

The logo for IRSN, featuring the letters 'IRSN' in a bold, sans-serif font. The 'I' and 'R' are red, the 'S' is blue, and the 'N' is red. Below the letters, the full name of the institute is written in a smaller, blue, sans-serif font.

INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

EMRAS II : Biota Working Group

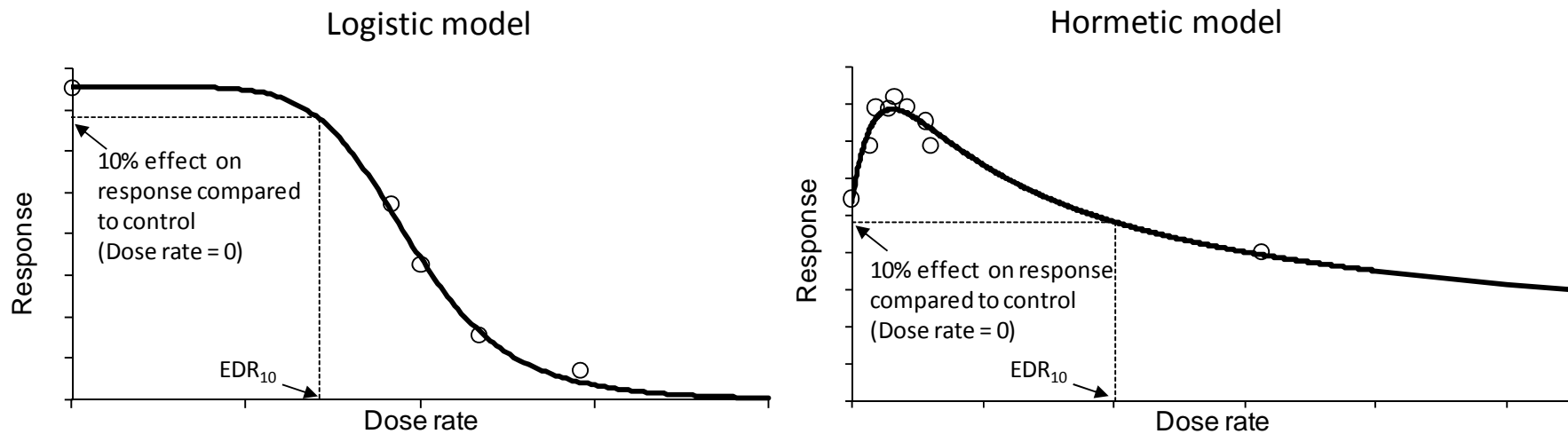
Effects subgroup:

*“Main outcomes and plan on DRC
and SSD”
by “all of us!”*

Institute For Radioprotection & Nuclear Safety, France

The effects data from FREDERICA (reminder)

- Examination of additional papers from sub-task led by Almudena (still limited to 2 dose-response patterns)
- Increased dataset for laboratory gamma external irradiation (EMRAS task) by including controlled field gamma external irradiation (papers from FREDERICA not considered previously –done by Claire)
- On going: increasing data from contaminated sites on going through a collaboration with Stanislav Geraskin (e.g., Chernobyl, Bryansk...)



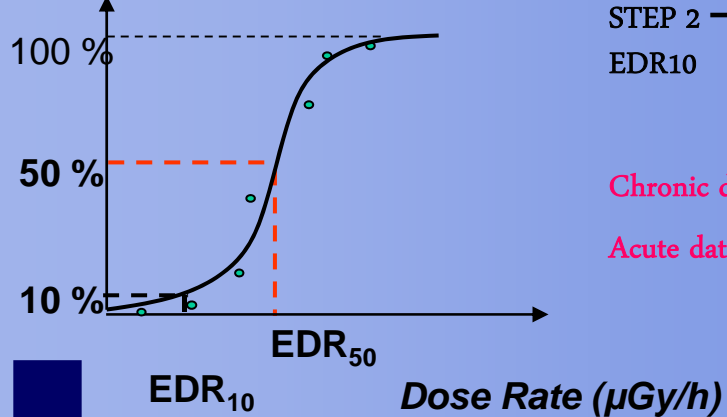
Partners' contribution within EMRAS

STEP 1 — Compiling quality assessed exposure-effect data

**FREDERICA
Radiation Effect Database**

135 new papers among which 66 had a QC score > 35 and dose-response data (see Almu's task conclusion)

