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Radiological Toolbox

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U.S. Nuclear Regulatory Commission

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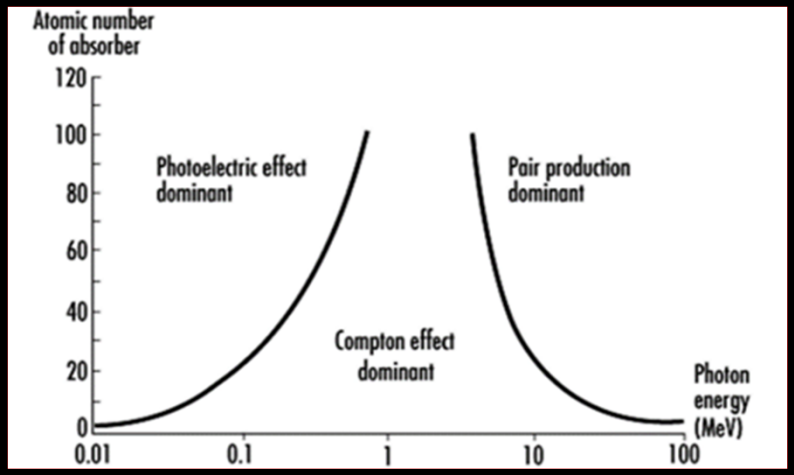
(db6) Element Database

- Interaction coefficients for alpha, electron, photon, and neutron radiations in elemental absorbers.
  - Not available for every element or for each radiation type
  - Can be plotted
- Geometric progression form of the photon buildup factors from ANSI Standard 6.4
  - 0.015 and 15 MeV at distances ranging from 0.5 to 60 MFP
  - The photon and neutron kerma coefficients were taken from KERMAL, RSICC package DLC-143
- Atomic mass and isotopic abundance data 16th edition of the Chart of the Nuclides



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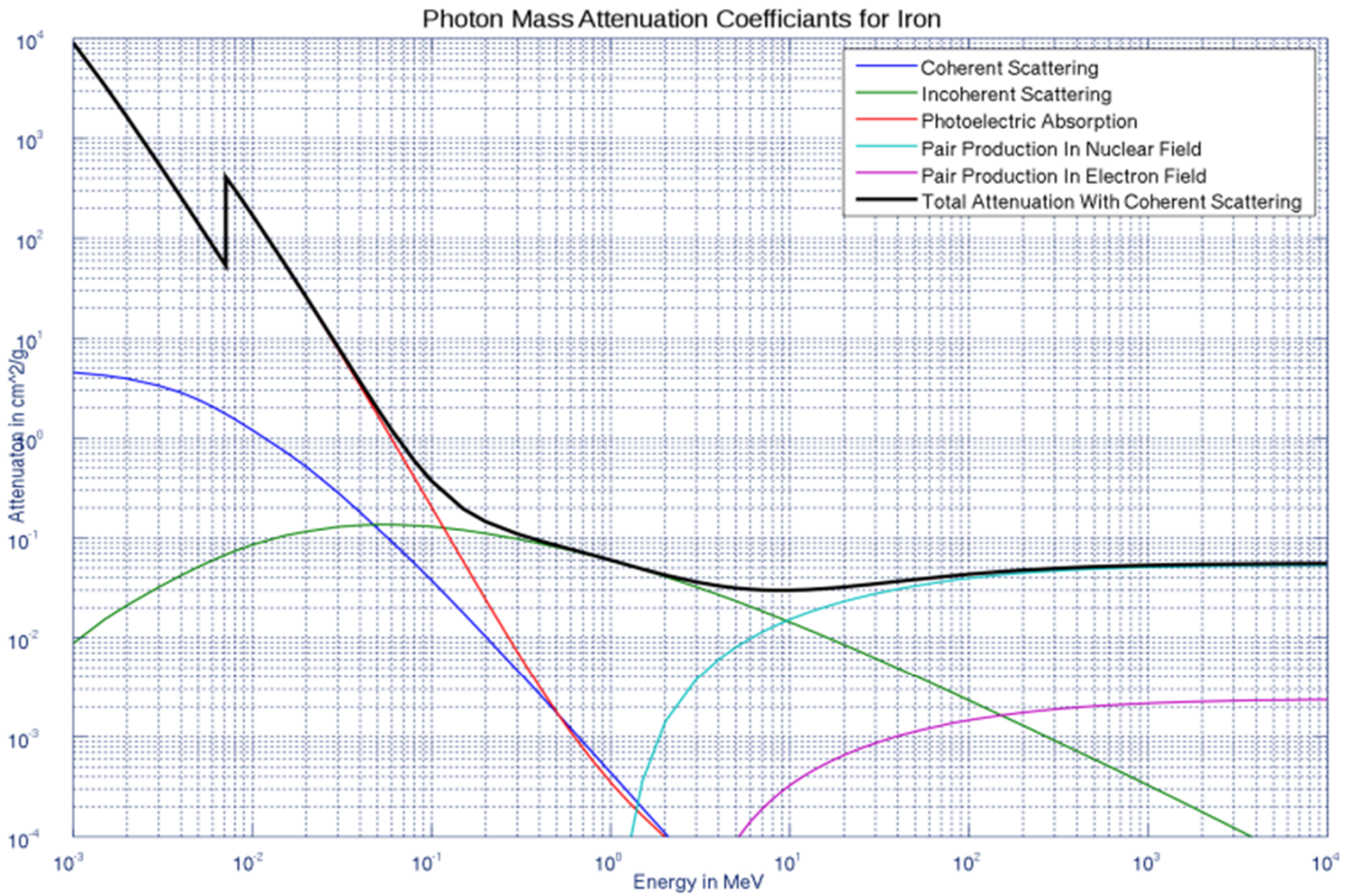
Element Data (Fe)



