The LNT Landscape and the Role of Radiation Protection Professionals

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THOSE LINEAR NO-THRESHOLD BLUES

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• Emeritus member of ICRP Committee 3
Since the human data left us
Without any low-dose facts
We’re lost on how to deal with
The less than 10-rad whacks.

We’ve got those linear ... those linear no-threshold blues.

The theories all have key flaws
The experiments often vary
The explanations are not solid
And the science is quite hairy

We’ve got those low-down linear ... those low-down linear no-threshold blues.
Some people cry hormesis
Some people yell repair
Most people moan we don’t know
So let’s pretend it’s there

We’ve got those very-low-down linear … those very-low-down linear no-threshold blues.

The profession gets more vocal
The government more staid
What should we really do about Millirads in which we bathe

We’ve got those linear … those linear no-threshold blues.
The Council and Commission
Sound caution and constraint
But folks are spending big bucks
On risks for which there ain’t.

We’ve got those low-down linear
... those low-down linear no-threshold blues.

Science and perception
May forever disagree
Even if it’s clarified
By microdoesimetry.

We’ve got those very-low-down linear
... those very-low-down linear no-threshold blues.
A dialogue has started up
Opinions are prolific
Everyone has got the chance
To claim they’re scientific

We’ve got those linear ... those linear no-threshold blues.

That discourse is ongoing
A debate that’s fully staged
Day by day and year by year
The question stays engaged.

We’ve got those low-down linear ... those low-down linear no-threshold blues.
Those “for” have a point of view
Those “not for” have another
A magic link is needed
To join one to the other.

We’ve got those very-low-down
linear ... those very-low-down
linear no-threshold blues.

Those low-down blues.
My Daughter’s Room

Co-60

Cs-137
You Should Say .....
HPS is a professional organization whose mission is:

“Excellence in the science and practice of radiation safety”

https://hps.org/documents/strategicplan.pdf
Once I Asked a Few Colleagues
What a Safe Dose of Radiation Is

(Data presented during my HPS president-elect chapter tour, 2011-12)

• All radiation professionals
  • 41 HPS members (87%)
  • 21 CHP (45%)
  • 16 PhD (34%)
  • 10 PhD/CHP
  • 3 MD

• Range of responses spanned three orders of magnitude!
  • For adults: 1 mSV to 1000 mSV
  • For children: 0.3 mSV to 250 mSV
The LNT model ... should continue to be used for radiation protection purposes.

This is in accord with judgments by other national and international scientific committees ... that no alternative dose-response relationship appears more pragmatic or prudent for radiation protection purposes than the LNT model.
• [Use of the LNT model] is considered by the Commission to be the best practical approach to managing risk from radiation exposure.
ICRP Publication 99 (2005)
Low-dose Extrapolation of Radiation-related Cancer Risk

- While existence of a low-dose threshold does not seem to be unlikely for radiation-related cancers of certain tissues, the evidence does not favor the existence of a universal threshold.

- The LNT hypothesis, combined with an uncertain DDREF for extrapolation from high doses, remains a prudent basis for radiation protection at low doses and low dose rates.
• Current scientific evidence is consistent with the hypothesis that there is a linear, no-threshold dose-response relationship between exposure to ionizing radiation and the development of cancer in humans.

• The assumption that any stimulatory hormetic effects from low doses of ionizing radiation will have a significant health benefit to humans that exceeds potential detrimental effects from the radiation exposure is unwarranted at this time.
Dose-effect relationships and estimation of the carcinogenic effects of low doses of ionizing radiation (2005)

- “On the basis of our present knowledge, it is not possible to define the threshold level ... or to provide the evidence for it.”
- “[LNT] should be considered as a tool which is useful for regulatory purposes because it simplifies the administrative task.”
- “LNT relationship is often applied incorrectly to large numbers of people ... These calculations based on collective doses do not have any meaning, as UNSCEAR and ICRP have pointed out. Nevertheless, some people are still applying them.”
- “Without any scientific justification, these calculations propagate the idea that even a very small dose of radiation is dangerous.”
The French Academy of Sciences presenters pointed out that the LNT theory of radiation damage can be appropriately used as a risk management tool but not as a risk assessment tool.

Based on the Committee’s review of the French Academy report and the BEIR VII report, the Committee finds the current state of knowledge does not warrant any change to current NRC radiation protection standards or limits.
Swiss Commission for Radiation Protection and Surveillance of Radioactivity

Prise de position de la CPR concernant le modèle linéaire sans seuil

Version: 14.11.2013

“The KSR/CPR considers that the LNT model remains the best tool to manage the risk of radiation exposure.”
• “Despite inherent limitations, the LNT model is, in regulation and practice, the most widely used and recommended approach for prospectively managing radiation risks.”

• “It should be underlined that the radiological protection system remains very effective, and there is no need for a prompt revision.”
The Current System of Radiation Protection

• Although not perfect, it **has worked.**
  • A culture of safety is in place.
  • Unnecessary exposures to workers and the public have been reduced.

• **It does need improvement.**
  • We face serious challenges in the age of communication.
  • More cleanup of terminology and concepts is needed.

• **It can be misused ... and it often is!**
  • Exaggerated risks, misplaced priorities and expenditures
  • Radiation safety professionals can play a constructive role here.
Undermining Our National and the International System of Radiation Protection

• Erodes public confidence
• Disillusions young RP professionals
• Hurts our profession

Let’s remember:
“Excellence in the science and practice of radiation safety”
Thank you!

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