Effect (%)

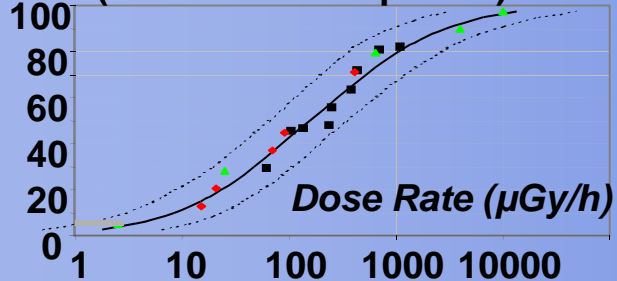


STEP 2 — Building dose rate-effect relationships to estimate critical ecotoxicity values EDR₁₀

Chronic data sets : 60 among which 15 accepted

Acute data sets : 208 among which 114 accepted

PAF (% of Affected Species)



STEP 3 — Deriving benchmarks

New EDR₁₀ : no new species in comparison with PROTECT; All new values higher than the previously selected; No change in the Protect SSD

New ED₅₀ : not treated at present — on going

Additional data mining (restricted to CHRONIC exposure at that stage)

- Examination of the russian database by Stas, Almudena & Claire (only chronic and controlled field) and
- Examination of FREDERICA papers reporting results obtained under « controlled field » conditions (i.e. where the external gamma dose rate estimates are robust)



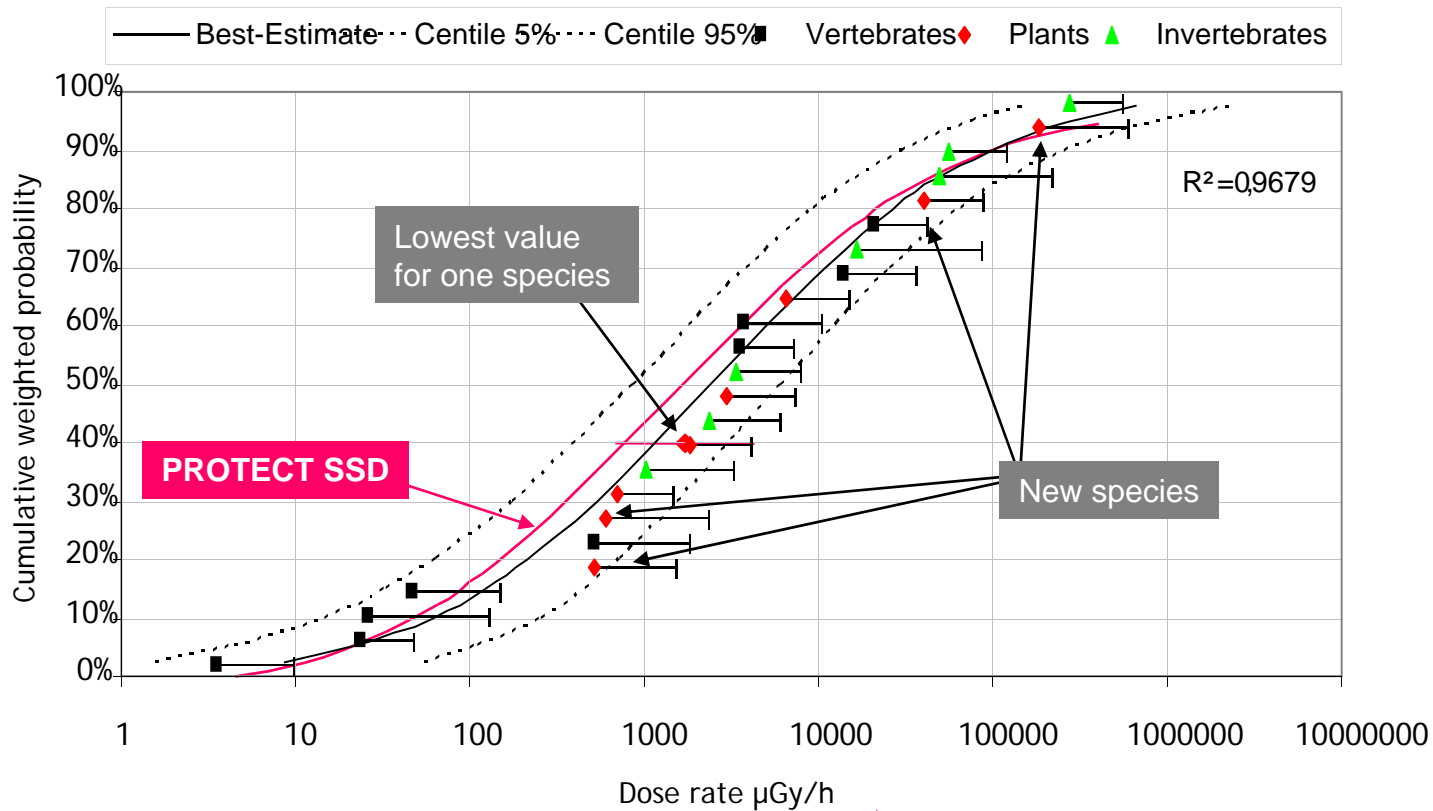
- 37 accepted data sets from 13 papers including 4 new species (Balam fir, Potato, Barley, Grape) and one EDR10 lower than the one used in Protect for Wheat
- Examination of data from field is a huge work. Difficult to integrate it in the remaining time....