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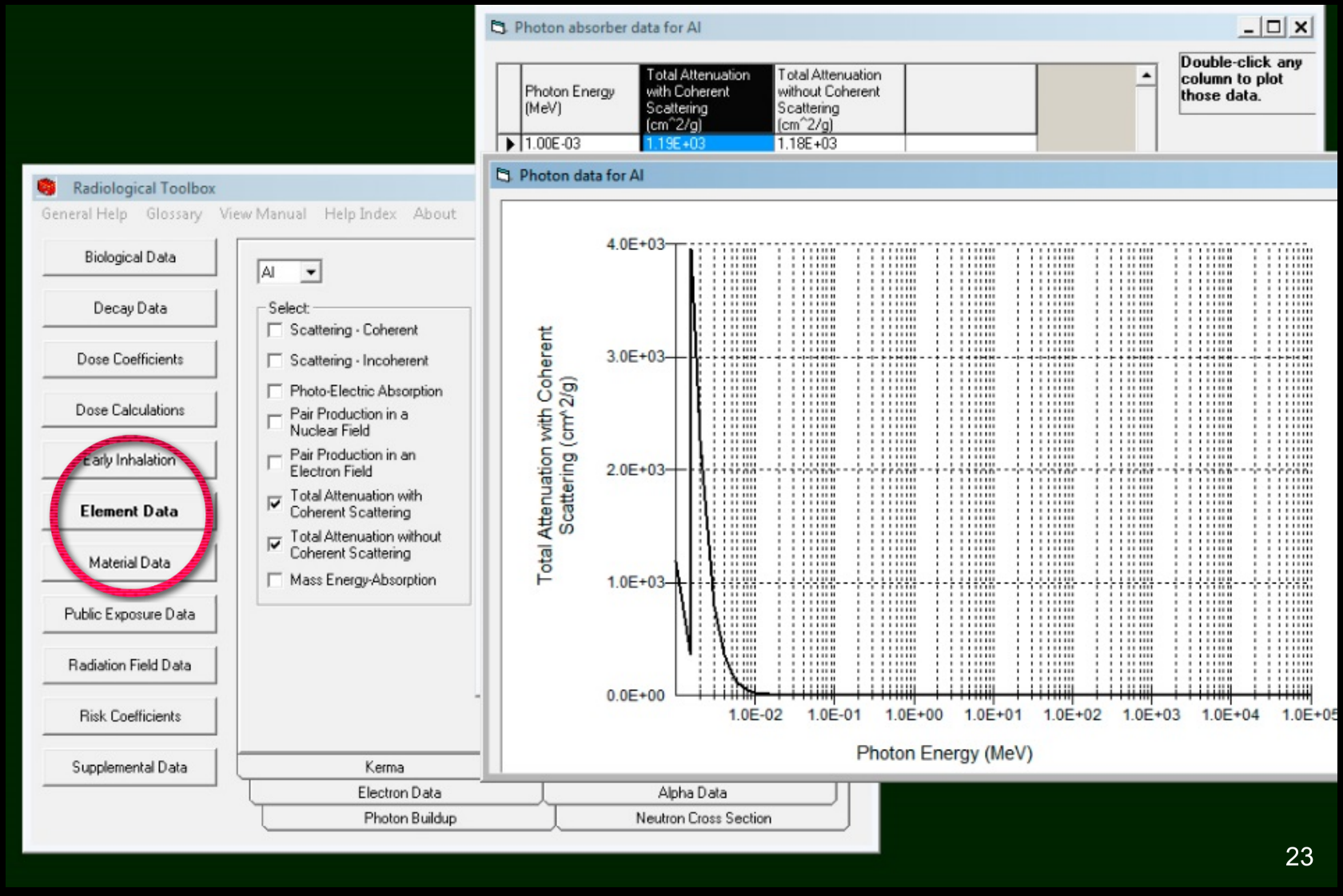
Element Data (Al)



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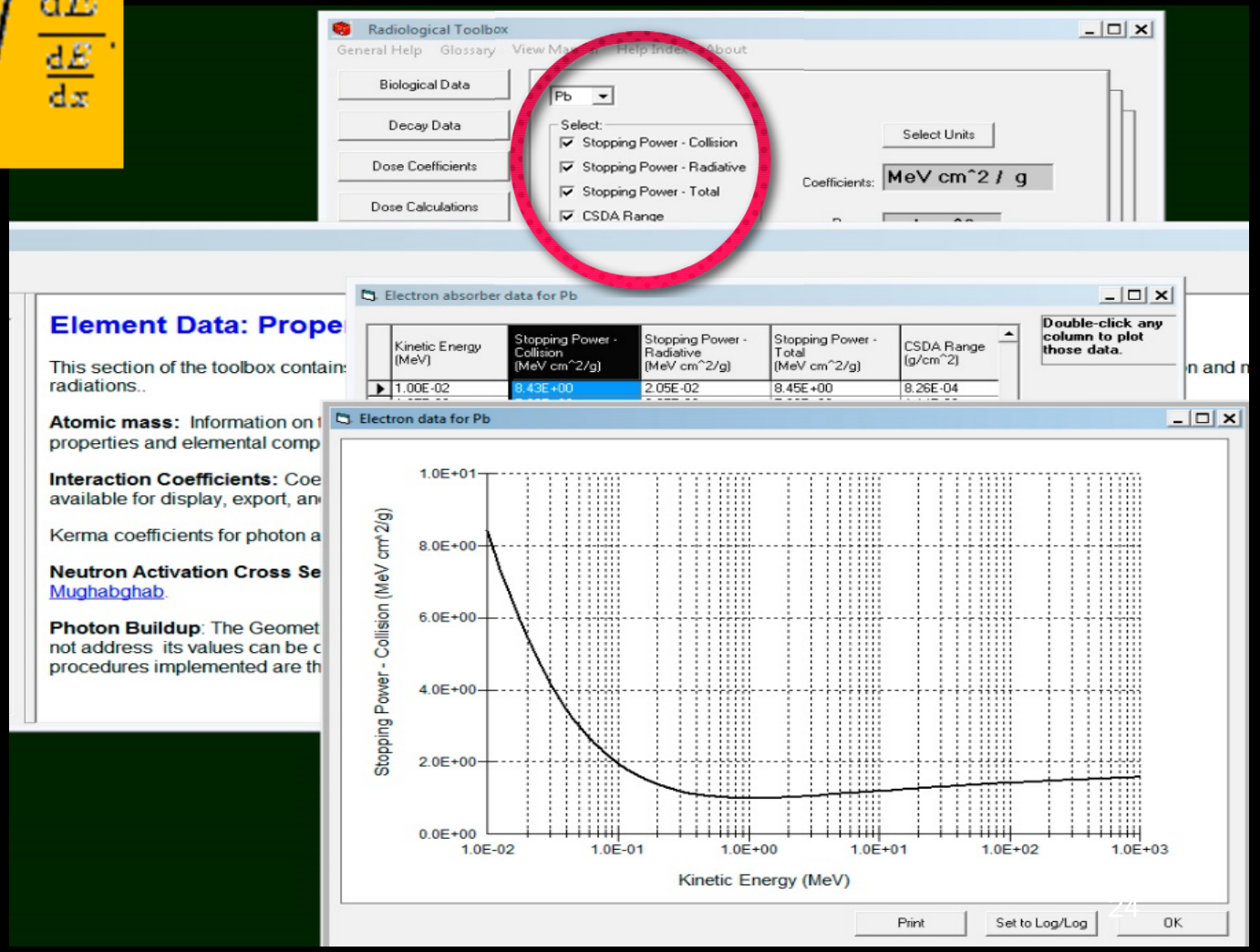
Element Data (Pb)

