRSN)
Species Sensitivity Distributions (acute vs chronic; field- vs lab-derived;
at various taxonomic levels)

- 3) Incorporate POPULATION MODELS (**T. Sazykina**; Russia)
(Review existing models; life history data; data analyses)

F. Alonzo, R. Helling, T. Hinton, I. Kawaguchi, A. Kryshev, A. Lorentzon ,
L. Monte, J. Vives i Batle

POPULATION MODELS (T. Sazykina; Russia)

Reviewed existing population models appropriate for adaptation to radiation effects assessments for non-human biota

Emphasis was placed on 8 models, that collectively formed the basis for developing a generic population model

- **Predator- prey interactions**
- **Discrete age classes**
- **Limited environmental resources**
- **Migration**
- **Damage, as well as repair from exposure to radiation**

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at various taxonomic levels)

- 3) Incorporate POPULATION MODELS (**T. Sazykina**; Russia; Jan. '11)
(Review existing models; life history data; data analyses)

- 4) **Multiples Stressors** (**H. Vandenhove**; Belgium; with **IUR**)
(Review literature; chemical industry; report on applicability to IAEA)

D. Copplestone, R. Gilbin, T. Hinton, N. Horemans, s. Mihok, D. Oughton, K.
Stark, T. Sazykina, S. Sundell-Bermman, T. Yankovich, S.Yoshida

Multiples Stressors

(H. Vandenhove; Belgium with IUR)

- Established a radiation-multiple-stressor database
57 entries from open literature; 7 organism/ecosystem combinations
- Examined methods used for chemicals from the EC-NoMiracle project (Novel Methods for Integrated Risk Assessment of Cumulative Stressors in Europe)
- Organising a mixture toxicity workshop at SCK•CEN
(in 2010, collaboration with IUR – co-funding)

Output: Review manuscript multiple stressor research
with recommendations for IAEA (draft stage)

First Year Progress Report

5) Canadian Benthic Data (**S. Mihok**; Canada) (Uranium mining; derive dose to benthos; multivariate stats)

- large and diverse data set of sediment cores taken from U mining areas
- includes population abundance / diversity info on benthic invertebrates
- archived data have been retrieved, validated and annotated into Excel.
- discussion on statistical analyses at the current meeting

First Year Progress Report

- 5) Canadian Benthic Data (**S. Mihok**; Canada; July '09)
(Uranium mining; derive dose to benthos; multivariate stats)
- 6) **Alternative Approaches** (**T. Sazykina**; Russia; Jan. '11)
(will non-parametric and Bayesian methods produce screening levels similar to SSD?)
- 7) **Develop and Publish Guidance Documents** (**T. Hinton**; France; July. '11; Documentation of methods to derive screening levels; guidance on use of screening levels; guidance in conducting effects type research)
- 8) **Final Reports to IAEA** (**T. Hinton**; France; Jan. '12)