Data summary (Chronic gamma external irradiation)

ID	subid	Taxo	SpeciesL	EffectDescription	UmbrellaEffect	EDR10-DRC	SE-DRC	origin
Hertel-Aas	2	Invertebrates	<i>Eisenia foetida</i>	Hatchlings per adult during the whole 13 weeks reproduction exposure period (F1/ Adult F0)	Reproduction	3369	1130	Protect
361	13	Invertebrates	<i>Ophryotrocha diadema</i>	The percentage of worms in generation 3 surviving to day 62.	Mortality	2360	1268	Protect
<i>Gilbin</i>	3	Invertebrates	<i>Daphnia magna</i>	survival when food lacks) - stress on stress test of indirect	Mortality	16797	53263	Protect
1065	10	Invertebrates	<i>Daphnia pulex</i>	Population birth rate (per day) Data read from graph	Morbidity	277634	8676,6	Protect
247	12	Invertebrates	<i>Porcellio scaber</i>	Mean number of offspring per tank per dose rate group	Reproduction	1030	1245	Protect
296	8	Invertebrates	<i>Mercenaria mercenaria</i>	Survival of juvenile clams (%) on day 426. Dose = max. cumulative dose	Mortality	49520	119778	Protect
326	5	Invertebrates	<i>Physa heterostropha</i>	No of eggs/snail	Reproduction	55831	8002	Protect
523	5	Plants	<i>Abies balsamea</i>	Summary of mean fir characteristics for seven dose-rate categories, Number of buds (1975),	Morbidity	2945	1524	Protect
841	4	Plants	<i>Fagopyrum esculentum</i>	Productivity in M3 generation (1979), Yield of seeds (g/sq,m)	Reproduction	40151	8252	Protect
416	4	Plants	<i>Pinus rigida</i>	Effect of long term irradiation on seed development. Dose rate provided as average per day	Morbidity	710	39	Protect
998	27	Plants	<i>Triticum monococcum</i>	Productive bush amount, % of the control value	Reproduction	6434,3	2137,5	Protect
Shershunova et al., 1990	1	Plants	barley	Number of fertile pollen seeds in one anther	Reproduction	181921	246110	Sgeraskin's database controlled field
Archangelskaya, 1970	2	Plants	Grape	Length of ripe shoot, cm	Morbidity	603,33	1142,9	Sgeraskin's database controlled field
523 (Dugle 1986)	5	Plants	Balsam fir	Summary of mean fir characteristics for seven dose-rate categories, Number of buds (1975)	Morbidity	1841	486,3	Frederica Controlled field
880 (Grechushnikov 1966)	1	Plants	Potato	Yield centres per hectare, Lorch cultivar,	Morbidity	514,43	522,03	Frederica Controlled field
448	a	Vertebrates	<i>Larus ridibundus</i>	number embryos reaching full term developement as a % of the control	Reproduction	3695,9	3063,4	Protect
448	b	Vertebrates	Chicken	hatchability as a % of the control	Reproduction	13932	8191	Protect
Egami	5	Vertebrates	<i>Oryzias latipes</i>	Male gonadal somatic index (mean gonad weight (mg) / mean body weight (mg) *100)	Reproduction	20881	61	Protect
207	3	Vertebrates	<i>Pleuronectes platessa</i>	Mean proportion of plaice testes occupied by different cell types irradiated for 197 days - sperm	Reproduction	47	56	Protect
74	3	Vertebrates	<i>Poecilia reticulata</i>	Mean life time fecundity	Reproduction	516	791	Protect
170	a	Vertebrates	<i>Oncorhynchus tshawytscha</i>	% (of irradiated fish) undifferentiated sex	Reproduction	3518	104	Protect
616	4	Vertebrates	<i>Mus musculus</i>	Nº of litters per fertile female during 245 days (mean; SE).	Reproduction	26	76	Protect
593	1	Vertebrates	<i>Rattus norvegicus</i>	A1 Spermatogonia (% of control)	Reproduction	23,785	0,4044	Protect
629	8b	Vertebrates	<i>Sus crofa</i>	Gonadic index : Testis weight (g) at 150 days of age (+SE)/Body weight (g) at 150 days of age	Reproduction	3,6	2,6	Protect