$$\Re_{CSDA}(E_0) = \int_0^{E_0} \frac{dE}{\frac{dE}{dx}}.$$



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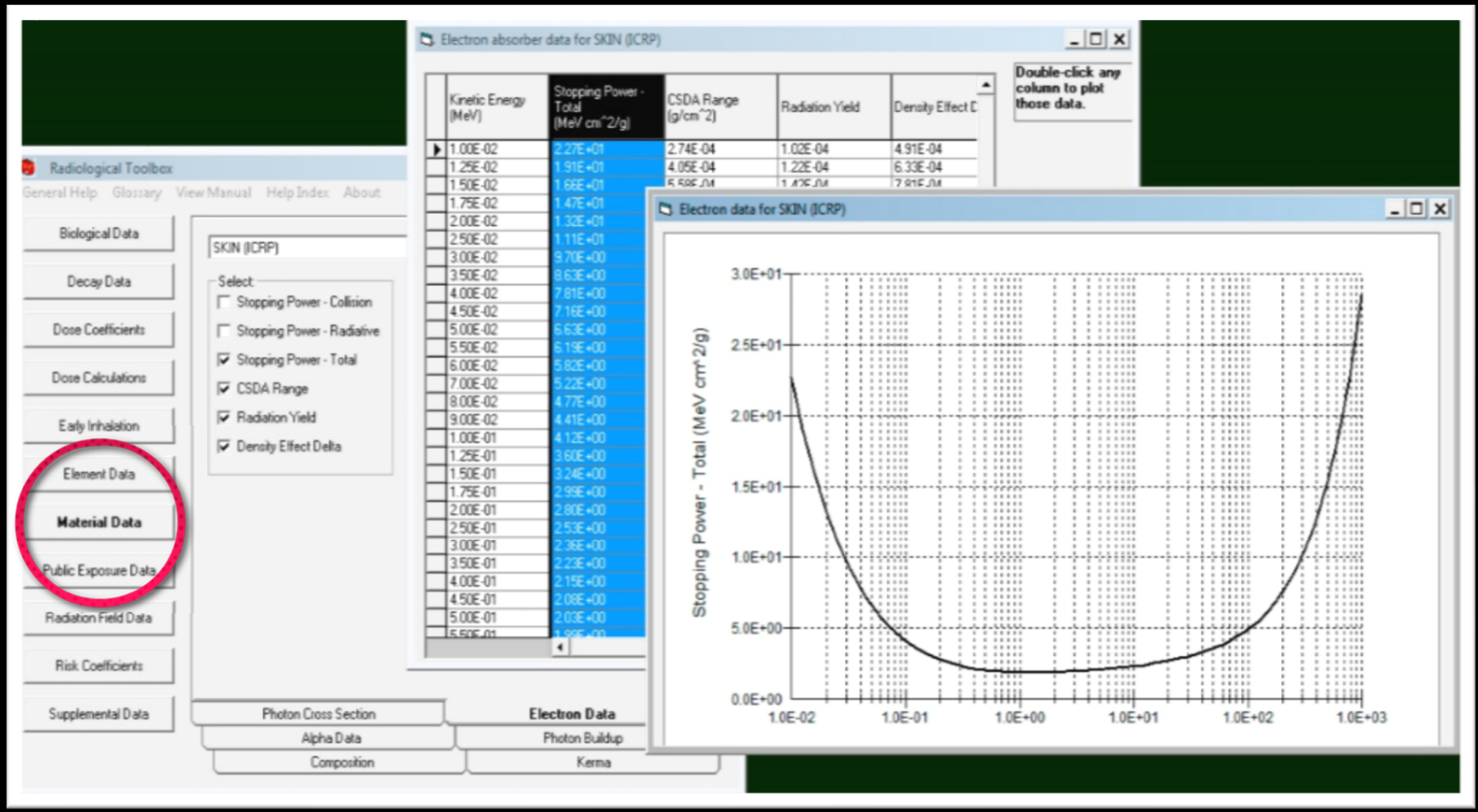
(db7) Material Data (Skin)



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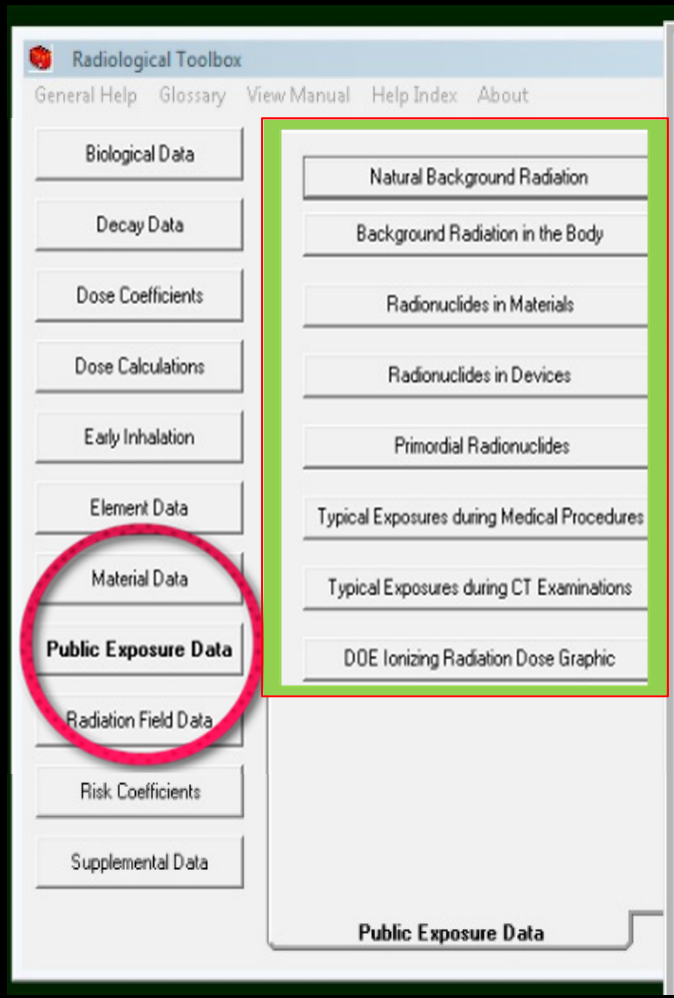
(db8) Public Exposure Data



