

Comments on paper
by Gyuseong Cho *et al.*, titled:
“Proposing a Simple Radiation Scale for
the Public: RAdiation INdex (RAIN)”

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The Radiation Richter Scale, or “RADRISC” Level

Logarithmic (factors of 10 above background)

- analogous to the Richter Scale

“***Level 0***” set to correspond to a ***typical background level***:

- 10 μ Sv per day

Total range possible on Earth is encompassed roughly by
RADRISC Levels 0 - 9

- coincidentally, ***the same range*** and ***similar “severity”*** as the Richter Scale

Examples Using the RADRISK Scale

	<u>Standard Units:</u>	<u>RADRISC Level:</u>
Background Levels:	~ 0.365 rem/y or <u>10 μSv/d</u>	0.0
Radiation from the granite inside U.S. Capitol:	~ 800 μSv/y	0.1
Living at 2,000 meters altitude (e.g., Denver):	an extra ~ 6 μSv/d	0.2
Flight Attendant or Rad Worker Regs (<i>on the job</i>): (<i>average</i> over time at work and at home):	up to 10-20 mSv/y	up to 1.0 - 1.3 (<i>at work</i>) up to 0.5 - 0.8 (<i>average</i>)

Some of the first responders at Fukushima encountered (at this level, reached annual occupational limit in 25 hrs, or 3 shifts)	~ 10 mSv/h	4.4
“Spent Fuel Standard” (considered <i>self-protecting</i>) (LD-50 exposure in ~4 hrs)	1 Sv/h (at 1 meter)	6.4
Near <u>unshielded</u> spent nuclear fuel right after discharge (fatal dose of 10 Sv in 90 seconds)	~ 400 Sv/h	9.0

Advantages of the RADRISC Scale

- Easy to remember by *analogy to Richter scale*
- Easy to understand in terms of *relative levels of risk*
- Helps convey to the public that radiation risk is best described by “*orders of magnitude*,” rather than a simple linear scale of what’s measurable, e.g.,
 - flight attendants allowed environments up to: RADRISC Level 1
 - first responders at Fukushima saw levels up to: RADRISC Level 4-5
 - near unshielded spent nuclear fuel assembly: RADRISC Level 9
- Makes it *easy to translate* radiation levels into extra days’ or years’ worth of *background dose* -- and thus to compare doses vs., say, an 85-year lifetime of background dose. For example:
 - RADRISC Level 1 for a year is *10 extra years* of background
 - RADRISC Level 2 for a day is only *100 extra days* of background
 - LD-50 is roughly 1,000 years of background (in an acute dose)

CDC's Radiation Thermometer - Text Version

Rem (rem)	Millisievert (mSv)	<u>Extra vs. Background</u>	DESCRIPTOR
1000	10,000	2,500 years	Dose that results in death for 100% of those who receive it. People who are close to the site of a radiation emergency may be at risk for this dose. [?]
400	4,000	1000 years	Dose that results in death for 50% of those who receive it. People who are close to the site of a radiation emergency may be at risk for this dose. [?]
100	1,000	250 years	Lowest dose that could cause acute radiation syndrome . -- Is also the dose for which risk of getting a fatal cancer increases from about 22% (average risk of cancer in United States) to about 27%.
50	500	125 years	Dose that causes damage to blood cells .
2	20	5 years/year (RADRISC 0.8)	Recommended threshold for relocating people (if projected dose from radioactive contamination for the coming year is greater than this).
1	10	2.5 years	Dose received during a typical CT scan (Computerized Tomography).
0.62 0.365	6.2 3.65	"background" (RADRISC 0)	Average dose per year for people in the U.S. from: -- naturally occurring background radiation: 310 mrem -- medical exposures: 300 mrem [median medical is likely much less than this] -- consumer products: 10 mrem
0.01	0.1	10 days	Typical dose from a chest x-ray .
0.0035	0.035	3.5 days	Dose from high altitude solar and cosmic radiation during a flight from New York City to Los Angeles.
0.0005	0.005	12 hours	Typical dose from dental x-rays (bitewings or full mouth survey).