Changes in PROTECT SSD

Species RadioSensitivity Distribution (generic ecosystem) Chronic Gamma external irradiation



20 species **HDR₅ = 17 µGy/h [2-211]** **AF=2** → (benchmark//PNEDR) 10 µGy/h
24 species **HDR₅ = 21 µGy/h [4-150]** **AF=2** → (benchmark//PNEDR) 10 µGy/h

HDR5 in $\mu\text{Gy/h}$

Vertebrates	2	(SSD with 9 data)
	no new EDR10	
Invertebrates	500	(SSD with 7 data)
	no new data	
Plants	SSD not possible (too small data set)	
	120	(SSD with 8 data)

Your views are needed on :

- **To produce a short paper on the changes in protect SSD – [Chronic gamma external exposure situations]**
 - **S. Geraskin will search the russian database for additional data with robust gamma dose rates estimates (ie from lab or controlled field)**
 - **We will try to explore the possibility of estimating NOEDR to expand the data sets (possibility to give them a lower weight than the one attributed to EDR10 in SSD)**
 - **We will try to derive more robust benchmarks at the “taxonomic” level**

A good draft could be submitted to the group by IRSN for the next meeting in january to be discussed and finalised

Your views are needed on :

- **To produce the first paper on the variation of inter species sensitivity for acute gamma external exposure situations**
 - **All data sets ready (from the first treatment done in ERICA and the one done in our EMRAS group)**
 - **We will try to explore the possibility of estimating NOEDR to expand the data sets (possibility to give them a lower weight than the one attributed to EDR10 in SSD)**
 - **We will try to use the data to propose acute taxonomic protection values**

A Table of content could be submitted to the group by IRSN for the next meeting in january to be discussed and distributed among volunteers

<p>2. Dose Response Curves and SSDs (JGL)</p> <p>2a. train group members for using database and developing dose-effects relationships</p> <p>2b. establish new dose-response curves</p> <p>2c. develop chronic SSDs at taxonomic level</p> <p>2d: develop and compare SSDs for acute vs chronic</p> <p>2e: publication</p> <p>6. Reports and Guidance Documents (TH)</p> <p>6b: guidance document on deriving screening levels</p>	<p>2a: July 2009</p> <p>2b: Jan 2010</p> <p>2c: July 2010</p> <p>2d: Dec 2010</p> <p>2e: July 2011</p> <p>6b: Feb 2011</p>	<p>Ended in Jan 10</p> <p>Ended in Jul 10</p> <p>On going <i>Draft paper in Jan 11 chronic</i> <i>Draft paper in Sep 11 acute</i></p> <p>?? Discussion in Jan 11 on TOC and work allocation among volunteers</p>
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