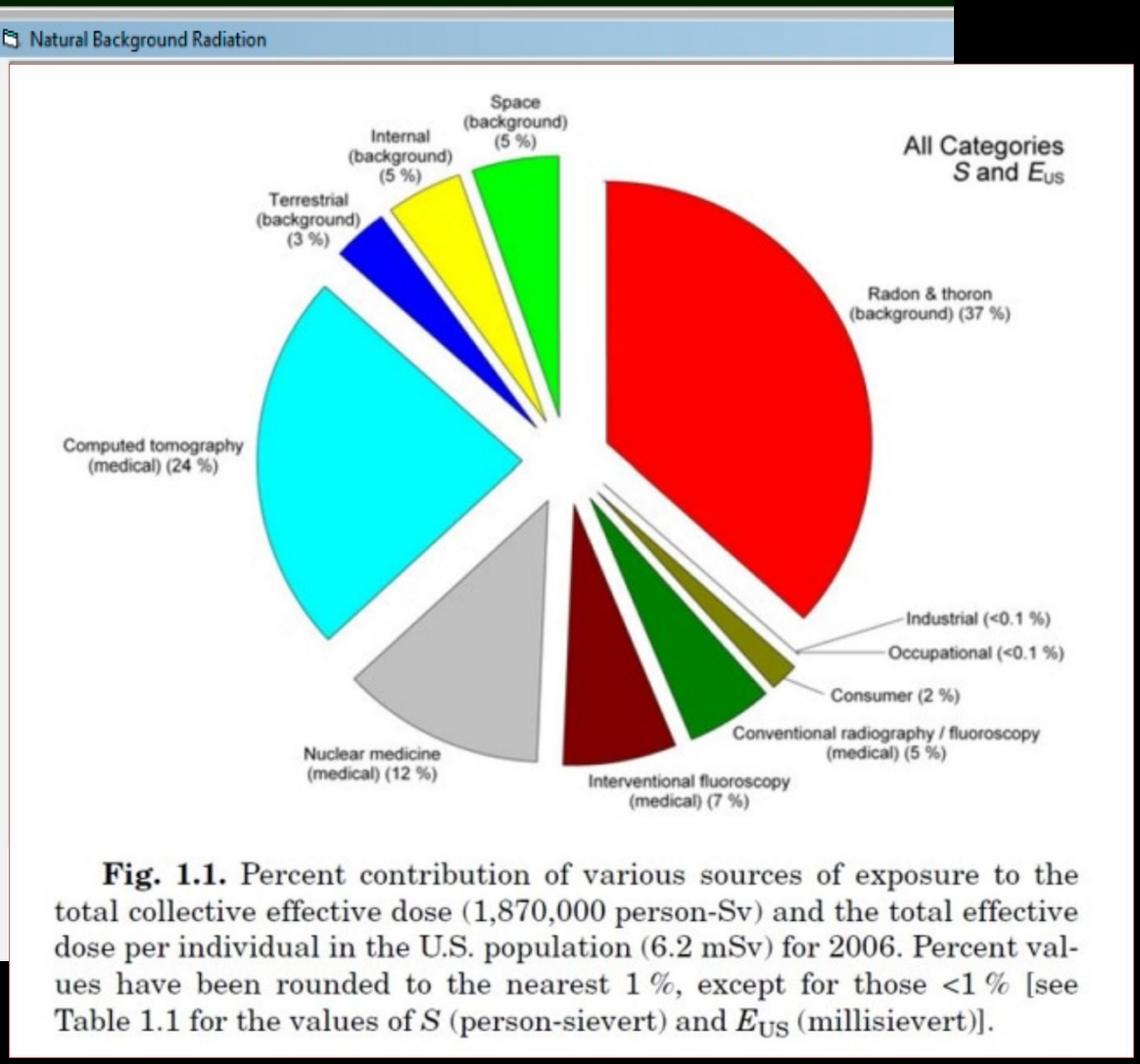


Fig. 1.1. Percent contribution of various sources of exposure to the total collective effective dose (1,870,000 person-Sv) and the total effective dose per individual in the U.S. population (6.2 mSv) for 2006. Percent values have been rounded to the nearest 1 %, except for those <1 % [see Table 1.1 for the values of S (person-sievert) and E_{US} (millisievert)].

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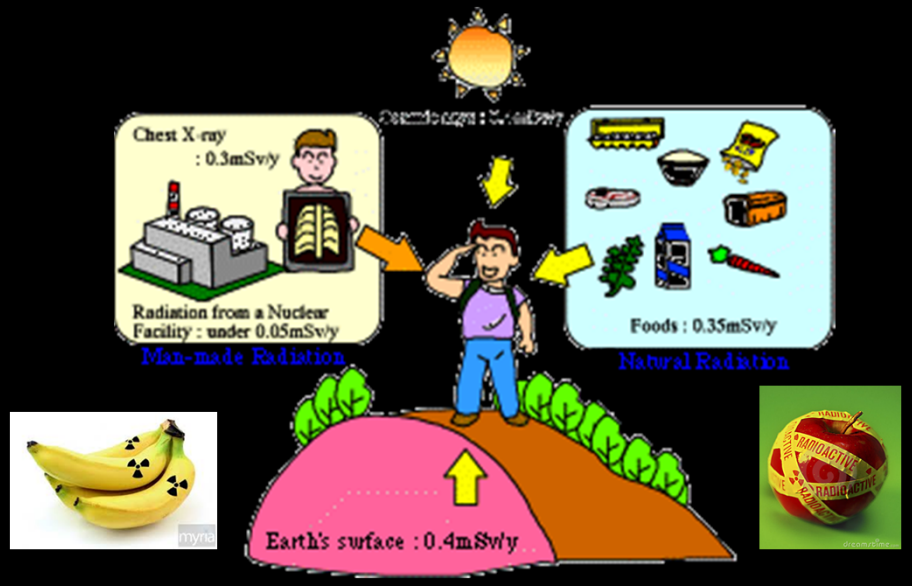
Natural Radiation in Life

Radionuclides in Food		
Food	**K-40 (pCi/kg)**	**Ra-226 (pCi/kg)**
Banana	3520	1
Brazil nuts	5600	1000-7000
Carrots	3400	0.6 - 2
Potatoes	3400	1 - 2.5
Beer	390	-
Red meat	3000	0.5
Lima beans	4640	2 - 5
Drinking water	-	0 - 0.17



Natural Occurring Radionuclides in Body		
Nuclide	**Mass**	**Activity**
Uranium	90 µg	1.1 Bq
Thorium	30 µg	0.11 Bq
Potassium 40	17 mg	4.4 kBq
Radium	31 pg	1.1 Bq
Carbon 14	22 ng	3.7 kBq
Tritium	0.06 pg	23 Bq
Polonium	0.2 pg	37 Bq

Radionuclides in Oceans	
Nuclide	**Concentration**
Uranium	33 mBq/L
Potassium 40	11 Bq/L
Tritium	0.6 mBq/L
Carbon 14	5 mBq/L
Rubidium 87	1.1 mBq/L

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(db8) Medical Exposures

Dose from Medical Diagnostic Procedures		
Procedure	**Dose (rem)**	**Dose (mSv)**
Chest x-ray (1 film)	0.01	0.1
Dental x-ray	0.16	1.6
Mammogram	0.25	2.5
Lumbosacral spine	0.32	3.2
Bone scan (Tc-99m)	0.44	4.4
Cardiac (Tc-99m)	0.75	7.5
Cranial CT	5	50
GI fluoroscopy (barium)	8.5	85
Spiral CT	3-10	30 - 100

Computed tomography examinations

Effective dose per CT scans	
Examination	**Dose (mSv)**
Head	2
Chest	7
Abdomen/pelvis	10
Extremity	0.1
CT angiography: heart	20
CT angiography: head	5
Spine	10
Interventional	0.1
Whole-body screening	10
Calcium scoring	2
Cardiac	20
Virtual colonography	10
Miscellaneous	5

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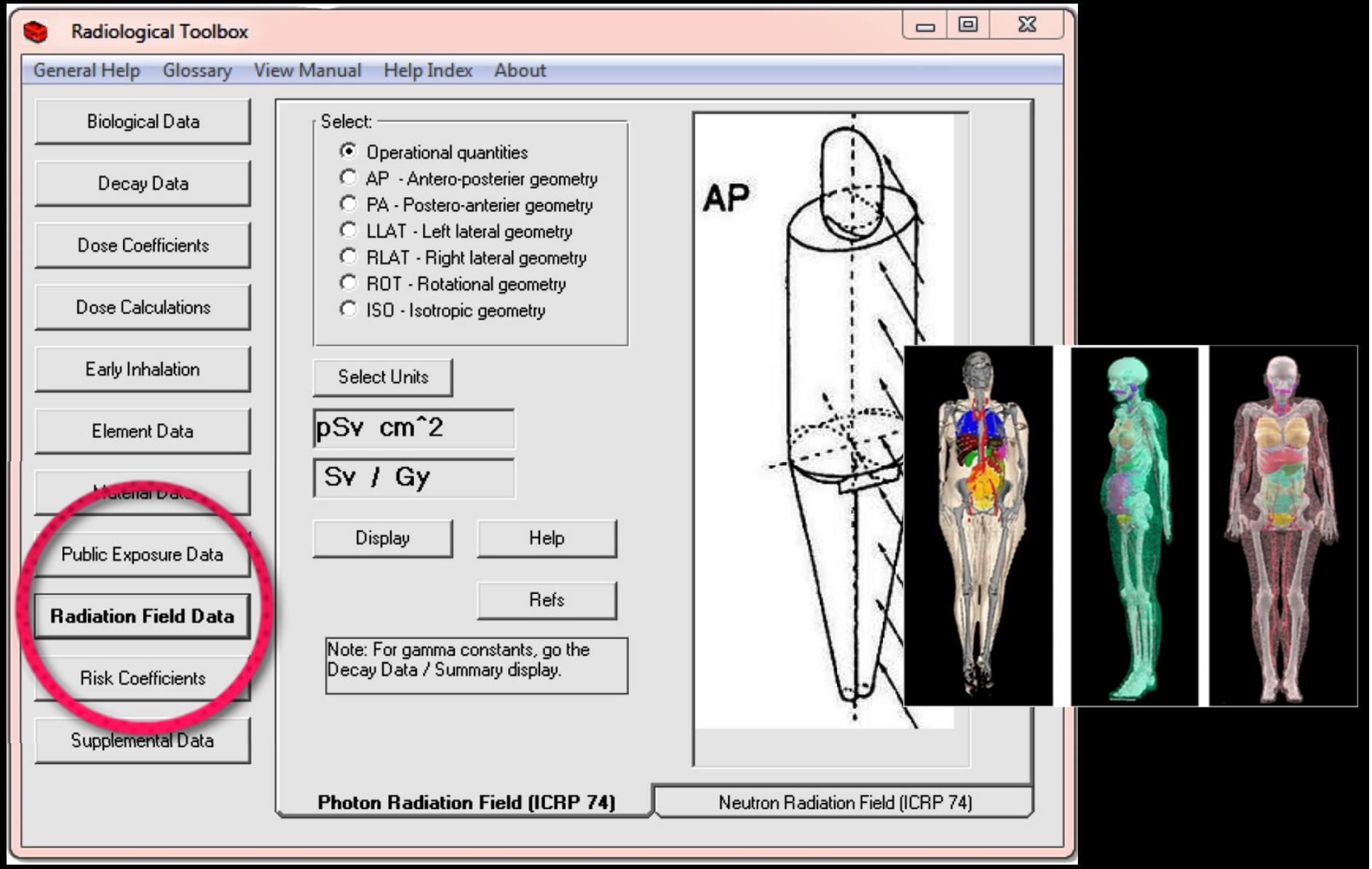
(db9) Radiation Field Data



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(db10) Radiological Risk Coefficients for Cancers

- Federal Guidance Reports 13
- Data presented for 14 cancer sites
- Average member of the US public
  - Mortality risk coefficient per unit activity inhaled or ingested for internal exposures or per unit time-integrated activity concentration in air or soil for external exposure
  - Morbidity risk coefficient is a comparable estimate of the average total risk of experiencing a radiogenic cancer, whether or not the cancer is fatal

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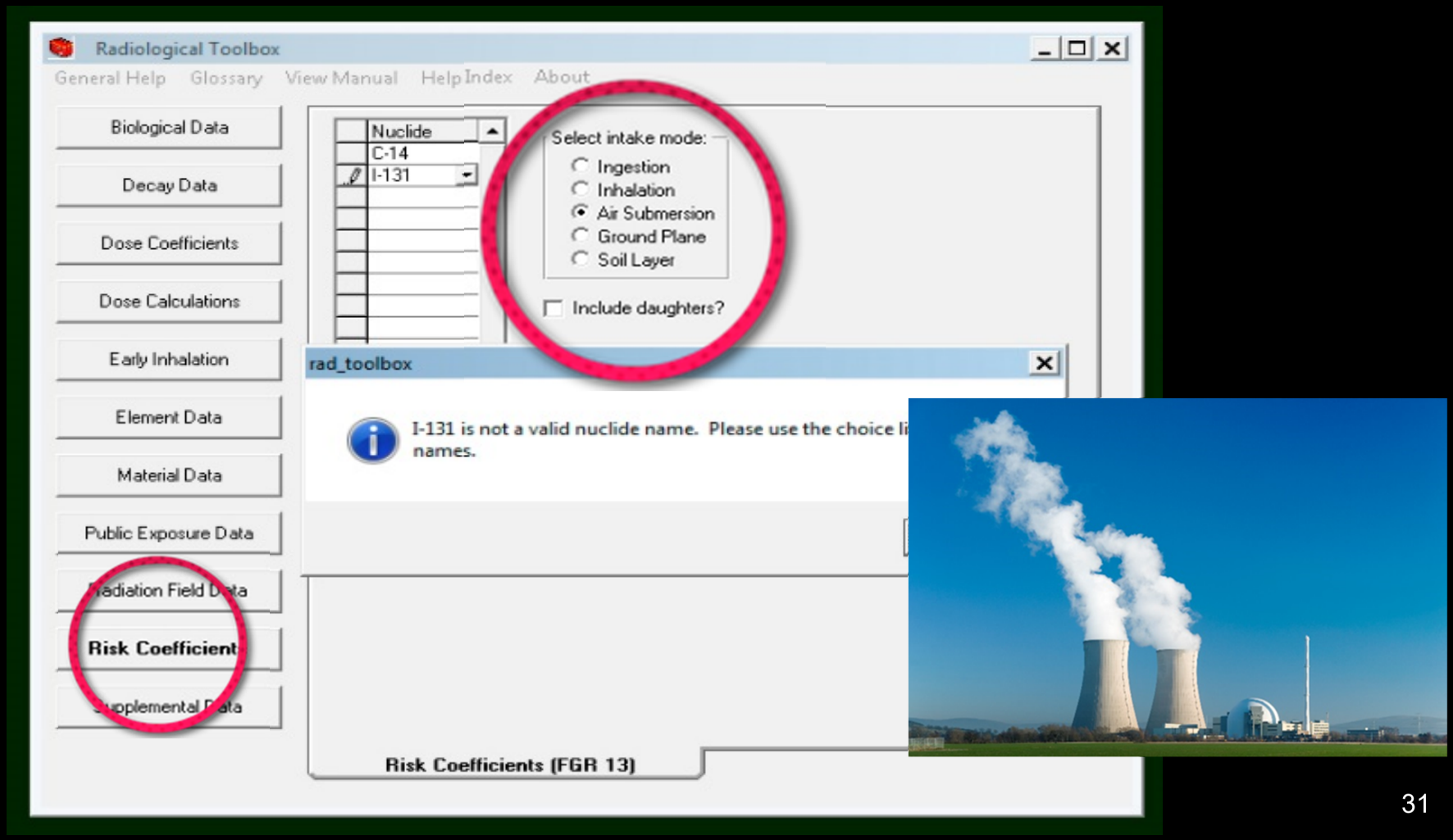
(db10) Radiological Risk Coefficients for Cancers



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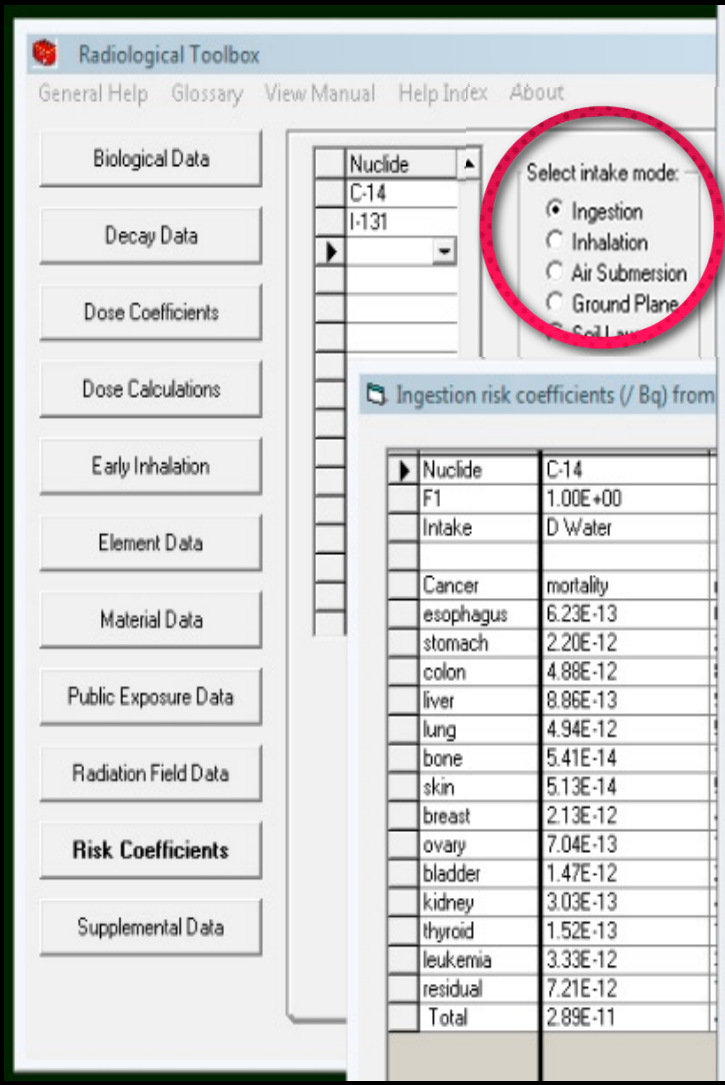
(db10) C-14 and I-131



Workbook Views | Zoom | Window

A1: Ingestion risk coefficients (/ Bq) from FGR 13

	A	B	C	D	E	F	G	H	I	J
1	Ingestion risk coefficients (/ Bq) from FGR 13									
2	Nuclide	C-14		C-14		I-131		I-131		
3	F1	1.00E+00		1.00E+00		1.00E+00		1.00E+00		
4	Intake	D Water		Diet		D Water		Diet		
5										
6	Cancer	mortality	morbidity	mortality	morbidity	mortality	morbidity	mortality	morbidity	
7	esophagu	6.23E-13	6.92E-13	7E-13	7.78E-13	2.22E-13	2.47E-13	2.75E-13	3.06E-13	
8	stomach	2.2E-12	2.45E-12	2.93E-12	3.25E-12	1.28E-12	1.42E-12	1.75E-12	1.95E-12	
9	colon	4.88E-12	8.87E-12	6.85E-12	1.25E-11	1.83E-12	3.32E-12	2.76E-12	5.01E-12	
10	liver	8.86E-13	9.32E-13	9.89E-13	1.04E-12	8.67E-14	9.12E-14	1.02E-13	1.07E-13	
11	lung	4.94E-12	5.2E-12	6.08E-12	6.4E-12	1.13E-12	1.18E-12	1.47E-12	1.54E-12	
12	bone	5.41E-14	7.73E-14	6E-14	8.56E-14	1.3E-14	1.86E-14	1.46E-14	2.09E-14	
13	skin	5.13E-14	5.13E-14	6.43E-14	6.43E-14	7.08E-15	7.08E-15	9.18E-15	9.18E-15	
14	breast	2.13E-12	4.27E-12	2.86E-12	5.71E-12	3.24E-13	6.48E-13	4.58E-13	9.16E-13	
15	ovary	7.04E-13	1.01E-12	7.97E-13	1.14E-12	7.46E-14	1.07E-13	8.91E-14	1.27E-13	
16	bladder	1.47E-12	2.94E-12	1.58E-12	3.17E-12	2.01E-12	4.01E-12	2.18E-12	4.35E-12	
17	kidney	3.03E-13	4.67E-13	3.41E-13	5.25E-13	2.76E-14	4.25E-14	3.25E-14	5.01E-14	
18	thyroid	1.52E-13	1.52E-12	1.99E-13	1.99E-12	1.22E-10	1.22E-09	1.73E-10	1.73E-09	
19	leukemia	3.33E-12	3.36E-12	3.62E-12	3.66E-12	6.17E-13	6.23E-13	6.83E-13	6.9E-13	
20	residual	7.21E-12	1.02E-11	9.74E-12	1.37E-11	1.27E-12	1.78E-12	1.77E-12	2.49E-12	
21	Total	2.89E-11	4.2E-11	3.68E-11	5.4E-11	1.31E-10	1.23E-09	1.85E-10	1.75E-09	
22										
23										
24										

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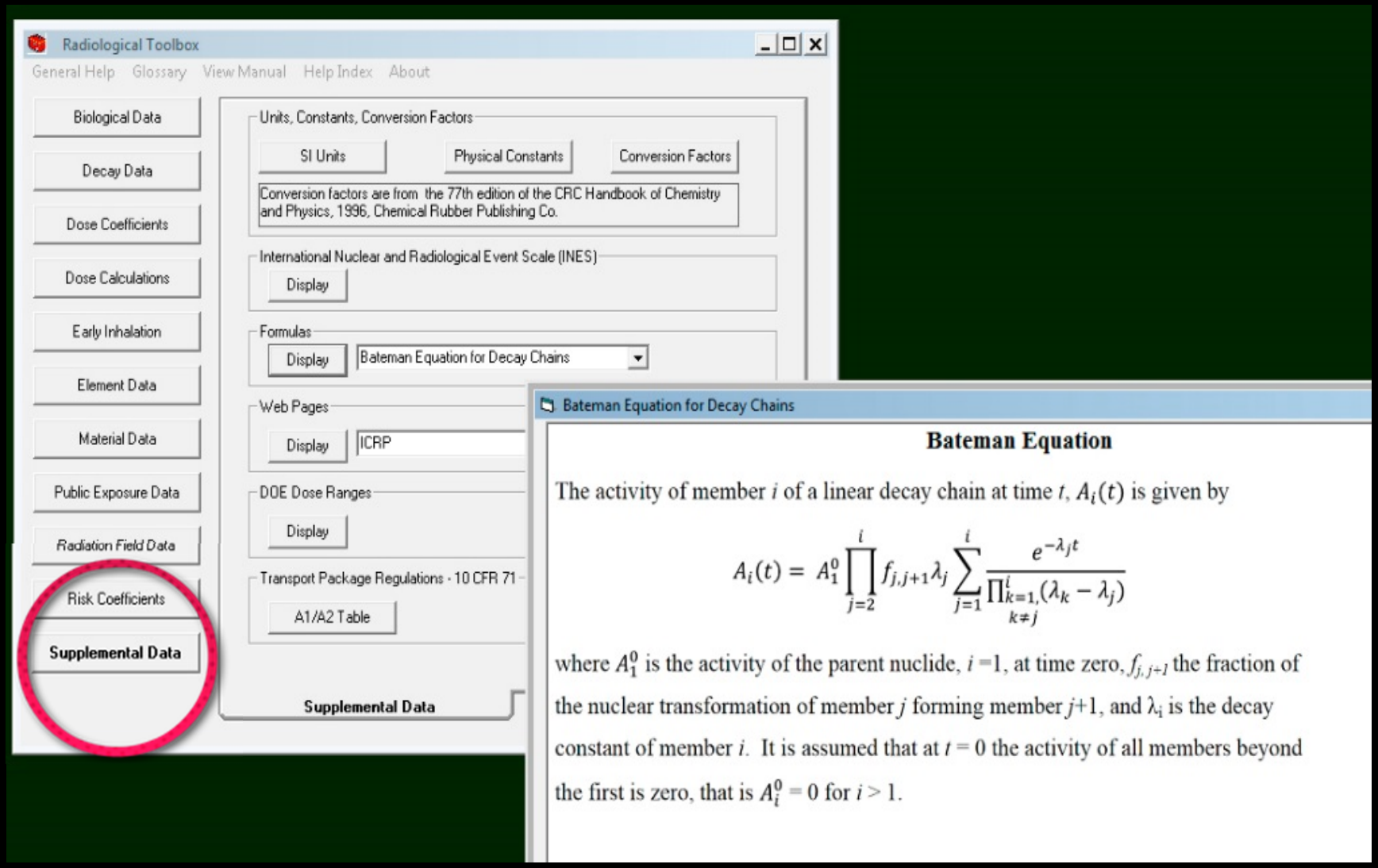
(db11) Supplemental Data



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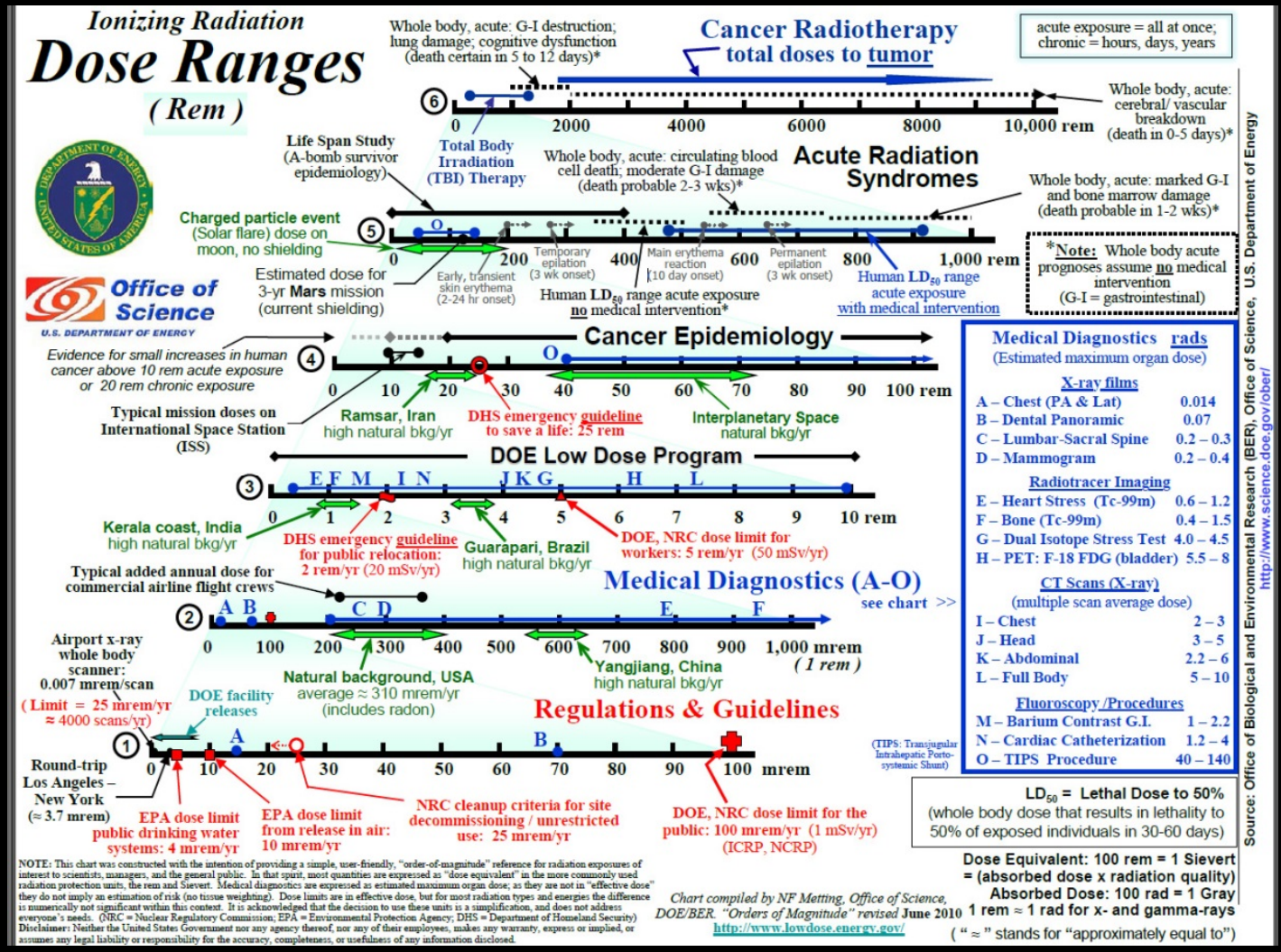
(db11) DOE: Office of Science



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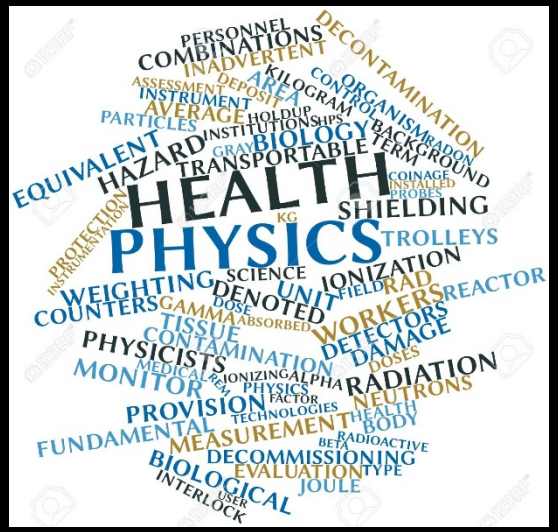
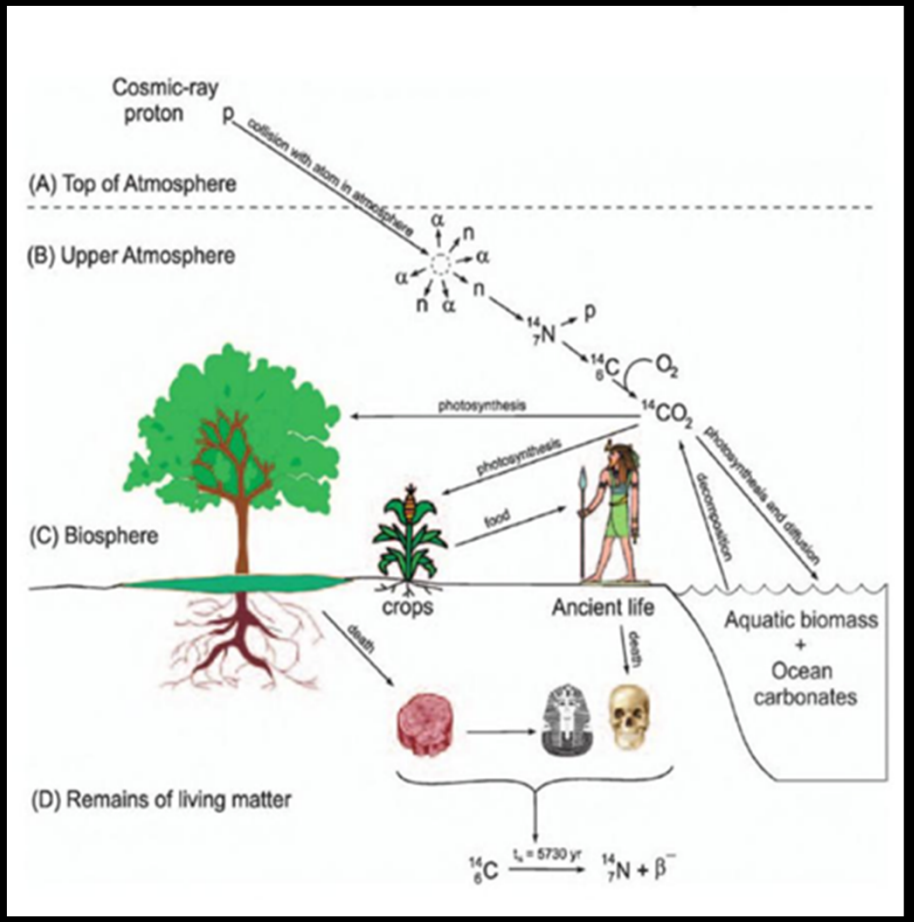
Do We Need More Database?





$$C(x,y,z,t) = \frac{Q}{2\pi u \sigma_y \sigma_z} \cdot \exp\left(-\frac{y^2}{2\sigma_y^2}\right)\left[\exp\left(-\frac{(z-H_e)^2}{2\sigma_z^2}\right) + \exp\left(-\frac{(z+H_e)^2}{2\sigma_z^2}\right)\right]$$

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Oranges & Apples

A first peek at Cuyama Valley solar project

Plant would generate power for 13,000 homes, company says

By Brian Bullock / Staff Writer / bbullock@santamariatimes.com
Jan 29, 2013

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